Topic Overview: HEAD INJURY

Module T7

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Topic overview (Handout)

A head injured patient may have other injuries as well as a head injury. The condition, cause, complications and co-morbidities should be considered as in all emergency department presentations.

It is therefore important that we still use the same approach that we use for any other trauma patient – DRS-AcBCDE (DEFG) as the Primary Survey, followed by a thorough Secondary Survey head to toe, once the patient is stabilised.

D – Danger – ensure that you and your team are safe to approach the patient (chemicals, glass, weapons, people, etc). This is an issue most commonly with the violent or aggressive patient in the emergency department – note that this could be a sign of a significant head injury also. Remember your PPE (Personal Protective Equipment).

R – Response – Check the responsiveness of the patient. In this modern society of ours trauma is often linked with alcohol and or drug consumption. This quick assessment of responsiveness will also give you an idea of the patient's GCS or AVPU score and possible the perfusion to their brain!

S – Shout for Help – if the trauma team has not been called, perhaps now would be a good time to activate them. It is also a trigger for the team and especially the team leader to think about other specialities, equipment and personnel that may be needed to treat this patient effectively.

As well as having a significant head injury, your patient may also be bleeding profusely from another site of injury. If the bleeding is going to kill the patient in the next few minutes (if it is not stopped) then this needs to be dealt with immediately.

A – Airway – Assess the airway as you would any other trauma patient. Look, listen and feel. Talk to them! Is the airway patent or in danger of compromise? Are there injuries around the airway that may affect it? Is the responsiveness of the patient going to influence the patency of the airway? The neck is a part of the airway so remember to examine it well – Trachea, Wounds, Emphysema, Lacerations, Veins and Every time you reassess (TWELVE)!

c – C-spine – Head injured patients are at risk of cervical spine injury. Depending upon the mechanism of injury (with motor vehicle accident victims being at higher risk) 4-9% of patients with moderate to severe head injuries will have an associated cervical spine injury. Of these just over half have a spinal cord injury.[1]

B – Breathing – Adequacy of breathing must be assessed. Saturations will give an idea of oxygenation but may not give you the entire picture on adequacy of ventilation. Clinical assessment and an arterial blood gas may be invaluable! It may be that a higher carbon dioxide level may exacerbate a rising intracranial pressure by causing cerebral vasodilatation. Artificial ventilation may be indicated to control the CO_2 and thus aid in decreasing the pressure in the head.

C – Circulation – Patients with a moderate to severe head injury require a good perfusion pressure to the brain to minimise secondary brain injury. Hypotension should be avoided and a systolic blood pressure of at least

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90mmHg should be maintained[2]. Any hypotension with increase the mortality of the severely brain injured. Urgent management of the critically bleeding patient has been covered in T6.

D – Disability – Trauma head injury patients is where the Glasgow Coma Scale was validated as an assessment and prognostic tool. AVPU is still a quick and useful assessment tool. A score of P will correlate to a GCS around 8/15. GCS is useful as it can give you an idea of the severity of the head injury: Mild – 14 to 15, Moderate – 9 to 13 and Severe – 3 to 8. Prognostically the lower the GCS the worse the outcome is likely to be – especially a low motor score[2]. Pupils will play an important part of the assessment of disability. Unequal pupils may point to a rising intracerebral pressure with pressure on the third cranial nerve as the brain is pushed down towards the foramen magnum. This could cause one pupil to be dilated and unreactive when compared with the other. Absent pupillary reflexes after systemic resuscitation is also a poor prognostic indicator.

E – Exposure – Having a look at the whole patient is important so that things are not missed. In trauma patients this is facilitated with an early logroll and removal of the patient's clothing. Again we must remember that we need to maintain the patient's dignity (even if they are unconscious) and also to maintain the patient's temperature. Hypothermia is a killer in trauma!

DEFG – Don't Ever Forget Glucose – Checking the BSL is a quick and easy test that may point to an easily reversible cause for a low GCS. Patients may have co-morbidities affecting their response to trauma and one of these could be diabetes. If alcohol is involved then a resulting low blood sugar may complicate the picture.

Following the Primary Survey and Resuscitative phase complete a thorough Secondary survey.

Investigations for the trauma patient will depend upon the mechanism of injury, co-morbidities, the patient and the emergency department that you are in.

Bloods will need to be taken and patients with moderate to severe head injuries should have full blood count, electrolytes-urea and creatinine, liver function tests, calcium-magnesium-phosphate, coagulation studies and group and hold or save samples sent to the laboratory as routine. Good communication with the laboratories will be useful for rapid assessment of these samples and the preparation and delivery of blood products, if they are required.

We will concentrate on the radiological side of the investigations and focus more on those specifically looking at head injured patients. Head injury patients may well require the full trauma series of X-rays to be taken in the resuscitation bay. This may be recommended in patients who cannot give a detailed history as to the mechanism of injury. It is easy to miss other life threatening injuries if the team is focusing upon the head injury and vice versa. The use of C-spine imaging in moderate to severe head injured patients is required due to the high incidence of c-spine injury, in these patients if a CT brain is to be performed a cervical spine CT should be performed. A lateral C-spine X-ray may be helpful if the patient is going direct to theatre for other reasons prior to CT scanning. Again the appropriateness of the rest of the series of X-rays will depend upon the patient and the mechanism of injury.

All patients with a moderate to severe head injury should have a CT scan of their brain[2]. This should be done as early as practicable looking for neurosurgically correctable intracranial haematomas

FAST scanning is a radiological extension of the primary survey in trauma.

Disposition of the patient with a moderate to severe head injury will largely depend upon the hospital's resources and the progress of the patient. Patients with moderate head injury (GCS 9-13) will either improve (80% of patients) or deteriorate into the severe head injury category (GCS 3-8). The improving 80% should be treated as complicated mild head injuries and this treatment will depend upon your hospital's protocols/resources and the NSW guidelines[2].

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Patients with severe head injuries should be treated in a unit that has the resources to manage all the likely complications and should therefore be transferred to a neurosurgical unit. Patients with moderate head injuries should certainly be transferred if:

- Clinical deterioration
- Abnormal CT scan
- Normal CT scan but not improving clinically
- CT scanning is not available

Transfer of patients to a hospital with a CT scanner but not neurosurgical capabilities should be avoided[2].

In NSW consultation with the Medical Retrieval Unit early is essential.

Management is aimed at avoiding secondary brain injury and expediting neurosurgical care.

Other recommended treatments include:

- Avoid hypoxaemia – maintain oxygen saturations above 90%.
- Avoid hypotension – maintain the BP above 90mmHg systolic.
- Posturing with 30^{o} head up to allow good venous drainage of the head (as long as other injuries allow).
- If the patient is intubated and sedated patient, can the C-spine collar be loosened and blocks applied to aid venous drainage from the brain and head? The ETT may be taped in rather than tight ties.
- Importantly seek early neurosurgical opinion.
- Maintain normoglycaemia, normothermia and normocarbia.
- Prophylactic anticonvulsant therapy is optional and should be discussed with the receiving team.
- ICP monitoring is often useful and will be placed by neurosurgery.
- ICU admission – preferably a neurosurgical ICU.
- Brain injury rehabilitation consultation.

In a deteriorating patient other therapies can be considered:

- Mannitol – 1mg/kg or 3% Hypertonic Saline
- Hyperventilate to $PaCO_2$ 30-35 mmHg (this is recommended for short term use only to decrease ICP in a deterioration. There is a risk of causing too much cerebral vasoconstriction leading to brain hypoperfusion)

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• Repeat CT scanning

7 Non-Technical Team Tasks

- Assemble the correct team
- Plan and prepare
- Manage resources
- Manage people
- Communication
- Monitor and evaluate
- Support each other

References:

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2.Reed D. Adult Trauma Clinical Practice Guidelines, Initial Management of Closed Head Injury in Adults; 2nd Edition. NSW Institute of Trauma and Injury Management; 2011.

3.O'Regan S, Watterson L, Sisson G. Australian Trauma Team Training. NSW Institute of Trauma and Injury Management, Sydney Clinical Skills and Simulation Centre; Aug 2010.

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