The Sequelae of Head Injuries

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THE DIAGNOSIS and treatment of head injuries is directed not only to the immediate manifestations of injury but also towards the prevention of sequelae.

It is true that the majority of patients ultimately make a complete recovery, although this is often at the cost of prolonged morbidity and occasionally of partial or complete incapacity.

About 35,000 individuals are admitted to hospital in the United Kingdom each year on account of head injuries; 75 per cent result from road accidents, the rest from accidents at work, at home or at play. Consequently cases of brain injury, for that is, as has already been stressed, the important aspect of these cases, are widely dispersed. We, who are charged with the privilege of teaching, have only ourselves to blame if there are doctors less aware than they should be of the diagnosis and management of acute brain injuries and of the recognition of complications needing surgical intervention.

Sepsis

In mentioning this I would note that the most simple head wound may be deceptive and, especially when there is a fracture, may result in osteomyelitis of the skull, an extra- or subdural abscess, localized or generalized meningitis or a brain abscess. The danger of these is minimised, of course, by the proper care that goes with understanding of their possibility. In this respect, reference must be made to Cairns' (1937) and Calvert's (1942) work in relation to fractures of the cranial wall of the frontal and ethmoidal sinuses. In some of these there is slight and fleeting rhinorrhoea so that repair of the dural tear that exists is regarded as unnecessary; these workers considered this policy indefensible for they recorded the development of brain abscess or meningitis months or years after the cessation of evanescent rhinorrhoea. Furthermore, in some of their cases, there was no such history nor was there radiological evidence of air within the skull and yet two-thirds of the cases in this group died from abscess or meningitis. The need here is for special x-rays designed to demonstrate the sole indication for repair.

Sequelae of Organic Neurological Defects

These deserve consideration. Amongst the most important are

1. those due to damage to the brain or the projection pathways,
2. permanent loss of function of one or more cranial nerves,
3. post-traumatic convulsions.

Permanent Damage to the Brain

The result of this naturally depends on the area involved. From the patient's point of view the most serious effects are:

a. weakness or spasticity of one side of the body, always associated with abnormal reflexes and often with some sensory disorder,
b. ataxia and cerebellar incoordination,
c. speech defects which are rarely as circumscribed as in vascular lesions and consequently more likely to make a slow and incomplete recovery.

Permanent Loss of Function of Cranial Nerves

Damage to the olfactory nerves or bulbs may occur in the absence or presence of cerebro-spinal rhinorrhoea after injury to any part of the head; it is most common in occipital and frontal injuries, which are usually severe as judged by the length of post-traumatic amnesia and the length of time in hospital, followed often by prolonged ill-health and permanent disability to be ascribed to the accompanying frontal lobe injury (Leigh, 1943). Associated loss of taste is inconstant (Leigh, 1943). Recovery of smell is not common and only occurs within the first six months. If we say little of the loss of some of life's savour from anosmia and aguesia, we must remember the increased hazards to life for ordinary people unable to smell and more especially for chemical workers.

Blindness may occur at the time of the injury, usually of slight severity; visual loss may be partial. In the majority of cases the cause is damage to the vessels supplying the optic nerve or chiasma, but when the onset of traumatic blindness is delayed it may be that there is a fracture of the optic foramen with pressure on the nerve by callus; fibrous tissue or progressive arachnoiditis may produce the same effect. In
these cases decompression of the nerve should be done early for little improvement can be expected once optic atrophy has occurred and certainly none after a month.

Diplopia as an early symptom but without demonstrable weakness of the 3rd, 4th or 6th cranial nerves is probably caused by circulatory disturbances in the brain-stem causing incoordination of eye movements. It is usually of short duration. When a squint, not previously present, is obvious the trunks of the nerves have been injured and recovery is doubtful if it has not begun within three months. This is a serious disability especially in precision work and in that needing appreciation of speed and distance.

Permanent injury to the main branches of the trigeminal nerve is rare; intractable pain may, however, develop in the maxillary division after a basal fracture and requires an alcohol injection to control it. The supra-orbital nerve may be similarly affected, but numbness over its distribution is more common and resolves with time.

The facial or auditory nerves may be damaged by fractures through the petromastoid: there is haemorrhage into the middle ear. Immediate facial paralysis is rare as is recovery from it, in contrast to the more common delayed paralysis appearing one to four days after injury and usually recovering in one to three weeks. Degeneration of the nerve is very rare and when it occurs regeneration takes three to four months. The cause is probably compression of the nerve by haemorrhage in the facial canal. In those cases where no recovery takes place, anastomosis with the 12th nerve should be considered.

Deafness is an important sequel: loss of hearing may be partial or, when the inner ear is involved, complete and permanent, together with vestibular disturbances. True vertigo is rare and is probably due to haemorrhage into the labyrinth. An audiogram is necessary to determine the type and degree of deafness, and caloric tests and objective evidence for appreciation of vestibular dysfunction. In older people it is necessary to confirm statements about their hearing before the accident.

Post-traumatic Convulsions

These may occur at any time after a head injury and because the pathological state of the brain is entirely different, according to the time of their appearance, it is convenient to divide cases into immediate, delayed or late.

In the immediate group, convulsions occur from 12-24 hours after injury and are due to contusions or lacerations, to haemorrhage outside or within the brain, to pressure from depressed fractures or irritation from penetrating fragments, to oedema and to the beginning of sepsis. It is interesting to record that in a series of 362 cases of simple, uncomplicated concussion at Montreal there was not a single case with fits (Penfield, 1941).

Delayed convulsions occur in 2-4 weeks and are to be related to the healing process or to pathologic complications which call for further investigation and sometimes for surgery.

Late epilepsy appears after apparent recovery and is due to cerebral or meningo-cerebral scars, to traumatic cysts, to abscess, foreign bodies or occasionally to a chronic subdural haematoma.

Post-traumatic epilepsy is not frequent in peace-time for the obvious reason that dural penetration and gross cerebral damage with the added risk of infection are so much less common. Whether in peace or war inadequate surgery increases the incidence.

Doubt has been thrown (Garland, 1942) on the common conception of traumatic epilepsy as a focal phenomenon. Recent work by Penfield (1954) has, however, brought many more cases of generalized epilepsy into the focal category, a finding of immense significance in treatment.

The prognosis in post-traumatic epilepsy is not always gloomy but becomes worse the longer the latent period.

The treatment of post-traumatic epilepsy is primarily medical, by advice as to conditions known to favour or inhibit attacks, by suitable employment and by appropriate drugs. Surgery should be considered where there is a surgical lesion or where medical treatment has failed: it should only be undertaken where special facilities for investigation exist. Absolute contraindications are extensive neurological involvement, mental deterioration, chronic infection and general debility.

Skull Defects

In the absence of dural defect or sepsis, these are not serious. They can easily be remedied by simple repair with tantalum, acrylic resin or autogenous bone. This needs to be done when a man's life is made incomplete on account of deformity or a sense of insecurity. It is a very different matter where wounds are not soundly healed or have not done so by first intention, for to re-open them may activate latent infection.

Mental Disturbances

It is well known that these, and rarely malingering, occur after head injuries. The subject of post-traumatic psychotic states has become very important with the increase of industrial and road accidents, the development of industrial compensation and of laws tending to place the responsibility for the accident and the ensuing injury. Observations about the mental state before the accident are usually missing so that it might be well if all new employees had a careful neurological and psychological examination.

Post-contusional State

I intend to give most attention to this "man's land", and I am at one with Symonds (1942) in opposing the division of the features in this condition into organic and functional. The patients have a variety of complaints with little in the way of signs. More than one observer (Symonds, 1942; Strauss and Savitsky, 1937) has
commented on the inherent difficulties of this problem and their aggravation by lack of thorough clinical examination in the early stages, and of adequate records.

The case should be regarded as a new one and more attention paid to the pre-traumatic personality and intellectual level and to inherited or latent predisposition to mental disturbance than to a protracted neurological overhaul. In considering the post-contusional state the individual’s adjustment, responsibilities, plans and ambitions before the accident must be compared with the changes in his living conditions, work and prospects thereafter.

Rowbotham (1949) has drawn a beautiful and sympathetic clinical picture of the man who complains of the results of a head injury, with litigation at stake. He describes the slow and hesitant entry of the patient into the consulting-room, his mental dullness and disregard of appearance in the presence of a wife, as profoundly unhappy as himself, but who, in becoming the initiator of action and the mouthpiece for them both, stresses the profound mental and physical change and the loss of interest and memory. The patient is convinced that nothing can be done for him and can only be persuaded to define his difficulties reluctantly. Emotional episodes and expressions of despair punctuate the slow and easily interrupted process of undressing. The gait is deliberately slow. There is caution in turning and often tremor. In short, mental and physical sluggishness and changes in disposition dominate the findings.

Although no sex or age is immune, this state is most common in young and middle-aged adults. The outstanding features are headache, dizziness, inability to concentrate, fatigue, changes in disposition, loss of zest, insomnia and mental retardation, usually without any abnormal neurological findings.

Rowbotham (1949) recognizes two groups. In one the patients are incapacitated by headache and remain so from the time when consciousness is recovered, although it is as rare for them to be explicit about its character as for the headache to be unaccompanied by other symptoms. The problem is complicated by the fact that many of these patients are awaiting some kind of compensation under the Workmen’s Compensation Act, at civil law or by private arrangement. It is a problem that demands considerable expenditure of time if we are to arrive at correct diagnosis, assessment and treatment. To this end, it is important that the doctor understands the illness and has his patient’s confidence, that there is early and satisfactory settlement of litigation, that a subdural haematoma or hygroma be eliminated, that the patient be removed from surroundings tending to perpetuate his symptoms and that he has correct rehabilitation. These principles are difficult to attain and often uncertain in their results as is seen with the patients in the second group, who have made a reasonable recovery and returned to useful work: later they break down and complain of persistent headache. In these cases it is assumed that the psychological factors which precipitated the headache had been minimised by correct medical and surgical treatment in the acute stage and during convalescence, by early settlement of worries and reassurance as well as by appropriate rehabilitation.

There are clearly two variables: the nature of the pain and the mental stature of the patient. It is quite wrong to disregard these subjective complaints, which have a physiological basis, and to do so may retard the patient’s recovery. In forestalling these problems we are torn between an adequate rest period and the desirability of early return to normal activity, knowing well that to prolong inactivity unduly serves only to create an abnormal mental attitude on the part of the patient towards his injury.

The electro-encephalogram is of considerable value in determining the rate of recovery and possibility of sequelae. In all cases of significant brain injury abnormalities are invariably: in mild injuries, they are fleeting. The severity and persistence of dysrhythmic activity depends on the severity of the injury. Improvement in successive electro-encephalograms usually runs parallel with clinical improvement. If, however, improvement stops or the abnormality increases, prognosis for recovery is poor and permanent sequelae are likely.

Conclusions
When we consider the mechanism of head injury, it is not surprising that there is such a rich variety of sequelae. At one end of the scale are those due to organic structural changes, at the other the purely psychological, with the post-contusional state lying in between. It is, therefore, essential that these patients be cared for by enlightened people aware of the complex nature of their disabilities. Amongst these are already included those employers in industry who have had the wisdom to appoint medical men and women with such qualities of heart and head that each individual who has suffered injury is assured of all the help and understanding that go to re-establishment in the work-a-day world.

References