

ORIGINAL

Damage from a head injury arises in three ways :

- i) Damage from impact, this is unavoidable.
- ii) Damage from resulting intra-cranial haemorrhage and oedema. This is also unavoidable but can be modified by expert treatment.
- iii) Damage from subsequent inadequate ventilation. This is, or should be, avoidable.

The management of head injuries can be considered under the following headings.

ASSESSMENT

The assessment of a head injury should start as early as possible. Ideally this will be at the accident site and assessment can then be continued during transport and at the accident department. 30 % of all patients with a head injury will have sustained some other injury so a full and careful examination is mandatory. The head injury part of the examination should proceed as follows.

a) Level of consciousness

This is the most important part of the initial examination. However, a single assessment of the level of consciousness is nothing like as useful as serial assessments. The classical example is the patient who has a brief period of unconsciousness following his head injury, then recovers consciousness

The Management of Head Injuries

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described by Teasdale and Jennett (1974). The Glasgow Coma Scale is based on the measurement of three aspects of behaviour. These are the motor responses, the verbal responses and eye opening. A chart is used to record the appropriate response (Figure 1) on which three ticks are written on each successive

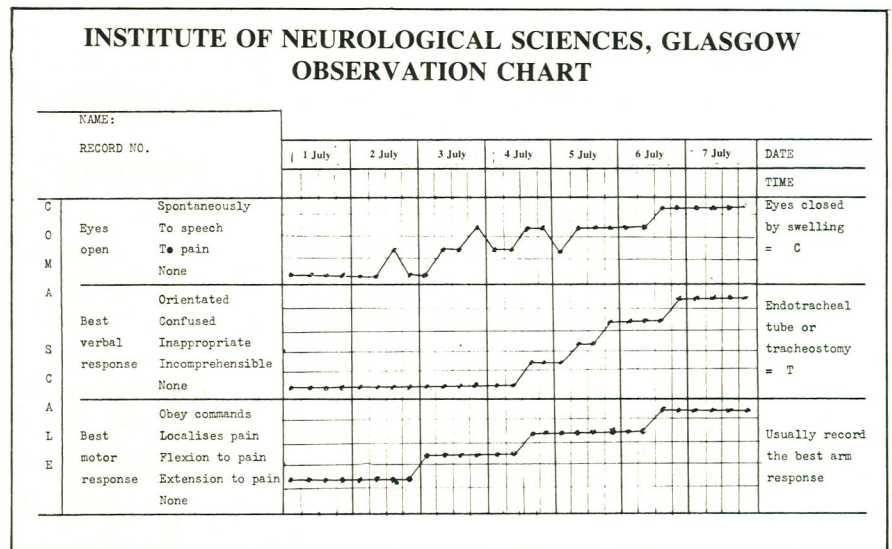


Fig. 1. Glasgow Coma Scale

for an interim period only to lapse back into unconsciousness later. This 'lucid interval' is diagnostic of intra-cranial bleeding — usually an extra-dural haemorrhage.

The value of several assessments of the level of consciousness has been increased by the wide adoption of the Glasgow Coma Scale

occasion. The intervals may be hourly in the early stages of management but may be increased to two-hourly, four-hourly or daily as the patient's condition progresses. Three graphs will thus appear on the chart and the ascent of these graphs will indicate improvement whilst the descent of the graphs will indicate deterioration. One of the great advantages of using this scale is that it is simple and straightforward for all grades of staff and yet has been shown to have a high

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degree of consistency between different observers.

b) *Pulse*

The pulse is, of course, always palpated as part of a general physical examination. In the patient with a severe head injury, however, the pulse may suggest the presence of raised intracranial pressure. A slow pulse should be viewed with suspicion and a rate less than 60/min. be regarded as significant.

c) *Pupils*

The equality or otherwise of the pupils is of fundamental importance in the assessment of head injuries — more so than their absolute size. Pupils that are initially equal and subsequently become unequal provide strong evidence of a developing lesion on the side of the dilated pupil.

d) *Limbs*

Examination of the Limbs of an unconscious patient is obviously necessary because of the likelihood of concomitant injury. It is also important to establish, if possible whether all limbs move normally. Where a patient with a severe head injury is found later to have a hemiplegia or paraplegia, it is clearly of great importance to know whether this was present on admission.

e) *Discharge of blood or CSF*

Clear fluid issuing from either ears or nose is probably CSF and is indicative of a fractured base of skull. Bleeding from the ear carries the same significance but bleeding from the nose is more frequently due to nasal injury. A patient with a CSF leak requires prophylactic antibiotic therapy.

INVESTIGATIONS

Following clinical assessment of

a patient with a head injury, the need for other investigations should be considered. These will depend on the severity of the injury and the facilities available.

a) *Skull X-rays*

Unless there is a need for immediate surgical intervention, all patients with severe head injuries should have skull x-rays taken. These should include a lateral view from each side, an antero-posterior view and a Towne's view. Wherever possible, a radiologist should be asked to assist in their interpretation since the differentiation of normal markings from fracture lines can be exceedingly difficult.

Whilst undisplaced skull fractures rarely constitute an emergency in themselves, their previous identification is important when subsequent surgical intervention is contemplated. Thus, if signs of intra-cranial bleeding have become apparent, the most likely site is below a skull fracture. The identification of skull fractures is also of medico-legal importance.

b) *Lumbar puncture*

This is contra-indicated in patients with known head injury since, if performed in the presence of a raised intra-cranial pressure, there is an increased danger of coning, that is, of the brain's downward displacement into the foramen magnum with resulting pressure on the medulla. Where there is suspicion that the onset of unconsciousness preceded an accident or fall, a lumbar puncture may be thought necessary to exclude a sub-arachnoid haemorrhage as a causative factor.

c) *Specialist investigations*

Although echo-encephalography and cerebral angiography have been of some value in the

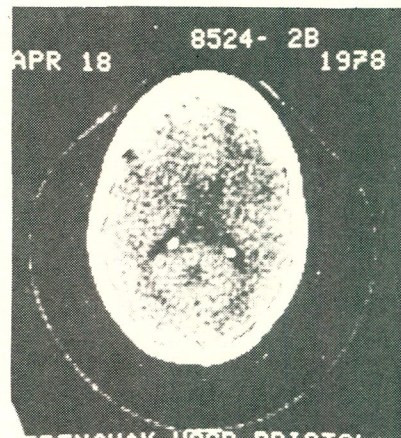


Fig. 2. Normal CAT Scan

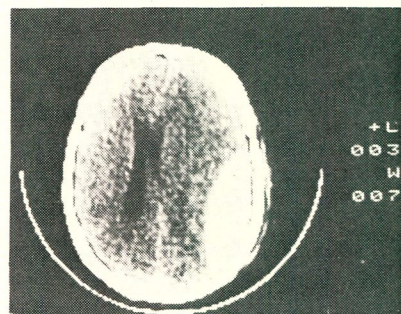


Fig. 3 CAT Scan showing extra-dural haemakoma

management of head injuries, they have been largely displaced by the introduction of computerised axial tomography (CAT scan). Although this elaborate and expensive apparatus has, to date, only been available at a limited number of centres, a new generation of scanners at a substantially lower cost should be available within the next year or two. CAT scanning has revolutionised the diagnostic management of head injuries. It is a quick, simple and non-invasive investigation with, of course, many applications beyond head injury. Figures 2 and 3 show a normal scan and one revealing an extra-dural haemorrhage.

d) *Intracranial pressure measurement*

The measurement of the intracranial pressure (ICP) is a sophisticated technique presently confined to neurosurgical units. There are many technological problems in

developing reliable and safe methods for measuring the ICP for long periods but these are gradually being overcome. The value of ICP measurements lies partly in their use as a diagnostic aid but more as a means of monitoring treatment. The outcome of head injuries bears a relationship to the severity and duration of the rise in ICP. Treatment, therefore, is aimed at keeping the ICP down to an acceptable level but, to do this effectively, frequent measurement of the ICP is essential (see later).

TREATMENT

a) *Airway and ventilation*

It has been estimated that 25% of patients with severe head injuries that are taken to hospital, arrive with their condition having deteriorated because of a failure to maintain a patent airway and effective ventilation. A patient with a severe head injury will have a raised intra-cranial pressure either from intra-cranial bleeding or cerebral oedema or both. For such a patient to then be subjected to hypoxia and hypercarbia from inadequate ventilatory care is to add insult to injury! All unconscious patients, especially those with a head injury, should be seen by an anaesthetist at the earliest possible moment so that subsequent care of their ventilation is safeguarded. Ideally, such expert airway care should be taken to the patient by the use of special mobile resuscitation units (Zorab & Bassett, 1977). In any event, expert airway and ventilatory care for patients with head injuries is essential from the earliest possible moment. Only thus can further damage to the already injured brain be avoided.

b) *Surgery*

From the whole spectrum of head injuries, the diagnosis of extra-dural haematoma stands out

on its own. This condition, though relatively uncommon, responds dramatically to early diagnosis and treatment. The condition is usually associated with low velocity injuries such as being hit with a fist or chair, or falling off a horse, a bicycle or downstairs. There is usually a lucid interval and very severe headache is almost universal. Patients presenting with this picture form the small group in whom delay in surgery can be disastrous. Burr holes *must* be made at once at the site of the fracture, under the scalp bruise and in the temporal, parietal and frontal regions on the side of the dilated pupil. Craniectomy may also be necessary to evacuate the blood and release the intra-cranial compression.

c) *Steroids*

The use of steroids in the management of a raised ICP *from trauma* is contentious. Practice varies from centre to centre and from country to country. In the absence of sound evidence that steroids have a beneficial effect in the management of a raised ICP from a head injury, there is a growing tendency to avoid their use.

d) *Mannitol*

Osmotic diuretics will always produce a fall in the ICP. This fall, however, is of limited duration and after the effect has worn off, the ICP may return to a higher value than it started at. This is known as the 'rebound phenomenon'. Mannitol produces less rebound than either urea or sucrose and is, therefore, the agent of choice. Mannitol is indicated where a patient is deteriorating from a raised ICP and while he is being prepared for surgery. Under these circumstances, mannitol can 'buy time' prior to the surgical decompression. In a patient with no surgically treatable lesion, the use of mannitol is more debatable. Neverthe-

less, where a raised ICP is causing a deterioration in the patient's condition, serial doses of mannitol on a four — six hour basis may be used.

e) *Artificial ventilation*

Some patients with a severe head injury are unable to maintain adequate spontaneous ventilation and will require artificial ventilation. Others will hyperventilate so strenuously that they also need artificial ventilation. A third group are capable of ventilating themselves adequately but it has been suggested that they should also have artificial ventilation in order to maintain pO₂ and pCO₂ at predetermined levels. The efficacy of this treatment remains unproven and it is probably better to err on the conservative side until the place of artificial ventilation becomes clearer.

f) *Barbiturates*

A recent development in the management of head injuries is the use of barbiturates — usually thiopentone or pentobarbitone. It has been known for many years that barbiturates lower the cerebral oxygen consumption and it has also been shown that, in many patients, they will lower the ICP. Since a raised ICP is known to have such a damaging effect on the injured brain, it is logical for barbiturates to be used in this manner. Nevertheless, their use must be accompanied by ICP measurements and direct arterial manometry and therefore these are techniques for the neurosurgical unit at the moment.

CONCLUSION

From this brief account, it can be seen that the management of head injuries presents many unanswered questions. Nevertheless, as the epidemic of head injuries continues as a world-wide phenomenon, efforts have to be made to

apply what knowledge we have. Early airway care, computerised axial tomography and improvements in the measurement of ICP are the cornerstones on which future management trends will be based and the greatest of these is the early care of the airway. The incidence of the first accident (the unavoidable impact) is bad enough. The second accident (the avoidable damage from hypoxia and hypercarbia) is the more tragic

because, so often, it need not have happened.

SUMMARY

A brief review is presented of the management of head injuries. The assessment, investigation and treatment is considered in the context of existing advances and their place in routine treatment. The importance of first class airway care, computerised axial tomography and the measurement of the intra-cranial pressure is stressed.

REFERENCES

- Teasdale, G. & Jennett, B. (1974) Assessment of coma and impaired consciousness: a practical scale. *Lancet* ii, 81.
- Zorab, J.S.M. & Baskett, P.J.F. (1977) *Immediate Care*. W.B. Saunders Co. Ltd. London & Philadelphia. □□



H.E. The Heir Apparent and Commander-in-Chief of the Bahrain Defence Force Shaikh Hamad Bin Isa Al-Khalifa touring the various Sections of the Sabah Al-Salem Al-Sabah which H.E. opened on May 24th, 1980.