



POSNA

The Core Curriculum

Fractures of the distal femur

Objectives

1. Describe patterns of distal femoral fractures in the skeletally immature
2. Describe a useful classification system for distal femoral physeal fractures
3. Describe management of distal femoral physeal fractures
4. Discuss complications of distal femoral physeal fractures

Discussion point

1. Why is subsequent growth so often impaired after Salter-Harris type II fractures of the distal femur?

Discussion

Fractures of the distal femur in children are essentially physeal fractures. They are much less common than radial or tibial physeal injuries, and account for about 1% of all fractures in children. Although some distal femoral physeal fractures occur at birth or in infancy, mostly from birth palsy or child abuse; most occur in the adolescent. Most result from sports or vehicular trauma. The clinical appearance of a displaced distal femoral physeal fracture can be very dramatic. Classification systems have been described on the basis of mechanism of injury, but the most often used classification is the Salter-Harris. Infants almost invariably sustain a Type I fracture; Types I and II predominate at all ages. There is sometimes difficulty in diagnosis of a nondisplaced Type I injury in an adolescent, point tenderness on clinical exam is certainly a helpful finding, and rarely is there absolutely no evidence of radiographic injury, such a physeal widening even when nondisplaced. Stress films have been recommended in the past; it is a bit brutal to do this without adequate anesthesia. It has long been evident that both the distal femoral physis and the knee ligaments may be injured, failure at one site does not necessarily protect the other. Nondisplaced fractures can obviously be managed with simple immobilization. Displaced fractures require reduction and maintenance of reduction. Analysis of results of closed treatment of Type II fractures indicate an unpredictable failure rate, therefore some type of supplemental fixation is presently preferred. This may often be percutaneous, crossed Steinman pins are reliable. If the metaphyseal fragment is substantial, cannulated screws are also effective. Closed reduction is successful for most Type II fractures, but open reduction, approaching the prominent distal metaphyseal protuberance of the proximal fragment is sometimes required to remove obstacles to reduction. Type III and IV fractures are now preferably managed by closed or open reduction followed by cannulated screw fixation parallel to but not crossing the physis; threaded Steinman pins may be used if cannulated screws are not available.

There is a relatively high rate of growth disturbance following Salter II distal femoral physal fractures. The portion of the physis protected by the metaphyseal spike of the distal fragment is obviously protected, but the remainder of the physis is subjected to combination of shear forces. The distal femoral physis undulates more than most; thus when the bone fails, the fracture line may meander through different portions of the physis or even the bony metaphysis in some areas. If this is the case, as it often is, prevention of subsequent growth deformity is very difficult. Leg length discrepancy, often accompanied by angular deformity from differential growth (the protected portion of the physis grows at a more rapid rate) has been noted in about 25% of patients following Type II fractures. Peroneal nerve neuropraxia is uncommon, with an incidence < 5%. Popliteal artery injury is presently very rare, but has been reported. Most reports indicate improvement of vascular status with reduction of the fracture. Most complications of distal femoral physal fractures are amenable to presently available techniques. Strategies for the management of complications secondary to growth disturbances include excision of physal bridge when practical, physal or hemiphysal stapling or arrest, osteotomy, and (in the young patient) lengthening.

For the so-called floating knee in children, with fracture of both femur and tibia, better results have been reported with operative fixation of at least one of the fractures.

Although nonunion of distal femoral fractures is essentially nonexistent in patients with neurologically normal lower limbs, union is characteristically very delayed in children with myelomeningocele.

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