cases at from six to nine minutes. Curve 4 has points of correspondence with the other three curves, but the variations occur in more elongated form. These constitute one type of effect.

With tincture 10, on the other hand, excepting for an immediate and short-lasting drop in one case, the flow rises with the onset of digitalis, and is maintained at a rate above the normal during the first half of the experiment, until the tonus of the heart has begun to rise in a marked degree, when the flow falls below the normal (Fig. 4). This marked increase of flow cannot be due to a rise of pressure, seeing that the pressure of the fluid entering the coronary vessels is in these experiments kept constant throughout their course. Nor can the greater flow be attributed wholly to increase in rate and strength of beat; variations of heart-beat may influence to a certain extent, but will not wholly account for the variations of flow which have been recorded. This can be shown from many experiments; to give one instance—the normal rate of beat was 200 per minute, the rate of flow 25 c.cm.; two minutes after the onset of digitalis the rate of beat was 196, the force being also diminished, but the flow was 31½ c.cm. per minute; six minutes later the rate of beat was 108 and the flow 40 c.cm. per minute. The only conclusion to be drawn is that a direct action on the coronary vessels had taken place.

In dwelling upon the differences observed between the action of tincture of digitalis from sample to sample, examples have been chosen from among the best-marked cases. With some tinctures these differences do not come out clearly; the samples cannot be said to belong to either "type."

To what the differences of action are due, and whether they are of importance from the point of view of practical testing—whether, for instance, an observed tendency in a tincture to produce delirium cordis should be held to detract from the value of that tincture—are questions at present difficult to answer. Further investigations might throw light on the causes of the variations observed. To hazard a conjecture, it seems possible that the constituent glucosides of digitalis may affect differently or in different degrees the various properties of the heart, and a preponderance of one glucoside over another in a tincture may give different results on that account. It would be useful to test reliable preparations of digitoxin and its fellows in the same way that these tinctures have been tested, with a view to tracing to its source each variety of effect.

The slowing of the heart-beat, which is so characteristic a feature of digitalis action, occurred with most of the samples tested. Fig. 1 is a good example. In some of the experiments, however, a correction has to be made for changes of temperature, and at present the amount of the necessary correction cannot be estimated.

The strength at which the drug was used (for reasons already mentioned) is less favourable to the demonstration of slowing effects than are weak solutions, such, for example, as those employed by Dixon² and Haynes.³ In testing the later samples, an experiment with the tincture at 1 in 1,000 was made, in addition to two or three experiments with the 1 in 200 solution, in order to bring out more clearly these effects.

In conclusion, it may be said that by the method here adopted it is possible to ascertain with regard to a tincture (1) its "strength"; (2) its capacity for producing "therapeutic results"—for example, slowing of the heart's beat and increase of its amplitude; (3) its tendency to cause disorganization of the heart's rhythm. It may be stated here that great care was taken to keep the conditions of experiment as constant as possible, much trouble being expended in securing animals of approximately similar age and weight. The number of experiments made amounted in all to 98.

It has not at present been shown whether very small differences in alcoholic strength, such as may exist between one fresh tincture and another (the samples used were all fresh) could modify their action on the heart when the tinctures are used at a strength of 1 in 200. Such differences in the samples so far examined should be very small. It would be desirable, however, to make some experiments with a view to possible fallacies in this direction, especially since it has recently been shown by Dixon⁴ that very small amounts of alcohol in

Ringer's solution affect the calibre of mammalian blood vessels.

The inquiry was undertaken in the first instance at the suggestion of Messrs. Evans, Sons, Lescher, and Webb. I have to thank them for supplying a great part of the material and a number of the various samples tested.

REFERENCES.

¹ Dixon, *Transactions of the British Pharmaceutical Conference*, Brighton, 1905. ² Dixon, *Manual of Pharmacology*, p. 173. ³ Haynes, *Bio-chemical Journal*, February, 1906. ⁴ Dixon, *Journal of Physiology*, March 27th, 1907, p. 357.

ON MIGRAINE.*

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You may remember the advice given by Gobind the One-eyed to the author of *Life's Handicap*, when asked by the latter (as to the art of telling tales) "in what manner is it best to set about the task, O chiefest of those that string pearls with their tongue?" and Gobind replies, "Do thou this: tell them first of those things that *thou* hast seen and *they* together. Thus will their knowledge piece out thy imperfections."

And thus it is that I have chosen migraine as the subject of this short paper, seeing that we have all met with numerous cases, and also as I have had an intimate, if unwilling, acquaintance with this interesting disorder. I hope that you, with your knowledge, will piece out my imperfections.

DEFINITION.

The word, of course, is the shortened form of hemi-crania, and represents a definite entity, and must not be used, as it so often is, for headaches from whatever cause.

We call migraine a functional disease (thereby meaning that as yet we have discovered no organic basis), which is characterized by paroxysmal attacks of headache, usually one-sided, and which may be associated with sickness, peculiar affections of sight, and various mental symptoms.

If each disease could have its description written by one who has himself suffered, we should have truer and more graphic accounts to read, and our textbooks would be far more interesting.

ETIOLOGY.

We must look upon migraine as hereditary to a large extent. Perhaps one should say that the tendency to suffer from a neurosis is hereditary, but that the neurosis may appear in one generation as migraine, in another as spasmodic asthma, etc.

A patient who suffers from migraine generally has one parent gouty or a sufferer from migraine. The age of onset is variable, most cases begin about puberty, and on the other hand most cases improve about the age of 60.

Women are said to suffer more than men; but in my experience there has been a preponderance of men. Goodhart speaks well of us, he says, "migrainous subjects mostly come from the ranks of the temperate livers, who often work their brains to exhaustion."

As to the primary cause of the disease, at present we can only say that there is an hereditary predisposition to a brain storm. When we come to the immediate and exciting causes, one generally finds that mental or bodily fatigue, worry, or eyestrain are responsible. Typical causes are a cinematograph exhibition, a tour round a picture gallery, and prolonged microscopical work. I have never noticed in my own case, or in those of my friends, that errors in diet have produced a migrainous attack. It is often stated to the contrary in the textbooks, but so much the worse for the textbooks. A fatiguing journey, followed by a full meal taken on a hungry stomach, may predispose to an attack, but I am inclined to blame the fatigue and not the food.

SYMPTOMS.

May I begin by describing an attack of which I was the victim a few weeks ago? In the morning, while visiting a patient, I noticed that the lady's nose had become luminous and was trembling, and I knew that I was in for an attack. The area of disturbance was just below the central point of vision. Of course both eyes are equally

* A paper read before the North Lancashire and South Westmorland Branch.

affected and the lights keep dancing even though one shuts one's eyes. In five minutes the area had increased, so that if I looked a little to one side of the lady's face the whole of her head was blotted out of my vision. The advancing edge of the area was especially brilliant, the central part being blind. During the next fifteen minutes the disturbance increased in extent, but never involved the central point of vision. With me the central point of vision is never affected, but this is not the rule. It often begins just to one side of the central point and then extends outwards and around.

One's area of vision by this time is greatly reduced, for most of the field of vision is filled with a boiling sea of light. The lights at the advancing edge assume a zigzag form similar to that moulding called "Dog-tooth" seen in early English Gothic architecture. The luminous area is impenetrable and shuts out all vision from that quarter. One sees people with trunks but no legs, and legs without trunks. Of course, this is only relatively true, for the moment that one moves one's eyes one sees the rest of the object, whilst the part first seen disappears in a boiling sea of light. The term "fortification figures" is used for the appearance, since the form assumed corresponds to the ground plan of a fort, all angles and corners.

During the fifteen minutes or so that the fortification figures have been developing there comes on a certain amount of mental numbness. One cannot think very acutely, and one has to content oneself (during a bad attack) with talking platitudes. One loses one's powers of concentration, and I have noticed myself answering questions in a mechanical sort of way. A feeling of nausea fixes one about this time; and now, about twenty to thirty minutes after the first symptoms have appeared, the blindness on one side is complete, and one walks into people or chairs without being conscious of their existence.

Subsidence of the symptoms is rapid, and in another five minutes the blind area has shrunk or disappeared, and a headache gradually makes its presence felt on the side of the head opposite to that on which the blindness appeared. The headache lasts twenty-four to thirty-six hours. With me vomiting has never occurred.

This may be taken as a brief account of the chief symptoms of migraine; but I would point out that all cases do not present these symptoms. I would follow Liveing's classification:

1. Simple *Hemicrania*, typical in that it is unilateral and responds to every arterial beat; it recurs every few weeks.
 2. *Sick Headache*, again periodical; unilateral headache culminating in nausea, followed by vomiting and prostration; hereditary.
 3. *Blind Headache*, such as I have already described.
- But there may be other and more alarming symptoms grafted on to any case of migraine:
- (a) Tingling of lips or the arm.
 - (b) Numbness of arm.
 - (c) Drowsiness.
 - (d) Aphasia (motor aphasia).
 - (e) Squint (temporary paralysis of third nerve).

There is a form of the disease which I have not seen described in the textbooks, but which is occasionally met with—namely, one that might be termed the "status migrainicus" (from analogy to status epilepticus), in which one attack is immediately succeeded by another, so that the patient is for several hours troubled by the fortification figures and the blindness.

Another point worth mentioning is, that when a patient complains of waking in the morning with a typical hemicrania, and you ask, "Were you dreaming last night?" they will tell you "Yes"; and on asking the nature of the dreams they will often say that vivid lights played an important part in them. This seems to show that the fortification figures may be appreciated during sleep without actually waking the sufferer.

A friend of mine, who has suffered for thirty years from migraine, volunteered the statement that for many years before the typical attacks came on he used to dream of lights, and in the mornings to wake with headache.

DIAGNOSIS.

The headache is quite typical in that it responds to every heart beat, is made intolerable by stooping and coughing, and is in the great majority of cases unilateral. The character of the headache, its periodicity, and usual

association either with vomiting or blindness, makes the diagnosis easy.

Gowers has pointed out the numerous cases in which migraine has been mistaken for epilepsy. I shall allude to this directly.

A diagnosis of cerebral tumour might be made if the classical symptoms of both diseases were not inquired into.

PATHOLOGY.

Attempts have been made to show that the headache of migraine is the referred pain set up by disorders of the viscera. This cannot be so, for the areas of the cutaneous nerve supply associated with the visceral nerve supply should also be affected, and they are not; also the character of the pain is different. I need hardly mention that the fortification figures cannot be due to disturbance of the retina primarily, for both eyes are affected, and the homonymous hemianopia shows that the disturbance must be situated behind the optic chiasma, possibly in the optic thalamus.

During the attack there seems to be a contraction of the vessels of the part affected, causing depressed activity—for example, anaesthesia of the skin, loss of power of co-ordination, delayed digestion, mental lethargy, and partial blindness. When the attack is passing off, we have the arteries previously contracted now becoming dilated, and one experiences the headache, which responds to every heart beat, and which may be temporarily lessened by pressure on the carotid.

As to the actual nature of the attack, we can only say that it is one of a large group of nerve storms which are liable to sweep over the human organism—epilepsy, spasmodic asthma, tic douloureux and others. Certain constitutions seem to accumulate stores of nervous energy, which are liberated in one of these explosive methods. It may be we are laying up a store of poison which accumulates until the nervous system can stand it no longer. Haig, himself a sufferer from migraine, naturally puts it down to uric acid, and says that he can free himself from attacks by dieting.

Most observers seem to think that a poison is absorbed from the much-abused intestinal tract, and that eye-strain, fatigue, and hunger are only the matches which light the fuse.

TREATMENT.

I.—To Lessen the Tendency to the Explosive Action in the Nervous Centres.

Trousseau says: "In proportion as the nutritive and vegetative functions are feeble and languishing, nervous phenomena are mobile, exalted, irregular." To alter this condition belongs to the rudiments of medicine, and need not detain us. I need only point out the necessity for sufficiency of sleep, nutritious food (but not *excessive* in quantity), prevention of intestinal fermentation, and regular exercise. Haller cured himself by taking large quantities of water every day and a light dietary. Linnaeus also. (I am now quoting from Liveing.) "Marmontel," says Labarraque, "who was for seven years tormented by paroxysms of a very painful character, and who consulted the Queen's physician to no purpose, cured himself by following the prescription of a farrier, who advised him to drink water, eat little, and take exercise."

II.—To Avoid the Immediate Exciting Causes.

These are: (1) Gastric disturbance; (2) constipation; (3) eyestrain (by wearing + 1 cylindrical lenses for reading, I was able to reduce my attacks very considerably).

Gowers speaks highly of nitroglycerine. I have not tried it regularly. I have tried amyl nitrite inhalations when the attack was developing, hoping to overcome the arterial contraction, but, in addition to the headache of migraine, I had to put up with that caused by amyl nitrite.

The suggestive lectures by Gowers on the borderland of epilepsy opens up an interesting field for discussion. I think the chief points are these:

1. In rare cases migraine alternates with epilepsy.
2. Migraine may develop into epilepsy.
3. The tingling sensation, which may come on in the finger and gradually pass up the hand and arm during the twenty minutes in which the fortification figures are developing in migraine, may also occur as an aura of epilepsy; but in this case it is only momentary.

4. Headache follows both; that of migraine being more severe.

5. The aura of migraine seldom affects a leg or the trunk.

6. Somnolence may occur in both.

As Gowers says, "it is curious that the most frequent relation between epilepsy and migraine is as a source of error between the two." Of course, one always has to remember that they are both comparatively common complaints, and there will be a natural overlapping, apart from any affinity.

The antecedents of migraine are migraine or gout, those of epilepsy being epilepsy or insanity. In migraine there is no deterioration of mind.

THE REMOVAL OF FOREIGN BODIES FROM THE AIR AND FOOD PASSAGES.

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AMONG the cases of foreign bodies in the air and food passages which came under my department during the last twelve months, two are of special interest, and appear to be worthy of record. While illustrating the ease with which such foreign bodies can be extracted even from deep-lying sites by means of the direct method, they show, at the same time, the importance in using it of having good illuminating power. They will also serve, I hope, again to call attention to this admirable mode of treatment, as it has hardly received in this country the attention it deserves.

Nutshell in the Left Bronchus—Extraction by Bronchoscopy.

A young sailor, 18 years old, was admitted to hospital in January, suffering from difficulty of breathing. He was eating nuts whilst playing "leap-frog," and aspirated part of a nutshell into his larynx. He had a severe suffocative attack lasting some time, during which he was partially cyanosed and in great distress. After a while the obstruction appeared to become displaced, and, while the breathing was relieved, discomfort was felt lower down in the chest. When seen, twelve hours later, he complained of a feeling of constriction of the chest and cough, and wheezing was audible. Beyond rhonchi heard over the larger air tubes there were no definite physical signs to be made out in auscultation. He was put under chloroform, which he took rather badly, there being much cough and cyanosis. After the upper part of the respiratory tract had been well cocaineized, a Killian tube 9 mm. in diameter was passed through the larynx into the trachea, which was injected and intensely red and contained much frothy mucus. This was rapidly removed by means of the saliva pump and cocaine applied to the lower air passages. The tube was passed down the right bronchus, which was explored as far as the second ramification and found empty. Its mucous membrane was much injected, probably explained by the fact that the patient had been suffering from a "bronchial cold" for some days. In searching the left bronchus a mass, reddish in colour, was found blocking it just below the commencement, but its relations were difficult to make out owing to the insufficient illumination given by a worn-out lamp. The examination was accordingly suspended, and on the following day the patient was again placed under the influence of chloroform, which he this time took very well. Using a new lamp giving a greatly-improved light, I passed the tube at once down to the left bronchus, and when the mucus was removed the reddish mass was made out to be the piece of nutshell lying inside the bronchus having a small hook-like process over the bifurcation. The convexity of the shell was uppermost, and from under it a constant stream of frothy mucus poured out of the bronchus. Its red colour closely resembled that of the adjacent mucous membrane, and it was the greyish tint of the part of the shell next the bifurcation which enabled its exact relations to be recognized. A Killian long forceps was passed down, the hooked end was seized and the nutshell drawn out along with the tube. The whole procedure did not last more than a quarter of an hour. The patient left hospital two days later.

The object removed was a fragment of a Spanish nutshell measuring 2 cm. by 1.6 cm. (Fig. 1). Its outer smooth convex surface was of a uniform red colour resembling that of the bronchial mucous membrane. Towards the apex, where it terminated in a hook-like process, it had more of a greyish tint, and this was the only point which stood out in contrast to its surroundings. Foreign bodies in the bronchi usually become covered with mucus and assume a grey appearance

which renders their identification from the adjacent structures easy; but in this case the polished surface of the shell afforded no hold to a mucous covering, and the entrance of the bronchus looked at first sight as if it were

Fig. 1.—Nutshell (a) impacted in left bronchus; (b) after removal.

filled by a smooth globular swelling. The use of a good light soon revealed, however, the condition of things; and, the exact relations having been ascertained by means of a probe, the extraction presented no special difficulty.

Plum Stone in the Oesophagus: Removal by Oesophagoscopy.

A Norwegian sailor, aged 16, was admitted in June, 1907, with difficulty in swallowing so complete that nothing had been passed for forty-eight hours. There was a complete block of the gullet, and this had come on after swallowing a plum stone. Attempts to dislodge it had been made in the hospital of another town but without success. On admission the resident medical officer passed soft bougies, and found that a small size could be got as far as the cardiac end of the oesophagus, where it stopped, and a large size was arrested about the middle of the chest. He wisely refrained from employing any force or using a coin-catcher. The patient was placed under chloroform, and an oesophagoscopic tube of 13 mm. diameter passed down until it was stopped about 8 in. from the teeth by a narrowing of the gullet, which was emphasized by spasm. But even abolition of the spasm under deep anaesthesia did not permit its passage. Accordingly a tube of 9 mm. diameter was introduced, and this went through the narrow part without difficulty. It was carried as far as a short distance above the cardiac orifice 12 in. from the teeth, where the plum stone was found lying transversely across the gullet. The mucus was wiped away, and the exact relations of the body ascertained by the probe. It was readily grasped by the forceps, and was being drawn up along with the tube, into which, on account of its size, it could not enter, when it stuck at the narrow part and the forceps slipped. This happened twice. By a little manipulation the plum stone was turned lengthwise and then grasped, after which it was manoeuvred through the constriction and brought out along with the tube. We subsequently learned that the patient when a child had swallowed some caustic alkali and was obliged to be very careful in eating. A few years ago he had trouble with food which remained in the oesophagus for several days.

The size of the fruit stone extracted (Fig. 2) was 2 cm.

Fig. 2.—Plum stone extracted from cardiac end of oesophagus.

by 1.2 cm. It had a sharp hook-like process at one end. This was embedded in the mucous membrane of the cardia and a forcible attempt to push down the stone would certainly have led to laceration. As a rule a foreign body is easily recognized, standing out, as it generally does, in sharp contrast to the pink tint of the mucous membrane. In this instance, again, the red colour of the foreign body gave no such distinction, and accordingly a good light giving brilliant illumination was indispensable.

The general technique of the method of removing foreign bodies by bronchoscopy and oesophagoscopy I have already