



# POSNA

## The Core Curriculum

### Tibial shaft fractures

#### Objectives

1. Describe the frequency of tibial shaft fractures at differing stages of childhood.
2. Discuss the limits of angulation in both the sagittal and coronal planes that are compatible with a long-term acceptable result of a fractured tibia (and fibula), including possible differences with age.
3. Discuss methods of immobilization presently used for treating the child's fractured tibia (cast, internal fixation, external fixation), including indications, expected outcome, limitations, and complications of each method.
4. Describe patient assessment for possible compartment syndrome, using locally available resources.
5. Describe an approach to managing open fractures, using locally available resources.
6. Describe management of the "floating knee" (ipsilateral femoral and tibial fractures).

#### Discussion points

1. Describe the "toddler's fracture," its frequency, assessment, and management.
2. What are your indications for internal or external fixation of the child's tibial fracture? Describe the data base to justify your position.
3. What are the most important factors affecting outcome in the child's open tibial fracture?

#### Discussion

The tibia is the most commonly fractured bone of the lower limb in children. The "toddler's fracture" has been well described, and should be suspected whenever a young child refuses to walk. Localized tenderness is a helpful clinical sign, and 3 radiographic views are often necessary to visualize the fracture. Hyperextension of the knee has been recently incriminated as causative of the proximal tibial toddler's fracture. Fractures of the shaft can generally be managed with casting. Less than 10 degrees of angulation should be the goal in older children, although a longterm study of adult patients concluded that less than 5 degrees angulation resulted in less degenerative changes. Varus angulation remodels better than valgus or posterior angulation. The recent literature trends toward more aggressive intervention, but Shannak's results with cast treatment remain as a high standard. Non-weightbearing casts have often been used initially, but Brown and Sarmiento reported improved results with early weightbearing, even with unstable fractures. In adults, intramedullary nailing has been reported as having a modest but definite better quality of result. The European literature is more inclined toward operative intervention than the American.

Open fractures of the tibia in the younger child have a better outlook than those of children over 12 or adults. The superior capability of the child's periosteum seems to be largely responsible. Various methods of immobilization have all been reported as effective for the child's open tibial fracture, and the need for rigid fixation appears less pressing than for adults with similar injuries. Nonunion and delayed union are less frequent, especially with younger children. Compartment syndromes have been reported in open as well as closed fractures (the status of the fascia is not included in the grading of open fractures). Although many authors recommend fasciotomy for compartment pressures over 30mm Hg, one study reported a 29% fasciotomy rate for this criteria. An alternate method of calculating the need for fasciotomy is maintaining > 30 mm Hg between the diastolic and compartment pressures. Time tested clinical assessment tools (increasing pain, pain on passive stretching of ischemic muscles) are also useful when compartment pressure measurements are not available.

Treatment of the so-called "floating knee" also varies with age. Older children have a higher incidence of knee ligamentous injury, and operative fixation of at least one fracture appears more often indicated in older children.

There are presently many choices for management of the child's tibial fracture. Most closed fractures can be managed with cast treatment. For more complex injuries (open fractures, high energy comminuted) some authors advocate external fixation, but others caution of higher rates of delayed union or refracture. Office removal of fixators is a definite cost-saving measure. Flexible intramedullary nails are becoming more often used at present. Rigid nailing is an option in the child approaching skeletal maturity. The severe grade III open fracture requires skilled management of both the bone and soft tissue. Decisions regarding salvage or amputation are difficult, in borderline cases, amputation has been reported as having better follow-up results.

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