TREATMENT IN GENERAL PRACTICE

This article is one of a series on the management of some lesions of the nervous system met with in general practice.

THE TREATMENT OF HEAD INJURIES

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Of the parts included within the head the brain is anatomically the largest and functionally the most important. Fracture of the skull is of little import except in so far as it may cause haemorrhage of a kind that may compress the brain, or open pathways through which the meninges or the brain itself may become infected. It is true that the presence of fracture offers proof of a degree of violence which must almost always have caused direct injury to the brain, but it is also true that the brain may be severely damaged in a case of head injury without fracture of the skull.

The most important part of the treatment of head injuries, therefore, is that which concerns direct injury of the brain. The commonest immediate effect of such an injury is the loss of consciousness, which by tradition is accepted as the result of concussion—a term which provides a convenient cloak for our ignorance of the underlying pathology. A patient may recover from concussion, even though the state of traumatic stupor may persist for several days without other evidence of cerebral injury. On the other hand, a patient who has escaped concussion may present other and more lasting symptoms of damage to the brain. From the practical point of view, however, the most convenient approach to the treatment of head injuries is by way of a division of the cases according to the presence and duration of concussion after the accident.

I. PATIENT UNCONSCIOUS WHEN FIRST SEEN

We shall begin, therefore, by considering the case of a patient who is unconscious when first seen by the doctor, and who is reported to have been so since the moment of the accident. Before the patient is moved a few essential observations should be made.

1. Is there any dangerous degree of bleeding from the scalp? If so, this should be controlled, so far as possible, by a pad and firm bandage, but nothing stops bleeding completely save suture, and this will not be possible or even desirable as a first-aid measure. It is a mistake to suture up a scalp wound properly until conditions are favourable for a full exploration of its depths.

2. Is the patient collapsed—that is, pallid, with rapid, thready pulse? If so, measures should at once be taken to procure warmth.

3. Are there other gross injuries, such as fractures of the limbs, neck, or spine, which may be masked by the state of unconsciousness and which may demand first-aid treatment?

4. What is the depth of unconsciousness? This question is not simply answered. The following tests provide a rough measure of the degree of stupor from least to greatest severity: (a) Can the patient be roused to respond to a simple question forcibly put, such as, "How are you?" or "What is your name?" (b) Does he respond to a forcible command, such as "Put out your tongue," "Give me your hand"? (c) Does he respond by appropriate movement to a painful stimulus—for example, does he withdraw his arm

or leg when the skin is pinched? (d) Is the corneal reflex present?

A note should also be made of the size, and especially the relative size, of the pupils, and of the presence or absence of any difference between the power and tone of the muscles of the face and limbs on the two sides of the body.

The Scalp Wound

Whenever feasible the patient should be moved into a nursing home or hospital, and, if possible, x-ray photographs of the skull should be taken on admission, except in the case of a patient who is severely collapsed.

At this stage certain surgical problems may present themselves. Unquestionably the most effective method of arresting haemorrhage from the scalp is by deep suture. Sometimes the quantity of blood lost from a scalp wound is prodigious. Bazett, working on the blood volume of severe injuries, estimated that the loss from a scalp wound might amount to as much as one-fifth of the total volume. Clearly judgement must be exercised in the treatment of severely exsanguinated patients with dirt-ingrained wounds. These require excision of their edge, but it would be a great mistake to take this step immediately without regard to the state of exhaemic shock present. The best plan would be to insert such sutures as are necessary to arrest the bleeding, and to leave the débridement of the wound aside for a sufficient number of hours to allow of recuperation. Scalp wounds of great size are not very common; they result most often from glass cuts in motor accidents.

It is the rule to inspect the floor of a scalp wound for evidence of fracture. If there is a linear crack it should not be interfered with. If there is a depression the treatment will be that of a compound fracture (see below). If a fracture line is seen it is worth while to note its direction. Does it seem likely to cross the path of the middle meningeal vessels? If so, we should be more than ever on the watch for an epidural haemorrhage. The operator should always confirm his impression of the fracture by studying the x-ray films, but these are often not available at the time when the scalp wound is first attended to. Scalp wounds are always the better for drainage with a narrow strip of rubber.

Depressed Fracture

If a depressed fracture is present, should it be operated upon? Always, if there is a scalp wound over it, for infection of the bone that may spread deeply is a real danger, and, moreover, operation should be performed within as few hours as is judged wise having regard to shock and loss of blood. A very limited bone removal is advised, after removing a small disk at the edge of the depression. The object of the operation is not so much the elevation of the depression as the extirpation of infected bone and the provision of external drainage. If the scalp over the depression is intact there is no need generally to intervene unless the x-ray films show an in-driven bone fragment, such as may have penetrated the dura. If that has happened an operation should be undertaken within forty-eight hours.

We believe that a shallow depression does little permanent harm, and that epilepsy is no more likely to

develop in such a case than after a general cerebral concussion. The most potent cause of epilepsy is local laceration of the cortex; hence the importance of determining by x-ray examination whether the bone has been driven deep enough or angularly enough to have caused severe local injury. This implies that late operations on pond depressed fractures will very rarely be done.

General Treatment

On admission to hospital the patient should be laid flat in bed with his head to one side. A more thorough examination should then be made: this will include the points already mentioned, together with a record of the pulse, temperature, and respiration; examination for thoracic or visceral injury; and a note of the tendon jerks, abdominal reflexes, and plantar responses.

From this time onwards the nurse should keep a record at regular intervals not only of the pulse rate but of the depth of unconsciousness as indicated by the tests already mentioned, of any difference between the tone and power on the two sides of the body, and of the relative size of the pupils. During the first forty-eight hours this record should be two-hourly, and should thereafter be continued at a four-hourly interval until consciousness has been regained. During the early stage of this period sedatives should be avoided if possible. Fluids should be given by spoon or feeding-cup. A watch should be kept on the bladder and the need for catheterization.

Danger Signals

The nurse should be instructed to call the doctor in case of any of the following developments: progressive deepening of unconsciousness; progressive loss of tone or power on one side of the body; progressive slowing of the pulse; and progressive discrepancy in the size of the pupils. In such cases the questions which the doctor is called upon to decide are whether there is sufficient evidence of progressive meningeal haemorrhage to warrant exploratory craniotomy, and, if so, whether he should attempt the operation himself or call to his aid a surgeon with particular experience of cerebral surgery.

With regard to the first question, there are certain preliminary considerations to be weighed. Progressive deterioration of the patient's condition in the early stages after a severe injury is not necessarily an indication for surgical intervention. There is a large group of cases in which from the outset the depth of unconsciousness is profound—no response to painful stimulation; often absence of corneal reflex—the pulse remains feeble whether it be slow or rapid; the temperature is either persistently subnormal or shows a precipitate rise; and the patient usually dies within the first forty-eight hours without the development of any localizing signs.

The cause of death in these patients is laceration of the brain. No operation can save them, and such chance that they may have is better if they are left alone. The point which is of greatest value as evidence of compression from meningeal haemorrhage is an increasing depth of unconsciousness. It must, however, be recognized that in a certain limited degree this may occur in a state of concussion without compression. It is not uncommon to find a patient who for the first hour or two after the injury is able to answer questions in a dazed fashion, but subsequently becomes unresponsive to this test and even to simple commands, though he will exhibit spontaneous restless movements and will react to painful stimulation; and in this state he may remain for several days. It is, then, the degree of unconsciousness in relation to its initial depth that has to be taken into account, with especial emphasis upon a depth which is steadily

progressive, and loss of the response to painful stimulation. A hemiparesis which is undoubtedly progressive is a clear indication for operation. Progressive slowing of the pulse rate is of value when taken together with the other indications. In a patient who shows no progression in the depth of unconsciousness or other danger signs a slowing pulse rate is not necessarily of importance.

The delayed appearance of a dilated pupil, though it may sometimes be due to intrapontine oedema, is always suggestive of a meningeal haemorrhage, usually on the side of the abnormal pupil. In case of doubt it is better to explore, and it is to be remembered that acute subdural haemorrhage is as common a cause of compression as the better-known epidural haemorrhage from the middle meningeal artery, and that the former not infrequently occurs in the absence of a fracture. The exploratory operation, therefore, is not complete until the dura has been opened. Whether the general practitioner will attempt the operation will naturally depend upon local and personal considerations which are outside the scope of this article. If the progress of symptoms is rapid from hour to hour time is of the first importance, but when the development is measurable in terms of days there is usually opportunity for a carefully planned operation, and there is much to be gained from the service of a surgeon accustomed to the modern technique of cerebral surgery.

Technique of Emergency Operation

If an emergency operation is to be undertaken it is best done under local anaesthesia—30 c.cm. of novocain (1 per cent.) and adrenaline. Through a vertical incision $3\frac{1}{2}$ to 4 inches long in the temporal fossa, 1 inch in front of the ear, an opening is made in the temporal bone after splitting the muscle. When an epidural haemorrhage is present the dark clot is at once seen. The bone opening is enlarged and the clot removed as far as possible. There is no very great difficulty so far, but the securing of the actual bleeding may be no easy matter, and gauze may have to be used as a pack. This, of course, is undesirable, for its volume might well equal that of the clot removed, and every effort must be made to under-run the meningeal artery with an occlusive suture. There is no doubt that this operation is a much more difficult one than is commonly supposed, and when the bleeding comes, as it may, from an inaccessible spot, the only good way to arrest it is by plugging the foramen spinosum with a shaped piece of matchstick. But in case of dire emergency, and this can arise, the practitioner must operate and make the best of it.

If no epidural clot is present a very dark tinge will suggest a subdural haematoma. A very small dural incision will suffice to show whether a subdural haematoma is present or not. Attempts at intradural exploration are not recommended through the limited approach outlined above. A small flap allows a much better approach, but it requires considerable experience and dexterity in the making if the patient's chances of recovery are not to be jeopardized.

The clot of a subdural haematoma has long been known to be curiously fluid, a state which we now believe to be due to the osmotic passage of cerebro-spinal fluid through the thin endothelial covering that so rapidly surrounds an intradural blood clot. This fluidity allows of the easy extraction of the contents of such a clot, so that it could be dealt with through a small opening if this happened to lie over it. But a small osteoplastic flap, made again under local anaesthesia, allows of better exposure. Large flaps are not advisable in traumatic cases, in any event.

Continuation of General Treatment

The administration of sedatives should be postponed so far as possible until it is clear that the depth of stupor is diminishing, and they should be given s.o.s. to control a harmful degree of restlessness. In certain cases restlessness may be present from the first, and in these sedatives will be needed:

R _x	Chloral hydrate	...	...	...	...	gr. xx
	Pot. brom.	...	...	...	...	gr. xx
	Aq. chlorof.	...	...	...	ad	3 ss

This mixture should be taken in two ounces of water up to four-hourly if required. Morphine should be avoided as far as possible, but is often necessary. If a patient is sufficiently restless and vigorous to require it, it will do him no harm. Its disadvantage is that it masks the possible development of progressive stupor. Small doses—1/6 grain to 1/4 grain—should be given and repeated when indicated, the patient being allowed to recover from the effect of each dose sufficiently for an assessment of his mental state before another dose is taken. Hyoscine hydrobromide 1/200 grain to 1/150 grain may be combined with the morphine if necessary for extreme restlessness, but should be avoided, if possible, owing to its toxic effects. For the patient who is noisy and unmanageable at night paraldehyde, 3 to 4 drachms in a wineglass of orange-juice and water, is an effective hypnotic, and may be followed by one or more doses of the chloral and bromide mixture. When the need for hand feeding is past, the patient may have whatever food he can take. Alcohol should be forbidden.

Control of Intracranial Pressure

At the end of thirty-six hours, if the patient has recovered from shock but is still unconscious, lumbar puncture should be performed. The pressure of the fluid should be estimated by manometer, and if it is above 120 mm. of water, fluid should be run off until this level is reached. If the pressure is above 200 mm. of water, such of the following measures as may be practicable should be employed for the diminution of intracranial volume and pressure.

The patient should be propped up in bed in the Fowler position. A solution of magnesium sulphate, 3 ounces in 6 ounces of water, should be administered per rectum. The solution should be warmed and run in slowly through a tube and funnel, and has to be retained for half an hour for a successful result. Or 2 drachms of magnesium sulphate in 2 ounces of water may be taken by the mouth, and thereafter 1 drachm of magnesium sulphate in the same amount of water hourly until a watery stool is obtained. Lumbar puncture should be repeated daily if the pressure is over 300, and at less frequent intervals when the pressure is lower, with drainage to a normal level as already described. If at the first lumbar puncture the pressure is normal these methods of treatment will not be required, and as the patient becomes more conscious he should be encouraged to rest in whatever position he finds most comfortable.

It is difficult to lay down a definite rule about the use of intravenous hypertonic solutions (the best being 50 per cent. glucose). There is no doubt about the potency of this method of therapy; therein lies its danger. Certainly it should never be used during the first hours after injury. In those cases in which more than two lumbar puncture readings have shown the pressure to be above 200 mm., the injection of hypertonic solutions is allowable, but one must be reasonably sure that no large local clot is present. In most cases intravenous hypertonics are best unused.

After Recovery of Consciousness

As soon as the patient regains consciousness in the sense of being perfectly and continuously aware of his surroundings, a new phase of treatment is begun in which subjective symptoms guide the degree and duration of cerebral rest required. The symptoms to be looked for are: headache; difficulty in concentration; mental fatigue; insomnia; and giddiness on movement. So long as any of these symptoms are present the policy of strict rest should be continued, and this should be reinforced by medinal 5 to 10 grains, s.o.s., nocte, and a mixture such as:

R _x	Pot. brom.	...	...	...	...	gr. xx
	Liq. arsenical.	...	...	...	...	m ij
	Aq. chlorof.	...	...	...	ad	3 ss
	3 ss, t.d.s., p.c.					

For the headache the patient should be encouraged to find the posture of greatest ease, and, if necessary, should be propped up. Lumbar puncture should be reserved for severe headache, and the manometer should be employed as a guide to the further need for withdrawal of fluid and dehydration by means of salts as already described. One or two tablets of empirin should be prescribed at need, or, if the headache is exceptionally severe, a powder containing 5 grains each of aspirin and pyramidon and 1/6 grain of heroin hydrochloride. Giddiness on movement may be relieved to some extent by 1/2 grain of luminal, t.d.s., p.c.

The proper management of the patient at this stage is of great importance, and often beset with practical difficulties. In the detailed instructions which follow we shall be precise in order that we may be clear, with full recognition of the need that may arise of modification according to circumstance.

Graduated Convalescence

Under nursing home conditions the patient should be nursed in bed, should be read to rather than allowed to read, and should be permitted not more than one visitor, who should remain with him for short periods only. The room should be darkened for part of the day. Boredom, however, may induce a degree of restlessness which is itself harmful, and allowance must be made for this factor in handling the individual patient. The continued presence of a quiet-minded and influential relative or friend in the room may be of help in some cases. When under such conditions the patient has been free from symptoms for forty-eight hours, or if after complete recovery of consciousness he has at the end of three days admitted to no complaints, a plan of graduated progress towards greater cerebral activity should be begun as follows.

The patient may have some mental exercise for an hour in the morning—such as listening to the gramophone or wireless, working at a jigsaw or crossword puzzle, or playing a game of cards. In the afternoon he may sit up in a chair for an hour. If under these conditions there is recurrence or development of symptoms the conditions of strict rest must be reimposed. If, on the other hand, the first step towards greater activity is successful, at the end of forty-eight hours he may take the next. He may be allowed up to bath and lavatory, may read at will, and may have a few visitors, though not more than one at a time.

If he again remains symptom-free, at the end of another forty-eight hours he may dress and sit up in his room, and may have more than one visitor at a time. If he remains well after another forty-eight hours he may begin coming down for meals, go out for a daily short walk or drive, and lead a quiet life in the household.

If, after the same interval, he remains well, walking exercise should be increased, and he may be allowed a normal life at home. If at the end of another forty-eight hours he is free from symptoms he should have fourteen days' holiday, proceeding gradually to a fully active existence, before he returns to work. Recurrence or development of symptoms *at any stage* should be the signal for a backward step to the point at which the patient was symptom-free.

This plan of graduated convalescence may be applied as well to patients who have been long unconscious—for instance for ten days—as to those in whom the duration has been brief—for instance, ten hours. In practice it will be found that as a rule a long duration of unconsciousness is attended by more severe and prolonged after-symptoms, but it is a rule to which there are striking exceptions.

Under hospital conditions neither the initial quiet nor the smooth progress towards greater activity is so easily obtained. The same graduated stages should be observed. In the earlier stages the patient's bed should be screened, and should be in the quietest part of the ward. It is better that he should have his visitor at some time removed from the bustle and noise of a visiting day. On first getting up he should sit apart from the other patients in a quiet corner of the ward or balcony. The transition from the relatively peaceful surroundings of the hospital to those of the home is often too abrupt, and leads to recurrence of symptoms in a patient who is thought on his discharge to have recovered. He should therefore be kept in hospital until he has been able to lead an ambulant existence both indoors and out for three or four days without symptoms, and should then usually be transferred direct to a convalescent home.

Return to Work

According to the plan outlined it will be possible at the optimum for a patient to return to his work in three or four weeks from the time he recovers consciousness. On the other hand, the graduated progress may have to be spread over a period of several weeks or months. In any case in which the duration of unconsciousness has been longer than forty-eight hours the patient should be advised to take 10 grains of potassium bromide at night for the ensuing two years as a precaution against epilepsy.

This plan of early return to work may strike some readers as revolutionary, but the plain fact is that symptoms must be our guide. Where there are none, the above programme may be safely followed out; there is nothing to be gained by prolonging an unwanted convalescence. An extended rest would not matter if it were not for the fear of a neurosis developing, but there is this danger, and too solicitous an attitude may do harm. On the other hand, we must give sympathetic attention and credence to such complaints as may continue to give trouble; and where there are complaints we must alter our plans to deal with them. In particular, we should recognize that an undue liability to fatigue (both mental and physical), insomnia, and difficulty in concentration are common residual symptoms of organic damage, and must not lightly be dismissed as neurotic. The kind of work to which the patient must return has also to be taken into account, and in relation to this we would emphasize the importance of testing the patient, as far as possible, to his full capacity before declaring him finally recovered—whether by means of mental or of manual labour.

Finally, the point we would stress is that the date of return to work should be determined for each individual by analysis of the symptoms in his particular case. It is not everyone who will be well enough to begin work

in three or four weeks after a severe head injury; sometimes it will be three or four months, especially in the case of middle-aged or elderly persons, but a really prolonged period such as a year or more is very rarely required, except by patients with symptoms of focal injury—for instance, aphasia.

II. REPORTED TO HAVE BEEN UNCONSCIOUS

The period of unconsciousness in the case of a patient who is conscious when first seen but is reported to have been unconscious will usually have been less than an hour. In such an event it is important that the degree of mental alertness should be estimated at once, and that it should be estimated again after the patient has been put to bed, when a rough neurological examination should be made, as described in Section I.

The period of strict rest in such a case should be forty-eight hours, after which graduated progress should be attempted on the same lines as described in Section I, but with an interval of twenty-four hours between each step and with a terminal three or four days' holiday when progress is uneventful. If symptoms are present, or if they should develop after a latent interval, they should be treated as already described, and the interval of freedom from symptoms before the next forward step is taken should be forty-eight hours. The skull should be x-rayed as soon after the injury as possible.

III. NEVER UNCONSCIOUS

If there are no symptoms, the patient who has not been unconscious should be rested in bed for twenty-four hours, and may then be allowed to return to his normal way of life. He should, however, be warned that symptoms (headache, giddiness, etc.) may occur after a latent interval, and that he must report at once if they do so. If symptoms of this kind are present from the first, or appear later, they should be treated on exactly the same lines as those described in Section I. The patient who has not been concussed may prove to require treatment as careful and prolonged as the man who has been unconscious for several days. The necessity for x-ray examination will depend upon the nature and severity of the injury.

CHRONIC SUBDURAL HAEMATOMA

Chronic subdural haematoma should be remembered as a rare sequel which may complicate head injury, even without concussion, especially in elderly patients. The development of progressive headache, drowsiness, or hemiparesis a few weeks or months after a head injury must therefore be regarded with the same suspicion and treated in the same way as it would be in the earlier stages.

CONCLUSION

It is advisable to inform the patient who has had a head injury, whether severe or mild, as soon as he is able to take an interest in his condition, that symptoms such as we have described are common and sometimes of long duration, but are benign, and that complete recovery is the rule. He will need often to be told that the time spent at rest until freedom from symptoms is procured will prove an economy in the long run.

The twelfth conference of the German Pharmacological Association will be held at Munich from October 20th to 23rd, and in connexion with it there will be a performance of *Don Giovanni* in the National Theatre and a motor tour through the Bavarian hills. The fee for membership of the conference is RM. 3. The programme is obtainable from Professor B. Behrens, Dorotheenstrasse 28, Berlin, N.W.7.