

Trauma surgery: Back to basics

Trauma fascinates many medical students, but to handle acute emergencies it is necessary to follow the principles of the primary and secondary survey. In the first part of a new series, **Omar Mukhtar** and **Kirsten Jones** go back to basics

Gunshot wounds, stabbings, and burns are disturbing but common events that many doctors deal with the world over. Although Hollywood might depict these injuries as glamorous, reality is different and often distressing. In this series we will cover non-ballistic and ballistic trauma, as well as burns. A sound understanding of resuscitation is necessary in all of these situations, which we take you through in this first article.

The first rule of medicine: do no harm

The principle of doing no harm should not be taken lightly. Although aggressive interventions may be needed during the resuscitation and evaluation of an acutely injured patient, a patient is most vulnerable during this time. Thus, it is important to use a systematic method of examination and treatment to ensure that life threatening injuries are quickly identified; other significant injuries also need to be treated before they cause additional problems. The standard approach consists of primary survey, resuscitation, detailed secondary survey, and initiation of definitive care.

Appropriately qualified personnel and the necessary equipment should be available and ready before any patient is admitted to aid this management system.

Box 1: Roles in a trauma team

- Team leader—must decide whether he or she will take a hands on or a distant approach, set treatment and diagnostic priorities, and coordinate the team
- Airway doctor—(either an anaesthetist or an emergency doctor) clears the airway, controls breathing, and carries out central venous or arterial cannulation (if needed)
- Circulation doctor—responsible for wide bore peripheral intravenous cannulation, insertion of chest drains (if needed), splinting fractures, catheterisation, and so on
- Relatives' nurse—makes sure the relatives are kept informed of the patient's condition

Preparation and the trauma team

A trauma team usually consists of four doctors, five nurses, and a radiographer. In many parts of the world, including parts of the United Kingdom, however, this is not possible, and the trauma team consists of two or three doctors and a similar number of nurses. A team leader should be chosen before the patient arrives and a role assigned to each individual (box 1). Some degree of overlap is inevitable and flexibility is essential. In order to avoid chaos and disorganisation, no more than four people should be touching the patient at any given time.

Box 2: Primary survey

- A—Airway management with cervical spine control
- B—Breathing
- C—Circulation
- D—Dysfunction of the central nervous system
- E—Exposure

Primary survey

The primary survey is a structured assessment that aims to identify and treat immedi-

ate and life threatening problems (box 2). Each patient is assessed in the same way and the routine should be familiar to everyone who works in a clinical setting. It is essential that the team leader re-evaluates his or her findings on a continuous basis, as patients may deteriorate rapidly. In fact, impaired consciousness is the most commonly missed diagnosis in trauma patients.

A—Airway management with cervical spine control

In simple cases, managing the airway with cervical spine control may mean opening the airway using the jaw thrust or chin lift manoeuvre; alternatively you may need to use an oropharyngeal or a nasopharyngeal airway.

The consumption of alcohol and a number of chest and abdominal injuries increase the possibility of vomiting. In this case the patient should not be moved into the recovery position, until a cervical spine injury has been ruled out both clinically and radiologically. Instead, it is possible to tilt the trolley to improve the suction of vomit.

If the patient is on a "spinal" board for immobilisation, it must be removed as soon as possible; after 20 minutes, this device has caused serious pressure sores which may fail to resolve.



B—Breathing

It is often forgotten that a patent airway does little for a patient who is not breathing, if no ventilation is provided. Expose the chest wall and look for its characteristic rise and fall. Record respiratory rate, effort, and symmetry, all of which provide a sensitive indication of underlying pathology.

Patients who are breathing spontaneously should be given high flow (80%) oxygen, via a face mask and a reservoir bag. Those needing help to maintain breathing should be given 100% oxygen through a bag valve mask and intubation should be considered. It is essential to rule out (and treat if present) the injuries listed in box 3, all of which may compromise ventilation.

Box 3: Immediate life threatening chest injuries

- Tension pneumothorax
- Massive haemothorax
- Open chest wound
- Cardiac tamponade (abnormal pressure caused by excessive fluid between the pericardium and the heart)
- Flail segment (unstable ribcage after multiple fractures of the ribs and sternum)

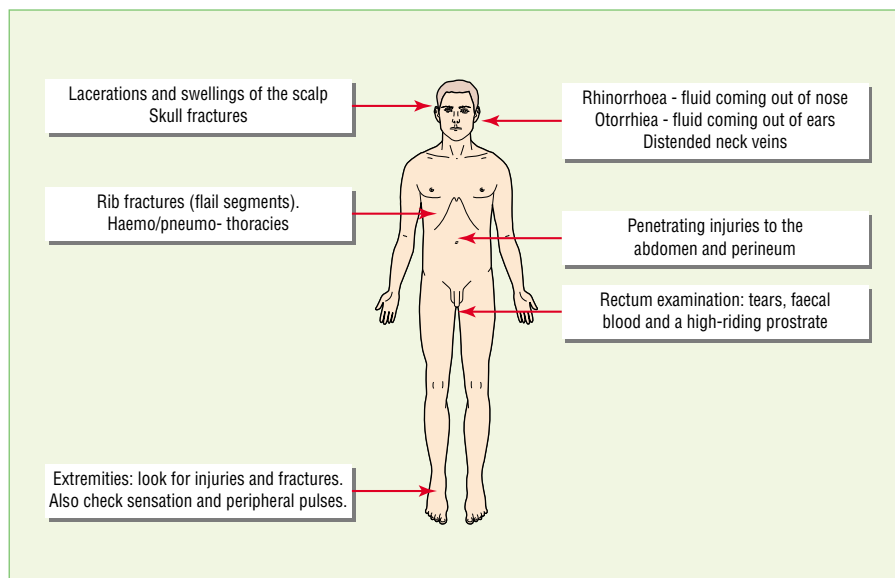
C—Circulation

Blood volume and cardiac output are key concerns in the acute setting; prolonged impairment of the cerebral circulation will ultimately cause death of brain cells. Therefore, it is important to consider hypovolaemia; thinking of both internal and external injuries. A number of clinical signs are typical of hypotensive shock (box 4). However, no single factor should be used to rule out hypovolaemia.

The commonest mistake is to miss an internal haemorrhage in a young patient because they have a normal blood pressure; hypotension is a relatively late sign of hypovolaemia in young patients. Internal haemorrhage may require immediate surgery; severe external haemorrhage should be controlled by direct manual pressure on the wound.

Box 4: Signs of hypotensive shock¹

- Increased respiratory rate
- Decreased blood pressure
- Increased heart rate
- Decreased pulse pressure
- Clammy skin
- Decreased urine output
- Increased capillary refill time
- Decreased level of consciousness



D—Dysfunction of the central nervous system

A quick neurological assessment is performed early in the care pathway and forms part of the initial impression. If the patient is talking, he or she must have a clear airway, adequate ventilation, and intact cerebral perfusion. Although this does not give any long term reassurances, other areas of priority can be assessed.

The neurological status of a patient who is not talking must be evaluated; this is best done by using the AVPU system (box 5), and pupil reflexes must also be established. Although the Glasgow coma scale (GCS) is more comprehensive, it can be approximated to AVPU. A formal assessment using the GCS is done as part of the secondary survey.

Box 5: AVPU

- A—Alert (GCS 14-15)
- V—Responds to vocal stimuli (GCS 9-13)
- P—Responds to painful stimuli (GCS 4-8)
- U—Unresponsive (GCS 3)

E—Exposure

By this stage of the initial assessment, most of the patient's clothes will have been removed; those that remain should be cut away, leaving the patient fully undressed. This allows a thorough examination (as part of the secondary survey). Take care to keep the patient warm because hypothermia can have devastating consequences.

Secondary survey

A secondary survey, a thorough head to toe assessment, is made after the patient has been stabilised and aims to identify all the injuries sustained. Often interrupted by var-

ious investigations—for example, x ray imaging and computed tomography—and procedures—for example, catheterisation—it is vital to pay attention to detail. Euphemistically described as the assessment whereby “a finger and a tube is inserted in every orifice,” you must remember that this may be the only full evaluation of the patient while in hospital.

Take a complete history from the patient if possible, or from the ambulance crew or relatives. Key questions stem from the mnemonic AMPLE: allergies, medication, past medical history, last meal, and events and environment related to injury.

Before examining patients with a possible history of blunt trauma, take x ray images of the cervical spine, chest, and pelvis. Other views may also need to be taken later. Start the secondary survey at the head and work down, taking care to look for specific injuries at each and every stage (see figure).

Injuries to specifically rule out during a secondary survey

Definitive care

Definitive care begins once the patient has been resuscitated and any life threatening problems dealt with; during this phase a complete package of care is planned for the patient, and includes fracture stabilisation, operative intervention, or the transfer of the patient to a tertiary referral centre.

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¹ Skinner D, Driscoll P, Earlam R, eds. *ABC of major trauma*. 2nd ed. London: BMJ Books, 1996.