Osteochondritis Dissecans of the Pediatric Knee

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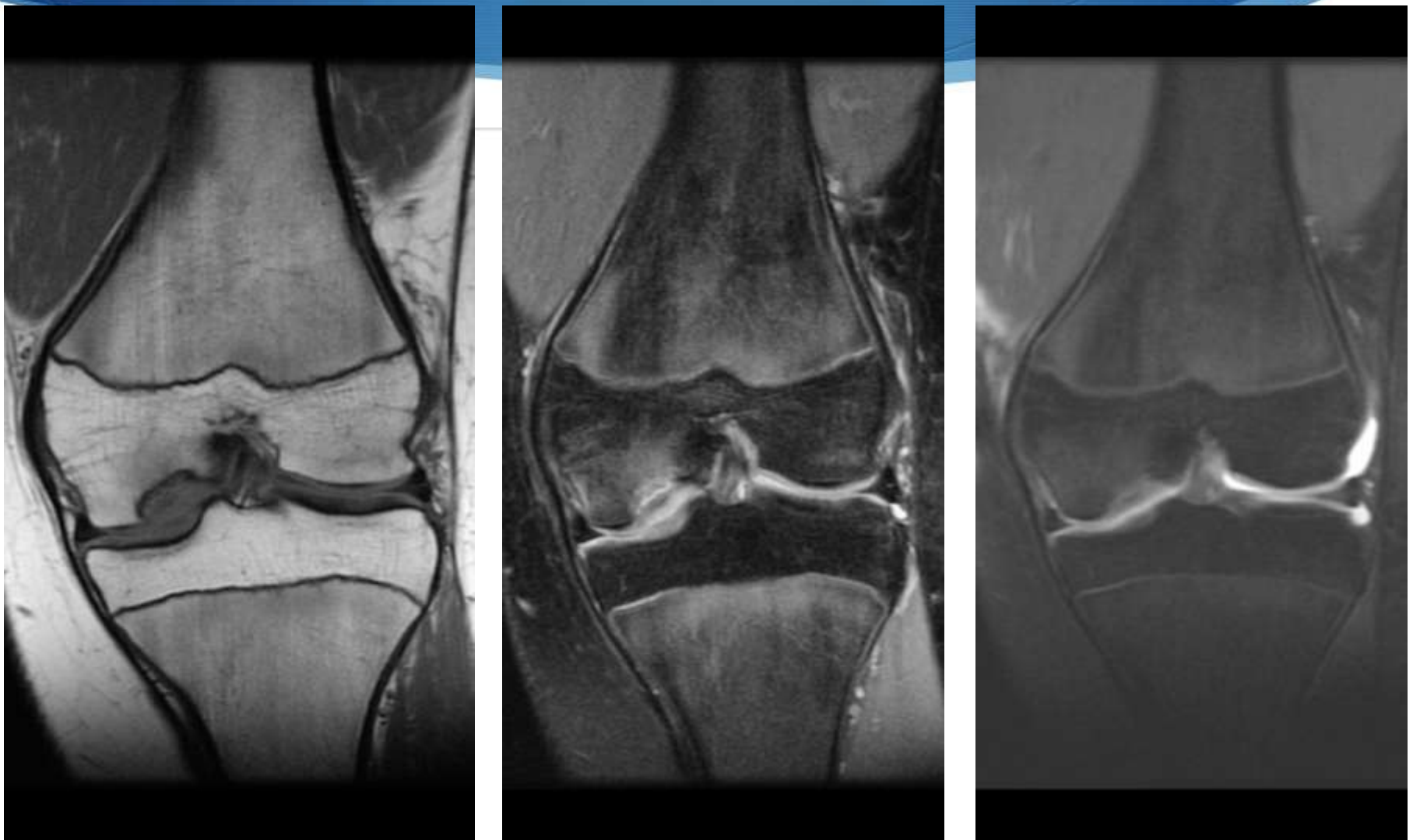
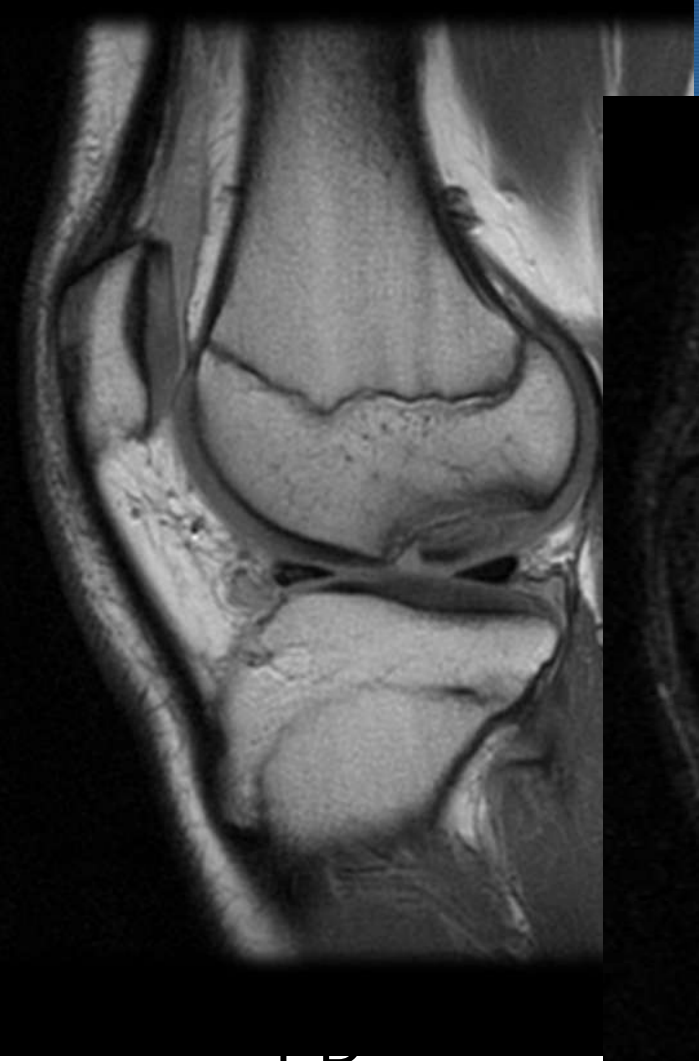
Clarification of definitions

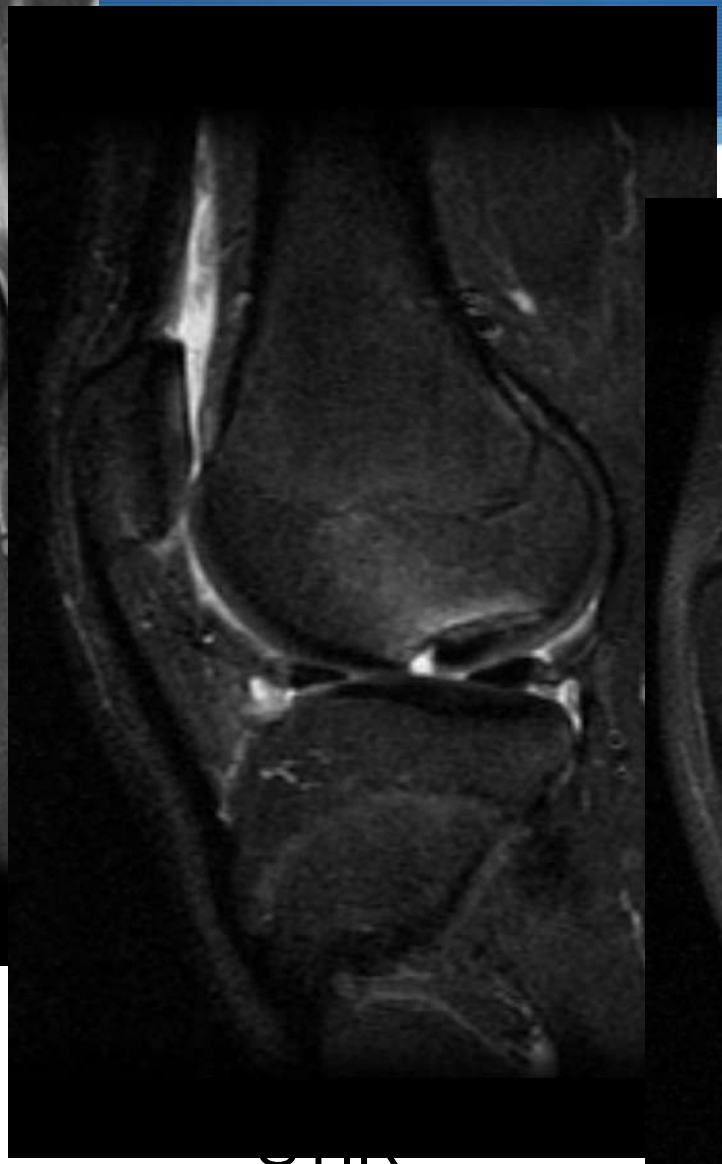
- OCD:a fragment of cartilage and subchondral bone separates from an articular surface in adolescents; a misnomer name as there has been investigators have failed to identify inflammatory cells in histologic sections of excised osteochondral loose bodies. The definition implies an acute, inflammatory condition.
- Pathogenesis: repetitive microtrauma, which leads to micro-fractures, may cause subsequent focal ischemia or alteration of growth. As a result, the subchondral bone offers reduced support, the articular cartilage softens, and fragment sepa-ration may lead to cartilage injury and later crater formation

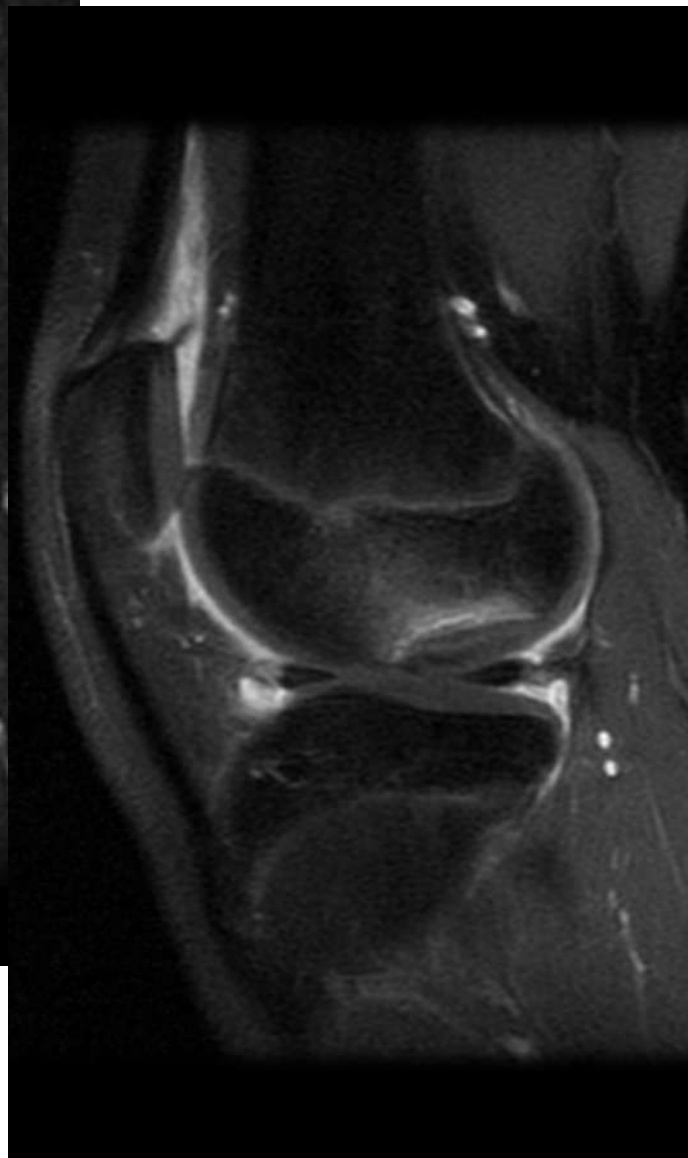
OCD Lesion 16 y/o male

OCD Lesion Knee









Staging OCD based on arthroscopic findings

- Stage 1, the lesion is 1 to 3 cm and the articular cartilage is intact. Thickened and edematous intra-articular and periarticular soft tissues are observed. Often, adjacent metaphysis reveals mild osteoporosis resulting from active hyperemia of the metaphysis.

- Stage 2 is characterized by an articular cartilage defect without a loose body. epiphysis reveals an irregular contour and a thinning of the subcortical zone of rarefaction. Epiphysis may demonstrate fragmentation. Blood vessels within the epiphysis are incompetent because of thrombosis or microfractures of the trabeculae, which results in poor healing.

Staging OCD based on arthroscopic findings

- Stage 3, a partially detached osteochondral fragment with or without fibrous interposition is found. Period of repair in which granulation tissue gradually replaces the necrotic tissue. Necrotic bone may lose its structural support, which results in compressing and flattening of the articular surface.
- Stage 4 demonstrates a loose body with a crater filled with fibrous tissue

Osteochondrosis

- Osteochondrosis: family of ortho disease that occur in children. They are characterized by interruption of the blood supply of a bone, in particular to the ***epiphysis***, ***followed by localized bony necrosis***, and later, ***regrowth of the bone***.
- Examples include: Freiberg's disease, Legg-Clave Perthes Disease, Osgood Schlatter Disease, Sever's Disease

Osteochondrosis

1. Any disease that affects the progress of bone growth by killing bone tissue.

2. Osteochondrosis is seen only in children and teens whose bones are still growing.

- http://emedicine.medscape.com/article/827380-media

Clarification of definitions

Osteochondral Fracture:: cartilage covering a bone in a joint is torn. Secondary to trauma or repeated stress. Associated with a fatty hemarthrosis.

Osteochondral Fracture

- www.imageinterpretation.co.uk

Pediatric considerations

- OCD affects 2 distinct populations of patients differentiated by the status of their physes. Patients aged 5-15 years who have open physes have the juvenile form of the disease. Older adolescents and adults who have closed physes have the adult form of the disease.
- OCD occurs in the knee 75% of the time, elbow 6% of the time, and ankle 4% of the time. In the knee, OCD occurs in the medial femoral condyle 75% of the time, on the weight-bearing surface of the medial condyle 10% of the time, on the weight-bearing surface of the lateral condyle 10% of the time, and in the anterior intercondylar groove or patella 5% of the time.

Pediatric considerations

- OCD has a male predominance, with a male-to-female ratio of 2-3 to 1.
- The average age at presentation of ***juvenile OCD in the knee is 11.3-13.4 years***. The average age at presentation of adult OCD in the knee is 17-36 years, but this form can occur in adults of any age.
- Genetic predisposition: osteochondrosis deformans tibiae of the adolescent type
- Growth anomalies: uncalcified cartilage on MRI that was same signal intensity as subchondral bone,

Etiology OCD in Peds

- Multifactorial and still confusion on exact mechanism
- Possible causative factors include repetitive microtrauma, ischemia, genetic and endocrine factors, and anomalies of ossification.
- OCD must be given sufficient medical attention in young patients because it impacts a child's present and future activity levels and can contribute to degenerative joint disease later in life.
- Prognosis depends on status of the growth plate

OCD clinical presentation

- **Lateral aspect of the medial femoral condyle is the most common site of involvement in the knee, accounting for 73% to 85% of all OCD lesions.**
- **Activity related pain that develops gradually, usually at extreme ROM**
- Pain, swelling, catching, locking, and giving way, possible limp on LE

Physical exam of the OCD knee

- Effusion, tenderness, crepitus
- Ambulation with affected leg ext rotated
- Wilson sign +

RAD Findings

- Lucency of ossification front representing growth inhibition
- In older adolescents, the OCD lesion frequently appears as a well- circumscribed area of sclerotic subchondral bone with a radiolucent line between the defect and the epiphysis
- Use a notch or PA tunnel view to see OCD lesion

16 y/o male stable OCD lesion

RAD Findings

- Children between the ages of 8 and 11 may present with inhibition of the ossification front, which creates the appearance of a defect
- Severe lesions may show lysis of the developed epiphysis, similar to the radiographic findings in avascular necrosis.

OCD Lesion Suspected

- MRI used to stage OCD lesion. MRI useful for features of the articular cartilage and underlying subchondral bone, including edema, fractures, fluid interfaces, articular surface integrity, and fragment displacement
- A patient with a more mature epiphysis and a more advanced lesion will show a fracture line initially through the region of the subchondral plate, and eventually through the articular cartilage.

OCD Lesion Suspected

- Patients close to skeletal maturity may present in later stages with a well-circumscribed ossicle on plain radiographs.
- On MRI, four critical MRI criteria of instability exist: a line of high signal intensity at least 5 mm in length between the OCD and underlying bone, area of homogeneous signal at least 5 mm in diameter beneath lesion, focal defect in the articular surface, and high signal line traversing the sub-chondral plate into lesion (fracture of subchondral bone)

OCD Lesion Follow-up

- Technetium bone scintigraphy has been used to monitor the progress of treatment
- **It can detect osteoblastic activity, regional blood flow, and the amount of osseous uptake, which seem to be correlated to the potential amount of healing possible in the osteochondral fragment**

Treatment

- NONOPERATIVE:activity modification, protected weight bearing (partial or non-weight bearing), and immobilization. Skellatally immature, intact lesion, no loose body.
- OPERATIVE:Failure of 3 months nonop tx, approaching skeletal maturity, persistent symptomatic lesions, sig progression

NON-OP tx OCD Lesion

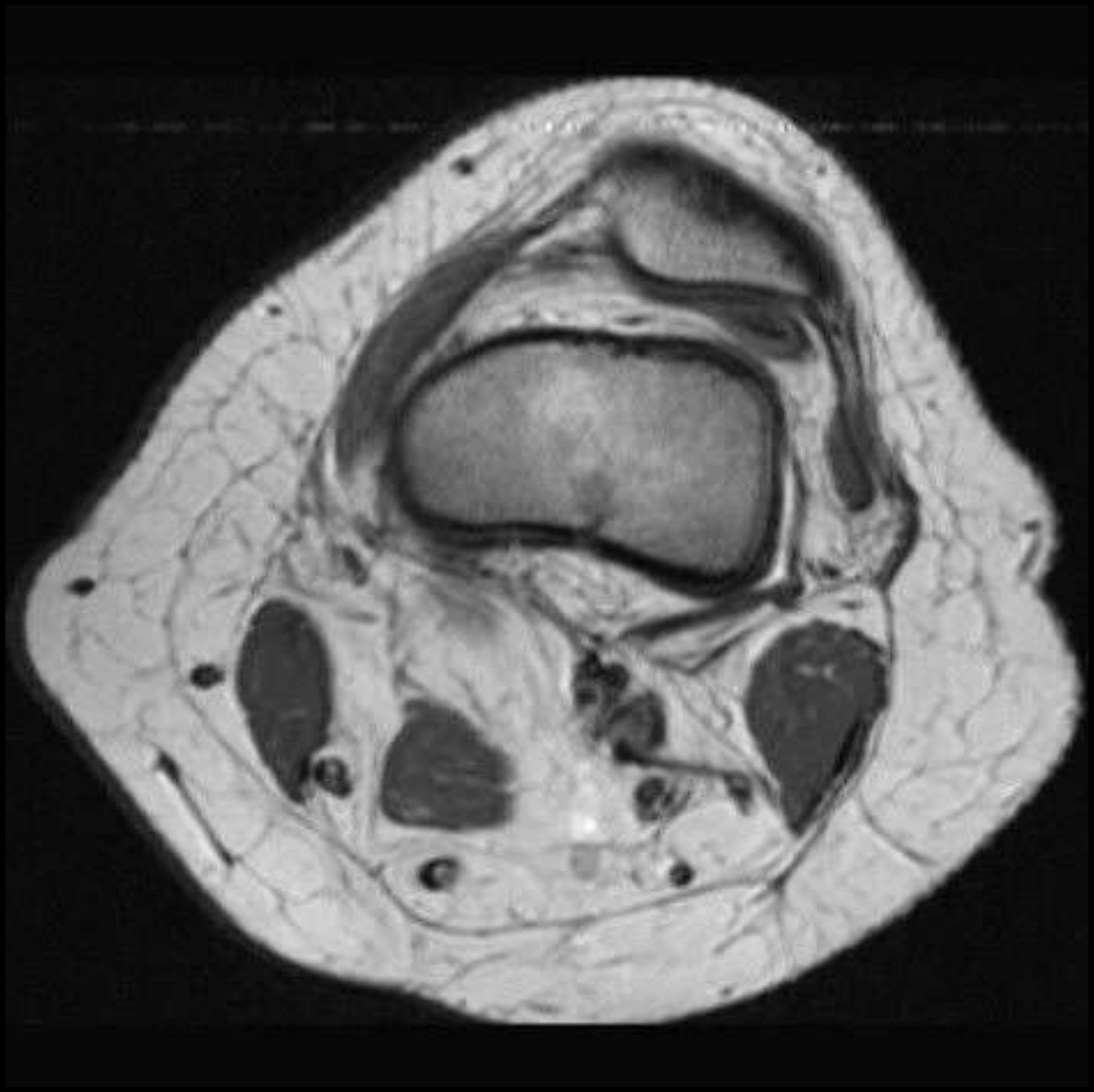
- The goal of non-operative intervention is to promote healing in the subchondral bone and potentially prevent chondral collapse, subsequent fracture, and crater formation
- Knee are immobilized for 4–6 weeks in a cylinder cast in extension to remove shear stress from the involved area, with wt bearing as tolerated
- If XRAYS reveal after 3 months non-op tx that the radiolucency has resolved, then gradual return to sports is instituted

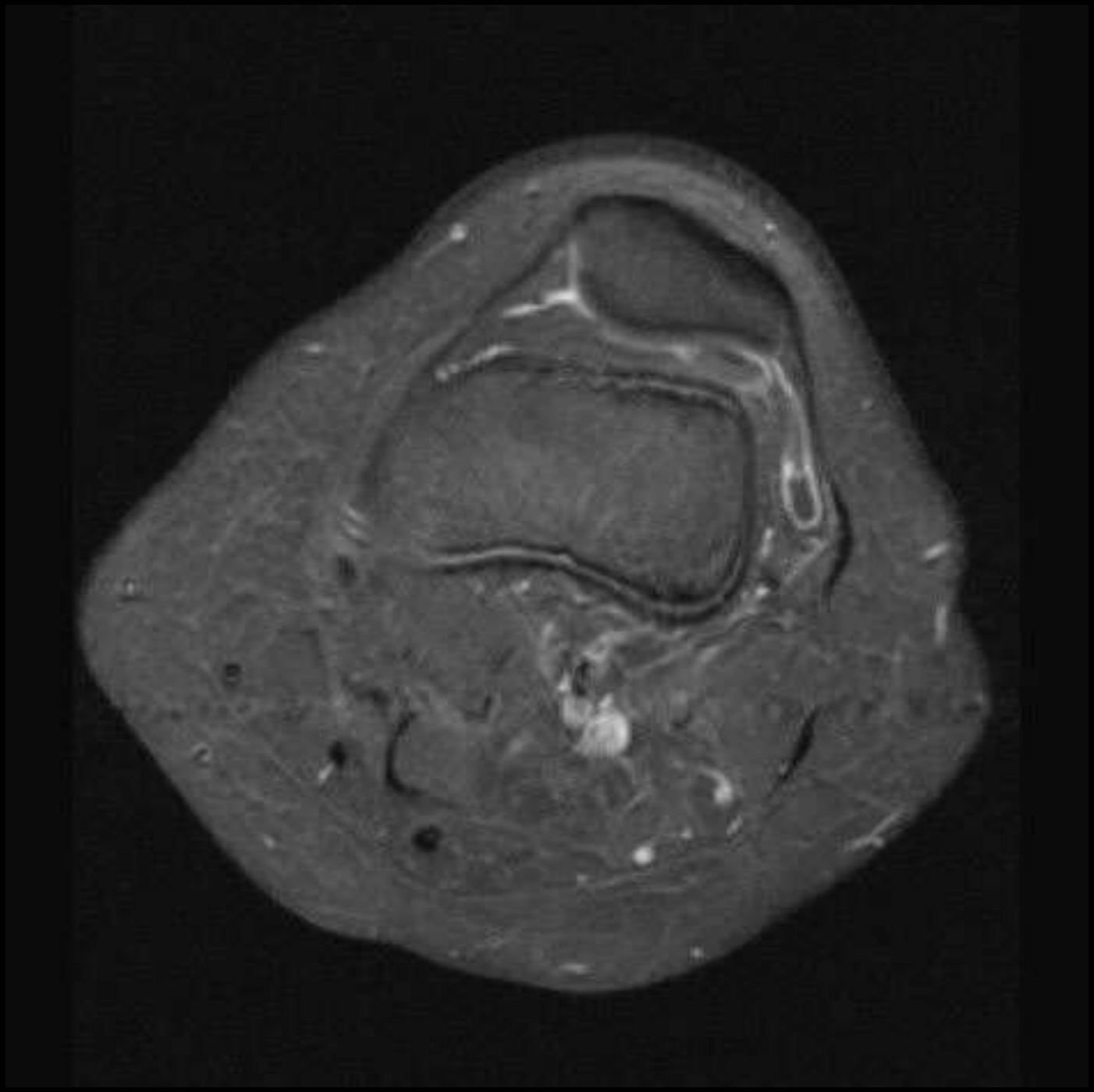
The Future

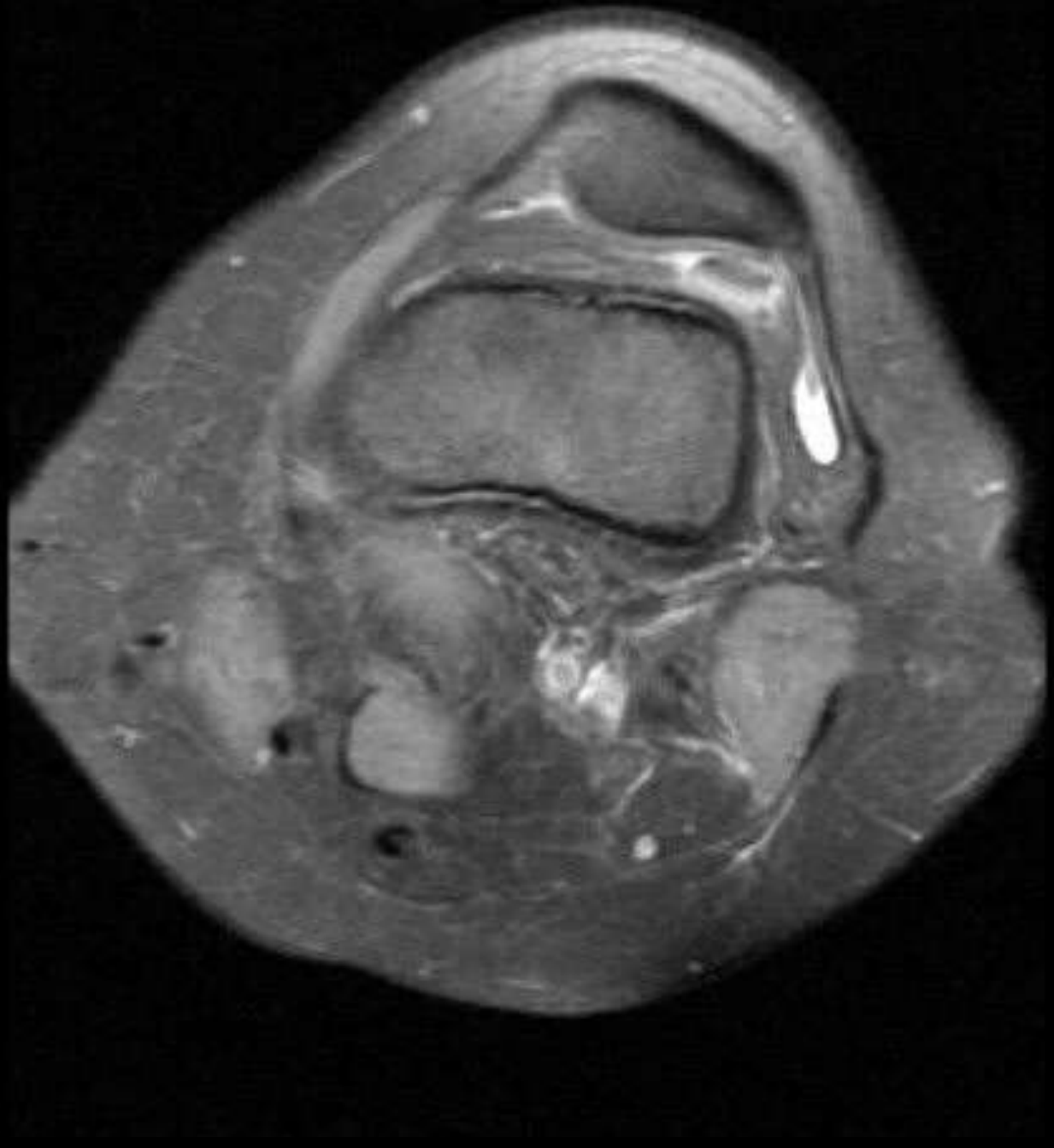
- A variety of materials have been investigated, including: fibrin, collagen, ceramics, and syn- thetic polymers. Biodegradable matrices perhaps show the most promise for the future.
- Methods to deliver growth factors and cytokines locally with temporal control will be the subject of many future studies. Synthetic polymers that closely approximate the biomechanical characteristics of normal articular cartilage are also being developed.

A Pediatric Case

- 13 y/o WM gymnast presents for knee pain x 2 weeks. Pt found out made a special gymnastic team and was excited and did a jump landing on his knees thinking it was a spring floor. Pt was able to do normal activity but was in pain with any squatting, pressure on knee, running. An MRI was taken after neg xray x 2.







OCD Resources

- 1. Aichroth P. Osteochondritis dissecans of the knee. A clinical survey. *J Bone Joint Surg 53B:440–447,1979.*
- *2.* Bradley J, Dandy DJ. Osteochondritis dissecans and other lesions of the femoral condyles. *J Bone Joint Surg 71B:518–522, 1989.*
- 3. Cahill B. Treatment of juvenile osteochondritis dissecans and osteo- chondritis dissecans of the knee. *Clin Sports Med 4:367–384, 1985.*
- 4. Harding WGD. Diagnosis of ostechondritis dissecans of the femoral condyles: the value of the lateral x-ray view. *Clin Orthop 123:25–26, 1977.*