THORACIC TRAUMA—II

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The plan of action in the treatment of patients with thoracic trauma depends on the initial findings on chest radiography, results of intercostal drainage, overall clinical state of the patient, and the relative priorities of associated visceral, vascular, and bony injuries.

The most common location of ruptured aorta is just distal to the origin of the subclavian artery and ligamentum arteriosum. The transection may be partial, complete, or spiral, and immediate survival depends on the formation of an acute false aneurysm. Diagnosis depends on a high index of suspicion then chest radiography followed by aortography.

An aortogram is always required as the sites of aortic injury may be multiple. The patient must be investigated in the hospital where surgery will be performed with the surgeon and team on site, as deterioration often follows injection of contrast fluid. If there is no thoracic surgeon the patient must be transferred to a cardiothoracic centre. Reliable blood pressure control must be maintained during transfer: patients with transected aorta are hypertensive owing to inappropriate baroreceptor responses and are therefore subject to exsanguination. It is best to transfer the patient intubated, ventilated, and heavily sedated or anaesthetised. On arrival at the cardiothoracic centre the department of radiology must be fully prepared.

If the angiogram confirms an aortic injury the treatment is by surgery and should take priority over all but immediately life threatening haemorrhage. During preparation for the operating theatre the patient’s blood pressure is kept below 100 mm Hg with an infusion of sodium nitroprusside. Aortic repair is by direct suture of the laceration or by graft replacement of the injured area.

Whereas a penetrating injury to the heart is usually obvious cardiac contusion is rarely considered before the onset of life threatening arrhythmia, cardiogenic shock, or cardiac arrest. Myocardial contusion occurs in patients with deceleration trauma and constitutes the most common unsuspected fatal injury. Two dimensional echocardiographic evidence of abnormal ventricular wall motion and pericardial effusion are the most reliable early clues to important myocardial damage. The possibility of blunt cardiac injury must be determined during resuscitation and assessed as soon as is practical as right ventricular dysfunction may demand higher filling pressures to maintain cardiac output.
Immediate thoracotomy for blunt trauma with cardiac herniation. The severely contused heart was strangulated in the atrioventricular groove. The patient required an intra-aortic balloon pump for three days.

Injury to major airways

 Signs of injury to major airways

- Free air
- Subcutaneous or deep cervical emphysema
- Pneumothorax
- Pneumomediastinum
- Pneumopericardium
- Haemoptysis
- Airways obstruction
- Stridor
- Aphonia
- Difficult intubation

Extensive free air in the neck, mediastinum, or chest wall should always raise the suspicion of major airways injury. Transected trachea and bronchus proximal to the pleural reflection cause extensive mediastinal and deep cervical emphysema, which may spread to the subcutaneous tissues. Pneumothorax occurs when there is bronchial laceration distal to the pleural sheath. All levels of the trachea or main bronchi may be involved, though more than 80 per cent of injuries occur within 2–5 cm of the carina with equal distribution between right and left sides. The type of lesion varies from simple linear mucosal laceration to full thickness tears in the trachea, main bronchi, and branch bronchi.

The diagnosis is suggested by detection of free air on physical examination and chest radiography and confirmed by bronchoscopy. A rigid Negus or Storz instrument is preferred as bronchoscopy must also clear the airway by removing blood clots and debris. The site, nature, and extent of injury are carefully defined. Torn bronchial mucosa and oedema may obscure the true extent of injury, and care must be taken not to displace the ends of a transected trachea or bronchus if a satisfactory airway exists. Treatment is usually by early primary repair, though conservative treatment is permissible if a longitudinal tear in the posterior tracheal membrane is short or if a bronchial tear is less than one third of the circumference and chest tube drainage fully re-expands the lung. Minitracheostomy can be performed to maintain a low intratracheal pressure and discourage leakage of air into the mediastinum while the mucosal laceration heals spontaneously.

Lacerated diaphragm

Ruptured left hemidiaphragm with the stomach in the chest.

Lacerated diaphragm is commonly overlooked if positive pressure ventilation, undertaken urgently, masks respiratory distress and signs such as bowel sounds in the left chest. Ventilation may also replace some of the viscera back into the abdomen and prevent gastric distension.

Ruptured left hemidiaphragm is more common as the right side is protected by the liver. Bilateral rupture is rare but can be encountered even in the absence of visceral injury. It is not unusual to overlook diaphragmatic rupture during laparotomy for hepatic or splenic rupture.

Surgical repair should be undertaken immediately unless exsanguinating haemorrhage or intracranial lesions take priority. If the tear is recognised early in a patient with abdominal injuries the transabdominal surgical approach is acceptable, though satisfactory access to the right hemidiaphragm is difficult. In the absence of intra-abdominal injury diaphragmatic repair is best undertaken by thoracotomy. When penetrating injuries pass through the diaphragm the defect should be closed to prevent strangulating hernia, particularly on the left side. However, not all patients with such injuries meet the criteria for thoracotomy or laparotomy.
Penetrating wounds

Most penetrating wounds damage only the chest wall and underlying lung. In many wounds haemorrhage has already stopped by the time the patient reaches hospital. Insertion of an intercostal drain with suction is all that is required. The necessity for surgical intervention is based on the rate of bleeding or leakage of air from the intercostal drain. Cardiac tamponade, a transmediastinal missile track, and injury to the major airways or oesophagus are definite indications for thoracotomy. Suspected oesophageal or major airways involvement should be investigated by endoscopy beforehand to determine the precise site of injury. False aneurysms from major vessel laceration are delineated by digital subtraction angiography.

When patients are admitted with knives or transfixing implements still in place no attempt should be made to remove these until the surgeon is satisfied that no major vascular structure is damaged or until the patient is in position for thoracotomy; even then it is wise to leave the implement in situ until thoracotomy has exposed the damaged structures.

Patients with penetrating wounds that damage the aorta or main pulmonary arteries usually die before reaching hospital, as do those with appreciable disruption of the atria or ventricles. In contrast, patients with simple stab wounds that affect the heart but not a major coronary artery usually reach hospital alive with cardiac tamponade and their injuries are easily remediable by immediate or early sternotomy and repair. Until a cardiac or vascular injury is ruled out do not raise the systemic pressure uncontrollably as this may precipitate bleeding and death. A central venous and a large bore peripheral cannula should be inserted in preparation for rapid transfusion during the operation.

Cardiopulmonary bypass is rarely required in patients with penetrating thoracic trauma. Consequently, if a hospital does not have cardiothoracic surgeons either the general surgeon must be prepared to intervene or, if time allows, a thoracic surgeon should be transferred from the nearest regional centre. Interhospital transfer of patients with serious penetrating thoracic injuries is contraindicated.

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The ABC of Major Trauma has been edited by Mr David Skinner, FRCS; Mr Peter Driscoll, FRCS; and Mr Richard Earlam, FRCS.

ANY QUESTIONS

A menopausal woman in her late 40s suffers from hot flushes. There is a family history of ischaemic heart disease. Is it safe to prescribe hormone replacement treatment?

The relation between hormone replacement therapy and ischaemic heart disease remains controversial. Although some studies report an increased risk of coronary heart disease associated with oestrogen use for menopausal symptoms most recent studies suggest that oestrogen replacement therapy protects against acute myocardial infarction. There are three groups of patients. The first is those without a past medical or family history of ischaemic heart disease, the second is those with a family history of ischaemic heart disease, and the third is those with a past medical history of ischaemic heart disease. A recent longitudinal study in California showed that women with a family history of ischaemic heart disease who used oestrogen replacement therapy had a relative risk of death from all causes of 0.8 compared with women who never used oestrogens. Much of this reduced mortality was the result of a marked fall in the number of deaths from acute myocardial infarction among users. This study also found that this lower death rate from acute myocardial infarction persisted even in the presence of other known risk factors for coronary artery disease. This study examined numerous factors including previous myocardial infarction or angina, previous high blood pressure, smoking habits, and body mass index together with the dose of oestrogen and the duration of use. This study did not attempt, however, to collect information on the use of progesterone used in conjunction with oestrogen. It is possible that progesterone may partly or completely reverse the observed beneficial effects of oestrogen on the incidence of myocardial ischaemia in postmenopausal women. — P TERRY, consultant in obstetrics and gynaecology, Aberdeen