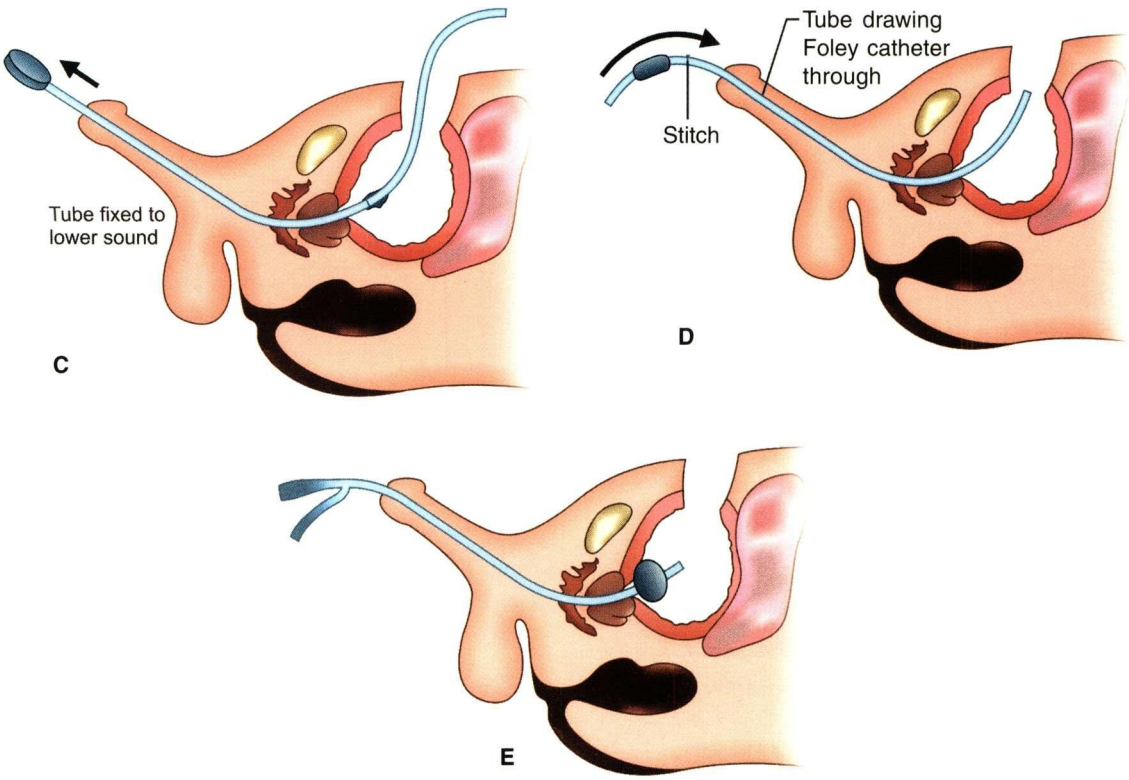

Figs 10.19C to E: Railroading with sounds: (C) A rubber tube is fitted on the lower sound and is drawn through the patient's urethra, (D) The rubber tube has been stitched to the Foley catheter and the rubber tube is pulled to place the Foley in the urinary bladder, (E) Bulb of the Foley is inflated in the urinary bladder

dilatation or internal urethrotomy. In cases of longer stricture segment, open urethroplasty can be undertaken at a later date.

Anterior/Bulbar Urethral Injury

Patients with bulbar urethral injury have perineal bruising, blood at the urinary meatus and retention of urine. A urethtral catheter must not be passed as it may aggravate the injury. If the patient passes urine, he should be given antibiotics and followed up. Patients with urinary retention should be treated by inserting a suprapubic catheter. Antibiotics are given and urethrography is performed after about five days. If the patients develops stricture later on then it is managed by either urethral dilatation or endoscopic urethrotomy for incomplete stricture or urethroplasty for complete stricture.

Penetrating Anterior Urethral Injury

This type of injury should be explored. Devitalized tissue should be debrided carefully to minimize tissue loss. Defects up to 2.0 cm in the bulbar urethra and up to 1.5 cm in the penile urethra can be repaired primarily by direct anastomosis over a catheter with fine absorbable sutures. Longer defects are reconstructed at a later date.

pelvic tamponade and increase venous return. However, several studies have not shown a survival benefit for use of pre-hospital MAST although none have focused on pelvic fractures. The device is also associated with inherent complications, such as lower extremity ischemia/reperfusion, development of compartment syndrome, and skin necrosis.

Pelvic Binder or Sheet Wrapping

Over the past decade, simple devices, such as bed sheets have been used as an alternative to MAST, tied around the greater trochanter to apply pressure with internal rotation of the legs. Sheeting facilitates closing the pelvis in open-book pelvic injuries but avoids lower extremity ischemia. Commercial pelvic binders have been devised which permit tension adjustment to 140–200 N. These circumferential pelvic sheets or binders are advantageous because of their ease of application, relative safety, cost-effectiveness, and non-invasive character. They also minimize the movement of the fracture site during transport and provide pain relief for patients. The application of a pelvic binder should be considered as early as possible. Patients in the pre-hospital setting in particular, may benefit because maintaining the fractured pelvis' stability prevents disruption of hemostatic clots and consumption of clotting factors which can lead to coagulopathy. Potential complications are the development of pressure ulceration, skin necrosis, or slough. Another disadvantage is these devices compromise access for laparotomy or pelvic packing as well as prevent monitoring of the skin around the pelvis. Sheet wrapping and pelvic binders are less rigid than external fixators, and fracture reduction and restoration of bone contact is tenuous except in cases of simple open-book injuries. These external pelvic interventions can only provide a temporary solution in serious situations, buying doctors time to carry out hemostatic treatment. Pelvic binders or sheets should be considered as temporary measures bridging acute injury towards more rigid stabilization. If the binder appears to be effective and longer application is needed, other definitive means, such as external fixation or internal fixation should be planned.

Invasive

External Fixation (Figs 11.7 and 11.8)

In conjunction with the development of clinically useful fracture classifications based on the stability of the pelvic ring, immediate external fixation of unstable pelvic fractures has been a mainstay in the treatment of hemodynamically unstable patients for

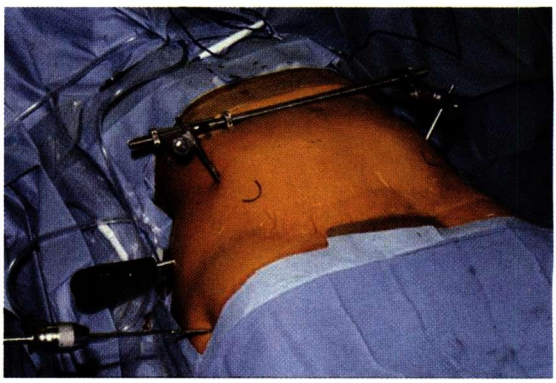

Fig. 11.7: A simple external fixator in situ

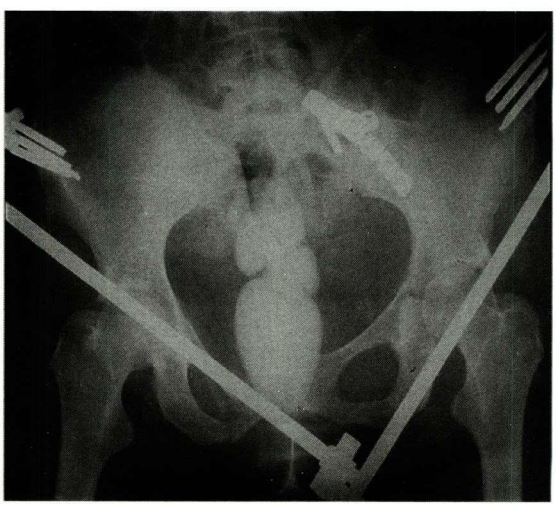

Fig. 11.8: Radiograph with external fixator in situ

occur more frequently than arterial injury. Even when arterial bleeding is clearly present, the likelihood of concomitant venous bleeding is probably close to 100%. Most treatment approaches grossly overestimate the significance and incidence of arterial bleeding while underestimating the significance of venous bleeding. This miscalculation likely contributes to the ongoing high mortality for pelvic fracture patients who fail to respond during initial resuscitation.

MANAGEMENT OF OPEN PELVIC FRACTURES

Open pelvic fractures consist of open iliac wing fractures that do not destabilize the pelvic ring and open wounds associated with pelvic ring injuries. Whereas the iliac wing fractures tend not to cause damage to deep vasculature and organs, the open pelvic ring injuries can be devastating. While they can vary in severity, there are few situations more challenging than a patient with severe soft tissue, bony, and vascular injury located within or adjacent to the pelvis. Because of the severity of these injuries, many of these patients do not survive to reach medical attention.

Richardson et al. advocated four important treatment priorities for these devastating injuries: (a) control of hemorrhage, (b) debridement and management of the concomitant soft tissue injury, (c) recognition and treatment of associated injuries, and (d) treatment of the pelvic fracture itself. Despite advances in the treatment of pelvic fractures and the associated injuries, a mortality rate of 45% for patients with open pelvic fracture was published in a recent series (Fig. 11.10). Deaths from open pelvic

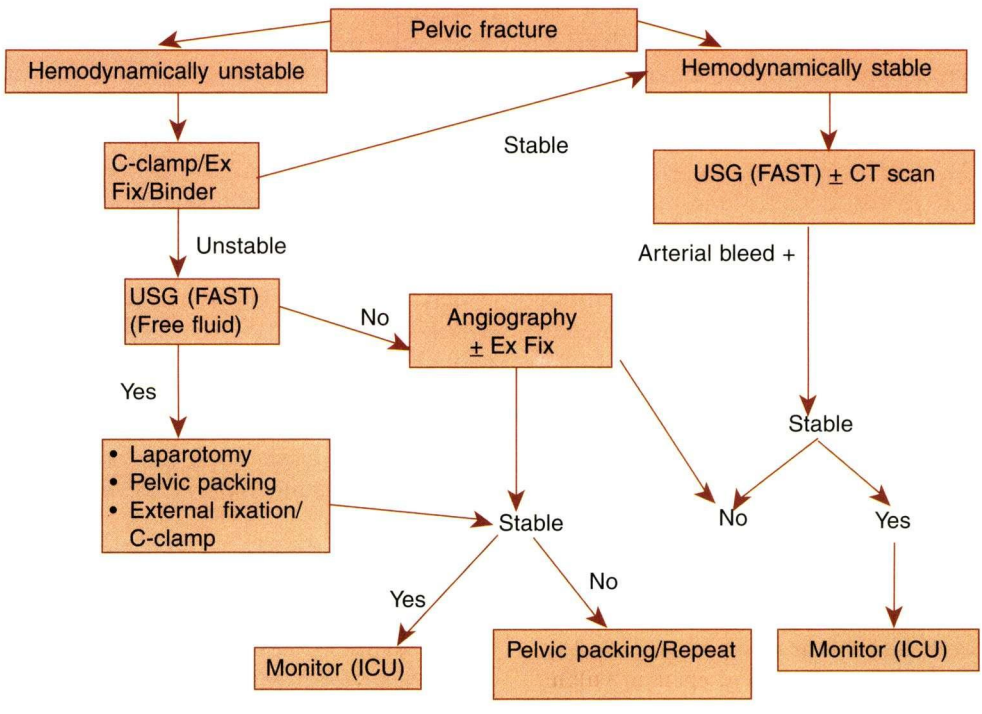

Fig. 11.10: Suggested algorithm for bleeding control and management of pelvic fractures

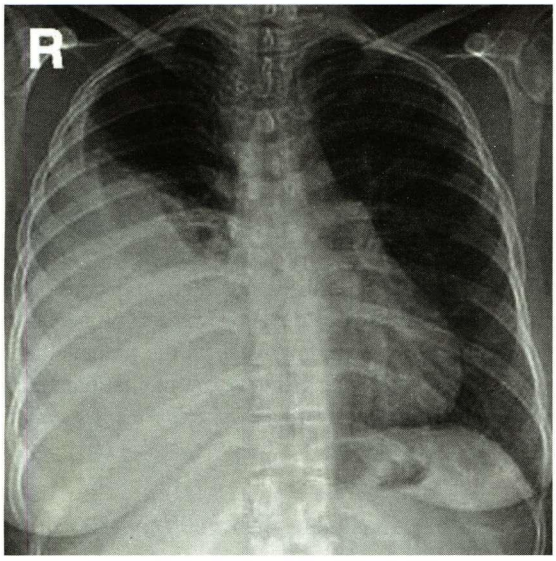

Fig. 12.3: Chest X-ray showing right sided hemothorax with blunting of costophrenic angle

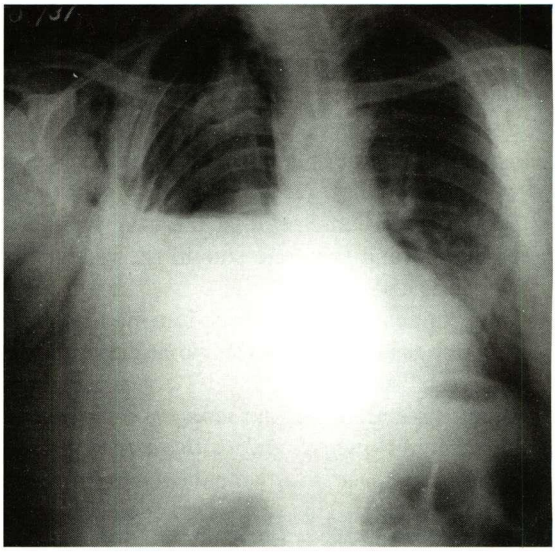

Fig. 12.5: Right side hemo-pneumothorax as suggested by air fluid level and associated ribs fracture

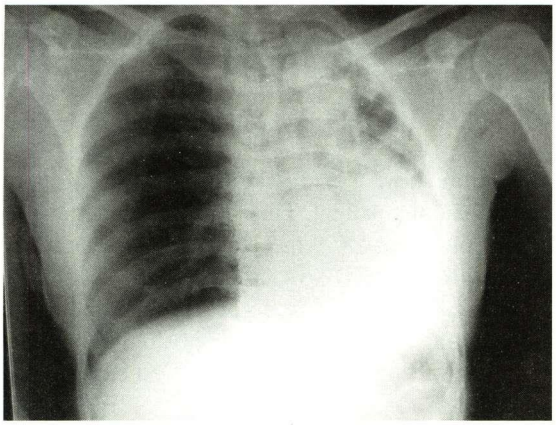

Fig. 12.4: Left side hemothorax causing white out chest

Treatment

It comprises of continued decompression of the chest and restoration of the blood volume. A large bore chest drain (32 F or larger) should be used. The rapid infusion of fluid replacement is started through large caliber venous cannula until type specific or cross-matched blood is available.

If there is continuing blood loss of more than 200 ml/hour for more than three hours, exploratory thoracotomy must be undertaken by an experienced surgeon. Any penetrating wound medial to the nipple should heighten suspicion of damage to the heart, great vessel or hilar structure.

INTERCOSTAL CHEST DRAINAGE

Underwater seal drainage successfully treats most cases of hemopneumothorax. The modern chest drains

- are made up of clear plastic
- are available in varying diameters
- have length markers
- have multiple side roles
- have radiopaque stripe to allow confirmation of tube position on radiograph.

Choosing the Site

The safest place is lateral to the anterior axillary fold, in the 4th or 5th intercostal space.