HEADACHE

SIEGMUND AUERBACH

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ITS VARIETIES, THEIR NATURE, RECOGNITION AND TREATMENT

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HEADACHE

ITS VARIETIES, THEIR NATURE, RECOGNITION AND TREATMENT

A THEORETICAL AND PRACTICAL TREATISE
FOR STUDENTS AND PRACTITIONERS

BY

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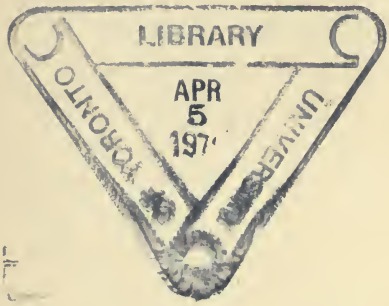

PREFACE

I HAVE for several reasons decided to publish a more detailed treatise upon headache, although text-books and encyclopediæ upon special pathology and therapeutics discuss this complaint, and although there are in existence several good and comprehensive descriptions. I have, however, been convinced, both in the polyclinic and in my consulting hospital and private practice, that a clear differential diagnosis of the individual varieties of headache and a mode of treatment founded thereon are as yet by no means within the reach of every physician. This is doubtless ascribable to the fact that during the University curriculum and years of practical instruction due value is not accorded to the polyclinical teaching which deals with the minor maladies of such great importance to the practitioner. It has appeared to me as though the treatises so far published did not discuss the different forms of chronic headache, which frequently occur as fairly independent complaints, with the requisite uniformity, nor corresponding to their practical importance. In particular, insufficient attention is

paid to the combinations in the same individual of several, ætiologically different, forms of this disorder, which are in my experience of great importance and shed much light upon the question of treatment. Finally, in the last few years there have appeared a series of works upon this subject which are calculated to cause confusion in the special pathology of headache, especially in students. Herein clearness is aimed at, so far as the present state of our knowledge of the facts permits of it.

THE AUTHOR.

FRANKFURT a. M.
September 1912.

CONTENTS

	PAGE
THEORETICAL INTRODUCTION	1
SCHEME OF EXAMINATION. GENERAL DIAGNOSIS	12
CLASSIFICATION OF DIFFERENT FORMS OF HEADACHE	21
A. The More Independent Forms of Headache	24
1. Migraine	24
2. Neurasthenic (Exhaustion) Headache	65
3. Nodular (Rheumatic) or Induration Headache	83
B. Headaches associated with Diseases of Individual Organs	132
1. Headaches in Brain Disease	132
2. Headaches associated with Disorders of the Special Senses	166
3. Headaches in Diseases of the Digestive Tract	183
4. Headache in Diseases of the Kidney	186
C. Headache in General Diseases	190
1. In Infectious Diseases	190
2. In Acute and Chronic Intoxications	193
3. In Constitutional Diseases	195
D. Combinations of Different Forms of Headache—so-called 'Habitual Headache'	197
1. Nodular Headache, associated with Severe Hystero-neurasthenia and Migraine	199
2. Severe State of Exhaustion as the Result of Nodular Headache	200
3. Combination of Migraine and Nodular Headache	201
4. Combination of Chlorosis with Nodular Headache	202
5. Combination of Nephritis, Suppurative Otitis Media and Nodular Headache	203
6. Migraine, Neurasthenia, Frontal Sinus Suppuration, and Supra-orbital Neuralgia	204
BIBLIOGRAPHY	206

HEADACHE

THEORETICAL INTRODUCTION

It appears pertinent first of all to discuss the question: in which portions of the central and peripheral nervous systems can headache originate, i.e. the pain which we refer to the interior of the skull, and to what primary causes is it referable? It will be agreed that it is at the present time impossible to give an accurately scientific answer to this question. We are here in many respects still dealing with hypotheses. We can, however, on the strength of observations upon cerebral diseases of most diverse localization, as well as from the results of normal and morbid cerebral anatomy and physiology, establish one or two guiding facts which will help to furnish an answer to the question we have raised. It is obvious that zoological experiment can be of no service to us here, or only in the broadest outlines. The subject has been so far dealt with in greater detail by Moebius [1], Edinger [2], and Spitzer [3]. We know for certain that all headaches are perceived in the innervation areas of the trigeminus and of the

sensory branches of the upper cervical nerves, and that very severe headaches are associated with all intra-cranial diseases leading to irritation of the meninges, particularly of the dura mater (cerebral tumours, meningitis, &c.). The arachnoid, however, has no nervous supply, the pia mater probably receives only sympathetic twigs accompanying the blood-vessels. Diseases of these membranes can, on the other hand, lead indirectly to irritation of the dura, particularly by pressure.

The dura mater in relation with the anterior part of the cranial vault and the anterior fossa of the skull is supplied by the meningeal nerve, arising from the second or maxillary division of the trigeminus, before it leaves the cranial cavity. The anterior fossa of the skull is also partly innervated by the anterior and posterior ethmoidal branches of the ophthalmic nerve.

From the first division of the fifth nerve come the tentorial nerves which leave the ophthalmic nerve in the sinus cavernosus and run backwards to the tentorium cerebelli, supplying it. The dura covering the middle portion of the cranial vault as well as the middle fossa is supplied by the recurrent branch of the third or mandibular division of the fifth nerve, arising below the foramen ovale and entering the cranium through the foramen spinosum, communi-

cating with the meningeal branch of the maxillary division of the fifth (F. Arnold). The dura of the posterior fossa is supplied not only by the tentorial nerves, but also by the meningeal or recurrent branch of the vagus, running upwards through the jugular foramen and ramifying in the dura mater in the neighbourhood of the latter. According to Rüdinger the posterior meningeal or recurrent sensory nerves arise from the sympathetic, hypoglossal, and vagus. It is highly probable that in the production of headache the sensory endings of the sympathetic running in the vessel walls in many parts of the dura play an important rôle.

That the dura of the base of the skull is more richly supplied than that of the vault is evident from the anatomical origin of the above-mentioned dural branches of the fifth (recurrent nerves) and tenth nerves from the main trunks as they appear at the base of the brain. The richer innervation of the base of the skull can also be deduced from the fact that headaches arising from tumours of the base of brain or skull are *ceteris paribus* more severe and lasting than those caused by tumours situated on the convexity of the brain. Moreover, in trephining carried out under local anæsthesia it is easy to prove that patients complain of greater pain on injury to the dura (section, tearing, &c.) the more nearly the base

is approached. But here also, apart from personal sensitiveness, there are individual differences conditioned by the variations in peripheral innervation. This may be deduced from the fact that patients operated on under local anæsthesia not uncommonly feel no pain even upon section of a large portion of dura, as may easily be proved by interrogation. Finally it must be pointed out that the great majority of persistent headaches are felt in the region of the base of the skull or where the vault merges into the base.

But it is not the irritation of the peripheral sensory nerves alone which, as we know, elicits pain, but also that of the associated ganglia and roots. The pain is then projected into the area of distribution of the nerve concerned. Edinger relates the case of a celebrated musician who suffered throughout his whole life from terrible headaches, mostly originating in the occipital region. On post-mortem examination Edinger found one of the upper cervical nerve-roots embedded in an old scar. I have[4] reported the clinical history of a large intra-dural tumour which involved not only the entire cervical cord from the foramen magnum to the first dorsal segment, but also the lowest part of the medulla oblongata, causing the patient pain radiating into the ears and occipital region, and

sometimes also extending into the temples and forehead. It must be left undecided whether these pains, certainly referred to the area of the fifth nerve, arose from pressure upon the spinal root of the trigeminus, known to extend to the second cervical segment, or from irritation of the secondary or central conduction path of the fifth, which after nearing its nucleus reaches the opposite side and, according to Wallenberg, runs in the dorso-medial region of the medulla. Edinger holds that there are no observations proving beyond doubt that disease of the intra-cerebral portions of the roots leads to pain. He admits, indeed, that it is not *a priori* impossible. I am of the opinion that this may not improbably explain my observation. Another case, recently seen, seems even more strongly to point to this probability.

A man of 20, who had four and a quarter years previously undergone operation for a left-sided cerebellar cyst, had to have a similar cyst removed from the right side. The cavity was drained. As a fresh drainage-tube was inserted the patient complained of very severe pain in the right eye and right half of the forehead, but nowhere else in the head. Although the tube was at once withdrawn and shortened, these pains continued in almost undiminished intensity for nearly eight days, so that morphia had repeatedly to be injected. Only then did they gradually disappear. These cysts had taken up the greater part of the cerebellar hemispheres,

and of its base, as was evident from the fact that the twelfth nerve of the same side was paretic; the finger passed 9 cm. forwards and towards the middle.

It is therefore quite possible that the inserted drainage-tube had caused irritation of the spinal root of the trigeminus or the secondary conduction path of the fifth nerve; lesion of the intra-cerebral root or central path would have produced localized pain in the area of supply of the first division of the fifth; there was no objective alteration of sensibility. This assumption seems to me more credible, owing to the protracted duration of the pain, than a lesion of the tentorium, which is supplied by the above-mentioned tentorial branches of the first division of the trigeminus.

Another point, first emphasized by H. Oppenheim, which I can confirm from many personal observations, is that the corneal reflex, in tumours of the cerebellar hemispheres, is almost consistently abolished or diminished on one side without the occurrence of any disturbance of sensibility in the rest of the trigeminal area. This reflex must take place in the course of the descending root of the trigeminus, probably where the communicating twigs to the facial nucleus are given off. It appears to me, therefore, that if so circumscribed a zone as the cornea has its reflex specially represented in the

intra-cerebral root, there is no inherent improbability in explaining a pain in the area of distribution of a branch of this nerve by the irritation of a particular portion of its root or central path. Perhaps in the future, when greater attention is paid to these possibilities, observations such as the above-described will more frequently be made.

In the case of the ordinary, uncomplicated varieties of headache these trigeminal regions will only exceptionally come into consideration, as in the case of their lesion the symptoms of involvement of neighbouring nerve-areas will for the most part predominate, such as are lacking in headache in the strict sense of the term. The possibility cannot be excluded, however, just as in Edinger's case where a cervical nerve-root was embedded in a scar, that, following an injury, as, e.g., to the skull, a circumscribed portion of the intra-cerebral root of the fifth, or of the central path of this nerve should thus be involved. The same holds true of the further course of the latter as far as the corpora quadrigemina and the thalamus. From the ventral nucleus of the latter, where a redistribution takes place, to the cortex, runs, as is well known, the great sensory path for the opposite side of the body; lesions which involve it may have as a result, in addition to the familiar objective sensory

disturbances, pain of the severest character, which, however, in that case always affects the entire corresponding side of the body. The trigeminal area can never under such circumstances be alone implicated.

Nor do we as yet know of any place in the sensory cortex in which the trigeminal area is exclusively represented. *A priori* this would not appear impossible, since we are familiar with isolated paralyses of individual muscle-groups, and even of individual muscles, caused by circumscribed affections of the motor cortex. It is therefore quite a possibility that circumscribed lesions of the ascending parietal convolution, as, e.g., by small tumours or scars of inflammatory or traumatic origin, should produce only pain in the area of distribution of the fifth cranial nerve—that is to say, in the head itself. Such observations may be recorded in the future if the attempt is made to localize more accurately than heretofore the headaches complained of in diseases of the cortex. Headache, like every other pain, is, of course, appreciated in the cortex.

That a source of irritation situated in the Gasserian ganglion or the main branches of the fifth nerve is not often followed by actual headache is proved by experience in the case of severe trigeminal neuralgia.

We therefore come to the conclusion that headache in the strict sense of the term, i.e. a pain felt in the interior of the skull, is the result of irritation of the dural branches of the trigeminal nerve.

What, then, are the primary sources of irritation of the dural nerves? They may be grouped as physical and chemical. In many cases one may also speak of reflex irritation, and even of transmission or conduction, also of irradiation from one sensory nerve to a neighbouring one. Of the physical causes of irritation the most important are mechanical injuries, and amongst these the chief rôle is played by increased intra-cranial pressure, such as is often to be found in cerebral tumours. There can be no doubt that it is the pressure as such which produces a powerful direct irritation of the nerves in the dura mater, leading thereby to a mostly persistent, frequently intense headache. (It might well be worth while to examine by the new histological methods the nerves of the dura mater in cases of cerebral tumour; they may have been examined with the methods hitherto available, but I have been able to find no information upon the subject.) The pressure must also cause indirect injury to these nerve-endings, partly by compression, partly by dilatation, of the blood- and lymph-vessels surrounding them, according to its seat and variation.

That such nutritional disturbances affecting the nerves can produce pain is a fact made familiar by study of the neuralgias. The vasomotor influences, which made themselves felt on the vasa nervorum as on the rest of the cerebral vessels, also act on the whole mechanically, since the result of these variations of pressure is an oft-recurring fullness of the dural vessels. Clinical observations support the fact that hyperæmia of long duration, as well as anæmia of the dura mater, can lead to irritation of the nerve-endings lying in it. The subject will be referred to again in dealing with individual forms of headache. It appears probable, from many observations in daily life, as well as from clinical experience, that a part is played in the production of headache by thermal, optic, and perhaps electrical, stimuli.

The chemical irritants of the dural nerves are many: toxins in febrile disorders, products of putrefaction absorbed from the bowel in constipation, possibly other entero-toxins, urinary constituents retained in the body in nephritis, and finally the narcotic and many other poisons: alcohol, ether, nicotine, chloroform, amyl nitrite, opium, lead, carbonic oxide, &c. Some of these organic and inorganic poisons attack the ramifications of sensory nerves in the dura directly; others, like alcohol and

amyl nitrite, cause a vascular paresis and thus a rise of intra-cerebral pressure, and yet others, as, e.g., lead, cause painful cramp of the unstriated muscle of the vessels. Probably in the various forms of anæmia, poisons (toxins) are alike the cause of the pathological blood states and of the accompanying headaches.

The headache of bodily and mental exertion and of emotional disturbance is doubtless brought about, in addition to excessive hyperæmia, by the irritant effect on the brain and its envelopes of accumulated fatigue-toxins. Finally, it will not be incorrect to seek both physical and chemical causes for many varieties of headache.

SCHEME OF EXAMINATION

GENERAL DIAGNOSIS

HEADACHE may be a comparatively independent affection, and remain so throughout the greater part of life. Although in such case it may sensibly prejudice the enjoyment of existence and interfere in no small degree with the capacity for work, it is nevertheless in this form no dangerous evil, nor threatening to life. But here also, as we shall see, precise diagnosis and differentiation of individual varieties is by no means always easy, although these are essential preliminaries to an efficient course of treatment. On the other hand, headache is one of the commonest symptoms of the most diverse complaints, acute and chronic, mild and severe. There is hardly an organ in the body damage to which is not accompanied by symptomatic headache. In such cases also it not infrequently dominates the scene, and often enough, if only temporarily, stands in the foreground of the whole clinical picture. At times it is one of the first signs of a severe disease, and on that account of no little prognostic significance. For all these reasons every patient presenting

himself to the physician with the complaint of headache must be submitted to a minute and complete examination. Not only the nervous system, but the organs of the thoracic and abdominal cavities, the pulse, blood, urine, and much besides must be carefully investigated. It is not on that account necessary to assume beforehand the existence of a serious complaint. This often occurs to beginners in practice who, in their academic training, have not had sufficient opportunity of observing at close quarters the minor disorders which assail mankind. It should always be borne in mind that so far as life is concerned the great majority of sufferers from headache may be given a good prognosis. The opposite mistake must likewise be avoided of the rule of thumb practitioner, who dismisses such patients with a superficial examination or none at all and prescribes the first anti-neuralgic remedy occurring to him. It must, however, be emphasized that even the experienced may, in judging of so common a symptom, fall into errors of serious import. One should therefore make it a rule, both in anamnesis and examination, so far as possible, to follow a definite schedule, so that nothing vital be overlooked.

Anamnesis. It is obvious that with patients complaining of headache a very careful interrogation

into the Where ? How ? When ? &c., is essential. The external signs of the pain, which also we can only observe when we have the opportunity of seeing the patient during an attack, afford us no definite information. Our attention is indeed sometimes attracted in the case of those attacked, particularly children, by a painful contortion of the face, the head being rested on the hands. I recommend the following questions to be put to the patient :

1. **Where is the pain felt ?** In the forehead, eyes, temples, vertex or occiput ? Always on one side or bilaterally, or does it alter at different times or in individual attacks ? Is it superficial or deep ? Does the pain begin anteriorly or posteriorly ?

2. **What is the nature of the pain ?** Is it only a pressure on the vertex or forehead, a constriction, a sensation of weight or emptiness in the head, or is the feeling as though a board were placed against the forehead, or as though the latter were compressed by a band, or as in a vice ? Or is there real pain, a dragging, tearing, boring, or stabbing ? Or is there a sensation as though the skull were being burst asunder ? Is the pain preceded by twitching of the eyelids, formication in one arm ? Is it accompanied by vomiting or nausea ?

3. **At what time** does the headache usually begin ?

Chiefly at night? In that case does the pain cause loss of sleep? Does it get worse towards evening? Does it only occur during the day? Does it occur at stated times, always the same, or irregularly? Does it come on in periodical attacks—if so, what is the duration of the interval and of the attacks? In the case of women: mainly or exclusively at the menstrual periods, or does it last longer? Approximately how many days or weeks? Is it always of the same intensity, or does it vary? Are there any particular causes which give rise to it or aggravate it, such as stooping, talking, masticating, bodily or mental exertion, anger or emotion? Does fresh air improve it, or do cold compresses? Does cold, such as wind or change in the weather, make it worse? Are hot applications soothing?

4. **What are your circumstances of life?** Occupation? Hours of work—regular or irregular? Night work? Are the rooms in which you work well ventilated or hot? Do you work in the daytime by artificial light (gas?)? Are you frequently exposed to changes of temperature? Do you perspire frequently about head or neck? In the case of women: Do you frequently wash your head with water, and how do you effect the drying? Have you ever had any severe head-injury? Did you in such case lose consciousness or bleed at nose or

ear ? Are you exposed to the effects of poisons, particularly lead and carbon bisulphide ? What are your habits as regards spirits ? How much beer, wine, brandy, &c., do you take daily on an average ? Are you a heavy smoker ? Have you had syphilis, or malaria ? How long do you sleep ? Do you mostly go to bed about the same hour ? Are the bowels regularly and adequately open ? Was the first onset of the headache preceded by a severe illness, particularly influenza or other infectious disease ? Have you suffered from muscular or articular rheumatism ? Do you complain of any affection of eyes, ears, or nose, or did you ever so complain ? Do you suffer from tinnitus ? Do you sleep with your mouth open ? In the case of women the menses should be the subject of interrogation, particularly with regard to the amount of blood lost.

5. **Heredity.** Did father, mother, brothers or sisters suffer from headache ? If not now, in former years ? Grandparents or more distant relatives ? Children ? Have you knowledge of other nervous or mental diseases or of epilepsy amongst your relatives ?

6. **How long** have you suffered from headaches ? From childhood, from youth, or did they only begin in later life ? Have you been free for considerable

periods? Have the nature and seat of the pain been constant, or have you noticed any alteration?

Objective Examination has to include:

1. Examination of the nervous system.
2. Examination of the rest of the body.

1. First of all the head itself must be carefully investigated. Particularly if the history includes that of any well-defined injury search must be made for any possible scars, bony depressions, or periosteal thickenings. The shape of the skull must be noted and individual regions carefully percussed with the finger or pleximeter. The points of emergence of the supra- and infra-orbital and occipital nerves should be investigated with regard to possible tenderness on pressure.

One should never forget to examine the cranial muscles for indurations and swellings, notably at their points of attachment, in particular to the mastoid processes and nuchal lines; the muscles of the side and back of the neck are also carefully to be palpated; the epicranial aponeurosis must be minutely investigated. It must also be ascertained whether the movements of the head in various directions are free and painless.

To this must be added an examination of the most important functions of the nervous system, as

usually carried out ; the pupillary reactions, ocular movements, corneal and pharyngeal reflexes, movements in the areas supplied by facial and hypoglossal nerves, of the palate and throat. The sensibility of the face and the function of the muscles of mastication must not be forgotten. Examination should be made for Romberg's sign ; finally the state of the patellar reflexes should be investigated. Of the organs of special sense the eyes should first be observed. The most important examination in this respect is the ophthalmoscopic, particularly with reference to the possible existence of optic neuritis or albuminuric retinitis.

It should be an unalterable rule that with every headache of considerable duration and degree of severity the fundus oculi should be examined. The remaining ophthalmic examination, such as that of the refraction, the presence of astigmatism or similar error, if there be reasonable grounds for suspecting the presence of such, should be left for the specialists, if the physician is not complete master of the necessary methods. I would give the same advice with regard to the more detailed investigation of the nose, with its accessory cavities, and the ears.

It is naturally not necessary to employ all these measures in every case of headache ; one can

generally determine for oneself if both nostrils are patent or whether the neighbourhood of the tragus or mastoid process is notably tender to the touch. If a specialist is called in one should in every case demand a detailed investigation, and the definite question should be put as to whether the condition present could explain the headache. (For further details see the respective sections.)

2. Examination of the rest of the body should in particular determine whether heart and lungs are healthy : to be borne in mind are, valvular disease, cardiac hypertrophy, accentuation of the aortic second sound, and possible arrhythmias. Of lung complaints those come more especially into consideration which are associated with signs of congestion, e.g. emphysema and bronchitis. I have also repeatedly seen the not uncommon headache of commencing phthisis wrongly interpreted.

Examination of the abdominal organs, particularly of the stomach (dilatation), is to be undertaken in the usual manner.

Examination of the urine for albumen and sugar is of especial importance, and, if the headache prove intractable, one must not shirk the slight trouble of repeated examinations.

In spite of the answers given to the numerous questions above enumerated, and even after careful

examination, it is not always possible in difficult cases to establish a diagnosis free from all doubt. It then becomes necessary to undertake more or less protracted observations. Patients often exhibit surprise at the number of questions put to them and at the examination of the body as a whole; one must never allow oneself to be distracted by this, but must explain the necessity of such a course of action. On the other hand it is often possible, keeping before one's eyes the classical varieties, rapidly to come to a decision.

CLASSIFICATION OF DIFFERENT FORMS OF HEADACHE

In the present state of our knowledge any systematic classification of the different forms of headache offers considerable difficulties. Formerly a distinction was made according to the severity of the complaint: **Cephalalgia,** under which name were included the milder forms, and **Cephalea,** which designated the more severe ones. Other distinctions were the accidental from the habitual, the transitory from the chronic, the periodical from the continual, the essential from the systematic.

Edinger [2] made an attempt to divide true headaches from allied affections, such as neuralgias, as well as from head pains in diseases of the throat and nose, and of the accessory cavities, in dental caries and aural disease, from hysterical headache and the oppression of the head of neurasthenics. True headaches he classifies into those without obvious anatomical lesion and those caused by organic disease. Amongst the former he includes: migraine, the headaches of children, of adolescents, the headaches of anæmia and vaso-paralytic headaches. Amongst those caused by organic disease he includes

hyperæsthesia of the hairy scalp, nodular headache, those due to disease of the bones of the skull or of the periosteum, also those caused by diseases of the brain and its coverings, by syphilis and uræmia. I am of the opinion that these attempts at classification are too one-sided, too superficial, partly also too comprehensive, as were those of earlier times, but that the classification of Edinger, however desirable, goes ahead of the facts at our disposal, takes insufficient account of our practical requirements, and fails to attain its aim. It is by no means decided whether there may not be anatomical changes underlying migraine; I would rather maintain the contrary (vide paragraph on ' Migraine headache '). The headaches caused by dental caries, diseases of nose and ears, have also underlying organic changes, which lead to irritation of the dural nerves. Anæmia, indeed, is a disease of an organ. Hyperæsthesia of the scalp occurs in all sorts of functional and organic headaches. There are also good grounds for doubting whether it is feasible to distinguish the headache of children and adolescents as a special subdivision of the group characterized by absence of anatomical lesion. It is obvious that, in the present state of our knowledge upon this subject, it is not even remotely possible to undertake a classification upon an ætiological or anatomical

basis. That this must be the goal of our endeavour is beyond dispute.

Hence it seems to suit our purpose best in the classification of the varieties of headache before all things to keep in view the necessities of practice. Thus those forms of continued headache which occur most frequently, and which appear as relatively independent diseases, forms upon the diagnosis and treatment of which the physician has daily to decide, will be dealt with first, and these in detai in proportion to their importance. Even although the fact must be emphasized that headache, pathologically speaking, has no individual entity as a disease, it would be contrary to facts to deny that this symptom very frequently persists a long time as the sole or most prominent one, and must be regarded as an entity from the point of view of differential diagnosis. The second main group includes the varieties of headache arising in diseases of individual organs, the third those associated with constitutional disorders. Under a fourth heading will be discussed the important combinations of different forms of headache.

In the ensuing treatise only those forms of pain will be discussed which are referred by the patient to the interior of the cranium, whatever the ætiology and point of origin may be. The typical trigeminal

neuralgias (tic douloureux), which are referred to the exterior of the cranium in the course of the individual branches of the fifth nerve (supra- and infra-orbital, supra- and infra-maxillary neuralgias), as well as cervico-occipital neuralgia, neuralgia in the areas supplied by the great and small occipital, great auricular and other cervical nerves, will not here be dealt with in detail. From the point of view of diagnosis, however, reference to these pure neuralgias will often be necessary.

A. THE MORE INDEPENDENT FORMS OF HEADACHE

1. MIGRAINE

Symptomatology. Headache may be the only symptom of the disease 'migraine'. This is no infrequent occurrence.

It is by no means confined, as might be concluded from the name hemicrania (*ἡμικρανία*—Galen), to one half of the head. According to Moebius and other authors the unilateral pains are about twice as frequent as the bilateral; the former are rather more frequent on the left than on the right side. The statement is not infrequently made that the side varies in different attacks, occasionally even that a regular alternation takes place. The pain is,

almost without exception, referred to the sinciput and deeply, in the interior of the skull, never externally. Most frequently it is in the region above the eyes, but also in the centre of the forehead, the temples, and the root of the nose. Occasionally the pain is referred to the interior of the eyeball, as in glaucoma. In severe attacks it may extend to the upper jaw and the occiput, or even into the nape of the neck; it does not, however, begin here, at least I have myself never seen a true migraine headache commence in these regions. In slight attacks it is confined to the forehead and the region around the eyes. The degree of pain varies from trifling sensations to unbearable agony; many patients are able, with an effort, to pursue their avocations, others become almost demented. The pain is most frequently described by intelligent patients as boring or gnawing, and not uncommonly seems as though it would burst the skull asunder. The patients often feel most miserable and exhausted, many appear extremely pale. If one has the opportunity of seeing patients during a severe attack of migraine, the close resemblance of their behaviour and attitude to that of the subjects of cerebral tumour becomes striking. Like these they avoid the slightest movement, in contradistinction to patients suffering from other severe

pains ; the headache is in particular aggravated by movements of the head and eyes. All strong sense impressions, particularly bright light and noises, are appreciated as pain. There exists a high degree of general hyperæsthesia in the domains of common sensation and the special senses.

There is also generally hyperalgesia of the scalp. I have frequently found the points of exit of the supra- and infra-orbital nerves to be tender to the touch, just as in the case of sufferers from typical neuralgia ; these points have not evinced the same susceptibility after cessation of the attack. Cold applications or the ice-bag alleviate the headache in the majority of cases (cf. also under Treatment).

It is characteristic of migraine headache that it recurs periodically ; the frequency of the attacks varying greatly, even in the same individual. For the most part they are separated by several weeks, sometimes by several months, less frequently by several years. The frequency may at times be such that the attacks recur several times in one week, or even for a time the intervals may be absent—*Status hemicranicus.*

The most usual intervals are from two to four weeks ; in women the attacks may for years be coincident with the menses, although in many no such relationship exists.

The **individual attack** begins, as a rule, on waking in the morning, less often at night or in the evening. Many patients feel certain prodromata even the previous day : fatigue, irritability, general malaise, slight dyspepsia, unfounded anxiety. Sometimes the attack begins at a certain definite hour, generally in the morning. The duration of the attack varies from a few hours to two or three days ; twelve hours might well be given as an average. Much of course depends upon the circumstances of the patient and upon the determining causes of the attack.

One of the relatively most constant features of a migraine attack is vomiting, which takes place in about one-half, or even two-thirds of the cases. In the great majority it occurs towards the end of the attack, not infrequently being repeated, when there is a marked resemblance to sea-sickness. In the medium and severe cases appetite is entirely in abeyance.

In a more detailed description of the cephalalgia of migraine it would seem advisable to consider briefly one or two peculiarities of the attack, which are, however, only observable in a minority of cases. The one most frequently met with is ocular migraine (migraine ophthalmique of the French). In these cases the onset is heralded by a visual aura (Moebius). The patient sees light or dark points or spots, or

sometimes brightly illuminated fortification figures, which make their appearance on one side of the field of vision and occupy half or the whole of this, mostly in one eye only.

Sometimes there is only a darkening of the visual field, or scotoma, more frequently this is surrounded by bright figures (*scotoma scintillans*). It may also radiate from the fixation-point towards the periphery of the visual field. There are many variations, but true amaurosis is not seen. These optical phenomena last from two or three minutes to an hour, then follows the headache. I am in agreement with Moebius in maintaining that the frequency of *scotoma scintillans* is exaggerated, it probably does not occur in more than one-fourth to one-fifth of the cases of migraine, in Germany at any rate.

Of considerably less frequent occurrence than the visual are the other forms of aura: unilateral paræsthesiæ and transitory aphasia. The former consist of the well-known sensations of formication, numbness, beginning in the fingers of one hand (less often in one foot), and extending upwards to the arm and frequently to the corresponding side of the face. In a severe case under my own observation in a girl of 22 there was coincidently with these sensory perversions a considerable degree of paresis of the (right) arm in all muscular groups and a diffuse

objective hypæsthesia for all forms of sensation; the latter was most pronounced in the fingers and hand, and became less so on the proximal side. An interesting communication from O. Renner [6] proves that a condition of hemiplegia may repeatedly arise which, in common with other symptoms of migraine, may in a short space of time completely disappear. As a rule, however, genuine paralyses, in common with convulsions, are absent, whereby these paræsthesiæ are for the most part to be differentiated from attacks of Jacksonian epilepsy. The sensory, and for the most part transitory, aura is as a rule only present when preceded by a visual one; both commonly affect the same side of the body. A transitory aphasia may also be added, particularly when the paræsthesiæ affect the tongue. It appears to me that, as in the case of the above-mentioned patient, there is often a dysarthria, i.e. a difficulty in or incapacity for the right pronunciation of words, rather than a true motor aphasia, i.e. an inability to find the right word. Liveing,[5] with an exceptionally wide experience of hemicrania, in common with the French authors, describes cases in which undoubted motor, and even sensory, aphasia (word-deafness) existed; agraphia is also described. Liveing found disturbance of speech in 15 out of 60 cases; in 12 of these there was a precedent sensory

aura, which in 7 was confined to the right side, in 4 was bilateral, and 1 case was uncertain. The face in the attack is sometimes flushed and warm, sometimes pale and cold ; increased lachrymation often occurs. The pupils are mostly contracted ; exceptionally there is a distinct difference between the sides.

The fundus oculi for the most part is unaltered ; but I have occasionally on the day following an attack seen an appreciable hyperæmia of the optic disc and veins. The temporal artery on the side of the headache is not uncommonly distinctly dilated. The pulse-rate is usually normal ; in common with other observers, however, I have seen retardation to 50 per minute.

Psychic disturbances very rarely accompany hemicrania ; these consist mostly of visual hallucinations, confusion, and marked agitation, which, however, rapidly disappear. Whether, as Mingazzini maintains, there is an independent *dysphrenia hemicranica*, or whether the reported mental disturbances are to be included amongst epileptic manifestations, is a question which must for the present be postponed.

Disturbances of hearing and taste and increased salivary secretion only occur exceptionally ; giddiness is commoner. H. Oppenheim mentions a

sufferer from migraine in whom the attacks commenced with marked cerebral inco-ordination:

I have at present a lady of 65 under treatment for a somewhat severe, definitely traumatic right-sided sciatica. She states that she comes of a family in which typical migraine and giddiness lasting throughout life are hereditary. The latter, however, does not occur mainly with the attacks, but is constant.

Her grandfather lived to be 80 and suffered frequent injury through the vertigo. In the next generation of nine children, three suffered from severe migraine with vomiting and permanent vertigo; one of these three was the patient's mother, who, whilst becoming free of her periodical headaches at about 50, suffered from this distressing inco-ordination till her death in her eighty-fourth year. In her own generation (two families) four children have had for many years the severest form of migraine, but only two migraine and permanent giddiness. In her own case the migraine and the inco-ordination made a simultaneous appearance in her sixteenth year. Whilst the headaches had ceased for about twenty years the vertigo still persisted. As a result of the latter she has had many falls; three years ago, as a result of a fall in a sitting posture, she developed a somewhat protracted neuralgia of the right sciatic nerve, which disappeared after several weeks. A month ago she injured herself in the same way, and then came under my care with a severe right-sided sciatica. Under suitable treatment this was as good as cured when she had the misfortune, in an attack of giddiness on rising from a chair, to fall on the same place, and suffered from a severe relapse. This is at the moment nearly well; in

addition the patient, at my advice, takes bromide constantly, and uses a stick with a rubber end. 'In the attacks', as she describes it, 'I have the sensation of rising in the air and hardly feel the ground under my feet. Often, when I go to bed, I feel as if I lay in a ship, rocked by the waves.' One of her children, now a young woman of 28, suffered from headaches with vomiting from her twenty-fourth to her twenty-sixth year, not since then; no vertigo. Three brothers are free from both symptoms. Objectively there is nothing pathological to be discovered in this patient except a marked Romberg phenomenon and a permanent uncertainty of gait, which, however, according to the daughter, was much more severe before the administration of the bromide; in particular is there no nystagmus, nor any other manifestation connected with vestibule or cerebellum. It is of interest to note that the vertigo has never been treated in this patient nor in her relatives. The phenomenon has always been accepted as something inherited and unalterable. I have recorded this case at some length on account of its clinical interest and rarity. I have not been able to find in the literature a similar combination of permanent familial vertigo plus migraine.

The above-mentioned symptoms may arise in the most varying combinations. At times one attack closely resembles another; more often there is great irregularity in respect of the different forms of aura.

At one time they accompany every attack, at another they are incomplete, or may be entirely wanting.

The most usual form of migraine attack consists,

as has already been stated, in headache with vomiting, or headache alone. There are, however, rare cases in which the headache is lacking and periodical vomiting alone occurs ; this may be looked upon as a larval form of migraine, described by English authors as ' sick-giddiness '. Unusual abortive forms are also known which consist merely in a transient luminous scotoma or an evanescent nausea with oppression in the head.

Great interest attaches to the **relationship between migraine and epilepsy.** It is undeniable that there is a great clinical similarity between these diseases. In both there is incidence in attacks, frequently an introductory aura and a terminal sleep. In both there are complete and incomplete seizures ; the determining factors in both are, as we shall see, almost identical. The conjecture that underlying both diseases is a similar cerebral change differing only in degree, is one which suggests itself to every one. This assumption is the better grounded in that it can no longer be doubted that a transition may occur in the same individual from long-standing hemicrania to epilepsy. Both diseases may be present simultaneously. At the same time these are only exceptional occurrences, but of theoretical interest. It would, on the other hand, be going much too far to consider ' féré ' epilepsy and migraine

as the same thing ; one need only bear in mind the fact that in the latter case dementia never occurs, however long the duration.

As in epilepsy, so in migraine, there are probably 'equivalents' (Moebius) : periodically recurring gastric pain, intestinal colic, anginal attacks, severe pain in a circumscribed portion of the trunk or an extremity (Oppenheim), attacks of giddiness and mental depression.

More doubtful are the so-called 'transformations' of Liveing and other authors, e.g. into attacks of asthma, spasm of the glottis, &c.

Paralysis of individual ocular muscles has been observed by various authors during a migraine attack, ptosis being certainly the commonest ; this I have twice seen in undoubtedly pure cases of hemicrania ; more frequently a protracted paresis of one or more of the ocular muscles has been reported.

Periodical oculo-motor paralysis (Moebius, *Migraine ophthalmoplégique* of Charcot), in which paralyses occur at fairly regular intervals from childhood or adolescence onwards, restricted to the oculo-motor nerve and associated with headache and vomiting, is probably, in spite of the contrary opinion of Moebius, to be looked upon as a modification of true hemicrania, provided there is no under-

lying local affection in the middle fossa of the skull (occasionally small tumours of the third nerve have been found).

Incidence, Ætiology. Migraine is the commonest of all forms of headache. This is hardly disputable by any one who takes the trouble carefully to investigate the history. On the whole, more women than men are attacked by the complaint, but the difference is less than some authors have assumed; the proportion is about five or six to four, taking an average from the more carefully compiled statistics. Position and occupation probably exert little influence; it certainly is not true that the so-called upper classes are notably more affected by the disorder. On the other hand, it is probable that brain-workers, in consequence of their mode of life in confined spaces and through lack of bodily exercise, are more frequently and severely visited by the attacks than the members of the working-classes whose business is in the open air. The disease begins almost invariably in childhood or youth; the more carefully the patient is interrogated the earlier will the onset be found to have been. In individual cases, however, the disease makes its appearance only in the third or fourth decade. If the onset is given with certainty as later than this, the diagnosis should be made with caution. Most frequently, in at least one-half

the cases, the first attack was between the twelfth and twentieth years.

There is no nervous disease, probably no disease at all, which depends in the same degree as hemicrania upon direct, homogeneous heredity; herein I am in complete accord with Moebius, who found heredity in 90 per cent. of his cases. If one considers what incomplete information is obtained upon such matters, even from those held to be well educated, one can assert with confidence that migraine is almost without exception hereditary. This is of great theoretical and practical interest.

One must naturally bear in mind that the inheritance must have had a beginning, so that the disease may be making its appearance in the patient for the first time. Most migraine patients also belong to the primarily nervous, although every experienced neurologist will know families in which migraine is endemic without there being other more definite manifestations of neurasthenia or hysteria. That a man who has for years suffered from attacks of hemicrania should become neurasthenic is hardly surprising.

The predisposition to hemicrania must be distinguished from the exciting causes of the outbreaks. It is fairly well established that the first attack frequently follows one of the infectious diseases.

Typhoid and scarlet fevers are most often held responsible ; influenza, too, is, I think, to be mentioned in the same category.

Amongst the actual exciting causes of individual attacks I would agree with Moebius in mentioning emotional disturbance, particularly anger of any kind ; then follow at a distance mental over-exertion, alcohol, and sexual excesses. Bodily exertion comes less frequently into consideration. Digestive disorders are more often blamed than is justifiable ; since migraine is commonly accompanied by nausea and vomiting, cause is often here confused with effect. It is possible that in some individuals indigestible food may call forth an attack.

I know several migraine sufferers who for many years martyrized themselves by now leaving off farinaceous food, now milk and fruit, or even butter, all to no purpose. One patient declared that since following this régime—at the commencement of the sixth decade—his attacks had ceased. He finally became so reduced that interference proved necessary. It was not easy to persuade him that the cessation was due to advancing years. In a short time he ate everything, and regained his health without any return of the migraine.

Constipation and the **menstrual periods** undoubtedly play an important rôle. It must also be admitted that diseases of the mucous membrane of the nose and of the accessory cavities, possibly also

of the ears, may, under suitable conditions, precipitate the onset of the disease. Whether this occurs reflexly or, as seems to me more probable, *per contiguitatem*, will be discussed later. The influence of variations in barometric pressure is doubtful, as is that of diseases of the genital organs. The causal connexion between migraine and true gout (*arthritis urica*) which is emphasized by Gowers and French authors, and also assumed by Haig in reference to individual attacks, will not withstand detailed criticism; nor can an ætiological relationship be supported between chronic articular and muscular rheumatism on one side, and true, uncomplicated hemicrania on the other. (For further details, cf. the sections on 'Nodular or induration headache'.)

Course and Prognosis. Hemicranial headache not uncommonly accompanies a patient throughout his whole life, although sometimes with considerable intermissions. But all writers agree that the attacks, about the fiftieth year or at the menopause, become milder and less frequent, and often cease entirely. Vomiting and luminous scotomata more often cease before this. Sometimes, through conditions entirely unknown to us, complete cure may be earlier brought about. It seems very doubtful to me whether, as some authors maintain, pregnancy, head-injuries, or infectious diseases are capable of

dispelling migraine. The ameliorating influence of the menopause may in exceptional cases have a contrary and aggravating effect, as I have occasionally seen.

The **prognosis** *quoad vitam* is favourable. The relationship to epilepsy has been dealt with above. The 'transformation' into tabes or paralysis is an extremely unlikely occurrence, probably accounted for by a mistake in diagnosis, since attacks of migraine may be early symptoms of these diseases (see later). As regards the transition of migraine into gross cerebral lesions, or the onset of these at an unusually early age, little is known for certain ; these are certainly not common occurrences, but greater attention might be paid to these possibilities in the future. The experience of the last decade upon the significance of neuro-vascular diseases (Oppenheim) make such eventualities seem not inherently impossible. As an example of such an observation may be quoted the following (Oppenheim, *Deutsche Handschrift für Nervenheilkunde*, Bd. 41, S. 385).

In the case of a man who had for three years suffered from a periodic, finally very severe, left-sided supra-orbital headache, having all the characteristics of a nervous cephalalgia, there ensued in his fiftieth year an apoplexy with aphasia and right-sided hemiplegia, followed by death. There was no autopsy. In another similar

observation by the same author the identical paralytic phenomena ensued; the anatomical lesion was a thrombosis of the internal carotid artery shortly before giving off the *Arteria fossæ Sylvii.*

In such cases, however, one must be able to exclude a subsequently acquired lues, as also in those cases where a hemicrania is supposed to have undergone transition into epilepsy. This is now more readily to be done, in cases where the anamnesis fails, by means of reactions in the blood and cerebrospinal fluid, i.e. the Wassermann reaction in the blood and fluid, examination of fluid for globulin according to the method of Nonne-Apelt, and that for lymphocytosis.

The prognosis *quoad sanationem* is much less favourable, as indeed may be deduced from the above observations upon the course of the complaint. The complete attacks, especially, may considerably prejudice the patient's enjoyment of life and capacity for work. The less frequent and severe the attacks the less the danger of any tangible secondary damage to the brain.

Differential Diagnosis. The headache in the typical complete migraine attacks can offer no difficulties, and the isolated periodically recurring unilateral headache is also easy of recognition. For the rest the distinction becomes the more difficult

the less complete the attacks are, the larval forms and the hemicranial 'equivalents' being the most obscure. One important question always demands an answer, whether migraine is present, independently and alone, or whether it is only the symptom of another disease: symptomatic migraine. In this respect, in addition to tabes and general paralysis, consideration must be given to all localized intracranial diseases.

The headaches complained of in the last will be dealt with under section B. Here it will only be mentioned that pathognomonic signs of these troubles, such as bradycardia, may exceptionally be met with at the height of a true migraine attack. Where any doubt exists the fact should be borne in mind that migraine headache is hereditary and begins in childhood or adolescence; this is one of the most important criteria in differential diagnosis in contrast to all other forms of headache. Where inheritance cannot be substantiated after searching examination the diagnosis of migraine headache should only be provisional. If the onset be beyond the third decade one should in the first instance think of tabes, general paralysis, or a localized cerebral affection. The next most important characteristic is the periodicity of the headache and its occurrence in attacks, which indeed may be marked in many

symptomatic forms, but which serves to distinguish migraine with satisfactory assurance from many other forms of headache. Only the rare condition of *Status hemicranicus* could give rise to difficulty in this respect. Where these three cardinal characteristics of migraine headache, or one of them, fail, great care in diagnosis should be exercised. For further details reference must be made to subsequent chapters.

Confusion with supra-orbital neuralgia could only occur through great carelessness. The ' headache of children ' and ' headache of adolescents ' (*cephalea adolescentium*) distinguished by many authors may mostly be considered as migraines, the typical periodicity of which is at this age not always sharply defined, or as neurasthenic headache (q.v.).

Treatment. The predisposition to hemicrania cannot be guarded against : possibly in marriage some consideration might be paid to it by avoiding potential transmission from both sides. For the rest, the prophylaxis is as for diseases of the brain in general : absolute abstention from alcohol, well-regulated hygiene of daily life, avoidance of emotion and mental over-exertion, and an open-air life, are the most important precautions. In the choice of profession, if circumstances permit, preference should be given to occupation in the open air and away from

large towns. Members of migraine families, as well as those predisposed to neurasthenia, should observe the following two special precautionary measures: 1. To set up as an unassailable principle in the conduct of their daily life the fundamental law of the physiology of the nervous system touching interchange of activity and repose; that this is a possibility even amongst the less well-to-do social classes I have already demonstrated.[7] 2. Not to make any too great pauses between meals, but to take some meal, even if small, every two or three hours; a piece of bread, some biscuits, or a glass of milk suffice.

The actual therapeutics aim at lessening the number and severity of the attacks. This purpose can only be attained by so far as possible avoiding the above-enumerated predisposing and exciting causes.

Amongst these I would specially emphasize all exciting occupations, overheated and ill-ventilated rooms, over-exertion in sport, exhaustion from repeated social functions, theatres, concerts, &c. At the same time no eccentric habits must be allowed to take root, over-sensitiveness is naturally not desirable. A too exclusive meat diet, such as is usual in city life, is undoubtedly harmful if persisted in; temporary trial of an exclusively vegetarian

diet is often advisable. Change of residence may be helpful; if the attacks tend to increase in number a prolonged sojourn at the sea or in the mountains is to be recommended. These measures, in common with other anti-neurasthenic treatment, lead often to an amelioration in the attacks; but one must not expect that they will remove the constitutional tendency, nor will this be effected by the numerous electro-therapeutic methods in vogue. We are thus in most cases unable to dispense with **medicinal treatment.** Sufferers from the milder forms should avoid all drugs; in our over-sensitive age this requires emphasis. To withhold anodyne drugs from sufferers from the medium or severe forms of migraine would be both cruel and foolish. Here a distinction must be drawn between such remedies as attack the disease itself, and in particular combat an increase in the attacks, and those which serve to ameliorate the pain only. In the former group the bromides stand first, but are in my experience too little and too unsystematically administered. For their neglect are to blame, in part, legendary and quite unfounded statements as to the harmfulness of these preparations, as is the case in the unmethodical treatment of epilepsy. I agree with Moebius in attaching value to the prolonged administration of the salt, in cases of medium severity, 30–45 grs.

a day for at least six to eight weeks, in the more severe ones 60–90 grs. The dose must then be gradually reduced. I prefer the bromide of soda to the other salts. In order to intensify the action of the bromide one may, as in the treatment of epilepsy, prescribe a salt-free diet. This bromide cure, as recommended by Liveing and later by Charcot, can if necessary be repeated several times in the year, and is always indicated in *Status hemicranicus*. I know no remedy which, even in the worst forms of hemicrania, gives anything like so favourable a result as this, systematically administered, and it would appear as though many sufferers from migraine were exceptionally tolerant of this remedy. I will only mention that I have frequently received grateful thanks for such courses of systematic bromide treatment from colleagues and their relatives who admittedly constitute a very sceptical clientèle.

During the attack the bromides have less prompt action. The best results are then obtained from the modern anti-neuralgic and analgesic drugs, the most successful of which are : antipyrin, 5–15 grs., phenacetin, 10–15 grs., migrainin, 15 grs. (= antipyrin + citrate of caffeine). Pyramidon, 5–7½ grs., aspirin, 15 grs., may also be tried. Moebius recommended 15–30 grs. of sodium salicylate. The rule should be made to administer these remedies upon the first

sign of an approaching attack and to repeat the dose in one or two hours, but never upon a completely empty stomach, otherwise unpleasant toxic symptoms may arise. The best method is, in my opinion, to take a cup of strong coffee with one or two biscuits and to swallow the tablets or powder with the last mouthful. I advise abstention from the innumerable migraine remedies; they are superfluous and not infrequently harmful. For the worst pains there is only one certain remedy, an injection of morphia ($\frac{1}{4}$–$\frac{1}{3}$ gr.); it would be inhuman to withhold this panacea from the sufferer through an exaggerated fear of morphinism. Absolute rest, a darkened room, a cold, wet compress or ice-bag on the head, materially assist the action of the above anti-neuralgics in the majority of patients. A minority do not tolerate cold to the head, but prefer a dry cloth bound tightly around it; great heat in the shape of a thermophore or poultice is only exceptionally preferred. If the patient is able to take light food during the attack this is advisable; in all the more severe attacks every kind of nourishment is refused on account of the nausea; no useful purpose is served by attempting to force food upon the patient.

The theory of migraine headache. Pathogenesis. How can we explain the origin of the headache in

hemicrania ? Consideration will not be given here to every theoretical view that in the course of time has been evolved upon this question. It will suffice to mention those of greatest historical interest, critically to consider those which are not inconsistent with our present-day anatomical and physiologico-pathological views, and to indicate a path which may help us towards the elucidation of this difficult and interesting problem.

It would appear from the writings of Hippocrates that he was familiar with migraine. Aretæus of Cappadocia (second century A.D.) differentiates it from other cephalalgias and designates it heterocrania. From this time onwards migraine has enjoyed a place apart ; Galen, as has been mentioned, conferred its name upon it. He divides up all headaches according to the humours and vapours. An excess of black bile in the head and viscera is made responsible for hemicrania. This idea of the black bile, suggested by the associated vomiting, has held its place in different forms up till recent times. Of the views developed in the Middle Ages that of Valescus of Taranta deserves mention, on account of its similarity with quite recent hypotheses ; he placed the site of hemicrania in the ventricles of the brain.

Based upon the investigations of Claude Bernard into the sympathetic and observations upon himself,

Du Bois-Reymond advanced in 1860 the thesis that the ailment depended upon irritation of the sympathetic — *Hemicrania sympathico-tonica s. angiospastica*, the pain being caused by vascular spasm. In opposition to this irritative theory Möllendorf in 1867 enunciated his paralytic theory: *Hemicrania sympathico-paralytica*. Eulenburg thought both assumptions correct; both forms existed. The manifestations, however, upon which these hypotheses were based, viz. the behaviour of the vessels of the face and neck as well as of the pupils, are quite inconstant, they may change and be entirely different in individual attacks in the same person; moreover there are a number of observations in which the state of the blood-vessels, as well as the size of pupils and palpebral fissures, have been quite normal. If the sympathetic hypothesis were correct it would be a remarkable thing if, in the case of a well-defined primary or secondary sympathetic syndrome (e.g. exophthalmic goitre), actual migraine phenomena were not of frequent occurrence. Liveing (1873)[5] sees in hemicrania a kind of nervous discharge (nerve-storm) which was bound to set in when the tension, like electrical tension, became over-great. Both he and Moebius energetically opposed the vasomotor neurosis theory of Du Bois-Reymond. Moebius believed that the primary cause

was to be sought in changes in the cells of the cerebral cortex, in many cases of the frontal lobes, but also of the remainder of the cerebrum ; on this hypothesis were to be explained the different aura manifestations and the fairly constant sequence of symptoms ; the circulatory disturbances were secondary. In my judgement, Moebius's theory, in combating the assumption of a ' neurosis ', remains unsupported by anatomical and physiological facts ; it is also difficult to understand why the hypothetical cortical changes give rise to no symptoms in the interval. Of later authors Edinger and Oppenheim lean once more towards the pure vasomotor conception, the former assuming hyperæmia as well as anæmia from vascular spasm, acting upon the vessels of brain and dura, and through these upon the nerve-endings in the dura mater; the latter author assuming vascular spasm, whereby the transient central brain manifestations are best explained. Ulrich [31] also, in a recently published work, comes to the conclusion that the determining factor appears to be a congenital defect of the vasomotor system. In support of the relationship between the disorder and the vasomotor apparatus Oppenheim adduces the tenderness to pressure frequently observed by him of the upper cervical ganglion of the sympathetic. As regards this latter statement I have for several

years examined every case of migraine in this respect and have done my best to palpate the upper cervical ganglion, but I have never succeeded, even in thin people, nor, from the topography of the region, do I believe it possible. Toby Cohn is at one with me in this opinion. In his well-known book [8] he says : ' It is hardly necessary to mention that the sympathetic nerve, lying in the neighbourhood of the spinal column, behind the vessels, is not palpable.' It may also be remarked that even careful palpation of this neighbourhood in healthy people is frequently extremely painful. The weightiest argument in my opinion against exclusive responsibility being cast upon the sympathetic and vasomotor apparatus in the pathogenesis of migraine is the circumstance that we not uncommonly, apart from exophthalmic goitre mentioned above, see severe forms of vasomotor neurasthenia in which the symptom-complex of migraine is entirely lacking. The headaches arising in this disease have an entirely different character (see section ' Neurasthenic headache ').

Vasomotor influences, as we shall see, undoubtedly play a part in the production of the migraine attack, but they cannot explain the predisposition. The same may be said of the various toxin theories, and the assumption of disturbances of internal secretion ; they can only be considered as exciting causes.

Flatau,[32] whose monograph on migraine appearing after the completion of this work can only be considered upon one or two of its more important points, attempts to replace the toxic theories, particularly that implicating a typical gout (neuro-arthritism), by the assumption of what he calls ' pathological neuro-metabolism '. For the rest this writer, with the French authors, ascribes a causative importance in hemicrania to uricæmia, which it is difficult to reconcile with the facts. The theory that this complaint is to be included amongst the exudative diatheses, in analogy with urticaria and Quincke's acute circumscribed œdema of the skin, must in my opinion be discarded, since in that case migraine patients would suffer regularly or at least frequently from these anomalies, which is far from being the case. Another untenable hypothesis presupposes a deficiency of phosphorus in the cortical centres as cause of migraine, the headache arising from hypersensitiveness of the sensory and special-sense centres. (Other theories, such as those of Henschen, Peritz, A. Müller and Cornelius, are discussed in the section ' Nodular or induration headache '.)

There can be no doubt that until quite recently in the attempted pathogenetic explanations there has not been sufficient distinction drawn between

the factors giving rise to the individual attack and the constitutional predisposition, and, moreover, too little attention has been paid to the diseases caused by known anatomical changes accompanied by severe headache and often by the entire symptom-complex of typical complete migraine. The most prominent of these are all the cerebral disorders associated with increase of intra-cranial pressure. The first to establish himself on this firm basis was A. Spitzer.[3] According to him ' the migraine attack is a symptom-complex called forth by an acute and transient closure of the foramen of Monro with consecutive cerebral congestion, and the relative stenosis of this opening which underlies the lasting predisposition to such temporary closure is the essential factor in the disease of migraine '. The fluid secreted from the choroid plexus in the lateral ventricles can only escape through the foramen of Monro. If the edges of the foramen are thickened through inflammatory connective tissue hyperplasia (lepto-meningitic changes), made rigid and the opening thereby narrowed, there occurs also, as in the exciting causes of the attack, an active or passive hyperæmia of the brain and therewith a hyperæmia of the choroid plexus. There follows then complete obstruction of the foramen of Monro, stagnation of the fluid in the ventricles, and further

a swelling of the entire cerebral hemisphere which, whilst the obstruction to the outflow lasts, is pressed against the dura mater and skull. Thus the auræ (luminous scotoma, paræsthesiæ, aphasia) can well be explained by irritation of various areas of the cortex, and, following upon this, severe headache as the result of pressure upon the terminals of the fifth nerve in the dura mater. The cessation of the attack by the eventual re-opening of the foramen of Monro as a result of the protracted intra-ventricular over-pressure is to a certain extent plausible. Spitzer also rightly dwells upon the fact that headache both in cerebral tumour and migraine is conditioned by pressure upon the dura, and that the differences in the distribution of the pain and in the accompanying general symptoms may be explained by the varying extent, degree and duration of the cerebral pressure. He considers it possible that vasomotor processes may constitute the source of irritation precipitating the migraine attack. As for the vomiting we know that all diseases leading to increase of cerebral pressure may cause this. Spitzer and other authors state that the reason is unknown, but I would suggest that in these affections, as in migraine, it is called forth through irritation of the recurrent meningeal branch of the vagus supplying the dura of the posterior fossa of the skull and by

conduction of this impulse to the vagus itself and the vomiting centre in the medulla.

Another circumstance pointing to the same conclusion is that in intra-cranial disease vomiting is most frequent with tumours of the posterior fossa and basal meningitis which is predominantly localized here. This branch of the vagus (see p. 3) is overlooked by most authors. In tumours and meningeal inflammations of the posterior fossa, vomiting doubtless also occurs through direct pressure upon the vomiting centre.

The weakest point in Spitzer's hypothesis, which will not here be discussed in greater detail, is, as A. Schüller has already pointed out, the assumption of lepto-meningitic changes in the vicinity of the foramen of Monro. That there should be in some families a greater tendency than in others to inflammatory processes of the ependyma, as is held by Spitzer, is a condition concerning which we have no information. According to our knowledge it is highly unlikely. The important question of heredity is left severely alone by Spitzer, obviously because his theory offers no explanation of it. It is, moreover, somewhat remarkable that the remains of the hypothetical meningitic changes should be exclusively confined to the region of the foramen of Monro. Now we know that the brain of the child

is on the whole more subject to meningitic and meningo-encephalitic changes than that of the adult, yet these are by no means as common as migraine ; in the anamnesis of migraine patients, also, we should expect to find frequent reference to such diseases. This is, however, not the case. Spitzer's theory fails, moreover, to explain the two cardinal features of migraine, direct heredity and commencement in youth. I cannot but think that Spitzer, in spite of the ingenious character of his arguments, has been carried away by his deductions ; he stands upon an insufficiently firm foundation of fact. One need hardly be surprised at this on the part of an author who states that ' a theory, founded upon an explanatory deduction, requires no verification for its scientific usefulness nor to justify its existence '. The contrary is the truth ; the point to investigate is whether the assumed pathologico-anatomical changes can be established in the case of migraine sufferers dying of intercurrent disease—for neither in the interval nor in the attack is migraine fatal. The explanatory value of Spitzer's theory lies, in my opinion, solely in his introduction of intra-cranial pressure in the explanation of the pathogenesis of migraine. H. Quincke[9] had previously expressed the opinion that many severe forms of migraine accompanied by giddiness and apathy depended

upon an acute exudation into the ventricles. Such observations form in some sense a transition from migraine to epilepsy.

I saw four and a half years ago a 7 year old boy who had suffered for six months from severe headache with frequent attacks of vertigo and unconsciousness (petit mal). There was no history of antecedent acute infection. As there was a slight degree of optic neuritis, and as after prolonged observation no localizing symptoms could be discovered, on my advice puncture of the lateral ventricle was performed. Some 40 cc. of clear fluid under considerable pressure was removed. All symptoms disappeared and since then the boy has remained perfectly well.

The contents of the skull may be increased in their fluid parts (external and internal hydrocephalus, meningitis in its different forms), or a growth may develop in the cerebral tissues, or the cerebral tissues may intrinsically become over-developed (relative hypertrophy, megalocephaly). In all these cases there ensues a disproportion between skull-capacity and volume of brain. This is, as Schüller clearly points out, best evidenced in cranio-stenosis, malformations of the skull arising by a developmental defect in which premature synostosis of sutures occurs, sometimes even congenital. To these belong the oxycephalic skull, in which the frontal sutures are prematurely ossified, and certain cases of high

degree of dolichocephaly. It is a point of great interest that Schüller reports that a large number of cases observed by him had typical migraine attacks. The same observer also examined these patients by means of radiographs, and established in them the presence of exaggerated digital impressions and thinning of the calvarium.

The symptomatic attacks of hemicrania in tabes and general paralysis are possibly to be explained by the ' cerebral expansion ', more carefully studied in recent years by Reichardt [10] and others, in which there is also a disproportion between the contents and the capacity of the skull. The causation of this swelling is yet obscure, but probably the enlargement of the volume of the brain is brought about by autonomous pathological cerebral processes of special intensity. Its occurrence has so far been established with certainty in various acute infections and in a number of obscure forms of sudden death, as well as in a series of cerebral disorders, psychoses, and epilepsy. Reichardt, by careful estimation, has established that a difference between the capacity of the skull and the weight of the brain of 10 per cent. is a normal average. Anything less than this difference is to be considered pathological ; the brain and its membranes have in such case insufficient play for the numerous

possibilities which may lead to an increased blood-supply. It is obvious that this theory of the relationship of the cranial capacity to the varying cranial content must stand in closest relationship with the doctrine of intra-cranial pressure. An instructive fact which has been established by Reichardt as the result of his numerous estimations is that the cranial capacity in the mentally sound is subject to very considerable and very frequent oscillations independent, for the most part, of stature, build, and sex. It is of further interest that some brains appear to be more prone to the so-called 'cerebral expansion' than others. If, therefore, all these factors are taken into account, there may possibly exist, as Schüller pertinently puts my views, held since the publication of Reichardt's work, 'a completely analogous disproportion underlying idiopathic migraine, so that in individuals suffering from idiopathic migraine the cranial content is too great or the cranial cavity too small.' A better way of putting it, in my opinion, would be to say that the predisposition to migraine rests upon this condition. Schüller also rightly points out that the direct heredity of migraine is entirely compatible with this hypothesis, since every-day experience teaches that there is heredity in the shape and size of the skull. That the volume and configuration of the skull is likewise a family

peculiarity may be deduced from the fact established by Karplus that even the same forms of convolution often reappear from generation to generation. Schüller thinks it probable that in typical cases of idiopathic migraine the skull capacity is normal, but that the content, i.e. the brain volume, is too great. To decide this question it seems to me that numerous systematic investigations are required on the model of those of Reichardt upon migraine patients dying from intercurrent disease.

There are, moreover, other important peculiarities of hemicrania which may without straining the point be explained upon our assumption, in particular the almost invariable onset of the disease in youth and amelioration in later years. Hyrtl (*Human Anatomy*) says: 'After the onset of puberty the shape of the skull does not change, and it remains, except for a slight peripheral increase, stationary. . . . In old age the bones of the skull become thin and brittle, the diploë atrophies, in certain places (sphenoidal process of the zygoma, *Lamina papyracea*) openings appear through absorption of the bone.' It is clear that when the power of expansion of the skull bones ceases at puberty the hypothetical disproportion between skull capacity and content makes itself felt, just as when the bone atrophies its influence upon the brain must get less

or disappear altogether. To this may be added the fact that, according to Reichardt, the brain in youth, perhaps on account of the relatively large amount of water it contains, is particularly liable to cerebral expansion, and that the senile and presenile brain is often subject to gradual atrophy. The conjecture, too, that the brains of migraine patients are subject to a higher degree of this obscure process, 'cerebral expansion', is not outside the range of probability. Reichardt himself, so far as I can see, does not appear to have entertained this possibility.

How, then, on our hypothesis is the periodicity of migraine attacks to be explained ? This question, too, is, in my judgement, not difficult to answer. To this end we must recall to mind the most important exciting causes : emotions, mental overstrain, alcohol, sexual excess, and the menses in women. All these influences have the effect upon the brain of producing marked hyperæmia and increase of volume. This is proved by the important work of E. Weber [11], who has demonstrated that there must be a vasomotor centre for the cerebral vessels on the central side of the medulla oblongata. The impression had long forced itself upon me that the so-called periodicity of migraine might possibly be accounted for by the multifarious character of those vaso-

motor influences from which no man can shield himself. I was supported in my supposition upon becoming acquainted with the results achieved by E. Weber through investigations with improved methods. Every one must admit that, apart from the menstrual cycle, there is no question of a regular periodicity; that much more frequently there is a direct causal connexion between the attacks and the above-mentioned factors leading to dilatation of the cerebral vessels and increase in the volume of the brain, just as the continuance of these not infrequently leads to persistence of the migraine (*Status hemicranicus* or *Hemicrania permanens*). The possibility must always be kept in mind that other toxins and, in particular, an increase or diminution of the products of internal secretion may exert a similar influence upon the brain. Many investigations of recent date, notably of the Viennese school, point distinctly in this direction. When, however, the volume of the brain increases, if the above-outlined disproportion exists, an increase of cerebral pressure must take place with its well-known attendant symptoms.

I think that, in advancing theories upon the pathogenesis of migraine, too much stress has been laid upon certain of its peculiarities, particularly upon its unilateral character, which, as has been

pointed out above, is by no means constant. But even this may, from our point of view, be quite well explained. We need only refer to the asymmetry of the skull, which, as is well known, is by no means uncommon, and which must obviously be accompanied by an increase or diminution of the cranial capacity on one side only, also to the experience of Reichardt that ' cerebral expansion ' may be limited to one hemisphere, or even to a portion of one hemisphere. In this direction also extended and accurate observations are urgently called for. The incidence of pronounced symptoms referable to the sympathetic in many cases of migraine need not entirely shake our faith. I would look upon them also as an effect of a transitory increase of intracranial pressure, and I cannot consider it out of the question that the sympathetic centre definitely referred to the mid-brain by Karplus and Kreidl [12] should by this pressure be irritated or temporarily paralysed. The individual phenomena of migraine, headache with or without vomiting or with the latter and the various auræ, can be most naturally explained by the particular, and in different parts of the cranium extraordinarily variable, degree of this disproportion as well as by the varying intensity of the determining factors at different times. It must, moreover, be taken into account that the irritability

or possibly even more the exhaustibility of the whole vasomotor apparatus, particularly of the cerebral centres, may be of a very different degree in those predisposed to migraine, and therewith also the most important result of these conditions, i.e. the increase in volume of the brain, may fluctuate within wide limits. (The question of a separate vaso-dilator centre cannot here be further pursued.) The diminution of the attacks of migraine with advancing age may, in addition to the factors above mentioned (p. 59), be explained by a diminution in susceptibility on the part of the vessels as a result of increasing rigidity in their walls.

It may finally be mentioned that, according to E. Weber, the most efficacious drugs in attacks of migraine, sodium salicylate, antipyrin, and caffeine, cause vascular constriction, and so diminish the volume of the brain. The same author succeeded in demonstrating that analgesics as a whole acted by contraction of the cerebral vessels, as does morphia. It is a remarkable fact that bromide of soda, which has so notable an effect in ameliorating the disease, should, according to Winkler, have a like action. This author, in common with other authors, established the fact that cold applications to the head, which are so grateful to the majority of sufferers from migraine, bring about contraction

of cerebral vessels and diminution of volume of the brain, whilst warm applications have an opposite effect.

If, now, we reconsider all the theories advanced to explain the pathogenesis of the disease we arrive at the following conclusions : the symptom-complex of migraine can most plausibly be explained if we assume that the predisposition depends upon a disproportion between cranial capacity and brain volume, and that the attacks are brought on by exciting causes which, through the action of the vasomotor mechanism, are calculated to exaggerate this disproportion.

Every new hypothesis brings with it new tasks and raises new problems. Extended methodical investigations upon the model of Reichardt's in cases of migraine sufferers dying from intercurrent disease, must establish whether the above oft-quoted disproportion actually exists, and if so, with what frequency and to what degree. The frequent occurrence of migraine makes the material for such investigation not difficult to come by ; all that is necessary is the interest of those with a large amount of clinical material at their disposal, and of the pathological anatomists. Only when a large accumulation of facts shall have led to a confirmation of the assumptions we have made will it be time to ventilate

the question whether in the most severe cases, refractory to our present therapeutic endeavours, relief of pressure should be sought by means of lumbar or ventricle puncture or by a decompressive trephining.

In his comprehensive attempt at explanation Flatau collects all the more important theories so far advanced and blends them together. I am unable to see that the question as to the true nature of the disease, its *conditio sine qua non*, is hereby advanced. In the pathogenesis of hemicrania we shall only arrive at greater enlightenment if we distinguish sharply between the predisposition to the disease and the exciting causes of the attacks.

2. NEURASTHENIC (EXHAUSTION) HEADACHE

The neurasthenic is the commonest headache after migraine. This is a higher pathological degree of the headache from which any healthy individual may temporarily suffer after over-exertion or exhaustion, particularly mental. It is part of the clinical picture of constitutional and acquired neurasthenia, but not infrequently exists for years as the only symptom complained of.

Symptomatology. In the great majority of cases there is no actual pain, but an oppression, a con-

striction and heaviness of the head. One frequently has to question the patients, whose complaint is of headache, at length before eliciting the admission that in their case one is dealing with one of the above sensations, which cause extreme discomfort with disinclination for work. The pressure is most frequently situated in, or rather behind, the entire forehead, extending downwards into the eyes and root of the nose; less frequently in the temples. The sufferers often have the sensation as though a board were firmly bound upon the forehead. Pressure on the vertex and in the occipital region is on the whole less complained of. The sense of oppression extends as a band or hoop from the forehead over the temples to the occiput, as though an elastic band were stretched over this region. Sufferers from this painful sensation mostly feel the necessity of lifting the hat and replacing it lightly. The feeling of constriction may also include the entire head; the sensation arising as though the skull were squeezed in a vice, or as though the inside were filled with lead (*casque neurasthénique* of Charcot). Relatively frequently, also, the head is described as hollow or empty, dead, or 'as though the brain were falling out', &c. Sensations of unpleasant heat are common, those of cold, of throbbing, buzzing, and booming in the head less frequent.

Whilst these are by far the most usual symptoms of which neurasthenics complain, they are by no means free from actual pains, only these are not as a rule so severe and lasting as other varieties of headache ; they may, however, for the most part transitorily attain to considerable intensity, especially after strong emotions or great anxiety. The painful sensation then chiefly affects the frontal region and has a boring, gnawing character ; the feeling as though the skull were about to burst may be added, sometimes with an unpleasant sense of heat, which may include the entire face and the ears. There may be an accompanying light- or dusky-red colour of these parts. The pains may assume a decidedly neuralgic character, without limitation to any definite nerve areas ; in such cases the complaint is usually made of piercing stabs, which shoot through the head first in one place and then in another, and may also be felt superficially, when a certain degree of cutaneous hyperæsthesia of the head may be elicited.

A small minority of neurasthenics complain of paræsthesiæ of the head which may take the form of sensations of itching, numbness and formication, particularly in the temples and forehead, sometimes extending to the rest of the face. Neither the oppression nor the above-described painful

sensations, even the severest forms, are associated with nausea or vomiting.

The great majority of neurasthenics suffer from these forms of cephalalgia ; those whose complaint takes the cerebral form, without exception. In the latter cases the headache is characteristic. Its intensity may show great variations at different times in the same individual, and still greater variations in different patients ; every possible degree is met with. Aggravation of the sense of constriction may cause every form of mental work to be interrupted. The duration also is very variable. In the severe forms of neurasthenia the symptom of cephalic oppression may last for months and years ; the patients are unable to remember the time when their heads were ' free '. The sense of weight is mostly felt on waking. Diversion may make it less severe. In milder cases the painful sensation may only occur following definite occasions, and may last days or even only hours, there being thus a gradual transition from the normal fatigue-headache of healthy people. This headache shows no tendency to periodicity, nor to occurrence in attacks like that of migraine.

Since neurasthenia is often bound up with hypochondria, or rather many neurasthenic disabilities become hypochondriacal in type, this nosophobic

tendency may include headache. One often hears the dread expressed that there may be an underlying more serious cerebral affection present or in development, particularly cerebral softening. The pathological tendency to introspection is often enough fostered by pseudo-popular writings and increases the evil to an immeasurable extent.

Differential Diagnosis. The neurasthenic headache is easily distinguished from that of migraine by a careful anamnesis and examination. In migraine the sense of pressure alone does not occur. The complete absence of nausea or vomiting, not to mention the other symptoms of aura, lack of periodicity, the onset by no means confined to youth, but occurring at any age, are all distinguishing characteristics. Direct heredity, which in hemicrania is almost without exception demonstrable, is frequently wanting, except when marked neurasthenia has been present in the family. In childhood and youth diagnostic doubt may more easily arise, since, as has already been mentioned, migraine attacks at this period are often incompletely developed. But here also the character of the pain and the evidence in the anamnesis of some form of long-continued exhaustion, especially eye-strain, and not uncommonly also of other subjective and objective symptoms of neurasthenia, lead to a

diagnosis ; in many cases, however, only the course of the complaint can finally decide. Frequent occurrence of vertigo coincidently with or apart from the headache is more in favour of neurasthenic headache, as are well-marked hypochondriacal ideas. One must never forget that migraine flourishes upon a soil of nervous debility, and that, in particular, neurasthenia may be developed as a sequence of repeated migraine attacks. The ' interparoxysmal manifestations ' of Flatau (loc. cit.) belong without exception to the neurasthenic syndrome, and are not in any way peculiar to migraine. There is also the not uncommon combination of both forms of headache, easily recognized by means of a careful clinical history, whilst the patients themselves often state that the new headache is of quite a different character from that which has existed from their youth. Tenderness on pressure at the points of exit of the supra- and infra-orbital nerves, as well as of the entire orbital margins, is present in many hyperalgetic neurasthenics, but the commencement and course of a typical neuralgia of these nerves, as well as the limitation of the often exceedingly severe pain to the areas of distribution of these nerves, should prevent any confusion with the headache of neurasthenia.

The **Prognosis** of this form of headache is that of

neurasthenia and of its various clinical manifestations. The most obstinate form of the disease is undoubtedly the cerebral, in these cases the mode of life must frequently be revolutionized if the harassing disturbance is to be banished, otherwise it fluctuates in its intensity and duration like the other phenomena of nervous weakness.

A constant improvement at the onset of the menopause or at the commencement of the sixth decade is not observed in the case of neurasthenic headache; on the contrary it may frequently get appreciably worse at this age. A transition into the arteriosclerotic headache (q.v.) is in my experience no rare event. On account of the considerable resemblance between these two forms care must be taken to avoid confusion.

Treatment. It is not our present task to describe the entire therapeutic armamentarium brought to bear upon neurasthenia. Only the most important measures will be outlined here and emphasis laid upon one or two points of view which in my experience are not sufficiently considered. Something has already been said in the treatment of migraine (q.v.). Here, as in so many other diseases, our most useful sphere of action lies in **prophylaxis**. Unfortunately in one of the principal causes of nervous debility, viz. heredity, we are as good as powerless.

Nevertheless, it is one of the duties of the conscientious physician to impress upon constitutional neuropaths the importance of this factor to the future generation. Here and there such information may serve as a fruitful warning, but tactful explanation by word of mouth is essential.

Dietetic treatment must before all things endeavour to reform unhygienic habits, to combat the stress and strain of modern life and the tumult of existence, in so far as the *dira necessitas vitæ* allows of this. To this end a thorough investigation into the entire life of the patient is essential, and one must not hesitate to unveil errors with energy and method, although with due tact, and clearly to indicate their dangers to health. The commonest of these errors is the excessive and thoughtless abuse of alcohol and tobacco. If one becomes convinced that these are the sole or preponderating causes of the nervous weakness, one should at once forbid every drop of alcoholic liquor and every form of tobacco, whilst omitting any further directions, since over-treatment is always inadvisable. If, however, the ' agents provocateurs ' of the disease are to be found elsewhere, the moderate consumption of alcohol and tobacco may be permitted. Sexual excesses, particularly onanism, are strictly to be forbidden, but in such a manner as to arouse no apprehension, which in

many cases already exists upon this point; one should always add the assurance that cessation of the habit will with certainty prevent the occurrence of any more serious consequences. In the case of married people, too, one should never omit to investigate the question of sexual relations, even of possible abnormalities, such as the harmful *coitus interruptus*. I have repeatedly had under treatment severe forms of neurasthenia which had for months submitted to all forms of treatment, even in sanatoria, without the most important cause, excessive marital intercourse, being discovered and forbidden. On this question one not infrequently obtains a curious insight into views as to what constitutes moderation, this bearing by no means a direct relation to the bodily physique. Even in the case of women one must not hesitate, if one's suspicion is aroused, further to investigate this delicate question. The severest cases of neurasthenic headache, of nervous exhaustion in general, are seen in multiparous and exhausted working women, following upon too short a lying-in. In them the most important consideration is to prevent conception, without this precaution any other treatment is a Sisyphean task.

Great stress must be laid upon the regulation of daily work, above all upon the interpolation of

several hours' rest. If the so-called ' English ' hours of business are observed, which from experience I should not unconditionally recommend for neurasthenics, from the medical side must be recommended at least one hour's interval, during which a small but nourishing meal is taken in quietness. Generally speaking, it is impossible to over-emphasize the value of regularity and repose in relation to meals, and all those predisposed to nerve-weakness should take some small amount of nourishment at least every two to three hours (a roll, piece of bread and butter, glass of milk, or three or four biscuits). Of no less importance in this ' disease of protracted exhaustion ' is the ensuring of adequate sleep. Neurasthenics require a sleep of at least eight to nine hours. I am convinced that sleeplessness or inadequate sleep is widespread in the great cities and is becoming increasingly so. The special treatment of this evil, so potent a source of neurasthenia, cannot here be further considered.

In the local treatment of neurasthenic headaches amongst physical methods are to be recommended, first and foremost, cold compresses, which nearly always relieve ; in obstinate cases Leiter's tubes or similar apparatus may be used. Rubbing with a menthol cone or a 5 to 10 per cent. menthol ointment temporarily relieves the sense of pressure. Electro-

therapy is undoubtedly of use in such cases. Two methods, with the galvanic current only, are to be considered. 1. Passing the current lengthwise through the head, using an ordinary electrode applied to the nape of the neck as kathode and a large rectangular anode, 6–8 cm. by 12–15 cm., flexible and closely fitting the whole forehead. Strength of current, ½ to 1½ m. ampères; length of sitting, ten minutes; once or twice a day for three or four weeks. 2. The so-called galvanization of the neck: the anode to the nape of the neck, two small flexible electrodes at the two angles of the jaw as kathode. Strength of current, 1–2 m. a.; duration and frequency as in No. 1. Whether this electrical treatment acts by suggestion, or by influencing the circulation (by acting upon the vagus or the vaso-motor centre in the medulla) is uncertain; the result is undoubtedly good in many cases. As regards hydro-therapeutic measures, daily warm foot-baths (rising in the course of a week from 100° to 110° F., of ten minutes' duration and followed by energetic rubbing by some one else of feet and ankles, which must be immersed in water to the knees) exert a desirably beneficial effect upon the cephalic pressure.

As far as drugs are concerned, as with migraine, so here, bromide stands first, exerting the same

good effect as upon many other neurasthenic symptoms. Smaller doses, however, suffice (30–45 grs. per diem), but the drug should be administered regularly for three or four weeks. The actual analgesics may generally be dispensed with; they will be called for only in the exceptional and truly painful exacerbations which mostly occur as the result of special provocations. The treatment is that of the migraine attack as described above.

The beneficial effect of change of air upon sufferers from neurasthenic headache is well known. To the hygienic effect of fresh air—of medium and greater altitude, and, for many patients, of the seaside—must be added that of absence from the cares of business. Such change must, nevertheless, not be too short, certainly not under a month. I have not been able to convince myself of the utility of repeated short vacations for neurasthenics. It seems to me *a priori* doubtful, since the increase of work which departure and return imply to the professional or business people make the benefit of their short duration illusory.

For the severe and obstinate forms of neurasthenia and neurasthenic headache, temporary removal from work and institutional treatment are necessary. During the warmer months of the year a sanatorium in the mountains should be chosen. In this con-

nexion I cannot refrain from indicating one or two misconceptions which are prevalent in the sanatoria for the well-to-do. First and foremost is the habitual over-use of therapeutic, particularly of hydro-therapeutic, measures. Naturally a definite routine must be observed, but in this daily schedule in my experience far too little emphasis is laid upon the necessity for rest, much the most important remedy for the exhausted.

Cure by means of rest in the open air, coupled with a system of over-feeding suited to the individual patient, must constitute the key-note of all sanatorium treatment, to a far greater extent than is as yet the case.

In many of the severest forms of nervous prostration there should be accommodation for such cure to be carried out in isolation, at any rate during the commencement of the stay. The principle of segregation should in my opinion be more frequently put into practice, even at meals, where eating in public with a large number of noisy and garrulous people is certainly ill suited to many of our neurasthenic patients. *Primum non nocere.* Moreover, more value should be attached to inculcating a mode of life likely to lead to a sound nervous disposition, with a view to resumption of the responsibilities of life.

Theory of neurasthenic headache. Pathogenesis. If we conceive of neurasthenia, at any rate the acquired form, as being prolonged fatigue, or exhaustion as a result of manifold adverse influences, amongst which may be included the infectious diseases, it may be assumed that the poisonous materials, or toxins, elaborated within the body as a result of these causal factors, inclusive of the fatigue toxins, are capable of doing considerable damage over a long period of time to the dural nerves. That this is at least transitorily the case is proved by the often intense headache accompanying all kinds of infectious diseases ; that we have here, as with the other symptoms, to deal with the effect not only of the accompanying fever, but possibly in a higher degree of the poisons circulating in the blood, is now generally accepted. It is a familiar fact that other known poisons stimulate or damage the nerve-endings in the dura. One need only refer to the abuse of alcohol and tobacco. It seems very doubtful whether the toxins absorbed from the gastro-intestinal tract play a part in neurasthenia as is assumed by French authors. It is a difficult problem to decide why one of these agencies should be responsible rather than another, nor is there any adequate explanation concerning the congenital tendency, the predisposition, which without doubt

is frequently inherited. Possibly this consists mainly in an originally exaggerated irritability of the cells of the sensory cortex.

I am, however, of opinion that the neurasthenic headache more often comes about by way of the vasomotor system. Runge,[13] who was the first to give a detailed account of this cephalic oppression, seems to lean towards this pathogenesis. He draws attention to the frequency of dilatation of the temporal arteries in his patients. It is certainly a fact that, even in the third and fourth decades in neurasthenics, the temporal arteries may be markedly serpentine and distinctly prominent. But apart from such obvious alterations there is ample evidence of the extreme sensitiveness of the entire vasomotor apparatus in these patients. The vasomotor centres in the brain as well as the subordinate vasomotor apparatus in the spinal cord, in the sympathetic, and that in the vessel-walls themselves, are in a condition of 'irritable weakness', i.e. the response to stimulus of the vascular nerves is exaggerated in contrast with that in a healthy person, but becomes proportionately sooner exhausted. One need only call to mind the rapid and excessive blushing and paling from trifling causes, the high degree of dermographia, the oscillations of pulse-rate, &c.; hardly ever in the neurasthenic

does one or other of these symptoms fail to be present. The assumption is thus not unjustifiable that the vessels of the dural nerves, the vasa nervorum, are also subject to such oscillations, which eventually lead to a diminution of the power of resistance and elasticity of the vessel-wall, and thereby to an enlargement of the lumen of the vessel. The result of the last in its turn will be partly an active hyperæmia in the arteries, partly a passive congestion in the veins of the dura mater (probably also of the brain itself), and thereby an increase of pressure upon the nerve-endings. This increase of pressure is naturally only of slight degree, and is not to be compared with that of cerebral tumour or even of migraine. This is on the whole in correspondence with the intensity of the headache occurring in these affections. In later stages of these vascular changes thickening, particularly of the media (arterio-sclerosis), may ensue, and therewith anæmia of the corresponding vascular areas. In recent years Oppenheim has rightly pointed out the significance of neuro-vascular manifestations in the development of early arterio-sclerosis, the heart being also involved, and every neurologist who has had the opportunity of watching his patients over a considerable length of time will agree with him. It may be asserted with a great show of probability that these

changes may also gradually be established in the vessels of the brain and its membranes. This is evidenced clinically in the fact that the neurasthenic pressure passes into the generally persistent arterio-sclerotic headache, which is usually accompanied by other symptoms indicating commencing cerebral arterio-sclerosis.

This pathogenesis of neurasthenic headache, which from numerous observations seems to me the most plausible, becomes more convincing through the circumstance that we not uncommonly see cases in which the vasomotor influence is obvious to every onlooker at the first glance, by the unusually dusky-red colour of the face as well as by the weakness of innervation of the cutaneous vessels. This form has been specially designated 'vasomotor' or 'vaso-paralytic' headache. I can only view this as a higher grade of neurasthenic headache, since in these cases one can almost without exception point to great over-exertion, particularly mental, as a causal factor, and in addition can demonstrate a whole series of other typical neurasthenic symptoms. The following case, at present under treatment, may be cited as typical.

A student, æt. 18, had been for six months in an institution, preparatory to becoming a teacher. She had had to work exceedingly hard and without proper holidays.

For about two months she had suffered from continuous severe headaches, particularly frontal and vertical. At times an oppressive weight was complained of, at times a real boring pain. It is constant, frequently gets worse towards evening and may not cease during the night. There is neither nausea nor vomiting. The slightest mental exertion causes exacerbation ; at the menstrual period the pain becomes unbearable. Sleep is insufficient and light. She never suffered from headaches previously, and there is no heredity nor headaches in the family. No previous illnesses ; no constipation nor anæmia. Objective examination. Ears and face somewhat dusky red, marked dermographia, pulse 100, varies with the slightest movement, and displays the characteristic nervous change of rhythm. Patellar reflexes much exaggerated. Tremor of the hands, marked twitching of the closed eyelids and protruded tongue, fundus normal. Urine free from albumen and sugar. Considerable improvement has followed three months' complete rest with systematic bromide and open-air treatment. The patient is considering my strongly urged advice to give up her studies.

There is at present a universal assumption that in neurasthenia there are no demonstrable tissue changes either in the central nerve organs nor in the peripheral nerves. These have not, however, been sought with systematic perseverance ; the hypothesis of molecular but intangible changes is considered satisfactory. There are nevertheless cases of neurasthenia which for years show the same severe symptoms in almost unaltered sequence—

I refer especially to many forms of cerebrasthenia and myelasthenia—and which therefore raise the suspicion that possibly the more improved histopathological methods recently employed in examination of peripheral nerves might demonstrate changes in the corresponding central cell-groups. May it not well be possible that such fine lesions exist even in the dural nerves which have for years been subjected in cerebrasthenia (and migraine) to the above-described influences ?

I cannot agree with the explanation of Binswanger,[14] who refers neurasthenic headache mainly to sensations of muscular fatigue due to tension of the muscles during mental work, because the sense of pressure is referred by patients of good powers of observation to the interior of the skull.

One or two other views upon the origin of neurasthenic headache will be considered in the next chapter (Peritz, Cornelius, A. Müller).

3. NODULAR (RHEUMATIC) OR INDURATION HEADACHE

This form of headache is still too little known and recognized in Germany, even by authors who have specially written upon headache (cf. Moebius, loc. cit., Windscheid,[15] &c.). Flatau considers rheumatic headache to be rare. It is also, both abroad and in

Germany, included with migraine and neurasthenic headache, a mistake which leads to unpleasant therapeutic consequences. For these reasons I consider it advisable to describe this variety of headache somewhat at length.

Symptomatology. The majority of patients are women of middle or advanced age, who almost invariably have been in childhood and youth free from any kind of severe headache and, if educated and intelligent, almost without exception deny any hereditary predisposition. The majority, when they came under our treatment, had been sufferers for a long time, some for over ten years, and had been treated unsuccessfully by a number of physicians with electricity, hydrotherapy, rest-cures, and baths. In exacerbations of the pain the patients make use of the popular anti-neuralgics mostly with good if transient effect. Hardly at any time of the disease is there complete freedom from pain ; the existence of genuine attacks with free intervals such as are characteristic of migraine headache could never be established. As a rule there is persistent, severe, extremely disabling pain, involving the whole head, but almost without exception beginning in the occiput and nape of the neck, and frequently radiating towards the back and shoulders. It does not cease at night, in some cases even becoming

more severe in the recumbent position ; it is rarely associated with nausea, never with vomiting, and in its most severe forms reduces the patients to a terrible degree and robs them of every pleasure in life. In spite of an attitude of great scepticism against this causal factor, we were unable, after the most detailed investigations, to escape the impression that in these cases an important ætiological rôle is played by frequently repeated apparent chills of various kinds (unavoidable temperature changes and draughts associated with occupation, wettings, excessive perspiration after bodily exertion without the opportunity of changing, &c.). Edinger considers that the exposure to localized chill from washing the hair was a frequent cause. We have often been able to establish the fact that sudden chill during treatment and after decided improvement brought about relapses, often of considerable duration, and, moreover, that atmospheric conditions (barometric depression, snow, storms), as with rheumatic affections, were very readily appreciated by the patients. Cold, in the form of compresses, was never tolerated, whilst warmth was always grateful. I have also occasionally observed increase of headache on hot summer days, in patients who perspired freely and who had then probably been exposed to draught.

Detailed general examination revealed almost

uniformly normal conditions of the internal organs (I would here once more emphasize the importance in all obstinate headaches of ophthalmoscopic investigation even where vision is unimpaired). On the other hand, we were able by palpation regularly to demonstrate in the scalp changes which were sometimes easy to feel, but at others were found even by practised fingers only after long search and comparison of the two sides. There were:

1. Nodules of the size of a millet-seed, lentil, or even a bean in the subcutaneous tissue and in the occipital fascia and fasciæ of the nape of the neck, at times also of the upper part of the back and sides of the neck as far as the shoulders. These were almost all very tender, even to a light touch. These infiltrations may be distinguished from enlarged lymphatic glands by the above-mentioned tenderness, and also by the fact that the latter are rounded, the former often quite irregular in shape. The same nodules are frequently found in the parietal subcutaneous tissues and particularly in the tendon of the occipito-frontalis. Here they are mostly flatter, sometimes attain the size of a shilling and may not be movable, giving the impression of being part of the periosteum. I have also repeatedly found them, although less commonly, in the frontal and temporal regions.

2. In the whole course of the superior nuchal line of the occipital bone and on the mastoid process, where the larger cervical muscles and occipito-frontalis are inserted, may be felt fairly hard, sometimes flattish, sometimes rather raised, infiltrations, which give the impression of callosities. They may frequently be made out in the most variable spots in the muscle-substance. One side is not more involved than the other. They are almost without exception very tender to the touch, and cannot always be sharply demarcated from the rest of the muscle-substance, but move with it. In some cases they attained the size of a hazel-nut or almond. The muscles concerned are generally the trapezius and sterno-cleido-mastoid, then the scalenus posticus and splenius. I once found an induration of about the size of a sixpence in the occipito-frontalis, close to its insertion into the tendon; in the temporal muscle I have several times made out a diffuse elastic swelling of some size. In several cases there occurred, in addition to a small number of subcutaneous nodules, a distinct infiltration in the upper insertions of the sterno-mastoid and trapezius, extending a certain distance into the muscle itself.

It is advisable, in the examination of the muscles primarily concerned, to have them relaxed, which is most easily attained by directing the patient to

bend the head gently backwards. In palpation of the sterno-mastoid the chin should be turned towards the side of the muscle under examination. One should avoid examination during the exacerbations, otherwise confusion is possible with reflexly contracted muscle-bundles. To the educated touch such an error is hardly possible, but avoidance is also advisable since under these circumstances the pathognomonic tenderness loses its significance. For it is sufficiently well known that even in a migraine attack many spots in the neck, throat, and particularly in the upper part of the trapezius are very tender to the touch, just as are the points of exit on the face of the different branches of the fifth nerve.

The patients themselves have, as a rule, no suspicion of these affections of the scalp, but palpation of the spots causes them to shrink. A few (amongst whom was a medical man who had heard of the condition) indicated a nodule or nodules which before an exacerbation swelled, and on recovery diminished in size. I have myself once proved this to be the case.

Several of our patients had been for months under treatment by an authority in diseases of the throat and nose without result; one patient had in vain had nearly all the accessory cavities of the nose

opened. In this case the pain was chiefly located in the anterior part of the head.

Not a few of the patients had been obliged to relinquish their professions until the massage treatment presently to be described brought them improvement or cure. In a small series of cases we found in other than the above-mentioned places indurations in the subcutaneous tissues or scar-like thickenings which also caused local pain and likewise disappeared under massage. A special characteristic of these headaches is that, coincidently with removal of these swellings by means of massage and local heat application, sometimes through the latter alone, they disappear and—generally even in old-standing cases—were almost all radically cured or greatly improved.

For this reason an ætiological connexion must be assumed between these two manifestations. The effect of suggestion is not an adequate explanation, since these patients had almost all been so vigorously treated in such a variety of ways that they had had ample opportunity to react to the suggestive power of these multifarious therapeutic methods. Another reason is that this treatment demands a considerable length of time and a great deal of patience and energy on the part of the patient, as we shall see in the sequel. Finally relapses, due to chills, during

the course of treatment and after improvement had begun, are not uncommon.

Differential Diagnosis. This may frequently be established from the anamnesis alone if the latter be purposefully and thoroughly elicited. This is, however, as has already been emphasized, absolutely necessary for all forms of protracted headache, along with detailed examination of the whole body. Onset in later life, never in childhood, occasionally in youth, almost invariable start of the pain from the occipital region, hardly ever from forehead or temples as with migraine or neurasthenia ; history of the influence of undoubted chills, both in the general ætiology and in that of the occasional exacerbations, with relatively little influence attributable to psychic stress or similar factors ; permanent character of the pain without any free interval, extreme rarity of unilateral distribution, absence of heredity, of vomiting, and every kind of aura—all these points distinguish this form of cephalalgia already so sharply from those enumerated under 1 and 2, as well as from other headaches, that the palpable changes in scalp and head-muscles are hardly necessary. Demonstration of the latter is not as easy as it might appear. One must avoid confusing the indurations situated subcutaneously and in the deeper fasciæ of the side and nape of the

neck from the enlarged lymphatic glands to be found here in many people (syphilis, tuberculosis, eczema, &c.). The latter are also for the most part not so sensitive to touch (see above). Whoever by skilled use of massage (which is, unfortunately, not within the capacity of every physician, although—applied *secundum artem*—it is one of our most potent remedies), or by any other means, has gradually cultivated his sense of touch, has a decided advantage over others in judgement upon these changes, only to be revealed through palpation. Nevertheless these indurations can, as we have experienced in our polyclinic, be so demonstrated that, having once properly felt them, most physicians can subsequently find them for themselves. Special directions in this regard cannot well be given. It is in this case as with the images in laryngology and ophthalmoscopy, which, once properly seen (which in elementary instruction does not occur at once), can afterwards be readily recognized.

On the other hand, it is a matter of astonishment to me that some authors claim to have discovered nodules and indurations in all possible places where I, in common with other investigators, have only quite exceptionally succeeded, e.g. at the points of exit of the facial nerves and in the skin of the face. The possibility must, however, be borne

in mind that the distribution of these changes in northern climates may be a wider one than in Germany. I am at a loss to explain how Henschen [16] as well as Norström [17] in many cases of headache have found the upper cervical ganglia of the sympathetic enlarged, thickened, and tender. I have never succeeded, after careful endeavour even in very thin people, in feeling on the antero-lateral aspect of the spinal column any structures which I could with certainty take to be the sympathetic ganglia, quite apart from the fact that I should never trust my power to distinguish an enlargement from the normal size. This lack of success will, however, not appear incomprehensible to any one who has a clear conception of the anatomical relationships of the lateral aspect of the upper part of the neck (see above under 'Migraine'). When Norström, in regard to palpation and massage of the cervical ganglia of the sympathetic, says that he 'is unable to lay down any definite rules', I am very willing to believe him. When, however, he continues that 'it is the skilled individual sense of touch which decides', I must join issue with him. It is most regrettable that, through such exaggerations, what is accurate and meritorious in the labours of these authors is by many investigators apparently overlooked and underestimated.

A second reason for this fact is that Henschen, to whom is indisputably due the merit of having been the first to point out these till then little-known affections of the subcutaneous connective tissues and muscles, has a totally different conception of migraine from ourselves. According to him it is a local disease depending upon a constitutional basis (rheumatic and neurasthenic) and demands both local and constitutional treatment. There is a variety of different forms: (1) Principally local, only curable by massage; these are often mainly rheumatic in nature. (2) Mixed forms, where neurasthenia and anæmia are present in addition to local disease. He treats them with massage, iron and arsenic, and general hygienic measures, such as fresh air, &c. (3) Inveterate forms, dating from youth, in which the disease was originally local and vasomotor disturbances arose only later (secondarily). Massage is useful in these, but not fresh air. Henschen realizes the difficulty in diagnosis, and particularly from the fact that, according to him, there are varieties of migraine of intra-cranial origin which are not infrequently associated with tenderness of the soft parts of the head.

It is obvious that Henschen includes under 'Migraine' all protracted independent headaches. It is, however, undoubtedly an important step, both in

respect of diagnosis and above all in treatment, that we should have learnt to distinguish these varieties from an ætiological point of view. It must, indeed, not be overlooked that in this matter we are still upon uncertain ground. This is due chiefly to the nature of the disease, which is so difficult of access to anatomical and experimental investigation. It is possible that in the more rigorous climate of the North the above-described affections of the scalp and neck-muscles occur so much more frequently than in Germany as to explain the emphasis laid upon local treatment in Henschen's classification.

Norström bases his earlier publications entirely upon Henschen; in a later edition, however, he appears to embrace the view that migraine is an independent disease, but inclines to lay too great a weight upon the designation of the disorder favoured by the patient.

O. Rosenbach [18] assumes 'that migraine is a many-sided disease, implicating the most diverse regions and not in all cases identical nor even following upon the same causes'. Thus there are, according to him, cases where the symptoms are principally dependent upon affections of well-defined muscular areas of the head and neck, and which thus display great differences as regards diagnosis and treatment when contrasted with the

clinical picture of hemicrania, founded upon a nervous basis. Rosenbach's investigations, it may be remarked, were undertaken during attacks or exacerbations. As I have said above, this procedure is misleading ; adequate criteria are only obtainable by examinations made in times of relative health, as in the case of migraine in the free intervals. Now I must insist that in the intervals of typical migraine I have never found painful spots in the scalp or muscles of the neck, but, as above stated, regularly in nodular or induration headache.

Rosenbach, moreover, speaks nowhere of the infiltrations, but only of ' tender spots, or whole areas of great pain, having nothing in common with the well-known points of nerve-tenderness '. I have myself also seen cases in which, in addition to trifling subcutaneous infiltrations, only a slight resistance and rigidity was to be felt in the neck-muscles. I therefore do not deny the possibility that in many sufferers from headache there may be nothing but simple myositis, which objectively leads to nothing except some tenderness to touch. In these cases the pain is rarely intense or long-lasting. It is mostly present on rising in the morning. I imagine that it arises from strain of the neck-muscles (analogous with traumatic lumbago), owing to an abnormal position during sleep, such as is

assumed by many people. Possibly some part may be played by lymphatic obstruction to which these parts are subject owing to their deeper position and to the less active circulation during sleep. This explanation might also suffice as a reason for the exacerbation of the majority of headaches at the time of waking. In all muscular forms this lymphatic congestion causes an increased pressure upon the intra-muscular sensory nerve-endings. In the varieties arising out of direct irritation of the dural nerves, including the headache of cerebral tumours, meningitis, &c., such congestion acts indirectly upon these nerves. Not uncommonly one can obviate this morning aggravation by means of a more upright position during the night.

In face of the above-enumerated views of all these and other authors, which will be discussed under the heading 'Theory—Pathogenesis', we must unconditionally cling to the fact that migraine is a well-defined disease *sui generis*, characterized almost invariably by direct heredity and conditional upon constitutional, and probably intra-cranial abnormalities. The headache accompanying it is to be sharply distinguished from all other forms of headache, and has nothing in common with nodular or induration headache. The latter through its equally distinctive clinical characters presents a clearly defined picture.

In addition to the numerous points of differentiation between these two forms of cephalalgia already enumerated, I should like to mention two which have impressed themselves upon me in the course of time. In the case of migraine systematic bromide treatment almost infallibly leads to considerable improvement or diminution of the attacks ; in nodular headache it has only slight success ascribable to the generally sedative effect of the drug. Whilst in the latter variety of headache suitably carried out massage results almost always in cure or considerable improvement, in migraine patients whom I have treated in this manner, *experimenti causa*, no benefit has ever accrued.

Confusion between nodular headache and neurasthenic pressure, or exhaustion-headache, is hardly possible if one keeps before one the points in differential diagnosis already enumerated. Occipital neuralgias, like most neuralgias, are nearly always present on one side only, have a greater tendency to occurrence in attacks, mostly show the typical tender points on pressure, whilst nodules and indurations are wanting. Also they are rarely of the same duration as many cases of nodular headache. In the case of syphilitic osteocopic pains (q.v.) the anamnesis and the usual history of nocturnal aggravation indicate a diagnosis.

The diagnosis is sometimes made more difficult owing to the fact that the form of headache under discussion may be accompanied by any other variety of headache, purely symptomatic as well as the more independent. For there is no obvious reason why a nephritic should not add a nodular headache to his uræmic one, nor why a sufferer from migraine should not develop this complaint. I shall describe below combinations of hemicranial and anæmic headache. Difficulties might possibly arise in the case of the less common unilateral forms of nodular headache. In such cases the most important thing, in addition to a careful general examination, is a thorough, purposeful anamnesis, specially directed towards the pathogenetic factor, whereby the superposition of the two clinical pictures may be resolved and it may clearly emerge which form of headache was present in the first instance and which became engrafted upon it. I must point out, however, that this may involve a tiresome, long-drawn cross-examination of the patient, even amongst the so-called cultured classes.

As regards the frequency of this form of headache in comparison with other forms, Edinger, who was the first sharply to differentiate it from migraine, estimates that fully two-fifths of headache patients suffer from nodular headache, a like number from

migraine, and the rest from other forms. I should consider that about one-fifth to one-fourth of all headaches are of the rheumatic form, whilst migraine is far the commonest type, neurasthenic headache coming next.

The **prognosis** of this cephalalgia, so long as it does not come under our notice in combination with other forms of headache, is in general entirely favourable, at any rate far more favourable than that of migraine, provided that the correct treatment, local heat and massage, finds a place, and that the aggravating chills are avoided. Even this circumstance, as has been indicated above, is of value from the point of view of differential diagnosis.

Cases of years' and decades' duration can be completely cured by systematic treatment, although the duration of the cure undoubtedly stands in direct relationship to that of the disease. Generally speaking, the course is as follows. After the first sittings, which indeed are often extremely painful, there is considerable aggravation, which is readily comprehensible, since the manipulation of the for the most part chronic process stimulates it into an active condition. For we should keep this clearly in mind, that resolution must be brought about of the foci under the skin and in the muscles, and the more vigorously this is attempted the greater the likeli-

hood of relapses being avoided. In the beginning one has no little difficulty in persuading patients to persevere; it is a wise precaution to warn them from the beginning of the initial aggravation, but at the same time one can definitely promise them complete freedom from their complaint if they decide to persist. It is therefore advisable during this time not to be sparing of anti-neuralgics or narcotics. In order to get more quickly over this painful period I have with some patients in the first one or two weeks had the massage done twice daily with success. Exceptionally this exacerbation does not take place. After eight or ten sittings the proceeding is no longer painful; the exacerbations also cease to occur. After the third week the improvement begins as a rule to make itself felt, in patients who have suffered for a very long time this point may be deferred to the fifth or sixth week. The total duration of the treatment extends in recent cases to three or four weeks, in those of moderate severity to four, six, or eight weeks, the massage being undertaken at least once a day; in the worst cases to two or three months. If circumstances are favourable all the inflammatory deposits should be manipulated until they can no longer be felt. It is obvious that this treatment makes great demands on the tolerance both of physician and patient.

Relapses after temporary improvement often occur during the cure, and naturally have a considerably depressing effect. Almost without exception I have been able to indicate a severe chill as the cause. When these take place one must persevere and refuse to be discouraged. In the case of one middle-aged patient in whom massage for a month had produced no effect, and who was dissatisfied, I prescribed iodide of potassium (without there being any suspicion of syphilis). Improvement rapidly set in and led to complete cure, although the success should not be attributed to the iodide. On theoretical grounds, however, it must not be withheld as an accessory in obstinate cases or where the patient appears to demand medicinal treatment.

The prognosis is unfavourable or at least doubtful when combinations of severe general neurasthenia or anæmia co-exist with rheumatic headache.

Either—and this seems to me the more frequent occurrence—the exhaustion of the entire organism is the result of the long-drawn-out pain, often preventing sleep, or the pain has been accidentally superimposed upon a severe form of neurasthenia. In the first case one is in great doubt which primarily to combat, the cause or the effect. Although it may appear the obvious course first to take steps against the former, from my personal experience I should

advise against it and recommend improvement of the general health by means of an augmented dietary, administration of iron and quinine or arsenic, and only later undertaking treatment of the head itself. A good effect upon the pain during this period of preparation, in addition to mild sedatives such as bromide of soda with antipyrin and codeine, seemed to me to be exerted by the daily application for several hours of hot poultices (linseed meal or the more convenient thermophore) to the nape of the neck or scalp (possibly also hot air or diathermy). If the general health has improved the massage may be gradually begun, the sittings being short and at first taking place only every other day. If the nodular headache has been superadded as a complication of the neurasthenic condition, it should at once be got rid of, if of long duration it will appreciably aggravate the latter, as would be the case with any protracted painful condition.

Therapeutics. All authors are agreed that the most important part of the treatment consists in manual massage. It appears to me doubtful whether a gradual system of hardening against climatic conditions can effect prophylaxis, since we have seen several patients who belonged to classes by no means pampered. The constitutional or even acquired tendency to such rheumatic processes

seems too powerful for us to be able effectually to prevent it. Nevertheless at the end of treatment one should advise patients subject to relapses to take adequate precautions against chills.

During the cure the following precautions should be taken in addition to those already enumerated. In the first week or two the ordinary avocations should be suspended or at least restricted. Exposure to chills must be strictly avoided. Rigid abstinence from alcohol should be enjoined and the *primæ viæ* carefully regulated. It is advisable for the patients as a general rule, but especially during the treatment, to sleep with the head raised ; it is my impression that this brings amelioration (? through the avoidance of hyperæmia in the more dependent parts of the head; see above). Women at this time should leave off washing the head ; later also only spirituous hair-washes should be allowed, and emphasis laid upon the importance of thorough drying. I have never had to go so far as to cut even very thick hair ; one soon learns to overcome the obstacle presented by it. The sittings should in all circumstances be daily until a decided improvement manifests itself, then on alternate days. The duration should be from fifteen to twenty-five minutes, according to the sensibility of the patient and number of nodules and indurations. In order

to minimize the unavoidable jarring and shaking of the head from certain of the manipulations the chin should be supported by the hand on a table, the patient being comfortably and suitably reclined on a chair with not too high a back. Generally speaking, the head massage in this affection is a matter for the physician, even though it is laborious and a tax upon time ; in the severe cases it should exclusively be undertaken by him, since the requisite conscientiousness and delicate sense of touch is not to be found in masseurs or masseuses. It is difficult also to instil into their minds the increase and diminution of pressure necessary in the more painful manipulations. Nevertheless in the slighter and moderately severe cases the treatment, under personal supervision, may be left to the more intelligent of these assistants after teaching them the special technique and sequence of the individual manipulations ; they must also themselves have thoroughly felt all the indurations present in any individual case. Occasionally it is possible in time successfully to teach some apt relation (men as a rule adapt themselves less readily than women).

I precede every sitting with a one or two hours' application of hot poultices (linseed meal or thermophores) ; I am under the impression that the affected spots in the scalp and muscles are thereby

rendered softer and more susceptible of resolution. Where the infiltrations are of considerable size and hardness I have at times made use of an ointment of ichthyol (20 per cent.), but as a rule I carry out the massage with dry hands.

As after treatment and to consolidate the success I have frequently, where circumstances permitted, ordered a brine bath cure, as in the case of other rheumatic affections. I should also advise experiments with radium emanations, which have recently been recommended both for gout and muscular rheumatism, and in particular inhalation in a closed chamber. Cataphoresis might also be tried.

As regards the special technique of massage in rheumatic headache, I have not found detailed instructions given by any author. Norström refers to his book, *Traité théorique et pratique du massage*, Paris, 1891, giving otherwise only partial and easily misunderstood directions. Naturally in this head massage the principles are those of massage in general, but I hold it to be absolutely necessary in so characteristic an affection with such typical changes to describe a definite procedure whereby physicians who have little experience in the practice of massage may also have a guide. Naturally I do not imply that this *modus procedendi* alone will give the desired result. It is for the most part in

harmony with the results of Most's investigations.[23] The main circulatory areas which come into consideration, and which on the whole correspond with the area of distribution of the veins, are depicted by this author.

One should begin with forcible stroking (effleurage) of both lateral aspects of the neck, from the mastoid process to the acromion, carried out with the flat of the hand; the middle of the occiput and nape of the neck is then treated in the same way, with the right hand (ten times)—this action, as with all massage intended to promote absorption, as far as possible serves to empty all the centripetal lymph-vessels. The hair may so far be left undisturbed. For the later manipulations the necessary regions must be exposed by parting the hair or throwing it forward or, in the case of heavy masses of hair, supporting it on the arm used for the massage, which will hardly interfere with the work.

Then follows a thorough kneading (pétrissage) of muscles and skin, first of the left lateral occipital and cervical region as far as the shoulder, then of the central, and finally of the right. I always carry this out with both hands, one opposing the other, vertically to the course of the muscles to be massaged. This manipulation is not very easy and involves considerable strain upon the finger muscles.

One must endeavour so far as possible to raise the deeper muscles from their supports and get them between the fingers. Each kneading should be carried out five times and be followed by a vigorous stroking.

This stroking should be directed, along the whole circumference of the occiput from one mastoid process to the other, to the insertions of the muscles of the neck and back of neck, either with the thumbs or the closely approximated tips of the other fingers, in a centripetal direction (i.e. towards the neck) downwards into the muscular bellies (twice from left to right and the reverse way).

The individual subcutaneous and intra-muscular indurations should then be sought out and stroked separately. This movement of simultaneous friction and percussion is best carried out by means of the tips of three or four fingers, closely approximated, in such a manner that the wrist remains stiff and the actual movement becomes one of rotation through a small circle from the shoulder. Herein one must constantly keep in view the end aimed at, viz. to disintegrate the nodules and indurations. Each nodule should be manipulated for not longer than half a minute, ending up with effleurage, directed according to the topographical position of the individual nodules. This

manipulation is also somewhat of an exertion for the masseur.

The next thing is to place both hands simultaneously on each side of the sagittal suture and carry out a movement of effleurage, using some force, pressing through scalp and temporal muscles on to the skull, finishing close behind the auricles (six to eight times). The indurations situated in the area so marked out are then sought and massage employed as above described. If the temporal muscle itself is affected it must be thoroughly treated by effleurage in the direction of its fibres (towards the ceronoid process of the lower jaw) and then by pétrissage.

Hereupon follows stroking of the occipito-frontalis in its entire breadth, from its tendinous insertion to the eyebrows, with the approximated finger-tips (six or eight times). Possible nodules in this region are rubbed as above described.

Finally one should proceed to effleurage of the skin of the forehead and side of the face, using the palm or surfaces of the fingers, those of the left hand on the right side of the forehead and those of the right on the left, so that the tips of the fingers on each side meet, stroking downwards to the bones of the face, pressing through the soft parts of the forehead, proceeding backwards to the temples and

cheeks, using firm pressure more and more of the whole hand. When the angle of the jaw is reached the hand is so turned that the thumbs on each side press into the region in front of and internal to the sterno-mastoid, where the great vessels and nerves lie, and carry out firm but not too deep effleurage over the great vessels and lymphatics in a centripetal direction.

After the massage the patient should rest for half an hour to one hour, if possible lying down.

Theory. Pathogenesis. What is the significance of the above-described conditions, and how can we explain by this means the origin of the pain? I must premise that so far there is no record of any anatomical demonstration. The authors, particularly northern, who were the first to feel these changes, obviously because they were the earliest and the most thorough practisers of massage, have assumed that they had to deal with chronic indurative inflammations in the subcutaneous tissues (cellulitis) and in the muscles (myositis), such as were first demonstrated in the most diverse places in the trunk and extremities (cf. B. A. Kjellberg [19]). Henschen, to whom, as far as I can see, the credit belongs of being the first to bring these indurations into relationship with headache, speaks only of 'svullnad' = swellings. Kleen [20] and Bum [21]

designate the muscle infiltrations as myitis or myositis, as does Norström; upon the nature of the localized deposits in the subcutaneous tissues they express no opinion. It was *a priori* likely, especially having regard to the assumed rheumatic pathogenesis of this variety of headache, that the lesions were chronic inflammations of muscle such as had long been familiar in other parts of the body.

It seemed to me desirable, however, to be able to base oneself upon direct anatomical investigations, since many new points of view might then emerge, particularly in respect to the relationship of these inflammatory products to the intra-muscular sensory nerve-endings. Material for such investigations is naturally not easily acquired. The opportunity presented itself to me in 1904 of excising an infiltration from the left splenius and examining it microscopically. It was of about the size of a hazel-nut, felt fairly hard, and was situated in the upper third of the muscle; the whole of the rest of this being as soft as the splenius of the opposite side. Pressure upon it caused the patient, a woman of 56, acute pain. She had also, in the trapezius, at the insertion of both sterno-mastoids and in the occipito-frontalis considerably smaller nodules. Her spontaneous pains began in the occipital region, sometimes also deeply in the nuchal region, mounted to the vertex

and radiated to temples and forehead. The patient was in a considerably depressed condition owing to her pains. I may state that she derived notable benefit from twenty applications of massage, always preceded by local heat, but was unable to devote more time to the treatment. Every physician present at the extirpation considered the macroscopic appearance to indicate increased interfibrillary connective tissue. The microscopic appearance also pointed to the same conclusion; there were even places where the intra-muscular nerve-endings were apparently surrounded by a ring of connective tissue.

Had we then under our eyes the histological substratum of this painful affection? I could not arrive at this conclusion until I had made a control preparation from a woman of the same age who had died of pneumonia, and who had not suffered from headaches, with the result that we found an exactly similar microscopic appearance. We have, therefore, not advanced any further in our anatomical knowledge of the disease, or rather we are compelled to say, although indeed only upon the evidence of this one case, that it is not referable to a *myositis fibrosa*. Have we here also to do with a circumscribed dilatation of lymph-vessels, possibly with inspissated lymph, which in my former work

I advanced as an explanation of the deposits in the subcutaneous tissues? (See also below.) The negative results of the microscopic examination would then be comprehensible. We are here confronted by the same *non liquet* as in the case of chronic muscular rheumatism, where one also appears to have a circumscribed induration under the fingers as, e.g., in lumbago. The question appears to me to be further complicated by the fact that the existence of lymph-capillaries in the muscles, as in the bones and connective tissues, is still a matter of controversy. We only know that lymph from deeper tissues, as injections by means of deep punctures seem to show, always flows towards the same lymph-vessels and glands as the lymph from the superficial capillaries. Further histological investigations are in my opinion necessary. I have also endeavoured to obtain similar material from dogs, which not uncommonly suffer from severe rheumatism of the back of the neck, but so far without success. One or two attempts upon old dogs to produce such an affection by the employment of considerable differences of temperature had a negative result.

H. Lorenz says in the introduction to his monograph upon muscular diseases: 'The diseases of muscles are reckoned as amongst the most obscure

chapters in human pathology. The cause is to be sought on one hand in the confused descriptions of the histological observations so far made and in the ambiguous character of histological preparations of muscle in general on the other, which immensely complicate any realization of the processes taking place during life. . . .' The inflammation attacks chiefly the interstitial tissues in the acute as well as in the chronic forms. It is an instructive fact that, of the numerous varieties of muscular inflammations, the only one of importance to us is *myositis fibrosa*, and only the primary, independent form of that, as compared with the secondary, which represents the outcome of heterogeneous affections of the muscular substance (e.g. syphilitic myositis, trichinosis, dermato-myositis). The former is to be considered as an apparently primary affection of muscle characterized by connective tissue proliferation of the perimysium, 'with a marked tendency from the first to the formation of deposits.' This pathological manifestation 'is both in its nature and ætiology still wholly obscure; this is probably the reason why, up to recent times, it has repeatedly been described as a rheumatic disease' (Lorenz, loc. cit.). This author dissents from the ætiological theory of an infection held by others, and considers that enunciated by König as more probable. The latter

regards the formation of deposits in the muscles as 'the result of a constitutional abnormality, a tendency to connective tissue formation peculiar to the individual' and analogous to *myositis ossificans*. This would also explain the phenomenon of new connective-tissue formation in fresh foci of disease in the muscles (see, however, my above-described investigation). In his description of clinical symptoms, Lorenz, though as it seems to me rather upon a basis of other authors' descriptions than upon his personal experience, advances the theory that in fibrous myositis the relatively slight or absent tenderness on pressure of the affected muscles is characteristic, although he relates a case in which vigorous massage resulted in the most acute pain. In a case under my observation of a woman of 50 suffering from rheumatic headache, and in whom numerous indurations were to be felt in the muscles of arms and legs, these were excessively painful to the least pressure. I have seen the same phenomenon in a whole series of other patients, e. g. in a young girl in the deltoid and triceps, in an elderly gentleman in the extensors of the forearms, in a traveller of middle age in the quadriceps femoris. This circumstance, therefore, would not be an argument against the indurations found in our form of headache and almost without exception very tender to

the touch, being included in the group of fibrous myositis. The course, the almost invariably favourable outcome, and the treatment (especially massage) are the same in both.

It is equally difficult to see one's way clearly concerning the nature of the deposits in the subcutaneous tissues. The handbooks upon pathological anatomy, so far as I have been able to discover, give no information upon what the northern authors designate from its clinical localization as cellulitis. As far as I am aware no single anatomical discovery has been recorded. Moreover I am under the impression that these subcutaneous indurations do not always stand in direct relationship to the muscular changes since they are often missing from parts where the underlying muscles are infiltrated with nodules. I have often wondered whether they might not be circumscribed dilatations of lymphatic vessels with stagnant, inspissated lymph dependent upon some circulatory disturbance. But even so, one is forced to conclude that there must be an increased development of connective tissue, at least in the immediate neighbourhood. These perhaps not entirely unfounded hypotheses can, as has been said, only be solved by direct anatomical investigations.

As regards the formation of these nodules, it would appear as though, in those predisposed to them,

they could be produced by local cold from evaporation. This is borne out by their frequent occurrence in people who perspire freely, particularly round about the head, also in women who frequently wash their heads with water, without adequate and rapid drying.

I recently saw in consultation a locksmith who had such nodules—as large as peas—exclusively in the occipito-frontalis, the nuchal muscles being entirely free. His headache was extraordinarily acute. The case interested me exceptionally since I had long wished to obtain such a nodule for microscopic examination. We advised the patient to allow one of these deposits to be extirpated, but he would only consent if his ailment could not otherwise be cured, which was more than we could conscientiously affirm. And in fact all the nodules disappeared in four weeks under local heat and massage and the headaches with them.

The statement is also sometimes heard that the deposits are gouty—in the strict sense of the term—such as are well known to occur in the auricles with uric acid arthritis. I am not aware that any such proof has been established in the affection under discussion, nor have I ever observed a typical attack of gout in these patients involving the metatarso-phalangeal joint of the big toe. Another circumstance which contradicts this assumption is that the great majority of sufferers from this form

of headache is composed of women and girls who, as is well known, are rarely attacked by genuine arthritic gout.

How are the severe headaches to be explained by the changes above described ? I would lay stress on the fact, in disagreement with Moebius, that most of our patients complained of acute pain in the head, not of splitting headache ; that very few spontaneously referred their pain to the occipital region. Not a few of the patients even refused to believe that the nodules were the cause of their ' headaches ' until convinced by their removal. I have also seen patients who complained only of pain on the head. In this case, however, there were no more than a few nodules, or even only one, particularly in the neighbourhood of the ear. There can be no doubt that the swellings in the subcutaneous connective tissue and in the insertions of the muscles as well as in their substance must set up a mechanical irritation of the ramifications and terminals of the sensory nerves in and around them, and that the inflammatory process (?) may *per contiguitatem* involve the latter themselves, or at least their neurilemma.

One need only remember that one of the commonest neuralgias, sciatica, often comes about through extension of a myositis to the nerve. The

nerves chiefly involved are the trigeminus and the sensory branches of the upper cervical nerves, the great and small occipital. In cases where muscles and skin-areas lower down are implicated the supra-scapular nerves must be involved. One may readily imagine that long-continued irritation of a large number of fifth-nerve endings in the scalp, such as is set up by multiple hard nodules, may be reflected to the intra-cranial area supplied by this widely distributed nerve, particularly via the recurrent branches, irritation of which, as has been explained above, can in all probability give rise to generalized headache. This conclusion requires no more justification than the explanation of temporal headache in old-standing dental caries. If we bear in mind that the fibres of the sensory root of the trigeminus extend from the pons some distance into the cervical cord, passing in turn into the fifth nerve nuclei, and that the nuclei of the cervical nerves are in close proximity, we can readily understand that a protracted irritation in many places in the distribution area of the sensory cervical branches (nodules or indurations) can extend to the brain and its coverings supplied by the fifth nerve. In my opinion it is not even necessary to assume Head's doctrine of the extension of a stimulus to the entire segment.

The objection may be raised: 'Why do other sources of irritation (rheumatic torticollis, occipital neuralgias, &c.) not generally give rise to pain, referred to the interior of the skull?' The answer probably is that a more lasting, more widely distributed stimulus is necessary, and that possibly in this respect there may be considerable individual variations referable to topographical differences of intercommunication between the finer nerve-twigs. This last factor must play no inconsiderable part. One need only reflect upon the relatively small number of sufferers from dental caries in the upper jaw whose pain is felt in the interior of the skull as contrasted with the thousands who feel it locally.

A variable relationship of exactly analogous nature obviously occurs in the cervical region. Some of my observations can only be explained in this sense. The following may be quoted as examples.

Some years since a colleague (a surgeon), aged 56, was sent to me by Professor Hoffa, for massage of the deeper neck muscles and fasciæ. The patient, until then always healthy and capable, had for a year been forced to abandon his practice and his work at a Children's Hospital, on account of severe and ever-increasing pain situated deeply in the nuchal region. He could no longer stoop nor drive, since the slightest vibration considerably increased the pain. An eminent surgeon

had diagnosed a malignant growth of the spine, another authority spondylitis. The patient had in the meantime developed the morphia habit and relapsed into a condition of despair. Hoffa considered it to be an inveterate inflammation of muscles, fasciæ and possibly even ligaments in the deeper parts of the cervical region. The patient referred his pain exclusively to their area, never to the head. After a month of daily deep massage, at first extremely painful, with preliminary application of heat, the patient was completely cured and gradually resumed his work in its entirety. He died five years later from the results of severe influenza, without having had any relapse of his disease.

A hairdresser, aged 24, had suffered for six months from intense headache referred to the interior of the occiput, often also felt over the vertex. For two months he had been unable to work. I made out scar-like indurations and deposits the size of lentils in the nuchal muscles and probably also in the deep cervical fasciæ, in exactly the same places as in the above-recorded case ; he referred his pain exclusively to the interior of the skull. After five weeks' treatment (local heat and massage) he was again able to take up work.

In addition to these pathogenetic discussions upon the hypothetical nature of rheumatic headache, I must shortly consider a few publications of the last few years, the contents and conclusions of which are lacking in all scientific self-criticism, are based solely upon fantastic speculation, and are only calculated to increase the confusion surrounding

a classification of the more independent forms of headache.

Recently G. Peritz [24] has made the attempt to ascribe to myogenous changes in the trapezius and sterno-mastoid, in which he observed tenderness, both migraine and its symptoms (scotoma, vomiting, as well as neurasthenic headache). He even asserts that all his cases were distinguished from genuine migraine in that they were acquired in later life; further that they did not occur in attacks, but took the form of a more chronic complaint, and finally that in no case did heredity exist. I make no doubt that he had to deal partly with rheumatic headache, partly with headache due to cerebral arterio-sclerosis, which had nothing in common either with hemicrania or neurasthenia. The symptoms accompanying migraine and neurasthenia (vertigo, vomiting, scotoma) he explains by the peculiar assumption that they depend upon the transference to the frontal region of the drag and tension of the painful neck muscles owing to the approximately globular shape of the head (! ?), or else by the effects of pressure upon (the fifth, tenth and sympathetic) nerves. Such speculative and unfounded views, ignoring all the main characteristics of hemicrania, are astonishing, the astonishment being converted into speechless amazement on reading the views of Aswadurow [25]. The latter comes to the conclusion that in nearly all his cases of migraine myalgia was present in the sterno-mastoid and trapezius, on one or both sides; further that in nearly all cases permanent inequality of the pupils was observable and that the pupil in the side of the more marked myalgia was dilated or (? !) contracted, conclusions which

are completely contradicted by the experience of most other authors, myself included.

A. Müller's [26] views are summed up as follows. (1) 'Every headache not due to organic disease of the brain or its membranes, of the skull, cervical vertebræ, eyes, ears, nose or teeth, is muscular and depends upon affections of the cervical, nuchal, and head muscles. The headache following head injury and migraine is also muscular. (2) The most important peculiarity of the muscular affection which underlies this headache is not the formation of "indurations" or "nodules", but exaggerated muscular contraction, "hypertonus."'

The following cases are submitted as illustrating the sharply defined clinical picture presented by this form of headache.

A. Two severe cases in women of middle age and above.

1. A widow, æt. 56. The headaches have lasted twelve years, beginning in America, where the patient formerly lived in a somewhat trying climate. The pains were intense and lasted as long as a week at a time, to be followed by shorter intervals of improvement, particularly in summer; but she was never actually quite free. True attacks were not complained of. The seat of the trouble was at the commencement mainly the vertex and the occiput, for the last four years the entire head, which felt as though about to burst. But even now the pain radiates towards the nape of the neck and the back. Cold compresses were never well borne, wrapping up the head was beneficial; chills had carefully to be avoided. At times there were pains in the chest and right thigh. For the last three months she had

hardly slept more than one or two hours, but then waked with acute pains the exact point of origin of which she could not fix. She was always obliged to get out of bed, as only then could she obtain any relief. There was no vomiting, rarely nausea, no lights before the eyes. The last few weeks, both night and day, she had been taking frequent doses of phenacetin and antipyrin, which always brought some relief, but at the time of writing existence had become unbearable to her. Her appetite had become very poor, she had lost much weight, and was unable to look after her affairs. Previous treatment had consisted in a six weeks' course of electricity—presumably galvanization—which was useless ; in America she also had morphia administered for a while, but had not had any for two years. She was quite certain that her parents had not suffered from headaches, nor were her brothers and sisters affected. She had not had any severe illness before the onset of this trouble, nor since. She has had no miscarriages ; her four grown-up children are in good health and have not had headaches. Up to her fortieth year she had practically never been troubled in this way.

Present Condition. A pale, diminutive, delicate-looking woman. Examination of the nervous system (pupils, fundus, reflexes) showed no abnormality. The second aortic sound is somewhat accentuated ; heart sounds normal otherwise. Urine free from albumen and sugar. Examination of the head discloses the following : Below and internal to the left-mastoid process is a spot in the trapezius about the size of a hazel-nut, very hard and extremely sensitive to pressure ; it cannot be separated from the muscle and only moves with it. In the right sterno-mastoid muscle, in its upper

third, is a similar spot, flat and about the size of a sixpence. In both parietal regions are numerous infiltrations, in size from a lentil to a bean, very resistant and barely movable and all extremely tender. In the middle of the vertex is a somewhat softer spot, about the size of a shilling, quite easily differentiated from the surrounding parts, but less tender to touch. In the forehead and temples there is little to be felt. On the other hand, in the upper part of the left breast there are numerous nodules of the size of cherry-stones and obviously situated subcutaneously; palpation of these causes acute pain. There is nothing similar to be found elsewhere on the chest-wall. In the right rectus femoris, near the middle, there is a tender induration about the size of an almond, and in the groove between the quadratus and adductors are to be felt numerous lentil-sized painful subcutaneous nodules.

Course. In the first month of treatment (massage, immediately precedent linseed-meal poultices, daily sitting; aperients) there was no alteration in the condition. From the fifth week onwards considerable improvement, although the diminution in size of the above-described spots proceeded very slowly. The patient was discharged cured after three and a half months' treatment. The breast and thighs were undertaken by a masseuse. The affected spots were diminished in size, but not entirely removed, pains not quite gone. The patient wished to have more massage to these parts. Five years later the patient stated that she had been quite free from headache in the interval, but had often experienced pain in the breast and legs. She was still extremely grateful.

2. The wife of a butcher, æt. 44, had for a year

suffered from severe pains in the head, particularly in the occiput and nape of the neck; when this became aggravated the pain extended as far as the forehead, but never commenced anteriorly.

It is almost always present. It regularly occurs on waking and frequently arouses the patient at night; the duration generally extends over the whole day. She has to sell in the shop almost continually, and is therefore much exposed to draughts, and the shop is insufficiently warmed. Moreover she perspires freely. For the last two months she has felt so weak that she has had to engage some one to help her. There is no heredity, no nausea, no vomiting. No severe illness preceded the onset of the pain. No evidence of syphilis. Appetite poor, bowels and menstruation regular. Warmth always does good, cold not well borne, the pain becomes worse in cold weather and with snow. In the hot summer months there is little complaint.

Present Condition. Examination of the nervous system, of the thoracic and abdominal organs displays nothing of note. Urine free from albumen and sugar. Isolated smooth nodules about the size of sixpences behind both ears, firm and tender to the touch. The trapezius and sterno-mastoid muscles on both sides, right more than left, from their insertions 4 cm. into the belly of the muscles are resistant and excessively tender to the touch. Skin and muscles in the middle cervical region are also more resistant than usual. All these places are tender even to a light touch. In the limbs there are only occasional and slight pains. Objectively there is here nothing to be made out.

Course. Improvement commenced after twelve sittings. After twenty-seven sittings cure was complete, with the

exception of one nodule over the left mastoid process, which is still somewhat tender on pressure. In wind and snow the patient experiences here a little pain. The rigidity in the muscles has disappeared. Two years later the patient told me that she only rarely had experienced the pains since her treatment, and that in great cold, whilst the degree of pain was quite bearable. She has been able since then to carry out her arduous work.

B. Two slighter cases in older women.

3. A widow, æt. 58. Until ten years ago periodical attacks of migraine shortly before the menses, with vomiting. For the last six weeks headaches 'of quite a different nature', which with great regularity wake her every morning at five o'clock, and then mostly last the entire day. They begin mainly in the occiput; after a few hours, however, they include the vertex and forehead to a very painful degree. During this period there has also been pain in the upper part of the back, which has lately diminished under the influence of massage. The patient has the head shampooed every month, first with warm water, then with cold, and goes out immediately afterwards.

Present Condition. Beyond a trifling enlargement of the heart to the right and somewhat faint sounds (to which signs may probably be attributed the occasional asthmatic disturbances occurring in this patient), increased deposit of urates and enlargement of the inter-phalangeal joints of both hands, examination of the rest of the body disclosed nothing. Behind and above the right ear are to be felt several subcutaneous indurations of the size of lentils, not very firm, but

extremely tender to the touch ; the same are present in the left parietal region. The nuchal muscles and those of the upper part of the neck feel distinctly more resistant than normal ; manipulation of them causes exclamations of pain.

Course. Strict injunctions against careless head washing, and daily massage by a masseuse instructed and controlled by myself, resulted after three and a half weeks in complete removal of the cephalalgia and the objective changes described. No relapse after two and a half years.

4. A Baroness, æt. 73. Never suffered previously from headache. She lived in a spot exposed to inclement winds and in an isolated house. Complained of severe headache following influenza in the spring of 1901, with constant pain all over the head during the last three months, especially on the vertex and nape of neck, robbing the patient of rest and making her extremely nervous. She had already tried every possible remedy in vain. Physical examination revealed nothing except general arterio-sclerosis. No distinct infiltrations or nodules were to be felt, but widespread diffuse rigidity of all the nuchal muscles, which were distinctly tender. There was some remission of pain even after the first three sittings ; a complete cure in three weeks. No relapse up to the time of her death from apoplexy seven years later.

C. Moderately severe form of disease in a middle-aged man.

5. Manufacturer, æt. 43. Is exposed in his work to frequent considerable differences of temperature. Slightly neurasthenic, but so far without headache. After

a severe attack of influenza (possibly even a short time before), which kept him for six weeks in bed, severe pains began in the occipital and cervical regions, soon assuming a boring, raging character and extended over the whole of the head. He often had the feeling as though the contents of the skull were so engorged with blood that they were about to burst. The nights were almost entirely free, even towards evening the trouble lessened. There was neither nausea nor vomiting; neither syphilis, alcoholism, nor excessive smoking.

Present Condition. The nervous system and other organs were apparently healthy. In the occipital and nuchal regions were irregularly distributed a number of deposits, varying in size from a lentil to a pea, mostly readily movable, not very hard and only moderately sensitive to the touch. In the upper part of the right splenius and left trapezius were several discrete scar-like indurations, of the size of almonds, lying in the muscular tissue and very tender to touch. Both these muscles and the sterno-mastoids felt more resistant than usual.

Course. Under treatment by thermophore and massage, a cure resulted in five weeks, greatly to the patient's relief, who had made up his mind that he had a severe brain trouble. No relapse after one and three-quarter years, his work in the factory having been so arranged that he is no longer exposed to marked differences of temperature.

D. Very severe type in a young woman.

6. A teacher, æt. 28. Father has been twelve years in an asylum, the dementia being ascribed to business losses. The patient enjoyed good health up till two years ago, when she had thrombosis in the left leg. The veins have been

excised. Had never had headaches before, nor are these in the family. Six months ago, she got wet to the skin and was several hours before she could change her clothes. The next day she got a severe cold which lasted a month; she got rid of it after several nasal operations. Then commenced tearing, boring pains, constantly getting more severe, at first only on the right side of the head, soon, however, including the whole head and radiating down into the cervical region. They persist almost continuously day and night, and are not accompanied either by nausea or vomiting. She sleeps badly, and has for fourteen weeks been incapacitated from work. Recently she underwent a seven weeks' rest-cure without any improvement; on account of her headaches she has lately had the frontal sinus and both antra explored, whilst opening the sphenoidal sinus was contemplated. Bowels, appetite, menses are normal. For the last three months there have also been acute pains in the left mammary region.

Present Condition. A big, strongly-built, rather pale and bloated-looking woman. The nervous system and internal organs display no objective abnormalities. In the trapezius and sterno-mastoid muscles on the right side are several deposits, the size of a cherry-stone or almond, firm and very tender; in the scalp at the vertex and in both parietal regions can be felt a whole series of flat infiltrations ranging from the size of a lentil to fully that of a shilling, mostly very firm; delimitation of these causes the patient to flinch.

There are one or two large indurations in the intercostal muscles of the left second and fourth spaces.

Course. The usual treatment led to considerable improvement after four weeks. Since this was not

accompanied by the desired diminution in size of the deposits, the cure had to be extended over eight weeks, from the sixth week onwards sittings taking place only every two or three days. Complete cure resulted and no relapse had occurred two years later.

E. Two cases of a slighter character in young women.

7. Patient, æt. 27, six months pregnant. For the last six weeks has had severe pain night and day, particularly in the occipital region and back of neck, during the last few weeks over the whole head. Formerly no headaches; no family history of the same. The patient is in despair and thinks she will never get well. There is no cause discoverable. Has been perspiring freely during her pregnancy; bowels regular, appetite good. In the subcutaneous tissues of the middle of the nape of the neck there is a considerable number of nodules, about the size of a pea and tender to the touch, one or two of the size of a pea in the parietal region of the scalp. Nothing particular to be felt in the neck muscles. Twenty sittings of massage effected a complete cure. She promised, in case of a relapse, to return to the polyclinic, but has not put in an appearance.

8. Patient, æt. 20. Suffered much from headache even as a young girl, but never so severely nor continuously as for the last four or five weeks. No assignable cause; no heredity nor antecedent illness. The pain principally affects the temples, the forehead and vertex, to a less extent the occiput. The pain is not accompanied by vomiting. Sleep is disturbed; bowels and menstruation regular. One child, has been married two years. Great hyperæsthesia of the whole scalp, particularly over both temples and parietal regions; in the latter

and on the vertex were several spots of thickening, rather soft to the touch, from which the patient flinched readily. In the neck and nuchal region nothing similar was to be felt. After four sittings there was considerable improvement, then relapse during menstruation. Cure resulted after another thirteen sittings. I have no information upon the subsequent history of the patient, but it may be assumed that in case of a relapse she would have returned to me.

F. Headache with indurations, localized chiefly to the temples and vertex.

9. Merchant, æt. 36. Ten years ago suffered from phthisis ; after a three months' cure has remained well till now. No history of headaches in the family, but of tuberculosis. Seven years ago had severe pains all over the head and in the back of the neck, lasting several weeks, cured by powders. For several years afterwards only had headaches now and again ; the last four years they have returned more frequently. For five months has had severe pains in the temples, particularly the left ; during the last few weeks has had them again in the back of the neck. Occasionally there has been a feeling as though a wire were drawn through the vertex and the tongue. The pain lasts for weeks at a time and then for a few weeks is better ; there are no real attacks, no vomiting. Occasionally there are stabbing pains in the vertex. Lately he has suffered from frequent pains on chewing, the temporal muscles seem to 'swell'. Draughts and winds made the pain distinctly and considerably worse. The patient is much in the open air ; he has always sweated profusely about the head ; no history of syphilis or alcoholism.

Present Condition. The left temporal region, as can at once be seen, is distinctly prominent; there is here a rather soft, flat swelling of the temporal muscle, which is very tender, particularly on firm pressure. At its insertion in the squamous portion of the temporal bone there are numerous hard nodules of the size of a lentil, which are also tender. The right temporal region is also distinctly swollen, though less so, and is less tender. In both parietal regions there is a hard movable nodule of the size of a pea in the occipito-frontalis tendon, very sensitive. In the neck a few small infiltrations in both trapezius muscles, which latter are tender to touch. The insertions into the mastoid processes and nuchal lines are free. In the centre of the vertex there is a part of the skin and scalp of the size of a half-crown in a condition of boggy swelling; this region is also extremely tender.

Course. Slight improvement at the end of a fortnight; occupation resumed in three weeks, but treatment continued at time of writing as the swellings had not disappeared.

B. HEADACHES ASSOCIATED WITH DISEASES OF INDIVIDUAL ORGANS

1. HEADACHES IN BRAIN DISEASE

(*a*) *In cerebral tumour.*

Headache is the most constant and therefore the most important general symptom of cerebral tumour; this frequency is also fairly independent of the seat of the tumour. Every protracted, obstinate headache must arouse suspicions of this disease; it is

a signal with which no other morbid symptom is comparable. It is described as dull, boring, or gnawing, and always referred to the interior of the skull; the patients often declare that they have a feeling as though the head were about to burst. It can best be compared with the migraine headache, and, like the latter, is often accompanied by nausea and vomiting. The degree of pain is generally extreme, so unbearable as frequently to drive the sufferer to suicide. In the later stages of the disease it is often less felt on account of the increasing lethargy, but even then does not forsake the patient, as may be deduced from the groans, from the head-holding and other manifestations of the most acute pain. In children, even with cerebellar tumours, when pain in adults is almost without exception intense, I have had the impression that it is not so acutely felt, perhaps on account of the greater elasticity of the cranial bones; but even at this age it may be extraordinarily severe.

This symptom in general follows the rule laid down above, i.e. it is moderate at the commencement and increases with the other manifestations. In many cases, however—a fact to be emphasized from a diagnostic point of view—it shows a marked intermittence, and for weeks or months may disappear or cause little disturbance. The patients can then

pursue their avocations for prolonged periods. It is obvious that, under such conditions, particularly when other general signs such as optic neuritis or central symptoms are lacking, differential diagnosis from migraine may offer great difficulties. Although such observations are fairly uncommon, I would like to record a most instructive one of my own which has been studied from an anatomical point of view by Max Landau.[27]

The patient, a merchant, æt. 29, came from a heavily afflicted family. The father had been many years confined in an asylum ; the nature of his complaint was not ascertainable ; he died of nephritis. The mother had been some years in the same asylum suffering from hysterical manifestations, and the only sister on account of dementia præcox. There was a history of severe migraine running through several generations of the mother's family.

In November 1906 the patient, who shortly before had received an injury to the foot through a large nail, suffered from general convulsive attacks, ascribed to reflex epilepsy. Extraction of the nail left a deep scar on the foot ; after excision of this the attacks ceased. In November 1907 the patient was again under medical treatment, after having been a whole year absent and at work. This time he complained of severe hemicrania following upon exertion. Examination revealed no sign of organic brain mischief and the condition improved visibly under medicinal treatment (bromide, arsenic) and after galvanization. Next year (December 1908)

the patient was several months under treatment for the same trouble. He now complained of occipital pain with occasional vomiting. Examination, however, revealed nothing to justify a diagnosis of tumour and there were no other central symptoms; the fundus oculi was normal, the patellar reflexes increased, but no ankle-clonus, no Babinski; no retardation of the pulse. In the subsequent spring and summer (1909) the patient had so far recovered as to be able to attend to his business, and in the later summer to undertake a tour in the mountains. He was completely free from pain up till January 14, 1910. Then the pains began suddenly, particularly in the occiput, and at the same time occasional vomiting occurred. The results of examination were: head movements free, no tenderness to pressure or percussion, pupils, fundus oculi, other cerebral nerves all normal, no retardation of pulse. Patellar reflexes symmetrically increased, no ankle-clonus, no Babinski. On January 25 there set in for the first time distinct intention-tremors of the whole of the left arm, to a less degree of the left leg. Medicinal treatment was followed by improvement. On January 31 slight left-sided ptosis was visible, the other ocular muscles were free, tongue and facial nerve normal. The headache was much better, fundus normal. The tremor on the left side of the body became more pronounced, but there was no ataxia, no ankle-clonus, no retardation of pulse, no Babinski. The condition improved so much that the patient was able to be several hours out of bed daily. On the evening of February 6 death ensued suddenly, before I could be summoned. As I subsequently ascertained, a violent attack of vomiting occurred on the morning of February 6, with return of the

occipital headache. The speech was reported to have been indistinct; the patient complained of seeing specks in front of the right eye. In the middle of the day involuntary evacuations occurred. In the afternoon the condition improved so much that the patient was able, three hours before death, to take a basin of bread and milk. About nine o'clock he fell back dead in bed.

The characteristic feature of the case consists in the three remissions, each lasting nearly a year, which closely simulated a complete recovery. And even during the last illness of some three weeks, and during the last day, immediately before death, considerable improvement set in. Noteworthy, too, is the absence of any psychical manifestations, and of all cerebral pressure symptoms which might point to tumour. Taking into consideration the severe migraine prevalent in the mother's family, the diagnosis of hemicrania was made (it appeared as though it were in this case an equivalent of epilepsy). It was not until the first sign of irritation showed itself two weeks before death in the shape of intention-tremor of the left side of the body that a strong suspicion of tumour arose, and the probability was assumed of a growth in the neighbourhood of the right thalamus, presumably extending further forward. The necropsy disclosed a diffuse glioma of the right frontal region with extensive areas of softening invading the right corpus striatum.

More often hour-long and day-long intervals alternate with equivalent periods of the most severe pain. Then follow attacks of vomiting, occasionally also retardation of the pulse accompanying the headache. This interchange may particularly be seen in cases of tumours of the posterior fossa, probably because these are prone to be accompanied by hydrocephalus of variable degree. Aggravated headache as well as profuse vomiting is in such cases often produced by change of position. All factors leading to increased flow of blood to the head, psychic disturbances, consumption of alcohol, &c., or such as lead to congestion, even if only transient, e.g. straining at stool, coughing, sneezing, movement, vibration, may all aggravate the pain considerably. Patients, therefore, much prefer to lie quite still.

Only very exceptionally are the headaches completely absent throughout the whole or a great part of the course of the disease. It is occasionally the case with small tumours, which, owing to their situation, cause such well-marked localizing symptoms as to lead to operation before they attain any great size.

As regards the situation of the headache it is generally felt diffusely over the entire skull. In many cases it selects well-defined areas for a shorter

or longer time. Thus in cerebellar tumours it is very often complained of in the forehead (there is also sometimes in such cases marked tenderness on pressure over the supra- and infra-orbital nerves); in growths of the frontal region, on the other hand, it is often complained of in the occiput. One should, nevertheless, beware of drawing conclusions as to topical diagnosis from these statements. It is only when the seat of spontaneous pain persistently coincides with that of tenderness to percussion and pressure that the probability increases of the tumour being found beneath this spot, especially if a tympanitic sound can be elicited there on percussion. But even when all these signs coincide one can readily be deceived, as I once was when the right side of the posterior fossa was opened, whereas the tumour sprang from the anterior horn of the right lateral ventricle and grew into the right lobe. The most stringent care must be taken in this respect.

The differential diagnosis from migraine headache may, as mentioned above and shown by an example, present difficulties when the pain of tumour also occurs at intervals, and general manifestations, particularly optic neuritis and central symptoms are long absent. Confusion can hardly arise with neurasthenic pressure, on account of the slighter intensity of this pain, nor with the rheumatic form

in face of careful anamnesis and local examination. When any doubt arises examination of the fundus oculi should never be omitted, even if there is no complaint of loss of vision. Patients with tumour, especially at the beginning of the ocular changes, frequently remain free from all disturbances of vision; on the other hand they are sometimes troubled with this from the beginning and visit the ophthalmologist in the first instance. But even when papillitis is in evidence it must be remembered that the conjunction of this with headache may, although seldom, be present in the following affections: high degree of chlorosis (particularly in association with thrombosis of the superior longitudinal sinus), nephritis, disseminated sclerosis and chronic lead poisoning. In all these affections, however, the other pathognomonic manifestations soon lead to a correct diagnosis.

Prognosis and **treatment** are naturally those of cerebral tumours. Everything depends upon certainty of topical diagnosis and operative accessibility. If the tumour cannot accurately be localized, as indeed is frequently the case, or cannot completely or at all be removed, then the question of decompressive trephining has to be raised. This palliative operation often succeeds in removing or appreciably alleviating the headache or general symptoms for

a considerable time. If the case is only one of so-called *pseudo-tumor cerebri*, in which the manifestations are identical with those of real tumour, this operation will appreciably accelerate a complete cure.

In view of previous pathogenetic discussions it need not here be further emphasized that headache in cerebral tumours is conditioned by increased intra-cranial pressure. It is the result of the disproportion between cranial capacity and the brain volume augmented by the tumour and by external (and often internal) hydrocephalus. Thereby is caused increased tension of the dura and mechanical irritation of the recurrent branches of the trigeminal nerve which ramify in it. Probably this irritation is increased by disturbances of nutrition of circulatory origin in the vasa nervorum, which also in time occur as a direct result of increased pressure.

(*b*) *In cerebral abscess.*

Headache is one of the earliest and most constant symptoms of cerebral abscess, otitic, traumatic, or metastatic. Its degree may vary from trifling to the most severe. On the whole it is not of so great a severity or obstinacy as in the case of tumour ; it may, however, for a long time dominate the clinical picture as I have frequently seen happen in traumatic

abscess of the right lobe. Generally speaking, its seat, and in particular, the localized tenderness of the skull to pressure and percussion is of greater value in abscess than in tumour; notably in the uncommon subdural encapsuled variety. It is also aggravated by anything leading to increased blood-supply to or congestion of the brain.

If the headache is associated with fever, particularly of intermittent type, this is strongly suggestive of cerebral abscess, since this association of symptoms is otherwise found almost exclusively in certain forms of meningitis (q.v.). In this affection, however, there are for the most part other fairly unequivocal phenomena, such as retraction of the head, general hyperæsthesia, Kernig's sign, &c. Fever is not necessarily present throughout the whole course of the abscess. Papillitis is lacking far more frequently in abscess than in tumour; its absence, therefore, must not lead to a negative conclusion. Central symptoms are also more frequently wanting, but they must always be carefully sought. This is the more easily done since the seat of the most usual form of abscess, viz. the otitic, lies almost always either in the temporo-sphenoidal lobe or in the cerebellum. If it is in the right temporal lobe all localizing symptoms may be absent.

Diagnosis of cerebral abscess is on the whole

more difficult than that of tumour. It is always uncertain if none of the well-known ætiological factors are demonstrable (ear-trouble, head-injuries, primary suppurative affections, particularly of the lungs). Sometimes it will be facilitated by an exploratory puncture done with every precaution.

Prognosis and **treatment** are those of the underlying condition.

(c) *In hydrocephalus.*

In congenital hydrocephalus there usually are no complaints of headache, whether from the inability of children to express themselves clearly, or on account of the capacity of the skull for distension, whereby no increased tension of the dura comes about. The latter is the more plausible explanation.

In acquired hydrocephalus headache plays an important part, both in the so-called idiopathic form, the genesis of which is in many respects debatable, and in the secondary. The latter variety occurs in many acute infectious diseases (pneumonia, typhoid fever), more frequently in tuberculous pleurisy, not uncommonly also in acute suppurative otitis media. Finally, hydrocephalus occurs in addition to cerebral tumour or abscess as a simple effusion from obstruction in the form of blocking of the foramina of Monro and Majendie,

or as a result of pressure upon the *Vena magna Galeni*.

It is not surprising that the headache is usually the more severe the more quickly the affection is developed, worst of all, therefore, in acute acquired hydrocephalus or *Meningitis acuta serosa* (Quincke). In addition to headache there are usually vertigo, vomiting, confusion, optic neuritis, and cerebral ataxia. The clinical picture is frequently that of cerebral tumour, particularly of cerebellar tumour; often enough these two affections are mistaken one for the other, since the differential diagnosis may become extremely difficult. The readiest means of distinction lies in the absence of central symptoms in hydrocephalus and in the not uncommon variations in intensity of the manifestations with remissions, which have been known to last a year. But even these characteristics may fail. The only resource then lies in puncture of the ventricle at intervals; if these do not lead to a cure, after some time a tumour of the posterior fossa of the skull is probably present. As with the other symptoms headache in acquired hydrocephalus may be extraordinarily changeable in its intensity. There are cases characterized by acute exacerbations throughout a long chronic course, death following after years. On the other hand Quincke has described

very mild cases in which the only constant complaints have been of headache and vertigo, all objective symptoms being absent; in such cases confusion with neurasthenia can readily occur (cf. above, the section upon ' Migraine ').

(*d*) *In meningitis and encephalitis.*

In the various forms of acute and sub-acute meningitis—the chronic syphilitic forms will be discussed later in the section on *lues cerebri*—the common tuberculous basal meningitis, epidemic cerebro-spinal meningitis, as well as suppurative lepto-meningitis, the last of which most commonly arises from purulent otitis media or caries of the petrous portion of the temporal bone, headache is one of the earliest symptoms. In the sometimes protracted prodromal stage of infantile tuberculous meningitis, too, it often constitutes an initial manifestation which is at first intermittent, later persistent and of great severity. Whilst the seat of pain in purulent lepto-meningitis is often a circumscribed one and, corresponding to the starting-point of the pathological process, affects the temporal and lower parietal region, in the epidemic and tuberculous forms it includes the whole head and later becomes localized by preference to the occiput and nuchal region. The accompanying fever, the retrac-

tion of the head, the generalized hyperæsthesia, the convulsions and the familiar symptoms showing interference with the cranial nerves (oculo-motor nerves, facial, &c.), clearly indicate the nature of the affection. A certain precaution is necessary in the diagnostic differentiation from cerebral abscess since fever is also often present in this disease. The pathogenesis of meningitic cephalalgia is a double one. It comes about firstly through compression of the dural nerves by the exudate and then through increase of the intra-cranial pressure which results from the accompanying internal and external hydrocephalus. Not infrequently the increase of pressure is contributed to in tuberculous meningitis by larger tubercles which are situated in cerebral and cerebellar cortices, and which break through into the subarachnoid space.

The prodromal periods of the acute, non-suppurative encephalitis, which have become especially familiar in the last two decades as a result of influenza epidemics, have also not infrequently been accompanied by headache. This disease will cause no diagnostic difficulties, since the clinical picture developing for the most part rapidly with fever and paralysis of a cortical character (mono-hemiplegia, occasionally also aphasia) can hardly fail of recognition, if a reliable history is obtainable.

(*e*) *In pachymeningitis interna* (hæmatoma of the dura mater).

In this affection, which is usually referable to chronic alcoholism, the hæmorrhagic diathesis or serious injury to the skull, severe headache precedes or follows the frequently occurring coma. It is not uncommonly localized, especially in head injuries; its seat may then correspond with the site of greatest sensitiveness to pressure. The commonly occurring fever, convulsions and paretic manifestations which point to compression of the cortex must be taken into consideration in differential diagnosis, by no means always easy, especially from meningitis. Marked remission of all symptoms, particularly of headache, and the localization of paralytic phenomena to the same side as that of the injury (as a result of contre-coup), may readily lead to confusion with hysterical manifestations.

(*f*) *In cerebral and cerebro-spinal syphilis as well as general paralysis.*

Headache is one of the earliest and most constant signs of gummatous basal meningitis as well as of syphilitic meningitis of the convexity and the vascular form of syphilitic cerebral disease, which varieties, as is well known, may all be associated with spinal meningo-myelitis. Headache by no

means infrequently constitutes for a long time the sole symptom of the disease, a fact which should always be borne in mind. The pain in these conditions may attain an extraordinarily high degree of severity and may manifest itself in well-defined attacks; it is characterized, like cerebral and spinal syphilis in general, by marked changes. It is aggravated by mental and bodily exertions. Very commonly, as is the case with many luetic pains, it displays nocturnal exacerbation, and is not infrequently restricted to this time. These peculiarities of syphilitic headaches are, in my experience, insufficiently realized, and it should be made an invariable rule to question patients upon this point. It should nevertheless be borne in mind that absence of this nocturnal aggravation does not disprove the luetic character of the pain. Whilst in the basilar form the headache generally includes the whole head, only rarely showing preference for the occiput and cervical region, but sometimes being localized to the eyes and lower frontal region, in meningitis of the convexity it is often confined to the upper parietal area, where there is very frequently circumscribed tenderness to pressure and percussion. I have repeatedly observed the same in the case of arterial degeneration in this neighbourhood (that of the *arteria fossæ Sylvii*).

In **diagnosis** search must be made for the central localizing symptoms characteristic of all forms of cerebral or cerebro-spinal syphilis, first and foremost for the Argyll-Robertson sign, then for those connected with the basal cranial nerves which, as is well known, may all be damaged by gummatous infiltration. In syphilitic inflammation of the meninges of the convexity cortical symptoms dominate the clinical picture (Jacksonian epilepsy, mono- and hemi-pareses, disorders of speech of aphasic and articulatory character, if very widely spread also psychic disturbances). The vascular form may also produce a completely similar syndrome, which, however, upon occasion manifests a more fleeting character and is entirely dependent upon the extent of the endarteritic or thrombotic process. If there remain any doubt concerning the luetic nature of the phenomena the newer methods of examination of blood and cerebro-spinal fluid must be undertaken.

It is hardly necessary to emphasize the fact that the **prognosis** of headache in this affection, in common with that of the other symptoms, is dependent upon a thorough course of antisyphilitic treatment.

In the section upon 'Migraine' it was mentioned that symptomatic migraine attacks are of fairly

frequent occurrence in general paralysis. These headaches occur periodically in the prodromal stage of dementia paralytica, mostly in the form of 'migraine ophthalmique' (with scintillating scotomata, &c.). Such attacks are to be distinguished from genuine migraine by their commencement in middle age and by the absence of heredity and family history. More detailed examination will generally disclose one at least of the other symptoms of general paralysis: Argyll-Robertson pupil, disorder of speech, increase or absence of the knee-jerk, psychic abnormalities, recently commenced epileptiform seizures. Failing these signs the almost invariably occurring positive Wassermann reaction is of the greatest value. A simple oppression of the head, however, resembling that of neurasthenia, may long be complained of in the commencement of this disorder.

I recently saw as an unusual and misleading commencement of a fairly rapidly progressive dementia paralytica, an extremely severe headache lasting several weeks, exclusively confined to occiput and nape of neck, ushered in with slight mental dullness. With exception of the Babinski sign on the left side no objective change in the nervous system was discoverable. The probability appeared to be, despite the absence of papillitis, in favour of a cerebral tumour. Then followed melancholic sensations, alternating with euphoria; finally the

patient went blind after the pupil had become inactive to light. The necropsy was characteristic of progressive paralysis ; the entire course extended over six months.

In these syphilitic or para-syphilitic affections, headache ensues, either through direct specific disease of the dura or compression of the latter by the inflamed pia and arachnoid, or finally as a consequence of fluctuations of intra-cranial pressure in the arteritic form of cerebral syphilis.

(*g*) *In cerebral arterio-sclerosis.*

In all stages of calcification of the cerebral arteries, headache is a noteworthy symptom. It doubtless occurs mainly through the control of the regulating vasomotor apparatus over the inelastic vessel walls of the brain and its membranes having become uncertain and irregular, and in the most advanced cases almost paralysed. The fact must also be taken into consideration that the vasomotor nerves distributed to the vessels themselves must undergo alteration through the atheromatous process. To this must be added the anæmia (ischæmia) of the vascular areas brought about by narrowing of the arterial lumina. Finally the nerve-terminals in the dura may be directly irritated by the alterations in pressure conditioned by the often coincident cardiac hypertrophy.

The headache may in the milder forms of this disease exist for a long time as the sole pathological manifestation; for the most part, however, it is associated with extremely obstinate vertigo, frequently also with loss of intellectual capacity and depression of spirits. It generally manifests itself as oppression localized to the forehead, and may assume in these cases a particularly obstinate and harassing character. It sometimes undergoes exacerbation to severe pain; I have seen such aggravations occurring particularly frequently at night, although syphilis could with certainty be excluded; in such cases there had been some form of antecedent over-exertion, coitus being one of them (see above, the suggested explanation of nocturnal exacerbations).

Prognostic and therapeutic significance attaches to the headaches, often severe, which precede cerebral hæmorrhage or thrombosis as a premonitory sign. They are also associated with vertigo, occasionally with paræsthesiæ or pareses, transient at first, in hands or feet. If these warnings receive due attention, one can often, by means of absolute rest, derivative measures and careful regulation of the habits of life, postpone or prevent the onset of serious mischief. If the attempt is unsuccessful the patients are often troubled by headache in the later stages of paralysis (pseudo-bulbar paralysis, encephalomalacia).

The **differential diagnosis** from neurasthenic headache, which, as has been mentioned above, may, if long continued, pass directly into the arterio-sclerotic, is at times far from easy, so long as there are no localizing symptoms. One must always bear in mind the possibility of an arterio-sclerotic basis for obstinate cephalalgia, beginning towards the end of the fifth decade or later. Under such circumstances the heart and accessible arteries must be carefully examined, the blood-pressure be estimated, and the urine examined for albumen. Information may sometimes be obtained by an ophthalmoscopic examination of the fundus oculi for arterio-sclerotic changes. In some cases I have found concurrent Menière's symptoms of value from a diagnostic point of view, e.g. marked attacks of vertigo with vomiting, tinnitus, and deafness of central origin, very probably due to arterio-sclerotic changes of the internal auditory artery. I had such a case under observation five years ago (a man of 65); by means of a methodical dietetic and medicinal course of treatment the patient was enabled, if in restricted degree, to attend to his business and materially to reduce the headache.

Prognosis is unfavourable on account of the underlying condition; nevertheless a reasonable mode of life may lead to years of good health free from pain.

In **treatment** a careful regulation of the habits of life is above all to be aimed at. So soon as the diagnosis is established only purposeful energy and thoroughness in treatment can avert more serious trouble. Limitation of professional activity is indicated, sometimes its complete cessation. Alcohol and tobacco are, preferably entirely, to be interdicted; the unfavourable influence of nicotine poisoning upon the sympathetic vascular nerves will in the future have to be taken much more into consideration when we have learnt more accurately to estimate the dangers following in its train. Everything must be carefully avoided which is calculated to raise the blood-pressure or to lead to cerebral hyperæmia, above all bodily, mental, and sexual over-exertion and emotion of every kind. Hot foot-baths (see above) are highly to be recommended, also mustard-leaves to the nape of the neck or chest. A copious daily evacuation, if necessary by means of aperient waters, is absolutely essential. Consumption of meat should be restricted; adequate sleep should be provided for. As regards drugs, iodide should above all be administered over long periods in small doses: iodide of potassium, 10–20 grs. night and morning, sajodin tablets, 0·5 gramme, or iodival, 0·3 gramme, one tablet three times a day. The combination of sodium bromide with potassium

iodide is also very beneficial. These remedies are best administered three or four times a year for four to six weeks at a time. In the last few years also I have had very good results from diuretin (theobromine sodium-salicylate), which is also effective in arterio-sclerotic angina pectoris: 15 grs. in tablet form or solution two or three times a day for one to three weeks. Naturally in a form of headache, which by its nature is protracted and irksome, recourse will be had to the various analgesics and anti-neuralgics. If their use in exacerbations cannot be avoided, antipyrin, 5–15 grs., phenacetin, 5–15 grs., or pyramidon, 5–10 grs., should be prescribed. Cold applications, the ice-bag for a short while, always lessen arterio-sclerotic headache.

Climatic cures at an altitude and sea-bathing are to be avoided, mild sea-air and forest resorts at a medium altitude are not contra-indicated; in plethoric individuals the cures of Kissingen, Marienbad, Homburg, &c., may be advised.

(*h*) *In circulatory disturbances associated with heart and lung disease.*

All affections of the neighbourhood of the thoracic organs which lead to a passive hyperæmia of the brain may be associated with headache. In particular does this hold true of emphysema with diffuse

bronchitis, uncompensated valvular heart-disease, as well as all forms of chronic myocarditis with back-pressure signs. (The last-named affections can also cause headache through cerebral emboli.) Here must also be mentioned all diseases which lead to compression of the great vessels in the thorax or neck (aneurysms, mediastinal tumours, enlargements of the lymphatic glands in the neck, thrombosis of the great veins in the neck). The return of blood from the head may also be interfered with by too high and narrow a collar. (These should be given up if for no other reason because they interfere with the very important ventilation of the chest and neck, and because they cause a weakening of the throat, leading to a predisposition to sore throats.)

The headache of passive hyperæmia is protracted, is often felt as a heavy pressure affecting the entire head, and only increases to real pain when from any cause the congestion is rapidly augmented.

The **diagnosis** is only possible in the presence of one of the above-mentioned causes. The **prognosis** and **treatment** are those of the underlying cause.

(*i*) *The headache of hysteria.*

The typical hysterical headache is the so-called *clavus hystericus*, the hysterical nail. The patients complain of a peculiar gnawing pain at the vertex

or to one side of it, less commonly at the occiput, over an area varying in size from that of a half crown to the palm of the hand ; they often volunteer the statement that they feel as though a nail were being driven into the skull. Its duration is variable ; it may be hours, days, or weeks. Like other hysterical phenomena it is especially aggravated by emotional occurrences, and is frequently associated with pronounced hyperæsthesia of the scalp and an endless variety of paræsthesiæ (pricking, burning, sensation as of trickling water, &c.). This form of headache may go hand in hand with vomiting or nausea, or even with a typical scintillating scotoma. In such case there is probably an association with migraine, which is not uncommon in hysterics. A careful anamnesis, with special reference to the onset of the disease, will often resolve the difficult problem. An obstinate occipital headache extending to the temples and forehead is also not uncommon in hysteria. In order to avoid diagnostic errors one should never omit to examine occiput and nuchal region for nodules and indurations, nor forget that a hysterical patient may add a rheumatic headache to her other troubles. These occipital pains may in isolated cases be associated with rigidity of the neck, hebetude, and delirium, and so simulate the picture of a tuberculous basilar meningitis—*pseudo-meningitis*

hysterica. The affection, however, occurs for the most part in attacks and does not develop gradually, whilst the absence of fever, pulse retardation, and all localizing symptoms should arouse suspicion.

Hysterical headache, much more frequently than neurasthenic, assumes a neuralgiform character, mostly in the guise of neuralgia of the supra-orbital and occipital nerves (hysterical pseudo-neuralgias), which are at times extremely difficult to distinguish from real neuralgias, since the typical tender points are also present.

In all these cases, in so far as they are not distinguishable by means of the above enumerated characteristics, the so-called hysterical 'stigmata' should be looked for—absence of corneal reflex, anæsthesia of the palate, hemi-anæsthesia and hemi-hyperæsthesia, and note be taken of the often fantastic, exaggerated nature of the complaints and the anomalies of character often to be recognized after prolonged observation of hysterics. Finally it should be borne in mind that hysterical headache, like most of the manifestations of this often obscure neurosis, is, in keeping with its pathogenesis, often in the highest degree responsive to suggestive treatment, whether hypnotic or waking. Thus, after exhausting all possible differential diagnostic criteria, light may come *ex adjuvantibus*.

There is no satisfactory explanation of the special localization of hysterical headache in the form of clavus.

(*k*) *Headache in Epileptics.*

In the course of so-called genuine epilepsy—epileptiform attacks caused by organic changes are symptoms of cerebral disease which have for the most part been already discussed (tumours, dementia paralytica, encephalitis, &c.)—headache plays a by no means unimportant and, as it seems to me, an underrated part. As an aura it is not uncommon in the form of a dull, diffuse, mostly transient pain; it may also resemble a migraine attack (with hemianopic disturbances). More often, however, it occurs in the intervals between attacks, in my experience most frequently as frontal oppression, and may be a lasting and severe burden to the patient. The **diagnosis** rests upon the most important symptoms of this complaint, viz. the convulsive attacks, loss of consciousness, and the characteristic dementia.

(*l*) *Traumatic headache.*

Every direct or indirect injury to the skull or skull-contents may produce headache. The most important are naturally actual head-injuries, but spinal concussion, e.g. through heavy falls in a sitting

posture, transmitted to the skull, may have the same effect.

The severest head-injuries are in the first place simple and compound fractures of the skull which, as is well known, are often accompanied by depression of bone and splintering of the inner table. The latter condition may arise without visible injury to the soft parts or outer bone surface. In these events we have to deal with direct pressure on the dura, which is elevated by circumscribed or diffuse hæmorrhage (hæmatoma), thus leading to severe irritation of the meningeal nerves. Later, adhesions may form between bone and dura, or if the bone is missing, between the soft parts and the dura, or between this and the arachnoid or pia mater. It is obvious that such adhesions may, during movement, purely mechanically bring about pain of the most severe character. These are mostly circumscribed and conditioned by the seat of injury; at times they may extend into the adjacent parts, they are generally persistent and severe, and are aggravated by all factors tending to raise the blood-pressure and increase the volume of the skull-contents (see above).

Even when no external injuries are visible, and examination is not undertaken until some considerable time after the injury, small scars, adherent to

the bone, may indicate the seat of pain; circumscribed tenderness is then nearly always demonstrable. In order to establish the extent of the lesion an X-ray examination is always advisable. **Treatment** of these cases is mainly surgical and consists in the removal of splinters of bone, particularly of the inner table, in the separation of adhesions and, in order to prevent their future formation, in the plastic repair of dural defects. Further details would here be out of place.

Prognosis should be given with the greatest care, since even after many years epilepsy may ensue.

Simple concussion of the brain, too, *commotio cerebri*, without any injury to the skull, may be followed by intense headache, located diffusely all over the head, both immediately following the injury (associated with characteristic vomiting and bradycardia), and after a considerable interval. This probably arises through the vasomotor system, caused by damage to the vasomotor centre in the medulla or else through slight injury to the centres which, according to many authors, are found scattered over all the cerebral cortex and regulate the blood-pressure and calibre of vessels. All authors agree that when a brain with vessels already undergoing arterio-sclerotic changes is the subject of concussion, headache (as well as other phenomena

dependent upon vasomotor disturbances, e.g. vertigo) is of an extremely obstinate character and often resists all therapeutic measures, obviously because the considerably altered vessel-walls are less influenced by the imperfectly acting regulative process than those retaining their full elasticity. Even in younger patients, in whom there is evidence of the occurrence of well-marked head-injury, distinct vascular changes, such as narrowing of the lumen, ectasia of the walls and the like, may only show themselves after years of vasomotor disturbances.

M. Friedmann (Mannheim) has differentiated the so-called ' vasomotor symptom-complex ' from the variable clinical picture presented by the traumatic neurosis. The patients suffer from frequent vertigo in addition to nearly permanent headache, particularly in stooping or looking upwards, and regularly from intolerance of alcohol. If they are asked to lift an object off the ground, the face and neck often become of a red or bluish-red colour. This syndrome may at times be called forth or appreciably increased by compression of the carotids or galvanization of the head. These cases always run a protracted course, but are susceptible of cure. On occasions, however, death has occurred after a long time with meningitic manifestations. Microscopic examina-

tion then disclosed that the smaller cerebral vessels, particularly those of the medulla, were dilated and filled with blood; in the vessel-walls there was round-cell infiltration, whilst the walls had often undergone hyaline change.

The headache of traumatic neurosis, which is often nothing else than a 'compensation neurosis', particularly when the disability complained of bears no relation to the triviality of the injury, or when no head-lesion occurred, but injury to another part of the body, may, like many other symptoms of this traumatic nervous affection, be brought about by purely psychic factors. Either the complaint is the result of a psychic shock experienced through the accident, or of litigation concerning compensation; in many cases both factors are responsible. The pain is, then, not actually great; it is rather of the type of neurasthenic pressure which, like other complaints not under objective control, is greatly exaggerated.

In arriving at a **diagnosis** attention must be paid not only to anamnesis, but also to the well-known, typical complaints and the various objective signs of traumatic neurasthenia and hysteria.

The **prognosis** of headache in the severe forms of the vasomotor symptom-complex is, as emerges from the above, to be made with circumspection,

even as regards life. In the milder cases the duration is likely to be a long one. In the typical neurosis, where compensation is involved, this phenomenon is as obstinate as most others. In such case the prediction is in the first instance dependent upon the possibility of getting the subject of the accident back to work at the earliest opportunity. This is also the most important task from the point of view of therapeutics in these forms of headache, whereas the more serious cases of head-injury with associated pain should be kept as long as possible absolutely at rest, the same measures being otherwise employed, as in arterio-sclerotic headache.

The headache of insolation (sunstroke), which may assume a high degree of severity, is mainly ascribable to deprivation of fluid and thickening of the blood ; it is therefore to be combated by promptly supplying water per os, per rectum, and subcutaneously.

(*m*) *In other diseases of the brain and spinal cord.*

Under migraine was mentioned the fact that in tabes (also in general paralysis) complete migraine attacks may occur in the initial stages. Since tabes commonly begins in middle age, there is generally no difficulty in excluding true migraine. If one does not omit to think of the pathognomonic symptoms of early tabes (lancinating pains, Westphal's pheno-

menon, frequently absence of knee-jerk, hypalgesia of the legs, also fixed pupils and slight bladder troubles) one will mostly be saved from unpleasant errors.

Headache is frequent both in the beginning and in the later course of multiple sclerosis which, together with the sense of vertigo which generally accompanies it, may occur in paroxysms. I have relatively often in the last few years observed a severe headache in the very beginning of multiple sclerosis which set in simultaneously with subjective and objective disturbances of vision—sometimes in the latter case there was diminution of the central acuity of vision, sometimes there were irregular, more often central, scotomata—in one or both eyes, the headache being mainly confined to the region over the eyes, but invariably referred to the interior of the skull. The patients generally visited the ophthalmic surgeon first, who as a rule made a diagnosis of retrobulbar neuritis with considerable reduction of visual power. Neurological examination revealed in the majority of these cases, of great importance from a practical point of view, one or several of the certain signs of disseminated sclerosis, e.g. absence of the abdominal reflex, considerable increase of the patellar-tendon reflex, ankle-clonus, and the Babinski toe phenomenon on one or both sides, and, moreover, the paradoxical reflex of

Gordon, i.e. dorsal flexion of the great toe from pressure on the sural muscles, also intention-tremor and nystagmus. The patients were mostly affected first in the beginning of the third decade, quite suddenly, when in good health, with disturbances of vision. The latter usually disappeared under mercurial treatment in one to four weeks, whilst the objective symptoms affecting the nervous system frequently remained. This mercurial treatment was carried out, not because there was any ground for assuming syphilitic infection—the Wassermann reaction, always undertaken, was invariably negative —but simply on ophthalmological grounds. The headache, here also associated with vertigo, also disappeared fairly rapidly. In one or two cases which we were able to keep under observation the entire clinical picture of multiple sclerosis developed in a few years. These observations, which produce the impression of an acute infection—once or twice a mild degree of fever was present—are naturally of great prognostic importance. Their significance in regard to the pathogenesis of multiple sclerosis has not been adequately realized, although Bruns and Stölting and, later, other authors have for many years called attention to this course of the disease, and although my experience has shown it to be more frequent than was suspected.

Incidentally it may be mentioned that headaches are a feature of some far more uncommon diseases of the brain and spinal cord, which it is not necessary to enumerate here. Recognition causes no difficulty on account of the unequivocal nature of the accompanying symptoms.

2. HEADACHES ASSOCIATED WITH DISORDERS OF THE SPECIAL SENSES

(*a*) *The eyes.*

There is no doubt that headaches caused by abnormalities of the organs of vision are often overlooked and for years misunderstood. On the other hand the error, not unknown from the ophthalmic point of view, must be avoided of associating every headache (even in cases of epilepsy) with ocular defects.

The slightest forms may occur even with perfectly normal eyes if subjected to strain, temporarily or for a long period, especially that due to close work. This strain must be aggravated if the light employed be bad. Most people will at some time have experienced a dull headache in the forehead and eyes after prolonged reading, writing, sewing, &c., in the dusk. The strain in these occupations falls upon the muscles of accommodation and the internal recti, through the action of which convergence takes place.

If the contraction of these muscles occurs under unfavourable conditions, dependent upon abnormal structure or temporary pathological conditions of the organ, a cramp-like, protracted muscular spasm occurs. By means of excessive innervation this obstacle is sought to be overcome. Hereby, as by every muscular spasm, sensory nerve-endings are irritated ; in this case these lie in the area of distribution of the first branch of the fifth nerve, the ophthalmic. The pain remains at first confined to the eye, if the irritation increases in degree and duration it spreads to the ophthalmic nerve itself, to the tentorial nerves springing from these, and in its further course to the other branches of the trigeminus, from which the branches supplying the rest of the dura spring (see Introduction). Thus pain in the forehead is followed by pain all over the head. The irritation may also extend to the supra-orbital nerve and then causes typical neuralgia in its course. If the excessive innervation leads to an increase of intra-ocular tension there may be consequent phenomena of retinal irritation, flashes of light, luminous scotomata, &c., with the resultant clinical picture of migraine. With cessation of the muscular spasm, the above-mentioned consequences cease.

What ocular abnormalities may be looked upon

as the causes of this spasm ? Above all hyperopia, or long-sight, in which the accommodation, particularly for all near objects, is in a high degree of over-action ; exaggerated action of the ciliary muscle is, however, generally associated with the same condition of the internal recti. In presbyopia, the sight of old age, there is the same strain of the innervation of accommodation, caused in this case, if help is not given, by loss of elasticity of the lens. A considerable degree of over-exertion of the muscles in question is common as a result of astigmatism, or asymmetrical curvature of the cornea, also through anisometropia, or unequal refractive power of the two eyes. Over-use of the internal recti alone occurs in very short-sighted people who have not had their myopia corrected, and also in so-called nervous (neurasthenic) asthenopia, the underlying cause of which is an insufficiency of the internal rectus muscles. The last may be brought about by all the ætiological factors leading to neurasthenia, and occurs also in Graves's disease. It is also instructive to note that a congenital difference in the vertical position of the two eyes, causing vertical strabismus and overaction of the levator of one eye or depressor of the other, may lead to an occasionally considerable degree of headache often associated with vertigo. Heimann has lately pointed this out. Equalization of

the two eyes could only be brought about in such cases by separate innervation of levator and depressor of each individual eye, which is not possible. Whether in reality, as Heimann states, there is 'a large number of patients with headaches inhabiting sanatoria' who could be cured of their trouble by means of prisms or operative interference with the muscles at fault, must remain undecided. At any rate this cause of frontal headache must be borne in mind. Finally, mention should be made of a few employments in which over-use of these muscles results from one position constantly occupied or often-repeated movement of the eyes in one direction, whereby headache is produced. To this category belong miners, who frequently acquire nystagmus, proof-readers, &c.

As regards the **diagnosis** of headache in these different ocular conditions one can only give the advice that in all cases of protracted, obstinate headache or ophthalmic neuralgia, in which the cause cannot with certainty be established, an accurate examination of the eyes should be undertaken. **Prognosis** naturally depends upon whether the needful treatment, which consists in the prescription of glasses or operation for strabismus, is carried out or not. If this is done, the headache is generally soon cured.

Naturally, inflammatory affections of the eyes will, by extension of the irritation, cause headaches, which in this case also usually affect the frontal region only. Amongst these may be mentioned conjunctivitis, keratitis, iritis, and irido-cyclitis, as well as the more uncommon tumours. Here should also be included glaucoma, which, as is well known, is characterized by an increase in intra-ocular tension. This affection, particularly in the prodromal stage, in which the dilatation and sluggish reaction of the pupil, as well as the characteristic cupping of the optic disc are often not demonstrable, may give rise to difficulties in diagnosis. The accompanying pains in the eyes, forehead and face may be so severe as to dominate the clinical picture and to suggest a simple ciliary neuralgia. One must then depend upon the invariable elevation of intra-ocular tension, the subjective existence of coloured rings around lights and the typical contraction of the visual field. Confusion with migraine attacks on account of the remote resemblance of the photopsia is at least possible; it can hardly occur if one considers the usual commencement of hemicrania in youth at a time when glaucoma only very exceptionally occurs. Acute inflammatory glaucoma as well as the fully developed process will less often give rise to the possibility of error. It calls for no

more than bare mention of the fact that even a temporary failure to recognize this disease, with its extraordinarily important significance as to vision and its ready cure by appropriate treatment (eserin, iridectomy), may be followed by the most unpleasant sequelæ for the physician. One should therefore make it a fixed rule invariably to keep glaucoma in mind in all cases of neuralgiform affections limited to the eyes and forehead, especially in individuals on the wrong side of fifty.

(*b*) *In diseases of the nose and its accessory cavities and of the teeth.*

It is not long since every headache was considered to be of nasal origin and was treated as such. We have learnt with time to free ourselves of such exaggerations and to place differential diagnosis upon a more precise basis. It stands established to-day that headache in nasal disease of every sort is an extremely distressing symptom and may on account of its severity and obstinacy mask all others. This question has in recent years been dealt with from the rhinological point of view, in several comprehensive works which on account of their well-balanced outlook deserve general recognition. In particular should be mentioned those by R. Veckenstedt [29] and A. Hartmann [30],

upon which the following account will mainly be based.

That diseases of the nose are capable of producing headache should cause no surprise since the sensory supply to the region in question is entirely from the first and second branches of the fifth nerve. The anterior and posterior ethmoidal nerves springing from the frontal branch of the first division (ophthalmic) innervate the mucous membrane of the anterior part of the nasal cavity, the septum, the anterior ethmoidal cells and the frontal sinus as well as the skin of the nose as far as the tip, and that of the forehead from the middle-line as far as the centre of the orbital margin. The second division (maxillary) gives off the superior dental nerves supplying the floor of the nose and the maxillary antrum ; in addition sensory twigs go from the spheno-palatine ganglion to the mucous membrane of the posterior portions of the nasal cavity and septum as well as to that of the posterior ethmoidal cells and sphenoidal sinus. These three sensory zones are therefore of importance because a consideration of them affords a clue to the location of nasal diseases. Speaking generally, localized pain at the upper inner corner of the orbit or over the eyebrow denotes disease of the anterior part of the nasal cavity, of the frontal sinus, or of the anterior ethmoidal cells ;

pain situated deeply in the head disease of the posterior part of the nasal cavity or of the sphenoidal sinus, and pain in the cheek or in the teeth (dental trouble being excluded) extending to the nose or cheek points to disease of the antrum or floor of the nose.

Although these local and neuralgic pains of nasal origin are, strictly speaking, not to be reckoned as actual headaches, they must nevertheless be discussed for diagnostic reasons, quite apart from the fact that in individual cases pains in the interior of the skull occur as well, as for instance in empyema of the frontal sinus. Localized pains occur almost exclusively in acute inflammations of the accessory sinuses. In acute empyema of the frontal sinus and maxillary antrum there is often in addition a localized tenderness to pressure of so acute a nature and anatomically so exactly corresponding to the position of these cavities that without more detailed examination (transillumination, &c.) the diagnosis can easily be made. In the acute inflammations of the ethmoidal cells and sphenoidal sinus a careful examination with mirror and probe is naturally essential. The spontaneous pain may also radiate into surrounding parts, as from the antrum to the teeth and temporal region, from the frontal sinus to the eye and forehead as far as the margin of the

hair; it must also be borne in mind that sphenoidal sinus pain is often referred forwards to the forehead. The extraordinary acuteness of the pain characteristic of these cases is, in addition to the pressure upon the trigeminal nerve-endings through inflammatory swelling of the mucous membrane, to be explained by the simultaneous pressure effect due to retention of exudate in the cavities owing to closure of their orifices.

Neuralgiform pains in the course of the supra- and infra-orbital nerves and of the superior dental nerves occur with the acute and chronic inflammations of the accessory cavities, partly owing to direct extension of the inflammation (perineuritis) to the nerves in relation with the particular bony walls (supra-orbital with that of the frontal sinus, infra-orbital and superior dental branches with that of the antrum), partly through irradiation to another branch. This latter mode undoubtedly accounts for the neuralgia in the region of the supra-orbital nerve which sometimes accompanies inflammation in the antrum of Highmore, since it is well established that even intermittent frontal headache may be present with disease of this cavity without any involvement of other accessory cavities (frontal or sphenoidal sinuses).

Actual headache referred to the interior of the

skull is more or less widely diffused over the whole head. Initially and in the milder cases it is a pressure, resembling the neurasthenic, which may increase after a time and become a dull pain, primarily in the forehead, but also affecting vertex and occiput. A universally familiar example of this is to be found in the mental obfuscation of an acute cold with its associated characteristic *aprosexia nasalis* (i.e. incapacity to fix the thoughts or concentrate attention), which may serve as a prototype of all those headaches which arise as a result of inflammatory swelling of the mucous membrane and nasal obstruction. Their pathogenesis is to be sought in the passive hyperæmia accompanying these nasal affections, which on anatomical grounds spreads to the interior of the cranium. The veins of the nasal cavity (*venæ ethmoidales*) communicate extensively with those of the brain, dura and longitudinal sinus and, according to the researches of Key and Retzius, the nasal lymphatics, by means of the lamina cribrosa with the great subarachnoid and subdural lymphatic space. Thus a stasis both of blood and lymph circulation may ensue. This congestion is further increased through the fact that at each breath, as the result of a rarefaction of air on the obstructed side, blood is aspirated into the upper air passages. The diminished or suspended

nasal respiration has a further prejudicial effect in that the absorption of oxygen in the circulation is lessened as well as the elimination of carbon dioxide and other toxic products of combustion. Thus a diminution of hæmoglobin (anæmia, or more correctly, chlorosis) is brought about in the brain and its coverings as well as in the rest of the organism. That these sequelæ of nasal obstruction cannot be got rid of by means of drugs is obvious. They occur through relaxation of the alæ nasi, particularly seen in old age, in chronic rhinitis, often leading to hypertrophy of the posterior ends of the inferior turbinates, in chronic inflammation of the accessory cavities, in hyperplasia of tonsils, adenoids and ozœna, also with polypi and all forms of tumours of the nose. According to my observations there is in the last class of cases early hypæsthesia of the cheeks and the skin of the nose, particularly when the tumours originate in the spheno-palatine fossa. There can, too, no longer be any doubt that deviations and thickenings of the septum, often of traumatic origin, bony ridges and spurs of the same, either alone or in association with the above-mentioned affections, if they lead to narrowing of the nasal passages or contact between septum and turbinates, may give rise to such forms of headache. In rarer cases the latter may arise not only by means

of the above-mentioned circulatory disturbances, but also reflexly, for the most part only in association with general hyperæsthesia, as is characteristically seen in the clinical picture of neurasthenia. The stimulus in such cases may come from any part of the nose ; there is then usually considerable hyperæsthesia on examination with a probe, the richly innervated tuberculum septi, from which, as is well known, asthma attacks may be precipitated, being specially susceptible.

Since there is an intimate relationship between the nasal mucous membrane and the genital organs, and a reflex nervous hyperæmic swelling of the mucous membrane may often be observed during menstruation (or with strong sexual excitement), the assumption is not untenable that the exacerbation of headaches of variable origin so frequently occurring at the menstrual epoch and the periodic recurrence of migraine attacks precedent to or coincident with it may in part at least be a result of this nasal obstruction. It must also be admitted that the migraine tendency—quite apart from any connexion with the sexual organs—may be brought to a head by any pathological process leading to nasal obstruction as described above *per contiguitatem*. Clinical experience shows this. The headaches caused by intra-cranial complications of suppurative

processes in the accessory cavities, particularly of the frontal and sphenoidal sinuses as well as the ethmoidal cells, correspond with those described under cerebral abscess and meningitis.

It may be added that Pässler, in the *Congress für innere Medizin* of 1911, described protracted headaches observed by him in chronic follicular sore throat, associated with neurasthenic manifestations (readily-produced fatigue, disturbance of sleep), and which culminated in nocturnal sweats. He recommended in such cases radical extirpation of the tonsils.

In the **diagnosis** of nasal headache, besides the above points the following must be taken into consideration. Its recognition is most easily effected through the characteristic localized pain, associated with clearly-defined tenderness on pressure. The neuralgic pain offers greater difficulties. The following are the commonest causes of typical tic douloureux : malaria, articular rheumatism, ocular troubles, and, above all, influenza. The last disease is of particular importance since both inflammations of the accessory cavities and genuine neuritic neuralgias are common events, so that only detailed and expert examination can decide between them. The statement made from the rhinological side that every neuralgia in the neighbourhood of the fifth

nerve occurring after influenza is the result of an acute sinus inflammation is wide of the mark ; there can be no question of this, as is evident from the frequent cures of these neuralgias by means of simple anti-neuralgic treatment, leaving the nose entirely out of consideration. The distinction from migraine is always easy if the hereditary nature of the latter and its commencement in early life be kept in mind, together with the realization of the fact that vomiting and similar phenomena representing auræ are not accompaniments of nasal headache. Since, as we have already seen, inflammatory ocular affections may be associated with headache, and, moreover, as we now know, diseases of the nose and accessory cavities may to a considerable extent implicate the eye (retrobulbar neuritis), so much so that patients may first consult the oculist, great care is essential lest the mistake be made of treating the secondary effect rather than the cause. Confusion with rheumatic headache is most readily avoided by carefully palpating the muscles of the scalp and back of neck. The commencement of nasal headache in the occipital region, as is the rule in nodular and induration headache, is extremely uncommon. The case of a teacher recorded above (*D* 6) illustrates a serious mistake made in this connexion. The greatest diagnostic

problems are likely to arise on account of the resemblance between neurasthenia and nasal headache. In both there is mostly a sense of pressure. Only careful anamnesis, and in case of the slightest doubt expert examination of the interior of the nose, especially of the frontal sinus, can settle this question. Inquiry concerning discharge from the nose, obstruction of one or both nostrils, and disturbance of the sense of smell must not be omitted. It is also imperative that the possibility of a combination of nasal headache with any other form be borne in mind. In such a case the cure of the nasal condition will be followed by persistence or speedy return of the headache. The fact must in addition be emphasized that headache may be entirely lacking in the clinical picture of nasal diseases, even the most severe, and that long-standing inflammations and tumours may run an entirely painless course. Therefore one should guard against assuming every positive discovery in the nose to be the cause of a co-existent headache.

The **prognosis** of nasal headache is dependent upon timely recognition and appropriate treatment, which is frequently operative in nature and usually brings speedy relief.

In **diseases of the teeth** neuralgias in the course of the maxillary and mandibular nerves may occur in

addition to local pain. If the teeth of the upper jaw, particularly the molars, are affected, there is not seldom a severe, dull and boring pain in the corresponding temple, which may often be confused with other forms of headache. Therefore, if consulted concerning a pain thus localized, one should never omit an examination of the teeth. The oversight of a cause so easily remedied in temporal headache is naturally an extremely awkward occurrence. One must therefore bear in mind that not only dental caries, which is at once recognizable, but also diseases of the pulp, with an intact surface, may give rise to neuralgia and temporal headache. These affections, which may have many causes underlying them, may be recognized by the teeth being tender to percussion and remaining dark upon transillumination. Why in the one case only a localized pain, restricted to the diseased spot, should be felt, and in the other a widespread neuralgia or an obstinate pain in the temporal region without the nature and extent of the dental condition affording any adequate explanation, cannot be said with certainty. Apart from individual hypersensitiveness, which cannot always be substantiated, there must probably be variations in the anatomical course of the anastomoses which one feels tempted to advance as explanatory of this variable behaviour

(cf. the chapter above on 'Nodular or rheumatic headache').

(*c*) *In diseases of the ear.*

It is mainly in acute otitis media, both catarrhal and suppurative, that headaches, generally of great intensity, occur; these are at first confined to the corresponding side and are aggravated by the movement of the lower jaw in mastication. If in suppurative middle-ear disease perforation of the drum does not soon occur with evacuation of the pus, the pains radiate all over the head, and are then of a throbbing and pulsating character. In these affections there is always a considerable tenderness on pressure in the region in front of the tragus and on the mastoid process; the otitic headache can usually be easily recognized by the above peculiarities, and also by the fact that fever is generally present. If the suppuration involves the mastoid process this also becomes the seat of spontaneous pain. The intra-cranial complications (extra-dural abscess, purulent lepto-meningitis, cerebral abscess, serous meningitis) dependent upon acute and chronic disease of the tympanic cavity, to the latter of which belongs in particular cholesteatoma, are frequently ushered in by severe headache, in that case usually accompanied by tenderness on pressure and per-

cussion, and soon followed by other characteristic symptoms (see above). Every protracted or severe headache in the aural region should induce the physician to inquire concerning former ear-trouble and to examine the ear. Menière's symptom-complex, usually associated with disease of the middle or inner ear (vertigo, tinnitus, vomiting), is generally accompanied by diffuse headache.

3. HEADACHES IN DISEASES OF THE DIGESTIVE TRACT

Diseases of the stomach are often associated with headache. Not a few people experience a marked sense of oppression in the head if they remain a long time without food, which disappears when they break their fast. Acute and, less frequently, chronic gastric catarrh frequently cause headache accompanied by vertigo (*vertigo e stomacho læso*), which is at times restricted to the front of the head, but not rarely includes the whole, and which varies in severity according to the cause of the gastritis (frequently alcohol). The headaches accompanying nervous dyspepsia and enteroptosis are concomitant phenomena of a general neurasthenia, like these affections themselves. The same is true of gastric hypersecretion (hyperacidity), occasionally periodic, in which quantities of fluid rich in hydrochloric acid

are vomited. These attacks may synchronize with severe headaches, in which case migraine attacks are very closely simulated. Confusion may be avoided by remembering that migraine begins in childhood or adolescence at a time when hyperacidity is hardly seen.

One of the most important and frequent causes of headache is constipation. For this reason, and also because this form of headache is common as a relatively independent affection, it should already have been described in chapter A, and only finds its place here to ensure a more systematic subdivision and to avoid repetition. If the constipation is only transient the headache disappears with it. Chronic obstipation so often leads to intractable headache, varying from ordinary sense of heaviness to diffuse neuralgiform pain, that it should be an invariable rule on complaint of this affection to question the patient as to whether they have regular, and above all adequate, evacuations. The quantitative side of the question is of the greatest importance, particularly in the case of young girls, who consider it immodest to discuss this most important function with a physician. Mothers should have this point brought to their notice and be recommended to exercise control over it. In these cases treatment should always be inaugurated with an aperient. In

this way the differential diagnosis between anæmic and constipation headache may most quickly be made apparent, and that very frequently in favour of the latter form. But even in the other varieties of headache it is advisable, if even the slightest doubt exists upon the subject, to provide for regular evacuation of the bowels.

Whether intestinal entozoa can produce headaches is extremely doubtful.

From the point of view of pathogenesis, in order to explain the headaches caused by gastritis and obstipation, irritation of the dural nerves by the toxic matters circulating in the blood must be assumed. Possibly in exaggerated conditions of constipation a certain degree of passive hyperæmia of the brain and its membranes may be postulated. In this connexion it may be pointed out that in many sufferers from headache, particularly in patients with the arterio-sclerotic variety, straining at stool has a considerable effect in aggravating it, and may in the latter case even precipitate a cerebral hæmorrhage. In order to avoid this such patients should be assisted to easy defæcation. It is a point of interest that not a few people, particularly women, and not necessarily small eaters, have the bowel emptied only at intervals of three, four, eight or ten days without ever suffering from headache. These

exceptional cases prove that even for the symptom of headache there exists a certain immunity ; according to my experience these individuals prove refractory to other causes leading to headache. It is not easy to say *a priori* upon what this favoured disposition rests.

In regard to disorders of the liver it may be said that long-standing jaundice, of whatever origin, frequently has headache as an accompaniment ; it is not, however, more than oppression.

4. HEADACHE IN DISEASES OF THE KIDNEYS

Headaches are frequently ascribable to all forms of nephritis and to all such diseases of the kidneys as are followed by destruction of the specific tissues leading to interference with the urinary secretion. Patients with small granular kidneys in particular complain of this trouble, which frequently takes the form of severe pain, mostly affecting the frontal region, but which may be unilateral or radiate to the back of the neck. More commonly there is simple oppression, confined to the forehead. Increase of headache is sometimes to be looked upon as a warning of impending uræmia.

Nephritic or uræmic headache is chiefly caused by the urinary substances which in this disease are not eliminated but circulate in the blood and

damage not only the brain and other organs but also the nerves of the dura. Probably also a causal part is played by circulatory disturbances (passive hyperæmia or arterial anæmia), and further by increased intra-cranial pressure as a result of the cardiac hypertrophy which so often accompanies granular kidney.

The **differential diagnosis** of nephritic headache is dependent upon demonstration of albumen and of the characteristic organic elements in the urine. These investigations—this point should particularly be emphasized—must, however, be carried out repeatedly and, where suspicion of granular kidney is entertained, daily for eight to fourteen days, and should never, as is unfortunately so often the case, be restricted to the nocturnal urine. If other characteristic symptoms of chronic uræmia are in evidence (vomiting, diarrhœa, pruritus, transient unconsciousness), the significance of the headache will offer no difficulties, even if at the time no albuminuria can be demonstrated. As a rule, however, the latter is present. It should never be omitted in every case of protracted headache to investigate the urine. Another important differential diagnostic symptom which is of frequent occurrence in all kinds of chronic nephritis is albuminuric retinitis. This can naturally be recognized

only by ophthalmoscopic examination; subjective disturbance of vision may be associated with it (clouded vision, &c.), but as in the case of patients with cerebral tumours, this does not necessarily occur. The presence of albuminuria or cylindruria and albuminuric retinitis, or one of these phenomena, enable renal headache to be diagnosed with certainty. The only difficulty likely to arise is between this and the headache of cerebral tumour, so long as this is causing no localized symptoms, in particular if the urinary examination should temporarily be negative. The reason of this is that in cerebral tumour there are forms of optic neuritis with retinal hæmorrhages and striæ which closely resemble the retinal changes of albuminuria. Even when a hemiparesis exists the possibility must be remembered that this may be dependent upon the arteriosclerosis and cardiac hypertrophy so often associated with granular kidney, and that it is to be looked upon as the result of a cerebral apoplexy, not as a localized symptom of a tumour. I have, moreover, had cases referred to me by oculists in which albuminuria and cylindruria existed, but in which the ophthalmoscopic picture was more indicative of tumour. These were combinations of cerebral tumour and nephritis; the retinal changes being ascribable to the tumour.

At the end of last year I saw the following case in hospital: a farmer, æt. 42, who for a year had suffered from nephritis and mild diabetes. A month ago he had a right-sided convulsive attack with loss of consciousness, since which time the right side has been weaker; the attacks have been frequently repeated.

Present Condition. General sensibility dulled; complains of severe headache, particularly on the left side of the head; there is here constant tenderness on pressure and percussion over the lower parietal and temporal regions. Hemi-paresis with ankle-clonus and Babinski phenomenon, as well as increased patellar reflex; slow utterance, no aphasia, no apraxia. The urine contained a small quantity of albumen, a few hyaline casts, no dextrose. Ophthalmoscopically: at first the clinical picture of albuminuric retinitis, the papilla indistinct, copious hæmorrhages in the retina, no swelling; only after several days did the nerve become prominent. Sluggish pupillary light reaction. Distinct cardiac hypertrophy and arterio-sclerosis. Clinical diagnosis: tumour of the left hemisphere (on account of the well-defined and constant tenderness on percussion), ? if in the motor region. In addition there was nephritis. The hemi-paresis and retinal changes are probably caused only by the tumour. On account of the unfavourable general condition puncture of the left lateral ventricle only was undertaken in order if possible to afford some relief to the brain; the result was negative. Death ensued next day.

Autopsy. Diffuse glioma of the left temporal lobe, including the left basal region. Hypertrophy and dilatation of the heart; myocardial degeneration; both kidneys engorged.

These are, however, rare occurrences, but their possibility must be borne in mind, and, in addition to an alternative, a combined diagnosis considered.

Whether any diseases of the uterus and ovaries by themselves produce headaches is very doubtful; their once widely assumed reflex occurrence is disputable. It is indeed probable that these complaints, if of long duration, may bring about a general hystero-neurasthenia, upon which headache may be engrafted. The aggravating or exciting influence of menstruation upon different forms of headache has already been referred to.

C. HEADACHE IN GENERAL DISEASES

1. IN INFECTIOUS DISEASES

Headache is a regular accompaniment of all acute infections, and mostly affects the frontal region, but often enough involves the whole head and may be of extraordinary severity. Apart from the above-mentioned forms of meningitis the infections which are particularly distinguished for great intensity and protracted duration of the accompanying headache are typhoid fever, septicæmia and pyæmia, influenza and erysipelas. Most probably it is caused less by the elevation of temperature than by the infective virus, which probably directly irritates the

dural nerves. It may also be assumed that a part is here played by the well-established vaso-paralytic effect of these poisons, which must result in circulatory disturbances in the brain and its membranes to which doubtless is ascribable the frequently demonstrated 'cerebral expansion' occurring in these disorders. It is universally recognized that in these headaches local cold applications are beneficial.

Of the chronic infections syphilis is the most important. Headaches occur in this disease as very common symptoms of the eruptive period. They sometimes radiate over the entire head, may be limited to one side of the occiput or to a fairly circumscribed portion of the skull, mostly in the parietal region. The intensity, too, is very variable ; they range from a trifling inconvenience to a raging intensity, which brings the patient to the verge of distraction. They display a tendency to considerable exacerbation towards evening and at night—*dolores nocturni*. It is still uncertain what is the cause of this peculiarity of luetic headache which, whilst of the utmost importance in diagnosis, has not yet been sufficiently recognized from the point of view of differential diagnosis. It may be due to the evening rise of temperature, or possibly to the warmth of the bed ; in favour of the latter explanation is the fact that night-workers who are used to sleeping by day

display the converse phenomenon. The question yet remains open, however, as to the manner in which the warmth of the bed brings about the nocturnal exacerbation. In cases where the underlying cause of the luetic headache is to be found in the shape of small or larger periosteal swellings (*periostitis syphilitica*), situated immediately under the skin, the blame might be attributable to the hyperæmia induced by the warmth of the bed and the increased pressure upon the admittedly very sensitive periosteal nerves. These periosteal swellings are found chiefly on the frontal and parietal bones, and there is always a considerable accompanying sensitiveness to pressure as well as spontaneous pain. When, however, these swellings are absent and the changes in question are probably in the inner periosteum of the skull, the dura (Lang's meningeal irritation), one can depend less upon this attempted explanation, and still less in the case of the previously described manifestations of lues cerebri. It must in addition be taken into consideration that these nocturnal accessions of pain may be lacking, and that their absence by no means contra-indicates their syphilitic origin. **Treatment** can only be specific ; considerable improvement often sets in after an iodide course (45–75 grs. a day), if only of a few days.

In chronic pulmonary tuberculosis headache is no very prominent symptom ; on the whole it comes and goes in proportion with the fever, which is dependent upon the absorption of toxic products into the blood. In individual cases, however, it has seemed to me as though, in the very beginning of phthisis, oppression of the head has been an outstanding symptom.

2. IN ACUTE AND CHRONIC INTOXICATIONS

Of the acute intoxications associated with headache, acute alcoholic intoxication deserves first mention. It is well known what severe headache, involving the whole head, follows upon return to sobriety. This may sometimes assume a neuralgiform character. Headache is also a frequent event in intoxications from methyl alcohol, which has not been uncommon in recent times, and the same holds true of poisoning from meat and fish, and in bolutism.

Another cause of headache is to be found in nicotine ; smoking one or two strong cigars will even produce this effect in some people. In chronic over-smoking the neuralgic form of headache predominates, neuralgias in other parts of the body being indeed no uncommon result of this abuse. The pathogenesis of headache in alcoholic and nicotine intoxication is probably a vasomotor one (see also the ' Theoretical introduction ').

One of the chief symptoms of saturnine encephalopathy which, as is well known, may present a very heterogeneous clinical picture (hemiplegia, convulsions, fugitive hemianopsia, delirium and other psychic disturbances in addition to changes in the optic nerve), is the sense of pressure generally involving the whole head, and most closely resembling that which has been described under neurasthenia and cerebral arterio-sclerosis. It is probably due to spasm of the vessels of the brain and its membranes, and in its higher grades to arterio-sclerotic changes. The **diagnosis** is only possible if other manifestations of chronic lead-poisoning are demonstrable, such as the blue line on the gums, previous or co-existent lead-colic, wrist-drop, albuminuria, arterio-sclerosis. The **treatment** is that of lead-poisoning.

A severe frontal headache is by no means uncommon in those who show an idiosyncrasy towards iodides, even after the first few doses. This begins simultaneously with the iodide coryza, and has the same genesis as headache arising from swelling of the nasal mucosa.

Amongst the rarer acute and chronic intoxications by which headaches may be caused are to be mentioned those by carbon monoxide, sulphuretted hydrogen, opium, chloroform, iodoform, and ether.

3. IN CONSTITUTIONAL DISEASES

First and foremost in this connexion must be mentioned the various forms of anæmia, and the most frequent cause, in proportion to its incidence, is chlorosis. The headache in this disease of puberty is for the most part a dull oppression, affecting the forehead and the ocular region, which may establish itself in the temporal region and radiate over the entire head. It may, however, like the neurasthenic weight, undergo neuralgiform exacerbation and become a really obstinate, tormenting symptom. There may sometimes be a difficulty in saying with certainty whether a given case is that of a purely neurasthenic or a chlorotic headache, a difficulty which is proportionately greater since the remaining symptoms of the latter are in the main those of the former disease. In those cases recognizable by the gross changes of the visible mucous membranes and other obvious pathological phenomena (fainting, &c.), the diagnosis is of course easily made, occasionally a blood or hæmoglobin count is advisable. It has been already mentioned above that in severe chlorosis changes in the fundus occasionally occur which may simulate the papillitis of tumour ; also that chronic obstipation, which has by many authors been brought into ætiological relationship with

chlorosis and may co-exist with it, sometimes causes difficulty in diagnosis. The **treatment** of chlorotic headache is that of the primary complaint and will not be discussed here. I would only recommend a prescription which meets both indications, the lack of hæmoglobin and the constipation, which has rendered me good service and has the merit of cheapness. I order in the morning and at midday after meals two Blaud's pills (later three), and at night a pill of aloes and iron, varying in strength according to the degree of constipation.

The secondary anæmias after loss of blood or after acute infectious diseases, as well as pernicious anæmia and leukæmia, may be accompanied by headaches, generally felt as oppression, but true neuralgias in the fifth nerve area may also complicate these blood-states. As regards pathogenesis, in addition to diminished oxidation to which all nerves are sensitive, most probably toxic substances have to be taken into consideration which are of ætiological significance both in chlorosis (internal secretion of the ovaries) and in pernicious anæmia and leukæmia, even though their nature is not known to us.

In diabetes severe headache may also be present, but generally only as a forerunner of coma ; there is usually no more than oppression of the head,

which has nothing characteristic, and is probably due in most cases to a co-existent arterio-sclerosis of the cerebral vessels.

Just as the diabetic is predisposed to neuralgias and neuritis in general, so also is he to neuralgia of the fifth nerve, which in this complaint may often display great severity and intractability.

Gouty arthritis as such does not cause headache. When this occurs with true gout it is mostly caused by complications (arterio-sclerosis, nephritis, &c.). The expression ' gouty headache ', often heard, is misleading ; it is usually applied to cases of rheumatic or nodular headache, but also to that of neurasthenia and migraine.

D. COMBINATIONS OF DIFFERENT FORMS OF HEADACHE—SO-CALLED ' HABITUAL HEADACHE '.

In the chapter on ' Nodular or induration headache ' emphasis was laid on the fact that this form of cephalalgia could be combined with all other possible varieties of headache. The same may now be said of the latter, as has already been pointed out in various paragraphs. The possible combinations are many. This circumstance puts obvious difficulties in the way of precise diagnosis, and also hinders accurate statements being made concerning

the incidence frequency of the different forms of headache. A diagnosis may be impossible of establishment; rather must the attempt be made to dissociate the forms in regard to the order of their occurrence; this, however, is only feasible by means of an exhaustive anamnesis, giving due weight to every detail. It is self-evident that a permanent therapeutic result will only be attained when the often confused relationships of the different forms have been clearly differentiated. If one becomes accustomed to deal in this methodical, if somewhat laborious manner with such cases of protracted headache, which have often resisted all kinds of treatment, one will soon learn to dispense with that diagnostic refuge, the 'habitual headache'. This designation should be banished from text-books; it is no diagnosis at all. One should always endeavour to make certain which form of protracted headache, or what combination of different forms, is present. An independent variety of purely 'habitual' headache does not exist. In this domain of special pathology we must moreover attempt to go further and attain to an ætiology, so far as our modern knowledge and experience permit.

Since concrete examples are often more illuminating than long theoretical discussions, a few cases of combinations of different headaches are briefly

recorded. The attentive reader will be able to gather from them their most important bearings. The possibilities of practice can naturally never be exhausted, only a brief indication of these is possible.

1. Nodular headache, associated with severe hystero-neurasthenia and migraine

Patient, female, æt. 50, married, has suffered for fifteen years from all kinds of hysterical and neurasthenic ailments: attacks of fear, of open spaces and streets, high degree of nervous dread and irritability. Since girlhood has had migraine-attacks with severe vomiting and scintillating scotomata, but only at the menstrual periods. During the last five years the pain has so far altered as to occur with greater frequency, to last longer, and instead of being localized over and in the eyes, to involve the entire left side of the head and back of the neck.[1] Vomiting and scotomata no longer occur. Is absolutely unable to bear cold. There is no decided climatic influence. She has taken an incredible number of 'powders', and her husband finds the position almost intolerable. Sleep is insufficient and restless; bowels somewhat confined; menopause one and a half years ago.

Present Condition. Increased tendon-reflexes, otherwise nothing noteworthy. In the left temporal region, extending upwards to the vertex are several quite small,

[1] The last two years there has been considerable aggravation, also during the past summer. At times there are intervals of several days, then gradual recommencement and a duration of four to five days.

hard, rounded nodules, and three rather flatter, very tender and about the size of sixpences, in the subcutaneous tissues. Great hyperæsthesia of hair and scalp in general. Neck muscles free.

Course. After two months of somewhat irregular treatment (thirty-five sittings in all) the nodules were for the most part absorbed and the pain almost completely relieved. No relapse.

2. Severe state of exhaustion as the result of nodular headache

Patient, female, æt. 38, married. As a girl was for some time nervous after a teachers' examination, but never had headaches. No family history of migraine. Three years ago had a slight attack of nephritis following diphtheria ; at the present time albumen is present only at considerable intervals and in small quantities. The headaches began gradually eight years ago, and for the last four years have been so constant and tormenting that she has for a long time been unable to look after her household. She generally wakes with the pain, which sometimes begins in the occipital, at others in the frontal region, and rapidly involves the entire head. Never has nausea, vomiting or scintillating scotomata. Warmth ameliorates, cold aggravates the pain.

Present Condition. Patient is anæmic, has a suffering and frail appearance. Albumen not present. In the scalp there is a whole series of nodules, about the size of peas and rather firm ; touching them evokes exclamations of pain. The muscular insertions into the occiput feel harder than usual and are also very tender. No actual indurated areas.

Course. In spite of the most careful, although not quite regular, treatment by massage for five weeks no decided improvement occurred. Patient went for three months to a sanatorium in order to improve her general health. Then, according to the report of her husband (a doctor), massage was recommenced and the pains were so far ameliorated as to make her condition bearable.

3. Combination of migraine and nodular headache

Patient, female, æt. 53; climacteric three years ago. For more than thirty years at the periods and since their cessation every five or six weeks, there have been typical attacks of migraine, with severe headaches in forehead and eyes, in addition to vomiting. Besides these always regularly recurring attacks she has suffered for six months from persistent headaches, quite unlike her usual ones. They are situated in the occiput, but when most severe they radiate over the entire head. Vomiting only occurs with the periodic pain, never with the 'new' one, even when at its worst. Latterly she has also had frequent pains in the limbs.

Present Condition. Nothing particular to be made out except on the head; several tender nodules of the size of cherry-stones in the skin of the nape and sides of the neck. In the left trapezius, about ¾ in. below its occipital insertion, there is a somewhat prominent induration about the size of a shilling.

Course. After six weeks' treatment with linseed-meal poultices and massage, the persistent occipital pain disappeared; the periodic attacks with vomiting recurred regularly five months after the commencement of this treatment.

4. Combination of chlorosis with nodular headache

Patient, a girl, æt. 21 ; has been anæmic for the last four or five years. For the last three years has suffered from headache without vomiting, situated mostly on the vertex and forehead, but also all over the head, lasting the whole day and then remaining absent for weeks. The last one and a half years the head has hardly ever been free, except during the period. The pains are regularly aggravated by strong wind, also by stooping or going upstairs. Mental or bodily exertion said not to influence the condition. Frequently after a quiet night the pains are very severe on waking, at others a ball may not be followed by any particular ill effect. In the past summer during two months in Schwalbach and Holland—complete rest and chalybeate treatment, but much rain and wind—the condition became almost unbearable. One and a half years ago a protracted course of Blaud's pills had a good result ; this treatment during the last few months has been quite ineffectual. No heredity ; bowels and menstruation normal.

Present Condition. Anæmia of medium severity (but has recently taken much iron) ; no other noteworthy discovery except in the head itself. In the scalp over both parietal regions are several nodules, as large as peas, fairly firm, little movable, extremely tender even on light pressure. Nuchal muscles free.

Course. Such marked improvement after four weeks' massage with preliminary heat, that the patient was able to enter for a musical examination. During this period the iron was suspended.

5. Combination of nephritis, suppurative otitis media and nodular headache

Patient, female, æt. 32, married. Nephritis dating from pregnancy in the preceding year, no vomiting at that time, but frequent diffuse headache, which continued after delivery. Two months ago left-sided purulent otitis media ; a moderate discharge of pus continues ; the left mastoid process very slightly tender ; no fever. For the last month unbearable headaches mostly on the left side, but often radiating to the right. They make sleep almost impossible and sometimes extend to the teeth of the left upper jaw. Examination discloses, in addition to nephritis and suppurative otitis, quantities of extraordinarily tender nodules, ranging up to the size of beans, in the tendinous portion of almost the entire scalp, more on the left than the right ; also indurations in the superficial cervical muscles and those of the lateral aspects of the neck. In the left frontalis muscle also and in the left zygomatic region are numerous small millet-seed-like deposits. No constipation ; fundus normal. In this case there were, ætiologically speaking, in concurrence nephritis, suppurative otitis and very marked and palpable changes in the scalp. Nephritis could not have been the cause of the new headaches, since those due to it were, as the patient expressly stated, of a totally different character. Neither was any increase of the renal disease demonstrable. Since the left mastoid process was barely, the pre-aural region not at all, tender, and since there was no tenderness on percussion on the left side of the skull and no fever, I excluded the otitis media as an insufficient cause. There

remained, therefore, the changes in the soft parts of the scalp which pointed towards a rheumatic ætiology. After a fortnight's treatment with local heat—massage was contra-indicated on account of the ear-trouble—there was considerable improvement; after another three weeks the more severe headaches were completely cured. The pains in the teeth of the left upper jaw were at times so severe that the house-surgeon suspected a latent pulpitis; as, however, the remaining deposits and therewith the pain disappeared, he employed, upon my advice, intensive heat to the left zygomatic region. This led to absorption of the nodules here also, and simultaneously cured the toothache.

6. Migraine, neurasthenia, frontal sinus suppuration and supra-orbital neuralgia

Patient, female, married, æt. 40; in child- and girl-hood suffered every two to three weeks from headache with vomiting; at times of excitement, to which the patient was prone, even more often. The vomiting has ceased during the last ten years, but nausea is still frequent. There is no family history of headache so far as she knows. No constipation. To these headaches was added towards the end of 1910 persistent pain, not occurring in paroxysms and confined to the centre of the forehead. Suppuration in the frontal sinus was discovered, and in January 1911 a radical operation was performed. (She is unable to say whether influenza preceded this or not.) Convalescence was uninterrupted; the frontal pain was considerably relieved. Soon there commenced severe, shooting pain over the left eye, for which the physician who consulted me had employed

a series of saline injections in the neighbourhood of the left supra-orbital nerve without effect. No vomiting or nausea with this pain, although these still occurred with the now less frequent migraine attacks. Sleep was much interfered with, even when pain was not present; occasionally there was vertigo. There had been no abortions and no other evidence of syphilis.

Present Condition. Operation scar on the forehead. Great tenderness over the left supra-orbital notch; hyperæsthesia over the entire area of distribution of the supra-orbital nerve. Fundus normal. Marked flushing of face and neck, increased on stooping. Pulse 104. Patellar reflexes much increased. Marked tremor of the separated fingers and of the tongue. No signs of hysteria, and patient does not convey the impression of hysteria. Urine free from albumen and sugar. No signs of any coincident disease. In this case the obstinacy of the otherwise typical supra-orbital neuralgia was ascribable to the original migraine and to the neurasthenia which followed a series of misfortunes. A regular course of bromide extending over a month, together with dietetic anti-neurasthenic treatment, effected considerable improvement. The patient remains under treatment.

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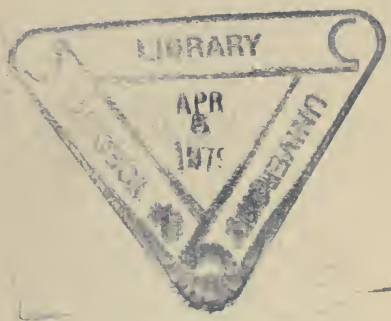
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