Medical.

MIGRAINE.¹

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FOR many years I have been interested in the study of refraction and other errors in their influence on human efficiency. The present paper is based on the last ten years of private refraction work in which the migraine cases have been specially studied. The total number of these is 300, and that of the new refraction cases seen about 5,100. This, however, does not represent the relative frequency of this affection in general refraction work: For (1) the specialist as a rule only sees the difficult cases; and (2) a large number of the patients referred to the writer have come from nerve specialists and others who sent them because of his interest in the subject. It is therefore clear that these figures do not afford material for any general deductions as to the relative incidence of migraine in the population, and none such will be attempted. At the same time, migraine is an affection which every practitioner sees sooner or later, not so much on account of its numerical frequency, but owing to two facts: (1) That a very large number of cases go so long unrelieved, and seek assistance from one doctor and one specialist after another; and (2) that the symptoms are always distressing and often alarming.

The method of examination that has been carried out on *all* refraction cases must be described, because too little stress is ordinarily laid upon the immense importance of minuteness in detail. On the first visit the ordinary history as to age, sex, marriage, children, relevant diseases, &c., is entered. Up to a certain limit, the patient is encouraged to talk, and in this way important hints are often dropped; the ophthalmoscope is used, not forgetting to examine the lens with a + 12.0 sphere, and to make sure of the transparency of the other media of the eye; oblique illumination is employed, with the aid of a corneal loupe and, if necessary, of a corneal microscope. Astigmometry is performed and the indications, both as to axis and astigmatism, carefully noted. Subjective examination with types for near and far distance is undertaken, and a careful test of muscle-balance is made in every case. If there is any doubt as to the accuracy of the diagnosis, and in the absence of any contra-indication, a cycloplegic examination is undertaken, homatropin being used for patients over 25, and atropin below that limit. Once again, ophthalmoscopy through the dilated pupil is undertaken, the clarity of the media being specially investigated; retinoscopy follows, and if necessary, examination by oblique illumination and by the corneal microscope. The subjective examination is repeated, the muscle-balance being again carefully tested. After an interval of two clear days where homatropin has been used, and of a fortnight in the case of atropin, the final

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subjective test is made, muscle-balance being again carefully gone into, both for near and far work. These details are stressed because, in a large number of cases, it has been found that important points had been overlooked.

One of the objections constantly met by physicians, who want a further examination made, is that the patient has been to so many specialists already and has been told that "the condition has nothing to do with the eyes." Dr. Arthur F. Hurst in his very valuable Savill Lecture which appeared in the *Lancet*, July 5, 1924, p. 1., has emphasised the close connection between migraine and eye symptoms, and I would like to place on record my entire agreement with his views on this subject. I am convinced that a very large percentage of all headache is either directly or indirectly of ocular origin. An ophthalmologist may fail to help a patient, even after taking great pains, but it is certain that a very large number of cases will be benefited by any man who works with meticulous care, even though they have been to a number of specialists before.

That this is not easy is obvious from Dr. Hurst's remarks on the subject in the paper above referred to. None the less, I have felt very strongly the need of an effort to do so, and it has seemed to me that a careful analysis of this comparatively large mass of data should enable us to draw some inferences that will not be without value in helping us to attain this end. There is one thing that strikes one with great force in looking at these data: the migraine attack varies enormously in different people. It may be so severe as to be taken for epilepsy, or it may present itself merely as a sick headache, not always one-sided, or rarely some one or more of the other symptoms may alone be present without any headache. A doubt may be suggested as to whether these are genuine migraine cases. The answer is simple, but conclusive. In quite a number of them an unmistakable migraine attack occurs from time to time in the course of atypical attacks, or again, in early years there may have been true migraine replaced afterwards by abortive attacks or vice versa. The ordinary general conception of migraine is that it is confined to one side of the head; that it is accompanied by nausea and vomiting, by hemianopia, and by zigzags or fortification signs; that it is definitely periodic in recurrence; that it runs a fixed course in each individual case; and that it begins in early life. This is very far from the conception of the disease that these notes give us, as may be gathered from an outline of some of the leading points derived from a consideration of the figures within the series.

(1) There was headache definitely commencing on one side (*migraine*) in only 161 cases (53·66 per cent.). This one-sided headache spreads along different routes until it involves a large part of the whole head. It becomes intense, and in many cases utterly disables the patient and forces him to lie down.

(2) *Nausea* and often actual *vomiting* frequently accompany the headaches. There were 224 cases in the 300 (74·66 per cent.).

(3) Contrary to all that is usually believed, *hemianopia* is a comparatively rare symptom. It occurred only in 55 cases out of the 300 (18·33 per cent.).

(4) *Zigzags* or *fortification signs* were seen by only seventy patients (25 per cent.) but always indicated marked severity of the case. Other alarming visual troubles were met with in 132 cases (44 per cent.), some of these overlapping the figure for the two previous items.

(5) There is a not inconsiderable group of cases complicated by the presence of *nervous phenomena of a general nature*. Such phenomena, which may be of great severity,

are not in any way associated with vision, and appear to represent the extension of the storm far beyond the occipital cortex.

(6) *Periodicity of the attacks.* This is a definite feature in a large number of cases, but by no means in all. Moreover, it varies greatly from time to time, even in the same patient.

(7) *Regularity of Course.* There are many patients whose powers of observation do not enable them to help in eliciting this sign, but one's attention is arrested by the large number of sufferers who know definitely the course that an attack will take from the moment it starts, or even a day or more beforehand.

(8) *Age of Commencement of migraine.* It is certainly not true that all cases commence in childhood, any more than it is true that they all disappear with advancing years.

The foregoing points will now be taken more in detail.

(1) Of the 300 cases, 161 (53·66 per cent.) definitely complained of migraine, but this does not mean that some of the others did not suffer from it, as may be inferred from the following remarks. In some cases the migraine is intensely severe and persistent, but this is the exception rather than the rule. On the other hand, an attack beginning with migraine often passes into a widely distributed headache of great severity, frequently associated with nausea and vomiting, a combination which usually completely prostrates the patient. These facts, I think, explain why it is so difficult to get from some patients the accurate information one would desire as to the migraine element in the case. It is not easy even for a surgeon who suffers from disabling periodic attacks of pain to note his symptoms carefully, and it is almost impossible to get accurate details from many lay patients. Out of these 161, twenty-six definitely stated that the migraine always started on the left side, twenty-two on the right. Twenty-five said that it might begin on either side, but of these, eight were clear that it usually started on the right, and seven that it usually started on the left. Four stated that it began on one side and crossed over to the other and never became a diffused headache. Two said their attacks finished with migraine on the right side. In one the migraine always started in the left palate. In others it was described as beginning in the temple or in the eye or in the frontal region or at the back of the neck. One patient said the pain felt as if the eye was being pulled out. Even where migraine occurs, it is by no means a constant symptom of the attack; indeed, some patients mention that it is only occasional in its incidence. In one case it had been constant in school days, had gone away for fifteen or sixteen years and had then returned. There may have been others in whom, in the passage of time, the one-sided commencement of their youthful trouble had faded out of recollection on account of the dreadful intensity of the general headache into which the migraine merged. Anyone who has tried to get histories of these cases will realize how very difficult it is to do so with meticulous accuracy. It will be clear from what has already been written that 139 of the 300 patients (46·33 per cent.) made no complaint of one-sided headache. Although it is not possible to say that there was not a migraine element in some of these, it is quite certain that a large percentage of them definitely denied any such history. Their headaches were, none the less, very severe. Indeed, I doubt if there is any difference in severity between those which begin with migraine and those which do not. On this point I feel I can speak almost with certainty. There were three cases in the 300 in which the attacks

were not complicated by any form of headache. In one of these there was hemianopia and discomfort in the eye on the same side; in another there were zigzags which were relieved by correcting his presbyopia; in the third there was aching of the eyes together with nausea.

(2) Of the 300 cases fifty-seven (19 per cent.) suffered from *nausea* alone, and 167 (55·66 per cent.) from both *nausea and vomiting*, thus making a total of **Nausea and Vomiting.** 224 (74·66 per cent.) if the two figures are added together. This leaves seventy-six cases (25·33 per cent.) in which there was no complaint of either nausea or vomiting; on the other hand, these latter patients all presented in varying degrees the other signs of migraine; in nearly half of them the headache was strictly limited to one side in at least some part of the attack; twenty-one of them saw zigzags or fortification signs; fifteen of them had hemianopia; forty-four showed severe visual symptoms such as scotomata, attacks of blindness, flickering of light and revolving wheels of light. In very many of them the headache was intense; in two there was a suggestion of epilepsy and in several of them there was regularity in periodicity or in the course that the headache took. That so large a percentage of the cases, that for other reasons one would unhesitatingly describe as migraine, were free from nausea and vomiting, was a most unexpected feature only revealed by a careful analysis of the notes. It emphasizes the point that the group we classify under the term "migraine" shows the very widest variety of symptoms, though all alike have the common characteristic of a nerve storm which shifts its seat during its course.

There are some other points of interest. It is a common belief that the headache is relieved by vomiting. The verdict of these 300 cases is strongly against this view, for in only eight could we elicit such a history, and an additional one said "sometimes relieved," a total of nine (only 3 per cent.). Very many laid special stress on the fact that the vomiting gave them no relief whatever. When vomiting does precede relief, may it not be that it is a sign that the attack is drawing to a close, rather than that it is the cause of relief? As to the nature of the vomit, it is frequently described as copious, watery and saline. Some of those who formerly had nausea and vomiting stated that they had ceased to have it, whilst others developed this symptom in later life. An effort was made by a very careful analysis of the cases to ascertain whether there was any relation between the nausea and vomiting on the one hand, and the incidence of zigzags, hemianopia, or other visual disturbances on the other. No such relationship could be found. Migraine seems to be an indicator of severity, for 125 of the 224 nausea and vomiting cases (55·8 per cent.) show this symptom, whilst only thirty-five of the remaining seventy-six negative cases (46 per cent.) had migraine.

(3) Hemianopia is a sign that no patient is likely to miss, and yet it occurred in only fifty-five cases out of the 300 (18·33 per cent.). Many of the patients, **Hemianopia.** though quite definite as to the presence of the symptom, could not say with any certainty which part of the field was affected. Some stated that it differed in different attacks. It would sometimes be the right half of the vision, sometimes the left, and sometimes the upper or lower parts of the field that disappeared. Occasionally some alarm was excited, but much more often this was absent, most probably due to the severity of the headache drowning all the other symptoms. One medical man stated that the lower right quadrant of the visual field was absent during the attacks, but the upper was only indistinct; these defects, which were much intensified during successive

attacks, were tending to become permanent. An analysis of the hemianopia cases under the heading of males, married females and unmarried females revealed no influence, either of sex or marriage. On the other hand, the existence of a hemianopia is an almost certain sign that the type of case is severe. In only one out of the fifty-five could it be described as mild, and his was a most aberrant case. Thirty-four (61·8 per cent.) suffered from other serious visual troubles. 72·7 per cent. had migraine, and 54·55 suffered from zigzags. If we compare the remaining group of people who did not suffer from hemianopia, the percentage of these various troubles is very markedly less (from 21 to 36 per cent. less).

(4) Closely associated with hemianopia we find a very variable group of symptoms in which one or more parts of the visual field may be affected. **Allied Visual Phenomena.** Twenty-one complained of black spots in front of their eyes during attacks and one of bright spots. It might be suggested that these are merely *muscae volitantes*, but the patients are very certain that the spots: (1) occur in large numbers; (2) are only seen during the attacks; and (3) are a very definite and distressing symptom. Moreover, the people who see these spots sometimes complain that they develop into actual scotomata. One patient who in earlier attacks complained only of spots later suffered from blind patches which lasted from a quarter to half an hour and were accompanied by flashes of light. It would appear probable that, like scotomata, the spots are visual phenomena taking rise in some part of the brain, presumably in the cortex. Blind patches in the field of vision (positive scotomata) were seen in twenty-nine cases (9·66 per cent.). These scotomata were sometimes small and occurred patchily in the field, whilst in others they were large and single. These larger ones were apparently central and blotted out the whole of the face of anyone looked at. Again, two patients complained of blurring of the central vision which did not go on to complete scotomata. In two others the vision was interrupted. One was a doctor who described it as "stammering vision"; the other was a submarine officer, and he lost this symptom completely as soon as he left the submarine service. In twenty-seven cases (9 per cent.) there was general blurring of the visual field in all grades from mistiness upwards. There were twelve (4 per cent.) who complained of objects shimmering, flickering or waving, or of the type of a book dancing in front of their eyes. One described it as the appearance of hot air rising from an engine. A more alarming symptom occurring in twelve cases (4 per cent.) was complete blindness. As far as one can discover, this, in the majority of cases, comes on gradually, though fairly rapidly, but in at least three of the twelve it was described as sudden. The complete failure of sight varied from five minutes to half an hour, and might follow general blurring of vision or hemianopia or commence without any such warning. One medical man was accustomed, when the attack came on, to get his wife to lead him away to some quiet spot where he could recover undisturbed, which he usually did in half an hour. Another point: A patient who in severe attacks will be absolutely blind, may in others merely present blurring of vision, hemianopia or localized scotomata. One patient complained of "flashing attacks of blindness" in the upper part of the field, suggesting hemianopia. Four cases had contraction of the visual fields during the attack. I have confirmed this with a perimeter.

(5) These two signs are usually thought and spoken of as if they were identical,

**Zigzags and
Fortification
Signs.**

whereas a close study points to there being very distinct differences between them. There is one thing that can certainly be said about them both ; no patient who has ever seen them is in the least doubt as to their existence or their nature. This lends point to the fact that only seventy-five (25 per cent.) complained of them. Even those who get them fairly regularly say that sometimes they are quite absent in an otherwise typical attack. One patient had only seen them once ; another used to see them as a child, but had ceased to do so at 20. As to the colour of the zigzags, the commonest description is that they resemble the filament of an electric lamp seen against a background of bright light. Others described them as golden, as white on a black ground, as black on a white ground, or as blue. There are two points on which they are all agreed : (1) That when they try to look in the direction of the zigzags, which are usually peripheral, these slide out of view ; and (2) that they are invariably in rapid movement. One patient described them as emanating from a bright triangle of light. They appear to occasion a mild interest rather than alarm. This may be due to the severity of the headache absorbing most of their attention at the time. Of the seventy-five cases, sixty-seven saw zigzags, seven saw fortification signs, and one saw both. For a long time I had confused the two sets of phenomena in my own mind. My first enlightenment came when I showed the Reverend Mother Hildegard's pictures of fortification signs to a very intellectual and deeply-interested sufferer, a priest of the Church of Rome. I think a word about the Abbess Hildegard of Bingen, born at the close of the eleventh century, cannot fail to be of great interest to all who are studying the subject of migraine. I shall have more to say of her in the third lecture, but would like here and now to express my indebtedness to Dr. Charles Singer for all the interesting information which his book, "From Magic to Science," gives about her. She was a woman of great intellect and energy, with a keen and highly-developed mind, considerable literary powers and a very active imagination. Her drawings of migraine phenomena, both fortification and other signs, are probably the earliest on record, and they are so faithfully executed that victims of the disease to-day recognize them as reproductions of their own trouble with an alacrity and a pleasure that show how truly she painted for after generations. In "From Magic to Science," by Charles Singer (Ernest Benn, Ltd.), Chapter VI is devoted to her story in this connection. On a glittering background of gold, on which appeared a shimmering point of red light, she saw very distinct fortification signs. The mysticism of her nature led her to depict God the Father and God the Son making revelations to her, while angels floated in the neighbourhood. To the thoughtful mind this story cannot fail to be a source of the deepest interest, throwing a light back over the past, and illuminating the interpretations that have been put by earnest and honest seekers after truth on phenomena which to-day we explain on a purely physical basis. The very fact that she could draw these fortification signs so clearly and well that they are at once recognizable to-day, bears out an observation that other sufferers from the same symptom have clearly confirmed ; whereas the people who see zigzags find them always in active and rapid movement, and very evasive when looked at, those who see fortification signs say that they move very slowly. Had they not been stationary, or nearly so, I do not think she could have drawn them as she did. What is the connection between the two ? Is there any real connection ? I throw out this query in hopes that others will study the two phenomena and shed light on them. That they are cortical

in origin I imagine that most people will agree, but it seems probable that the method of stimulation and possibly the exact area stimulated are different. The priest I referred to said the crenellations were not very regular, that they moved slowly from left to right as if they were alive, but they could be looked at and studied directly, whereas the zigzags were hazy and moved with extreme rapidity, sliding away when looked at. He described both signs as lasting about ten minutes, when the attack developed into numbness, headache, and so on. He made one more point which obtains some confirmation from other observers, namely, that the fortification signs are horizontal and the movement is along the length of the signs, whereas the zigzags are vertical and their movement is up and down them, reminding one of the waves by which light is transmitted.

If we divide the 300 into two groups, those who saw zigzags and fortification signs and those who did not, we are at once struck by the much greater severity in the type of the attack in the former as compared with the latter, for the percentages of occurrence of hemianopia, of various visual troubles and of migraine is enormously greater in the zigzag group than in the other. I would describe zigzags and fortification signs as another of the hall marks of severe cases.

Probably allied to zigzags and fortification signs are a number of other interesting light phenomena met with in migraine cases. Not infrequently these actually occur along with them, though they do not necessarily do so. I refer to the appearance of stars (six cases, 2 per cent.) which may be either fixed or shooting, of flashes of light (nine cases, 3 per cent.), of what are described as jets or waves or streams of light (six cases, 2 per cent.) of bright circles usually revolving (eight cases, 2.66 per cent.). One of these patients was sent me by a celebrated surgeon who had diagnosed glaucoma on account of her description of revolving coloured haloes. It is of interest to note that every one of these phenomena can be traced in the Reverend Mother Hildegard's illustrations, which, indeed, seem to bring our knowledge up to the present hour. In addition, she spoke of "exceeding bright lights," and these are suggested by the evidence of some of the patients included in this series.

(6) *Sensory Phenomena.* In these 300 cases there is a very interesting group suggestive of paresis of the sensory nerves in different parts of the body.

**Miscellaneous
Nervous
Symptoms.**

In two there was numbness of the fingers running up the arm at one side. In one numbness of the arm and leg on the same side as the eye symptoms. This patient also had metaphasia. In one the side of the face and the fingers went numb, usually on the right side. In two there was numbness of the tongue, lips, arm and hand; in one of the left temple; and in one of the back of the head. One complained of pain in the left eye and deafness, and one had pain down both arms. A feature of interest is that in quite a number of cases the migraine attacks were associated with nasal or aural symptoms. In several of them the headache either began at the root of the nose or worked over to that spot. In one a regular symptom of each attack was absolute occlusion of the left nostril which passed away towards the end of the trouble. In another there was profuse running from the left nostril. Some complained of deafness, and in one case there was severe earache associated with giddiness. Giddiness is a not very infrequent symptom of migraine, and considering the severity of the headache and the vomiting, this is not surprising.

There is another group closely associated with the previous one in which the

Motor Phenomena. patients complained of weakness ; in one of the left arm ; in one of the left side. One could not walk or stand or use the left hand properly the morning after an attack ; one had twitching of the left side of the face during the attack ; in two there was paresis of the tongue and blurred speech ; in another loss of power of speech ; in another great difficulty in thinking and speaking, and it is significant that his trouble came in waves. In one the left eye turned up and out during an attack ; in another the left eye squinted inwards and the man was conscious of "a funny feeling" when this happened. In a boy, aged 15, the right eye squinted outwards during an attack.

Several patients definitely complained of a feeling of coldness during the attacks, either of hands or feet or all over. Others said this chilliness preceded their attacks. Two had a cold feeling across their foreheads which warned them of the coming headache. In a recent case this symptom ushered in the close of each attack.

This leads on naturally to the discussion of other varieties of *aura* recorded in these 300 cases. The histories were as definite as any that one gets in an attack of epilepsy. In one there was weakness of the left arm ; in another sweating of the left side of the head ; one felt "alloverish" before an attack ; whilst eight knew when one was coming because they felt so extraordinarily well the day before. This is an observation to which I would like to draw special attention and to which I shall refer in discussing the pathology of migraine. One patient was warned of an approaching attack of an aura of coloured zigzags ; another by "sensations round the orbit" which she found it hard to describe, but of the significance of which she was never in doubt. One felt very thirsty ; two had a feeling of great hunger soon after food. Some had gastric discomfort ; one suffered acute abdominal pain. Two medical men complained of suspension of gastro-intestinal peristalsis. One of them said he knew his trouble was over as soon as fresh movements began in the epigastric region. In the meantime he had severe migraine and vomiting. In two patients the attack was sometimes accompanied by diarrhoea. In one woman indigestion constituted, if not an aura, at least a very early symptom of an attack which took a regular course. In three medical men there was a complaint of anuria followed by polyuria. One of these, a very able clinical observer, noted that while he had anuria his feet were cold. When his feet warmed and polyuria supervened he knew definitely that the attack was over. Another patient said that his attack ended with polyuria. Not being a medical man, it is possible that he may have had anuria as well without noticing it. One lady complained of suppression of urine before an attack.

Many years ago in Madras I saw an unmarried woman in the early twenties sent to me for epilepsy with eye symptoms. I have not access to her notes, but I remember well that the careful correction of her refraction resulted in a complete cure of her epileptic symptoms, a result which focused my attention on the possibility of a connection between errors in refraction and a condition which might be mistaken for epilepsy. During the war I saw an officer who was invalided for epilepsy. He was sent to me by a nerve specialist with the expression of an opinion that an accurate correction of refraction might prove helpful. The ocular condition was a complicated one, with hyperphoria. With suitable glasses the epileptoid condition disappeared.

In the present series of 300 cases there are four in which epilepsy was definitely diagnosed : (1) An unmarried lady of 56 ; the epilepsy started at 13, passed away as she

grew older and gave place to typical attacks of migraine aggravated by gastro-intestinal trouble. She had definite and well-marked refraction errors; I have lost sight of her. (2) An unmarried lady of 53; a year previously there had been a transient hemiplegia (hysterical ?); three weeks before I saw her she had an epileptic attack, and here comes the point of interest, she had been a sufferer from typical migraine as long as she could remember. She had severe refraction errors and a grave want of muscle balance. (3) A married woman, aged 42, had suffered from epileptic attacks for eight years, after a severe fright in 1919. These went away gradually under treatment, but since an attack of influenza this winter she has developed most typical attacks of migraine. (4) A man, aged 62, a life-long epileptic, had had no major attacks for five years, but his headaches had increased and during the last two years he has developed typical migraine attacks.

In eight migraine cases (three of them maiden ladies aged 32, 47 and 53 respectively, and one, a man, aged 39), there was a history of definite unconsciousness always described as a "fainting fit." My attention was brought back to them by a girl, aged 22, who had had migraine attacks all her life and who had told me that they were sometimes associated with fainting fits. I took her into the dark room and was examining her with an ophthalmoscope when she had a typical short epileptoid attack. She had definite errors of refraction which were corrected, and she promised to report progress, but failed to do so. It would appear that symptoms, either closely resembling those of epilepsy, or really epileptic in character, are not very uncommon in association with migraine. Some of them can be greatly benefited or even cured by general treatment, combined with a careful correction of the refraction and muscular balance.