



POSNA

The Core Curriculum

Fractures of femoral shaft

Objectives

1. Describe classification of femoral shaft fractures by location, fracture pattern, and energy dissipation
2. Discuss the association of children's femoral fractures with child abuse
3. Describe the phenomenon of overgrowth
4. Describe factors influencing the amount of acceptable angulation and shortening
5. Describe treatment options with respect to age and associated injuries
6. Discuss factors influencing length of follow-up
7. Discuss complications associated with different methods of management

Discussion points

1. Role of energy associated with injury in deciding treatment strategy, especially in relation to spica cast.
2. Growth stimulus of fractured limb.
3. How much overgrowth does one anticipate? Effect of age on overgrowth? When does overgrowth occur?
4. How much angulation is acceptable?
5. What is the best way to assess shortening?
6. Role and complications of external and internal fixation
7. What anatomic factors contribute to the development of avascular necrosis of the femoral head following antegrade nailing in adolescents?
8. Do socioeconomic factors play a role in the incidence of femoral shaft fractures in children?

Discussion

Femoral shaft fractures are relatively common in children, the incidence in Baltimore was 19.15/100,000. Common mechanisms of injury varied with age. Infants are susceptible to child abuse, falls for younger children, motor vehicle-pedestrian or bicycle accidents in midchildhood, and motor vehicle accidents or sports in adolescence (Hinton). Child abuse is a common factor in the infant, especially less than age one (Gross). There are no absolutes at present regarding management; the last two decades have seen dramatic changes in management techniques; more could be expected. For infants and young children, immediate spica cast treatment is satisfactory; excellent results have been reported with the 90-90 cast (Illgen). Greater amounts of initial shortening were associated with greater difficulty in maintaining reduction. Technique of cast application does matter (Czertak). Shortening is best assessed in the lateral view. The popularity

of casting diminishes after about age 6 due to the size of the child; but excellent results have been reported in older children, especially from countries that are less economically advantaged, (Sahin) where cost is a greater factor than convenience. Current modalities employed in midchildhood include external fixation, flexible intramedullary nails (FIN), and castbrace. External fixation enjoyed prominence in the early 1990's, (Blasier) but 2000 signals the decade of flexible intramedullary nails (Vrsansky, Mazda). Refracture has been reported following external fixation, and a recent study comparing external fixation with FIN concluded that there were less complications and an earlier return to function with FIN.(Bar-Or) The cast brace has not been widely used, but represents an alternate method for comminuted fractures.(Gross) For adolescents, antegrade nailing is popular and effective but does carry some risk of avascular necrosis of the femoral head. (Buckaloo, Stans) Whether technical refinements such as placement of the rod laterally in the greater trochanter can avoid such complications is unsettled at present, and intramedullary nailing still has its advocates. (Buford) The traditional traction and casting method is still reliable but distinctly unpopular in the US now, primarily due to the cost of prolonged hospitalization and inconvenience to the family of prolonged spica cast immobilization of larger children. Muscle weakness following traditional methods femoral shaft fracture treatment can be marked.(Damholt)

Features included in evaluating results of treatment of femoral fractures in children include leg length discrepancy (either shortening or overgrowth), angular or rotatory malunion, strength, refracture, infection, and avascular necrosis of the femoral head. Not all studies evaluate all parameters, and length of follow-up can influence results. Several generalizations can be made, although individual variations have been reported, and these must be regarded as provisional guidelines. (Griffin, Stephens) Considerable angulation can be accepted at the time of immobilization in very young children, up to 45 degrees in the AP plane (the plane of motion), Leg length discrepancy is rarely noted following femoral fracture in patients less than 2 years old. As the child matures, more precision is required for reduction, although shortening of 1 cm is regarded as ideal in midchildhood as there is more tendency toward overgrowth at this age than in younger or older children. More angulation can be accepted proximally than distally where the angulation is more visible and has more effect on the knee. Rotatory malunion has rarely been found to be a problem at follow-up.

There are many acceptable methods available for treatment of the child's femoral fracture, and it is better to use a simpler method that is applicable to the locale than to make an attempt at internal fixation in the presence of suboptimal conditions. Almost all children's femoral fractures can be successfully treated. The right treatment is the one that works.

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