Unusual Cause Of Knee Pain In A 16 Year Old Soccer Player

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Patient Presentation:
A 16 year old male high school soccer player presents two days after an injury to his right knee.

History:
During a game, he attempted to kick a ball and got his leg caught in between two defenders and thought he may have twisted his knee. He was evaluated by an athletic trainer on the field who thought he may have sustained an ACL/LCL injury. He was unable to bear weight immediately after the injury. He was made non-weight bearing on crutches, iced, and elevated the leg over the next 36 hours.

Physical Exam:
No ecchymosis. There is a trace knee effusion. Distal thigh circumference on the right is 3 cm greater than the left. He is diffusely tender to palpation over the right distal thigh. No tenderness over proximal fibula or tibia. He lacks 15 degrees of full extension and can flex to 80 degrees. He is tender over the LCL, medial joint line, and medial femoral condyle. He has a 1A Lachman’s and negative pivot shift. He has pain with varus and valgus stressing but has firm endpoints. Posterior drawer and McMurray's tests were limited due to pain and lack of motion. Distal pulses were intact.
Broad Differential Diagnosis:
1. ACL sprain/tear
2. LCL sprain/tear
3. Meniscus tear
4. Bony contusion of femur
5. Thigh hematoma
6. Femur fracture
Other Studies:
X-ray of the right knee shows widening of the femoral physis laterally with a faint linear lucency extending from the mid femoral physis toward the femoral metaphysis medially (Case Photo #1).

MRI of the right knee shows evidence of a non-displaced Salter-Harris type II fracture of distal femur with associated subperiosteal hematoma and surrounding hemorrhage and edema within the soft tissues (Case Photos 2-5)
Photo 1

QuickTime™ and a decompressor are needed to see this picture.
Photo 2

QuickTime™ and a decompressor are needed to see this picture.
Photo 3
Photo 4
Photo 5

QuickTime™ and a decompressor are needed to see this picture.
Working Diagnosis:
Non-displaced Salter-Harris type II fracture of the right distal femur.

Treatment:
1. He was placed in a long leg cast with non-weight bearing status, on crutches. Repeat radiographs at two weeks showed no displacement of the fracture.
2. After four weeks, the cast was removed and repeat radiographs demonstrated partial interval resolution of the fracture line. He had minimal tenderness over the distal femur and his thigh swelling had resolved. He was instructed to continue with his non-weight bearing status but was changed into a long drop-lock brace open from 0-60 degrees.
3. Two weeks later, he had improved motion and was pain free. The drop lock brace was discontinued and he was advanced to partial weight bearing. He began physical therapy for range of motion and light strengthening exercises.
4. At 9 weeks post initiation of treatment, repeat radiographs showed complete resolution of the fracture line and he was full weight bearing without pain. He was slowly advanced to full jogging, running, and a graduated return to soccer program. He returned to full soccer activities after 4 weeks.

Outcome:
Total time to return to play from initiation of treatment was 13 weeks. He is doing well, playing soccer without restrictions.
Teaching Points

Author's Comments:
Injury often occurs at the “weakest link” which in the pediatric skeletally immature patient often involves the physis instead of ligaments or tendons. Salter-Harris type II fractures are the most common type of physeal fracture and most commonly occur prior to or at the beginning of a growth spurt. Distal femoral physeal fractures are exceedingly rare and account for only 7% of fractures in the lower extremities [1]. Non-displaced or minimally displaced Salter-Harris type I and II fractures can be treated with cast immobilization. Almost all Salter-Harris III and IV fractures require open reduction and internal fixation [2]. It is important to keep physeal fractures in one's differential even in the older teenager.

Editor's Comments:
Distal femoral physis fractures are frequently the result of motor vehicle accidents or collision sports (especially football). (1,3,5) Although Salter Harris I and II fractures are generally felt to be benign injuries, the rate of complication in the distal femur is alarmingly high.(1-5) In Salter Harris II fractures with evidence of displacement or comminution of the metaphysis, there is a 70% rate of growth plate arrest with resultant leg length discrepancy, significant valgus or varus deformity, and/or significant range of motion loss. (4) A 2009 meta-analysis showed that the complication rate for all Salter Harris II distal femur fractures (defined as a growth disturbance that resulted in a leg length discrepancy > 1.5 cm) was 25.7%. (2) Clinicians caring for athletes with Salter Harris II fracture of the distal femur should counsel patients and families of the complications risks and should consider following the patient until the distal femoral physis closes, which occurs between ages 14 and 16 in girls and ages 16 and 18 in boys. (1,6)
Questions

1) Which type of non-displaced Salter-Harris fracture is usually managed non-surgically?
   A) Type 1
   B) Type 2
   C) Type 3
   D) Type 4
   E) Both A and B

2) Distal femoral physeal fractures represent what percentage of all lower extremity fractures?
   A) 7%
   B) 25%
   C) 40%
   D) 60%

3) The rate of growth plate abnormalities for non-displaced Salter-Harris Type II distal femoral fractures is:
   A) 10%
   B) 25%
   C) 40%
   D) 70%  (See Correct Answers after References)
Author’s References:

Editor’s References:
1) Which type of non-displaced Salter-Harris fracture is usually managed non-surgically?
   A) Type 1
   B) Type 2
   C) Type 3
   D) Type 4
   E) Both A and B

   Answer: E

2) Distal femoral physeal fractures represent what percentage of all lower extremity fractures?
   A) 7%
   B) 25%
   C) 40%
   D) 60%

   Answer: A

3) The rate of growth plate abnormalities for non-displaced Salter-Harris Type II distal femoral fractures is:
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   B) 25%
   C) 40%
   D) 70%

   Answer: B