International Journal of Neurology

Homage to
Harold Wolff

ISSUE DEDICATED TO:

HEADACHE

VOLUME 3 1962 NUMBER 1

INTERNATIONAL JOURNAL OF NEUROLOGY

CONTENTS OF VOLUME 3, Nº 1, 1962

Editorial

Este número de la Revista Internacional de Neurología se publica en homenaje a la memoria del Dr. Harold Wolff, cuyas contribuciones han sido de fundamental importancia en la comprensión del dolor de cabeza. Puede decirse que el Dr. Wolff fue uno de los grandes promotores del interés que este tópico ha levantado en el mundo científico médico.

La cefalalgia constituye uno de los temas más apasionantes de la medicina.

Es un síntoma muy frecuente y a veces sumamente molesto, tanto que algunas crisis por su intensidad llegan a ser invalidantes.

Acompaña a casi todas las enfermedades y en su génesis, frecuencia e intensidad a menudo inciden factores psíquicos que deben ser considerados siempre en el enfoque de estos problemas.

Sus mecanismos fisiopatológicos son variados y a veces se hace difícil dilucidarlos.

La cefalalgia no siempre tiene igual importancia dentro del cuadro clínico. Unas veces, particularmente en las enfermedades infecciosas, grippe, tifoidea, etc., existe mientras se mantiene el proceso del cual es un síntoma y habitualmente desaparece con éste.

En otras constituye un elemento importante en el marco de una enfermedad neurológica. Al clínico le preocupa la conducta a seguir frente a la lesión causal, peligrosa para la vida del enfermo; en esta situación se encuentran entre otras el tumor cerebral, la hemorragia meningea, la meningitis, etc.

Por último está el difícil problema de la cefalalgia crónica que constituye la razón de la consulta y de la terapéutica, lo fundamental de la entidad clínica, a menudo sin una lesión anatómica clara y que debe ser diagnosticada y tratada en forma racional.

Antes de la época actual en que tanto se ha avanzado en la comprensión de los mecanismos fisiopatológicos de las cefalalgias, gracias en gran parte a los aportes de las investigaciones de autores norteamericanos, el tratamiento de este malestar giraba alrededor de ciertos factores etiológicos cuya importancia se sobreestimaba.

Así se prestaba gran interés a la dentadura y algunos pacientes perdían por eso muchos, cuando no todos sus dientes; la posibilidad de una afección ocular llevaban al clínico y al enfermo a cifrar grandes esperanzas en una prescripción de lentes, la cual a menudo no resultaba en un alivio; el diagnóstico de una sinusitis se pensaba, podía dar la solución del problema; pero hoy se sabe que esta es una contingencia poco frecuente en un consultorio de cefalalgias.

Por último cuando se habían discutido todas las posibilidades orgánicas, si una cefalalgia se prolongaba y no se hallaba una explicación satisfactoria de la misma y todas las terapéuticas habían fracasado, entonces se sospechaba de que fuera síntoma de una sífilis que hasta entonces se había mantenido oculta y que nadie presumía y venía entonces irremediablemente un tratamiento de prueba en base a mercurio, bismuto a veces neosalvarsan o iodo. Por supuesto que esto en la gran mayoría de los casos fracasaba, simplemente porque la sífilis no existía; pero a veces el paciente quedaba señalado como posible sifilítico por el tratamiento recibido. El planteo de la sífilis no servía ningún propósito útil porque no era la causa de la cefalalgia; pero quedaba para el paciente un balance negativo para su futuro por la duda que imponía el tratamiento recibido.

Otras enfermedades más justificadamente han merecido gran atención en el estudio de una cefalalgia, la hipertensión arterial, las afecciones hepatobiliares, las endócrinas; pero no siempre al ser estas diagnosticadas y tratadas la cefalalgia mejora, indicio de que o hay simple coincidencia y no relación de causa a efecto, o existen otros factores agregados que juegan un papel fundamental y aquí cobran un interés de primer plano los de orden psicológico.

Actualmente el planteo del problema de las cefalalgias se hace en una forma especial.

Se estudia con nuevas técnicas con rigorismo científico, se han hecho y se hacen precisas comprobaciones clínicas, se ha experimentado en el hombre en el acto quirúrgico, hay datos recogidos por los investigadores sobre ellos mismos; se ha ahondado en el conocimiento de los problemas anímicos de los que sufren de cefalalgias y si bien queda mucho por saberse, los conceptos modernos sobre el tema son más racionales y precisos.

En este achaque es muy importante conocer los mecanismos que están en juego, se insiste mucho en los vasos, particularmente las arterias, y en los músculos, la región cervical se ha jerarquizado del punto de vista fisiopatológico.

Los factores psicológicos inciden con frecuencia. Si son bien aclarados y precisados en cada paciente, le significan a menudo el logro de un beneficio, mediando la buena palabra del médico, tanto como no se obtiene por ningún recurso farmacológico.

Expresamos nuestro reconocimiento al brillante grupo de científicos que con entusiasmo y espontaneidad brindaron sus valiosísimas contribuciones sobre este tópico, Dres. Arnold P. Friedman, Robert Ryan, Charles Kunkle, Max Chamlin, Lawrence E. Hinkle y Srta. Helen Goodell de los Estados Unidos; Dres. Shigeo Okinaka, Torijiro Ikemi, Haruo Akimoto del Japón y Dr. Jean Nick de Francia.

Editorial

This issue is in homage to the memory of Dr. Harold Wolff, whose contributions have been of fundamental importance in gaining an understanding of the puzzling problems of headache. It can be said that Dr. Wolff has been one of the greatest promoters of interest that this topic has aroused in the medical world.

Headache is one of the most fascinating subjects of Medicine. It is a frequent and sometimes a very disturbing symptom; some of the crisis reach the point of immobilizing the sufferer, at times it is very difficult to discover its mechanism, it coincides with almost every ailment. Psychogenic factors are often of great importance in the cause and also in its frequency and intensity, and they ought always to be considered in studing this kind of patients.

Headache has not always the same importance in the clinical picture.

Sometimes, particularly when dealing with infectious diseases, like grippe, typhus, etc. it exists during the course of the illness and ends when the general process is over.

In other circumstances it constitutes a very important symptom in the clinical picture of a neurological disease but the real preocupation for the clinician is the management of the causal lesion which endangers the patient's life. In this situation, brain tumor, meningeal hemorrhage, meningitis, etc., must be taken into account.

Lastly, there are the chronic headaches which constitute a very difficult problem. They are the chief complaint that brings about the consultation and the therapy, very often without any clear anatomical lesion, and which must be diagnosed and treated in a rational way.

Due in a great part to american investigators, who have shed light on this puzzling problem of headache, we know more about the physiopathological mechanism of this ailment. It is necessary to recall the time when the treatment of this disturbing symptom was determined by some etiological factors whose importance were overestimated; in this way great concern was given the dental condition of the patient and due to this, many of them lost many, if not all of their teeth. The possibility of some ocular perturbance lead to great hopes concerning eyeglass prescriptions, which in many instances did not alleviate at all; another solution to the problem was thought to a sinusitis behind the persistant headache. Today it is known that this is a rare condition in a headache clinic.

After this, when all the organic posibilities were exhausted, if a headache was unreasonably persistent and no satisfactory explanation encountered, and

all the therapeutic weapons had failed, then it was regarded as a symptomatic evidence of a syphilis that until then nobody suspected. Therefore, right away all the therapeutic measures reserved for syphilis were instituted.

They began a trial treatment with mercury, bismuth, neosalvarsan or iodine. As may be guessed all this in many instances leds to a failure, simply because there was not such a syphilis present; but the patient was left with the stigma of possibly being a syphilitic person, because of the kind of the therapy prescribed for him.

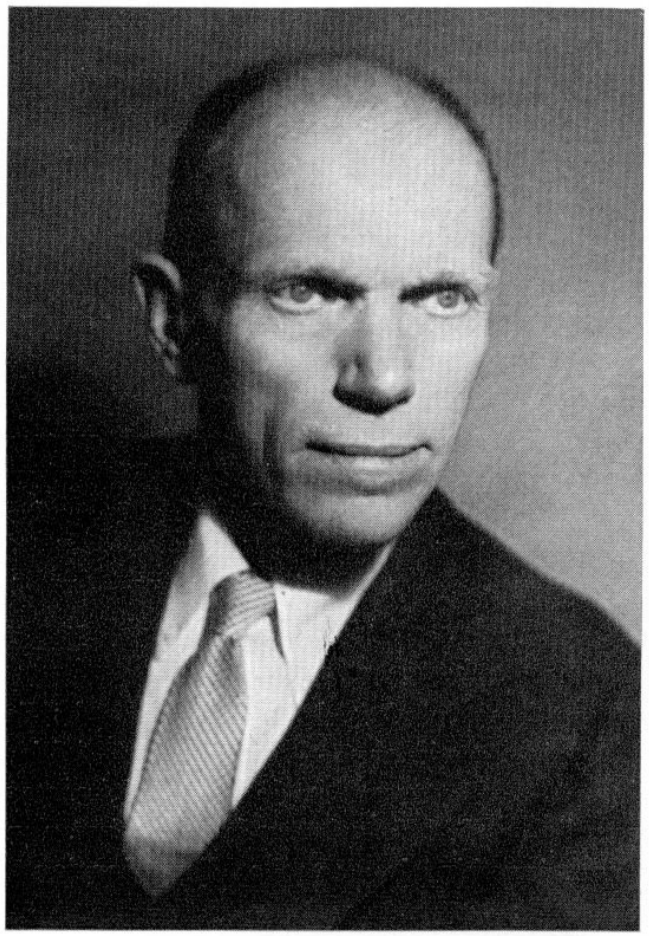
There are a number of illnesses that the doctor is more justified in regarding as headache producing, such as arterial hypertension, hepatobiliary and endocrine disorders, but not always their diagnosis and treatment result in headache improvement. This brings us to reflect whether there is a simple coincidence between headache and the diseases discovered, no relation at all, or that another factors which being superimposed play a fundamental role. It is in these instances that psychological factors are of prime importance.

At present the approach to the headache problem in done in a special way. New techniques are applied in its study with strict scientific criteria.

Precise clinical observations have been made and being carried on. Investigations have been done during surgical procedures, information has been gathered by the investigators about themselves. Knowledge of the animical problems of headache patients has been furthered and even though there are many problems to be solved yet, at present there is a more precise and coherent vision of this aliment. It is of main importance in throwing light on the mechanisms to understand the factors involved.

Much emphasis has been placed on the vessels, particularly arteries, and muscles, the cervical region has evidenced great importance from the physiopathological point of view. The psychological factors are very frequent, if they are discovered and carefully studied in every case a great benefit can be rendered to the patient, by means of a kind and understanding word of the physician, more than with a host of pharmaceutical products.

We are very much obliged to the brilliant group of doctors who have responded enthusiastically and spontaneously in furnishing their very valuable contributions on this topic, Drs. Arnold P. Friedman, Robert Ryan. E. Charles Kunkle, Max Chamlin, Lawrence E. Hinkle, and Miss Helen Goodell from U.S.A.; Drs. Shigeo Okinaka, Yugiro Ikemi, Haruo Akimoto, fram Japan, and Dr. Jean Nick from France.



HAROLD WOLFF
1898 - 1962

"I have loved no darkness,
Sophisticated no truth,
Nursed no deluson,
Allowed no fear."

Final words of William Osler addressed to the Profession of United States and Canada at the farewell dinner in New York, May 2nd, 1905.

Life has discharged one of its most valiant defenders, Dr. Harold Wolff, from its battlefield and with the highest honors. A scholar of nature he scrutinized medical problems under the cold light of his scientific mind. Many were the achievements conquered in behalf of his fellow man, the sufferer. And his intellectual gifts lighted the torch of scientific enthusiasm in a host of investigators, who are in the avant guard in illuminating the baffling problems of today's Medicine.

A New Yorker by birth, Harold Wolff was the only child of Louis and Emma Wolff, educated at the City College, and later at Harvard where he received his medical degree in 1923, and an M.A. degree in 1928.

After house staff training in Medicine at New York's Roosevelt Hospital and in Neurology at the Cornell Clinic he returned to Boston where the blending of clinical and laboratory work which was going to characterize his scientific contribution to medicine, was carried on in the laboratories and clinics of Drs. Harry Forbes and Stanley Cobb. From there he went to work at John Hopkins at the Phipps Clinic under Adolph Meyer, and he completed this period of his life where the trends of his future activities were clearly delineated.

Then to Russia to spend some time with Ivan Pavlov, and afterward a year with Dr. Otto Loewi at Graz in Austria.

So, training in clinical and experimental Neurology ranging from synaptic transmission to conditioned reflexes fully equipped young Dr. Wolff for his future endeavors in the conquest of knowledge of the mechanisms that regulate health and determine disease.

When in 1932 Cornell opened its new medical center at the New York Hospital, Wolff joined the faculty as Chief of the Neurological Division under Dr. Eugene Dubois in the Department of Medicine. Later he succeeded Dr. Foster Kennedy as Professor of Neurology and Director of the Neurological Division at Bellevue, as well as at Cornell and the New York Hospital. In 1958 the Anne Parrish Titzel Professorship of Medicine (Neurology) was created for him at Cornell through the bequest of one of his patients.

Many honors have been conferred on Dr. Harold Wolff, abroad and in his own country. A living testimony of the impact of his personality on our generation, is the long list of outstanding former collaborators scattered through out the world, many of them holding the rank of professor who are contributing through teaching and investigation to the dissemination and enrichment of knowledge.

The pursuit of knowledge in the shrine of science was Harold Wolff's only devotion until he was thirty years old. Then something wonderful happened to his life when he met Isabel Bishop a beautiful creative painter who was a rising star in the art world.

They married in 1934, went to Bermuda for their honeymoon and then returned to a lovely home near the Hudson river on the northern edge of New York City. The tranquil comfortable atmosphere there was in marked contrast to the hectic active din of downtown New York into which the New York Central Railroad would plunge them and thousands of their fellow uptown dwellers daily: Isabel to her studio to express her aesthetic ideas and Harold to the New York Hospital at Cornell Medical Center, to his many faceted activities of teaching, care of patients and investigation.

Returning from work they would still enjoy intellectual activity as relaxation. After dinner Harold would frequently ask his wife to read poetry or a selection from the classics. His laboratory associates might be entertained with Auden, Cummings, or Jane Austin; and once it was recalled that, Isabel read a chapter from Plutarch's Lives after dinner.

Their elders were surrounded by their loving devotion, Harold's parents lived with them and Isabel's mother spent the last years of her life in a next door house easy to reach across the garden.

The great amount of work carried on by Dr. Wolff, clearly speaks of his methodic life. His associates testify that the hours of his day were planned to the minute. The wards, the laboratories, the classroom demanded so much of his time, that there was no room for "small talk". Every minute of his heavy schedule had its purpose. It is said that pattern and order were his fetish.

Being otherwise, could he have possibly accomplished so many things well done? Teaching, administrating, attending patients, editing books and journals, writing, working on committees, lecturing hither and you and experimenting in the laboratory, all this demanded an inflexible will and iron resolution. No wonder that some of his early students refer to him as a great introspective philosopher. Those who enjoy life as if it were an eternal gift, and always having time to share with their fellow men in aimless conversation, may not understand the brusqueness of the one pressed by self imposed duty. Sir William Osler knew quite well that it is a drama for the doctor to extract time to perfect his art, and he used to give advise to cultivate the gift of taciturnity "You may learn to consume your own smoke", he said. "The atmosphere is darkened by the murmuring and whisperings of men and women over the non-essentials, the trifles that are inevitably incident to the hurly-burly of the day's routine".

This doesn't mean by any means that Dr. Harold Wolff wasn't aware of what was happening in the currents of non medical activities. Lunch time, where tension was a little bit relaxed, his associates enjoyed hearing his opinion about a great variety of subjects ranging through current drama, baseball, prize fights, music and painting. In his orderly life, art and sports and music received a goodly share of his attention.

Brain and muscles were daily equilibrated by a vigorous game of squash.

Under the spell of his unique personality, young men who shared with him long hours of exhausting work learned to play this game in order to enjoy his scintillating conversation during these moments of happy relaxation. "In order to become a good neurologist one must learn to play squash".

His benefical influence was also felt in the field of art. On Saturdays at four o'clock after experiments he would be off, with all his associates to visit a nearby gallery. His keen appreciation of the work exhibited, made of him a wonderful guide and his enthusiasm was so infectious that many of his followers began to collect valuable prints or pictures and three of them at least have already outstanding collections of modern painting.

No better word than "teacher", to classify his generous spirit in his devotion to share with others what he regarded as best in life.

But as an artist, his love of perfection made of him a rigorous leader, whose aim was to bring out the best of everyone connected with him. He did this even at the risk of being looked upon as too demanding so that they would not suffer from what Sir William Osler described in this way: "Occasionally a man of superlative merit is neglected, but it is because he lacks that most essential gift, the knowledge of how to use his gifts".

He secured very easily the cooperation of the young because everyone of them felt the warm glow of his interest in their preoccupations and ideas.

He always found time to help them go through their problems in an original and creative way. Being an expert at getting at the core of every problem, he would ask them when dealing with some facts that could give a new perspective to the topic in question "What is its significance?" The time that he was so jealous

to give to casual amenities was generously spared in helping others to formulate their ideas. This was done with a tolerant spirit, and boundless capacity for kindness and understanding was the frequent comment among the resident and research collaborators.

His students felt elated at his ability to lead the conversation at a level that elicited the best from them. Every bit of clinical data gradually and clearly integrated into a meaningful whole and held together by the solid link of the precise word, until truth was easily grasped through intelligence.

In many instances some of his junior associates would come to ask for his opinion about the results of a long laborious project. Reviewing it he would say "Why don't you dive down again and see if you came up with something better?"

This comment would be desvasting for those that did not know that he was applying to others his own proven formula. To dive into the inner self, and reach that luminous region of the mind where the poet affirms that all the enigmas are resolved, and all truth revealed; and to gather up fresher ideas and a more challenging perspective for the question under scrutiny.

He stirred what he recently called in one of his editorials the "Dormant Human Potentials" that unexpected change that springs from creativeness and is referred to in his article "As to why these hidden changes occurred at first whenever they did, we can only appeal, says Sinnot, to the innate creativeness and tendency to change that is in all protoplasm evident, to a small degree in lower organisms, but reaching its highest expression in the human species. Has man's protoplasm certain ends that it relentleassly seeks? If so, here lies his chief promise for the future".

Nobody like him derived such pleasure in seeing that all the young men that surrounded him fully evolved into well rounded personalities.

Art, philosophy, music, were cultivated along with a broad view of science. The latter being always approached with attitude of inquiry, rigorous self-discipline, and a respect for evidence.

Now again we realize how strong is in the young the impact of their teacher's personality, and how this projects their influence beyond the limitation of the chosen field. Osler used to say "in the teacher I have always valued the message of the life above the message of the pen".

He would go to any length of sacrifice to grasp a treasured truth, or save his fellow man's life. In many instances he would sleep on a stretcher in the laboratory to be near a patient seriously ill. No wonder that many tears were shed by those that recognized in him the most sincere ally of their welfare.

On Saturday his most fascinating occupation was to devote many hours to experimental work. "The best day of the week", he would say.

He was constantly alert, to avoid those gaps in the fabric of his days where the precious hours could slip through without any substantial results.

He managed to accept every invitation, and as one of his associate remarks "He would usually stay less than half an hour, and be off after a few sips of a drink, he would appear with gracious words for the host and then circulate around the room, shaking hands and exchanging meaningful words with a good number of guests. He had a special knack for telling a good joke and he was apt to tarry with the group who had a new one to tell him".

He would always carry the conversation to higher levels, so some profit was derived for all.

He tried to avoid the inane overtures, as Emerson said "Politeness ruins conversation", and when he joined a table for a dinner he would start with a challenging question that would be a dynamo to generate the poser for a fruitful and interesting piece of conversation.

Sometimes he could get by some problem that would be boring his mind. Then he would make his occasional interlocutor take part in the game of chasing out the right answer, by passing to him the annoying question. Very often they would be delighted at the intellectual exchange that would set to work their highest, reasoning faculties. Sometimes absorbed in the problem he would pass the ball to the wrong opponent and just this happened several years ago while working with the problem of the peptic ulcer. He was trying to disclose the hidden facts that made this disease more frequent in men than in women. It is commented that one evening as he sat down at a dinner in his home he turned to the lady at his right and asked Mrs. Y: "what do you consider the essential nature of maleness?" Mrs. Y blushed to the full limit of her decolletage. He quickly had the answer to his own question. Wolff with all his matter of factness and his devotion to precision was an extremely kind and gracious man who would never intentionally embarrass or hurt another human being.

It is narrated that one sensitive minister after a convulsive attack in public, felt he could never stand again in a pulpit. Dr. Wolff persuaded him to substitute preaching in small parishes outside New York and in order to strengthen his patient's courage, he traveled to Long Island, New Jersey, or Westchester to sit quietly in the congregation near the front.

However undemonstrative, Harold Wolff, he was regarded as a warmly understanding friend with whom one could discuss absolutely any subject without fear of ridicule, censure or betrayal. When he died one of his associates stated, "Scores of people lost their main anchor".

The human side of an investigator, physician, teacher or friend, sets the real value of personality, as the quality of the chrystal clearly defines its worth in spite of how perfectly it is engraved.

At his home he and his talented and beautiful wife gave frequent dinner parties at least once or twice a week. There the streams of Art and Science intermingled, when Isabel Bishop's friends from artistic and literary circles would join those who shared with Harold a life devoted to medicine and science.

Many of them came to his home from distant parts of the world such as Tanganyika, Japan, Sweden, South Australia and South Africa. The Wolff's home was a center of attraction for those who enjoyed conversation, art, science and music. Dr. Harold Wolff had a superb collection of records and his wonderful phonograph was one of his main prides. Among musicians Mozart was his favorite. Every day of his life had a musical intelude. Being respecful of others' opinion he once asked his son (when he was eight) what record he would like to hear. Without hesitation came the prompt answer "Gene Autry". Dr. Wolff began to make the panegyric of Mozart's virtues. The little boy stood firm, and Dr. Wolff finally was forced to make a deal with his reluctant son. Two Autrys for one Mozart. So, Harold and his guest went patiently through the Gene Autry records watching the enraptured face of the boy. Respectful to his word, Ramsen in turn quietly sat watching his father's delight listening to Mozart.

In 1960 on the occasion of presenting the anual report of the V. A. Research Program, we learned through his own word his beliefs concerning the personality of an investigator "The quality and accomplishment of a medical research program, he said: depend upon the originality, ingenuity, integrity, and intellectual maturity of the physician and medical scientist who contribute to it. The current concept of medicine clearly established an inseparable relationship between patient care, research and education.

A thoroughly competent physician, therefore, must be proficient in each of these components, and each physician will seek to associate with those institutions where adequate outlets for their capacities are available and encouraged".

How, in which way, did Harold Wolff fulfill his own vision of a medical man, and investigator?

Anatomy and physiology of the cerebral circulation attracted all his attention during his early work with Forbes.

After structure and mechanism of the brain were studied, its links with the environment were next to be explored in the Pavlov Laboratories. The intimate chemical changes that govern the neuronal function were also an object of his inquisitive mind and no better introduction to the subject than Otto Loewi's the Nobel Prize winner.

Thus prepared, the clinic experimentings and teaching were benefited by a wide perspective that this philosopher of nature gave to his art. For him Medicine was a way to comprehend man in health and illness.

He said: "Although the methods and data from chemical and physical laboratories are of value in defining details as to the site and nature of defect within the neuraxis, as yet the facts of the evolving symptoms and signs and the use of bedside methods of examination are of most value.

Though not very sharp, they are still far and away the best tools we have in the diagnosis of most neuropathies, neuralgias, neuritides, headaches, demyelinating diseases, seizure disorders and a host of reversible disturbances of brain function".

Nervous System and Disease

His inquisitive mind was not satisfied with just restornig the broken equilibrium that generates illness but to learn what are the mechanisms involved in both keeping and losing the gift of health.

The participation of the nervous system according to Wolff is of most importance in both instances.

"I am part of all I met" said Ulysses. This statement means that man cannot get away from his environment. Accepting or rejecting the enviromment is always working on his self. And the sensitive mediator is that delicate fabric of nerves and cells that is called the nervous system.

How it works, how it adapts to it, how it rises above it, of how, impotent to cope with its dificulties, it breakes down?

Dr. Wolff asserts that underlying diseases there is always an organic reaction to some conflicting situation, a misuse of adaptive reactions patters.

More, not only in diseases, but in health our whole being is affected by our state of mind, like the athlete who pulls together his whole being to perform muscular feats, every action is backed by the whole body.

But when the mind is confused when the anguish of uncertainty blurs the path to the sought after goal, when frustration, rejection, insecurity, set in

motion destructive thoughts, then like an orchestra in which the director flusters, everyone of the performers wishes to save the concert in front of the audience and begins to play a "solo" of his own invention exaggerating his part.

So, "the mucous membrane lining of the stomach becomes intensely engorged, its acid secretion greatly accelerated and its rhythmic contractions augmented" for a meal that will never come. The muscles of the neck and back, say "enter into action!" and contract furiously themselves for a fray that may never take place. The heart and vessels of the body may overwork and contract excessively as though the individual were stopping a mortal hemorrhage or facing a crisis of fight or flight, as Dr. Wolff said, when, as a matter of fact he may be sitting inertly in his office chair.

Thus, the harmonic function of this orchestra not only fails in the overexertion of its components but also the rhythm goes astray. If the situation reaches the point of being overwhelming the rhythm slows down and when the threat provokes aggresive action the rhythm is dangerously acelerated.

Dr. Wolff recalled that on the occasion of the Leningrad siege, 60 per cent of the population developed hypertension.

All these organic erroneous reactions resultin wide variety of ailments, in different systems and in more than one at the same time.

Dr. Wolff observed: edema, diapedesis, hemorrhage, erosion, increased friability of tissue, lowered pain threshold, and impaired organ function in nose, airways, eyes, stomach, colon, bladder and vagina.

He could also have the opportunity to study the modifications taking place in what Slaughter called "The case of the blushing stomach". The patient was fed from his childhood through an artificial opening leading to the stomach. Through this window, Dr. Wolff and Dr. Stewart Wolf could observe the changes in the tissue lining this organ under different life situations. This patient otherwise normal, under conditions of anger and resentment similar to those experienced by ulcer sufferers, showed an increased hyperhemia. If he was depressed or alarmed the rate of contraction decreased and his stomach was markedly pale. The blushing of the stomach was correlative of the changes in the faces observed under the same conditions.

This testifies once more to the wholeness of man's reaction to the events that put to test his nervous system. Only an intuitive artist like Shakespeare could put on the lips of Macbeth the knowledge that a brain perturbed by sorrow, need be cleansed of those noxious thoughts that are a heavy burden to the heart, when he says:

"Canst thou minister to a mind diseased,
Pluck from the memory a rooted sorrow
Raze out the written troubles of the brain,
And with some sweet oblivious antidote
Cleanse the stuffed bossom of that perilous stuff
Which weighs upon the heart".

Headache

One of the major contributions of Dr. Harold Wolff to contemporary neurology was his exhaustive study of the wide variety of pain gathered under the denomination of "Headache" and the no less wide scope of causes that set

it in motion. His demonstration that vulnerability of tissue can be enhanced by suggestion is a milestone in medicine.

Underlying the headache phenomena he pointed out the importance of the patient's temperament, as the perceptual experience varied in quality and intensity according to his personality and the meaning he gave to the pain producing situation.

Having been himself an occasional migraine sufferr it is interesting to learn how he defines this ailment to which he gave so much of his creative energy and whose mechanisms he formulated so brilliantly:

"The migraine attack is a relatively innocuous sign that the organism is under stress. It should be heeded, for unlike other signs such us those of peptic ulcer which are ominous and less reversible, the migraine syndrome touches with a light hand. In a sense, the painful episode is a blessing, since it imposes rest upon those who unwittingly tax themselves dangerously".

No patient was more gentle and understanding of the defense mechanism of nature, no doubt that pain that usually exagerates everyone's reactions couldn't make him lose his mastery of self, but it gave a finer temper to his steel and molded firmer the noble elements in his character.

He devoted many years of his fruitful life to clarifying the mechanism of headache. He was aware of the fact that a dilatation exists of the arteries during the atack of headache and that the major cerebral blood vessels are covered by a network of nerve fibers having to do with pain.

Along with his collaborators Dr. Wolff discovered a substance which they called "neurokinin" and that is manufactured in greater amounts during headache attacks than in normal states. He defined the neural mechanisms of its production.

Systematically Dr. Wolff studied every problem which in turn lead his inquisitive mind to newer ones. The large host of investigators that helped him in his pursuit of knowledge, clearly speaks eloquently of his contageous enthusiasm. Many of the more significant observations he made with interns and residents who had no previous training in investigation.

From the assumption that the network of nerves that envolves the blood vessels was a source of headaches, sprang a manifold of studies which called for the collaboration of internists, surgeons, ophtalmologists, otologists and dentists.

In his eagerness to understand man, both in normal and abnormal conditions, Dr. Wolff deepened his knowledge of human nature, from the neurochemical changes to patterns of behavior, unifying man's wholeness, so fragmented in the hands of antropologists, psychoanalists, sociologists, etc., in these days of dangerous ultraspecialization.

His inner eye, like the third one of Siva gazed into man's future and his plasticity and capacity for learning the most magnificent promise for the destiny of mankind. His contemporaries are deeply indebted to Dr. Harold Wolff for exalting the duties of a teacher, investigator, philosopher and humanist to the highest rank of Art.

VICTOR SORIANO

The Pathophysiology of Headache

Compiled from the writings of the late

HAROLD G. WOLFF, M. D.

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These studies have been supported in part by bequests from patients and grants from the U.S. Public Health Service and the Human Ecology Fund.

Headache is probably the commonest bodily complaint. More than 85 per cent of the people in the United States have headache at one time or another, while fewer than 15 per cent say they never have had headache. Of the 85 per cent who say they have headache, only about 15 per cent have headaches that are bad enough to send them to a doctor. It is fortunate that only one in two or three hundred headache patients coming to the doctor will have headache from serious causes.

Headache always means something wrong: but fortunately, it more often means "wrong pace" or "wrong direction", rather than an ominous signal of disease. The vast majority of discomforts and pains of the head stem from readily reversible bodily changes and are accompaniments of resentments and dissatisfactions. Headache may be equally intense whether its complications are malignant or benign. There are few instances in human experience in which so much pain may mean so little in terms of tissue injury; but failure to separate the ominous from the trivial may cost life or create paralyzing fear (1*, 6).

Headaches fall into two major categories as regards origin: those that arise mainly as a result of stimulation of structures on the inside of the head, which is a relatively small number; and those that occur from stimulation of tissues on the outside and adjacent to the skull, which constitute a large category.

HEADACHE RESULTING FROM STIMULATION OF STRUCTURES INSIDE THE HEAD

In this category are the headaches associated with brain tumors, brain abcesses, subdural hematomas, hemorrhages into the brain, inflammation (meningitis) and other brain injuries. When headache stems from such causes it may be a serious sign. Prompt study of the patient is urgent and surgical treatment may be necessary. Examples of other headaches due to stimulation of structures inside the head are lumbar puncture and drainage headache, the headache associated with fever, sepsis, and in some instances, a component of vascular headache of the migraine type. Such headaches result from pulling or pressing upon, displacement, inflammation, or distention of the pain-sensitive blood vessels —chiefly the large arteries, veins and venous sinuses—

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* Dr. Wolff completed the manuscript of a revised and enlarged edition of "Headache and Other Pain" only three weeks before his death. It will soon be published by the Oxford University Press, of New York and London.

the coverings, and nerves of the brain. The brain itself is not pain-sensitive; indeed it can be cut, cauterized, or crushed without causing pain.

The use of a variety of stimuli in many patients and the compilation of hundreds of observations by Ray and Wolff(10) has resulted in the following conclusions about the sensitivity to pain of the tissues covering the cranium, the cranium itself and most of the intracranial structures:

1. Of the tissues covering the cranium, all are more or less sensitive to pain, the arteries being especially so (Figure 1).

2. Of the intracranial structures, the great venous sinuses and their venous tributaries from the surface of the brain, parts of the dura at the base, the dural arteries and the cerebral arteries at the base of the brain, the fifth, the ninth and the tenth cranial nerves and the upper three cervical nerves are sensitive to pain (Figure 2).

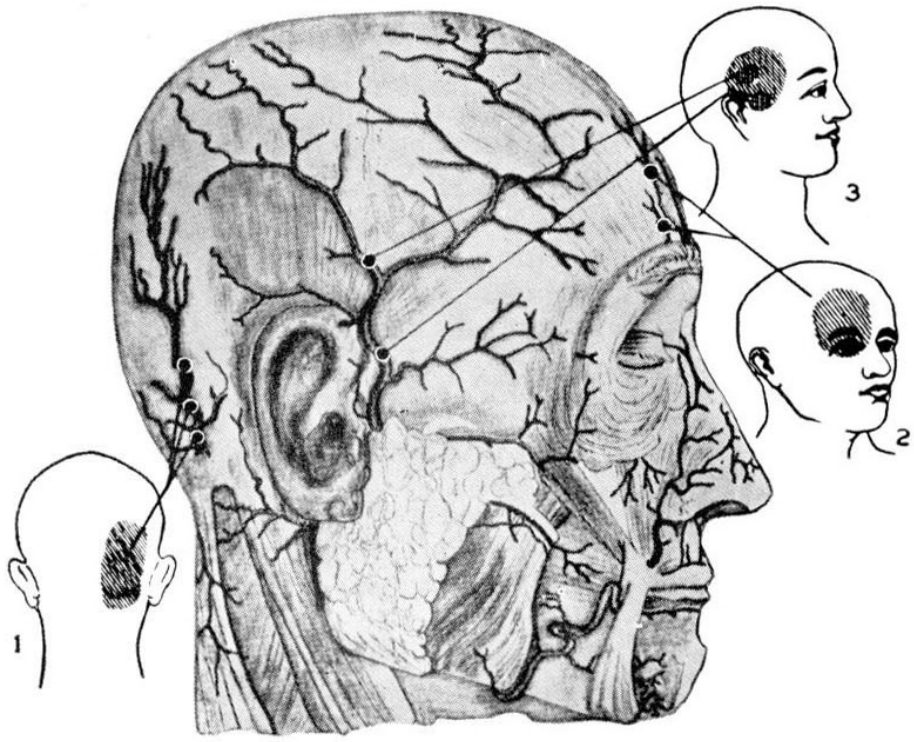

Figure 1. — *The arteries of the scalp The solid circle indicates the poins of stimulation causing pain. The diagrams of heads show the area of pain following stimulation of (1) the occipital arteries; (2) the supraorbital and frontal arteries; and (3) the superficial temporal artery.*

3. The cranium (including the diploic and the emissary veins), the parenchyma of the brain, most of the dura, most of the pia-arachnoid, the ependymal lining of the ventricles and the choroid plexuses are *not* sensitive to pain.

Intracranial diseases commonly cause headache through involvement of more than one pain-sensitive structure. Headache from intracranial disease is usually referred pain.

Stimulation of the pain-sensitive intracranial structures on or above the superior surface of the tentorium cerebelli results in pain in various regions in front a line drawn vertically from the ears across the top of the head. The pathways for this pain are contained in the fifth cranial nerve. Stimulation of the pain-sensitive intracranial structures on or below the inferior surface of the tentorium cerebelli results in pain in various regions behind the line just described. The pathways for this pain are contained chiefly in the ninth and the tenth cranial nerves and the upper three cervical nerves. Pain referred to the head from disease of tissue elsewhere than the head *does not occur,* with the rare exception of pain in the jaw or the neck with angina pectoris.

Headache due to intracranial disease may be secondarily associated with extracranial muscle contraction headache, usually at the occiput, but often elsewhere.

The Headache with Brain Tumor.

The headache with brain tumor was studied by Kunkle and Wolff (12). Local traction and direct pressure may be exerted by the tumor upon adjacent pain-sensitive structures. Extensive displacement of the brain, effected either directly by the enlarging tumor mass or indirectly by ventricular obstruction (internal hydrocephalus) evokes pain from structures remote from, as well as adjacent to, the tumor. Hence, tenderness of the scalp in a given location, a manifestation of pain-sensitive intracranial tissues, may result from disease of distant intracranial structures. Since the headache with brain tumor is usually referred pain, its site has limited value in localization of the lesion. Not only may the headache be remote from the site inducing it, but this site itself (e. g., through distant traction) may be remote from the tumor.

Despite these limitations, when the site of the headache is interpreted in terms of the known principles of intracranial pain production and pain reference, it may aid significantly in localization of the lesion.

1. About one-third of all headaches with brain tumor approximately overlie the tumor, and are usually intermittent.

2. In the absence of papilledema, two-thirds of headaches are near or immediately over the tumor. When unilateral, the headache is on the same side as the tumor.

3. Headache is almost always present with posterior fossa tumor and is the first symptom of such tumors, excepting cerebellopontine angle tumors. The headache is almost always over the back of the head. When headache occurs with cerebellopontine angle tumors, it is frequently and sometimes solely postauricular.

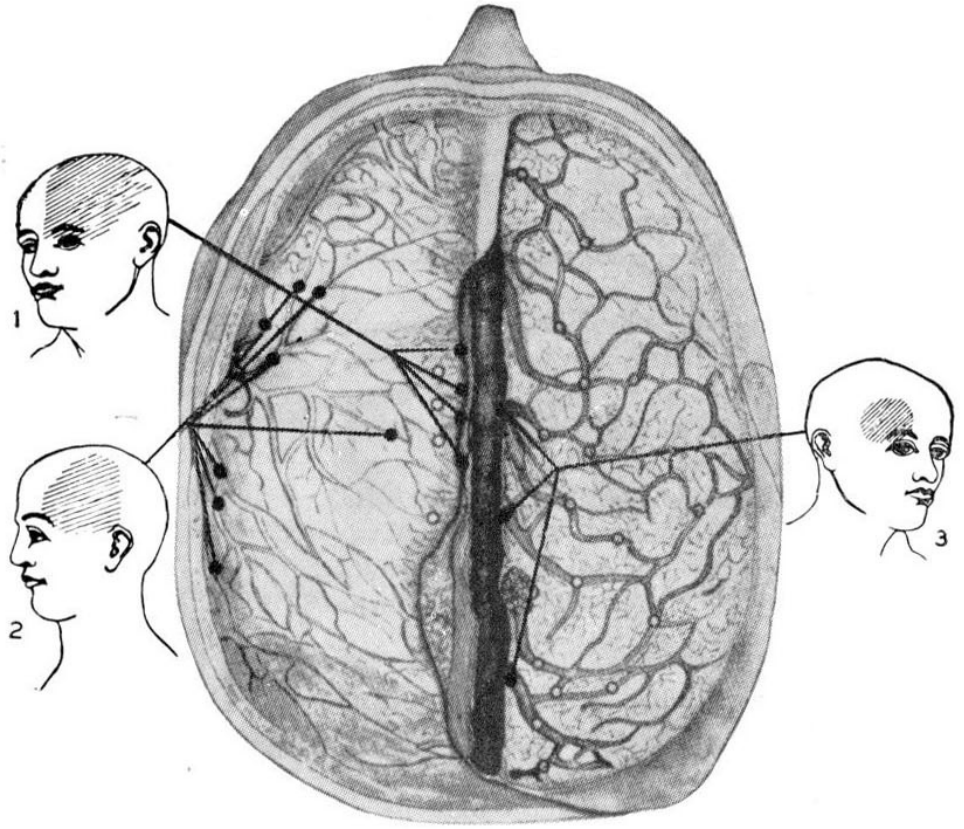

Figure 2. — The calvarium removed. The dura and the meningeal arteries are shown on the left; the cerebral and tributary veins are shown on the right. The hollow circle indicates the point of stimulation without pain; the solid circle indicates the point of stimulation causing pain. The diagrams of heads show the area of pain following stimulation of: (1) the margin of the superior sagittal sinus; (2) the middle meningeal artery; and (3) the tributary veins of the superior sagittal sinus.

4. Headache may be absent, but is a first symptom in about one-third of supratentorial tumors, and is usually in the front of the head. With such tumors, headache rarely occurs in the back of the head, unless associated with papilledema.

5. When headache is both frontal and occipital, the symptom signifies extensive displacement of the brain and has little localizing value.

The headache with brain tumor and with other space-occupying intracranial lesions

such as subdural hematoma(18) is deep, aching, steady, dull, and seldom rhythmic or throbbing. Intermittent headache is usual, but the pain is continous in one-tenth of patients, and is generally more intense in the morning and during the acute phase of minor infections. Occasionally, there is a history of headache which commences during, but persists after, an acute upper respiratory infection. Coughing or straining at stool may aggravate the headache. Some patients prefer the recumbent to the erect position. Rarely is the headache as intense as that associated with migraine, ruptured cerebral aneurysm or meningitis, and interference with sleep is uncommon. Even when there is direct compression and extensive traction displacement of pain-sensitive cranial nerves by slowly growing tumors, headache may be absent or slight and rarely as intense as the pain suffered by many with tic douloureux.

One rare form of agonizing paroxysmal headache is encountered in patients in the terminal phase of brain tumor. Pain is generalized, may last thirty seconds to a half-hour, and then disappear as quicky as it commenced, leaving the patient exhausted and sometimes stuporous. During an attack the patient may become comatose and expire.

The headache of brain tumor, when rarely it is severe, is associated with nausea and vomiting. When the headache is occipital or suboccipital in location, it is often associated with "stiffness" or aching of the muscles of the neck and tilting of the head toward the side of the lesion.

Headache Associated with Fever, Sepsis, and Other Bodily Disorders.

The head pain associated with fever ("pyrexial headache") (7), bacteremia, sepsis, nitrite, and foreign protein administration, carbon monoxide inhalation, hypoxia and asphyxia is due principally to dilatation and distention of intracranial arterial structures. A similar vascular mechanism is the probable basis for the headaches following epileptic seizures (with or without convulsions), certain "hangover headaches", and is a component in many migraine headaches and of those headaches associated with arterial hypertension and Ménière's disease. Painful distention of intracranial arteries is likewise responsible for the headaches induced by procedures which evoke sudden, brisk elevation of the arterial blood pressure. Examples are the headaches associated with: a) distention of the rectum or urinary bladder in paraplegics with transection of the spinal cord above the eighth thoracic segment(24, 26); b) rapid intravenous infusion of epinephrine; and c) the "hypertensive crises" occurring spontaneously or following abdominal massage in a patient with pheochromocytoma. There is no evidence of inflammation within or about the dilated and distended vessels during any of the aforementioned headaches.

The Headache Associated with Meningitis.

The headache of meningitis is primarily related to the lowered pain threshold of inflamed tissues and structures within or adjacent to the coverings of the brain. Though generalized, the inflammatory changes are usually most marked in the basal dura and pia and adjacent blood vessels and nerves at the base of the brain. Under these circumstances even slight jolting of the head, and the usually painless arterial dilatation and distention during each cardiac systole become painful-thus, the characteristic throbbing headache(1).

Headache following Lumbar Puncture.

The headache following lumbar puncture or drainage of cerebrospinal fluid is primarily due to dilatation of and traction upon pain-sensitive intracranial venous structures. In the laboratory, it has been demonstrated by Schumacher and Wolff (9, 11) to be associated with a decrease in cerebrospinal fluid volume, and with a fall in cerebrospinal fluid pressure. It has been completely eliminated by the intrathecal injection of an amount of saline equal to that of spinal fluid removed. Its intensity may be reduced by change from the erect to the horizontal position or by head flexion or extension; its intensity is increased by bilateral jugular compression.

Headache with Increased Intracranial Pressure.

The headache so often associated with increased intracranial pressure has generally been assumed, but never proved, to be related to the increased pressure. In the laboratory, elevation of intracranial pressure in normal human subjects to abnormally high levels has failed to cause headache(14). Headache homolateral to the lesion in a patient with a brain tumor has been induced by lowering the intracranial pressure, but could not be induced by elevation of the pressure to a high level of 550 mm.

Hence, increased intracranial pressure is neither a prime nor an essential factor in the headache that may be associated with it. That increased intracranial pressure is not the dominant factor in headache associated with brain tumor is suggested by an analysis of 72 patients in whom headache occurred almost as commonly (82 per cent) in 23 patients without increased intracranial pressure as it did (94 per cent) in 49 patients with increased pressure(12, 14). The reduction of elevated pressure did not inevitably eliminate tumor headache.

HEADACHE RESULTING FROM STIMULATION OF STRUCTURES OUTSIDE AND ADJACENT TO THE SKULL

In this category fall the vast majority of headaches. Only about 3 of a hundred of these headaches result from infections and abnormalities of the eyes, the ears, the teeth, the nose, or the sinusses, dramatic and troublesome though these headaches may be. Most of these headaches are varieties of so-called "sick headache" or migraine, and muscle contraction headaches.

Head Pain from the Nasal Structures and Sinusses.

Using themselves as subjects, Wolff and his colleagues(2, 13) studied pain from the nasal structures and upper airways. It was impossible to ascertain from the localization of pain in the general area of distribution of the first, second, and third divisions of the fifth cranial nerve, what specific part of these airways or their coverings might be involved. For example, putting an irritant pack under inferior turbinate caused a burning pain locally, followed by a spreading aching pain accompanied by a reddening of the cheek and inability on the part of the subject to tell whether pain was coming from the teeth, his eye, his frontal sinus, his antrum, or perhaps his nose (Figure 3). Stimulating with a faradic current of intensity sufficient to cause a 1 dol pain on the tongue, they found that the nasal and paranasal structures have a varying degree of pain sensitivity. The turbinates, the nasofrontal duct and the ostia of the maxillary sinuses were most sensitive but once inside the frontal sinus and the maxillary sinus, the unchanged intensity of stimulus induced again only a 1/2 to 1 dol pain, similar to that induced on the top of the tongue. The ceiling of pain intensity of 9 to 10 dols was experienced on stimulation of the ostium, and pain was experienced sometimes over the whole side of the face.

The lesson from these observations is well known; that much of the pain from the nose comes from the approaches to the nasal and paranasal spaces and rather less from the paranasal spaces themselves. If these spaces are diseased, obviously they must be treated; but as sources of headache they are indeed much over-rated. In our time the word "sinus" has become the equivalent of "headache" in common language. But indeed *inflammation in the sinuses themselves* was found to be a rare cause of headache, although nasal congestion is a common accompaniment of headache from other causes.

Head Pain from the Teeth.

With his colleagues Robertson and Goodell(21), Dr. Wolff ascertained the distribution and mechanism of headache and other pain in the face and head resulting from noxious impulses originating in the teeth. The investigators used their own teeth for study and made careful observations of their sensations. Noxious stimulation of one or more of the upper teeth resulted in pain that was experienced at first locally and then diffusely in tissues supplied by the second division of the fifth cranial nerve. Noxious stimulation of one or more of the lower teeth also caused pain to be

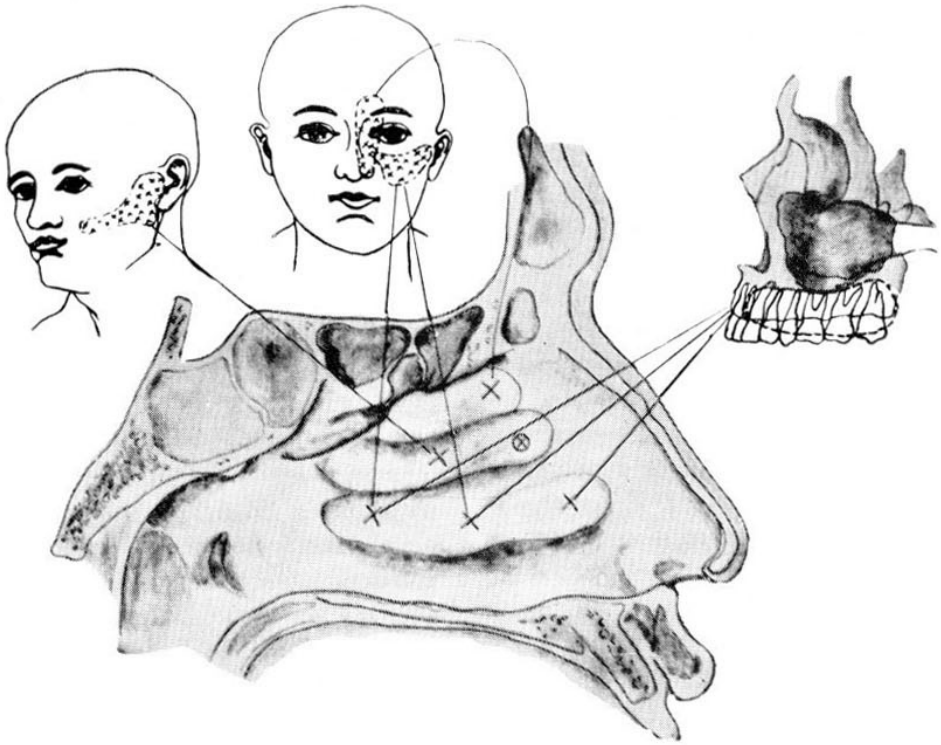

Figure 3. — *Sensibility of the turbinates. The points stimulated on the turbinates are indicated by crosses from which lines lead to the indicated areas in which pain of four to six dols intensity was felt.*

experienced, at first locally and then widely, in the tissues supplied by the third division of the fifth cranial nerve. Prolonged disturbances were more likely to give rise to distant pain than was short-lived stimulation.

Furthermore, homolateral hyperalgesia, tenderness, and vasomotor reactions of tissues remote from the source of impulses in the teeth, such as tender eyeball, reddening of the conjunctiva, and tenderness of the temporal and auricular tissues, were common. It was postulated that the experimental noxious stimulation of the tooth resulted in the liberation of a substance which lowered its pain threshold and in a local inflammatory reaction within the tooth, which outlasted the period of experimental stimulation. Because of the lowered pain threshold minor tissue changes, such as vasodilatation and edema, become capable of evoking impulses which incite central spread of excitatory effects. These are ultimately experienced as headache remote from the site of stimulation.

Muscle Contraction Headache.

About a third of all headaches arise from contraction of the skeletal muscles of the head and neck with or without concurrent vascular components (16, 31, 38). This headache does not throb, but is a steady ache, usually not of great intensity. It may go on for days, weeks, or even years. The individual feels as if he had a hat on or a band around his head, or his neck in a cast; his jaws ache, his shoulders are sore, and it seems that if he could stretch and be rubbed, he would feel better. These sensations ensue from inappropriately contracting the muscles of the head and neck in meeting day-to-day challenges, frustrations, and disappointments. It is the headache one gets from cramming for an examination, driving long hours in heavy traffic, and during the sustained alertness, anxiety and tension of readiness to spring into action, but which

action never comes off (Figure 4). This headache may occur together with vascular headache or may occur secondary to pain from other causes(19) in the head, such as that from sinus(2) and tooth infections (21), a cut or bruises on the head, posterior fossa tumors(1, 10) or from eye muscle imbalance(15).

A troublesome group of patients with muscle contraction headaches are those who have chronic headache following head injury proved not to be associated with subdural hematoma(20). An example of such an individual was a typical "G. I." who was injured in Guadalcanal during a bomb burst. Because of his sustained headache he was sent from veterans' hospital to veterans' hospital, from clinic to clinic. Action potentials recorded from his cranial musculature indicated excessive muscle contraction. The same patient was observed on days when he was relatively comfortable and without painful sensations in his head. Then action potentials from his cranial muscles were minimal. But repeatedly on days when he "nursed his grudge", his head not only felt "tight and sore", but action potentials were high.

Occasionally in an individual following head trauma one can find a painful scar or neuroma which may cause head sensations for weeks or years. These, however, constitute a minor group of "post-traumatic headache". More commonly, individuals with "post-traumatic headaches" have ordinary vascular headaches, muscle tension headaches, or a combination of the two.

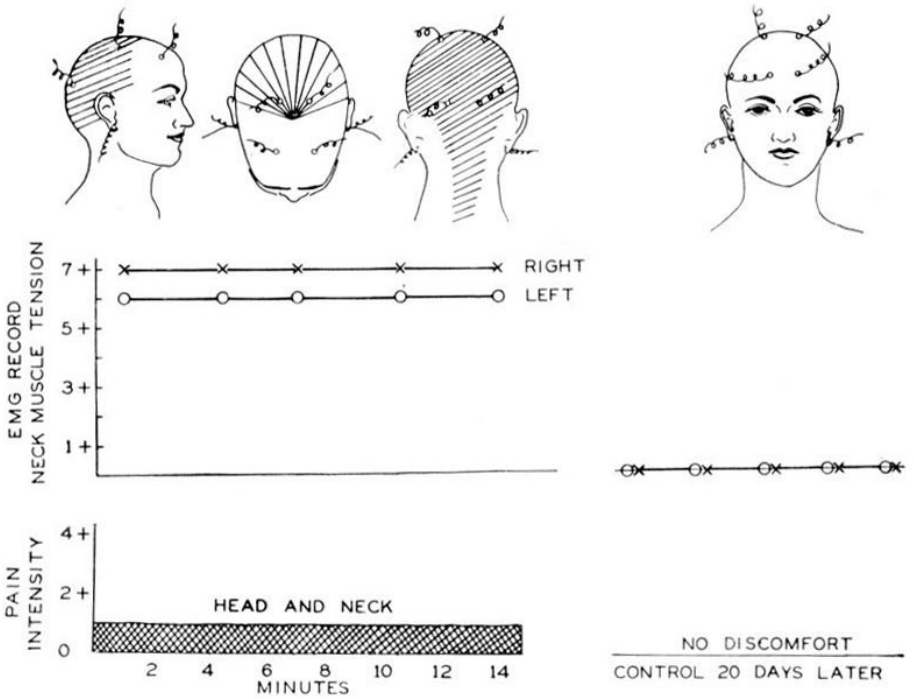

Figure 4. — *The head and neck muscle potentials in an anxious patient with persistent muscle contraction headache.*

VASCULAR HEADACHES

The great majority of all headaches are vascular in type(1). They may be of any intensity from a slight dull ache to a throbbing pain of prostrating severity. They are usually one-sided at onset, but may become generalized, are often accompanied by nausea and vomiting, sometimes by visual disturbances, and sometimes by numbness and tingling of the arms and legs. They may occur in several members of a family(32). Vascular headache is commonly prostrating, and costly in time, but is not damaging to a person in the sense of shortening his life. It results from the stretch of arteries mainly

on the outside of the head, together with the accumulation in the tissues of a substance which makes them tender and easily hurt by pressure from throbbing vessels. In a person having a one-sided vascular headache, the arteries over the temple on the aching side stand out in bold relief, as compared to the other side, and can often be seen to pulsate.

A useful classification of vascular headache of the migraine type has recently been made by a panel on Headache under the auspices of the United States Public Health Service:

A. Vascular headache with sharply defined, transient visual, other sensory and/or motor prodromes ("classic" migraine).

B. Vascular headache without striking prodromes and less often unilateral than Types A and C ("common" migraine). Synonyms are "atypical migraine" or "sick headache". Calling attention to certain relationships of this type of headache to seasonal, environmental, occupational, menstrual or other variables are such terms as: "tropical", "summer", "Monday", "weekend", "relaxation", "premenstrual", and "menstrual" headache.

C. Vascular headache, predominantly unilateral on the same side, associated with flushing, sweating and rhinorrhea, and increased lacrimation, brief in duration and occurring in close-packed groups separated by long remissions ("cluster" headache). Identical or closely allied are: erythroprosopalgia (Bing); ciliary or migrainous neuralgia (Harris); erythromelalgia of the head or histaminic cephalgia (Horton); and petrosal neuralgia (Gardner et al.).

D. Vascular headache featured by sensory and motor phenomena which persist during and after the headache ("hemiplegic" migraine and "ophtalmoplegic" migraine).

E. Headache of possible vascular mechanism centered primarily in the lower face ("lower-half" headache). In this group are atypical facial neuralgia, sphenopalatine ganglion neuralgia (Sluder), and vidian neuralgia (Vail).

The Pathophysiology of Vascular Headache of the Migraine Type.

In a long series of experiments with Clark, Hough, Schumacher, Graham, Marcussen, Kunkle, Tunis, Osfeld and Goodell (3, 4, 5, 8, 9, 22, 25, 27, 28, 30, 41, 42), Dr. Wolff demonstrated the relation of the intensity of headache and the amplitude of pulsations of the branches of the external carotid artery (Figure 1). Pulsations of the temporal and occipital branches were recorded by means of tambours placed on these arteries where they could be palpated under the skin, and connected to a Frank capsule by means of a thick rubber tube. A beam of light from a slit lamp was thrown on a mirror on the thin rubber diaphragm of the capsule in such a way it was reflected into the slit of a camera, to be recorded on moving bromide paper (Figure 5). Any pulsation

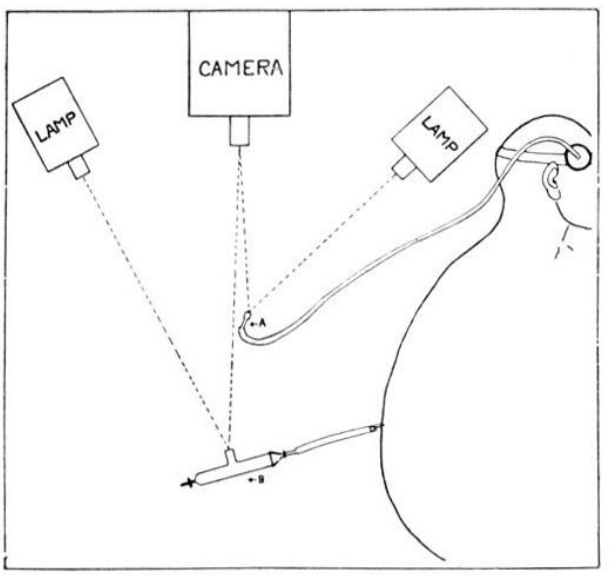

Figure 5. — *Diagram of the arrangement of the subject and the apparatus for registering, by means of light beams reflected from two Frank capsules, the temporal pulse (A) and the pulsations in the subarachnoid space (B), representing intracranial and spinal arterial pulsations and here briefly referred to as "intracranial pulsations".*

transmitted to this air system by the artery caused the mirror to deflect the beam of light through an arc, the length of which was proportional to the force of the impulse. In the same way, pulsations of the intracranial and intravertebral arteries, as

reflected in the spinal fluid, were recorded by means of a Frank capsule connected directly with a needle in the lumbar subarachnoid space. The intravenous injection of histamine results in dilatation of cranial arteries, mainly intracranial ones, which, with normal systemic arterial pressure, causes increased cerebral flow and cerebral vasodilatation (Figure 6). The intense headache associated with these changes was studied as a means of analyzing other, nonexperimental headaches.

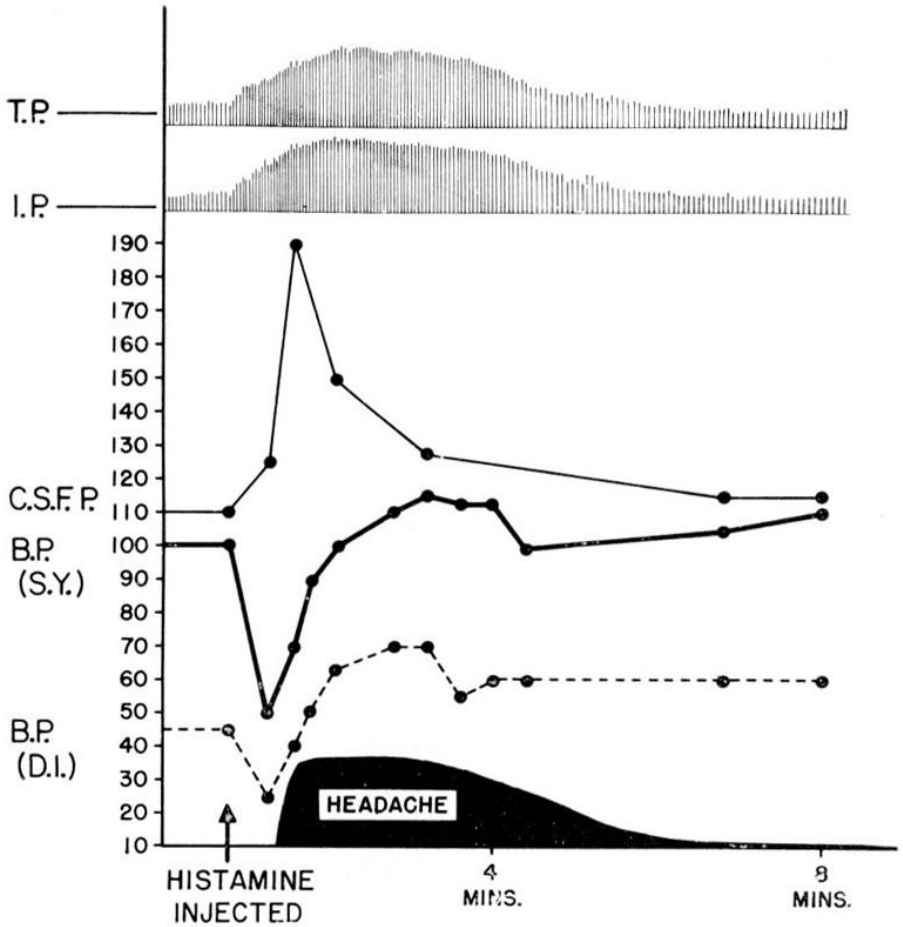

Figure 6. — *Diagrammatic representation of the course of events during headache produced by histamine in subject G. The headache was most severe with rising blood pressure, and it should be noted that at this time the cerebrospinal fluid pressure is returning to its resting level from the high point reached after the injection of histamine. Increase in amplitude and rate of the temporal pulse (T.P.) and of the intracranial pulsation (I.P.) are indicated in the upper two shaded areas. The line C.S.F.P. indicates the cerebrospinal fluid pressure in millimeters of Ringer's solution. Systolic blood pressure is indicated by the heavy black line at B.P.S.Y., and the diastolic blood pressure is indicated by the broken line at DI.*

The headache experimentally induced by histamine was found to be associated, at the height of its intensity, with high amplitudes of both temporal artery and cerebrospinal fluid pulsations, which diminished as the headache diminished. Headache intensity was therefore proportional to the degree of dilatation and stretch of the pial and dural vessels and the perivascular tissue.

The argument of Wolff and his associates for the vascular mechanism of preheadache and headache phenomena of migraine was based upon the following observations:

1. That the preheadache scotomas result from cranial vasoconstriction affecting the occipital cortex and sometimes the retina, was based upon the evidence that scotomas, promptly after their onset, can be diminished or eliminated by a vasodilator agent,

such as amyl nitrite, in amounts sufficient to improve the cerebral circulation but not to significantly lower the blood pressure(8). On the other hand, scotomas are augmented if such an agent is used in amounts sufficient to lower the blood pressure markedly and thus further increase cerebral ischemia.

2. That the pain associated with the migraine attack is caused by dilatation and distention of relaxed cranial arteries, primarily branches of the external carotid artery, was based upon the observation of the increased amplitude of temporal artery pulsations during headache, and the further observation that the intravenous or intramuscular injection of ergotamine tartrate resulted in a decrease in the amplitude of pulsations of the temporal and occipital arteries paralleling abolition(5) of the headache (Figure 7). The therapeutic effect of ergotamine tartrate depends on its ability to constrict relaxed, distended vessels(39). Furthermore, data indicating that during vascular headache of the migraine type there is elaborated locally in extracranial tissues through neuronal activity a tissue-damaging and a pain-threshold-lowering agent were accumulated from a series of experiments carried on with Bilisoly, Schottstaedt, Tunis, Reis, Ostfeld, Chapman, Ramos, Goodell and Silverman(29, 33, 34, 35, 36, 40, 43, 44, 46, 47, 48, 49):

1. During a migraine headache attack there predictably occur lowered deep pain thresholds and edema in those scalp areas in which headache is being experienced(29) (Figure 8). Less commonly, hematomas and painful nodular accumulations of fluid occur. It was observed that the lowered deep pain thresholds and edema predictably terminated together with abolition of headache, but often outlasted the headache itself. The administration of vasoconstrictor agents such as norepinephrine or ergotamine tartrate(36, 37) hastened this process.

2. The bulbar conjunctiva and its vessels on the side of the hemicrania during headache exhibited vasodilatation, edema, burning pain, reduced sensitivity to norepinephrine applied topically, and increased responsiveness to acetylcholine. The occurrence and duration of vasodilatation, edema, and

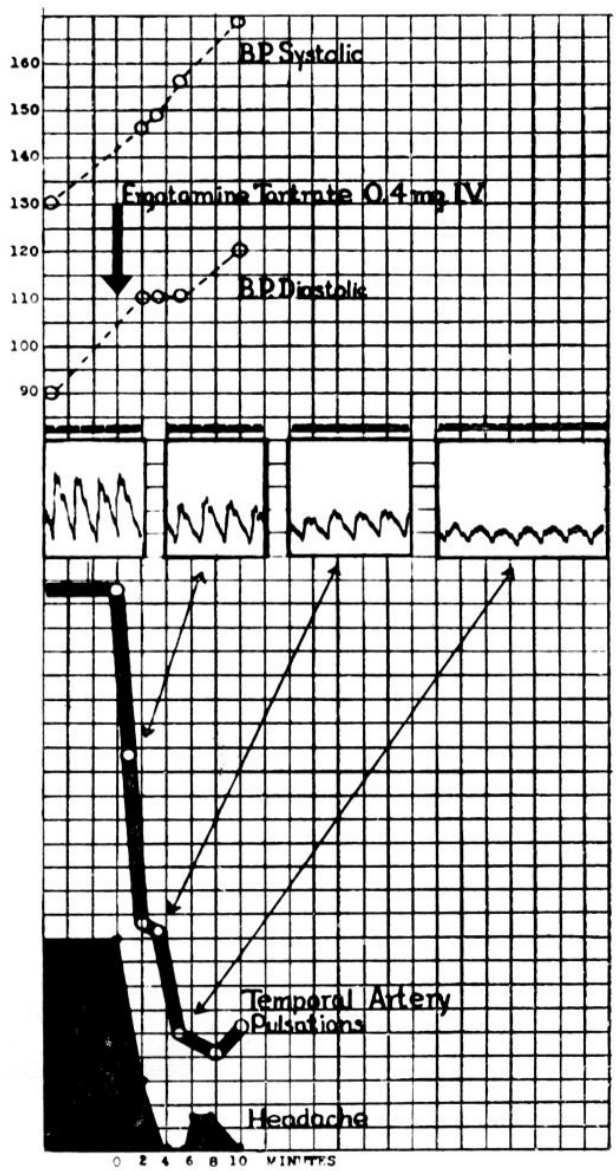

Figure 7. — *Relation of the amplitude of pulsations of the temporal artery to the intensity of headache after administration of ergotamine tartrate. The sharp decrease in the amplitude of pulsations following injection of ergotamine closely paralleled the rapid decrease in intensity of the headache. Representative sections of the photographic record are inserted. The average amplitude of pulsations for any given minute before and after administration of ergotamine was ascertained by measuring the individual pulsations from the photographic record. The points on the heavy black line represent these averages, expressed as percentages. In this record and those in the accompanying figures the initial or "control" amplitude was taken as 100 per cent. The interrupted line represents intervals of one second.*

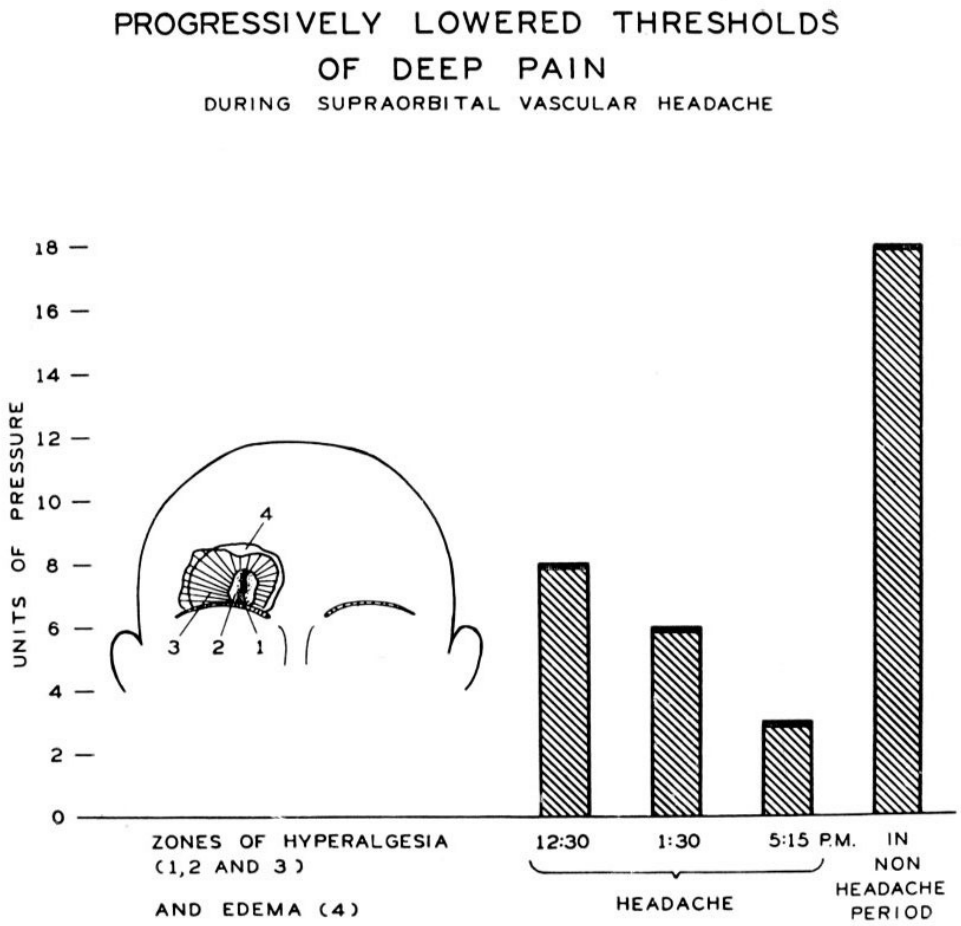

Figure 8. — *Progressively lowered thresholds of deep pain during supraorbital vascular headache. Demonstration of the zone of maximal pain intensity and lowest deep pain threshold over the supraorbital artery (1). Pain threshold was lowered in adjacent tissues (2,3) as headache continued. Note also that the pain threshold was progressively lowered in Zone 1 as headache continued.*

burning pain were not modified by either topical or parenteral administration of antihistaminic, or anticholinergic agents, but were terminated after the administration of the vasoconstrictor agents norepinephrine and ergotamine tartrate(38, 41).

3. Biopsy studies of temporal arteries removed under general anesthesia at a time when these vessels were involved in migraine headaches showed, as compared with temporal arteries removed from nonheadache subjects, perivascular and areolar edema(17).

4. The injection of a spreading factor (hyaluronidase) into a tender area of the head during a migraine headache attack increased the area of tenderness fourfold(40).

5. Extracranial tissue fluid removed from sites of headache contained increased amounts of one or more amino acids, a finding compatible with the thesis that, locally, protein breakdown is augmented during headache attacks(40).

6. Temporal artery dilatation induced by immersion of subjects in warm water was not accompanied by headache, nor by lowered deep pain thresholds(40). Therefore, both cranial artery vasodilatation and the presence locally of a pain-threshold-lowering agent are necessary concomitants to induce headache. These observations led to the hypothesis that in addition to vasodilatation, a local sterile inflammation occurs in headache and that a substance (or substances) that lowers pain threshold, increases capillary permeability, and heightens vulnerability to injury accumulates in the walls of

the arteries and in the adjacent perivascular, areolar and supporting tissues as well.

Demonstration and Definition of Neurokinin (40, 43, 44, 47, 48, 49, 51).

Sterile isotonic saline (2 cc.) was injected subcutaneously, and as much fluid as possible withdrawn under gentle negative pressure during a two-minute interval from a) the tender regions of the heads of persons during headaches of a wide range of intensity, from b) tender region of the scalp following headache attacks, from c) non-tender regions of the heads of persons subject to headache but during headache-free periods, and from d) persons not subject to headache attacks (Figure 9).

It was found that specimens of tissue fluid collected from the head dunring the headache attacks contain a substance that could

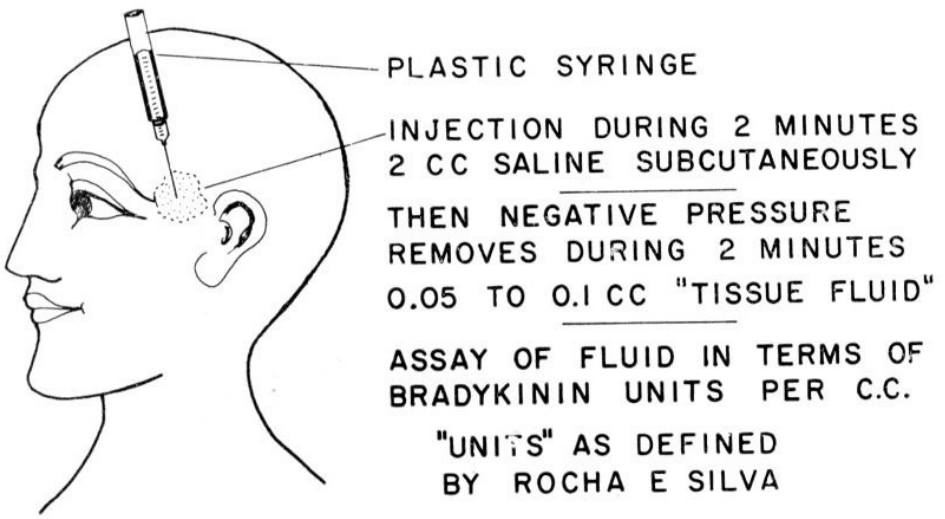

Figure 9. — *Method of collecting tissue fluid.*

be distinguished from serotonin, potassium, ATP, substance P, acetycholine and histamine, although these and other substances may also have been present. The active substance relaxed the isolated rat duodenum, contracted the rat uterus and depressed the blood pressure of the rat. A constant ratio of activity on these several assay preparations among several specimens of tissue fluid indicated that the observed activity of the specimens was due to a single substance.

The activity of the specimens could be stabilized by boiling. Incubation with chymotrypsin inactivated the stabilized specimens, indicating that the active substance remaining after stabilization is a polypeptide. The heat-stabilized substances had many of the properties of bradykinin, kallidin, or plasma kinin. However, when analyzed quantitatively using several assay procedures, including electrophoresis, it was evident that the substance is not indentical with any of these, although it closely resembles them and is a polypeptide of the same general type. This polypeptide has been labeled "neurokinin" and has been found by Dr. Wolff and his associates to be released during neuronal excitation. It is released into tissue fluid of the skin of man during antidromic dorsal root stimulation and during axon reflex flare(51). It is not the result of vasodilatation alone since it is not released during reactive hyperemia. It has also been found in the cerebrospinal fluid of patients during vascular headache of the migraine type(43, 44).

The polypeptide content of specimens collected during headache averaged 8 times as much and in rare instances 35 times as much as control specimens, and the amount was closely related to the intensity of the headache attack (Figure 10). Following administration of ergotamine tartrate in subjects with headache, the intensity of headache, amplitude of cranial artery pulsations, local tenderness, and polypeptide

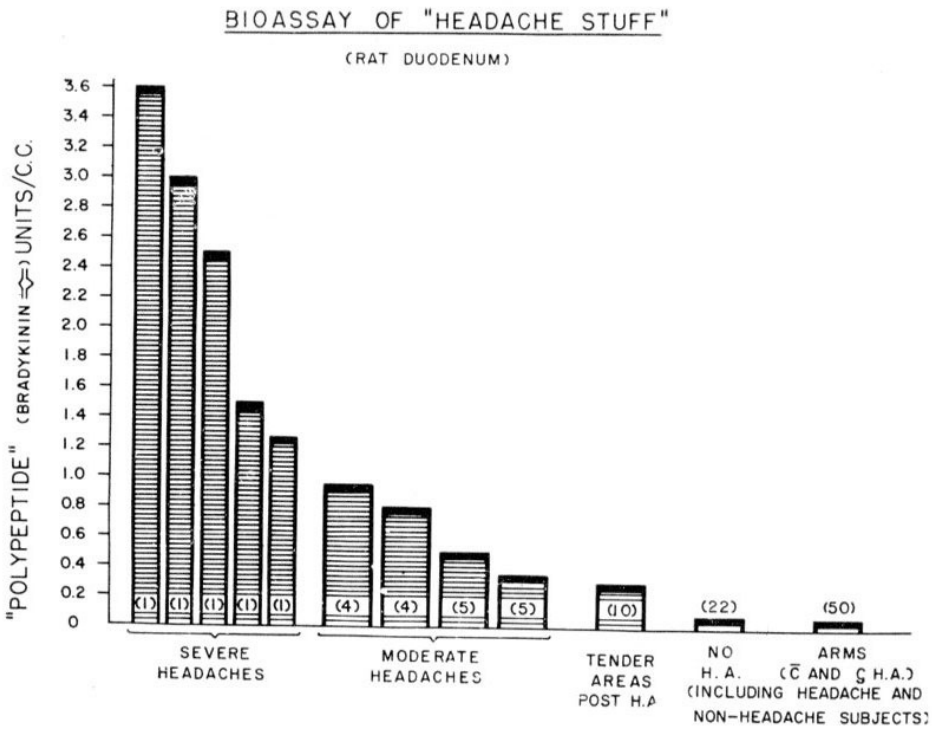

Figure 10. — *Results of bioassay of subcutaneous perfusates grouped according to the intensity of pain.*

content all decreased concurrently. Lowered deep pain thresholds returned to normal.

In addition to the polypeptide, headache fluid contains a proteolytic enzyme, protease, capable of forming neurokinin (presumably by cleavage of a plasma globulin present in subsurface extracellular fluid).

The increased content of polypeptide (neurokinin) and protease found locally can account for many of the features of vascular headache of the migraine type. Neurokinin is an extremely powerful vasodilator. When injected intradermally, tissue fluids containing mixtures of neurokinin and protease induce pain and erythema, lower pain threshold and increase capillary permeability (40, 50).

Since the release or activation of neurokinin-forming enzyme and subsequent formation of neurokinin has been observed during neuronal excitation in man in a variety of circumstances, the potent hypotensive and vasodilator action of neurokinin and its formation during neuronal excitation suggest that it serves in local vasomotor control for the central nervous system (51) (Table 1).

TABLE 1

HEADACHE "STUFF"

1. Present in sub-surface tissue of the head in aching and tender sites during and shortly after vascular headache of the migraine type.
2. In the human skin it
   1) induces vasodilatation
   2) lowers pain threshold
   3) increases capillary permeability
   4) increases vulnerability of tissue to injury.
3. Relaxes rat duodenum.
4. Contracts rat uterus.
5. Depresses rat blood pressure.
6. Its action on rat blood pressure is diminished by
   a) incubation with chymotrypsin (destruction of polypeptide)
   b) boiling (destruction of proteolytic enzyme).

   Its action on rat blood pressure is eliminated by a) plus b), i.e., (incubation with chymotrypsin, followed by boiling)

7. Its activity diminishes rapidly when it is allowed to stand at room temperature.
8. Its properties are those of a mixture of a polypeptide and a proteolytic enzyme and are distinguishable from the properties of bradykinin, kallidin or plasma kinin.

The Migraine Headache Attack as the Outcome of Central Nervous System Activity.

Migraine headache attacks are linked to activity of the central nervous system since they often occur following a long period of alertness, striving, extraordinary effort or major frustration usually associated with feelings of anger and resentment. They may begin with vasoconstriction affecting the cerebral cortex and the retina. The painful local reaction in the extracranial vessels may thus be an epiphenomenon of the excessive operation of the normal mechanisms for functional vasodilatation within the central nervous system (46). A common innervation of the branches of the external and internal carotid arteries (45) could lead to a simultaneous release of vasodilator substances both intracranially and extracranially. Thus, the pain of vascular headache of the migraine type can be seen as the outcome of the combined effects of large artery dilatation plus the action of pain-threshold-lowering substances accumulating in the blood vessel walls and perivascular tissue. These substances are implicated in local vasomotor control. Their accumulation, neurogenically induced, results in a sterile inflammatory reaction (46).

Craniovascular Instability and Vascular Headache.

Repeated measurements over several days of the amplitude of pulsation of the cranial arteries by Marcussen and Kunkle (22), and later by Tunis (27), indicated that in many subjects who have vascular headaches, the variation in tone of the artery walls during headache-free periods is far greater than in those who do not have recurrent headaches, and is indeed greatest in the days preceding

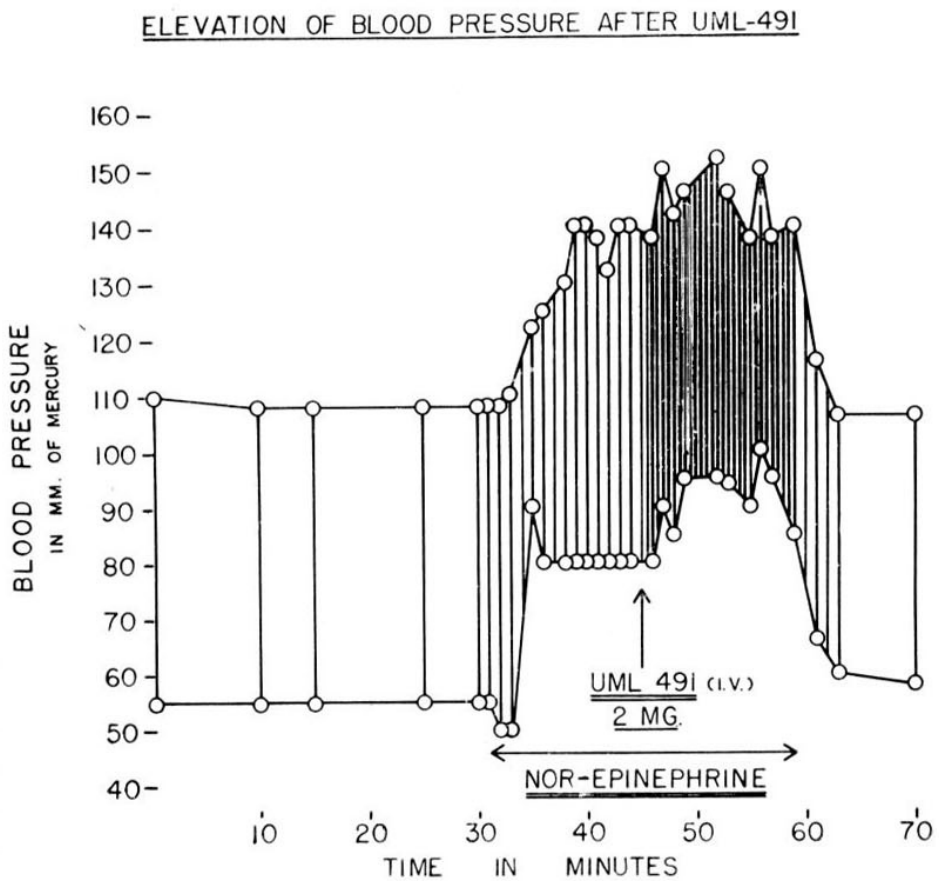

Fig. 11. — *Demonstration of the effect of 1 methyl-d-lysergic acid butanolamide bimaleate (UML-491) in enhancing the vasoconstriction resulting from infusion of norepinephrine.*

an attack. These observations gave support to the concept that the cranial vasomotor apparatus of patients with vascular headaches is more labile than is that of persons who are not subject to headache.

Pharmacodynamic properties of 1-Methyl-D-Lysergic Acid Butanolamide Bimaleate relevant to Vascular Headache of the Migraine Type.

Recently, the possibility of shedding further light an the pathophysiology of vascular headache of the migraine type was suggested by the reports of a number of investigators that 1-methyl-D-lysergic acid butanolamide bimaleate*, while lacking the capacity to terminate an existing headache, is often effective in reducing the number and severity of headache attacks when the agent is maintained at adequate blood levels. Although it does not by itself induce vasoconstriction, it does enhance the vasoconstrictor action of norepinephrine(50) (Figure 11).

1. Anti-Inflammatory Action of 1-Methyl-D-Lysergic Acid Butanolamide Bimaleate.

This agent is effective in diminishing edema formation induced by the injection of serotonin in the rat's paw. In order to show that this phenomenon was not specific

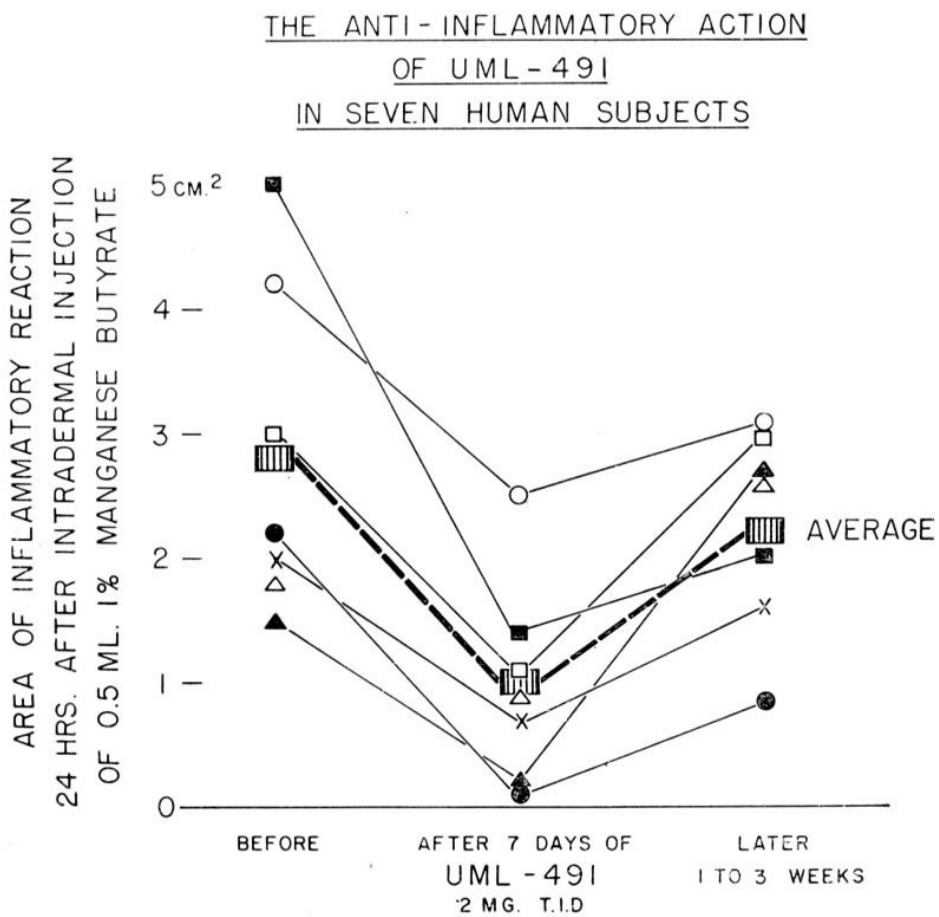

Figure 12. — *The anti-inflammatory action of UML-491 in 7 human subjects. The first column of symbols indicates the individual areas of inflammatory reaction to intradermal injection of manganese butyrate, as measured 24 hours after injection, and before the administration of UML-491. The second column indicates the individual areas of inflammatory reaction to the same amount of manganese butyrate under identical conditions, after 7 days of ingestion of UML-491, 2 mg. 3 times a day. The third column indicates the areas of inflammatory reaction similarly induced 1 to 3 weeks after withdrawal of the UML-491. The reduction in inflammatory reaction is evident during the UML-491 administration.*

* Supplied as UML-491 or Sansert for these investigations by the Sandoz Pharmaceutical Company.

to inflammation induced by serotonin, areas of sterile inflammatory response were produced through the subcutaneous administration of manganese butyrate to seven human subjects. The flare responses induced during UML-491 therapy were significantly smaller than those induced either before or several weeks subsequent to its administration(53) (Figure 12). A verification of this study was made in animal experiments by Zileli(56) where the volume of inflammatory exudate in croton oil pouches was significantly less after pre-treatment with UML-491.

2. Inhibition of Vasomotor Reflexes.

Dampening of the pressor reaction to carotid occlusion is a well recognized property of many of the ergot alkaloids(39). In the anesthetized cat, this pressor response can be abolished by infusion of UML-491 at a rate of 1 mg/kg/hour, suggesting a moderate depressing action on the vasomotor centers, thus damping vasoconstrictor reflexes(54). Although the amounts of the agent required to *abolish* these reflexes in the cat is approximately 100 times more than the amounts that are effective in the prevention of migraine attacks, it is possible that damping of vasoconstrictor reflexes may also be induced by UML-491 in patients with migraine.

Evidence relevant to such a modifying effect on the sensitivity of vasomotor centers was afforded by a study of a series of persons subject to vascular headaches of the migraine type as regards the effect of this alkaloid on the carotid sinus reflex, the cold pressor reflex and the breath holding reflex (55). These were selected as samples of vasomotor reflexes that could be tested in man, although it is recognized that they represent different reactions than those implicated in vascular headache of the migraine type. The magnitude of these reflexes was studied before, during, and in some instances after the daily administration of 4 - 62 mg. amounts of UML-491. It was observed that those subjects experiencing the most striking reduction or elimination of headache also exhibited the greatest inhibitory effect on their vascular reactions to noxious and painful stimulation (Figure 13).

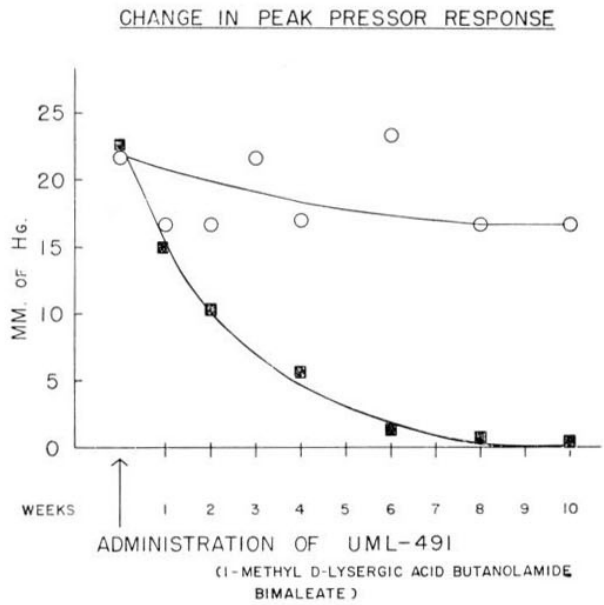

Figure 13. — *A curvilinear representation of the fall in pressor response to noxious stimulation, being a composite of data from 9 subjects with migraine headache of the vascular type, who were significantly benefitted by administration of UML-491 (lower curve). Over a period of 10 weeks, and especially during the first few weeks, the peak pressor response following immersion of the hand in ice water for 5 minutes gradually decreased. The total decrease was approximately 25 mg. Hg. The upper curve of data is from 7 patients who were not benefitted by the agent and who showed no such reduction in response to noxious stimulation.*

3. Inhibition of Changes in Responsivity of Cranial Vessels Associated with Shifts of Body Fluid.

The migraine attack is characterized by initial vasoconstriction followed by vasodilatation. UML-491, when effective, prevents both the preheadache (visual loss) or vasoconstrictor phase and the headache or vasodilator phase. Of its two actions, i.e., a) inhibition of central vasoconstrictor reflex effects, and b) augmentation of peripheral vasoconstriction produced by catecholamines, the former could be significant in inhibiting the initial vasoconstrictor phase of the attack, and the latter in minimizing the subsequent painful dilatation of the vasodilator phase. On the other hand, it is conceivable that the prevention of the ini-

tial vasoconstriction makes the subsequent vasodilatation unlikely to occur.

Since fluid retention and diuresis are part of the migraine attack and changes in the reactivity of the bulbar conjunctival blood vessels occur during such periods of fluid shift, the effects of UML-491 on these phenomena were studied. Fluid shifts were experimentally induced by evoking diencephalic reactions through nicotine. It was observed that concurrently with the oliguria the bulbar conjunctival vessels dilate and become less responsive to serial dilutions of norepinephrine. During the subsequent diuresis, all conjunctival vessels constricted and the response of these vessels to serial dilutions of norepinephrine returned to pre-oliguric levels. Headache was sometimes initiated during the vasodilator and oliguric phase and terminated shortly after the beginning of the vasoconstriction and diuresis (Figure 14). Prior administration of UML-491 during 48 hours strikingly diminished the magnitude of both of these vascular responses; no headache occurred (53, 54, 55).

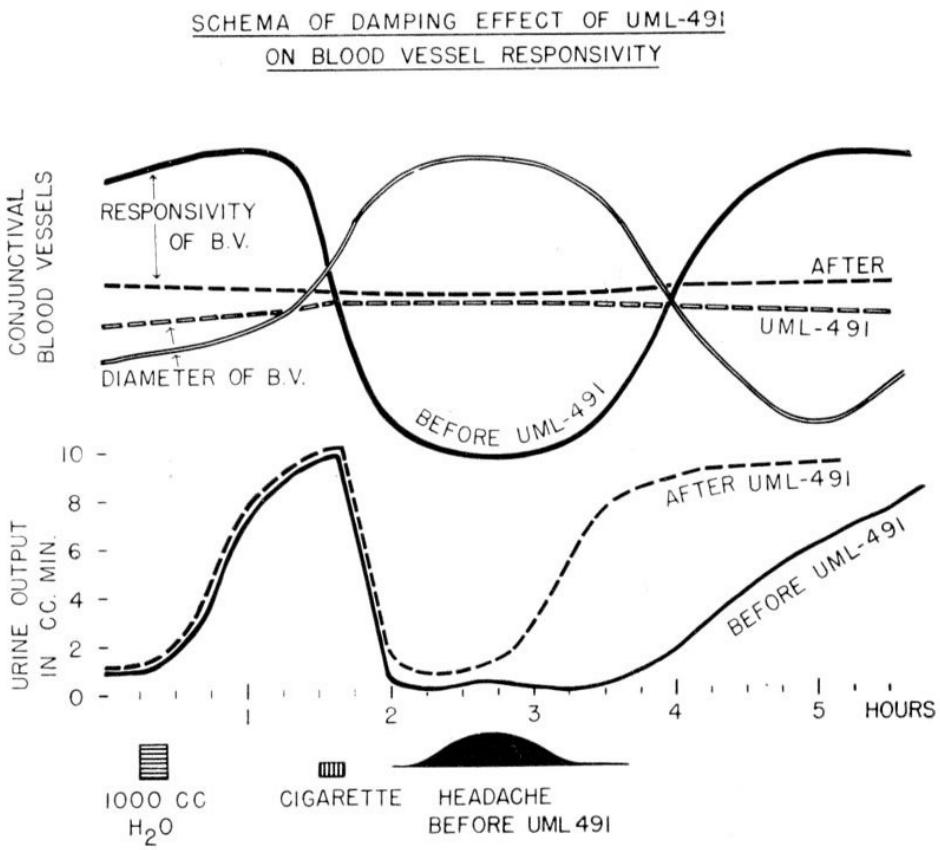

Figure 14. — *In overhydrated patients in whom oliguria is induced, the conjunctival blood vessels become dilated and the response of these vessels to serial dilutions of norepinephrine is diminished (from about 1:200.000 to about 1:50.000). During the spontaneous diuresis which follows induced oliguria, the dilated conjunctival blood vessels become slightly constricted, and the response of these vessels to serial dilutions of norepinephrine is returned to the preoliguria status. These changes in vascular diameter and responsivity to vasoconstrictor agents were related to the duration and degree of the induced oliguria and subsequent diuresis, being more profound in those patients in whom the fluid shifts were most striking. The prior administration of UML-491 reduced the magnitude of these vascular responses, especially during oliguria.*

4. Vasomotor Instability and Vascular Headache.

These data suggest that in the prophylaxis of vascular headache of the migraine type the peripheral actions of this therapeutic agent on cranial blood vessels are significantly supplemented by its effects on

the nervous system. The magnitude of cranial vascular responsivity is reduced, thereby preventing crises of vasoconstriction and vasodilatation that characterize the migraine attack. These observations further support the thesis that the migraine attack is the symptomatic manifestation of recurrent heightened reactivity of cranial blood vessels. Moreover, the modification of vasomotor reflexes, concurrent with a period of reduction in the intensity and frequency of headache attacks, adds further support to the inference that unstable cranial vasomotor functions are a prime factor in the pathophysiology of this variety of headache.

5. Action on Highest Integrative Functions.

From several hours to several days after the administration of 1-methyl-D-lysergic acid butanolamide bimaleate has been initiated, many subjects noted slight anorexia, nausea, "foggy" feelings, mild euphoria, feelings of relaxation, and difficulty in focussing the eyes, and disturbances in gait and equilibrium. These changes were most apparent in those who attempted to continue difficult tasks, maintain schedules, and demand excessive output of energy of themselves. This central action of this alkaloid makes it likely that the pattern of striving and excessive output of effort, so commonly seen in individuals who have migraine headache attacks, will be abandoned when the agent is to be effective in preventing headache.

The Management of Headache.

The management of head pain initiated by brain tumor, abscess, subdural hematoma, subarachnoid hemorrhage, or by disease of the eyes, ears, paranasal sinuses or teeth falls to the surgeon concerned specifically with these disorders. There are, however, no surgical measures of general value in the two commonest kinds of head pain, migraine and muscle-contraction headache; and herein lies the responsibility of the physician, since more than 90 per cent of persons with headaches have them as a result of vascular disturbances or sustained skeletal muscle contraction about the head.

Appropriate pharmacotherapy for acute attacks is commonly effective. The lysergic acid derivative, 1-methyl-D-lysergic acid butanolamide bimaleate, is a useful therapeutic tool in preventing vascular headache of the migraine type in many patients. Yet, for preventive treatment, the simplest and most effective remedy must still be a sympathetic relationship with the patient and a kindly, helpful attitude on the part of a physician who is willing to clarify for the subject the importance of life situations and attitudes in either precipitating or eliminating headache attacks(1, 6, 23).

Migraine headaches commonly occur when hereditarily susceptible persons attempt to control feelings of anxiety or resentment by means of organized and intense activity. It is thus a cranial vascular consequence of a way of life(57). So predictable is this behavior pattern in migraine patients that the interested physician can demonstrate it in nearly every subject he examines.

A striking demonstration of the effects of pernicious attitudes was made by Marcussen (23), who was able to precipitate headache attacks predictably in certain patients with migraine by discussing unsympathetically with them topics of personal importance so that they developed intense feelings of resentment and guilt. Under these circumstances discussions lasting approximately one hour were followed by typical headaches which were terminated by ergotamine tartrate administered intramuscularly (Figure 15). Subsequent encouragement of these patients to recognize the reasons for their angry reactions and helping them to modify their attitudes, resulted in diminution of both the frequency and severity of headache attacks.

No amount of therapeutic or preventive medication alone can take the place of helping the patient to understand himself, and to recognize those factors in his life that may be causing him to go in the wrong direction, or at the wrong pace. Two out of three patients with vascular or muscle tension headache, or this vascular-muscle tension headache combination, can be greatly helped by any physician who is interested in human problems and is willing to spend a minimum of time with his patients in reviewing them with him.

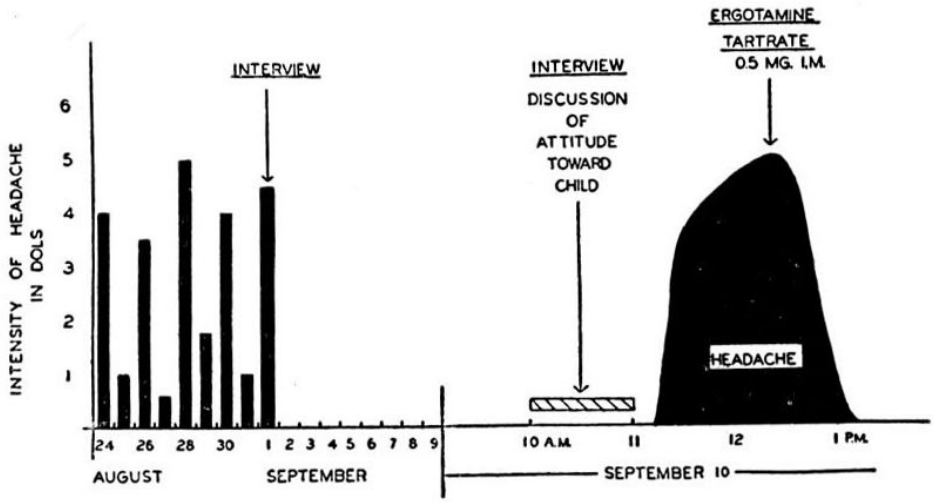

Figure 15. — *Experimental precipitation of a migraine headache attack in a setting of mounting tension by the introduction of a topic arousing conflict, anger, and guilt. Attack terminated by the intravascular administration of ergotamine tartrate. Initial interview on September 1, by dispelling guilt and conflict, reduced the frequency and intensity of attacks. The subsequent interview, intensifying these feelings, precipitated the headache.*

SUMMARY

Only one in two or three hundred headache patients coming to the doctor will have headache from serious causes. Headache may be equally intense whether its complications are malignant or benign.

Sensitivity to pain of the tissues covering the cranium, the cranium itself and most of the intracranial structures:

1. Of the tissues covering the cranium, all are more or less sensitive to pain, the arteries being especially so. 2. Of the intracranial structures, the great venous sinuses and their venous tributaries from the surface of the brain, parts of the dura at the base, the dural arteries and the cerebral arteries at the base of the brain, the fifth, the ninth and the tenth cranial nerves and the upper three cervical nerves are sensitive to pain. 3. The cranium (including the diploic and the emissary veins), the parenchyma of the brain, most of the dura, most of the pia-arachnoid, the ependymal lining of the ventricles and the choroid plexuses are *not* sensitive to pain.

The Headache with Brain Tumor

Local traction and direct pressure may be exerted by the tumor upon adjacent pain-sensitive structures. Extensive displacement of the brain, effected either directly by the enlarging tumor mass or indirectly by ventricular obstruction (internal hydrocephalus) evokes pain from structures remote from, as well as adjacent to, the tumor.

Headache Associated with Fever, Sepsis, and Other Bodily Disorders

The head pain associated with fever ("pyrexial headache"), bacteremia, sepsis, nitrite, and foreign protein administration, carbon monoxide inhalation, hypoxia and asphyxia is due principally to dilatation and distention of intracranial arterial structures.

The Headache Associated with Meningitis

The headache of meningitis is primarily related to the lowered pain threshold of inflamed tissues and structures within or adjacent to the coverings of the brain.

Headache following Lumbar. Puncture

The headache is primarily due to dilatation of and traction upon-sensitive intracranial venous structures.

Headache with Increased Intracranial Pressure

Increased intracranial pressure is neither a prime nor an essential factor in the headache that may be associated with it.

Head Pain from the Nasal Structures and Sinusses

Much of the pain from the nose comes from the approaches to the nasal and paranasal spaces and rather less from the paranasal spaces themselves. *Inflammation in the sinuses themselves* was found to be a rare cause of headache.

Head Pain from the Teeth

The experimental noxious stimulation of the tooth resulted in the liberation of a substance which lowered its pain threshold and in a local inflammatory reaction within the tooth, which outlasted the period of experimental stimulation.

Muscle Contraction Headache

About a third of all headaches arise from contraction of the skeletal muscles of the head and neck.

Vascular Headaches

The great majority of all headaches are vascular in type.

Classification of vascular headache:

A) Vascular headache with sharply defined, transient visual, other sensory and/or motor prodromes ("classic" migraine). B) Vascular headache without striking prodromes and less often unilateral than Types A and C ("common" migraine). C) Vascular headache, predominantly unilateral on the same side, associated with flushing, sweating and rhinorrhea, and increased lacrimation, brief in duration and occurring in close-packed groups separated by long remissions ("cluster" headache). D) Vascular headache featured by sensory and motor phenomena which persist during and after the headache ("hemiplegic" migraine and "ophthalmoplegic" migraine). E) Headache of possible vascular mechanism centered primarily in the lower face ("lower-half" headache).

In a long series of experiments Dr. Wolff and cols. demonstrated the relation of the intensity of headache and the amplitude of pulsations of the branches of the external carotid artery and that the intravenous or intramuscular injection of ergotamine tartrate resulted in a decrease in the amplitude of pulsations of the temporal and occipital arteries paralleling abolition of the headache. Both cranial artery vasodilatation and the presence locally of pain-threshold-lowering agent are necessary concomitants to induce headache.

It was found that specimens of tissue fluid collected from the head during the headache attacks contain a polypeptide with special characteristics.

This polypeptide has been labeled "neurokinin" and has been found by Dr. Wolff and his associates to be released during neuronal excitation. Neurokinin is an extremely powerful vasodilator.

1-methyl-D-lysergic acid butanolamide bimaleate, while lacking the capacity to terminate an existing headache, if often effective in reducing the number and severity of headache attacks.

Migraine headaches commonly occur when hereditarily susceptible persons attempt to control feeling of anxiety or resentment by means of organized and intense activity. It is thus a cranial vascular consequence of a way of life.

Two out of three patients with vascular or muscle tension headache, or this vascular-muscle tension headache combination, can be greatly helped by any physician who is interested in human problems and is willing to spend a minimum of time with his patients in reviewing them with him.

RESUMEN

En un conjunto de doscientos a trescientos pacientes con cefalalgia que consultan médico, se encuentra sólo un caso de enfermedad seria. La intensidad de una cefalalgia no depende de que su causa sea benigna o maligna.

Sensibilidad al dolor del cráneo, de los tejidos que lo cubren y de la mayoría de las formaciones intracraneanas:

1. Todos los tejidos que cubren el cráneo son más o menos sensibles al dolor, especialmente las arterias. 2. En las formaciones intracraneanas son sensibles al dolor, los grandes senos venosos y sus tributarios de la superficie cerebral, parte de la dura basal, las arterias durales y las arterias cerebrales de la base, los nervios craneales quinto, noveno y décimo y los tres primeros nervios cervicales. 3. No son sensibles al dolor, el cráneo (incluyendo las venas diploicas y emisarias), el parénquima cerebral, la mayor parte de la dura, de la aracnoides, el epéndimo que recubre los ventrículos y los plexos coroideos.

La cefalalgia por tumor cerebral

El tumor puede ejercer sobre las formaciones adyacentes sensibles al dolor tracciones y presiones. Puede ser evocado de lugares lejanos o cercanos al tumor al producirse importantes desplazamientos en el cerebro, sea directamente por la lesión expansiva tumoral o indirectamente por obstrucción ventricular (hidrocéfalo interno).

Cefalalgia asociada a la fiebre, infecciones y otros disturbios orgánicos

El dolor de cabeza asociado con fiebre (cefalalgia febril), estados sépticos, la administración de nitritos, de proteínas extrañas, inhalación de monóxido de carbono, hipoxia, asfixia, etc. se debe principalmente a la dilatación y distensión de las arterias intracraneales.

Cefalalgia asociada con la meningitis

La cefalalgia de una meningitis está relacionada en primer término a la disminución del umbral del dolor de las formaciones y tejidos comprendidos en, y adyacentes a las envolturas del cerebro.

Cefalalgia a continuación de la punción lumbar

Es debida primariamente a la dilatación y a la tracción sobre las formaciones venosas intracraneanas sensibles.

Cefalalgia que acompaña la hipertensión intracraneana

El aumento de la presión intracraneana no es un factor primario ni es esencial en la cefalalgia que pueda estar asociada con el.

Cefalalgia producida en los senos y formaciones nasales

El dolor en gran parte proviene de las cercanías de las cavidades nasales y paranasales, y en menor grado de las mismas formaciones paranasales. La inflamación de los senos es una causa poco frecuente de cefalalgias.

Dolor de cabeza de origen dentario

La estimulación dolorosa experimental de los dientes da lugar a la liberación de una sustancia que disminuye el umbral del dolor y a una reacción inflamatoria local dentro del diente, la cual se prolonga más allá del período de estimulación experimental.

Cefalalgia por contracción muscular

Alrededor de la tercera parte de todas las cefalalgias provienen de la contracción de los músculos esqueléticos de la cabeza y cuello.

Cefalalgias vasculares

La gran mayoría de las cefalalgias son de origen vascular.

Clasificación de las cefalalgias vasculares:

A) Cefalalgia vascular con prodromos visuales, a veces sensitivos y/o motores bien definidos y transitorios (jaqueca clásica). B) Cefalalgia vascular sin prodromos llamativos y menos frecuentemente unilateral que en los tipos A y C (jaqueca común). C) Cefalalgia vascular, predominantemente unilateral, asociada sobre el mismo lado con rubor, sudoración, rinorrea y lagrimeo, de breve duración y que se presenta en crisis muy próximas entre sí separadas por remisiones prolongadas (cefalalgia en racimo). D) Cefalalgia vascular acompañada con manifestaciones motoras y sensitivas que persisten durante y después de la cefalalgia (jaqueca hemipléjica y jaqueca oftalmopléjica). E) Cefalalgia de posible mecanismo vascular localizada primariamente en la parte inferior de la cara (cefalalgia de la "mitad inferior").

En una larga serie de experimentos el Dr. Wolff y colaboradores demostraron la relación de la intensidad de la cefalalgia y la amplitud de las pulsaciones de las ramas de la arteria carótida externa y que la inyección intramuscular o intravenosa de tartrato de ergotamina resultaba en una disminución en la amplitud de las pulsaciones de las arterias temporal y occipital al mismo tiempo que la desaparición de la cefalalgia. Para producir una cefalalgia es necesario la acción concomitante de la vasodilatación arterial y de un agente local que disminuya el umbral para el dolor.

Durante las crisis de cefalalgia se ha encontrado en muestras de humores obtenidos de los tejidos de la cabeza un polipéptido con características especiales. Este polipéptido ha sido llamado neuroquinina y Wolff y sus asociados han descubierto que es liberado durante la excitación neuronal. La neuroquinina es un vasodilatador extraordinariamente potente.

Ha sido estudiada la acción terapéutica del bimaleato butanolamida 1-metil-D-ácido lisérgico. Se comprobó que esta droga no consigue eliminar una cefalalgia existente; pero es a menudo efectiva para reducir el número y severidad de las crisis de cefalalgia.

La jaqueca ocurre generalmente en personas hereditariamente susceptibles cuando intentan controlar los sentimientos de ansiedad y resentimiento por medio de una actividad organizada e intensa. Señala de este modo la influencia sobre los vasos del cráneo de un modo de vivir.

El médico que se interese en los asuntos humanos puede ayudar en alto grado por lo menos a las dos terceras partes de estos pacientes con cefalalgia vascular y cefalalgia por tensión muscular, si les dedica el tiempo necesario para considerar juntos sus problemas y ayudar a resolverlos.

RÉSUMÉ

Dans un ensemble de 200 à 300 malades avec céphalalgie qui consultent le médecin, on trouve seulement un cas de maladie sérieuse.

L'intensité d'une céphalalgie ne dépend pas du fait que sa cause soit bénigne ou maligne.

Sensibilité à la douleur du crâne des tissus qui le recouvrent et de la plupart des formations intracraniennes:

1. Tous les tissus recouvrant le crâne sont plus ou moins sensibles à la douleur, particulièrement les artères 2. Dans les formations intracraniennes sont sensibles à la douleur les grands seins veineux et leurs tributaires de la surface cérébrale, une partie de la dure-mère basale, les artères durales et les artères cérébrales de la base, les cinquième, neuviéme et dixième nerfs crâniens, et les trois premiers nerfs cervicaux. 3. Ne sont pas sensibles à la douleur, le crâne (les veines diploïques et émissaires inclues), la paranchyme cérébrale, la plus grande partie de la dure-mère, de l'achronoïde, l'épendyme recouvrant les ventricules et les plexus choroïdés.

Céphalalgie par tumeur cérébrale

La tumeur peut exercer, sur les formations adjacentes sensibles à la douleur, des tractions et des pressions. Elle peut être évoquée d'endroits lointains ou proches à la tumeur au moment où se produisent d'importants déplacements dans le cerveau, soit directement par la lésion expansive tumeurielle ou bien indirectement par obstruction ventriculaire (hydrocéphale interne).

Céphalalgie associée à la fièvre, aux infections et à d autres troubles organiques

La douleur de tête associée à la fièvre (céphalalgie fébrile), états septiques, l'administration de nitrites, de protéines étranges, l'inhalation de monoxyde de carbone, l'hypoxie, l'asphyxie, etc. son principalement dûes à la distention des artères intracraniennes.

Céphalalgie associée à la méningite

La céphalalgie d'une méningite est relationnée en premier lieu à la diminution du seuil de douleur des formations et des tissus compris et adjacents aux enveloppes du cerveau.

Céphalalgie à la suite de la pontion lombaire

Elle est dûe d'abord à la dilatation et à la traction sur les formations veineuses intracraniennes sensibles.

Céphalalgie accompagnant l'hypertension intracranienne

L'augmentation de la pression intracranienne n'est pas un facteur primaire et n'est pas non plus essentielle dans la céphalalgie pouvant être associée à celui-ci.

Céphalalgie produite dans les seins et les formations nasales

En grande partie, la douleur provient des alentours des cavités nasales et paranasales, et en moindre degré des formations paranasales. L'inflammation des seins est une cause peu fréquente de céphalalgies.

Douleur de tête d origine dentale

La stimulation douloureuse expérimentale des dents donne lieu à la libération d'une substance qui diminue le seuil de douleur et à une réaction inflammatoire locale dans la dent, laquelle se prolonge au-delà de la période de stimulation expérimentale.

Céphalalgie par contraction musculaire

A peu près un tiers de toutes les céphalalgies proviennent de la contraction des muscles squelettiques de la tête et du cou.

Céphalalgies vasculaires

La plupart des céphalalgies sont d'origine vasculaire.

Classification des céphalalgies vasculaires:

A) Céphalalgie vasculaire avec prodromes visuels, parfois sensitifs et/ou moteurs bien définis et transitoires (migraine classique). B) Céphalalgie vasculaire sans clairs prodromes et moins fréquemment unilatérale que dans les types A et C (migraine commune). C) Céphalalgie vasculaire, principalement unilatérale, associée du même côté avec la rougeur, sudoration, rinorhée et larmoiement, de courte durée, se présentant en crises très rapprochées, séparées par des rémissions prolongées(céphalalgie en grappe). D) Céphalalgie vasculaire accompagnée de manifestations motrices et sensitives qui persistent pendant et après la céphalalgie (migraine hémiplegique et migraine oftalmoplegique). E) Céphalalgie de mécanisme vasculaire possible localisée d'abord dans la partie inférieure de la figure (céphalalgie de la "moitié inférieure").

Au cours d'une longue série d'expériences le Dr. Wolff et ses collaborateurs ont démontré la relation d'intensité de la céphalalgie et l'ampleur des pulsations des branches de l'artère carotide externe et que l'injection intramusculaire ou intraveineuse de tartrate d'ergotamine donnait comme résul-

tat une diminution de l'ampleur des pulsations des artères temporale et occipitale en même temps que la disparition de la céphalalgie. Pour produire une céphalalgie il est nécessaire qu'il y ait une action concomitante de la vasodilatation artérielle et d'un agent local qui diminue la douleur.

Pendant les crises de céphalalgie on a rencontré dans des échantillons d'humeurs obtenus des tissus de la tête un polypeptide possédant des caractéristiques spéciales. On a dénominé ce polypeptide neuroquinine, et Wolff et ses collaborateurs ont découvert qu'il este libéré au cours de l'excitation neuronale. La neroquinine est un vasodilatateur extrêmement puissant.

On a étudié l'action thérapeutique du bimaléate butanolamide 1-méthyl-D-acide lysergique. On a constaté que cette drogue n'arrive pas à éliminer une céphalalgie existant déjà; mais elle est souvent effective pour réduire le nombre et la sévérité des crises de céphalalgie.

La migraine a généralement lieu dans des personnes héréditairement susceptibles lorsqu'elles essaient de contrôler les sentiments d'anxiété et de rancoeur moyenant une activité organisée et intense. Il signale de cette façon l'influence sur les vaisseaux du crâne d'un mode de vivre.

Le médecin s'intéressant aux questions humaines peut aider en un très haut degré les 2/3 au moins de ces patients souffrant de céphalalgie vasculaire et de céphalalgie par tension musculaire, s'il leur dédie le temps nécessaire pour considérer leurs problèmes ensemble et pour l'aider à les résoudre.

ZUSAMMENFASSUNG

Nur einer von 2 bis 300 Patienten, die den Arzt wegen Kopfschmerzen aufsuchen, haben diese Kopfschmerzen aus ernsten Ursachen. Die Kopfschmerzen pflegen gleich stark zu sein, ob nun ihre Komplikationen gut-oder boesartig sind.

Die Schmerzempfindlichkeit der Gewebe die den Schaedel umhuellen, des Schaedels Selbst und der meisten endokraniellen Strukturen:

1. Alle den Schaedel umhuellenden Gewebe sind mehr oder weniger schmerzempfindlich, besonders die Arterien. 2. Von den endokraniellen Strukturen den grossen venoesen Sinus und ihren venoesen Zufluessen von der Hirnoberflaeche, Teile der Dura mater an der Base, die Arterien von Dura und Gehirn an der Base, der fuenfte, neunte und zehnte Kranialnerv und die ersten drei zervikalen Nerven sind schmerzempfindlich. 3. Der Schaedel (einschliesslich der Diploë und der venae emissariae, das Parenchym des Gehirns, der groesste Teil der Dura mater, der groesste Teil der Pia-Arachnoidea, der ependymale Belag der Ventrikel und die Plexus choroidei sind *nicht* schmerzempfindlich.

Der Kopfschmerz beim Gehirntumor

Die lokalen Zerrungen und der direkte Druck pflegen durch den Tumor auf die benachbarten schmerzempfindlichen Strukturen ausgeuebt werden. Die grobe Verschiebung des Gehirns, entweder direkt durch die Vergroesserung der Tumormasse oder indirekt durch die Obstruktion der Ventrikel (interner Hydrocephalus) provozieren Schmerzen durch in der Naehe oder entfernt vom Tumor gelegene Strukturen.

Der Kopfschmerz bei Fieber Sepsis oder anderen organischen Stoerungen

Der bei Fieber, Bakteriaemie und Sepsis bestehende Kopfschmerz, sowie der durch Nitrite, Fremdeiweiss, Karbonmonoxyd, Hypoxie und Asphyxie hervorgerufene Kopfschmerz ist hauptsaechlich durch die Erweiterung und Dehnung der endokraniellen arteriellen Strukturen verursacht.

Der Kopfschmerz bei Meningitis

Der Meningitiskopfschmerz ist in erster Linie durch die herabgesetzte Schmerzschwelle der entzuendeten Gewebe und Strukturen innerhalb und in der Naehe der Hirnhuellen bedingt.

Der Kopfschmerz nach Lumbalpunktion

Der Kopfschmerz ist hauptsaechlich durch die Erweiterung und Zerrung der empfindlichen endokraniellen venoesen Strukturen bedingt.

Der Kopfschmerz bei erhoehtem endokraniellen Druck

Der erhoehte endokranielle Druck ist weder der hauptsaechliche noch ein wesentlicher Faktor bei den Kopfschmerzen, die dabei bestehen goennen.

Der von den nasalen Strukturen und den Sinus herruehrende Kopfschmerz

Sehr oft kommt der Kopfschmerz durch die Nase, von den Zugaengen zu den nasalen und paranasalen Raeumen und wohl weniger von den paranasalen Raeumen selbst. Man hat gefunden, dass die Entzuendung der Sinus selbst selten Ursache von Kopfschmerzen ist.

Von den Zaehnen herruehrende Kopfschmerzen

Die schaedigende experimentale Reizung des Zahnes rief die Freisetzung einer Substanz hervor, welche die Schmerzschwelle herabsetzte und eine lokale entzuendliche Reaktion im Zahn hervorrief, die laenger andauerte als die fuer die experimentale Reizung notwendige Zeit.

Kopfschmerz durch Muskelkontraktion

Ungefaehr ein Drittel aller Kopfschmerzen entstehen durch die Kontraktion der Skeletmuskeln von Kopf und Hals.

Vaskulaere Kopfschmerzen

Die ueberwiegende Mehrzahl aller Kopfschmerzen sind vaskulaer.

Klassifizierung der vaskulaeren Kopfschmerzen:

A. Der vaskulaere Kopfschmerz mit scharf definierten und voruebergehenden visuellen, anderen sensorischen und oder motorischen Prodromata (die "klassische Migraene").

B. Der vaskulaere Kopfschmerz ohne diese auffallenden Prodromata und weniger oft einseitig als die Formen A. und C. (gewoehnliche Migraene).

C. Der vaskulaere vorwiegend auf derselben Seite einseitige Kopfschmerz begleitet von aufsteigender Hitze, Transpiration, Rhinorrhoe und vermehrter Traenenabsonderung, von kurzer Dauer und in Serien von haeufigen Attacken die von langen Remissionen getrennt sind, auftretend (cluster Kopfschmerz).

D. Vaskulaere Kopfschmerzen charakterisiert durch sensorielle und motorische Phaenomene die vor und nach dem Kopfschmerz andauern (hemiplegische oder ophtalmoplegische Migraene).

E. Kopfschmerzen wahrscheinlich durch einen vaskulaeren Mechanismus verursacht und hauptsaechlich in der unteren Gesichtshaelfte lokalisiert (Kopfschmerz der unteren Gesichtshaelfte).

In einer grossen Reihe von Experimenten haben Dr. Wolff und Mitarbeiter eine Beziehung zwischen der Intensitaet des Kopfschmerzes und der Amplitude der Pulsationen der Aeste der arteria carotis externa festgestellt und auch dass die intravenoese oder intramuskulaere Injektion von Ergotamintartrat eine Verminderung der Amplitude der Pulsationene der arteriae temporalis et occipitalis zugleich mit dem Verschwinden des Kopfschmerzes hervorrief. Sowohl die Erweiterung der kraniellen Arterien als auch das lokale Vorhandensein einer die Schmerzschwelle senkenden Substanz muessen notwendigerweise zusammentreffen, um die Kopfschmerzen hervorzurufen.

Man hat gefunden, dass Muster von Gewebsfluessigkeit vom Kopf, die waehrend der Kopfschmerzkrisen gewonnen worden waren, ein Polypeptid mit besonderen Eigenschaften enthalten. Dieses Polypeptid wurde "Neurokinin" genannt und wird, wie Dr. Wolff und Mitarbeiter gefunden haben, waehrend der neuronalen Reizung in Freiheit gesetzt. Das Neurokinin ist ein aeusserst maechtiger Gefaesserweiterer. Das 1-methly-D-liserginsaure Butanolamid-bimaleat, obwohl es nicht in der Lage ist einen schon bestehenden Kopfschmerz zu coupieren, ist oft wirkungsvoll, um die Anzahl und

Schwere der Kopfschmerz-krisen zu vermindern.

Migraenekopfschmerzen ereignen sich gewoehnlich wenn hereditaer belastete Personen versuchen, ein Gefuehl der Angst oder des Grolles durch organisierte und intensive Aktivitaet zu unterdruecken. Es ist somit eine kraniovaskulaere Konsequenz einer bestimmten Lebensfuehrung.

2 von 3 Patienten mit vaskulaeren oder Muskelpannungskopfschmerzen oder einer Kombination von vaskulaeren und Muskelspannungskopfschmerz koennen weitgehend gebessert werden durch jeden Arzt, der an menschlichen Problemen interessiert ist und bereit ist, ein Minimum von Zeit seinen Patienten zu widmen, um sie zu untersuchen.

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Headache due to Systemic Disorders: Headache in Internal Medicine, Especially in Diseases of the Nervous System

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The evaluation of headache, one of the most subjective symptoms among neurological manifestations, is a difficult problem. Except for rare instances in which headache alone constitutes the chief complaint, episodes of slight headache are usually transient, being easily evoked by fever, overwork, insomnia, nervous tension, menstruation, and side actions of certain medication. Generally speaking, therefore, logical connection of such headaches with the original disease is not to be insisted upon. As shown in Table 1, causes of headache are numerous and its manifestation,

TABLE 1

Main Diseases Causing Headache

1. Vascular Headache.
   a) Migraine and related conditions.
   b) Migraine variants, histamine headache.
   c) Others.
2. Tension Headache.
3. Headache due to Intracranial Lesions.
   a) Meningeal irritation.
   b) Brain tumor and intracranial hypertension.
   c) Infection, inflammation.
   d) Cerebrovascular accidents (hemorrhage, arteriosclerosis, vascular anomaly).
   e) Others.
4. Post-traumatic Headache.
5. Headache due to Diseases of the Nose, Paranasal Sinus, and Teeth.
6. Psychiatrical Disorders.
7. Fever and Toxic Headache.
8. Headache due to Systemic Disorders (Hypertension, Collagen Disease, Infection, Renal Disease, Anemia, etc.).
9. Headache following Lumbar Puncture.
10. Neuralgia.

mode of onset, intensity, property, location, and duration may also show a surprising variation. We have studied the problem of headache in several diseases in the field of internal medicine, basing on a survey of 7730 hospitalized patients, 1460 ambulant patients treated in the neurology clinic, and 272 ambulant patients treated in the hypertension clinic at the Third Department of Internal Medicine, University of Tokyo Faculty of Medicine (Director, Prof. S. Okinaka), together with an investigation in 533 autopsy cases above 60 years of age at the Yokufukai Home for the Aged in Tokyo (Director, Dr. F. Amako, M. D.), using clinical records as the main tool of investigation.

Tables 2 and 3 show the frequency of headache in hospitalized patients, excluding cases in which headache is entirely incidental or cannot be attributed to the basic disease. Table 2 indicates the frequency of headache in hospitalized patients as chief complaints and Table 3 shows the frequency throughout the course. Although the classification does not cover individual diseases, a tendency of frequent association of headache with diseases of the nervous system, diseases of the endocrine system, collagen disease, diseases of the kidney, infectious disease, and hypertension is evident. Headache may become one of the chief complaints at admission in diseases apparently unrelated to the nervous system. The frequent occurrence of headache in collagen disease including erythematodes, angitis, and scleroderma might be explained on the basis of fever and generalized vascular changes particularly in the central nervous system.

TABLE 2

Frequency of Headache as Chief Complaint in Patients Hospitalized at the Third Department of Internal Medicine, University of Tokyo Faculty of Medicine

	Total Cases	*Positive Cases*	*%*
1. Diseases of the Nervous System	1545	126	8.2
2. Diseases of the Endocrine System	166	11	6.6
3. Diseases of the Kidney and Urinary Tract	382	20	5.2
Uremia, Contracted Kidney	34	3	8.8
Nephritis	164	13	7.9
Others	184	4	2.2
4. Diseases of the Circulatory System	905	41	4.5
Essential Hypertension	262	27	10.3
Others	643	14	2.2
5. Infection	669	25	3.7
Infection with Fever and Other Signs	375	15	4.0
Infection with Fever Alone	54	7	1.3
Parasitic Disease	240	3	1.2
6. Diseases of Metabolism	385	11	2.9
7. Diseases of Blood	478	12	2.5
8. Diseases of the Respiratory System	1214	13	1.1
9. Diseases of the Digestive System	1639	10	0.6
10. Collagen Disease	42	0	0
11. Diseases of Allergy	41	0	0
12. Miscellaneous	264	6	2.2
Total	7730	275	3.6

TABLE 3

Frequency of Headache in the Entire Course in Patients Hospitalized at the Third Department of Internal Medicine, University of Tokyo Faculty of Medicine

	Total Cases	Positive Cases	%
1. Diseases of the Nervous System	1545	498	32.2
2. Diseases of the Endocrine System	166	49	29.6
3. Collagen Disease	42	12	28.6
4. Diseases of the Kidney and Urinary Tract	386	94	24.5
Uremia and Contracted Kidney	34	15	44.1
Nephritis	164	56	34.2
Others	184	23	12.5
5. Infection	669	126	18.8
Infection with Fever Alone	54	23	42.5
Infection with Fever and Other Signs	375	94	34.1
Parasitic Disease	240	9	3.7
6. Diseases of Allergy	41	7	17.1
7. Diseases of the Circulatory System	905	147	16.2
Essential Hypertension	262	78	29.8
Others	643	69	10.7
8. Diseases of Blood	478	68	14.2
9. Diseases of Metabolism	385	42	10.9
10. Diseases of the Respiratory System	1214	92	7.6
11. Diseases of the Digestive System	1639	75	4.6
12. Miscellaneous	264	16	6.1
Total	7730	1226	15.8

Complaint of headache in diseases of the nervous system is shown in Table 4. Frequent association of headache with migraine, meningitis, subarachnoid hemorrhage, brain tumor, encephalitis, and epilepsy confirms the general experience. Relatively common occurrence of headache in polyneuritis and demyelinating disease is noteworthy. Headache was encountered in 30 - 40 % of apoplexy ond its sequelae, cerebral arteriosclerosis, and neurosyphilis. The percentage of association in less than 10 % would most likely indicate a poor correlation with the original disease.

As Table 5 indicates, more than 30 % of the cases of brain tumor, subarachnoid hemorrhage, and meningitis as well as most of other neurological disorders associated with headache showed normal CSF pressure, indicating that the causes of headache in these cases should be sought outside the elevation of cerebrospinal fluid pressure. On the other hand, elevated CSF pressure was unexpectedly encountered in non-neurological disorders with headache. Frequent occurrence of headache following lumbar puncture in cases with low initial CSF pressure is shown in Table 6. Headache was found in 25 % of cases with initial pressure less than 100 mm H_2O, 4.8 % in cases with initial pressure between 100 - 200 mm H_2O, and in none with initial pressure above 200 mm H_2O. Cases of meningitis, brain tumor, and subarachnoid hemorrhage in which lumbar puncture frequently relieves headache are not included. In addition to the commonly accepted explanation of the post-lumbar puncture headache, namely the leaking of the CSF from the hole of puncture, our results indicate the low initial pressure as an important factor, relating to the headache after lumbar puncture. Al-

TABLE 4

Frequency of Headache in Major Neurogical Disorders

Classification	Total Cases	Positive Cases	%
1. Migraine	12	12	100
2. Meningitis	78	75	96
3. Subarachnoid Hemorrhage	40	32	80
4. Brain Tumor	85	62	73
5. Encephalitis	26	19	73
6. Epilepsy	39	23	59
7. Demyelinating Disease	31	12	39
8. Apoplexy and Sequelae	163	62	38
9. Polyneuritis	40	15	38
10. Cerebral Arteriosclerosis	72	27	37
11. Syphilis of the Brain	53	16	30
12. Neurosis	110	31	28
13. Syphilis of the Spinal Cord	21	3	14
14. Parkinson's Syndrome	41	4	10
15. Spinocerebellar Degeneration	24	2	8
16. Myasthenia Gravis	52	4	8
17. Amyotrophic Lateral Sclerosis	40	2	5
Spinal Progressive Muscular Atrophy			
18. Progressive Muscular Dystrophy	57	1	2
19. Spinal Arachnoiditis	52	0	0
20. Tumor of the Spinal Cord	35	0	0
21. Syringomyelia	15	0	0

TABLE 5

Cerebrospinal Fluid Pressure in Major Neurological Disorders and Other Diseases in Internal Medicine Associated with Headache

	Classification	Total Cases	Elevated CSF pressure (%)	Normal CSF pressure (%)
Neurological Disorders	Brain Tumor	49	70	30
	Subarachnoid Hemorrhage	29	66	34
	Meningitis	70	63	37
	Cerebral Hemorrhage and Softening	39	41	59
	Encephalitis	15	40	60
	Cerebral Arteriosclerosis	13	31	69
	Migraine	10	30	70
	Epilepsy	19	26	74
	Polyneuritis	12	25	75
	Syphilis of the Brain	15	20	80
	Neurosis	24	13	87
	Demyelinating Disease	11	9	91
Other Diseases in Internal Medicine	Diseases of the Kidney	12	75	25
	Hypertension	33	39	61
	Diseases of Blood	6	33	67
	Infection	26	20	80
	Diseases of the Endocrine System	19	16	84
	Diseases of the Circulatory System	8	13	87

TABLE 6

Headache Following Lumbar Puncture

Initial Pressure	*Total Cases*	*Positive Cases*	*%*
Below 100 mm H_2O	20	5	25
100 — 200 mm H_2O	21	1	4.8
Above 200 mm H_2O	23	0	0

though the relationship of hypertension and headache is well known, no relationship is evident between headache and renal function, as indicated in Table 7.

As Table 8 indicates, appearance of headache in 232 cases of essential hypertension was 50 % in cases below the age of 50 and 17 % in patients above 50. Such predominance of headache in juvenile hypertension might be explained on the basis of fluctuation and instability of the blood pressure as well as the lack of sufficient time for the individual adjustment to blood pressure changes compared with older age groups.

TABLE 7

Relationship between Renal Function and Headache

(I) PSP

Excretion in 15 min.	*Headache (+)*	*Headache (—)*	*Total*
Below 25 %	20 (31 %)	44 (69 %)	64
Above 25 %	33 (35 %)	62 (65 %)	95
			159

(II) NPN

NPN mg %	*Headache (+)*	*Headache (—)*	*Total*
Above 30	33 (35 %)	60 (65 %)	93
Below 30	22 (27 %)	58 (73 %)	80
			173

TABLE 8

Age and Sex Difference of the Frequency of Headache in Hypertension. Observation in 232 Hospitalized Cases

	Sex	*Cases*	*Positive Cases*	*%*
Below 50 years of age	Male	48	21	44
	Female	26	16	62
Above 50 years of age	Male	100	11	11
	Female	58	17	29

Females are generally more prone to have headache than males, especially above age 50. Investigation on such sex or age difference should be extended to other diseases. Cases of nephritis with PSP excretion of less than 25 %, NPN above 30 mg %, systolic pressure above 150, and diastolic pressure above 100 showed a frequency of headache slightly above normal. Frequent elevation of CSF pressure in renal disease with headache is to be noted.

As Table 9 indicates, more than one third of patients with leukemia complained of headache, which represented the most common neurological symptoms in this disease. Headache is either initially noted as chief complaint, or associated with meningeal irritation or meningitic signs in leukemia. Frequent demonstration of leukemic infiltration of the leptomeninges in leukemia might explain such headache. In the terminal stage, gradually progressive disturbance of consciousness and intense headache characterized the leukemic cerebral hemorrhage and are diagnostically of value.

Survey at the Hypertension Clinic

Among 272 ambulant patients with hypertension, vertigo was complained in 98 cases (36 %), heavy feeling in the head in 90 cases (33%), headache in 78 cases (29%), stiff shoulder in 63 cases (23%), tinnitus in 57 cases (21 %), and disturbance in sleep in 27 cases (9.9 %). Headache seems to be predominant in females and subjects below the age of 50. No correlation was demonstrated between retinal arteriosclerosis and headache in 333 cases of hypertension both above and below the age of 50. When groups with similar degree of retinal arteriosclerosis is compared above and below age 50, the group below 50 showed severer manifestation of headache.

TABLE 9

Headache in Leukemia

Diagnosis	*Headache (+)*	*Headache (—)*	*Total Cases*
Acute Leukemia	32 (41 %)	11 (14 %)	78
Chronic Leukemia	6 (24 %)	2 (8 %)	25
Total	38 (37 %)	13 (13 %)	103

The Survey at the Yokufukai Home for the Aged

In Yokufukai Home for the Aged in Tokyo, 533 autopsy cases above the age of 60 were studied unselectively for a definite period, with retrospective survey of the clinical records. Dizziness and heaviness in head are separated from headache. Frequent complaint of headache was classified as (+). Emphasis was placed in hypertension and cerebrovascular accident among various causes of headache. As Table 10 indicates, head-

TABLE 10

Age and Sex Difference in Headache Among 432 Aged Subjects at Yokufukai Home for the Aged

	Headache (+)	*Headache (—)*	*Total*
1) *Age*			
60 - 69	36 (34.6 %)	68	104
70 - 79	84 (35.6 %)	152	236
Above 80	34 (37.0 %)	58	92
2) *Sex*			
Male	39 (27.9 %)	101	140
Female	115 (39.4 %)	177	292

ache was complained with similar frequency in the 7th, 8th and 9th decades, and significantly more frequently in females than in males. ($P < 0.05$) More frequent complaint of headache in 278 hypertensives (39.5 %) than in 154 normotensives (25%) was also confirmed. No age difference and predominance of females are again shown in these separate groups. A positive correlation was demonstrated between the frequency of headache and maximum and minimum blood pressure which were divided into 5 grades according to the severity to I - V and A - E respectively as shown in Table 11.

TABLE 11

Headache and Blood Pressure Observation in 516Cases Above Age 60 at the Yokufukai Home for the Aged

	Maximum Blood Pressure	*Total Cases*	*Headache (+)*
I	Always below 160	105	19.0 % (severe 5.7 %)
II	Fluctuating around 160	94	30.9 % (severe 7.4 %)
III	Between 160 - 200	98	33.7 % (severe 2.0 %)
IV	Fluctuating around 200	132	41.7 % (severe 6.1 %)
V	Always above 200	87	51.7 % (severe 4.7 %)
	Minimum Blood Pressure		
A	Always below 90	154	23.4 % (severe 5.2 %)
B	Fluctuating around 90	140	36.4 % (severe 7.9 %)
C	Between 90 - 110	76	38.2 % (severe 5.3 %)
D	Fluctuating around 110	75	44.4 % (severe 2.7 %)
E	Always above 110	71	43.7 % (severe 2.8 %)

Elevation of maximum blood pressure is more closely correlated with the degree of headache. It should be noted, however, that a severe and obstinate or consistent headache is scarcely related with elevation of blood pressure, suggesting the independence of this kind of severe headache from hypertension.

Correlation between the frequency of headache and the severity of atherosclerosis divided in 4 grades; (—) (±) (+) (++) (Table 12). Frequency of headache is well correlated with the degree of atherosclerosis

TABLE 12

Macroscopic Standardarization of Cerebral Atherosclerosis

(—)	No lesions
(±)	Small number of atheromatous plaques No calcification or ulceration
(+)	Moderate number of atheromatous plaques without calcification or ulceration or small number of plaques with calcification or ulceration
(++)	Large number of atheromatous plaques Moderate to severe degrees of calcification or ulceration

in A. basilaris, A. cerebri anterior, A. cerebri media, and A. cerebri posterior, especially in A. basilaris as shown in Table 13. In cases of severe arteriosclerosis, functional disturbance of the brain or dementia might interfere with the accurate expression of complaints so that the actual frequency of headache is even higher. Severe and uncontrollable headache again was not correlated with the severity of arteriosclerosis.

While cases with single small lesion, middle sized lesions, and large lesions showed a distinctly higher percentage of headache than cases without cerebral hemorrhage or softening as shown in Table 14, scarcely any difference was observed according to the size of lesions. Headache was observed in increasing frequency in

1) cases without cerebral arteriosclerosis or cerebrovascular lesions
2) cases with slight cerebral arteriosclerosis and more than middle-sized cerebral hemorrhage or softening
3) cases with moderate to severe cerebral arteriosclerosis and slight cerebrovascular lesions

TABLE 13

Relationship of the Severity of Arteriosclerosis in Main Cerebral Arteries and Headache in Autopsy Cases at Yokufukai Home for the Aged

Degree of sclerosis	*Number of cases*	*Frequency of headache*
A. basilaris		
(—)	76	19.7 %
(±)	74	25.6 %
(+)	87	33.4 %
(++)	154	42.9 %
	391	
A. cerebri anterior		
(—)	116	29.5 %
(±)	90	38.9 %
(+)	106	43.4 %
(++)	55	41.8 %
	417	
A. cerebri media		
(—)	54	24.1 %
(±)	55	21.8 %
(+)	110	32.7 %
(++)	206	46.6 %
	425	
A. cerebri posterior		
(—)	107	29.0 %
(±)	93	31.2 %
(+)	125	38.4 %
(++)	90	45.5 %
	415	

TABLE 14

Macroscopic Cerebrovascular Lesions (Cerebral Hemorrhage and Cerebral Softening in 432 Autopsy Cases) at the Yokufukai Home for the Aged

Cerebral hemorrhage and cerebral softening	*Number of cases*	*Frequency of cases with headache*
(—)	102	22.5 %
Small lesions	168	36.3 %
single	56	26.8 %
multiple	112	41.0 %
Middle-sized lesions	94	42.5 %
Large lesions	68	41.5 %

4) cases with severe cerebral arteriosclerosis and cerebrovascular lesions.

Cerebral arteriosclerosis therefore appears to be more decisive in determining the degree of headache than cerebrovascular lesions, although both are related to the development of headache (Table 15).

As shown in Table 16, a positive correlation is demonstrated between the frequency of headache and thickening of leptomeninges, which should also be taken into consideration in the problem of headache in the aged.

Though the loss of consciousness in moderate or severe apoplexy precludes the accurate assessment of headache during the attacks, cerebral hemorrhage appears to be more closely related with headache than softening. Hemorrhage or softening in the cerebellum is associated with headache in

TABLE 15

Relationship of Cerebral Arteriosclerosis and Cerebrovascular Lesions to Headache in 509 Autopsy Cases at the Yokufukai Home for the Aged

Cerebral arteriosclerosis	*Cerebral hemorrhague cerebral softening*	*Nmber of cases*	*% Headache*
(—) — (±)	(—) — (±)	88	15.9
(—) — (±)	(+) — (++)	14	21.4
(+) — (++)	(—) — (±)	162	36.4
(+) — (++)	(+) —(++)	145	45.5

TABLE 16

Relationship of the Thickening of Leptomeninges to Headache

Headache / *Thickening of leptomeninges*	—	±	+	++	*Total*	*% Headache*
—	14	3	2	0	19	26
+	52	7	10	6	75	31
++	17	2	11	4	34	50

a high percentage. Massive cerebellar hemorrhage is characterized by relatively slight disturbance of consciousness in the initial stage, severe vomiting, dizziness, and especially and excruciating headache. A large hemorrhage around the lenticular nucleus gave rise to headache in 20 %, large hemorrhage in the thalamus in 19 %, a massive hemorrhage in the cerebellum in 64 %, an extensive hemorrhage in the pons in 27 %.

In cases of hemorrhage in the thalamus, half of the complaints of headache are localized occipitally. Headache was found in 24 % of hemorrhage and 15 % of thrombosis in patients with apoplexy without loss of consciousness or little stroke. In spite of the fact that the lesions are uniformly smaller in little stroke than in ordinary attacks, frequency of headache is by no means smaller. The size of the lesion, therefore, is apparently little to do with the appearance of headache.

In 119 cases of cerebral hemorrhage, softening, and subarachnoid hemorrhage, some of prodromal symptoms such as headache, disturbance in sensibility, dizziness, hot flashes, pathological reflex, disturbances in motility, and disturbances in urination were noted within 3 months prior to the attacks in 71 % of the cases. Although headache appeared as a prodromal symptom almost in similar frequency in cerebral hemorrhage (28 %) and softening (23 %), these values are higher than corresponding figures in case of essential hypertension. Such prodromal headache is especially common in subarachnoid hemorrhage.

Conclusion

The problem of headache has been investigated through a survey of clinical records in diseases in the field of internal medicine and neurology. Since it is almost impossible to cover the entire field of headache, hypertension, nephritis, and cerebral arteriosclerosis are chosen for the detailed study on headache. Comparison between autopsy findings and clinical records was also carried out with a special emphasis on cerebrovascular injury.

We have to realize the importance and difficulty in elucidating the true cause and mechanism of headache in each disease. The study reported here will probably represent one step towards the understanding of the problem of headache.

SUMMARY

The frequency of headache was investigated from the standpoint of internal medicine and neurology in 7730 hospitalized patients and 1460 ambulant patients in the neurology clinic and 227 in the hypertension clinic at the Third Department of Internal Medicine, University of Tokyo Faculty of Medicine (Prof. S. Okinaka) as well as in 533 autopsy cases above the age of 60 at the Yokufukai Home for the Aged in Tokyo (Dr. F. Amako), by comparison of autopsy findings and clinical records. (1) Headache was rather frequently found in diseases of the nervous system, diseases of the endocrine glands, collagen disease, diseases of the kidney, and hypertension. (2) In diseases of the nervous system, frequency of headache was compared among individual diseases. (Migraine, meningitis, subarachnoid hemorrhage, brain tumor, encephalitis, and epilepsy are associated with headache with high percentages). (3) More than half of the cases with headache showed normal cerebrospinal fluid pressure, indicating causes of headache to be other than CSF pressure changes. (4) Post-lumbar puncture headache is apparently related to the low initial CSF pressure. (5) Headache is encountered with definitely higher frequency in cases of essential hypertension less than 50 years of age than those above 50. Females complain from headache more frequently than males. (6) In cases in which leukemic infiltration is demonstrated in meninges at autopsy, complaint of headache is quite common. (7) Correlation between the frequency of headache and degree of arteriosclerosis at autopsy was also demonstrated. (8) Thickening of leptomeninges was also well correlated with the occurrence of headache in the aged. (9) Although the presence of headache in severe and moderate apoplexy depends upon the state of consciousness, hemorrhage gives rise to

headache more frequently than softening. Massive cerebellar hemorrhage causes headache in the highest percentage. (10) During the 3 - 4 month period before the attacks of apoplexy, headache was seen in 28 % of cerebral hemorrhage and 23 % of softening, showing higher values than the corresponding figure in a 6 month period preceding certain point in essential hypertension.

RESUMEN

Se investigó la frecuencia de la cefalalgia en las enfermedades correspondientes a la medicina interna y a la neurología. Fueron estudiados 7730 pacientes hospitalizados y 1460 pacientes ambulatorios en el consultorio externo de Neurología y 227 en el consultorio externo de Enfermedad Hipertensiva, en el Tercer Departamento de Medicina Interna de la Facultad de Medicina de la Universidad de Tokio (Prof. S. Okinaka) así como 533 autopsias en casos por encima de los 60 años en el Hogar Yokufukai para ancianos en Tokio (Dr. F. Amako), comparando los hallazgos necrópsicos con las historias clínicas. (1) La cefalalgia se encuentra con bastante frecuencia en enfermedades del sistema nervioso, de las glándulas de secreción interna, del colágeno, del riñón, y en la hipertensión arterial. (2) En las enfermedades del sistema nervioso se hizo estudio comparativo de la frecuencia de la cefalalgia en cada enfermedad, (jaqueca, meningitis, hemorragia subaracnoidea, tumor cerebral, encefalitis y epilepsia están asociadas muy frecuentemente con cefalalgias). (3) Más de la mitad de los casos con cefalalgias muestran una presión del líquido céfaloraquídeo normal, lo cual indica que la razón de la cefalalgia no corresponde a cambios en dicha presión. (4) La cefalalgia consecutiva a la punción lumbar aparentemente está relacionada al descenso inicial de la presión del líquido céfaloraquídeo. (5) La cefalalgia es hallada con frecuencia definitivamente más alta en casos de hipertensión esencial, cuando el paciente tiene menos que cuando está por encima de 50 años. Las mujeres se quejan más de cefalalgias que los hombres. (6) Cuando se comprobó en la autopsia infiltrados leucémicos en las meninges, la cefalalgia estuvo presente en el cuadro clínico con bastante frecuencia. (7) También se demostró la correlación entre la cefalalgia y el grado de arterioesclerosis en la autopsia. (8) El espesamiento de las leptomeninges tuvo también relación con la ocurrencia de la cefalalgia en el anciano. (9) Aunque la presencia de cefalalgia en la aplopejía severa y moderada depende del estado de la conciencia, la hemorragia da lugar a cefalalgia más frecuentemente que el reblandecimiento. La hemorragia cerebelosa masiva es la que causa cefalalgia en el más alto porcentaje. (10) Durante el período de 3-4 meses antes del ataque de apoplejía la cefalalgia fue vista en el 28% de las hemorragias cerebrales y el 23% de los reblandecimientos, las cuales son cifras más altas que las correspondientes a casos de hipertensión esencial.

RÉSUMÉ

La fréquence de la céphalalgie a été investiguée dans les maladies correspondantes à la medecine interne et à la neurologie. 7730 malades hospitalisés et 1460 malades ambulatoires ont été étudiés dans la clinique externe de Neurologie et 277 dans la clinique externe des Maladies Hypertensives, dans le Troisième Département de Médecine Interne de la Faculté de Médecine de l'Université de Tokio (Prof. S. Okinaka) ainsi que 533 autopsies dans des cas (Dr. F. Amako), en comparant les trouvailles nécroscopiques aux histoires cliniques. (1) La céphalalgie se rencontre assez fréquemment dans les maladies du système nerveux, des glandes de sécrétion interne, du collagène, du rein, et dans l'hypertension artérielle. (2) Pour les maladies du système nerveux, on a fait l'étude comparative de la fréquence de la céphalalgie dans chacune d'elles (migraine, méningite, hémorragie subarachnoidée, tumeur cérébrale, encéphalite et épilepsie sont très fréquemment associées avec les céphalalgies). (3) Plus de la moitié

des cas avec céphalalgies accusent une pression du liquide céphalorachidien normal, ce qui indique que la raison de la céphalalgie ne correspond pas à des changements dans la dite pression. (4) La céphalalgie consécutive à la ponction lombaire est apparemment relationnée au décroissement initial de la pression du liquide céphalo-rachidien. (5) La cephalalgie fréquemment est trouvée définitivement plus élevée dans les cas d'hypertension essentielle, lorsque le malade a moins de 50 ans que lorsqu'il dépasse cet âge. Les femmes se plaignent plus de céphalalgies que les hommes. (6) Chaque fois qu'on a constaté dans l'autopsie des infiltrations leucémiques dans les méninges, la céphalalgie a été présente assez fréquemment dans le cadre clinique. (7) On a aussi démontré la corrélation existente entre la céphalalgie et le degré d'artériosclérose dans l'autopsie. (8) L'epaississement des lepto-méninges a aussi eu une relation avec la fréquence de la céphalalgie chez l'ancien. (9) Bien que la présence de la céphalalgie dans l'apoplexie sévère et modérée depende de l'état de la conscience, l'hémorragie donne lieu à la céphalalgie plus fréquemment que le ramollissement. L'hémorragie cérébelleuse massive est la cause de la céphalalgie dans le plus grand pourcentage. (10) Pendant la période de 3-4 mois avant l'attaque d'apoplexie, la céphalalgie a été constatée dans le 28% des hémorragies cérébrales et le 23% des ramollissements lesquels sont des chiffres plus élevés que les correspondants à des cas d'hypertension essentielle.

ZUSAMMENFASSUNG

Die Haeufigkeit des Kopfschmerzes wurde vom Standpunkt der Inneren Medizin und der Neurologie bei 7730 hospitalisierten und 1460 ambulanten Patienten der Neurologischen Klinik und 227 der Klinik fuer Hypertension in der Dritten Abteilung der Inneren Medizin, der Universitaet von Tokio (Prof. S. Okinaka) und ausserdem bei 533 Autopsiefaellen ueber 60 Jahre des Yokufukai Asyls fuer Alte Leute in Tokio untersucht, indem die Autopsiebefunde mit den Krankengeschichten verglichen wurden. (1) Kopfschmerzen waren ziemlich haeufig bei Krankheiten des Nervensystems, der Inneren Druesen, den Kollagenkrankheiten, Nierenkrankheiten und der Hypertension. (2) Bei Erkrankungen des Nervensystems wurde die Haeufigkeit der Kopfschmerzen bei verschiedenen bestimmten Krankheiten verglichen (Migraene, Miningitis, subarachnoidale Haemorrhagie, Hirntumoren, Enzephalitis und Epilepsie waren in einem hohen Prozentsatz von Kopfschmerzen begleitet). (3) Mehr als die Haelfte der Faelle von Kopfschmerz hatten einen normalen Liquordruck, was bedeutet, dass die Ursachen der Kopfschmerzen andere als die der Aenderungen des Liquordruckes waren. (4) Der Kopfschmerz nach Lumbalpunktion ist allem Anschein nach durch den anfangs erniedrigten Liquordruck bedingt. (5) Kopfschmerzen sind entschieden haeufiger in Fällen von essentieller Hypertension bei Leuten unter 50 Jahren als ueber 50 Jahren. Frauen klagen haeufiger ueber Kopfschmerzen als Maenner. (6) In Faellen von bei der Autopsie nachgewiesenen leukaemischen Infiltrationen der Meningen ist der Kopfschmerz durchaus gelaeufig. (7) Man hat auch eine Beziehung zwischen der Haeufigkeit des Kopfschmerzes und dem Grade der bei der Autopsie gefundenen Arteriosklerose nachgewiesen. (8) Die Verdickung der Leptomeningen steht auch in nachgewiesener Beziehung zur Haeufigkeit des Kopfschmerzes bei alten Leuten. (9) Obwohl das Vorhandensein des Kopfschmerzes bei der schweren und mittelschweren Apoplexie vom Bewustseinszustand abhaengt, ist der Kopfschmerz bei der Haemorrhagie haeufiger als bei der Erweichung. Den hoechsten Prozentsatz von Faellen mit Kopfschmerz stellt die massige zerebellaere Haemorrhagie dar. (10) Waehrend eines Zeitraumes von 3-4 Monaten vor dem apoplektischen Insult hat man Kopfschmerzen bei 28% von Faellen mit Gehirnblutung und 23% der Faelle von Erweichung beobachtet; diese Werte sind hoehr als diejenigen Ziffern, die der sechsmonatigen Periode vor dem Insult bei der essentiellen Hipertension entaprechen.

Vascular Headache, Including Migraine

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When a patient seeks help because of headache it is almost always true that he needs more than simply an analgesic medication and reassurance that his discomfort seems not to indicate an ominous disease. Effective treatment requires that the physician understands as much as possible of the pain mechanism and of the underlying cause of the trouble.

Particularly challenging in both diagnosis and management are the headaches termed "vascular", those which are closely associated with arterial dilatation, in some instances accompanied by temporary edema of the arterial wall. This review will examine several pieces of evidence collected in recent years concerning the nature of the most important group of vascular headache-migraine in its various forms. Major features of these are found in the review in this issue of "Mechanisms of Headache" by Goodell and Hinkle, summarizing the contributions of Dr. Harold G. Wolff. A succinct outline of migrainous and non-migrainous vascular headaches appears in a recently published "Classification of Headache"(1).

These illnesses are not as dramatic as that of a subarachnoid hemorrhage or as threatening as that of a glioma of the brain, but, together with muscle-contraction headache, they represent the core of the headaches seen by the practicing physician. They are sometimes disabling and may be most difficult to treat.

General Evidence that a Headache is Vascular in Mechanism

The most immediate clue from the history that a headache may be associated with cranial arterial dilatation is a description by the patient that the pain is "throbbing" or "pounding". This feature must, however, always be evaluated with caution, for by actual close inquiry it may be found that the throbbing is not necessarily synchronous with the pulse. As used by some patients the term seems merely to refer to irregular waxing and waning of severe pain and in such instances fails to indicate whether a headache is or is not vascular in mechanism. In addition, some vascular headaches do not throb or may lose this quality later in the course of an attack.

Secondly, there may be visible and palpable enlargement of the affected vessel, sometimes with local tenderness(2). This evidence is available only when a surface branch of the external carotid, such as the temporal, is at fault. In this circumstance the arterial compression test, easing the pain temporarily, may be of added diagnostic value, but this must be controlled; as usually induced by digital pressure at the base of one temporal artery for a unilateral temporal headache, the effect must be compared with that which follows pressure nearby, as on the zygomatic ridge.

Thirdly, reduction in the intensity of the headache may follow measures which lower cranial arterial pressure. In theory, this response should be most informative, but it is technically difficult to achieve. One method is by the application of centrifugal force in the head-to-seat direction. The giant centrifuge of the Air Force, constructed to carry a man, has served this purpose well(3). In the study of several different varieties of vascular headache, each was strikingly eased during exposure to moderate degrees of centrifugal force for a brief period. The technique is clearly cumbersome, however, and hardly suited to routine office or bedside use.

Lastly, pharmacologic analysis with a vasoconstrictor agent, particularly ergotamine, may be of significant value. Yet, such a test is not always decisive, especially if the headache has been well established before the medication is given or if the involved vessels are intracranial, for ergotamine appears to have relatively little action on internal carotid branches(2, 4).

Particular Features of Intracranial Vascular Headache

In the search for evidence that a headache may be vascular in mechanism, additional data of particular value and interest are available in some patients, those in whom *intracranial* branches of the internal carotid artery are the source of the pain. The special features of intracranial vascular headache are observed best in that which promptly follows the intravenous injection of a sufficient amount of histamine. What we find in the behavior of this experimentally induced headache is duplicated in certain clinical headaches (notably those associated with febrile illnesses, hypoxia, "hangover" and postictal states, as well as some varieties of migraine) and thus leads reasonably to the inference that these clinical entities stem from much the same source.

It is an old but long neglected observation that headache of this type may be readily augmented by rotary head jolt, presumably producing added distortion of dilated and tender arteries at the base of the brain(3). An acceleration of small degree may suffice to increase such headache, whereas in normal subjects free of headache to evoke pain requires a much more vigorous snap. An example of this effect upon headache induced by histamine is diagrammed in Fig. 1. The force of a rotary head

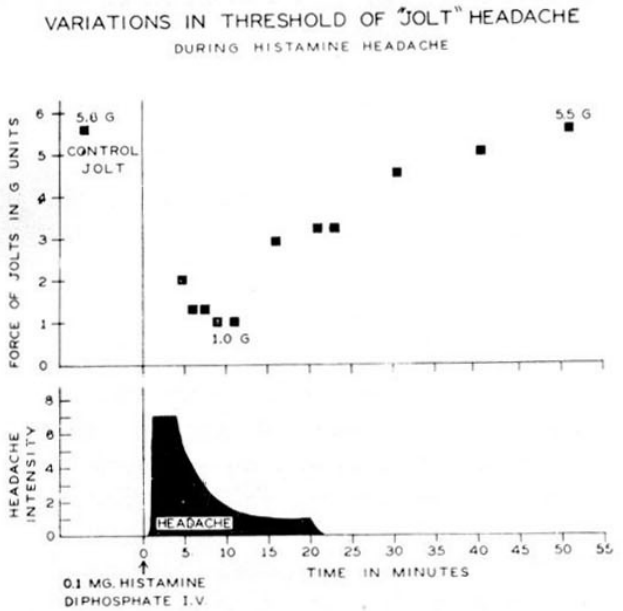

Fig. 1. — *Variations in the force of rotary head jolt (expressed in "g" units) required to evoke or accentuate headache at intervals before, during and after the intracranial vascular headache induced by intravenously administered histamine (see text and reference 3).*

jolt required to evoke or accentuate headache was measured at intervals in the course of the experimental chemical headache. Each test, indicated on the diagram by a small black square, measured the changing "jolt headache threshold" in units of "g" (the acceleration imparted by the force of gravity as recorded by a miniature accelerometer gripped between the subject's teeth). It should be noted, however, that a lowered threshold to headache on jolt is not in itself proof that intracranial arteries are dilated, for the same response is common in patients with intracranial inflammation, as with meningitis or subarachnoid hemorrhage, and in some with expanding intracranial masses. In these situations vascular anchors, either arteries or veins or both, are inflamed or already under stretch and therefore particularly vulnerable to jolt forces.

Intracranial vascular headache may be eased, on the other hand, by increased extramural vascular support, as by the intrathecal injection of isotonic saline through a needle inserted into the lumbar sac(2). This maneuver is not suitable as a routine test and has, in fact, had remarkably limited application to the analysis of clinical headaches. It may induce a brief but troublesome sterile meningitis. In the few instances in which it has been carefully carried out the procedure has been diagnostically useful, helping to confirm or disprove an intracranial vascular source of the pain.

A more feasible and somewhat related procedure is the application of the Valsalva maneuver for a 10-second period. As outlined in Fig. 2, during such sustained straining, intracranial vascular headache is likely to diminish moderately in intensity, as the result of a mild fall in mean systemic arterial pressure coincident with a rise in intracranial cerebrospinal fluid pressure(3, 4). On release of straining, whithin 2 or 3 seconds the arterial pressure quickly rebounds, usually rising for a few seconds to levels well above baseline, whereas cerebrospinal fluid pressure rapidly falls to normal. This phase is reflected in a sharp but brief increase in the headache to above its original level. Of additional interest are the transient worsening of headache on 1-second strain (or a cough) and a usually mild easing of the pain during bilateral jugular compression. The tests are easily applied and in some patients are most informative, although the responses here described are not infallibly diagnostic and must be interpreted by correlation with other clinical data.

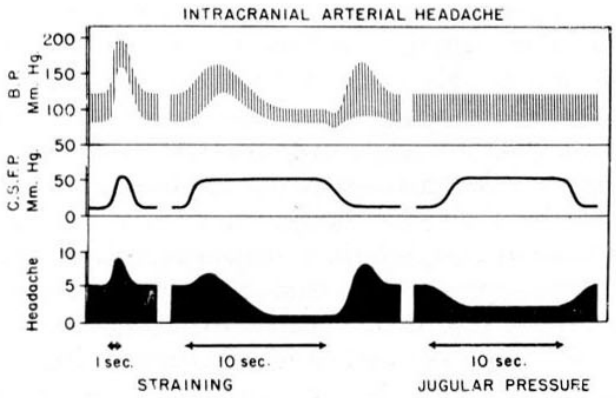

Fig. 2. — *Characteristic changes in the intensity of an intracranial vascular headache in response to easily applied forces, correlated with concurrent changes in systemic arterial pressure and cerebrospinal fluid pressure (see reference 3).*

From the application of these several tests to a large number of patients comes the general conclusion that vascular headache of migraine arises in some patients from extracranial and in others from intracranial arteries. Moreover, on the basis of observations offered by a few especially perceptive patients it seems likely that in some individuals, attacks of each type occur at different times, but the evidence regarding this question is still inconclusive.

The Significance of Certain Minor Eye Signs

In a few patients with migraine, trivial eye signs may develop, offering clues to the site and perhaps the nature of the disorder. This is particularly true of the migraine variant termed "cluster" headache, a fairly common disorder characterized by unusually intense but fortunately brief attacks of pain centered in and about one eye(3). The illness commonly begins in early adult life and is for unknown reasons encountered far more frequently in men than in women. Various time patterns are noted, but in most patients with this disorder the headaches occur in groups, each lasting several weeks, during which the separate headaches may occur once or several times each day or night. Remissions between clusters may last months or even years. Although cluster headache has in the past been termed "histaminic cephalgia", there is no convincing evidence that histamine plays a part in its mechanism or that "desensitization" to histamine is of any specific value in the prevention of attacks.

During a headache attack the eye on the affected side is often reddened and lacrimates excessively. The eye signs of particular interest, however, are the miosis, sometimes with ptosis, found on the side of the headache in a few of the patients(5). These signs are often inconspicuous and may be overlooked. They may appear only during

a headache or persist for years once they have developed. With them there is no impairment of sweating over the face. Close analysis of these features, aided by pharmacologic tests with cocaine and neosynephrine, indicates that they represent a partial Horner's syndrome (see Fig. 3).

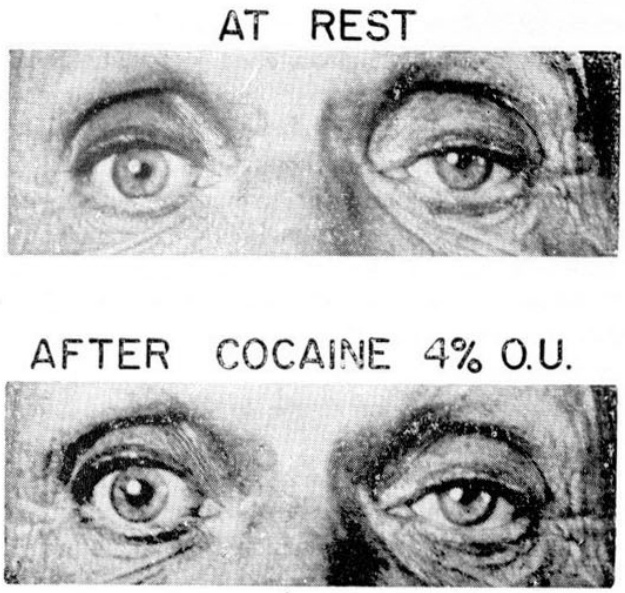

Fig. 3. — *Slight miosis and ptosis persisting on the left in a patient with recurrent bouts of left-sided cluster headache. The sympathicoparetic nature of the miosis is confirmed by its resistance to the pupillodilator action of cocaine eye drops (see reference 5).*

It is conjectured that they represent damage to the sympathetic fibers in the wall of the internal carotid below its siphon, perhaps the result of recurrent arterial dilatation in the headache attacks, as diagrammed in Fig. 4. An additional source of nerve injury may be local release of a noxious polypeptide metabolite ("neurokinin") which has been described by Chapman and his colleagues as a contributor to the pain of the migraine attack(6).

These trivial eye signs contrast sharply with the rarer but more dramatic and distressing palsies of one or more extraocular muscles which may appear once or repeatedly in a few patients with migraine. Such "ophthalmoplegic" migraine has been recognized for many years but its mechanism remains elusive(2). Where and how the damage occurs, usually to the third cranial nerve, is still unknown, but it is conceivable that the site may be a bit higher in the carotid tree than was postulated for the minor eye signs of "cluster" headache. The arterial segment at fault may be within the cavernous sinus or in one of the major trunks of the circle of Willis. Post-mortem evidence is scant and inconclusive.

BASIC PROBLEMS IN MIGRAINE

The essential nature of migraine is still to be clearly defined. Beyond question it is a complex biologic reaction, sometimes closely related to stressful attitudes and life situations(2). Much of the evidence suggests a discharge along vasodilator fibers from some central source in the brain stem or higher. The peripheral pathways for parasympathetic outflow to cranial vessels are not clearly charted; those to intracranial arteries probably leave the brain stem in large part, at least, over the seventh cranial nerve. Like parasympathetic dilator fibers elsewhere in the body, they may act by release of acetylcholine within arterial walls. Some support for this hypothesis comes from the results of a search for acetylcholine in the cerebrospinal fluid of patients afflicted with migraine(7). A minute amount of acetylcholine in body fluids can be detected with the aid of a highly sensitive tissue,

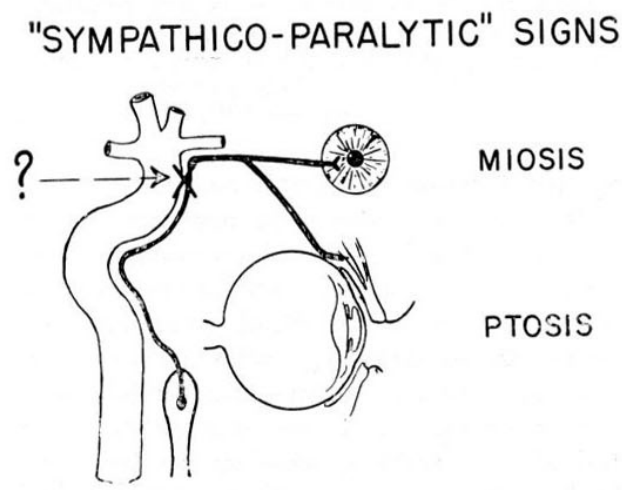

Fig. 4. — *Diagram of segment of internal carotid suspected to be the site of damage to periarterial sympathetic fibres, leading to the partial Horner's syndrome noted in some patients with cluster headache (see reference 5).*

the heart of the common clam. In a few patients, five of nine, with vascular headache apparently of the intracranial type, the cerebrospinal fluid obtained at lumbar puncture after the headache was well under way did contain detectable amounts of an acetylcholine-like substance, a substance not found in the cerebrospinal fluids of normal subjects, of patients with migraine arising in extracranial arteries, or of patients with non-vascular headaches. Without chemical confirmation, however, this substance cannot be assumed to be truly acetylcholine, and more evidence must be found to justify any conclusions as to its role as the primary vasodilator substance of the migraine attack.

The major mystery concerns the actual origin of the migraine attack itself — how it starts and where in the brain this may be, and why and how it remains so strangely restricted, often unilateral and localized. If we conceive that this is basically an involuntary recurrently discharging disorder of the central nervous system, mainly affecting autonomic functions, we can view it in a very broad sense as "epileptic". This is not a new but rather quite an old idea(8). In its support is the unpredictable occurrence of the attack in many patients, in a few the precipitation of an attack by flickering light, and the striking neurologic symptoms, visual and otherwise, which may precede the headache itself in "classic" migraine. It is evident, however, that the pace of evolution of a migraine attack is usually quite deliberate, and in this respect it differs from most of the other manifestations of the epilepsies with which we are familiar.

The Significance of the Visual Prodromes of "Classic" Migraine

In this connection, the visual prodromes of the attack of classic migraine are of special interest and importance. Earlier speculation and experimental evidence favored simply the view that these symptoms arise from constriction of certain cranial arteries, usually branches of one posterior cerebral artery, then followed by the painful phase, representing arterial dilatation elsewhere in the cranial vascular tree(9). Interruption of the development of the prodromal scotoma by inhalation of amyl nitrite, a known cerebral vasodilator, was demonstrated in one thoroughly studied patient, seeming to provide strong support for the vasoconstrictor hypothesis(2).

A revisión of this interpretation has been suggested more recently by Milner, who has called attention to the evidence from the neurophysiologic laboratory that a curious kind of "spreading depression" of electrical activity can be evoked in the cortex of the experimental animal after certain types of localized stimulation(10). This phenomenon, so well studied by Leao, bears some resemblance to the slow evolution of the visual symptoms of migraine. This is notably so of the description which Lashley has provided of the gradual march of his own scotomas and bordering scintillations, as reproduced inf Fig. 5(11). Milner has pointed out the provocative similarity between the calculated rate of spread of Lashley's prodromes and that of Leao's "spreading depression" in animal cortex, in each instance approximately 3 mm. per minute.

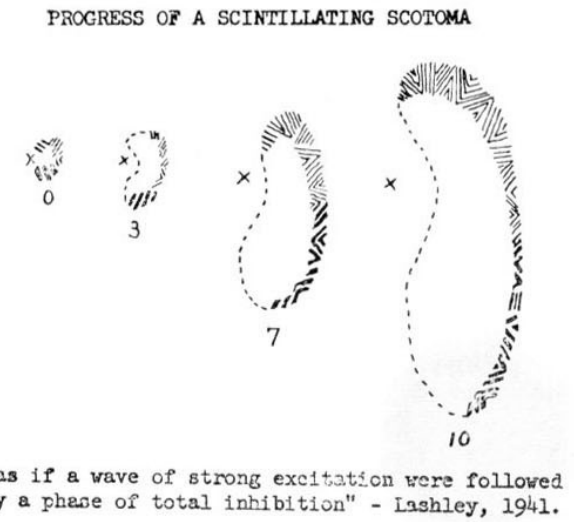

Fig. 5. — *Sketch by K. S. Lashley of the gradual evolution of his own scotoma and scintillations in a period of ten minutes, prodromal to a migraine headache (see reference 11).*

If such progressive changes in function within the occipital cortex preceding migraine headache do represent a special local electrical disorder —some unique and mysterious type of patterned and deliberately evolving cortical activity— the migraine prodrome becomes more complex in explanation than it has been in the past. In any

event, it may still be true that the prodromes are initiated by vasoconstriction, leading to temporary neuronal ischemia and then a slow evolution of the visual phenomena, conceivably by some process related to "spreading depression". The question is of fundamental importance, for it is plausible to view the prodromal phase as not simply the overture but actually the main part of the attack of "classic" migraine. The headache which follows is clearly the more enduring and disabling phase, but this may represent only a secondary relaxation of arterial tone in other cranial vessels in a misplaced or mistimed attempt to maintain normal blood flow.

A fresh look at some of the visual and uncommon associated phenomena of migraine has recently been offered by Bickerstaff. Some patients, he reports, describe prodromal symptoms of unusual severity and complexity, including visual loss or scintillations, or both, throughout both halves of the field of vision, perhaps with vertigo, dysarthria, tinnitus, and paresthesias in both sides of the body, occurring in various combinations(12). In a few patients, loss of consciousness, slow in onset and usually brief, is a particularly disturbing feature(13). He has noted that these varieties are restricted largely to adolescent females and that with further growth the attacks become less dramatic and more akin to "common" migraine. He presents compelling reasons for viewing such attacks as arising in the brain stem, intimately related to a disorder of circulation in the basilar artery, conceivably temporary constriction in the main trunk or one or several of its branches.

Acknowledgments: Approval was kindly granted by Hoeber Medical Division of Harper and Brothers, for reproduction of Fig. 2 from "Clinical Neurology", Vol. 2; and by the American Medical Association for reproduction of Fig. 3 and 4 from the Archives of Ophthalmology, Vol. 65, and of Fig. 5 from the Archives of Psychiatry and Neurology, Vol. 46.

SUMMARY

Among the most common headaches are those termed "vascular", associated with dilatation of portions of the cranial arterial tree. Of particular importance are the several varieties of migraine, particularly "common" migraine and the less often encountered "classic" migraine and "cluster" headache.

Suspicion that a headache is vascular in origin is supported by a throbbing quality to the pain, distinct enlargement of a scalp artery in the affected area, and improvement in headache by measures which lower cranial arterial pressure or which constrict cranial arteries (such as ergotamine). If the dilated arteries are intracranial, however, the surface sign is absent, and the headache is likely to be readily augmented by rotary head jolt. In addition, the pain is commonly lessened during straining for 10 seconds (the Valsalva maneuver), with a transient exacerbation on release of the strain.

The development of a mild and incomplete Horner's syndrome in a few patients with migraine, particularly if this be "cluster" headache, suggests that the dilated arterial segment at fault in these lies in the carotid canal.

A re-examination of the significance of the curious visual prodromes of "classic" migraine suggests that constriction of a branch of one posterior cerebral artery may not alone be a sufficient explanation. The patterns and gradual evolution of the visual phenomena bear some resemblance to "spreading depression" as evoked in the cortex of the experimental animal by Leao and others. With newer knowledge and expanding hypotheses, the explanation of migraine is becoming more rather than less complex.

RESUMEN

Las cefalalgias "vasculares" asociadas con una dilatación de una porción del árbol arterial craneano, constituyen el tipo más frecuente de cefalalgia. Son particularmente importantes algunas variedades de jaqueca, en particular la jaqueca ordinaria y las menos frecuentemente encontradas, la jaqueca clásica y la jaqueca "en racimo" ("cluster headache").

La sospecha de que una cefalalgia es de origen voscular está basada sobre la calidad pulsátil del dolor, la comprobación del ensanchamiento de una arteria del cuero cabelludo en la región afectada, y su mejoramiento por el descenso de la presión arterial craneana o la constricción de las arterias craneanas (por ej. por la acción de la ergotamina). Si la dilatación corresponde a una arteria intracraneana, entonces falta el signo superficial; en este caso la cefalalgia aumenta rotando la cabeza para uno y otro lado. El dolor disminuye generalmente haciendo que el paciente se esfuerce durante 10 segundos (la maniobra de Valsalva) con una exacerbación pasajera al suspenderse el esfuerzo.

La aparición de un síndrome de Horner poco manifiesto e incompleto en algunos pacientes que sufren de cefalalgias, en particular si se trata de cefalalgias "en racimo", sugiere que el segmento arterial dilatado se encuentra en el canal carotídeo.

La reconsideración del significado de los prodromos visuales de la jaqueca clásica, sugiere que la constricción de una rama de una de las arterias cerebrales posteriores quizá no constituye por sí sola una explicación suficiente de su mecanismo. El carácter y la evolución gradual del fenómeno visual tiene alguna semejanza con la "depresión que se propaga", tal como ha sido evocada en la corteza del animal experimental por Leao y otros.

Con los nuevos conocimientos y las crecientes hipótesis, la explicación de la jaqueca se está volviendo más bien más que menos compleja.

RÉSUMÉ

Parmi les maux-de-tête les plus fréquents sont ceux appelés "vasculaires" associés avec une dilatation d'une portion de l'arbre artériel cranien. Sont d'importance particulière plusieurs variétés de migraine, en particulier la migraine ordinaire et les moins souvent encontrées migraine classique et migraine "en grappe" ("cluster").

Le soupçon qu'une céphalée soit d'origine vasculaire est basée sur la qualité pulsatile de la douleur, l'élargissement distinct d'une artère du cuir chevelu dans la région affectée, et son amélioration aux moyens de l'abaissement de la pression artérielle cranienne ou de la constriction des artères craniennes (comme par l'ergotamine). Si l'artère dilatée est intracranienne, toutefois, le signe de surface est absent, et la céphalée sera augmentée par la rotation saccadée. De plus, la douleur est en général diminuée en se forceant pendant dix secondes (la manoeuvre de Valsalva), avec une exacerbation passagère provoquée par l'arrêt de l'effort.

Le développement d'un syndrome de Horner peu marqué et incomplet chez quelques malades souffrant de migraine, en particulier s'il s'agît de cephalée "en grappe", suggère que le segment artériel dilaté en question se trouve dans le canal carotidien.

Une réévaluation de la signification des prodromes visuels curieux de la migraine classique suggère que la constriction d'une branche d'une des artères cérébrales ne constitue pas une explication suffisante. Le caractère et l'évolution graduelle des phénomènes visuels rapellent "la dépression propageante" ("spreading depression") comme chez celle provoquée dans le cortex de l'animal expérimental par Leao et autres. Par de nouvelles connaissances et des hypothèses plus nombreuses, l'explication de la migraine devient plus complexe au lieu de devenir plus simple.

ZUSAMMENFASSUNG

Zu den üblichsten Kopfschmerzen gehören die, die als "vasculär" bezeichnet werden. Sie sind mit Erweiterung von Teilen der Kopfarterien verbunden. Von besonderer Bedeutung sind die verschiedenen Arten der Migräne, besonders der gewöhnlichen Migräne, der seltener angetroffen "klassischen" Migräne und des "Gruppen" ("cluster") Kopfschmerzes.

Der Verdacht, dass ein Kopfschmerz von vasculärem Ursprung ist, wird auf eine pochende Qualität des Schmerzes, auf deutliche Erweiterung einer Kopfarterie an der betroffenen Stelle und auf Besserung des Kopfschmerzes durch Massnahmen, die den Kopfaderdruck herabsetzen oder die Kopfadern zusammenziehen (wie ergotamine), gestuetzt. Wenn die erweiterten Arterien innerhalb des Schädels sind, fehlt jedoch das äussere Anzeichen, und die Kopfschmerzen vermehren sich gewöhnlich leicht bei starker Kopfdrehung. Dazu kommt, dass die Schmerzen gewöhnlich durch 10 Sekunden lange Anspannung (das Valsalva Manöver) abnehmen, mit einer vorübergehenden Verschlimmerung beim Aufhören der Anspannung.

Die Entwicklung eines milden und unvollständigen Horner Syndroms bei einigen Migräne Patienten, besonders, wenn es sich um Gruppen ("cluster") Kopfschmerz handelt, lässt vermuten, dass das erweiterte Arterien Segment, das ihn verursacht hat, im Carotis Kanal liegt.

Eine erneute Untersuchung der Bedeutung des seltsamen visuellen Prodroms der klassischen Migräne weist darauf hin, dass Zusammenziehung eines Zweigs einer "arteria cerebralis posterior" für sich allein noch keine ausreichende Erklärung sein kann. Die Formen und die allmähliche Entwicklung der Seh-Phänomene haben etwas Ähnlichkeit mit "sich ausbreitender Depression", wie sie im Cortex des Versuchstiers von Leao und anderen hervorgerufen wird. Mit neuerer Kenntnis und erweiterten Hypothesen wird die Erklärung der Migräne eher mehr als weniger komplex.

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Les Maux de Téte D'origine Cervicale

par JEAN NICK

(Paris - France).

Il n'est que trop vrai que le mal de tête tue peu. Dans cette constatation le coeur trouve plus de satisfaction que l'esprit. Le mal de tête tue peu et, si l'on ose dire, toujours les mêmes. On commence en effet à bien connaître les mécanismes des céphalées des maladies graves, vasculaires, méningées, tumorales, bref celles qui permettent une confrontation anatomo-clinique, au moins avec l'aide du neurochirurgien. On est beaucoup plus ignorant du mécanisme des céphalées bénignes et réduit trop souvent à des interprétations physiopathologiques hasardeuses parce qu'hypothétiques.

C'est pratiquement dans cette zone floue et incertaine que se situe le problème des maux de tête liés à la pathologie cervicale. On ne nous en voudra donc pas d'être suivant les moments circonspect ou péremptoire, sceptique ou affirmatif.

Les limites anatomiques du sujet

Le cou est essentiellement une zone de passage entre les centres céphaliques d'une part, le tronc et les viscères d'autre part. On peut considérer comme limites inférieures en avant le bord supérieur du manubrium sternal, en arrière la septième vertèbre cervicale, latéralement l'arc de la 1ère côte, le dôme pleural formant de chaque côté de l'axe viscéro-vertébral le plancher du cou. Les limites supérieures du cou sont constituées par la base du crâne et en avant la cavité aérodigestive du pharynx.

On trouve dans le cylindre cervical toute une série de formations qui peuvent jouer un rôle dans la genèse des céphalées.

1) l'axe rachidien et son contenu nerveux (bulbe, moëlle, racines) méningé, vasculaire.

   Rappelons cette notion fondamentale que l'innervation sensitive du cuir chevelu et des formations extracraniennes de la partie postérieure de la tête est assurée par le grand nerf d'Arnold issu des trois premières racines rachidiennes postérieures. Rappelons également que ces trois racines contribuent à innerver (pour la douleur) les formations sensibles de la fosse postérieure, méninges comprises, et la face inférieure de la tente du cervelet (Penfield et Mc Naughton-Guillaume). Cette innervation étant partagée avec des filets issus des nerfs mixtes (IX - X - XI).

2) les muscles et en particulier les muscles postérieurs spécialement le Trapèze et les muscles longs et courts du cou qui servent au maintien de la tête.

3) l'axe viscéral oesophago-trachéal ne semble pas jouer de rôle dans la genèse des céphalées.

4) les formations vasculaires et nerveuses sont en revanche de la plus haute importance: les carotides et les branches de la carotide externe; l'artère vertébrale si exposée dans son trajet intertransversaire; la jugulaire interne.

5) parmi les nerfs, les nerfs mixtes semblent jouer un rôle mineur; les nerfs moteurs n'en jouent aucun.

   Les formations sympathique et parasympathique sont des plus riches au niveau du cou: chaîne sympathique cer-

vicale avec ses relais ganglionnaires, nerf vertébral, formations autonomes périvasculaires. Tout cet appareil étant richement anastomosé et uni au système cérébrospinal par les rami communicantes.

6) le revêtement dermo-épidermique qui englobe tout cet axe cervical n'est pour notre sujet d'aucun intérêt.

* * *

La souffrance de ces diverses formations peut être génératrice de mal de tête. Certains faits sont de connaissance ancienne, de mécanisme évident. D'autres au contraire sont sujets à interprétation, à discussion. Le problème des céphalées étant avant tout un problème pratique, c'est, sinon dans une perspective thérapeutique, du moins sous l'angle du mécanisme que nous envisageons les diverses causes. Nous envisageons successivement les céphalées dont l'origine cervicale ne pose pas de question et les autres dont le mécanisme reste encore incertain.

* * *

Notre étude est basée sur le dépouillement de 166 observations personnelles diverses sans compter 483 cas d'algies de la nuque d'origine psychique, prélevées sur une statistique globale de 1887 observations personnelles de céphalées de toute origine. On devra toujours se rapporter à ce chiffre de 1887 pour avoir une idée de la fréquence relative des diverses variétés que nous allons étudier.

Ce qui est certain

I. — *l'Axe rachidien et son contenu* dans son segment initial, du trou occipital à la troisième cervicale comprise joue certainement un rôle dans la genèse de certaines céphalées. Et ceci parce que les trois premières racines postérieures assurent l'innervation sensitive des formations superficielles de la moitié postérieure de la tête d'une part, et de la fosse postérieure d'autre part.

A) Toutes les lésions osseuses vertébrales ou discovertébrales de cette région peuvent être en cause.

1) les lésions traumatiques d'abord: les fractures de l'Atlas, de l'odontoïde avec subluxation atloïdo-axoïdienne, le tassement d'une masse latérale de l'atlas; voire même une simple entorse atloïdo-axoïdienne sans traduction sur les clichés statiques et visible lors des mouvements enregistrés par radiocinématographie comme Fauré put l'objectiver pour une de nos jeunes blessées.

Dans de tels cas la céphalée est postérieure, habituellement unilatérale, rarement permanente mais procédant plutôt par crises provoquées souvent par une attitude particulière; l'un de nos blessés avait une douleur fulgurante rétro-auriculaire gauche avec une vasodilatation du même côté chaque fois qu'il tournait la tête à gauche.

Il est fréquent et précieux de constater une anesthésie ou une hypoesthésie dans le territoire d'un nerf d'Arnold. Il existe également souvent une contracture unilatérale de la corde musculaire de la nuque et la mobilisation du cou, qui doit être prudente, est douloureuse et limitée.

Sans parler des retentissements possibles sur les voies longues, il faut signaler la possibilité et même la fréquence des vertiges dont le mécanisme n'est sûrement pas univoque. Il peut s'agir d'une commotion des formations vestibulaires du bulbe, ou d'une perturbation circulatoire dans le territoire de l'artère vertébrale qui peut être étirée. Enfin on ne peut jamais savoir à quoi se limitent les effets directs d'un traumatisme, un simple ébranlement liquidien transmis pouvant entraîner une commotion labyrinthique.

Il faut noter également la possibilité de syncopes aux changements de position; elles aussi posent des problèmes difficiles (compression transitoire du bulbe ou d'une vertébrale).

2) les malformations de la charnière occipito-atloïdienne peuvent être en cause; la douleur est unilatérale, peut évoluer par crise d'une heure parfois, pulsatile. Le diagnostic est d'ordre radiologique. Chez un de nos malades un répit transitoire après alcoolisation nous a, lors de la rechute, incliné à faire pratiquer une radiocotomie de C2 - C3 qui a été suivie de guérison. Il s'agissait d'une impression basilaire discrète.

3) les lésions cervicarthrosiques peuvent être en cause mais si l'on s'en tient aux données radiologiques elles sont rares à ce

niveau; et pratiquement toujours consécutives à un ancien traumatisme. En tout cas s'il arrive qu'on constate une névralgie du nerf d'Arnold chez un sujet porteur de lésions cervicarthrosiques basses on n'est nullement assuré du rôle de la cervicarthrose, tant ce genre de constations radiologiques est banal.

4) le mal de Pott sous-occipital réalise les conditions anatomiques propres à provoquer ce genre d'algie. Mais l'affection tout au moins de nos jours et pour un neurologiste est devenue exceptionnelle.

B) Les lésions intrarachidiennes de ce segment initial du Rachis sont susceptibles de donner les mêmes algies de la nuque.

1) des tumeurs extramédullaires, comme l'illustre un cas inédit observé en 1949 avec Alajouanine et Houdart. Une névralgie d'Arnold unilatérale a constitué la totalité du syndrome lésionnel d'un méningiome latéro-cervical siégeant au niveau de C2 qui s'était présenté cliniquement pendant plusieurs mois comme une ataxie avec gros troubles de la sensibilité profonde affectant les quatre membres mais prédominant aux membres supérieurs, associée à une très discrète note pyramidale. La compression était probable en raison d'une dissociation albumino-cytologique du liquide céphalo-rachidien (albumine: 0,85; cell. 0,5); mais l'épreuve de Queeckenstedt était négative et le transit lipiodolé apparemment normal (la technique du remplissage segmentaire n'était pas encore au point). L'intervention fut décidée sur la survenue secondaire de la névralgie occipitale. La tumeur plaquée sur la face latérale du canal rachidien, et plutôt en avant avait le volume d'une amande. Nous avons deux autres cas analogues.

2) Une syringomyélie, ou une syringomyélobulbie peuvent être en cause dans leurs rares mais si pénibles formes douloureuses. Le diagnostic est facile en cas de lésions étendues au segment cervical inférieur, s'il y a des signes sensitifs, réflexes et trophiques au niveau d'un membre supérieur. Il est plus difficile s'il ne s'agit que d'une atteinte haute et c'est d'une part la constatation de l'anesthésie thermo-algique dissociée et d'autre part des signes bulbaires et en particulier un systagmus rotatoire qui peuvent mettre sur la voie du diagnostic (2 cas).

3) On en rapprochera le zona dont la localisation cervico-occipitale n'est pas exceptionnelle (4 cas).

C) C'est ici que nous plaçons la névralgie occipitale du grand nerf d'Arnold dans sa variété essentielle. Il est bien entendu nécessaire de faire chaque fois une enquête complète et en particulier de recourir à toutes les incidences radiologiques et tomographiques propres à objectiver une anomalie squelettique. Il arrive que l'on ne trouve rien. Cependant l'on ne peut pas se défendre d'invoquer parfois un facteur mécanique si la douleur est la conséquence du maintien prolongé d'une attitude inclinée (coiffeur); s'il existe une certaine gêne douloureuse aux mouvements qui s'effectuent dans la charnière. L'hypoesthésie du territoire du nerf, de même que le déclenchement de la douleur par la toux appartiennent plutôt aux névralgies secondaires qu'aux primitives.

De toute manière notre sentiment est que l'algie essentielle du nerf d'Arnold est rare. Nous n'en avons que 11 cas sur un total de 1887 céphalées. Dans cette série de 11 cas, l'âge moyen au moment du début des douleurs est de 41 ans, il y a 7 hommes et 4 femmes. L'algie est rarement fulgurante, plus souvent pulsatile; généralement paroxystique procédant par crises de 1/2 heure à 2 heures. Malgré le caractère pulsatile, les dérivés de l'ergot de seigle sont sans action; la novocaïnisation donne un résultat transitoire, et l'alcoolisation peut être efficace à condition de provoquer une anesthésie ce qui n'est possible que par une infiltration assez large (et pénible); le nerf d'Arnold lorsqu'il émerge du trapèze étant souvent déjà divisé en un bouquet de branches terminales. Il faut parfois demander la section du nerf ou des racines d'origine (C1 et surtout C2 et C3).

Cette thérapeutique peut s'appliquer à toutes les névralgies occipitales que nous avons étudiées précédemment (à l'exclusion des douleurs syringomyéliques et zostériennes bien entendu qui résistent à ce genre d'action locale).

II. — *Les muscles postérieurs du cou* (le

Trapèze et surtout les petits muscles longs et courts du cou) jouent un rôle également certain et indiscutable dans les algies craniennes postérieures. Ces muscles ont un rôle éminent de soutien; ce sont eux qui "portent" la tête.

1) les traumatismes cervicaux comportent, outre le torticolis, souvent une irradiation ascendante qui remonte jusqu'à la tubérosité occipitale externe ou même au-delà. Il existe une contracture douloureuse appréciable. Ce symptome est l'équivalent du lombago des hernies discales lombaires.

2) la raideur méningée des méningites aigues ou des hémorragies méningées cérébrospinales est une autre source d'algie musculaire cervicale.

3) mais il faut insister davantage sur les algies musculaires de la nuque d'origine statique comme on en voit chez les porteurs d'une cyphoscoliose vertébrale souvent dorsale, mais parfois cervicale basse. L'algie est ici la conséquence d'une contracture de compensation; elle est alors à prédominance unilatérale.

4) même mécanisme dans les dystonies d'attitude à type de spasme de torsion post-encéphalitique; l'attitude vicieuse et la douleur cessent dans le décubitus.

5) nous avons montré en 1949 avec Alajouanine l'importance du facteur statique dans l'algie de la nuque chez les anxieux et les déprimés où nous considérions comme éléments déterminants l'asthénie et l'anxiété; l'anxiété entraînant le gaspillage dans les contractions de soutien; l'asthénie, raccourcissant la durée de la tolérance des muscles postérieurs du con au maintien du port de tête. Nous avions à l'époque baptisé ce syndrome, syndrome d'Atlas en mémoire du géant qui portait selon la légende la Terre sur sa nuque.

6) On peut rapprocher de ces algies celles observées chez les couturières, les pianistes, les hommes de microscope, etc. (H. Wolf) qui maintiennent des heures durant la même attitude de la tète et du cou. Il va sans dire que ces divers facteurs déjà algogènes isolément, peuvent parfois se trouver associés chez un même malade.

Toutes ces douleurs de nuque en particulier les quatre dernières catégories sont donc des algies statiques en général bilatérales, souvent de très longue durée, étalées sur des jours et des mois pouvant s'étendre du vertex aux épaules et qui n'apparaissent que lorsque le sujet est debout ou assis et maintient sa tête. Elles disparaissent en revanche en quelques minutes de décubitus. On peut mettre en évidence la sensibilité musculaire très facilement en pinçant la corde des trapèzes. Les mouvements cervicaux sont en revanche libres et d'amplitude normale. Il n'y a pas non plus d'anesthésie dans le territoire du nerf d'Arnold, ni de signes neurologiques d'accompagnement.

Ce type d'algie céphalique postérieure d'origine musculaire est à notre sens trop négligé malgré son importance pratique. C'est la localisation psychalgique la plus fréquente (483 sur 964). Et c'est proportionnellement à toutes les étiologies de céphalée la plus importante (483 sur 1887). C'est le grand mérite d'Harold Wolf d'avoir insisté sur le facteur musculaire dans les algies en 1948. Nous même l'année suivante)Mars 1949) reprenions et développions cette idée avec Alajouanine. Notre opinion sur ce point n'a pas varié. C'est aux muscles qu'il faut rapporter ces douleurs qui sont parfois mises sur le compte de la souffrance des tissus superficiels. On parle parfois de "cellulite" en France, de "fibrositis" dans les pays anglo-saxons. Il faut faire un sort à ces formules et abandonner définitivement cette terminologie aux masseurs et aux esthéticiens.

III. — *Les veines du cou* sont rarement en jeu dans les céphalées. Tinel a décrit une céphalée d'effort déclenchée par un effort physique, la toux, l'éternuement, qui entraînent un accoup de pression dans le territoire veineux céphalique. On prouve le rôle des veines par le déclenchement de la douleur par compression des jugulaires. Ces céphalées trouvent leur explication dans une lésion souvent cicatricielle et traumatique d'un gros sinus veineux céphalique. Nous avons vu cependant deux cas où la céphalée était liée au port d'un col dur. La toux ne provoquait pas de douleur la nuit lorsque les sujets étaient déshabillés. Il a suffi de recommander le port d'un col mou pour supprimer ces pénibles céphalées d'effort.

Ce qui est discuté

Nous venons d'envisager le rôle du segment initial du Rachis cervical (C1 - C3) des muscles et accessoirement des veines. Restent le segment inférieur (C4 - C7) du Rachis et le rôle des artères et des formations sympathiques et parasympathiques du cou.

En réalité tout ceci constitue un problème physiopathologique unique. Du moment que les formations cérébrospinales qui jouent un rôle direct dans l'innervation sensitive d'une partie de la tête naissent au-dessus de C4, la pathologie vertébrale du segment C4 - C7 si elle intervient dans les céphalées ne le peut qu'indirectement. Que ce soit comme nous venons de le voir par l'intermédiaire de phénomènes musculaires, (contracture de vigilance réflexe, contracture statique); que ce soit par l'intermédiaire d'une perturbation de la vascularisation céphalique, celle-ci pouvant être la conséquence inmmédiate d'une souffrance de l'artère vertébrale vulnérable dans les trous transversaires et dans sa boucle sous-occipitale, ou la conséquence médiate d'une altération des voies sympathiques et parasympathiques.

On dénie en principe tout rôle direct aux formations végétatives dans la transmission de la douleur et si le système nerveux autonome est incriminé à l'origine de certaines céphalées ce ne peut être que par son action vasomotrice éventuelle sur la circulation céphalique. Ainsi le rôle du système neuro-végétatif serait-il double: ses lésions pourraient retentir sur la vascularisation cérébrale; il pourrait être également le vecteur sain d'irritations nées à son contact, en particulier au niveau des vertèbres et des disques cervicaux. On nous dispensera de rappeler ce que tout le monde connaît des dispositions anatomiques du sympathique et du parasympathique cervicaux, de ses connexions avec l'axe discovertébral et cérébrospinal (par les rami communicantes); du riche réseau périartériel (péricarotidien, périvertébral et nerf vertébral); de son rôle vasomoteur, sécrétoire, pupillomoteur au niveau de la tête et de la face.

Les conditions anatomophysiologiques pour un rôle éventuel dans la production de céphalées des vaisseaux, du système végétatif et du rachis cervical inférieur existent indubitablement. A quoi cela correspond-il dans la pratique? Cette partie de notre exposé sera donc à la faveur de l'analyse de certaines étiologies (cervicarthroses, algies vasculaires diverses, traumatismes cervicaux) une étude critique des facteurs vasculaires et sympathiques cervicaux dans la genèse des céphalées. Et c'est le point le plus délicat, le plus hasardeux de notre propos dans la mesure où les contrôles anatomiques font habituellement défaut, et où la part d'interprétation personelle est prépondérante et expose aux erreurs.

Un certain nombre de constatations positives ont été déjà versées dans le débat:

1) il peut y avoir des douleurs céphaliques dont l'origine est une souffrance artérielle au niveau de la région cervicale.

Rappelons à ce sujet l'observation de Ricard et Girard (de Lyon) d'une algie vasculaire faciale secondaire à une cicatrice adhérente de la peau et de l'artère faciale siégeant au-dessous du rebord de la mandibule. La douleur résista à la neurotomie du trijumeau pourtant correcte et ne céda qu'à l'infiltration puis à l'excision de la cicatrice et de l'artère.

Lazorthes rapporte un fait également intéressant; une striction entre les fibres du scalène antérieur du tronc thyro-bicervico-scapulaire entraînait une algie scapulaire, cervicale et occipitale et également une hypoacousie; la libération chirurgicale de cette striction fit disparaître tous les symptômes.

Nous-mêmes avons vu un sujet porteur d'une large cicatrice latéro-cervicale adhérente aux plans profonds et consécutive à une blessure de guerre, la douleur était cranio-faciale et intéressait tout le territoire superficiel de la carotide externe. Une neurotonie rétrogassérienne correcte si l'on en jugeait par l'anesthésie obtenue n'avait

amené aucun soulagement. Il est à parier qu'il s'agissait ici d'une souffrance de la carotide externe et de ses branches(1).

C'est à une telle théorie que se rangeait implicitement Wolf en ce qui concerne la migraine puisqu'il attribuait toute la phase douloureuse à une souffrance du territoire de la carotide externe. De même Rowbotham que avait proposé la section de la carotide externe comme cure des hémicranies vasculo-sympathiques.

2) il peut selon Barré (1925 thèse Liéou 1928) exister des céphalées en rapport avec l'irritation du sympathique. Le "syndrome sympathique cervical postérieur" de Barré entrainerait des douleurs généralement cervico-occipitales unilatérales, mais parfois aussi rétro-oculaires et faciales; également des vertiges et des troubles auditifs (acouphènes, modification transitoire de l'audition) des troubles visuels (scotomes scintillants, etc....). Il faudrait y voir l'expression de la souffrance du plexus périvertébral excité en quelque point de son trajet (côte cervicale, scalène antérieur, lésion du dôme pleural, lésions vertébrales ou discovertébrales) et retentissant sur la circulation vertébro-basilaire.

Armilf indique que l'excitation du sympathique périvertébral détermine des douleurs diffuses dans la tête et dans l'oreille. Weir-Mitchel a observée des céphalées, des douleurs oculaires et des bourdonnements d'oreille au cours de la section des derniers rami communicants cervicaux.

Voici donc des cautions illustres à ces théories qui éclairent certainement le mécanisme de quelques faits. Comment autrement pourrait-on expliquer certains paroxysmes cranio-cervico-scapulaires unilatéraux? Mais ces théories ont-elles une application plus étendue?

Nous avons retenu comme base de cette étude 129 cas de céphalées, groupées sous diverses rubriques qui posent chacune un problème pratique.

1. cervicarthroses et céphalées: 19 cas.
2. céphalées et souffrance de la fosse postérieure (lésions expansives exceptées): 12 cas.
3. céphalées et vertiges: 24 cas.
4. hémicranies vasculo-sympathiques et pathologie cervicale: 30 cas.
5. traumatismes cervicaux et céphalées: 44 cas.

Il ne s'agit point ici d'une classification que nous tenterons plus loin; ce n'est que l'illustration par plusieurs séries de cas de problèmes à la fois pratiques et physiopathologiques. D'ailleurs certains s'interpénètrent; comment dissocier les cervicarthroses de l'évolution tardive des traumatismes cervicaux par exemple; comment ne pas voir l'artifice d'un groupe "céphalées et vertiges" qui fait peut-on dire la liaison de tous les autres, etc....

I. Cervicarthroses basses et céphalées

Notre groupe de céphalées chez les porteurs de cervicarthroses basses (C4 à C7) radiologiquement vérifiées et de degré variable compte 19 malades (14 femmes et 5 hommes), l'âge moyen est de 52 ans.

La céphalée siège 17 fois sur 19 à la nuque tantôt bilatérale (9 fois) tantôt unilatérale (8 fois). Deux de ces dernières s'associent à des algies craniofaciales antérieures et homolatérales par rapport à l'algie occipitale.

Les deux cas restants sont l'un de siège cranio-facial uniláteral gauche évoluant par crises avec sensation vertigineuse el inégalité pupillaire (mais la mydriase relative est du côte de l'algie (la cervicarthrose est de siège C5 - C6).

Dans 5 cas on retrouve des antécédents de névralgie cervico-brachiale sans liaison évolutive chronologique avec la céphalée. Dans un cas cependant la crise comporte une algie cranienne postérieure droite cervicale et brachiale concomitante généralement déclenchée par le froid (lésion C4 - C5).

Il existe des troubles cochléo-vestibulaires dans 6 cas (une fois une surdité isolée;

(1) Ce fait et le cas de Ricard et Girard ne sont pas isolés. Les neurologistes admettent tous ou feignent d'admettre que la douleur ne passe que par le système cérébro-spinal. Malheureusement les malades ne paraissent pas tous au courant de cette séduisante théorie.

2 fois des vertiges isolés; 3 fois une double atteinte cochléo-vestibulaire), les explorations otoneurologiques ont révélé soit une intégrité vestibulaire soit des altérations de type périphérique.

Il peut exister une atteinte des voies longues à type de sclérose combinée. Nous rédigeons actuellement avec Contamin, Guillard et Lechevallier un article sur les myélopathies cervicarthrosiques. En général cependant l'atteinte médullaire fait défaut chez les cervicarthrosiques céphalalgiques.

De même en dehors des atteintes cochléo-vestibulaires, les atteintes des formations de la fosse postérieure font chez eux habituellement défaut.

On constate dans 1/3 des cas des stigmates d'atteinte artérielle (sclérose ou hypertension).

On constate également dans près de 60% des cas un dérèglement psycho-affectif du type dépressif (11 cas sur 19; dont 4 très importants).

Ce lot de 19 malades nous révèle que lorsqu'il existe une céphalée dans les cervicarthroses basses, le siège occipital est la règle. On peut se demander si son mécanisme est univoque. La note dépressive intervient sûrement dans quelques cas et l'algie de la nuque est alors une psychalgie; la mobilisation du cou est alors souvent facile; l'algie cède habituellement dans le décubitus; elle est généralement influencée par les traitements sédatifs et thymoleptiques et l'on peut se demander si la cervicarthrose a le moindre rôle dans la genèse de la céphalée.

Dans d'autres cas l'impression est différente. On a le sentiment parfois d'une véritable poussée arthrosique avec contracture musculaire de vigilance. Dans ces cas il existe une limitation des mouvements du cou et l'algie persiste dans le décubitus.

Dans deux cas seulement on a le sentiment qu'intervient un mécanisme sympathique:

Un cas d'algie vasculo-sympathique unilatérale cranio-faciale critique avec inégalité pupillaire paradoxale (cas A...).

Un cas d'algie cranio-cervico-brachiale critique (cas R...).

De toute manière ces 19 cas sont à mettre en balance avec un nombre infiniment plus considérable de cervicarthroses basses de même localisation radiologique, sans le moindre accompagnement céphalalgique et dépistées par exemple pour une algie cervico-brachiale pour une myélopathie de cause imprécise, ou même lors d'une radiographie systématique. Si bien qu'on droit considérer comme tout à fait contingent l'existence de céphalée dans les cervicarthroses basses. A la limite on peut se demander même lorsque cervicarthrose et céphalée coexistent s'il ne s'agit point d'une coincidence et donc de l'intervention d'un mécanisme tout à fait différent. C'est en tout cas ce que suggère l'importance numérique relative dans notre série des facteurs psychoaffectifs qui à eux seuls pourraient expliquer la céphalée.

II. Céphalées et souffrance de la fosse cérébrale postérieure

Nous avons isolé un groupe de 12 malades (7 femmes et 5 hommes) où la céphalée n'est qu'un des éléments d'un syndrome de souffrance de la fosse postérieure; toute étiologie tumorale étant bien entendue écartée.

La céphalée est 9 fois sur 12 localisée à la nuque et 3 fois seulement antérieure ou moyenne. Mais la céphalée n'est pas ici le fait dominant ni même celui pour lequel on est venu consulter.

Sauf exception la consultation a été motivée par des troubles de l'équilibre, des vertiges et parfois même le grand vertige brutal avec vomissement qui marque le début de certains syndromes vasculaires du tronc cérébral. Le syndrome vestibulaire a d'habitude une traduction clinique objective (signe de Romberg, déviation des index, et plus rarement nystagmus). Les examens oto-neurologiques lorsqu'ils ont pu être faits (6 cas sur 12) ont décelé chaque fois des signes centraux (à l'exception d'une malade où il fut négatif). Une atteinte cochléaire a été constatée dans la moitié de ces six cas.

A cette atteinte cochléo-vestibulaire qui encore une fois constituait la note domi-

nante du tableau clinique s'associent des altérations des paires craniennes 10 fois sur 12; il s'agissait 6 fois du Trijumeau (Hypoesthésie), 4 fois d'atteinte oculo-motrice (diplopie).

Enfin 4 fois l'on constatait des signes cérébelleux dont une fois en association avec une note pyramidale.

Pour ceux de ces syndromes à évolution progressive, et c'étaient les plus fréquents, même si un grand vertige pouvait avoir quelque solennité, l'on imagine volontiers que le diagnostic de Tumeur de la fosse postérieure ait été envisagé. Nous avons eu recours la plupart du temps à l'Encéphalographie gazeuse fractionnée; en vain. Une fois même sur le vu d'une anomalie de remplissage d'une citerne ponto-cérébelleuse une exploration chirurgicale de la région de l'angle ponto-cérébelleux a été faite = également en vain.

Enfin une autre malade décédée dans mon service d'une pleurésie purulente et suivie depuis 5 ans ne présentait d'autre anomalie à l'autopsie qu'une athéromatose à la coupe du tronc basilaire. Il n'y avait pas de lésion ischémique visible au niveau du tronc cérébral.

Nous sommes très tentés de faire jouer le plus grand rôle dans ce type de syndrome à une perturbation vasculaire dans le système vertébro-basilaire, même si l'absénce d'ictus est la règle. L'âge moyen de ce groupe est assez élevé (53 ans). Il peut s'agir d'ailleurs d'ischémie passagère comme l'on imagine qu'il puisse s'en produire à l'occasion d'attitude penchée du cou coinçant une artère vertébrale; ou à l'ocassion d'une thrombose vertébrale incomplètement compensée par le débit de l'artère symétrique.

Il y a tout à parier qu'il existe l'équivalent vertébral des thromboses carotidiennes basses. Malheureusement l'artériographie vertébrale est de technique plus difficile que l'artériographie carotidienne et sa pratique n'est pas exempte de danger. Et nous devons confesser qu'aucun des malades de ce groupe n'y a été soumis.

Cette lacune a été heureusement comblée par d'autres et il nous faut citer le beau travail récent de Djindjian et Pansini qui montrent des rétrécissements et des oblitérations de l'artère vertébrale dans son trajet intertransversaire cervical, en particulier au cours des cervicarthroses.

Dans notre série les clichés simples ont montré de façon inconstante des lésions cervicarthrosiques souvent discrètes. Rien ne permet d'inférer malheureusement des anomalies des clichés standard à leurs conséquences réelles sur la circulation vertébrale.

Il est cependent à noter —la constatation vaut ce qu'elle vaut— que l'âge moyen des malades de ce groupe (53 ans) est pratiquement le même que celui du groupe précédent (52 ans).

Mais encore une fois ce qui est essentiel ici ce sont les signes neurologiques objectifs; la céphalée est accessoire et contingente.

III. Cephalées et vertiges

Nous avons isolé un autre groupe de 24 malades (12 hommes 12 femmes) où la céphalée s'associe également à des vertiges à l'exclusion de toute autre atteinte des paires craniennes. L'âge moyen est de 47 ans.

La céphalée est habituellement postérieure (13 cas) et médiane; elle peut être diffuse (5 cas) ou avoir une disposition hémicranienne (6 cas) mais n'évoluant pas par crise et donc non assimilable à la migraine.

Comme dans le précédent groupe c'est le plus souvent, moins pour la céphalée que pour des vertiges que les malades ont consulté. Les vertiges s'associent dans la moitié des cas à des signes cochléaires (hypoacousie, acouphènes). Sur cinq examens otoneurologiques on a constaté 3 fois une intégrité vestibulolabyrinthique, et deux fois une hypoexcitabilité de type périphérique.

Ces malades n'ont aucun autre nerf crânien touché; pas davantage de signes radiologiques vertébraux. On trouve 7 fois des signes d'atteinte artérielle générale (hypertension modérée ou sclérose artérielle). On trouve surtout dans 12 cas —la moitié— un dérèglement psycho-affectif où domine l'angoisse, avec comme il est fréquent chez les vrais vertigineux une note d'agoraphobie.

Ce groupe est plus disparate qu'il n'y paraît. On peut à notre avis distinguer trois possibilités:

1) une forme mineure du syndrome précédent dont elle serait en somme le début

2) une atteinte primitive de l'oreille interne dont le retentissement psychique consécutif au drame de la surdité et à l'insécurité du vertige provoque la survenue secondaire d'une algie de la nuque de type psychalgique. Ceci nous paraît proportionnellement important

3) peut-être enfin une ébauche réalisée du fameux syndrome sympathique postérieur. Mais il n'y eut jamais de syndrome de Claude-Bernard-Horner. Encore l'absence de celui-ci est-elle acceptable si l'on considère qu'il nécessite soit une altération du centre cilio-spinal et des rami communicantes correspondants, soit une lésion de la chaîne sympathique cervicale. Les autres lésions du sympathique ou du parasympathique cervical peuvent se passer d'anomalie pupillaire.

Mais nous n'acceptons pas la dénomination de forme postérieure de la migraine; car la céphalée ne procède pas ici par crises courtes (quelques heures ou quelques jours) et n'a pas l'étalement sur toute une vie de la vraie migraine.

IV. Hémicranies vasculo-sympathiques critiques et pathologie cervicale

Abordons maintenant le problème du rôle éventuel de la pathologie cervicale dans le genèse des migraines. Nous englobons dans ce chapître les migraines vraies, hémicranies à bascule, avec ou sans phénomènes visuels d'accompagnement, commençant en règle dans l'enfance, et les algies vasculaires également hémicraniofaciales mais survenant toujours du même côte, s'accompagnant avec prédilection de phénomènes vasomoteurs, sécrétoires et parfois oculaires (enophtalmie) enfin souvent d'apparition plus tardive (Sluder-Horton). Les unes et les autres évoluent par crises et sont généralement suspendues par la grossesse.

Les migraines vraies mettent en branle *toute* la circulation céphalique. Et si Wolf incriminait surtout le rôle de la carotide externe dans la phase douloureuse, la carotide interne et la vertébrale participent également aux crises accompagnées. En réalité ce ne sont pas à notre avis tellement les troncs artériels qui jouent un rôle, que les formations artériolo-capillaires terminales sous l'influence probable d'un trouble humoral que les récentes études sur la Sérotonine permettent d'entrevoir.

La vertige ne fait habituellement pas partie du déroulement de la migraine. Un certain nombre pourtant en comportent (28 sur 264). Faut-il y voir le reflet d'un stimulus cervical particulier? Dans ces cas d'ailleurs le vertige est d'apparition souvent tardive, et remplace à titre d'equivalent la migraine. Il est sensible à l'ergotamine. C'est du moins ce que l'on observe 13 fois sur 19 migraines vraies. Aux vertiges s'associent dans la moitié des cas des phénomènes auditifs (acouphènes, hypoacousie); les explorations otoneurologiques sont en général négatives ou révèlent de légères altérations de type périphérique. On peut se demander si ces crises méniériformes ne constituent pas les vraies et seules migraines postérieures. En tout cas rien dans les explorations courantes (radio, etc....) ne permet de leur assigner un déclenchement cervical particulier. Simplement le phénomène intéresse désormais surtout le système vertébro-basilaire plutôt que le système carotidien.

On peut dans les algies rigoureusement unilatérales type Horton-Sluder (9 cas) observer le même décalage d'apparition, les vertiges succédant à la céphalée. On peut également voir (à peu près par moitié) la crise comporter un ensemble algique et cochléo-vestibulaire d'évolution simultanée; avec en particulier parfois une hypoacousie transitoire donnant une impression d'oreille bouchée. Si l'on ajoute qu'il peut exister à titre critique des modifications sécrétoires (larmes, narine bouchée) et vasomotrices, une énophtalmie également critique on a tout lieu d'incriminer une perturbation sympathique prouvée par ailleurs par l'action favorable de la phénolisation du ganglion sphéno-palatin. Si l'on est tenu de rechercher une cause locale, très souvent on ne trouve rien, parfois une altération de la base du crâne (trauma; otomastoïdite); trop rarement une lésion vertébra-

le arthrosique (comme un cas déjà signalé plus haut); dans un autre cas la radio révéla un déplacement latéral de l'Atlas vers la droite. Dans ce dernier cas, il existait d'une part une douleur sous angulo-maxillaire et laéro-cervicale droite permanente, et par crises, chaleur et rougeur sus-orbitaire droites, picotements de l'oeil droit, impression d'oreille bouchée à droite (action favorable de la phénolisation du ganglion sphénopalatin et de l'ergotamine).

Nous voudrions enfin rapporter deux observations d'algie vasculo-sympathique qui sont à rapprocher du cas R... signalé dans le chapitre consacré aux cervicarthroses.

J... âgée de 23 ans présente depuis 4 ans des crises étalées sur trois jours. La douleur débute au niveau de la machoire à gauche, puis gagne l'oeil gauche et la moitié gauche du cuir chevelu; le lendemain elle s'étale à la moitié gauche du cou, à l'épaule et à l'hémithorax gauche jusqu'au sein. Ces crises surviennent à peu près chaque semaine. Aucun signe radiologique anormal.

B... 54 ans opérée il y a 9 ans d'un cancer du sein droit selon la technique d'Halstedt se met à faire chaque jour de très nombreuses crises douloureuses bipolaires rigoureusement synchrones; au niveau de la région temporo-pariétale droite et de la face postérieure de l'avant-bras du même côté. La douleur d'abord fulgurante et courte, évolue par crise de 1/2 heure à type de brûlure. Aucun signe neurologique objectif. Aucun signe électrique ni gamma-encéphalographique anormal. Aucun signe d'évolutivité locale ou à distance du cancer. Effet remarquable du tartrate de Butanolamide de l'Acide 1 Méthyl D lysergique (antisérotonine). A noter que l'algie qui survient du côté de l'opération paraît sous la dépendance des altérations sympathiques consécutives au curage cervicoaxillaire.

Il n'y a ni dans l'un ni dans l'autre cas de modification pupillaire ou vasomotrices objectives, mais on ne voit pas comment expliquer ces phénomènes sans faire jouer un rôle au sympathique cervical encore que dans le cas J... on n'ait pas la moindre notion de la cause éventuelle de la mise en branle du sympathique.

V. Traumatismes cervicaux et céphalées

Les traumatismes cervicaux occupent une place importante dans la genèse des algies céphaliques. Nous avons ici 44 observations dont les lésions cervicales ont eu des causes différentes, d'intérêt inégal pour le problème qui nous occupe.

Il peut exister une composante cervicale (parfois dominante d'ailleurs) dans des traumatismes complexes comme il peut en arriver dans des accidents graves de la route par exemple, ou encore dans des chocs céphaliques antérieurs, postérieurs ou latéraux, entraînant par hyperextension ou hyperflexion, ou inclinaison latérale forcée du cou des dislocations vertébrales. Dans ces cas l'on ne peut toujours dissocier ce qui revient au traumatisme cranien et ce qui appartient au traumatisme cervical.

Plus intéressants sont les traumatismes dont la seule lésion est cervicale. Cela peut s'observer soit chez des sujets qui se livrent à un effort anormalement violent, soit et surtout chez l'automobiliste qui est tamponné à l'arrière par un véhicule plus rapide. C'est le type même de l'accident du conducteur prudent qui s'arrête à un feu rouge et est percuté à l'arrière par une autre voiture surprise par l'arrêt brusque de la première. Dans ce genre d'accident la brusque impulsion de sens postéro-antérieure transmise par le dossier de son siége au tronc de l'automobiliste entraîne un brusque mouvement de balancier de l'extrémité céphalique dans le sens sagittal. Ce sont les interlignes C4 - C5 ou C5 - C6 qui souffrent dans ces cas. Il n'est pas rare que les autres passagers de la voiture tamponnée présentent tous le même syndrome.

Enfin il faut tenir compte également des efforts habituels mais répétés des porte-faix habitués à porter sur la nuque de lourdes charges et qui peuvent par des microtraumatismes répétés créer un état lésionnel proche de certaines arthroses, mais chez des adultes jeunes. On peut aussi rapprocher les conséquences de certains efforts d'intensité moyenne ou de certaine attitudes anormales du cou longtemps maintenues chez des porteurs de cervicarthroses.

Nous nous intéresserons surtout aux traumatismes cervicaux purs (ceux du deuxième

groupe) qui ont reçu le coup de boutoir postérieur. 18 cas sur 44.

Il n'y a pratiquement jamais de coma initial. Tout au plus une éclipse de quelques secondes "un trou noir".

L'algie consécutive comporte pratiquement toujours un torticolis avec limitation douloureuse des mouvements; la céphalée est fréquente (14 fois sur 18), elle est pratiquement toujours postérieure uni ou bilatérale. Elle n'apparait pas forcément au décours immédiat de l'accident mais quelques heures ou même quelques jours plus tard.

Objectivement il existe parfois une attitude guindée du cou; toujours une certaine contracture douloureuse des muscles, unilatérale ou à prédominance unilatérale. La mobilisation antéro-postérieure et latérale du rachis est douloureuse. On constate non seulement un point douloureux précis au palper des épineuses ou des masses articulaires, mais encore une sensibilité des muscles du cou.

L'association à des vertiges est fréquente (10 sur 18). Deux fois même on note une sudité transitoire; deux fois l'on note aussi de vraies syncopes aux changements de position de la tête.

Ce qui est possible également c'est évidemment l'association à une algie cervicobrachiale habituellement du type radiculaire supérieur (4 fois associé à la céphalée — 2 fois indépendamment de la céphalée).

C'est également un retentissement médullaire qui) est exceptionnellement immédiat (2 cas), qui sera habituellement secondaire ou tardif à prédominance unilatérale parfois. C'est ici que la suite éloignée des traumatismes cervicaux rejoint le problème des cervicarthroses.

Une fois enfin nous avons vu un syndrome de Wallenberg déclenché chez un artérioscléreux de 50 ans par un brusque et violent effort (redressement d'un pare-choc tordu). Il est probable qu'une insuffisance circulatoire latente et préexistante a favorisé l'apparition du syndrome à la faveur de l'oblitération traumatique d'une vertébrale. Dans ce cas à la vérité, la céphalée unilatérale de la nuque a disparu au bout de quelques jours alors que le syndrome a mis des mois à s'amender et seulement partiellement; la céphalée paraissant bien plus liée à l'élément arthro-musculaire qu'à lélément artériel.

Nous avons d'ailleurs le sentiment que ce facteur arthromusculaire est essentiel dans la compréhension de la céphalée due aux traumatismes cervicaux en général, même à ceux qui affectent le rachis au-dessous de C3; la contracture musculaire débordant toujours l'articulation lésée et affectant les muscles postérieurs jusqu'à leurs insertions céphaliques. Le même mécanisme jouant lorsque le traumatisme altére la courbure normale, et donc la statique du Rachis cervical.

Cette observation confirme également pour nous l'impression que la pathologie de l'artère vertébrale au cou est moins souvent en cause dans les céphalées simples que dans les syndromes ischémiques du tronc cérébral. A ce sujet on se rappellera une observation analogue de Schott de thrombose vertébrale consécutive à un traumatisme, la survenue de lésions ischémiques après des manipulations cervicales intempestives (Boudin); ou par conservation prolongée d'une attitude anormale du cou (Alajouanine).

Au terme de l'analyse de ces diverses catégories de céphalées d'origine cervicale nous sommes tentés de faire un bilan des mécanismes possibles.

1) le rôle du sympathique cervical nous paraît pouvoir être retenu dans un petit nombre de cas avec une certaine probabilité. Nous en avons retenu 4 (2 au cours de cervicarthroses — 2 dans les hémicranies vasculaires). Peut-être est-il à l'origine d'un nombre plus grand d'hémicranies vasculo-sympathiques de topographie fixe type Horton-Sluder, mais il n'y a pas de preuve réelle de leur origine cervicale.

2) le rôle des perturbations artérielles d'origine cervicale et en particulier vertébro-basilaire apparaît comme de plus en plus important mais sans doute plus dans la genèse de syndromes neurologiques du tronc cérébral que dans la genèse de la céphalée elle-même; l'artériographie vertébrale montrera sans doute de plus en plus sou-

vent le rôle des altérations directes des artères vertébrales par les lésions squelettiques traumatiques ou arthrosiques.

3) cependant il faut reconnaître que sur le plan pratique deux facteurs jouent un rôle décisif sur la genèse des céphalées d'origine cervicale.

a) un facteur mécanique d'origine cervicale vraie: le retentissement arthro-musculaire des cervicarthroses et des traumatismes

b) un facteur qui n'est cervical que par "emprunt"; la myalgie statique des psychalgies.

Bien entendu ce dernier facteur n'est nullement la conséquence directe des lésions cervicales. Nous ne voudrions pas qu'il résulte de cet alinéa la moindre confusion. Le rappel est pourtant nécessaire sur le plan pratique. Trop d'algies de la nuque sont mises sur le compte de lésions vertébrales par ailleurs radiologiquement vérifiées, alors qu'elles relèvent d'un mécanisme psychogène associé sans doute fortuitement; seule dans ce cas la cure thymoleptique et sédative sera efficace. Cela est vrai comme nous l'avons vu pour les cervicarthroses; cela est vrai aussi pour certains traumatismes cranio-cérébraux ou la composante dépressive du syndrome subjectif est à incriminer.

RESUME ET TENTATIVE DE CLASSIFICATION

On peut diviser l'étude des céphalées en rapport avec la Pathologie cervicale en plusieurs catégories, suivant les causes et les mécanismes.

I. — *Celles qui relèvent des causes rachidiennes.*

A) dans le segment initial allant de l'occiput à C3 la souffrance des trois premières racines postérieures qui donnent naissance au nerf d'Arnold provoque des douleurs occipitales.

1. Il peut s'agir de lésions traumatiques, arthrosiques, inflammatoires, malformatives du Rachis.

A la souffrance des trois premières racines postérieures peut s'ajouter à titre accesoire un élément musculaire chaque fois que la lésion rachidienne comporte une lésion articulaire ou entraîne une dysharmonie de courbure et donc un trouble de la statique de la tête.

2. c'est également par compression des mêmes racines postérieures et accesoirement par contracture musculaire que les tumeurs intrarachidiennes m a i s extramédullaires, peuvent entraîner une céphalée de la nuque.

3. les lésions du ganglion rachidien postérieur (zona) ou de l'axe gris (Syringomyélie douloureuse) se projettent au même niveau par l'intermédiaire du nerf d'Arnold.

4. la rare névralgie primitive du grand nerf d'Arnold appartient à ce groupe.

B) dans le segment rachidien cervical inférieur (C4 - C7) la souffrance des racines du nerf d'Arnold ne peut être invoquée.

Des mécanismes différents peuvent être en jeu:

a) rarement un mécanisme sympathique cependant possible

b) parfois un mécanisme artériel (souffrance directe de la vertébrale) plutôt génératrice cependant de perturbations neurologiques du tronc cérébral que de céphalée vraie

c) plus souvent la lésion rachidienne entraîne une contracture musculaire des muscles de la nuque (contracture satellite de vigilance; contracture statique dans les distorsions vertébrales)

d) enfin il faut se méfier de l'association à une "pathologie cervicale" d'une composante psycho-affective qui est responsable de la céphalée et crée un ensemble symptomatique trompeur.

Ces mécanismes peuvent être en jeu aussi bien pour les lésions traumatiques qu'inflammatoires, arthrosiques ou malformatives.

II. — *Les lésions vasculaires (arterielles ou veineuses)* purement cervicales sont rarement en cause (cas exceptionnels de Ricard et Girard, de Lazorthes et de nous-mêmes).

Si l'artère vertébrale est plus souvent en jeu, ce n'est pratiquement jamais de façon primitive, mais comme conséquence d'altérations rachidiennes (et ceci bien entendu à cause de sa disposition anatomique).

III. — *Les lésions du sympathique extra-rachidien* sont exceptionnellemment génératrices de céphalée (un cas personnel à peu près certain un second plus douteux).

IV. — *Le rôle des muscles* est en revanche d'une énorme importance pratique.

1) dans les traumatismes cervicaux

2) dans les cervicarthroses en poussée inflammatoire

3) dans toutes les autres lésions du rachis.

Dans tous ces cas la contracture douloureuse peut être soit la contracture satellite de la lésion discovertébrale homologue de la contracture musculaire lombaire du lumbago discal, soit une contracture de compensation statique en cas de modification de courbure du Rachis cervical

4) cette contracture statique étant comme nous l'avons vu en jeu dans les algies de dystonies d'attitude (torticolis post-encéphalitique, spasme de torsion), etc...

5) et enfin et surtout dans les algies d'origine psychique.

En bref sur le plan statistique les mécanismes les plus importants de céphalée d'origine cervicale sont:

1) la souffrance des trois premières racines cervicales postérieures

2) la contracture douloureuse des muscles postérieurs du cou

3) la souffrance arthro-vertébrale et encore cette dernière emprunte-t-elle les deux mécanismes précédents dans la plupart des cas où elle déclenche une céphalée.

Ces trois mécanismes expliquent en pratique la quasi totalité (95 % environ) des céphalées d'origine cervicale.

RESUMEN E INTENTO DE CLASIFICACION

Las cefalalgias en relación con la patología cervical pueden ser divididas para su estudio en distintos grupos, de acuerdo con las causas y los mecanismos que están en juego.

I. — *Las que provienen de alteraciones raquídeas.*

A) En el segmento inicial de la columna cervical, en el sector comprendido desde el occipucio a C3, el sufrimiento de las tres primeras raíces posteriores que dan nacimiento al nervio de Arnold, provoca dolores occipitales.

1. Puede tratarse de lesiones traumáticas, artrósicas, inflamatorias, o de malformaciones del raquis.

Se suma a veces a la patología radicular un elemento muscular, a consecuencia de la lesión articular o de la perturbación en la curvatura raquídea que de este modo ocasiona cambios en la estática de la cabeza.

2. Los tumores intrarraquídeos extramedulares pueden provocar cefalalgias de la nuca por el mecanismo de la compresión de las raíces posteriores y accesoriamente por contractura muscular.

3. Por intermedio del nervio de Arnold se proyecta el dolor en las lesiones del ganglio raquídeo posterior (zona) o del eje gris (siringomielia dolorosa).

4. La rara neuralgia primitiva del gran nervio de Arnold pertenece a este grupo.

B) En el segmento raquídeo cervical inferior (C4 - C7) no puede invocarse el sufrimiento de las raíces del nervio de Arnold.

Pueden estar en juego mecanismos diferentes:

a) Un mecanismo simpático, posible; pero raro.

b) A veces un mecanismo arterial (sufrimiento directo de la vertebral), que quizá más que verdaderas cefalalgias, dé lugar a perturbaciones neurológicas originadas en el tronco cerebral.

c) Con más frecuencia la lesión raquídea provoca una contractura de los músculos de la nuca (contractura de vigilancia; contractura estática en las distorsiones vertebrales).

d) Siempre es preciso buscar asociado a una "patología cervical", un componente psicoafectivo, el cual es responsable de la cefalalgia y que puede configurar un conjunto sintomático que conduzca al error.

Estos mecanismos pueden estar en juego tanto para las lesiones traumáticas como las inflamatorias, artrósicas o las malformaciones.

II. — *Las lesiones vasculares (arteriales o venosas)* cervicales puras, están raramente

en causa (casos excepcionales de Ricard y Gerard, de Lazorthes y el nuestro).

Si la arteria vertebral está más frecuentemente afectada, no lo es casi nunca en forma primitiva, sino que a consecuencia de las alteraciones raquídeas (esto a causa de sus relaciones anatómicas).

III. — *Las lesiones del simpático extrarraquídeo* excepcionalmente generan cefalalgias (un caso personal casi seguro, un segundo caso más bien dudoso).

IV. — Por el contrario el *papel de los músculos* es de una enorme importancia práctica.

1) en los traumatismos cervicales

2) en los empujes inflamatorios de las cérvicoartrosis

3) en las restantes lesiones del raquis.

En todos estos casos la contractura dolorosa puede ser satélite de la lesión discovertebral, homóloga de la contractura muscular lumbar del lumbago discal, o una contractura de compensación estática en caso de modificación de la curvatura del raquis cervical.

4) esta contractura estática se presenta, tal como lo hemos visto, en las algias de las distonías de actitud (tortícolis post encefalítico, espasmo de torsión) etc.

5) por último y sobre todo en las algias de origen psíquico.

En resumen en el plano estadístico los mecanismos más importantes de las cefalalgias de origen cervical son:

1) el sufrimiento de las tres primeras raíces cervicales posteriores.

2) la contractura dolorosa de los músculos posteriores del cuello.

3) el sufrimiento artro-vertebral, el cual pone en juego los dos mecanismos precedentes en la mayor parte de los casos en que genera una cefalalgia.

Estos tres mecanismos explican en la práctica la casi totalidad (alrededor del 95%) de las cefalalgias de origen cervical.

SUMMARY AND ATTEMPT OF A CLASSIFICATION

The study of headaches may be divided according to the pathology of the neck in several categories, with regard to their causes and mechanisms.

I. — *Those who have vertebral causes.*

A) In the initial segment from the occiput to C-3 the participation of the first three posterior roots, giving rise to Arnolds nerve may provoke occipital pains.

1. In this case traumatic, arthrotic, inflammatory lesions of the spinal column may be the cause, but malformations as well.

To the participation of the three posterior roots may be added a muscular factor every time when the vertebral lesion is linked up with a damaged articulation or gives rise to a change of the cervical bend and therefore causes a static disturbance of the keeping up of the head.

2. It is by compression of the above mentioned nerve roots and accesorily by muscular contraction that the intraspinal and extra-medullary tumors may cause pains in the occiput.

3. The lesions of the posterior spinal ganglion (zona) or of the gray axis (painful syringomyelia) project on the same spot through Arnolds nerve.

4. The rare primitive neuralgia of the great nerve of Arnold belongs to this group.

B) In the lower cervical segment of the spine (C-4 to C-7), the participation of Arnolds nerve's roots may not be counted upon.

Various mechanisms may in this case play a role:

a) rarely a sympathetic mechanism which is nevertheless possible.

b) sometimes an arterial mechanism (direct participation of the vertebral artery) causing however neurological troubles of the brainstem rather than a genuine headache.

c) very frequently the vertebral lesions cause a muscular contraction of the neck muscles (satellite contracture of vigilance; static contracture of vertebral distorsions).

d) finally we have to be careful of the combination of a "cervical pathology" with a psycho-affective component, responsible for the headache and giving rise to deceiv-

ing syndrom.

These mechanisms may also be invoked for traumatic as well as for inflammatory, arthrotic of malformative lesions.

II. — *The vascular lesions* (arterial or venous) of purely cervical origin are very seldom the reason (exceptional cases of Ricard and Girard, Lazorthes and ourselves).

If the vertebral artery is mostly involved, this is practically never the case from the beginning but rather as a consequence of the spinal change (and this, of course, on account of its anatomical disposition).

III. — *The lesions of the extraspinal sympathetic* are but rarely the causes of headache (one personal case is practically sure, another rather doubtful).

IV. — *The role of the muscles* bears in return a very big practical importance.

1) In cervical traumatisms

2) In cervical arthrosis during an acute rheumatic process

3) In all other lesions of the vertebral column.

In all these cases the painful contracture may be as well caused by a lesion of the intervertebral disc, in the same way as muscular contracture is the consequence of the lumbago caused by a slipping disc, but also a contracture to be viewed as a static compensation in case of change of the curve of the cervical spine

4) This static contraction participates, as we have seen, also in the algias of faulty postures (post encephalitic torticollis, torsion spasms etc.)

5) And finally in all algias of psychic origin.

Statistically the most important mechanisms of headache of cervical origin may be summed up as follows:

1) The participation of the first three posterior cervical roots,

2) The painful contraction of the posterior muscles of the neck,

3) The arthro-vertebral participation in which the abovementioned two mechanisms are mostly involved where this participation causes a headache.

These three mecanisms explain practically nearly all (95%) of headaches of cervical origin.

ZUSAMMENFASSUNG UND VERSUCH EINER AUFTEILUNG

Man kann das Studium der Kopfschmerzen in ihrer Beziehung zur Pathologie des Gehirns in verschiedene Kategorien aufteilen, je nach ihren Ursachen und Mechanismen.

I. — *Jene, die auf das Rückgrat zurückzuführen sind.*

A) vom ersten Segment des Hinterkopfes an bis zum dritten Halswirbel, rufen Lesionen der drei ersten hinteren Rückenmarkswurzeln, aus denen der Arnold'sche Nerv entspringt, Hinter-haupts-Neuralgien hervor.

1. Es kann sich hier um traumatische, entzündliche, arthrotische Veränderungen des Rückgrats handeln, aber auch um Missbildungen.

Handelt es sich um die drei ersten hinteren Rückenmarkswurzeln, so kann man oft als unterstützenden Faktor einen Muskelschaden beifügen, und zwar, wenn die Rückgratslesion mit einer gelenklichen Dysfunktion verbunden ist, oder eine Dysharmonie der normalen Krümmung der Wirbelsäule zur Folge hat, und so zu Veränderungen der Kopfhaltung führt.

2. Auch durch Druck auf die gleichen Hinterhauptswurzeln und zusätzliche Verkrampfung der Muskeln können die intraspinalen, jedoch extramedullären Tumoren, Nackenschmerzen verursachen.

3. Die Lesionen des hinteren Rückenmarks-Ganglion (Herpes), oder des zweiten Halswirbels (Syringomyelie), machen sich über den Arnold'schen Nerv auf gleicher Höhe bemerkbar.

4. Die seltene Primär-Neuralgie des grossen Arnold'schen Nerven gehört zu dieser Gruppe.

B) Im unteren Segment des Rückgrats (zwischen dem vierten und siebenten Halswirbel) kann eine Beteiligung des Arnold'schen Nerven nicht immer vorausgesetzt werden.

Verschiedene Wirkungsmechanismen können beteiligt sein:

a) selten ein sympathischer Mechanismus

b) manchmal ein arterieller Mechanismus (direkte Beteiligung des betreffenden Wirbels), der meistens die Ursache ist, doch handelt es sich eher um neurologische Störungen des Gehirnstammes als um echte Kopfschmerzen.

c) sehr oft hat die Rückgratsverletzung eine Verkrampfung der Nackenmuskeln zur Folge (Verkrampfung der lange nach einer Richtung blickenden Wachtposten; statische Kontraktur der Wirbelverdrehungen).

d) schliesslich muss man sich vor einem verbindenden Faktor mit einer Pathologie der Nackenwirbel hüten: einem psychoaffektiven Komplex, der für die Kopfschmerzen verantwortlich ist, und zu einem täuschenden Symptomenkomplex Anlass gibt.

Die Mechanismen können ebenso gut durch traumatische, als durch entzündliche, arthrotische oder Missbildungs - Lesionen ausgelöst werden.

II. — Die vaskulären Lesionen (arterieller oder venöser Natur) der Halsregion sind nur selten die Ursache (die aussergewöhnlichen Fälle von Ricard und Girard, Lazorthes und unsere eigenen nicht gerechnet).

Wenn die Arteria vertebralis am meisten beteiligt ist, so geschieht das praktisch nie von Anbeginn,sondern als Folge der Veränderungen des Rückenmarkskanals (und zwar, wohlbemerkt, auf grund seiner anatomischen Anlage).

III. — Die Lesionen des ausserhalb der Wirbelsäule befindlichen Sympathikus sind nur in ganz seltenen Fällen die Ursachen von Kopfschmerzen (ein persönlicher Fall kann als fast sicher, ein weiterer als zweifelhaft angenommen werden).

IV. — *Die Rolle der Muskeln* ist dagegen von grösster praktischer Bedeutung

1) bei den Traumatismen des Halses

2) bei den Arthrosen der Region während rheumatischer Evolution

3) bei allen anderen Lesionen der Wirbelsäule.

In allen diesen Fällen kann die schmerzhafte Kontraktur ebenso gut eine Kontraktur von der Lesion der Zwischenwirbelscheibe sein, genau wie die muskuläre Kontraktur des Wirbelscheiben-Lumbago, aber auch eine Kontraktur statischer Kompensation im Falle einer Veränderung der Krümmung der Halswirbelsäule.

4) diese statische Kontraktur war, wie wir gesehen haben, bei den Schmerzen der Haltungsveränderungen im Spiel (post- enkephalitischer Schiefhals, Torsions-Spasmen, etc.).

5) schliesslich und vor allem bei den Schmerzen psychischen Ursprungs.

Statistisch betrachtet lässt sich sagen, dass die wichtigsten Ursachen der auf Hals und Nackenveränderungen zurveckzufuehrenden Kopfschmerzen folgende sind:

1) die Beteiligung der drei ersten hinteren Rückenmarkswurzeln,

2) die schmerzhafte Verkrampfung der hinteren Halsmuskeln,

3) die arthro-vertebrale Beteiligung, bei der die beiden eben angeführten Mechanismen in den meisten Fällen miteinwirken, wo diese Beteiligung Kopfschmerzen hervorruft.

Die genannten drei Mechanismen erklären praktisch fast alle (etwa 95%) Kopfschmerzen zervikalen Ursprungs.

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Headache.- An Otolaryngologist's Viewpoint of the Differential Diagnosis and Treatment of Certain Types

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One of the most common complaints encountered by the practicing physician today is headache. Headache is in itself not a disease but a symptom of a disease or illness that is either organic or psychologic. Because of the fact that there are so many different types, headache constitutes an enormous clinical problem in the field of medicine today.

Anatomically, pain in the head may originate in either the tissues covering the cranium or the cranial periosteum and endosteum, or certain intracranial structures. The intracranial structures sensitive to pain are: the trigeminal nerve, the glossopharyngeal nerve, the vagus nerve, the first three cervical nerves, the cerebral arteries, the dural arteries, parts of the dura at the base of the brain and the great venous sinuses and their venous tributaries from the surface of the brain. Insensitive to pain are the choroid plexus, the brain itself, the cranium, most of the dura, the ependymal lining of the ventricles and the piaarachnoid.

Diagnosis of the types of headache a patient has should not be attempted until the patient has described completely his symptoms and the results of his general physical examinations, laboratory tests and special diagnostic procedures have been reviewed. The patient should give his history and symptoms in his own words and the physician should be on the lookout for any element of nervous tension on the part of the patient while this done. If nervous tension is present, the patient, as well as the headache, have to be treated. Unless the nervous tension is combatted no drug will be entirely successful in relieving the headache attacks. The subject of nervous tension is a delicate one and must be handled with care because the patient will be sensitive to any inference that the condition is "all in the head".

In every headache problem, a detailed history should be taken. The first important item which must be taken care of is to have the patient describe what he means when he says that he has a headache. The intensity, frequency and character of the pain will vary at different times and in different cases. Perhaps the patient is suffering from more than one type of headache, if so, a careful history will reveal this. The history should start with the first attack of headache and should continue by recalling episodes in the sequence in which they actually occurred. The site and distribution of the pain should be noted. The time of onset of the headache is important in attempting to classify the headache. Important factors in classifying and identifying a headache are the presence or absence of tenderness, nausea, vomiting, rhinorrhea, conjunctivits, lacrimation, sensitivity to light, sensitivity to temperature change and occupational influence. The site of the pain is also import-

ant, is it unilateral, bilateral or generalized?

Proper treatment cannot be instituted until the headache has been classified. A complete physical examination and routine laboratory tests should be performed. The eyes, ears, nose and throat, as well as the nervous system, should be examined carefully. It is often well to have roentgenographic examinations of the head, sinuses and, at times, special tests also may be indicated in cases in which the presence of certain organic lesions is suspected.

Among the more common forms of headache seen in the average practice of an otolaryngologist we might include migraine, sinusitis, myalgia, histaminic cephalalgia, tension headache, trigeminal neuralgia, sphenopalatine neuralgia, glossopharyngeal neuralgia, allergic headache, temporomandibular joint syndrome, and, of course, psychogenic headache.

Myalgia of the Head

This type of head pain is characterized by a gradual onset and gradual termination. The area involved is tender to pressure and the pain may migrate from one area to another. This pain is often brought on by sudden temperature change, drafts, air-conditioning. The pain may be generalized or localized.

This condition responds well when treated with nicotinic acid. This preparation is given intramuscularly and later on the physician can switch the patient over to the oral form of the medication. It should be pointed out that nicotinic acid should be used, not nicotinamide, as the amide does not produce the desired vasodilation. Roniacol also helps in some of these cases.

Myalgia of the head also responds well to the application of wet heat to the involved area. The use of electrical stimulating currents to the muscles involved also helps in this condition, by increasing the blood flow to these muscles. It is the increasing of the blood flow to the involved muscles which helps bring relief of the pain of this condition.

Sinusitis

The average case of sinusitis headache presents a picture of acute inflammation in the nasal passages, usually with purulent nasal discharge. The nasal passages are congested and edematous. There are positive X-ray findings and possibly a slight temperature elevation. The area involved is usually tender to pressure. The pain is rather constant in nature, dull, and either unilateral or bilateral, depending upon which sinuses are involved.

In treating sinusitis, the medical form of treatment should consist of shrinkage and suction, heat, antibiotics and some form of analgesic. Of the antibiotics, I prefer penicillin, intramuscularly. The analgesics will help in the symptomatic relief of the pain. Such preparations as aspirin or empirin compound, often help, but at times something a little stronger may be needed.

Vasoconstrictor drugs should be used only when the patient is under close observation of the physician, because they may become habit forming and thus produce harmful effects by inhibiting the normal physiology of the nasal mucous membrane. This group of drugs may be used without harm over a short period of time but they should not be given to the patient to use at his own free will as the overuse of nasal medications is a very easy habit to acquire.

In treating nasal sinusitis, it is important that not only the disease be treated and controlled, but that the function of the nose be preserved.

Wet heat also helps some of these patients with acute sinusitis. Heat in such conditions cause an increased hyperemia and leukocytosis.

Rest is essential in many cases of acute nasal sinusitis. This is especially true in cases in which the patient has become rather exhausted from the pain which he has suffered. These patients often become irritable and a generalized feeling of malaise is frequently present. Rest in such cases is often helpful and actually desired by both the patient and the physician.

If sinusitis cases do not respond to the medical form of treatment, the surgical aspect must be considered.

Tension Headache

This type of headache is usually throbbing, periodic, dull, generalized or localized, and varying in severity. The patient is of a nervous personality and conscientious. He does not know how to relax or rest and is always under tension. The attacks frequently occur at night and are often seen with migraine.

These patients need a personality adjustment and must be shown how to relax and enjoy life. This is an important factor in their treatment. Some cases respond to intravenous histamine. Mild sedatives and heat sometimes offer some relief, as may analgesics.

The tranquilizing group of drugs seem to be of some benefit to these patients in selected cases. However, they are not helpful in some cases in which they would seem ideally suited.

The analgesic group of drugs (anacin, aspirin, empirin compound, etc.) are useful in cases of tension headache. Some patients respond to one type of analgesic, while others will choose another. This, again, is a matter of selectivity.

Psychogenic Headache

This type of patient is never incovenienced by his headache either at work, play or sleep. The patient is not unhappy, but is tense and has an apprehensive personality. His complaints are bizarre. The pain may be of any type or in any location; it is more severe with emotional disturbances, stress or strain. Usually these patients have normal physical findings, neurologic, fundi examination, otolaryngologic examination, blood pressure and skull and sinus X-rays.

The treatment of this type of headache, of course, is a personality adjustment and reassurance to the patient that nothing serious or organic is wrong.

Histaminic Cephalalgia

This is probably one of the most severe forms of head pain known to mankind. The pain is constant, burning or boring, unilateral, of short duration, excruciating and more severe on reclining. It usually occurs during the sleeping hours, having a sudden onset and sudden termination.

The histaminic cephalalgia patient will have on the side involved certain definite manifestations associated with his headache attacks. Among these will be a rhinorrhea, nasal congestion, lacrimation and conjunctivitis. Also, on the side involved, there will be a swelling of the temporal vessels and an increase in surface temperature.

This form of head pain is treated prophylactically by histamine desensitization. Nicotinic acid along with the histamine is often of value. This can be given orally.

The symptomatic form of treatment of histaminic cephalalgia consists of using such drugs as D.H.E.-45, Rectalad-Migraine, Pentergot Inserts, Cafergot PB, or Migral. These preparations all contain ergotamine tartrate or one of its derivatives. They do not cure the patient of his headache attacks, but merely abate the present headache.

Migraine

This form of headache is more frequently seen in women and often associated with their menstrual periods, either preceding or during the period. These headaches have a family history tendency and are usually accompanied by photophobia, scotomata, anorexia, nausea and perhaps vomiting. I have yet to see a true patient with migraine who does not state that he has a "sick headache". These attacks are often associated with tension. The pain is throbbing periodic, hemicraneal and present for several hours or days.

Usually, there are normal skull X-rays, general physical examination, eye grounds, neurologic and electro-encephalogram.

During the past several years many new preparations have been placed on the open drug market which are successful in aborting attacks of menopause.

One of the most successful drugs used to abort migraine is D.H.E.-45 (dehydroergotamine). This is administered preferably intravenously, giving 1.0cc. per injection. Relief from a typical migraine attack can be obtained in a matter of minutes.

Another successful drug used in aborting

migraine attacks is the Rectalad-Migraine. This is a small 2.0cc. medicated enema, containing ergotamine tartrate, caffeine, chloral hydrate, and scopolamin aminoxide. The drugs are administered rectally and since they are in solution, they can be absorbed almost inmmediately through the mucosa.

The Pentergot Inserts and Cafergot P.B. may be obtained in either the rectal suppository or the oral forms. They contain drugs similar to the Rectalad-Migraine.

The Migral preparation is an oral tablet containing ergotamine tartrate, caffeine and cyclizine hydrochloride which is used to combat the gastric side effects of ergotamine and the nausea which is so commonly seen in migraine itself.

Many of these preparations are given rectally so that the stomach may be bypassed. This is important because many of these patient's stomachs are in such a condition that they will expel any form of medication by vomiting before they have had any chance of absorption. Also, the rate of absorption through a stomach inflammed by nausea and, or, vomiting, is much slower than the rate through a normal stomach.

Trigeminal Neuralgia

This condition is primarily an affection of the gasserian ganglion and is frequently referred to as Tic Douloureux.

The pain of trigeminal neuralgia is quite severe, sharp, and knifelike, usually occurring in paroxysms lasting only a few minutes. These patients usually exhibit trigger zones which will bring on an attack when they become irritated. The condition is usually seen in the later decade of life and the patients have a certain feeling of anxiety or fear about them because the pain usually becomes progressively more severe and the attacks closer together as time passes. The ear, nose and throat and neurologic examination in these patients is usually of a negative nature.

Many of the patients require surgery such as ganglion removal or devision of the sensory root, or compression of the posterior roots of the ganglion.

Alcohol injections, heat, diathermy, B_{12}, trichlorethylene inhalations, boiling water injection, sedation, and intravenous stibamidine are some of the other things used in treating this condition. Intravenous histamine plus hydrochloric acid by mouth has been used recently with some success.

Glossopharyngeal Neuralgia

The pain of this condition occurs over the sensory distribution of the glossopharyngeal nerve. It has its origin in the superior and petrosal ganglia of the glossopharyngeal nerve.

This condition is characterized by paroxysmal attacks of severe pain of a sharp character. The pain usually originates in the tonsillar area and extends to the ear, down the neck, or over the pharynx.

The ear, nose, and throat examination of these patients is usually negative. Trigger zones are usually present in the tonsillar areas.

Among the agents used for treatment are cocainization of the ganglion, alcohol injection of the pharyngeal plexus, trichlorethylene inhalations, B_{12}, or intracranial section of the glossopharyngeal nerve, or its peripheral section.

Sphenopalatine Neuralgia

The pain of this condition may be unilateral or bilateral, but is always quite severe. The painful areas are the areas supplied by the sphenopalatine ganglion. This may include the nose, eyes, upper teeth, jaws, temporal or zygomatic areas, and the mastoid or occipital areas.

Treatment consists of cocainization of the sphenopalatine ganglion or cauterizing the ganglion with a 50 % solution of silver nitrate.

Allergic Headache

This is not a common type of headache but it is seen in the average ear, nose and throat practice.

In most cases of allergic headache there are usually some symptoms present which are referrable to the nose such as nasal obstruction, congestion, rhinorrhea, or

sneezing. These patients usually have a typical pale allergic nasal mucosa, hypertrophic and edematous. This does not mean that all nasal allergy patients have headaches but the reverse is usually true.

Allergic headaches are usually periodic, as they usually occur when the patient, comes into contact with the offending allergen.

Allergic headache is usually bilateral and mainly in the frontal area, the vertex, or the occipital area. Some mild gastrointestinal symptoms in the form of nausea may be present.

This condition is seen primarily in adults and rarely in children.

Treatment consists of removing the offending allergen. This may require skin-testing to find out the offender. Sometimes desensitization against the antigens found to give the positive skin reactions is necessary.

The antihistamines are also useful in cases of allergic headache.

Temporomandibular Joint Syndrome

The pain of this condition is unilateral, constant, dull, found in the ear or jaw area and sometimes spreading to the head, neck and shoulders. Tenderness in the antigravity muscles of the jaws, neck, shoulders, and sternomastoid is also common in this condition.

Dysfunction usually consists of limitation of mandibular movement.

Treatment consists of ethyl chloride spray or pressure infiltration of the muscles to relieve the pain. When pain subsides exercise of the mandible is needed.

Altering occlusion of the teeth usually is beneficial in these cases. This has to be achieved by a competent dentist. A final reconstruction of the bite is often needed. This is primarily a dental problem but it is frequently seen in otolaryngology.

These are the most commonly seen forms of headache in the practice of otolaringology. An attempt has been made to present, in brief form, the symptomtology and up-to-date treatment of the condition.

SUMMARY

Among the more common forms of headache seen in the average practice of an otolaryngologist we might include migraine, sinusitis, myalgia, histaminic cephalalgia, tension headache, trigeminal neuralgia, sphenopalatine neuralgia, glossopharyngeal neuralgia, allergic headache, temporomandibular joint syndrome, and, psychogenic headache.

Sinusitis. — The average case of sinusitis headache presents a picture of acute inflammation in the nasal passages, usually with purulent nasal discharge. The nasal passages are congested and edematous. There are positive x-ray findings and possibly a slight temperature elevation. The area involved is usually tender to pressure. The pain is rather constant in nature, dull, and either unilateral or bilateral, depending upon which sinuses are involved.

In treating sinusitis, the medical form of treatment should consist of shrinkage and suction, heat, antibiotics and some form of analgesic.

If sinusitis cases do not respond to the medical form of treatment, the surgical aspect must be considered.

Histaminic cephalalagia. — The pain is constant, burning or boring, unilateral, of short duration, excruciating and more severe on reclining. On the side involved will be a rhinorrhea, nasal congestion, lacrimation and conjunctivitis, swelling of the temporal vessels.

Migraine. — These headaches have a family history tendency and are usually accompanied by photophobia, scotomata, anorexia, nausea and perhaps vomiting. The pain is throbbing, periodic, hemicranial and present for several hours or days.

Trigeminal neuralgia. — The pain of trigeminal neuralgia is quite severe, sharp, and knifelike, usually occurring in paroxysms lasting only a few minutes. These

patients usually exhibit trigger zones which will bring on an attack when they become irritated.

Glossopharyngeal neuralgia. — This condition is characterized by paroxysmal attacks of severe pain of a sharp character. The pain usually originates in the tonsillar area and extends to the ear, down the neck, or over the pharynx.

Sphenopalatine neuralgia. — The painful areas are the areas supplied by the sphenopalatine ganglion. This may include the nose, eyes, upper teeth, jaws, temporal or zygomatic areas, and the mastoid or occipital areas.

Allergic headache. — In most cases of allergic headache there are usually some symptoms present which are referrable to the nose such as nasal obstruction, congestion, rhinorrhea, or sneezing. Allergic headaches are usually periodic.

Temporomandibular joint syndrome. — The pain of this condition is unilateral, constant, dull, found in the ear or jaw area and sometimes spreading to the head, neck and shoulders. Dysfunction usually consists of limitation of mandibular movement.

RESUMEN

Entre las formas más comunes de cefalalgias que atiende el otorrinolaringólogo, podemos incluir jaquecas, sinusitis, mialgias, cefalalgia histamínica, cefalalgias por tensión, neuralgia del trigémino, neuralgia esfenopalatina, neuralgia del glosofaríngeo, cefalalgia alérgica, síndrome de la articulación témporomandibular, y cefalalgias psicógenas.

Sinusitis. — En la forma corriente de sinusitis se presenta un cuadro de inflamación aguda de los pasajes nasales, habitualmente con descarga nasal purulenta. Los pasajes nasales están congestivos y edematosos, puede haber elevación térmica. La radiología suministra datos positivos. Habitualmente hay dolor a la presión en la parte afectada. El dolor es más bien persistente, sordo, uni o bilateral, según los senos afectados.

El tratamiento médico de la sinusitis, consiste en descongestionar y aspirar, calor, antibióticos y analgésicos. Si esto fracasa, se plantea la cirugía.

Cefalalgia histamínica. — El dolor es ardiente o penetrante continuo con carácter unilateral, de corta duración atroz y más severo al recostarse. Sobre el lado afectado aparece rinorrea, congestión nasal, lagrimeo, conjuntivitis y tumefacción de los vasos temporales.

Jaquecas. — Este tipo de cefalalgias muestran una tendencia a la historia familiar, están habitualmente acompañadas de fotofobia, escotomas, anorexia, náusea y quizá vómitos. El dolor es lancinante, periódico, unilateral y dura horas o días.

Neuralgia del trigémino. — El dolor de la neuralgia del trigémino es bastante severo, agudo, cortante, en general en paroxismos que duran algunos minutos. Estos pacientes habitualmente presentan pequeñas zonas ("trigger zones") desde las cuales por leves irritaciones se puede desencadenar una crisis.

Neuralgia del glosofaríngeo. — Se caracteriza por ataques paroxísticos de dolor intenso y agudo. A menudo este se origina en el área amigdalina y se extiende al oído, al cuello o sobre la faringe.

Neuralgia esfenopalatina. — Las áreas dolorosas son las correspondientes al ganglio esfenopalatino; están incluídas la nariz, ojos, dientes superiores, mandíbula, regiones temporal o zigomática, mastoides o región occipital.

Cefalalgia alérgica. — En la mayoría de los casos de cefalalgia alérgica, existen algunos síntomas que pueden referirse a la nariz, como obstrucción nasal, congestión, rinorrea o estornudo. Las cefalalgias alérgicas por lo general son periódicas.

Síndrome de la articulación témporo maxilar. — El dolor es unilateral, continuado, sordo, sobre el oído o el maxilar, se difunde a la cabeza, cuello y hombros. Existe en general una limitación al movimiento de la mandíbula.

RÉSUMÉ

Entre les formes les plus communes que l'oto-rhino-laryngologiste soigne, nous pouvons inclure les migraines, les sinusites, les mialgies, la céphalalgie histaminique, les céphalalgies par tension, la neuralgie du trijumeau, la neuralgie sphenopalatine, la neuralgie du glosso-pharyngien, la céphalalgie allergique, le syndrome de l'articulation temporo-maxillaire, et les céphalalgies psychogènes.

Sinusites. — Dans la forme la plus courante de sinusite les passages nasaux présentent un cadre d'inflamation aigüe, qui est accompagnée habituellement par des décharges nasales purulentes. Les passages nasaux sont congestifs et oedémateux, et il peut se produire une élévation thermique. La radiologie fournit des indices positifs. La pression sur la partie affectée produit habituellement une vive douleur. Cette douleur est plutôt persistante, sourde, uni ou bilatérale, selon les sinus affectés.

Le traitement médical de la sinusite consiste à décongestionner et à aspirer, de la chaleur, des antibiotiques et des analgésiques. Si cela n'a pas de succès on pratique la chirurgie.

Céphalalgie histaminique. — La douleur est ardente ou continuelle et pénétrante et a un caractère unilatéral; elle est d'une duration courte et atroce, et devient plus sévère en se couchant. Sur le côté affecté apparaissent de la rhinorrhée, une congestion nasale, du larmoiement, de la conjonctivite et la tuméfaction des vaisseaux temporels.

Migraines. — Cette sorte de céphalalgies laissent voir une tendance à l'histoire familiale. Elles sont habituellement accompagnées de photophobie, de scotome, d'anoréxie, de nausée et parfois de vomissements. La douleur est lancinante, périodique, unilatérale, et dure quelques heures ou quelques jours.

Neuralgie du trijumeau. — La douleur propre à la neuralgie du trijumeau est assez sévère, aigüe, tranchante, en paroxysmes durant quelques minutes. Ces patients présentent habituellement de petites zones ("trigger zones"), d'où l'on peut provoquer une crise par moyen de légères irritations.

Neuralgie du glosso-pharyngien. — Elle est caractérisée par des attaques paroxystiques d'une douleur intense et aigüe. Celui-ci a son origine souvent dans l'aire amygdaline, et il se propage vers le cou ou sur le pharynx.

Neuralgie sphénopalatine. — Les aires douloureuses correspondent au ganglion sphénopalatin; le nez, les yeux, les dents supérieures, la mâchoire, les régions temporale ou zygomatique, mastoide ou la région occipitale y sont comprises.

Céphalalgie allergique. — Dans la plupart des cas de céphalalgie allergique on trouve quelques sympômes qui peuvent se rapporter au nez, tels que l'obstruction nasale, la congestion, rhinorrhée ou l'éternument. Les céphalalgies allergiques sont généralement périodiques.

Syndrome de l'articulation temporo-maxillaire. — La douleur est unilatérale, continuelle, sourde, dans l'ouïe ou dans le maxillaire; elle se propage vers la tête, le cou et les épaules. On trouve généralement une limitation au mouvement de la mâchoire.

ZUSAMMENFASSUNG

Unter den gewoehnlichen Formen von Kopfschmerz, die ein Halsnasenohrenspezialist in der durchschnittlichen Praxis zu sehen bekommt, koennen eingereiht werden die Migraene, die Sinusitis, die Myalgien, der Histaminkopfschmerz, die Spannungskopfschmerzen, die Trigeminus, Sphenopalatinus- und Glossopharyngeusneuralgien, der allergische Kopfschmerz, das Syndrom des temporo-mandibulargelenkes und der psychogene Kopfschmerz.

Sinusitis. — Der durchschnittliche Fall von Sinusitiskopfschmerz bietet das Bild einer akuten Infektion der Nasenwege,

gewoehnlich mit purulenter Sekretion aus der Nase, dar. Die Nasenwege sind gestaut und geschwollen. Die radiologischen Befunde sind positiv und es ist eine leichte Erhoehung der Temperatur moeglich. Die betroffene Zone ist gewoehnlich druckempfindlich. Der Schmerz ist ziemlich konstant, dumpf, entweder, ein -oder beidseitig, je nachdem welche Sinus betroffen sind. Bei der Behandlung der Sinusitis sollte die medizinische Behandlung aus der Oedemverringerung, Suktion, Waerme, Antibiiotica und irgend einem Analgesicum bestehen. Wenn die Sinusitis nicht auf die medizinische Behandlung anspricht, muss der chirurgische Weg in Betracht gezogen werden.

Der Histaminkopfschemerz. — Der Schmerz ist konstant, brennend oder stechend, einseitig, von kurzer Dauer, nicht auszuhalten und noch staerker wenn der Patient sich nach hinten lehnt. Auf der betroffenen Seite findet man Hhinorrhoe, nasale Stauung, Traenenfluss und Konjunktivitis, Anschwellen der temporalen Gefaese.

Die Migraene. — Die Kopfschmerzen haben schon eine Tendenz zu ihr in der Familienanamnese und sind gewoehnlich von Photophobie, Skotomen, Anorexie, Uebelkeit und Erbrechen begleitet. Der Schmerz ist klopfend, periodisch, halbseitig und dauert einige Stunden oder Tage an.

Die Trigeminusneuralgie. — Der Schmerz ist bei ihr sehr stark, scharf wie ein schneidendes Messer und verlaeuft gewoehnlich in Anfaellen von nur wenigen Minuten Dauer. Diese Patienten haben gewoehnlich hoch empfindliche Zonen, die einen Anfall ausloesen koennen wenn sie gereizt werden.

Die Glossopharyngeusneuralgie. — Dieses Leiden zeichnet sich durch paroxysmale Attacken heftiger und schneidender Schmerzen aus. Der Schmerz entsteht gewoehnlich in der Tonsillargegend und breitet sich nach dem Ohr, den Hals heranter und ueber den Pharynx aus.

Die Sphenopalatinusneuralgie. — Die schmerzhaften Zonen werden von Ganglium sphenopalatinum aus versorgt. Diese umfassen die Nase, die Augen, die oberen Zaehne, die Kiefer, die temporalen und Jochbogengegenden, sowie auch die Zonen von Warzenfortsatz und Hinterkopf.

Der allergische Kopfschmerz. — In den meisten Faellen von allergischen Kopfschmerzen bestehen gewoehnlich einige Symptome, die sich auf die Nase beziehen, wie Verstopfung der Nase, Stauung, Rhinorrhoe und Schnupfen. Die allergischen Kopfschmerzen sind gewoehnlich periodisch.

Das Syndrom des temporo-mandibulaeren Gelenkes. — Die Schmerzen bei diesem Leiden sind einseitig, bestaendig, dumpf, in der Gegend des Ohres-und der Kiefer und breitet sich manchmal bis zu Kopf, Hals und Schultern aus. Die Stoerung besteht gewoehnlich in der Beschraenkung der Kieferbewegungen.

Headache of Ocular Origin

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HEADACHE OF OCULAR ORIGIN

The Ophthalmologist is frequently consulted by a patient complaining of headache. On the other hand, it seems that the patient, and even many general practitioners, too often feel that some malady of the eyes may account for the patient's headache. It is unfortunate that this is not true so often, because the eyes diseases causing headache are relatively readily diagnosed and can usually be treated adequately. In some cases the ocular findings may give evidence of intracranial disease. However, in some cases, there is evidence of ocular disease that may give rise to headache.[1] These diseases may be classified as follows:

1. Glaucoma
2. Inflammations of the inner eye
3. Inflammations of the external eye and adnexa
4. Refractive errors and muscle imbalance
5. Trauma
6. Neoplasms
7. Ophthalmic migraine

Glaucoma.

Glaucoma, as an ocular disease causing headache, is most important because its early recognition not only helps the headache but can prevent what may otherwise go on to severe loss of vision and even blindness. Normally the intraocular pressure varies between 15 and 25 mm Hg. This pressure is maintained by a constant production of aqueous by the ciliary processes and a constant outflow by filtration through the canal of Schlemm. When this balance is upset so that the intraocular pressure is increased above normal, the condition is known as glaucoma. Therefore, glaucoma may be the result of increased fluid production, but in the vast majority of cases it is due to some interference with the outflow. When the intraocular pressure is elevated for a long enough period of time, there is interference with the retinal structures as well as the retinal and optic nerve fibers thus leading to loss of visual function and finally to blindness.

While some cases of glaucoma are secondary to some other disease process such as iritis, central retinal vein thrombosis, intraocular tumors, intraocular hemorrhage, and trauma producing dislocation of the lens, the more common and important type is primary glaucoma. Primary glaucoma is due to a defect in the outflow of aqueous into the canal of Schlemm. The defect may be one of two types. In one type the angle between the iris and the cornea becomes quite narrowed because of the close approximation of the anterior iris surface to the posterior corneal surface. This prevents the fluid from gaining access to the angle wherein lies the trabecular meshwork which filters the fluid into the canal of Schlemm. This is the so called "narrow angle" or "closed angle" type of glaucoma. In the other type, the iris is well separated from the cornea at the angle, thus leaving the angle wide open. However, is this type, the

trabecular meshwork through which the fluid normally filters becomes somewhat impervious to the passage of fluid thus causing a rise in pressure within the eye. This is the so called "wide angle" or "open angle" type of glaucoma.

In cases of narrow angle glaucoma, the patient is usually somewhat past the age of thirty and he may experience episodes of rise in pressure particularly at night and in the early morning hours. With this rise in pressure the patient may have pain, discomfort and tenderness in the eye. This pain may develop into a severe headache usually in the area of the distribution of the ophthalmic nerve. If the pressure is high enough there may be slight edema of the cornea causing mistiness of vision and colored halos around lights, such as the street lights at night. Patients presenting with such recurrent low grade symptoms together with a narrow angle may be diagnosed as having chronic narrow angle glaucoma, and these low grade attacks may occur for years before a major episode takes place. If the patient is untreated however, such attacks will sooner or later go on to a full fledged attack marked by excrutiating pain in the eye or forehead and temple. The eye is congested, the pupil widely dilated and the cornea steamy. An acute attack of narrow angle glaucoma constitutes one of the real ophthalmologic emergencies since vision may be markedly and permanently impaired if relief is not obtained in a matter of hours. While the congestion of the eye and the dimness of vision usually draw the patients and physician's attention to the eye, the severe headache is often misleading enough to call attention to the head rather than the eye as a source of the pain. Nausea and vomiting usually accompany the acute attack and the constant retching often causes such severe abdominal pain that acute attacks of narrow angle glaucoma have been known to simulate acute abdominal conditions like cholecystitis.

Transient rises in pressure and even acute attacks of glaucoma may be brought on by the use of mydriatics such as for dilating the pupil. Thus, one has to be on guard when dilating the pupil in an adult for better visualization of the fundus. The presence of a very shallow anterior chamber or a very narrow angle should give warning of the possibility of an attack with dilatation by mydriatic. Definite evaluation of the angle can really be made only with gonioscopy, a method of visualizing the angle directly by use of a contact lens with a built in prism. In any event, if mydriatics are used in adults, it is much safer to follow it with a miotic like 2% pilocarpine in order to help forestall any rise in pressure with a narrow angle mechanism.

A rise in intraocular pressure due to a narrow angle may also occur with severe emotional stress or on prolonged exposure to the dark with the consequent dilatation of the pupils. The systemic use of belladonna-like drugs such as are used in gastric disturbance and Parkinsonism may also cause some mydriasis thus accounting for transient rises in pressure and headache.

The diagnosis of narrow angle glaucoma must be considered seriously in all obscure types of headache. If a simple tonometric measurement does not show a rise in pressure at the time of examination, a dark room test may serve as a safe diagnostic procedure to raise the intraocular pressure and thus help to make the diagnosis.

Wide angle glaucoma is less apt to show dramatic rises in pressure but instead will show a low grade insidious rise in pressure over many months or years. Such patients are likely to have headache over many months or even years and show a loss of visual field together with poor dark adaptation. The visual losses however may be so insidious that the patient does not notice them. Eventually the prolonged increased intraocular pressure causes cupping and atrophy of the optic nerve which then becomes a rather classical picture of prolonged increased intraocular pressure. The most diagnostic feature of this disease is the rise in intraocular pressure as measured on the tonometer. In cases where the diagnosis is suspected but the intraocular pressure is not very high at the time of examination, water provocative testing and tonography may be done to make the diagnosis. As

for the water provocative test, the intake of one liter of fluid will not change the intraocular pressure in the normal eye very significantly. In cases of open angle glaucoma, on the other hand, the rise in intraocular pressure usually goes well above normal so that the diagnosis can easily be made. Tonography is a method of measuring aqueous outflow by taking the intraocular pressure and applying a constant weight to the eye which would normally cause an increase in the outflow as indicated by a lowering of the tension. In patients with wide angle glaucoma, this rate of outflow is diminished.

In both types of glaucoma after prolonged increased intraocular pressure, nerve fiber bundle defects may develop in the field of vision together with the "glaucomatous cupping" mentioned above. The cupping is a part of the picture of optic atrophy seen in these cases and the blood vessels coming out of the disc show "dipping" as they come over the excavated disc margins.

The visual field defects may often show some altitudinal features which may be confused with the defects caused by subfrontal intracranial tumors, such as meningiomas.

Certainly all persons having unexplained headache should have a thorough ophthalmologic examination for glaucoma. Its detection and treatment will not only relieve the headache, but may well preserve the patient's vision and save him from eventual blindness.

Inflammations of the Inner Eye.

Uveitis is an inflammation of the entire uvea. The inflammation of the choroid does not as a rule cause any headache. On the other hand involvement of the ciliary body and the iris is usually accompanied by pain and tenderness. The pain may be like a headache or a toothache and is usually described as a throbbing or neuralgic type of pain. In a case of acute iridocyclitis, there is a circumcorneal type of injection of the blood vessels. The eyeball is tender to touch and this is referred to as "ciliary tenderness' because the ciliary body is almost always involved in these cases. The eye may be irritable and tearing and if the disease is acute, the inflammation causes the iris to go into spasm thus causing a miotic pupil and much pain. Exposure to a bright light causes more miosis and therefore more spasm and pain. This is called photophobia. The diagnosis is corroborated by slit lamp examination which would show a "flare" in the aqueous, thus indicating an increase in the protein content of the aqueous. In addition floaters which represent inflammatory and pigment cells may be seen moving about in the illuminated beam of light passing through the aqueous.

The diagnosis of iritis is usually not difficult except in low grade cases where the external evidences of congestion and pupillary miosis are minimal. In this type of iritis the patient may experience some pain around the eye without attributing the symptoms to the eye. In such patients the ophthalmologist is often rewarded by prolonged examination of the aqueous under the slit lamp microscope with the pupil widely dilated. In more severe forms of uveitis, particularly in the so called granulomatous types, there may be inflammatory deposits laid down on the back of the cornea and these are called keratic precipitates. Such deposits may also be laid down between the iris and the lens and cause adhesions of the iris to the lens which are called synechiae.

Those types of cases where precipitates and synechiae are not laid down are usually referred to as the non-granulomatous types of iritis, while those with the pronounced deposits and synechiae are referred to as the granulomatous types of iritis. The etiology non-granulomatous iritis in usually difficult to establish and there are many theories as to the etiology. In recent years, some association has been made with the so called "collagen diseases" a term first used by Klemperer to stress the importance of connective tissue reaction in a group of diseases with some similar clinical manifestations. The granulomatous types are sometimes found associated with syphilis, tuberculosis, sarcoidosis, brucellosis and other granulomatous diseases.

Once the diagnosis of uveitis is made, complete examination for the above conditions must be made and treatment against the cause should be instituted. Specifically for the iritis one uses cycloplegics such as atropine or homatropine to dilate the pupil, thus preventing traction on the inflamed muscle fibers and the associated pain and photophobia. Steroids are used both locally in the eye and systemically.

The occurrence of headache is not unknown in patients with chronic uveitis or iritis and this disease should be sought in all cases of obscure headache.

Optic neuritis is an inflammation of the optic nerve. The intraocular portion of the optic nerve is called the papilla and if this portion is involved the condition is called "papillitis". If the involvement is behind the globe then the condition is known as retrobulbar neuritis. In young adults about half the cases are associated with multiple sclerosis. In older people vascular disease is a frequent cause of optic neuritis. Optic neuritis is usually accompanied by some pain behind the eye and is usually aggravated either by movement of the eye or by retropulsion of the eye which will also produce pain behind the eyeball. The disease is usually abrupt in onset and accompanied by a sudden profound loss of vision, either in the central or the paracentral field. It is usually a unilateral disease, but may occur bilaterally. When the papilla is involved the appearance is very much like that of papilledema due to increased intracranial pressure, but the sudden onset together with pain on retropulsion and the typical nerve fiber bundle defects in the central field help to make the diagnosis distinct from that of papilledema. It has also been shown that in papillitis there are inflammatory cells found in the aqueous when examined with the slit lamp. This is not true in papilledema.[2]

In recent years, cranial arteritis has been recognized as a not too infrequent cause of headache in older people. Often, the temporal artery is involved, becoming palpably painful and tender. Often, the optic nerve is affected, the fundoscopic picture showing a very narrowed retinal artery and papillitis, an ischemic type of optic neuritis, with the usual pain and tenderness. So, while the eye itself may not always be involved, some form of cranial arteritis should always be looked for in obscure headaches in people over sixty.

Other types of intraocular inflammation causing headache are endophthalmitis and panophthalmitis. These two less frequent conditions are however quite dramatically acute and are not apt to pose any difficulty in being established as the cause of the pain.

Inflammations of the external eye and adnexa.

Inflammation of the lids many be caused by meibomitis, hordeolum, dacryoadenitis, dacryocystitis and orbital cellulitis. While all these conditions may cause some degree of pain above the affected eye, the differential diagnosis between them and other morbid states producing head pain should be relatively simple. The evidence of such inflammatory processes is usually quite easily visible. However, they do involve branches of the ophthalmic division of the trigeminal nerve thus accounting for headache in some cases.

Inflammations of the external eye such as conjunctivitis, episcleritis and keratitis may also cause a good deal of pain in the ophthalmic division of the trigeminal nerve thus accounting for headache. In these conditions, again the inflammatory reactions of the portions of the eye involved usually make the diagnosis relatively simple to recognize.

Refractive Errors and Muscle Imbalance.

The pathogenesis of headache due to refractive errors has been explained on the basis of sustained traction of the intraocular muscles. Such refractive errors are usually hyperopia and astigmatism. Presbyopia not corrected with glasses may also produce some headache. However, presbyopia is more apt to induce sleepiness rather than real headache when trying to read. The headache due to refractive errors of

hyperopia and astigmatism are often referred to as "eye strain" and usually start about the eyes and radiate to the frontal and temporal regions although they have been described as reaching as far back as the occiput. In linking refractive errors to headache, the history is extremely important. Thus children under school age will rarely if ever complain of headache as a result of a refractive error. In older children and adults headache due to errors of refraction usually come on with the use of the eyes for visual effort. Such a patient usually feels quite well in the morning but with continued use of the eyes during the day he experiences a sandy feeling or a blurring which may develop into a full blown headache later in the day. With lunch or relaxation from visual effort, the headache may clear only to return with renewed visual effort in the later afternoon. These patients usually obtain relief of symptoms when properly fitted with glasses. Similarly, a person past forty or forty-five with presbyopia will find relief when fitted with proper reading glasses. Headaches due to refractive errors do not appear immediately upon waking from sleep. Such headaches are usually due to other causes.

Muscle imbalance may also produce headache. Eckhardt, McLean and Goodell [3] explain the headaches on the basis of the sustained effort of the extraocular muscles to maintain binocular single vision, as well as upon prolonged contractions of the neck and scalp muscles.

Convergence insufficiency will produce symptoms when the patient attempts to do close work. Divergence insufficiency, on the other hand, produces symptoms when the patient tries to get panoramic views as from a moving vehicle. Both these conditions may at times be alleviated with simple muscle exercises. Vertical muscle imbalance when severe enough to cause symptoms, requires the use of prisms for correction. In more extreme cases, surgery may even be indicated. The headache due to muscle imbalance, like that due to refractive errors, comes on with visual effort and is not usually present on arising in the morning.

Aniseikonia is the name ascribed to a difference in the curvature of the two corneas which causes enough difference in the size of the images on the two retinas so as to produce symptoms such as headache. This aspect of eye strain has been given some attention by various workers but it is a rather controversial subject at this time and not recognized universally as a cause of headache.

The element of ocular neurosis must certainly be considered when one deals with patients with headaches which are presumed to be due to refractive errors and muscle imbalance. While the average ophthalmologist will often know when the refractive error or muscle imbalance is severe enough to cause headache, there is a wide range in the tolerance of such errors, so that the same amount of imbalance will cause symptoms in one person and not in another. Divergence palsy has also been shown to come about as a result of increased intracranial pressure.[4] Therefore, one must take a very careful history and find if these so called headaches come on with the use of the eyes in which case they are more apt to be due to a refractive error or muscle imbalance. The neurotic patient is often convinced of the need for glasses even before he is examined and may think he experiences relief even when given simple window glass.

In general one may say that while refractive errors and muscle imbalance may account for some headache, they probably account for far less headache than the general public or even the general doctors seem to think.

Miscellaneous causes of headache.

Trauma to the eye may affect any of the various anatomic components from the cornea to the optic nerve. Traumatic iritis may cause headache and intraocular hemorrhage may raise the intraocular pressure thus causing the same type of headache that any other type of glaucoma will. The history of trauma and clinical picture usually lead one directly to the eye as the source of the pain.

Intraocular neoplasms may indirectly cause headache. The common intraocular neoplasms are melanosarcoma of the choroid in adults and retinoblastoma of the retina in children. Metastatic tumors also occur in the eye. These neoplasms may cause headache in one of two ways: the tumor may undergo a necrosis with inflammatory changes causing uveitis or the tumor may actually cause secondary glaucoma. Headache may occur as a result of either one of these mechanisms although here again the diagnosis is not usually difficult to make and the clinical symptoms usually lead one directly to the eye as the cause of the headache.

Migraine.

While the headache of ophthalmic migraine may not really be ocular in origin, the ocular manifestations seem to indicate mentioning it here. During an attack of pain, there are often scintillating scotomata and much less frequently homonymous hemianopic defects. (Photophobia is also commonly compalined of). Origin of these headaches is probably of a vasomotor nature involving cranial vessels.

Conclusions.

In general, it may be said that headaches truly ocular in origin comprise a smaller ratio than is usually believed by the general public or even the general doctor.

Of the various causes mentioned, glaucoma is probably the most important because of the frequency of its incidence as well as the gravity of its consequences if untreated. It is therefore particularly important that even the non-ophthalmologist be carefully alerted to the early signs and symptoms of this disease.

SUMMARY

In looking for the cause of headache, the eye is frequently investigated as a source of headache but the incidence of headache due to eye disease is probably far less frequent than is generally believed.

Those ocular diseases that may cause headache are as follows: glaucoma, inflammations of the inner and outer eye and adnexa, refractive errors and muscle imbalance, trauma, neoplasms and ophthalmic migraine. Of the inflammatory diseases the one that is less likely to be recognized by the non-ophthalmologist and still give low grade symptoms of headache is chronic low grade iritis. Refractive errors and muscle imbalance should be looked for and properly diagnosed. Headache due to refractive errors and muscle imbalance usually come on after visual effort of some kind. Therefore, the type of visual headache that comes on immediately on arising and without using the eyes is not apt to be due to a refractive error or muscle imbalance.

Of all the diseases of the eye causing headache the most important is glaucoma. The narrow angle type of glaucoma will produce transient episodes of headache with blurring of vision or so called rainbows or halos around lights and may go on to acute attacks with violent headache, eye ache, congestion of the eye, dilated pupil and other symptoms of acute narrow angle glaucoma. The open angle type will give very low grade headache over a number of years and will cause a very low grade loss of visual field over a period of years. Therefore, of all the ocular diseases causing headache, it is most important that even the non-ophthalmologist acquaint himself with the signs and symptoms of glaucoma and suspect it strongly in all adults in whom headaches cannot otherwise be diagnosed. The early detection of glaucoma will not only help to get rid of the headache but will often prevent loss of vision or even blindness.

RESUMEN

Cuando se investiga la causa de la cefalalgia a menudo se hace examen de los ojos, pero la incidencia de cefalalgia debida a enfermedad ocular es probablemente mucho menos frecuente que lo que generalmente se cree.

Las enfermedades oculares que pueden causar cefalalgia son las siguientes: glaucoma, inflamaciones internas y externas de los ojos y sus anexos, errores de refracción y desequilibrio muscular, trauma, neoplasmas y migrania oftálmica. De las afecciones inflamatorias, la que tiene menos probabilidad de ser reconocida por el no-Oftalmólogo es la iritis crónica, la cual puede ser una causa de cefalalgia. Los errores de refracción y el desequilibrio muscular deben ser investigados y adecuadamente diagnosticados. La cefalalgia debida a errores de refracción y desequilibrio muscular usualmente aparece después de algún esfuerzo visual; por esto si se presenta inmediatamente que el paciente se levanta sin haber hecho uso de los ojos, no se le puede considerar en relación con estas dos anormalidades.

De todas las enfermedades oculares causantes de cefalalgia la más importante es el glaucoma. La variedad de ángulo estrecho puede producir episodios transitorios de cefalalgia con visión borrosa y arco iris o halos alrededor de las luces así como también ataques agudos con cefalalgia violenta, dolor ocular, congestión, dilatación pupilar y los demás síntomas del glaucoma congestivo agudo. La variedad de ángulo abierto o crónico simple, puede dar lugar a cefalalgia discreta y pérdida progresiva del campo visual durante un período considerable de tiempo. De tal manera que es por demás importante que aún el no-Oftalmólogo se familiarice con los signos y síntomas del glaucoma y lo sospeche en todos los adultos en quienes se presente el problema del diagnóstico de una cefalalgia. El diagnóstico del glaucoma al comienzo no sólo contribuye a eliminar la cefalalgia sino que puede prevenir la pérdida de visión y aún ceguera.

RÉSUMÉ

En étudiant l'origine de la céphalalgie on l'attribue trop souvent à une affection oculaire.

Cependant, parmi les maladies oculaires, seuls le glaucome, les affections inflammatoires de l'oeil et ses annexes, les amétropies, l'hétérophorie, le traumatisme, les tumeurs ainsi que la migraine peuvent provoquer la céphalalgie.

L'iritis torpide, par exemple, est une des maladies oculaires qui donne une céphalalgie légère et qui soit difficilement reconnue par le médecin général.

Par conséquint, on doit s'efforcer de chercher et diagnostiquer les amétropies et l'hétérophorie.

La céphalalgie due à l'amétropie et à l'hétérophorie se présente en général à la suite d'un effort oculaire.

Par conséquent, la céphalalgie se présentant dés que le malade se léve, et sans avoir fait des efforts oculaires, ne provient pas d'une amétrophie ni d'un deséquilibre oculomoteur.

Le glaucome est la maladie la plus grave des affections oculaires qui donnent la céphalalgie. Le glaucome congestif aigu commence par produire des périodes de céphalalgie intermittents, accompagnées par des brouillards et des halos. Ensuite, les crises de céphalalgie deviennent plus aigües. On peut noter une congestion oculaire, la dilatation pupillaire et des autres symptômes de glaucome aigu congestif.

Le glaucome chronique se manifeste par une céphalalgie légère pendant un nombre d'années, et par un rétrécissement graduel du champ visuel. Par conséquent, il est très important que même le médecin général se met au courant des signes et des symptômes de glaucome et qu'il s'en méfie dans tous

les adultes souffrant d'un mal de tête dont il n'y-a-pas d'autre diagnostique.

Le diagnostique précoce du glaucome aidera non seulement à éliminer les symptômes de la céphalalgie mais il évitera souvent la perte de vision ou même la cécité.

ZUSAMMENFASSUNG

Funktionsstoerungen und Erkrankungen der Augen sind viel seltener die Ursache von Kopfschmerzen als allgemein angenommen wird.

Es ist aber notwendig eine gruendliche Augenuntersuchung zu machen um die folgenden Zustaende nicht zu uebersehen.

Das Glaukom, Entzuendungen des aeusseren oder inneren Auges, Anomalien der Refraction, Motilitaetsstoerungen, Traumata, Tumoren und die Migräne Ophthalmique. Die chronische Iritis wird oft als Ursache von milden Kopfschmerzen uebersehen.

Kopfschmerzen, welche von Refraktionsfehlern und Stoerungen des Muskelgleichgewichts verursacht werden, erscheinen gewoehnlich nach laengerer Anstrengung der Augen und nur selten nach dem Erwachen.

Von den Augenerkrankungen, die Kopfschmerzen verursachen, ist das Glaukom das wichtigste. Das Engwinkelglaukom wird voruebergehende Episoden von Kopfschmerzen hervorrufen, mit Nebelsehen und Regenbogenfarben um Lichter. Diese Episoden koennen dann zu wirklichen akuten Anfaellen fuehren mit starken Schmerzen im Kopfe, und im Augapfel, mit Entzuendung des Auges, Erweiterung der Pupille und anderen Symptomen des Engwinkelglaukoms.

Das Weitwinkelglaukom kann milde Kopfschmerzen verursachen, die viele Jahre dauern, mit langsamer Einschraenkung des Gesichtsfeldes. Daher ist es von grosser Wichtigkeit, dass der Nicht-Ophthalmologe sich mit den ersten Anzeichen und Symptomen des Glaukoms bekannt macht, und diese Augenkranheit vermutet in all den Faellen wo die Ursache der Kopfschmerzen nicht diagnostiziert werden kann.

Das rechtzeitige Erkennen des Glaukoms wird nicht nur die Kopfschmerzen beseitigen, sondern auch etwaigen Sehverlust und sogar Erblindung verhindern.

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Psychogenic Factors in Headache

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Headache is not only one of the most common symptoms in our daily practice, but also one of the most popular complaints which is closely related to psychological factors. Nevertheless, there still remains much to be studied concerning the relationship between somatic changes inducing headache and psychological components partially because headache is such a common symptom of all kinds of diseases. Particularly, research work on this problem with a sound physiological foundation is very rare. Dr. Harold G. Wolff was one of the most distinguished workers in psychosomatic research, especially in the field of headache and gastric disturbances. His works in these fields have been very valuable because of a sound experimental and scientific basis.

I feel it a great honor to be able to describe in brief outline form the interrelation between headache and the psyche in this special issue devoted to Dr. Harold Wolff, with whom I kept in close communication in the course of our psychosomatic research and who greatly inspired me.

I. CLASSIFICATION

Various classifications of headache have been attempted. We have classified the conditions which induce headache into the following categories from the psychosomatic viewpoint.

A. *Primary psychosomatic disorders:*
   1. Neuroses
      a) Anxiety neurosis
      b) Hypochondriasis
      c) Neurotic depression
      d) Fatigue neurosis
      e) Hysteria (conversion reaction)
      f) Traumatic neurosis
   2. Psychophysiologic autonomic and visceral disorders
      a) Migraine
      b) Hypertension
      c) Others

B. *Secondary psychosomatic disorders:*
   1. Psychogenic overlay
   2. Undue prolongation of a slightly organic disease

C. *Non-psychogenic organ diseases:*

Before the authors begin a detailed ex-

planation of their classifications, they wish to show, for the purpose of comparison, Dr. Katsuki's system of classification from the neurological standpoint.

1. Migraine, migraine variant, vascular headache, atypical facial neuralgias, and histamine headache.
2. Tension headache
3. Headache due to intracranial disturbances (arteriosclerotic brain diseases, vascular anomalies and aneurysms, tumor, and infections)
4. Headache due to extracranial disturbances (eye, ear, nose, bones of the skull, and neck)
5. Post-traumatic
6. Headache due to systemic disease including hypertensions, fevers, infections
7. Psychogenic headaches

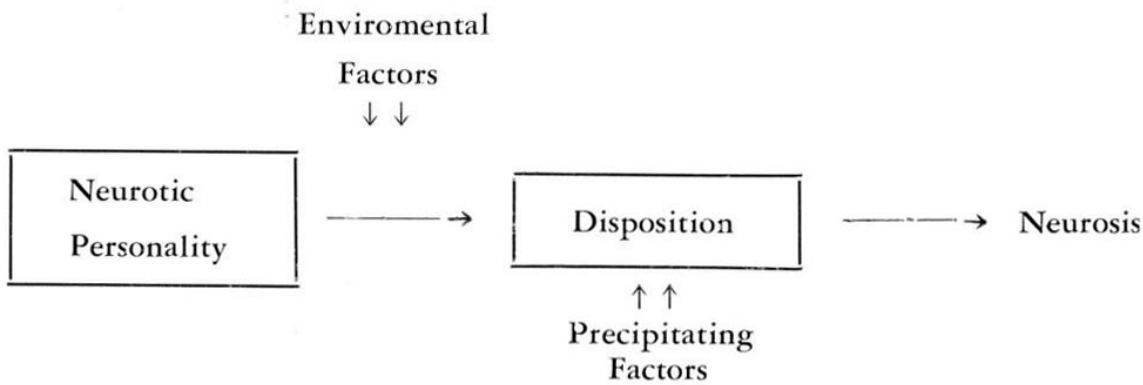
II. CLINICAL PICTURE

A. *Primary psychosomatic disorders.*

This is a condition where psychogenic factors are closely related to the onset and course of the illness. This disorder is classified into two large categories, that is, neurosis and psychophysiologic autonomic and visceral disorders — psychosomatic disorders in the narrow sense. A brief explanation of each condition follows.

TABLE 1

The Mechanism of the Development of a Neurosis



1. Neuroses

Neuroses are considered to occur as the result of maladjustments as shown in the following diagram.

Persons with neurotic personalities are exposed to various emotional stresses from their environment which increase in the course of their development. This results in the building up of a disposition for neurosis which may develop into an actual neurosis due to a precipitating emotional factor in their environment. The relationship between each type of neurosis and headache will be briefly discussed.

a) Anxiety Neurosis

In this condition, the patient suffers from "free-floating" anxiety because of a lack of a psychological defense mechanism. This diffuse anxiety is accompanied by various somatic symptoms, mainly due to autonomic unbalance. A part of the so-called "tension headache" is considered to be one of these somatic symptoms.

Friedman considered tension headache to be an "emotionally induced physiological reaction to various situations productive of anxiety", and stated that 75% of the sufferers are aware of the relationship between their headache and psychological factors. His theory can be simply illustrated in the following schematic form.

TABLE 2

Emotional conflict

Suppression or repression produces the end-organ discharge

Change in the muscles of the neck	Change in the blood vessels of the head
↓	↓
Muscular contraction	Vascular dilatation

Nerve impulse

↓

Central nervous system

↓

Painful sensation

b) Hypochondriasis

The main symptom of this disorder is an over-concern about the condition of one's health; patients pay too much attention to their normal physiological phenomena and consider themselves pathological. Morita originated a unique theory of this condition utilized in Morita Therapy. The essential part of his therapy lies in breaking the vicious circle which has been built up between too much attention to a certain part of the body and the resulting over-sensitivity and, sometimes, dysfunction of that part or organ. Headache induced by this kind of mechanism can be changeable in location and degree of severity, and is easily replaced by other somatic symptoms. Furthermore, there is often a daily change in symptoms.

c) Fatigue Neurosis

The main symptoms of this condition are easy fatigability, and difficulty in concentration mostly due to long-lasting emotional stress of a mild form.

According to Sadler, headache in this condition usually appears in the parietal and frontal areas, sometimes the occipital area, or "at the bottom of the brain". The quality of the pain is like a "pressure or pushing down, downward upon the head". As to the severity of this headache, there are different degrees from a "mild diffused" ache to a "most severe" pain.

d) Conversion Reaction

Classical cases of this condition are characterized by the appearance of somatic symptoms in organs under voluntary control, often having symbolic meaning. As patients obtain compensatory satisfaction of their frustrated needs by developing the somatic symptoms, their anxiety is considerably alleviated by these manifestations which often provide a secondary gain. As a type of hysterical headache, clavus, a headache localized in the parietal area, has been well-known. Patients say this condition feels as if their head "was being stirred up by a nail".

Not only such a classical type of headache, but also various types of pains can be complained of in different areas of the head by hysterical patients. The hyterical nature of these symptoms must be diagnosed by a thorough evaluation of the personality and the above-mentioned characteristics of this condition.

e) Traumatic Neurosis

In cases of post-traumatic headache, minute pathology in the brain is extremely hard to exclude. This makes the evaluation of psychogenic factors in this type of headache very difficult. However, if there is an obvious incompatibility between their daily behavior and their complaints, their personality and hysterical tendency should be evaluated. When the trauma is caused by an accident or other circunmstances where the patient receives compensation, the factor of compensation must be carefully examined.

2. Psychophysiologic Autonomic and Visceral Disorders

In regard to the difference between neurosis and psychophysiologic reactions, we arbitrarily use the following criteria:

i) The relative weight of mental symptoms is larger in neurosis, except for conversion reaction, while that of somatic symptoms is larger in psychophysiologic reaction.

ii) In the former, somatic symptoms are often multiple, transient, and easily changeable in location, while stronger tendencies to fix in a certain organ or organs is seen in the latter.

iii) Differentiation of psychophysiologic reactions from hysteria:
   a) Involvement of organs and viscera innervated by the autonomic nervous system, hence not under full voluntary control or perception.
   b) Failure to alleviate anxiety.
   c) Physiological rather than symbolic origin of symptoms.
   d) Frequent production of structure changes which may threaten life.

iv) Stronger participation of somatic factors, especially abnormal disposition of the autonomic nervous system and endocrine system, often accompanied by organic pathology.

v) Neurosis often occurs as the exaggerated reaction to emotional stress in daily life to which most others may not react to this degree. On the other hand, the emotional problems seen in psychophsysiologic reactions are more overwhelming, dramatic, long lasting, and largely prevented from being conscious.

a) Migraine

Migraine is a representative form of both vascular headache and headache due to psychophysiologic reactions. Dr. Harold Wolff's works which emphasized the close relationship between psychological and environmental factors, and the outbreak and progress of this disorder have been highly appreciated. People living in modern society, particularly those living in cities, are exposed to increasing environmental and emotional stresses. Many kinds of stimuli closely connected with modern life such as crowds, noise, vehicles, bright lights at night, air conditioning, etc., seem to precipitate migraineous attacks as shown in table 3. Alvarez stated tha migraine is a "vascular brain storm" induced by emotional, social, or sexual incompatibility. We provide five diagnostic criteria for migraine, following after Ogden:

1) Pulsating headache at the time of attack
2) Fitful gastrointestinal disturbance (nausea, vomiting, anorexia, etc.)
3) Characteristic eye symptoms (scintillating scotoma, defect of visual field, clouded vision, photophobia, etc.)
4) Characteristic personality and emotional type
5) Hereditary tendency of chronic headache of allergic conditions

TABLE 3 **Precipitating Factors in Migraineous Attacks**

Enviromental Factors		*Somatic Factors*	
Climate	74.6%	Short of Sleep	80.5%
Weather	70.6%	Eye Fatigue	70.6%
Crowd	66.7%	General Fatigue	60.3%
Time element	60.3%	Menstruation	46.0%
Noise	54.0%	Alcohol	14.3%
Vehicle	54.0%	Foods	6.4%
Ligth	49.2%	Illness	6.4%
Air conditioning	44.4%	Tobacco	4.8%

Fukamachi has done a detailed analysis of the psychological factors in 63 migraineous patients of both sexes, mainly through the interview technique.

Personality traits: perfectionistic, obstinate, and rather compulsive in more than 75%; short-tempered, excessively meticulous, too sensitive to criticism, and honest in more than 50%. These traits are usually said to compose a so-called migraineous personality. The dependent tendency is small and they are rich in the spirit of indepen-

dence, differing from many other types of psychophysiologic reactions.

As to the psychological factors related to the onset and recurrence, 60 out of 63 patients were found to be aware of such factors when enough time was spent in the interview.

TABLE 4

Precipitating Factors at the Onset

Conflict between the sexes	27	(42.9%)
Conflict at work	11	(17.5%)
Conflict with parents, siblings mother in law, etc.	10	(15.9%)
Others	6	(9.5%)
None	3	(4.8%)
Somatic factors (delivery, abortion, etc.)	3	(4.8%)

In the psychological factors mentioned in Table 4, suppressed or repressed severe hostility in interpersonal relatioships was found to be the common psychological background. A similar tendency was seen in the psychological factors related to the recurrence of symptoms.

TABLE 5

Precipitating Psychological Factors in the Recurrence of Migraineous Attacks

Irritation	61.9%
Apprehension	42.9%
Anger	41.3%
Anxiety	30.2%
Tension	28.6%
Depression	17.5%
Sorrow	14.3%

The following hypothesis of Alexander is well-known; it is that the inhibition of aggressive needs such as fight and flight may result in the persistence of the tension of the sympathetic nervous system which has been originally induced by those emotions. Such psychophysiologic conditions may develop into migraine, cardiac neurosis, hypertension, and others.

In the outbreak of migraine, such rather specific emotional stresses or environmental factors may act as precipitating factors on the basis of psychological and physiological dispositions.

Migraine and EEG

The frequency of abnormal EEG in migraineous patients differs according to different investigators. Imai examined the EEG of 58 migraineous patients and found a normal EEG in 32.8%, slightly abnormal

TABLE 6 **Relationship between EEG and Personality traits**

Migraineous Personality	*EEG* *Normal*	*Slightly Abnormal*	*Moderately Abnormal*	*Markedly Abnormal*	*Total*
Marked	6 17.1%	17 48.6%	10 28.6%	2 5.7%	35
Moderate	11 61.1%	6 33.3%	1 5.6%	0	18
Normal	2 40.0%	1 20.0%	2 40.0%	0	5
Total	19	24	13	2	58

Table 4, suppressed or repressed severe hos- in 41.4%, moderately abnormal in 22.4%, and markedly abnormal in 3.4%. The interrelation between personality traits and the findings of EEG is shown in Table 6.

The more marked migraineous personality the patients have, the more abnormalities can be seen in their EEG.

TABLE 7 The Effect of Drugs Upon Migraine and Tension Headache

	Effect	*Markedly Effective*	*Effective*	*Non-Effective*	*Total*
Migraine	Kallikrein	4	2	5	11
	Chlordiazepoxide	2	6	5	13
	Total	6	8	10	24
Tension Headache	Kallikrein	0	4	3	7
	Chlordiazepoxide	1	6	2	9
	Total	1	10	5	16

The Management of Migraine

The management of this disorder from the somatic standpoint will be discussed by other authors, therefore the treatment from the mainly psychosomatic point of view will be briefly described. Mimoto has confirmed the remarkable effect of Kallikrein tablets on the alleviation and prevention of symptoms. Among several psychotherapeutic drugs, chlordiazepoxide (Librium) was effective in 61% of migraineous cases, especially so in cases with a normal EEG.

Because of the so-called migraineous personality, the patients often work compulsively and cannot stop until they have become completely exhausted, and at the same time they are over-reacting to external stimuli. This usually results in migraineous attacks, therefore the therapist should give them insight into their personality traits and reaction pattern to their environment and advise them to modify their way of life.

Migraineous patients are inclined to shut themselves up in their own shells and try to manage their emotional problems for themselves without revealing them to others. This often makes the psychotherapeutic approach to the patients rather difficult.

b) Headache due to hypertension

As mentioned above, hypertension and migraine have a common psychological denominator. Many cases of essential hypertension are often classified as a type psychophysiologic cardiovascular reaction. In those cases, the consideration of psychological factors seems to be essential.

c) Headache due to other psychophysiologic reaction

i) Psychophysiologic musculoskeletal reaction; myalgias including some cases of cephalalgia, tension headaches.

ii) Psychophysiologic genitourinary reaction; headaches as a part of the menopause syndrome and similar syndromes in women not in the period of menopause which is intimately involved with psychic factors.

iii) Asthenopia, glaucoma, and other psychosomatic conditions of the eye in which the role of psychological factors has recently received more attention.

iv) Others.

B. *Headache due to psychogenic overlay.*

Neurotic patients suffering from organic diseases may develop various psychophysiologic symptoms which are not directly con-

nected with the primary pathology and mostly due to psychogenic reactions to the original organic disorders, which are often severe, life-threatening or long-lasting, or to the accompanying problems of their everyday lives which are aggravated by their illness. Tension headache is often a symptom of such a psychogenic overlay.

When neurotic persons suffer from any kind of organic disorder, their psychic energy which has been prevented from being released because of their distorted personality, may concentrate on their pathological organ making clinical pictures more complicated. In such a case, a headache caused by a slight organic disorder may be exaggerated and often follows an unduly prolonged course; sometimes it may be complained of even after the organic cause of the headache has cleared up.

III. DIAGNOSIS

The clinical pictures of psychosomatic headache of different categories which have been described in the former section may help in the diagnosis of each condition. Therefore, the authors' wish is to briefly, describe common techniques of how to discover the significance of psychological factors in these conditions.

A) Headache as a part of hallucinatory symptoms of schizophrenia, especially at the pseudo-neurotic stage of this psychosis or a border-line case, where somatic symptoms of a certain organ are exclusively complained of, must be carefully differentiated.

The vegetative seizure of epilepsy, where various somatic symptoms such as general discomfort, headache, nausea, vomiting, dyspnea, vasomotoric changes, etc. may be complained of in the absence of the attack of epileptic cramp. This condition also must be carefully ruled out by examining the EEG and rather characteristic clinical pictures. In such a case, the pattern of attack is mostly consistent and fixed and the content of the attack is relatively simple, elementary, and concrete. In addition, the interval between attacks finds the patients completely free of symptoms most of the time.

B) Thorough physical and laboratory examinations are important in the diagnosis of neurosis (negative diagnosis). At the same time, a positive approach in which the characteristic features of a neurotic condition are positively searched for is essential.

C) Some characteristic features of a neurotic condition

1. Functional conditions are positively considered when no noticeable organic changes are found in spite of a considerably long duration of a disorder.
2. General conditions are good in spite of colorful and dramatic and long-lasting complaints of the patient.
3. There is a close correlation between the rise and fall of symptoms and the patient's emotional life.
4. There is a neurosis or psychosomatic disorder in other parts of the body.
5. The patient wanders from doctor to doctor without benefit.
6. The complaints are plentiful and rich in variety, often scattered all over the body, sometimes peculiar and paradoxical.
7. They do not react to ordinary medication or therapeutic procedures, often showing abnormal reactions.
8. There are exaggerated complaints not corresponding to actual bodily changes. The location, degree, and kinds of symptoms are changeable and responsive to suggestion.
9. There is an over-sensitive reaction to the physical examination and other tests.
10. There is an escape mechanism into symptoms, especially in conversion reaction.

D) The interview technique will be practical and sufficient for the general clinician to look into the patient's emotional life. This is a technique to discover whether a patient is phobic to a certain illness or not, to discover recent social and environmental changes which may have induced maladjustment, and other emotional or physical stresses.

E) Amytal interview hypnoanalysis, and psychoanalysis may be used as advanced techniques.

IV. GENERAL MANAGEMENT

This is limited to the management from the psychosomatic standpoint.

A) The psychological meaning of routine medical management.

1. A thorough physical examination may reassure by eliminating the fear of serious organic conditions.
2. The removal from external strains by hospitalization.
3. Medical treatment may cut the vicious circle between too much attention to a certain organ and its oversensitivity by eliminating somatic symptoms.
4. The satisfaction of neurotic needs by ordinary medical treatment.

B) The elementary psychotherapeutic approach.

This may include reassurance, persuasion, advice, bibliotherapy, diversion (entertainment, hobbies), occupational therapy, and a rational use of psychotherapeutic drugs.

C) Brief psychotherapy.

1. The interview: This is a supportive approach through a regular interview in which the weakened ego of the patient is supported by the therapist so that the patient can ventilate his suppressed emotions and is given a chance to recover his emotional homeostasis and develop a new method of adjustment to his environment, mostly for himself, being helped by the therapist's interpretation, suggestions, and advice, which are given as the patient can accept them. The working through of this approach to stabilize the patient's insight will be performed through the guidance and re-education in the patient's daily life. Psychotherapeutic drugs and the rearrangement of the patient's enrivonment are used as auxiliary methods.
2. Suggestive therapy: Hypnosis and autogenic training.
3. Morita Therapy, desensitization, group psychotherapy, and others.

Acknowledgement

We gratefully acknowledge the assistance of Mr. Michael J. Millet, Dr. Haruo Dobeta, Dr. Tsuneo Imai, and Dr. Yoshiteru Ono.

SUMMARY

Headache is one of the most popular complaints which is closely related to psychological factors.

We have classified the conditions which induce headache into the following categories from the psychosomatic viewpoint.

A. Primary psychosomatic disorders:
   1. Neuroses
      a) Anxiety neurosis.
      b) Hypochondriasis.
      c) Neurotic depression.
      d) Fatigue neurosis.
      e) Hysteria (conversion reaction).
      f) Traumatic neurosis.
   2. Psychophysiologic autonomic and visceral disorders
      a) Migraine.
      b) Hypertension.
      c) Others.

B. Secondary psychosomatic disorders
   1. Psychogenic overlay.
   2. Undue prolongation of a slightly organic disease.

C. Non-psychogenic organ diseases.

Diagnosis

The clinical pictures of psychosomatic headache of different categories which have been described, may help in the diagnosis of each condition. The authors, describe common thechniques of how to discover the significance of psychological factors in these conditions.

A) Headache as a part of hallucinatory symptoms of schizophrenia.

The vegetative seizure of epilepsy.

B) Thorough physical and laboratory examinations are important in the diagnosis of neurosis (negative diagnosis).

C) Some characteristic features of a neurotic condition.

D) The interview technique will be practical and sufficient for the general clinician to look into the patient's emotional life.

E) Amytal interview, hypnoanalysis, and psychoanalysis may be used as advanced techniques.

General Management

This is limited to the management from the psychosomatic standpoint.

A) The psychological meaning of routine medical management.

B) The elementary psychotherapeutic approach.

C) Brief psychoterapy.

1. The interview: This is a supportive approach through a regular interview in which the weakened ego of the patient is supported by the therapist.
2. Suggestive therapy: Hypnosis and autogenic training.
3. Morita Therapy, desensitization, group psychotherapy, and others.

RESUMEN

La cefalalgia es uno de los malestares más comunes en relación con causales psicológicas.

Desde el punto de vista psicosomático hemos clasificado a los factores que inducen el dolor de cabeza en la siguiente forma:

A. Desórdenes psicosomáticos primarios.
   1. Neurosis.
      a) Neurosis de ansiedad.
      b) Hipocondría.
      c) Depresión neurótica.
      d) Neurosis de fatiga.
      e) Histeria (reacción de conversión).
      f) Neurosis traumática.
   2. Desórdenes psicofisiológicos, autonómicos y viscerales.
      a) Jaquecas.
      b) Hipertensión.
      c) Otros.

B. Desórdenes psicosomáticos secundarios.
   1. Factores psicogénicos sobrepuestos.
   2. Prolongación excesiva de una enfermedad orgánica leve.

C. Enfermedades orgánicas no psicogénicas.

Diagnóstico

Los cuadros clínicos descritos anteriormente pueden auxiliar en el diagnóstico. Los autores describen técnicas comunes de cómo descubrir la significación de los factores psicológicos.

A) Problema del diagnóstico de una cefalalgia dentro de los síntomas alucinatorios de la esquizofrenia.

En las crisis vegetativas de la epilepsia.

B) Exámenes básicos y de laboratorio completo deben ser hechos para afirmar la neurosis.

C) Reconocer las características de un estado neurótico.

D) En la entrevista el clínico debe reconocer la vida emocional del paciente.

E) Si es necesario se recurrirá a la entrevista bajo amital, el hipnoanálisis y el psicoanálisis.

Cuidados generales desde el punto de vista psicosomático

A) La orientación psicológica en los cuidados médicos de rutina.

B) Poner en práctica una psicoterapia elemental.

C) Psicoterapia breve.

1. La entrevista: En ella el terapeuta sustenta el ego debilitado del paciente.
2. Terapia por sugestión: Hipnosis, entrenamiento autógeno.
3. Terapia de Morita, desensibilización, psicoterapia de grupo y otras.

RÉSUMÉ

La céphalalgie est une des maladies les plus communes en relation avec les causes psychologiques.

Du point de vue psychosomatique nous avons classé les facteurs qui induisent le mal de tête de la façon suivante:

A. Troubles psychosomatiques primaires.
   1. Névrose.
      a) Névrose d'anxiété.
      b) Hypocondrie.
      c) Dépression neurotique.
      d) Névrose de fatigue.
      e) Hystérie (réaction de conversion).
      f) Névrose traumatique.
   2. Troubles psychophysiologiques, autonomiques et viscéraux.
      a) Migraines.
      b) Hypertension.
      c) Autres.

B. Troubles psychosomatiques secondaires.
   1. Facteurs psychogéniques superposés.
   2. Prolongement excessif d'une maladie organique légère.

C. Maladies organiques non psychogéniques.

Diagnostique

Les cadres cliniques décrits ci-dessus peuvent être utiles dans le diagnostique. Les auteurs décrivent des techniques communes sur la façon de découvrir la signification des facteurs psychologiques.

A) Problème du diagnostique d'une céphalalgie parmi des symptômes hallucinatoires de la schizophrénie.

Dans les crises végétatives de l'epilepsie.

B) Des examens complets de clinique et de laboratoire doivent être faits pour affirmer la névrose.

C) Reconnaître les caractéristiques d'un état neurotique.

D) Au cours de l'entrevue le clinicien doit reconnaître la vie émotive du malade.

E) S'il est nécessaire, on devra pratiquer l'entrevue à base d'amytal, l'hypnoanalyse et la psychanalyse.

Soins généraux du point de vue psychosomatique

A) L'orientation psychologique dans les soins médicaux de routine.

B) Mettre en pratique une psychothérapie élémentaire.

C) Une psychothérapie brève.
   1. L'entrevue: Au cours de celle-ci, le thérapeute soutient l'ego affaibli du malade.
   2. Thérapie par sugestion, hypnose, entraînement autogène.
   3. Thérapie de Morita, dessensibilisation, psychothérapie de groupe et autres.

ZUSAMMENFASSUNG

Der Kopfschmerz ist einer der gewöhnlichsten krankhaften Zustaende die Beziehungen zu psychologischen Faktoren haben.

Vom psychosomatischen Standpunkt aus haben wir die Faktoren die den Kopfschmerz hervorrufen in folgender Weise eingeteilt:

A. Primaere psychosomatische Stoerungen.
   1. Neurosen.
      a) Angstneurosen.
      b) Hypochondrie.
      c) Neurotische Depression.
      d) Ermuedungsneurose.
      e) Hysterie (Konversionsreaktion).
      f) Traumatische Neurose.
   2. Psychophysiologische Stoerungen, autonome und organische.
      a) Migraene.
      b) Hypertension.
      c) Andere.

B. Sekundäre psychosomatische Stoerungen.
   1. Ueberlagerte psychogene Faktoren.

2. Uebermaessige Verlaengerung einer leichten organischen Krankheit.

C. Organische nicht -psychogene Erkrankungen.

Diagnose

Die oben beschriebenen klinischen Formen koennen bei der Diagnose behilflich sein. Die Autoren beschreiben die gewoehnliche Technik mit der man die Bedeutung der psychologischen Faktoren entdecken kann.

A) Das Problem der Diagnose eines Kopfschmerzes bei den Halluzinations-Symptomen der Schizophrenie.

Bei den vegetativen Anfaellen der Epilepsie.

B) Grundlegende und komplette Laboratoriumsuntersuchungen muessen gemacht werden, um die Neurose nachzuweisen.

C) Die Eigentuemlichkeiten eines neurotischen Zustandes erkennen.

D) Bei der Unterhaltung muss der Kliniker das emotionelle Leben seines Patienten erkennen koennen.

E) Wenn noetig hilft man sich mit der Konversation unter Amythal, der Hypnoanalyse oder der Psychoanalyse.

Allgemeine Bemerkunger vom psychosomatischen Standpunkt aus

A) Die psychologische Orientierung ist bei der medizinischen Behandlung rutinemaessig.

B) Man muss eine elementaere Psychotherapie anwenden.

C) Eine kurze Psychotherapie.

1. Die Konversation: in ihr stuetzt der Therapeut das geschwaechte "Ego" des Patienten.
2. Suggestionstherapie: Hypnose, autogenes Training.
3. Therapie von Morita, Desensibilisierung, Gruppenpsychotherapie und aehnliches.

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Electroencephalographic Studies in Migraine

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Headache is a common symptom associated with various neuropsychiatric disorders. Besides the so-called symptomatic headache which ascertains an organic origin, it is not uncommon that the cause of a headache when it is the main complaint is unknown. Emotional headache and migraine which are related to the psychological mechanism are its typical cases.

Recently, the correlation between epilepsy and migraine has been noticed trough electroencephalographical study.

Of the out-patients who visited the Neuro-Psychiatric Clinic of University of Tokyo, since 1954, for a period of 5 years, the proportion of the patients who had headache as a chief complaint are seen in the table-one[9].

TABLE 1

The Proportion of Patients with Headache, who visited the Out Patient Clinic, Dept. of Neuropsychiatry, University of Tokyo

	Nº of Out-Patients	*Patients. with Headache*	%
1954	6697	299	4.5
1955	6875	637	9.3
1956	6344	316	5.0
1957	5974	343	5.7
1958	5741	367	6.4
Total	31631	1962	6.2

During this period of 5 years, the proportion of the patients who had headache as a chief complaint were invariable. It was about 6% of the out-patients. These cases with headache were classified into six groups, diagnostically (Table 2)[1].

TABLE 2

Classification of Headaches

	Classification	*Nº of Cases*	%
I	Migraine	349	17.0
II	Habitual Headache	236	12.2
III	Emotional Headache	730	37.0
IV	Headache with Psychosis	123	6.2
V	Headache with Organic Origin	173	8.8
VI	Epilepsy	73	3.7
VII	Others	278	14.1
	Total	1962	100.0

Three groups, migraine, habitual headache, and emotional headache, out of the six groups had no subjective symptom but a headache, nor any objective symptom. However in the other cases, headache was a symptom of other diseases. Only a few psychiatric patients, in general, have insight into their condition, but it is not rare that the depressive or schizophrenic patients complain of headaches in the early stages. It is noteworthy that there were epileptic patients who complained of headache without epileptic seizure and these may be related to migraine.

In foreign statistics, migraine seems to occur before the age of twenty, in our data,

however, there are no significant differences between migraine, habitual and emotional headaches. In any case, it appears to be concentrated in the middle aged; after the age of twenty.

Of the six groups, in the investigation of heredity, migraine has 12.6 % with a headache background and is the most commonly seen (Table 3). It can be distinguished from habitual and emotional headache in this way.

TABLE 3

Heredity

	Head-ache	*Epi-lepsy*	*Neuro-Psy-chiatric Dis-orders*
I Migraine	12.6	2.6	9.7
II Habitual Head-ache	3.6	1.3	8.5
III Emotional Head-ache	1.8	0.7	12.9
IV Headache with Psychosis	0.8	2.5	20.5
V Headache with Organic Origin	0	1.7	12.1
VI Epilepsy	3.6	10.9	9.6
VII Others	3.2	1.5	13.3

Meanwhile there is only 2.6 % of migraines with a heredity of epilepsy. The heredity of general neuropsychiatric disorder was rather high.

The characteristic of migraine that has been recognized is that the pain is unilateral. In our data, however, less than 50 %, is localized on one side of the head and in the other cases, they are, either, bilateral or with uncertain localization. The unilateral incidence is not always characteristic of migraine in terms of paroxysmal headache. Although, it is unilateral in nature its site is indefinite, occurring alternatively, or at times, it begins on one side of head and radiates bilaterally (Table 4).

TABLE 4

Comparison for Localization of Headache

Migraine	*Localization*		*Habitual Headache*
16.5	Unilateral	Right	6.4
16.5		Left	9.6
9.4	Alternative		4.8
42.4	Total		20.8
12.5	Bilateral		33.9
45.1	Others		45.3

In a migraine attack, other neuropsychiatric symptoms were noted in addition to headaches. As shown in Table 5, there was higher incidence of scintillating scotoma, nausea, and vomiting in migraine than in habitual headache. The habitual headache was usually accompanied with vertigo and tinnitus (Table 5).

TABLE 5

Symptoms associated with Migraine and Habitual Headaches

Migraine	*Associated Symptoms*	*Habitual Headache*
9.9	Scintillating Scotoma	3.6
49.6	Nausea and Vomiting	36.3
16.1	Dizziness	23.1
5.4	Ophthalmalgia	4.2
3.4	Tinnitus	17.3
1.3	Diplopia	0
1.3	Moody State	1.4
0.9	Dreamy State	0
0.02	Visual Hallucination	0
22.5	Others	23.0

In about 60 %, the duration of a migraine attack was less than 5 hours and it was rare that the attack lasted more than 24 hours (Table 6).

TABLE 6

Lasting Time of Migraine Attack

– 1 hour	28.1%	57.8%
1 – 5 hours	29.7%	
5 – 24 hours	16.2%	
1 day – 2 days	6.5%	
2 days – 5 days	13.5%	
5 days –	3.9%	

The possible relation between migraine and epilepsy has been long observed. Liveing (1872)[10] reported a case in which an epileptic seizure developed from a migraine attack. Flateau (1912)[4] reported 7.2% of epileptic seizures out of 500 cases of migraine attacks, and he called this "Migräno-epilepsie". On the other hand, in investigations of epilepsy, Buchanan (1925)[2] reported 29% of migraine attacks, Ely (1930)[3], 15 % and Marchand and Ajuriaguerra (1948)[11], 4 %. But in the study of our department by Goto (1959)[5], it was 1.6 %; 10 cases out of 641 cases had an independent migraine attack. In 50 % of these patients migraine attack precedes epileptic seizure, and there was one case where psychomotor seizure developed, after seven years of only migraine attacks. The other 50 % of patients, had migraine attacks accompanied by epileptic seizures.

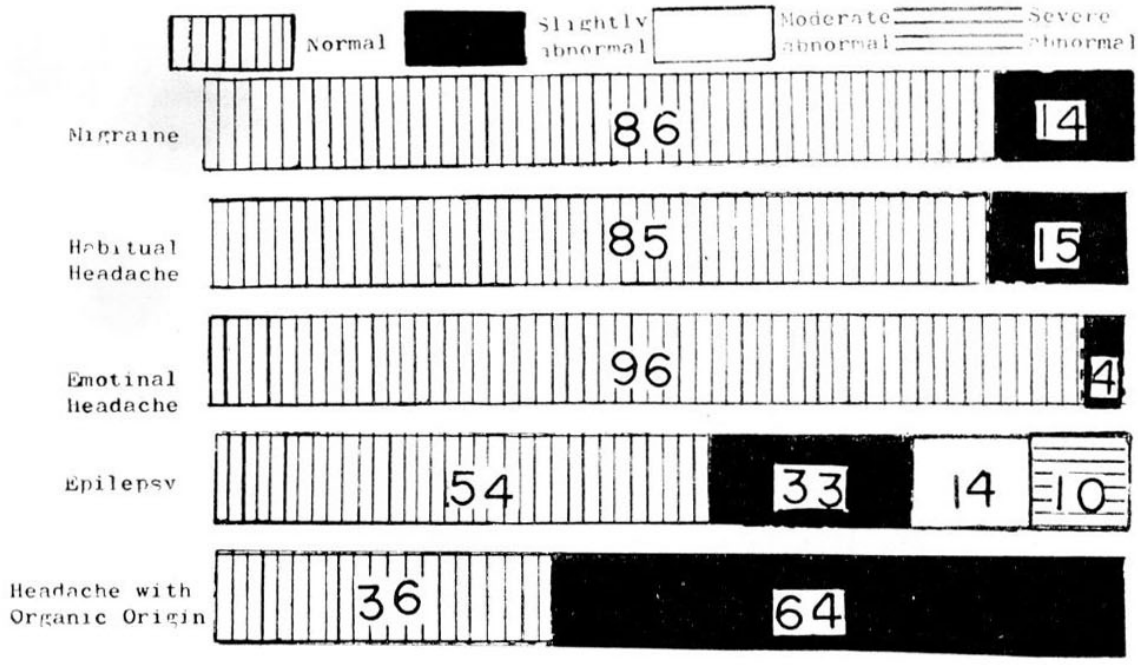
It has been felt that migraine is a symptom resulting from vasomotor dysfunction of cerebral arteries, and Gowers (1907)[6] believed that the vasovagale attack caused by epileptic, neurological mechanism, but it has been argued (Pette[12], Janzen[8], Alvarez[1], etc.) that migraine is a form of epileptic seizure. Electroencephalography of migraine, relating to this problem, in addition to the conventional, clinical observation, are expected to provide positive data in this respect.

We observed the resting and activated E.E.G. recordings in 180 migraine cases. The abnormal recordings were classified into 3 grades; mild, moderate and severe, according to degree. 86 % of migraine revealed normal E.E.G. in the resting record, and the ones with an abnormal recording were all mild. There were no differences comparing habitual headache with emotional headache. The epileptic recording was in marked contrast with 50 % abnormal (Table 7).

Heyck (1956)[7] took the resting record of E.E.G. in 62 cases of migraine, and reported 63 % of the cases with various degrees abnormality. Habitual headache to the contrary, had 37.5 % of abnormal recordings, and so was definitely less than migraine.

Roger and his colleagues found 14 cases of epileptic seizures clinically out of 36 migraine cases and seven cases with abnormal E.E.G. recordings out of the remaining 22. In our study, there was quite a low inciden-

Table-7· Comparison of Abnormalities in Resting Record of E.E.G.



ce of abnormality compared with these reports but there was no difference with the non-migraine groups. Most of the cases showed a normal E.E.G. in the resting record.

The abnormal E.E.G. in the resting record showed 14 %, and the degree was rather mild. The wave patterns were diffuse irregular, diffuse theta wave pattern, and slightly asymetric. There were no distinct localized-abnormalities, paroxysmal hypersynchronization nor significant dysrhythmies.

Case 1.

A 20 year-old female, had had migraine attacks accompanied by nausea and vomiting since November 1958. In the E.E.G. resting record, in all leads, except the occipital area, approximately 6 c/s dominant theta waves seen particularly in the central area (Figure 1).

In the cases where pentazol, megimide, photic stimulation, photo-pentazol, and photo-megimide activation were employed, its effectiveness was more conspicuous in migraine groups than in the other headache groups (Table 8).

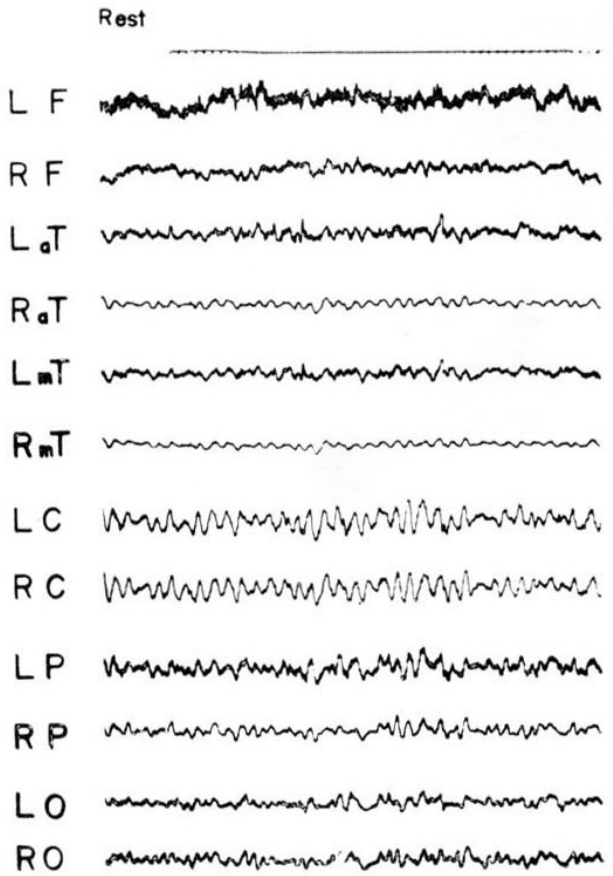
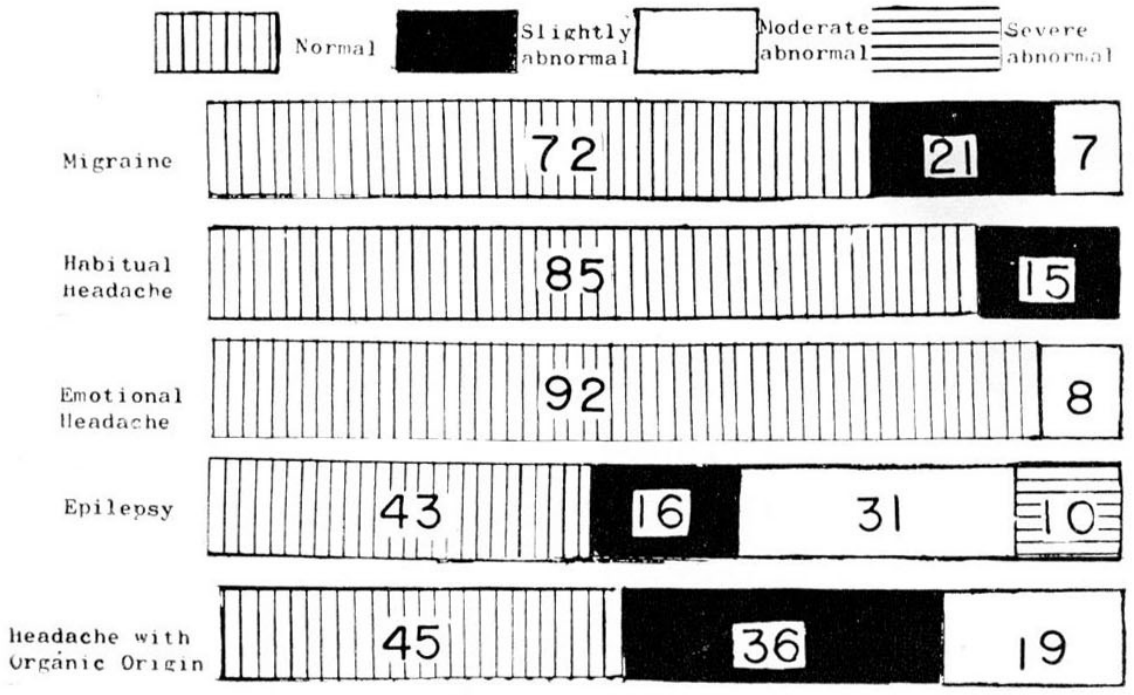


Figure 1. — *The Resting Record of E.E.G. Case 1. A 20-year old Female.*

Table-8: Comparison of General Finding in E. E. G. Recording (Resting and Activation)



The effect of activation was most significant with photo-pentazol or photo-megimide and then in a lesser degree with pentazol or megimide activation (30 - 50 %). There were a few cases in which the effect of activation by photic stimulation alone, could be obtained but it was not strong enough (5 %).

Case 2.

A 32 year-old male, had had migraine attacks which had been localized to the left temporal area since the end of 1958. Every attack was accompanied by nausea and vomiting. The E.E.G. resting record (Figure 2, rest) presents normal dominant lambda-waves. However, with the injection of 300 mgm of pentazol as shown in the right side of the Figure 2, irregular spike and wave burst were registered (Figure 2).

Case 3.

A 51 year-old female, had suffered from migraine attacks which began in the parietal area and then became generalized. The E.E.G. resting record shown in the right side of Figure 3 shows a normal dominant lambda-wave pattern except the asymmetry (Right > Left) in the fronto-temporal and central area. On injecting 300 mgm of pentazol, as seen in the right side of Figure 3 an irregular high voltage wave burst appeared and the asymmetry became more significant (Figure 3). The abnormal wave

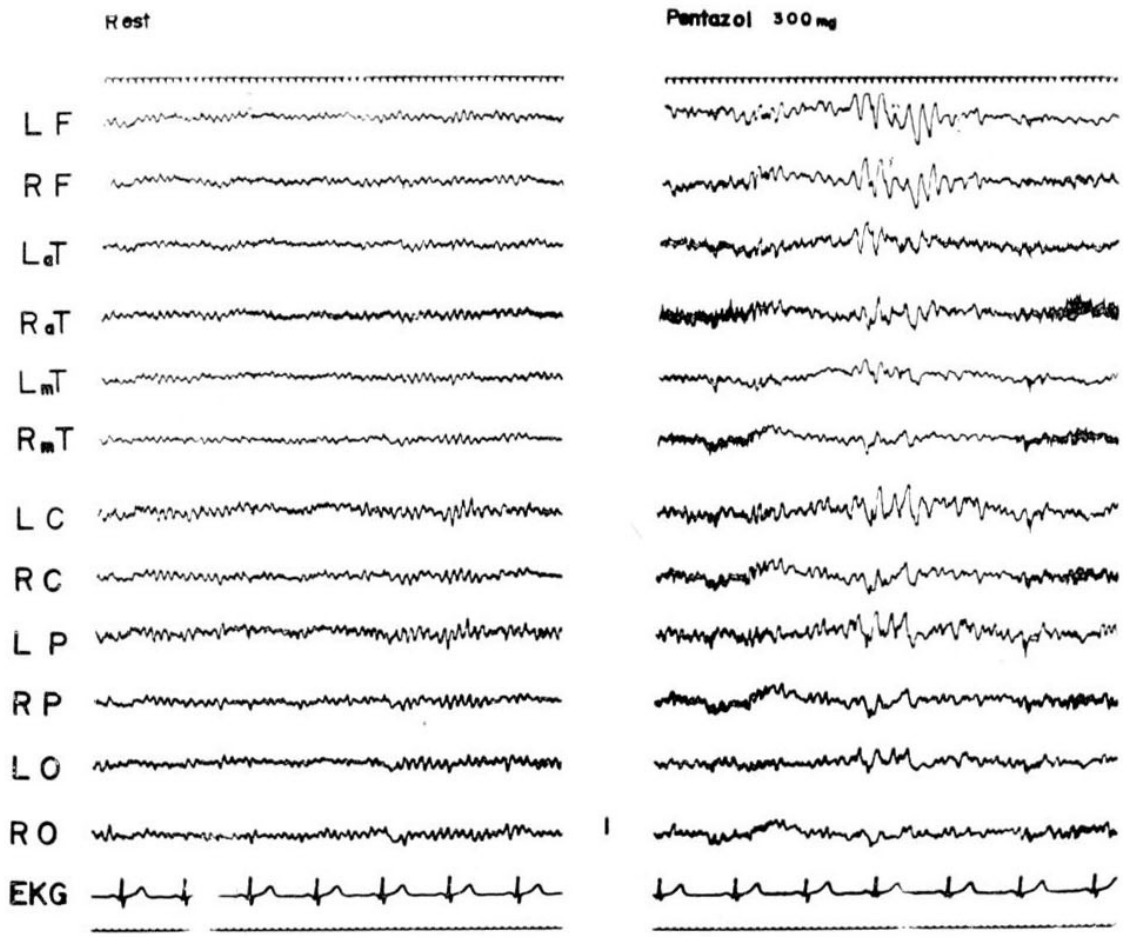


Figure 2. — *Abnormal E.E.G. by Activation in Migraine Case. Case 2. A 32 year old Male.*

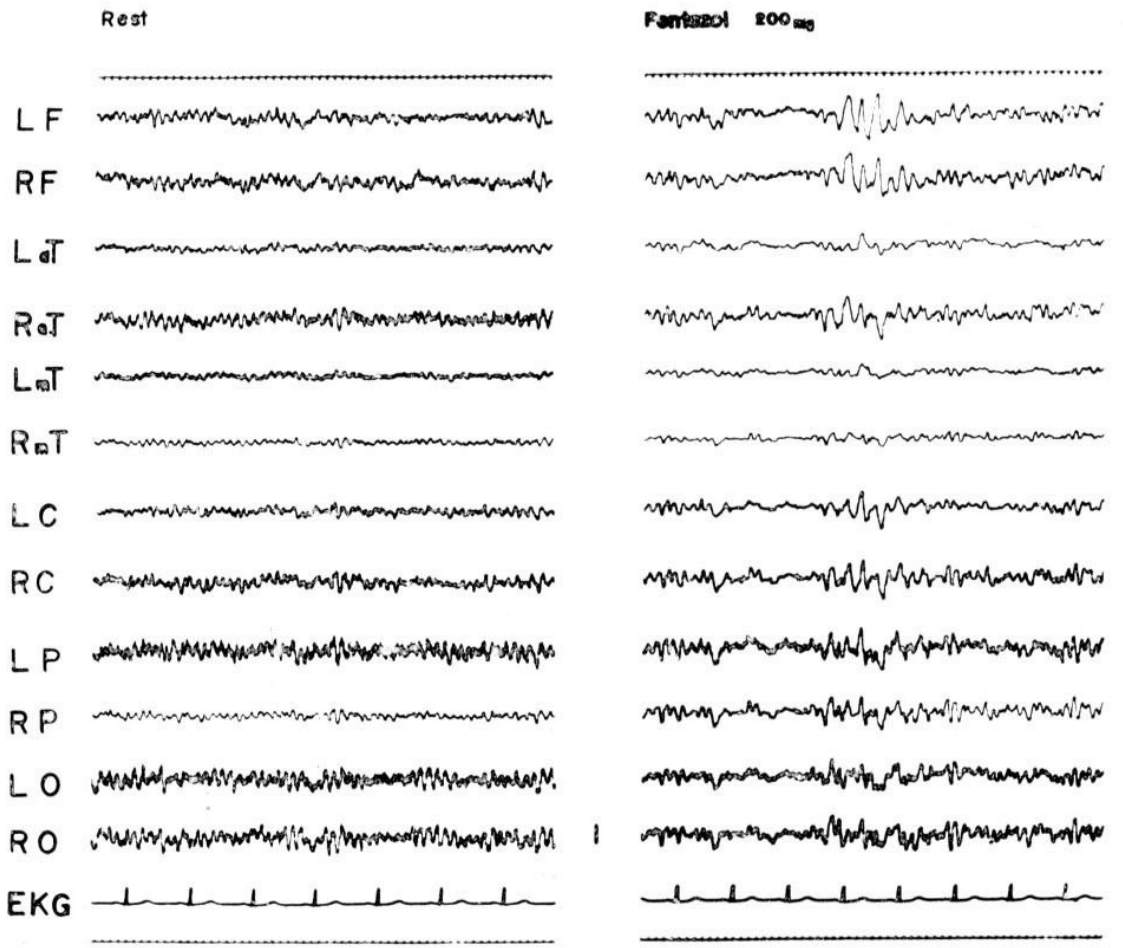


Figure 3. — *Abnormal E.E.G. by Activation in Migraine Case, Case-3. A 51 year old Female.*

pattern wich appeared in the resting or activation record, were a slow wave complex without showing irregular spike and wave complex or spike wave component as seen in the two afore mentioned cases. In the case of the asymmetrical pattern as can be seen in the E.E.G. resting record it becomes more noticeable with activation, but at times, it does not. In observing the relationship between the localization of an abnormal wave and headache in the E.E.G. recording of 30 unilateral headaches there were three cases which showed asymmetry. On the other hand out of 42 cases of bilateral headaches three cases had asymmetry, and it was not possible to notice any significant relationship between them.

There were a few cases with an appearance of abnormal wave and provoked headache attacks by activation, but they were rather rare.

In our investigation the migraine E.E.G. in the resting record alone, did not show much of abnormal wave patterns, in comparison with headache associated with epilepsy or other organic diseases, and there was no evidence to determine whether the characteristic of the abnormal wave patterns are epileptic in nature. They are definitely more susceptible to the various provocations than those of habitual and emotional headaches. The abnormal wave patterns by activation, were dysrhythmias, irregular wave and irregular spike and wave complex, yet we could not find any provocation of the wave patterns such as continuous paroxysmal wave, regular hypersynchronized wave complex and spike and wave complex which can be seen in epilepsy as a specific pattern.

There exist two situations, one is that migraine precedes clinically, and epileptic

seizure can develop during the process; the other one is that migraine attack and epileptic seizure can occur at the same time and we could conjecture the possibility that headache attack may occur as a form of epileptic seizure. However, the results of our electroencephalographical study, are to the contrary so we are rather inclined to think that we should differentiate between the mechanisms of migraine and epilepsy. Differing from the so-called habitual headache and emotional headache, we found out that migraine is extremely sensitive to the provocation of the various abnormal waves. In order to investigate the relationship to epilepsy further and if there is any activation method which is particularly effective to migraine, it will be necessary to look for it.

On the mechanism producing migraine, cerebral circulation was emphasized by Wolff[14 15] and the mechanism of "Vasculäre Krise" was manifested, but its cause remains unknown. Consequently, the treatment for this disorder has been limited symptomatically. I suppose that the electroencephalographical study will contribute to the investigation of this field.

SUMMARY

The possible relation between migraine and epilepsy has been long observed. In the study of our department by Goto, it was 1.6 %.

It has been felt that migraine is a symptom resulting from vasomotor dysfunction of cerebral arteries, and Gowers believed that the vasovagale attack is caused by epileptic, neurological mechanism; but it has been argued that migraine is a form of epileptic seizure.

We observed the resting and activated E.E.G. recordings in 180 migraine cases. The abnormal recordings were classified into 3 grades; mild, moderate and severe, according to degree. 86 % of migraine revealed normal E.E.G. in the resting record, and the ones with an abnormal recording were all mild. There were no differences comparing habitual headache with emotional headache.

In our investigation the migraine E.E.G. in the resting record alone, did not show much of abnormal wave patterns, in comparison with headache associated with epilepsy or other organic diseases, and there was no evidence to determine whether the characteristic of the abnormal wave patterns are epileptic in nature. They are definitely more susceptible to the various provocations than those of habitual and emotional headaches. The abnormal wave patterns by activation, were dysrhythmias, irregular wave and irregular spike and wave complex, yet we could not find any provocation of the wave patterns such as continuous paroxysmal wave, regular hipersynchronized wave complex and spike and wave complex which can be seen in epilepsy as a specific pattern.

RESUMEN

La relación posible entre jaquecas y epilepsia ha sido observada desde hace mucho tiempo. En el estudio realizado en nuestro departamento por Goto, se comprobó una frecuencia del 1.6 %.

Se piensa que la jaqueca es un síntoma que resulta de una disfunción en la vasomotricidad de las arterias del cerebro y Gowers creyó que el ataque vasovagal tiene un mecanismo neurológico epiléptico, en realidad se discute que la jaqueca es una forma de ataque epiléptico.

Estudiamos el electroencefalograma en reposo y con activación en 180 casos de jaqueca. Clasificamos los registros anormales en 3 categorías: leves, moderados y severos, de acuerdo al grado de las anormalidades. En los registros de reposo se observó trazados normales en el 86 % de las jaquecas; en el resto las anormalidades fueron leves.

No hubieron diferencias con lo que ocurre en las cefalalgias comunes y emocionales.

En nuestra investigación el electroencefalograma de la jaqueca tomado en reposo, no mostró mayor cosa de ritmos anormales, comparándolo con casos de cefalalgias asociadas con epilepsia o afecciones orgánicas, y no tuvimos evidencias demostrativas de que las anormalidades fueron de carácter epiléptico. Sin embargo eran claramente más susceptibles a modificarse por la activación que los casos de cefalalgias comunes y emocionales. Los cambios obtenidos con la activación fueron disritmias, ondas irregulares, complejos punta y onda irregulares, aunque no pudieron provocarse paroxismos continuados, ondas hypersincrónicas regulares, complejos onda y punta como puede observarse en típicas manifestaciones epilépticas.

RÉSUMÉ

La relation possible entre les migraines et l'épilepsie a été observée depuis longtemps. Dans l'étude réalisée dans notre département par Goto, on a vérifié une fréquence de 1.6%.

On suppose que la migraine est un symptôme résultant d'une dysfonction dans la vasomotricité des artères du cerveau et Gavers a pensé que l'attaque vasovagal possède un mécanisme neurologique épileptique. En réalité on discute le fait que la migraine soit une forme d'attaque épileptique.

Nous avons étudié l'électroencéphalogramme au repos et avec une activation chez 180 cas de migraine. Nous avons classé les registres anormaux en 3 catégories: légers, modérés et sevères, en accord avec le degré d'anormalités. Dans le registre de repos on a observé des graphiques normaux dans le 86% des migraines; pour le reste, les anormalités ont été légères.

On n'a pas constaté de différences entre ce qui se passe avec les céphalalgies communes et les émotives.

Dans notre investigation, l'électroencéphalogramme de la migraine pris au repos, n'a pas démontré particulièrement des rythmes anormaux, en le comparant à des cas de céphalalgies associées à l'épilepsie ou à des affections organiques, et nous n'avons pas eu d'évidences démonstratives que les anormalités ont eu un caractère épileptique. Cependant elles étaient nettement plus susceptibles à des modifications pour l'activation que les cas de céphalalgies communes et émotives. Les changements obtenus avec l'activation ont été des dysrythmies, des ondes irrégulières, des complexes de pointe et onde irréguliers; mais on n'a pas pu provoquer de paroxysmes continuels, des ondes hypersynchroniques régulières, des complexes d'onde et pointe comme on peut en observer dans des typiques manifestations épileptiques.

ZUSAMMENFASSUNG

Moegliche Beziehungen zwischen Migraene und Epilepsie sind schon seit langer Zeit beobachtet worden. Bei der in unserer Sektion von Goto durchgefuehrten Untersuchung fand man eine Haeufigkeit von 1,6%.

Man glaubt, dass die Migraene ein Symptom darstellt, das durch die Dysfunktion der Vasomotrizitaet der Gehirnarterien entsteht, und Gowers glaubte, dass die vasovagale Krise einem neurologisch-epileptischen Mechanismus gehorchte; in Wirklichkeit diskutiert man ob die Migraene nicht eine Form des epileptischen Anfalls ist.

Wir untersuchten das EEG in Ruhe und bei Aktivierung in 180 Faellen von Migraene. Wir klassifizierten die anormalen Kurven in drei Kategorien: leichte, mittelschwere und schwere, je nach dem Grade der Anormalitaeten. In den Ruhekurven beobachtete man normale Kurven bei 86% der Migraenefaelle; bei den uebrigen waren die Anormalitaeten leichter Art. Es gab keine Unterschiede wie bei den gewoehnlichen und emotionellen Kopfschmerzen.

Bei unseren Untersuchungen zeigte das EEG bei Migraene in Ruhe kaum anormale

Rhythmen, wenn man zum Vergleich die mit Epilepsie oder organischen Afektionen vergesellschafteten Kopfschmerzen nimmt; und wir hatten auch keine beweiskraeftigen Zeichen, dass die Abweichungen epileptischen Charakters waeren. Das EEG zeigte immerhin in diesen Faellen durch die Aktivierung hervorgerufene Abweichungen, die leichter waren als in den Faellen von gewoehnlichen oder emotionellen Kopfschmerzen. Die durch die Aktivierung hervorgerufenen Veraenderungen waren Dysrhythmien, unregelmaessige Zacken, unregelmaessige Komplexe von Spitzen und Kurven, obwohl man keine Kontinuerlichen Paroxysmen, regelmaessige hypersynchronische Wellen, noch Komplexe von Spitzen und Wellen hervorrufen konnte wie man sie bei den typischen epileptischen Manifestationen beobachten kann.

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Treatment of Chronic Headache

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For the establishment of an orderly approach to the treatment of headache, the physician must understand the basic mechanism involved in its production, which are both physiological and psychological. The object of treatment is two-fold; to relieve the underlying cause and prevent subsequent attacks and to alleviate the pain of an immediate attack. The major part of the information leading to successful treatment is obtained from a detailed history and examination. Relief of an attack of head pain is usually accomplished by pharmacotherapy, whereas in prevention the therapy consists of the use of drugs, and in some cases psychotherapy.

This communication is confined mainly to the use of drug therapy in the management of the more common types of chronic, recurring headaches the physician sees in his office. These are (1) Vascular headaches of the migraine type, including (a) "classic" migraine, (b) "common" migraine (c) "cluster" headache. (2) Muscle contraction headache. (3) Headache of nasal vasomotor reaction. (4) Non-migrainous vascular headache (arterial hypertension) and (5) Chronic post-traumatic headache.

In evaluating the treatment of headache by pharmacological methods, a number of factors are difficult to control. Headache as a symptom is a subjective response evident only to the individual experiencing it. The appraisal of therapy depends upon a cooperative statement made by the subject. Moreover, there are three areas in which effect of the drug must be considered: (1) the original pain sensation and its mechanism; (2) the anxiety associated with the pain, and (3) the secondary increase in dysfunction, including the additional pain sensation which accompanies the anxiety.

Response to any therapy will be affected by the patient-physician relationship. For example, in our experience, the pharmacological effect of sedatives, tranquilizers and analgesics is decidedly influenced by the physician's ability to relieve the patient's anxiety. Response to a remedy also depends upon the psychological status of the patient whose attitude may range from constructive to cynical. The physician's attitude toward the drug being administered influences the results. The therapeutic enthusiast always does not better than the therapeutic nihilist. It also must be emphasized that the physician's understanding of the pharmacologic action of the drug being used, including such parameters of a drug as a mode of administration, dosage, number of doses and frequency of administration have pronounced effect on the results of treatment.

Vascular Headaches of the Migraine Type
Pharmacotherapy - Symptomatic Treatment

In the symptomatic relief of all types of migraine, ergotamine tartrate is the drug of choice. This agent has a number of known pharmodynamic actions. However, the beneficial effect of ergotamine administration probably depends on its action on the smooth muscles of the blood vessels, causing a constriction of these vessels. This

can be demonstrated by the use of amplification and recording devices applied to the study of the extracranial artery pulse waves in patients with vascular headaches. The parallelism in time between the vasoconstriction action on cranial arteries and reduction in the intensity of headache is indicated by the following observation:

A more direct method of measuring local circulation in patients with vascular headache is by use of an isotope (Na^{24}) tissue clearance technique. This provides a measure of the rate which the isotope is removed from the site (tissue) injected and therefore serves as an index of the estimation of effective blood flow, or that which

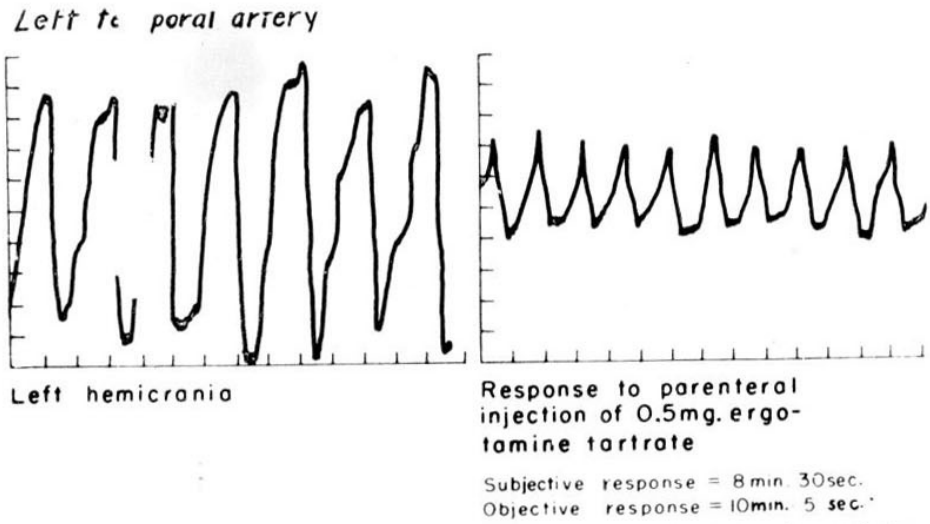

FIGURE 1. Pulse volume tracing, showing response to ergotamine tartrate in a patient with migraine headache.

traverses capillaries (in contrast to shunts), in measuring the fronto-temporal area of patients with anterior migraine headache. Ergotamine caused disappearance of headache and reduction of flow in 3 of 5 patients suggesting vasoconstriction. In the 2 whose headache persisted, blood flow remained unchanged.

The effectiveness of ergotamine in migraine therapy has further been improved by combining it with caffeine to potentiate its action and with other compounds to reduce its side effects and to control other symptoms associated with the migraine attack. Many forms of ergotamine derivatives are now available in proprietary preparations

TABLE 1

Temporal Skin
Sodium^{24} Tissue Clearance

Patient	*Ergotamine Before*	*Ergotamine After*	*Relief of Headache*	*No Relief*
S. R.	.147	.093	+	—
M. W.	.228	.149	+	—
J. S. (11/28/61)	.121	.066	+	—
J. S. (12/19/61)	.333	.189	+	—
G. S.	.152	.145	—	+
M. L.	.119	.119	—	+

incorporating antispasmodics, sedatives and antiemetics to suit the individual patient's need. The drug can be given by inhalation or by sublingual, oral, rectal or parenteral routes. In our experience rectal suppositories combining ergotamine with caffeine and an anti-spasmodic have proven most effective in the treatment of ordinary and classical migraine. In cluster headache, because of its transitory nature, the best results are usually obtained with ergotamine or dihydroergotamine and parenterally or by the aerosol inhalation of ergotamine. The use of antiemetics such as compazine (prochlorperazine) or Marezine (cyclizine hydrochloride) is very helpful in the prevention of nausea caused by the drug and headache.

The importance of administering the medication early in the course of an attack, and giving it in adequate doses, cannot be overestimated. Many therapeutic failures are ascribable to too small a dosage given too late. Many errors in therapy are owing to lack of knowledge of how to use the drug-from undue fears of its danger on the one hand to recklessness in its administration on the other. However, the physiologic effects of ergot are exceedingly variable from person to person. Even in the same patient the way the body deals with the drug varies with certain physiologic states of the responding tissues.

Because of its powerful vasoconstrictor action, ergotamine should not be used in patients who have or are suspected to have peripheral, cerebral or coronary vascular disease of venous or arterial origin. It is also contraindicated in patients with liver disease, renal damage, hypertension, pregnancy or septic states and in cachectic patients.

In the late states of migraine attack, analgesics and sedatives are sometimes helpful if the headache has persisted long enough for the vessels to become firm and tortuous. In an occasional patient, relief is secured from an acute attack by inhalation of 100 per cent oxygen, by the administration of injectable Dramamine (dimenhydrinate) or even by local infiltration of the affected artery by procaine. Efforts to abort "classical" migraine at the onset of aura by the use of nitroglycerin, carbon dioxide, nicotinic acid or other vasodilating agents have not been successful in our hands.

Prophylactic Treatment

The chemotherapeutic prevention and treatment of vascular headache of the migraine type has been uniformly unsuccessful.

Migraine patients may profit to a limited extent from the prophylactic use of tranquilizing drugs and in some instances may be especially helped by drugs such as methaminodiazepoxide (Librium) and certain monoamine oxidase inhibitors that elevate the patient's mood.

A small number of patients who have a family history of aphasia, hemiplegia, paresthesias prior to or during the headache attack and reveal an abnormal electroencephalogram with spike patterns respond well to hydantoins such as Dilantin. In some patients the hydantoins may be combined with caffeine for more effective results.

The recent introduction of a serotonin antagonist, 1-methyl-lysergic acid butanolamide (methysergide), has given us a more effective agent in the treatment of migraine. This chemical agent resembles methergine and is in fact methylated methergine. While lacking the capacity to terminate headache already in existence, it is often effective in reducing the number and severity of headache attacks taken prophylactically. The exact mode of action of methysergide in prevention of migraine is unknown. In addition to its central and anti-inflammatory properties of a non-specific nature, it may secondarily induce vasoconstriction. Recent evidence suggests it also plays a role in the modulating of unstable central vasomotor centers which may be a factor in triggering the migraine attack.

TABLE 2

Anti-Serotonin Activity in Vivo in Relation to Clinical Efficacy as Migraine Prophylaxis

Compound	*Inhibition of Serotonin-induced Edema in the Rat's Paw* E. D. 50 meg./kg.	Relative Value*	Relative Clinical Effect (Range, 0 to 4 +)
1. Hydergine	883	7	+
2. BOL 148**	196	29	+
3. Cyproheptadine ..	26	150	++
4. UML 491 (methysergide) ...	13	440	++++

* LSD - 25 100.
** D-2-Brom-lysergic acid diethylamide tartrate.

Unpublished observations in our laboratory would tend to support the view that methysergide has no direct peripheral action but acts by a central route. With the use of isotopic sodium (Na^{24}) the effect of skin blood flow was measured as a rate of disappearance of Na^{24} from an intracutaneous injection site on the forearm and fronto-temporal skin areas. It was noted that there was no consistent change in skin blood flow following parenteral administration of methysergide. However, intravenous norepinephrine and ergotamine tartrate have modified skin blood flow. Additional investigation in our laboratory has demonstrated no effect of the drug on electromyograms or symptoms during muscle contraction headaches. The exact mechanism of action is obscure. However, investigation holds promise of further insight into the mechanism of the migraine disorder.

A summary of our experience with methysergide in 325 patients with vascular headache of the migraine type over a period of 30 months is as follows: In patients with "classic" migraine, "common" migraine and "cluster" headache, it proved effective in 70% of the patients studied which was statistically significantly different from the placebo response.

The rest of the patients found no relief from the medication, or secondary effects were so severe the therapy could not be continued. Of the patients favorably affected, about 30% were troubled by moderate nausea, dizziness, epigastric distress, lethargy, restlessness and leg pains in order of their frequency. These reactions can be modified by adjusting the dosage to the requirements of each patient. Severe peripheral vascular effects were noted in 2 patients with loss of the pulses and change in color in the lower extremities. These disappeared upon discontinuance of the drug. Most patients were started on doses of methysergide at 6 mgm. per day, divided into 3 doses daily. Occasional patients received doses as high as 16 mgm. per day.

Peptic ulcer, pregnancy, peripheral vascular diseases, thrombophlebitis, severe hypertension, advanced coronary heart disease and renal disorders, must be considered contraindications to the use of methysergide. There is no evidence to support its use in muscle contraction headache.

In appraisal of a prophylactic chemical agent in the treatment of migraine, it is well to note that we can be misled by the natural history of the disorder, particularly by the unpredictable remissions which can last for months or even years.

Surgical procedures for migraine are usually not recommended. They are of two types: reduction of arterial dilatation by ligation or neurectomy, or interrupting of the afferent nervous pathways transmitting

pain from arteries. Novocain and alcoholic infiltration of arteries have been used but only with temporary success.

In patients with cluster headaches, a number of surgical procedures have been recommended. No great therapeutic triumph has emerged from section of the greater superficial petrosal nerve, removal of the sphenopalatine ganglia or trigeminal rhizotomy.

Muscle Contraction Headache Symptomatic Treatment

In the treatment of an acute attack of severe persistent muscle contraction headache, the non-addicting analgesics alone are seldom effective. The fact that so much attention is now being devoted to the search for new non-narcotic analgesic agents for the treatment of headache indicates the ideal one is yet to be discovered. The most practical and useful non-narcotic analgesic available for head pain of low intensity still remains acetylsalicylic acid. Likewise, tranquilizers and sedatives rarely control the discomfort of severe or persistent headache. The important fact is that we are treating not only the perception of pain but reaction of pain.

Thus, when the analgesic is combined with a tranquilizer or sedative, the combination becomes effective in the symptomatic treatment of muscle contraction headaches. A combination of analgesic sedative and/or tranquilizer gives relief in over 70 per cent of treated cases, whereas non-narcotic analgesics or sedatives, when used alone, are less effective (55 per cent). It should be noted that placebos are effective in approximately 45 per cent of these patients.

Prophylactic Treatment

The immediate source of pain in muscle contraction headache is presumed to be prolonged, sustained contraction of the muscles of the neck and head. This is usually associated with excessive reaction to emotional stress. Tranquilizers and muscle relaxants are the medical treatment of choice in the preventive treatment of muscle contraction. They have largely replaced the use of sedatives for this purpose. It must be emphasized, however, that drugs cannot replace insight and understanding of one's emotional problems. They are of value in reducing emotional stress and allow the patient to handle these situations more effectively.

The dosage of these drugs is highly individualized. Some patients demonstrate a favorable response to small doses of a tranquilizer while others need much more. Therefore, determination of the adequate dosage range and the proper dosage which can be adapted to the patient's condition become of paramount importance.

A drug should be discontinued if the patient does not respond within one month. In general, our observations indicate that the patients who do not respond to one tranquilizer also do not respond to another drug of this type. The importance of careful observation of the patients receiving these drugs is obvious, for the drugs are capable of producing marked side effects, both physical and mental.

TABLE 3

Results of Prophylactic Treatment of Muscle Contraction Headache with Various Tranquilizer Agents

	N° of Patients	*Per Cent Improved*
Methaminodiazepoxide (Librium)	260	70
Meprobamate (Miltown)	527	62
Hydroxyphenamate (Listica)	100	60
Reserpine (Serpasil)	641	55
Chlorpromazine HCI (Thorazine)	114	54
Placebo	100	45

Table 3 summarizes some of our experience with the use of tranquilizers in the prophylactic treatment of muscle contraction headache.

The use of skeletal muscle relaxants may be an effective adjunct in the interval treatment of muscle contraction headache. Objective evidence of the action of a muscle relaxant Carisoprodol (Soma) can be observed in the electromyograph (E.M.G. tracing shown in the following figure 2).

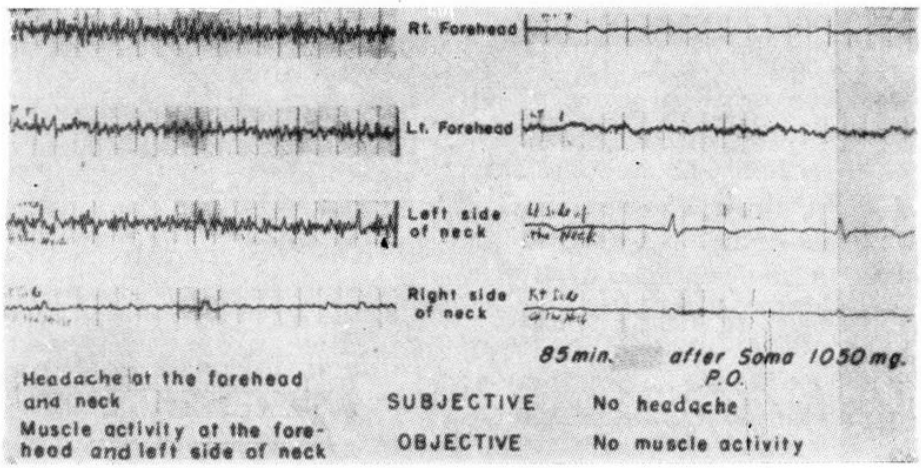

Figure 2

Physical Therapy

Physical measures which relax muscles are helpful in treatment of muscle contraction headaches. These include ethyl chloride spray and the injection of 1 per cent procaine hydrochloride into tender areas of the neck muscles. The use of hot packs and immersion of the neck and back of the head in warm water may be temporarily beneficial. Massage and mechanical devices such as a collar and head traction also have been recommended. However, the relief is seldom sustained.

Headaches Due to Vasomotor Rhinitis

Headache encountered in sinusitis can be due to a variety of factors, including inflammatory changes in mucosa of the ostium of the sinus and engorgement of the turbinate with impingement on the septum. The importance of differential diagnosis in this type of headache in relation to treatment is obvious.

The treatment of acute infections of any of the sinuses is directed toward eradication of the infection and improvement of sinus ventilation and drainage. The headache can be relieved temporarily by nasal shrinkage with neosynephrine or other vasoconstrictors. Temporary relief for the allergic rhinitis by anti-histamines or steroids may be of aid in judging the importance of this disease as a cause of the headache. Careful evaluation to rule out infection of the paranasal sinuses and the presence of nasal polyps should be made in all patients. In cases where an allergy can be demonstrated, causal treatment by elimination and/or desensitization is to be done whenever possible. Rhinitis due to house dust, molds or pollens usually requires treatment by injections or allergens.

Non-Migrainous Vascular Headache (Arterial Hypertension)

In the treatment of this condition, management of the general state of hypertension is always indicated, aiming at a decrease in the blood pressure and protection of the patient against vascular insults. The measures available for lowering the pressure include psychotherapy, rest, sodium restriction, specific antihypertensive drugs, such as reserpine, hydralazine hydrochloride, me-

camylamine hydrochloride, pentolinium tartrate and chlorothiazide. It should be noted that in our study of patients with headache and hypertension, a definite type of headache could not be clearly defined in these individuals. Frontal or occipital early morning headache occurred most frequently. Although many patients experience a fall in blood pressure or relief of headache on anti-hypertensive therapy, only 25 per cent experienced simultaneous definite loss of headache with fall in blood pressure. Headache in patients with severe hypertension, and in male patients with elevated, diastolic blood pressures, appeared to respond most satisfactory to specific therapy. Due to the great variability in the response of hypertensive headache to non-specific therapy, the use of this symptom as a guide for treatment or success of particular chemical agent for the treatment of hypertension is hazardous.

Treatment of Post-Traumatic Headaches

The therapy of chronic post-traumatic headache is similar to that of muscle contraction headache the exception being the surgical operation for subdural hematoma and the administration of anti-convulsant drugs in the patients with seizure and headache. It should be emphasized that when history and examination reveal no definite evidence of causal relationship between the trauma and a continuing headache, the doctor should turn his attention to the possible ways in which such a headache may serve the psychic needs of his patient.

Acceleration of convalescence in patients with head injury reduces the usual sequence of symptoms, including headache, by minimizing the patient's anxiety as to the extent of his injury.

These patients are best treated symptomatically with mild analgesics, such as aspirin compound, sometimes combined with a sedative. Ataraxics or muscle relaxants, such as meprobamate, hydroxphenamate and carisoprodol (Soma) are often effective adjuncts.

Local injection of 1 per cent procaine generally gives temporary relief from headache due to tender scar tissue or to occipital and subnuchal muscle contraction. However, local injections have in many cases proved more damaging than helpful.

When cervicocranial headache is present, physiotherapy such as heat, massage, manipulations, cervical collar and cervical traction is of variable value.

Prophylactic treatment for this type of headache is implied in the treatment of the symptoms.

SUMMARY

Relief on an attack of head pain is usually accomplished by pharmacotherapy, whereas in prevention the therapy consists of the use of drugs, and in some cases psychotherapy.

In the symptomatic relief of all types of migraine, ergotamine tartrate is the drug of choice. The beneficial effect of ergotamine administration probably depends on its action on the smooth muscles of the blood vessels, causing a constriction of these vessels. In our experience rectal suppositories combining ergotamine with caffeine and an anti-spasmodic have proven most effective in the treatment of ordinary and classical migraine.

In the late states of migraine attack, analgesics and sedatives are sometimes helpful if the headache has persisted long enough for the vessels to become firm and tortuous. Migraine patients may profit to a limited extent from the prophylactic use of tranquilizing drugs. The recent introduction of a serotonin antagonist, 1-methyllysergic acid butanolamide (methysergide), has given us a more effective agent in the treatment of migraine. While lacking the capacity to terminate headache already in existence, it is often effective in reducing the number and severity of headache attacks when taken prophylactically.

The most practical and useful non-nar-

cotic analgesic available for head pain of low intensity still remains acetylsalicylic acid.

When the analgesic is combined fith a tranquilizer or sedative the combination becomes effective in the symptomatic treatment of muscle contraction headaches.

Tranquilizers and muscle relaxants are the medical treatment of choice in the preventive treatment of muscle contraction headache.

It must be emphasized, however, that drugs cannot replace insight and understanding of one's emotional problems.

Physical measures which relax muscles are helpful in treatment of muscle contraction headaches.

The treatment of acute infections of any of the sinuses is directed toward eradication of the infection and improvement of sinus ventilation and drainage. In cases where an allergy can be demonstrated, causal treatment by elimination and or desensitization is to be done whenever possible.

The measures available for lowering the blood pressure include psychotherapy, rest, sodium restriction, specific antihypertensive drugs, such as reserpine, hydralazine hydrochloride, mecamylamine hydrochloride, pentolinium tartrate and chlorothiazide.

The therapy of chronic postraumatic headache is similar to that of muscle contraction headache. Acceleration of convalescence in patients with head injury reduces the usual sequence of symptoms, including headache, by minimizing the patient's anxiety as to the extent of his injury.

RESUMEN

Habitualmente un dolor de cabeza se alivia por la acción de ciertos fármacos; la prevención se busca por medio de drogas y en algunos casos por psicoterapia.

La droga de elección para el tratamiento sintomático de cualquier tipo de jaqueca es el tartrato de ergotamina. El efecto benéfico de la administración de la ergotamina probablemente depende de su acción constrictiva sobre los músculos lisos de los vasos sanguíneos. La vía rectal con supositorios de ergotamina en combinación con cafeína y un antiespasmódico, ha resultado lo más efectivo en nuestra experiencia para tratar la jaqueca.

En las etapas últimas del ataque de jaqueca, cuando el dolor se ha prolongado demasiado y los vasos se han vuelto rígidos y tortuosos, los analgésicos y sedantes pueden ser útiles. Estos pacientes pueden beneficiarse en forma limitada del uso profiláctico de drogas tranquilizantes. Contamos actualmente con un agente más efectivo para tratar la jaqueca, con la reciente introducción de un antagonista de la serotonina la 1-metil butanolamida del ácido lisérgico (metisergida). Aún cuando no calma el dolor, es a menudo efectiva en la profilaxis, reduciendo el número y severidad de las crisis.

Para la cefalalgia de poca intensidad, el analgésico no narcótico más útil y práctico sigue siendo el ácido acetil salicílico.

Cuando se combina el analgésico con un tranquilizante o un sedante, se tiene un tratamiento sintomático efectivo en las cefalalgias por contracción muscular.

Los tranquilizantes y los relajadores musculares constituyen el tratamiento médico preventivo de la cefalalgia por contracción muscular.

Sin embargo es preciso insistir en que las drogas no son un sustitutivo de un buen enfoque de los problemas emocionales del paciente.

El relajamiento muscular por medios físicos es útil para el tratamiento de las cefalalgias originadas en los músculos.

El tratamiento de las infecciones sinusales agudas se orienta a la eliminación de la infección y a mejorar la ventilación y el avenamiento del seno. En los casos en que puede demostrarse la alergia, en la medida de lo posible debe hacerse tratamiento causal sea por eliminación o desensibilización o por ambos.

Con el fin de disminuir la presión arterial se indicará psicoterapia, reposo, restricción del sodio, drogas antihipertensivas como la reserpina, clorhidrato de hidralazina, clorhidrato de mecamilamina, tartrato de pentolinium y clorotiazida.

La terapéutica de la cefalalgia crónica postraumática es similar a aquella de la cefalalgia por contracción muscular. El acortamiento de la convalescencia en pacientes con traumatismo cefálico, disminuye el desarrollo de ciertos síntomas entre ellos la cefalalgia, al reducir la ansiedad del paciente en cuanto a la magnitud de su lesión.

RÉSUMÉ

On allège normalement le mal de tête par action de certains médicaments; on en cherche la prévention par moyen de drogues et dans quelques cas par psychothérapie.

La droge choisie pour le traitement symptomatique de toute sorte de migraine quelle qu'elle soit, est le tartrate d'ergotamine. L'effet bienfaisant de l'administration de l'ergotamine dépend probablement de son action constrictive sur les muscles lisses des vaisseaux sanguins. La voie rectale pour des suppositoires d'ergotamine combinée avec de la caféine et un antispasmodique, a donné les résultats les plus effectifs, selon notre expérience dans le traitement de la migraine.

Dans les dernières étapes de l'attaque de migraine, quand la douleur s'est trop prolongée et que les vaisseaux sont devenus rigides et tortueux, les analgésiques et les sédatifs peuvent être utiles. Ces patients peuvent profiter en doses limitées de l'usage prophylactique des drogues tranquillisantes. Nous comptons actuellement, après la récente introduction d'un antagoniste de la sérotonine, la 1-méthyl butanolamide de l'acide lysergique (Métisergide), avec un agent plus effectif pour traiter la migraine. Même si elle ne calme pas la douleur, elle est souvent effective dans la prophylaxie, en réduisant le nombre et la sévérité des crises. Pour la céphalalgie peu intense l'acide acétil-salicillique continue a être l'analgésique non narcotique le plus utile et le plus pratique.

Quand on combine l'analgésique avec un tranquillisant ou un sédatif, on a un traitement symptomatique effectif pour les céphalalgies par contraction musculaire.

Les tranquillisants et les relâchants musculaires constituent le traitement médical préventif de la céphalalgie par contraction musculaire. Il faut cependant insister sur le fait que les drogues ne sont pas des éléments substitutifs du bon envisagement des problèmes émotionnels du patient.

Le relâchement musculaire par des moyens physiques est utile pour le traitement des céphalalgies originées dans les muscles.

Le traitement des infections sinusales aigües est orienté vers l'élimination de l'infection et vers l'amélioration de la ventilation et le drénage du sinus. Dans les cas où l'allergie peut etre démontrée on doit employer dans la mesure où cela est possible, un traitement causal soit par élimination ou par dessensibilisation, ou par les deux ensemble.

Dans le but de réduire la pression artérielle on indiquera de la psychothérapie, du repos, la restriction du sodium, des drogues antihypertensives comme la réserpine, le clorhidrat d'hidralazine, le clorhidrat de mécamilamine, le tartrate de pentholinium et la clorothiazide.

La thérapeutique de la céphalalgie chronique post-traumatique est similaire à celle de la céphalalgie par contraction musculaire. Le raccourcissement de la convalescence chez les patients souffrant du traumatisme céphalique, fait diminuer le développement de certains symptomes, entre lesquels la céphalalgie, puisque l'anxiété du patient est réduite en relation avec la magnitude de sa lésion.

ZUSAMMENFASSUNG

Eine Attacke von Kopfschmerzen beseitigt man gewoehnlich mit der Pharmakotherapie, waehrend in ihrer Verhuetung die Therapie in Medikamenten oder auch, in einigen Faellen, in der Psychotherapie besteht. Fuer die symptomatische Therapie aller Migraeneformen ist das Ergotamintartrat dar Mittel der Wahl. Die heilende Wirkung des Ergotamintartrat haengt vielleicht mit seiner Wirkung auf die glatte Muskulatur der Blutgefaesse zusammen, wobei es die Verengerung dieser Gefaesse

verursacht. Nach unserer Erfahrung haben sich rektale Supositorien in einer Kombination von Ergotamin, Coffein und einem Antispasmodikum am besten bei der Behandlung der gewoehnlichen und der klassischen Migraene bewaehrt. Bei den Folgezustaenden der Migraeneattacke sind zuweilen Analgesica und Sedativa von Nutzen wenn der Kopfschmerz lange angehalten hat, sodass die Gefaesse hart und gewunden geworden sind. Patienten mit Migraene koenen bis zu einem gewissen Grade durch die prophylaktische Verabreichung von tranquilisierenden Medikamenten gebessert werden. Die kuerzliche Einfuehrung des Serotoninantagonisten 1 - methil - lysergin saeure-butanolamid (Methylsergide) hat uns ein noch erfolgreicheres Mittel fuer die Behandlung der Migraene in die Hand gegeben. Obwohl es nicht einen schon bestehenden Kopfschmerz koupieren kann, ist es oft erfolgreich indem es Zahl und Schwere der Kopfschmerz attacken mindert, wenn es prophylaktisch genommen wird.

Das praktischste und am meisten nuetzliche nicht narkotische Analgesikum das wir gegen den maessig starken Kopfschmerz besitzen, ist immer noch das Acidum acetylsalicylicum. Wenn dieses Analgesicum mit einer tranquilisierenden Droge oder einem Sedativum kombiniert wird, erhalten wir eine wirkungsvolle Kombination fuer die simptomatische Behandlung der Muskelkontraktionskopfschmerzen.

Tranquilisierende und Muskelrelaxierende Mittel stellen die medizinische Behandlung der Wahl bei der Prophylaxe der Muskelkontraktionskopfschmerzen dar. Es muss jedoch betont werden, dass die Medikamente nicht das Verstaendniss fuer die Gemuetsprobleme des Patienten ersetzen koennen.

Physikalische Massnahmen, um die Muskeln zum erschlaffen zu bringen, sind nuetzlich in der Behandlung der Muskelkontraktionskopfschmerzen.

Die Behandlung der akuten Infektionen der verschiedenen Sinus ziehlt auf die Bekaempfung der Infektion und die Besserung der Ventilierung und Drainage der Sinus. Wo man Allergie nachweisen kann, muss, wenn immer noeglich, eine kausale Therapie durch Eliminierung und oder Desensibilisierung durchgefuehrt werden.

Die zur Verfuegung stehenden Massnahmen um den Blutdruck zu senken betreffen die Psychotherapie, Ruhe, Beschraenkung von Natrium, spezifische blutdrucksenkende Mittel, wie Reserpin, Hydralazine hydrochloricum, Mecalmylamin hydrochloricum, Pentolinium-tartrat und Chlorothiazid.

Die Behandlung der chronischen posttraumatischen Kopfschmerzen ist aehnlich der der Muskelkontraktionskopfschmerzen. Die Beschleunigung der Rekonvalescenz bei Patienten mit Kopftrauma vermindert die gewoehnlichen Nachwehen der Symptome, einschliesslich der Kopfschmerzen indem man die Besorgnis des Patienten bezueglich des Ernstes seiner Verletzung verringert.

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News

W. B. SAUNDERS COMPANY ANNOUNCES $ 15,000 WRITING FELLOWSHIP GRANT

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Applications should be submitted between *January 1, 1963*, and *May 1*, 1963, directly January 1, 1963, and May 1, *1963*, directly to Dr. Robert F. Loeb, care of W. B. Saunders Company, West Washington Square, Philadelphia 5, Pa. A decision on the award winner will be reached by August 1, 1963, and the recipient notified. Formal presentation will be made at an award dinner in October, 1963.