



POSNA

The Core Curriculum

The multiply injured child: Musculoskeletal aspects

Objectives

1. Discuss priorities for imaging musculoskeletal injuries in the multiply injured child
2. Discuss the indications for operative fixation of fractures in the multiply injured patient, and whether indications are altered from those for a patient with a single fracture
3. Discuss the different methods of fixation available, and your indications for cast or splint, external fixation, intramedullary nailing, and plate fixation
4. Describe the incidence of open fractures in the multiply injured child, and their management

Discussion points

1. What are the differences in indications for rigid fixation of fractures in the child and adult?
2. Are there any absolute indications for immediate fracture fixation in the multiply injured child?
3. Is there a "golden period" for debriding open fractures? Can debridement safely be postponed under any circumstances?

Discussion

Multiply injured children are optimally managed at a pediatric trauma center or adult level 1 trauma center, where added expertise is available. In general, the neck should be considered as injured in an unconscious child until proven otherwise. In conscious and cooperative patients (Glasgow Coma Scale 14-15), clinical assessment of neck stability was found to be reliable without radiography. The common pseudosubluxation of C2-3 was found in 21% of multiply injured children and should be considered a normal variant. In children under 6, a special transport board should be used because the young child's head is proportionally larger in relation to the trunk, so standard boards will flex the neck. Fractures are not life threatening, so their assessment is secondary to measures necessary to manage head or visceral trauma. If the child is unconscious, the neck should be splinted during imaging studies of other systems, as should any obviously displaced fractures. With the ability of the child to undergo spinal cord injury without radiographic abnormality, MR scanning of the spine has been suggested for comatose children. Technetium scanning has been reported to be beneficial in discovering additional fractures in the multiply injured child. A pelvic fracture accompanied by another skeletal injury indicates serious injury. Femoral fractures account for almost 25% of fractures in the multiply injured child. Loder reported that operative stabilization of fractures less than 72 hours after injury resulted in a shorter hospital stay, a shorter intensive care stay, and less ventilatory assistance. Hedequist, however, found early stabilization of femoral fractures had no effect on the pulmonary complication rate. Recent

suggests that mandatory debridement less than 8 hours after injury is not always necessary, and that outcome did not suffer from longer delays when other injuries delayed debridement. External fixation has been advocated either as a temporizing measure when fractures must be quickly stabilized, or for definitive management. Increased complications have also been reported with external fixation, especially in regard to delayed union or refracture.

The particular type of fixation for a given fracture is, for the most part, arguable. External fixation allows access to open wounds, but can be cumbersome and suffer pin tract problems. Union can be delayed if the fracture is distracted. Plate fixation allows primary closure, is reliable for fixation, but can predispose to leg length discrepancy in the femur, requires additional dissection, and has a small but definite risk of complication. In a small series of patients aged 8-12, excellent results were reported. Casting or splinting require repeated careful assessment in non-responsive patients to avoid pressure complications or compartment syndrome. Rigid intramedullary nailing must avoid growth plates, and especially, the piriformis fossa of the femur, to avoid the possibility of avascular necrosis of the proximal femur. Flexible intramedullary nailing is safe, but does not impart rigid fixation. K wires have been used as lower cost flexible intramedullary rods (Qidwai). A study suggesting that multiply injured children without head injury may not receive the rehabilitation necessary to achieve optimum functional recovery (Aitken).

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