

Orthopaedic Trauma: Review Questions

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QUESTIONS

Choose the single best answer for each question.

- Which of the following is the most significant risk factor for the development of adult respiratory distress syndrome (ARDS) in the multiply injured patient with a femur fracture?**
 - Head injury
 - Chest injury
 - Use of a reamed intramedullary rod for femoral fixation
 - Delay of 18 hours in stabilizing the fracture
 - Abdominal injury requiring laparotomy
- Which of the following tibial fractures is most likely to have residual angulation (> 5 degrees) after treatment with a statically locked intramedullary rod?**
 - A comminuted midshaft fracture
 - A distal third oblique fracture
 - A transverse midshaft fracture
 - A proximal third metaphyseal fracture
 - An open transverse fracture with a large butterfly fragment
- The tibial plateau fracture most often associated with vascular injury is:**
 - Schatzker type I (pure split of lateral plateau)
 - Schatzker type II (split depressed lateral plateau)
 - Schatzker type III (pure depressed lateral plateau)
 - Schatzker type IV (medial plateau fracture)
 - Schatzker type V (bicondylar fracture)
- Relative and absolute contraindications to the placement of an external fixator to control bleeding in patients with pelvic fractures include all of the following EXCEPT:**
 - A stable fracture pattern
 - A posterior element fracture with an associated "floating" iliac wing
 - A posterior element fracture with an associated ipsilateral acetabular fracture
 - Proven arterial bleeding
 - Head injury
- All of the following are indications for surgical management of humeral shaft fractures EXCEPT:**
 - Fractures caused by low-velocity gunshot wounds
 - Floating elbow (ipsilateral humeral and forearm fractures)
 - Bilateral humeral fractures
 - Neurologic loss following closed fracture manipulation
 - Polytrauma
- The incidence of complications and poor outcomes is high in fractures with vascular injury. Treatment for fractures with vascular injury should begin with which of the following?**
 - Fracture alignment and stability
 - Early (within 6 hours of injury) restoration of blood flow
 - Wound management
 - Early mobilization
 - Recognition of compartment syndrome

(turn page for answers)

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EXPLANATION OF ANSWERS

1. **(B) Chest injury.** ARDS is a known complication of multiple injury with femur fracture. Pulmonary complications associated with multiple injuries are decreased with early stabilization of femur fractures; however, a delay of less than 24 hours to fixation has not been demonstrated to increase the risk of pulmonary complications. The use of unreamed rods was once believed to lessen the shower of fat emboli to the lung at the time of fracture fixation. However, no clinical evidence exists to support better pulmonary outcomes with the use of unreamed rods, and fracture healing results may be compromised with their use. Head and abdominal injuries are associated with ARDS, but the most significant risk factor for the development of ARDS is serious chest injury.
2. **(D) A proximal third metaphyseal fracture.** Nailing of proximal third metaphyseal tibial fractures has been associated with a very high rate of malreduction. One series showed these fractures to have a residual deformity of greater than 5 degrees angulation in 84% of cases at postoperative follow-up.¹ Technical errors leading to malalignment are generally associated with a medialized entry portal and posteriorly and laterally directed trajectory of the rod. Techniques to avoid malalignment include placement of an adjunctive antiglide plate at the fracture apex and use of the semiextended knee position at the time of nail insertion. In general, alternative methods of treating proximal third metaphyseal fractures should be considered prior to intramedullary rodding.
3. **(D) Schatzker type IV (medial plateau fracture).** All fractures around the knee, particularly high-energy fractures (Schatzker types IV, V, and VI), can be associated with vascular injury. However, the medial plateau fracture behaves most like a knee dislocation, stretching or contusing the popliteal artery and the lateral soft tissues, including the peroneal nerve, at the time of fracture. The medial plateau requires greater force to fracture than the lateral plateau, and a fracture of the medial plateau should alert the examiner to possible significant soft-tissue injuries.
4. **(E) Head injury.** Pelvic fracture bleeding may be treated with external fixation during the resuscitation of the bleeding trauma patient. Although somewhat controversial, external fixation is believed

to achieve bony stabilization, which decreases the motion of fracture surfaces on themselves and allows clots to form, and reduction of pelvic volume, which allows early tamponade of venous bleeding. Stable fractures do not benefit from external fixation because the fracture surfaces are not moving and pelvic volume is not increased. External fixation is contraindicated with a floating iliac wing because a floating iliac wing does not allow control of the hemipelvis with the fixator. An ipsilateral acetabular fracture is a relative contraindication to external fixation because future incisions for acetabular surgery may be compromised by existing pin sites. Arterial bleeding is poorly controlled by external fixation and is better addressed with angiographic embolization. Head injury presents no contraindication to external fixation, which should be viewed as part of the resuscitation.

5. **(A) Fractures caused by low-velocity gunshot wounds.** Floating elbow, bilateral humeral fracture, and polytrauma are all indications for operative stabilization of humeral fractures because fixation allows mobilization of severely injured extremities and patients. Neurologic loss after fracture manipulation implies nerve entrapment at the fracture site and should be explored to ascertain the position and condition of the nerve, after which the fracture should be stabilized operatively. For fractures caused by low-velocity gunshot wounds, the entrance wound should be débrided, and the fracture can then be managed the same as a closed injury.
6. **(B) Early (within 6 hours of injury) restoration of blood flow.** The treatment of fractures with vascular injury necessitates early diagnosis of compromised circulation and the return of blood flow to ischemic tissue within 6 hours to avoid amputation. Fracture concerns become secondary; however, provisional alignment of the fracture may help the vascular surgeon repair injured vessels. Recognition of compartment syndrome is important, but compartment release without blood flow does not change the ischemic situation.

REFERENCE

1. Lang GJ, Cohen BE, Bosse MJ, Kellam JF: Proximal third tibial shaft fractures: should they be nailed? *Clin Orthop* 1995;315:64-74.