

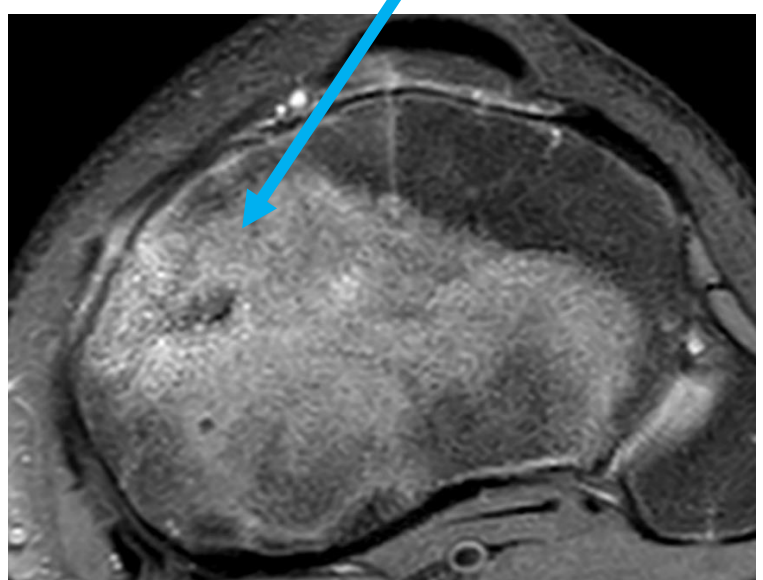
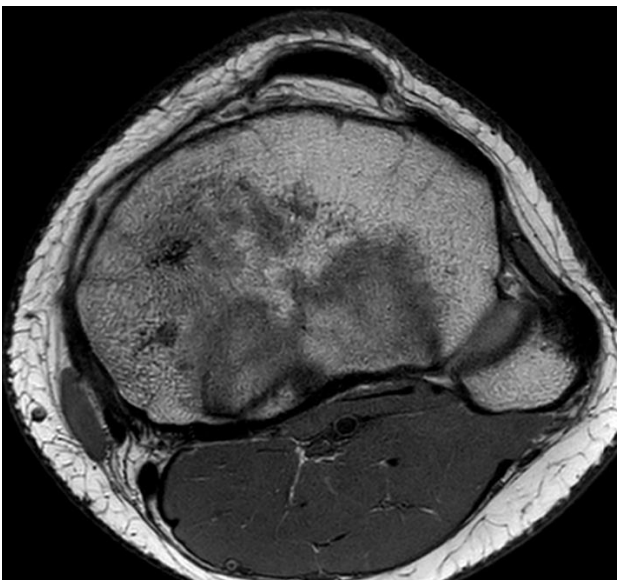
12 M with 4/52 vague/anteromedial knee pain when running. No history of trauma. Examination unremarkable.

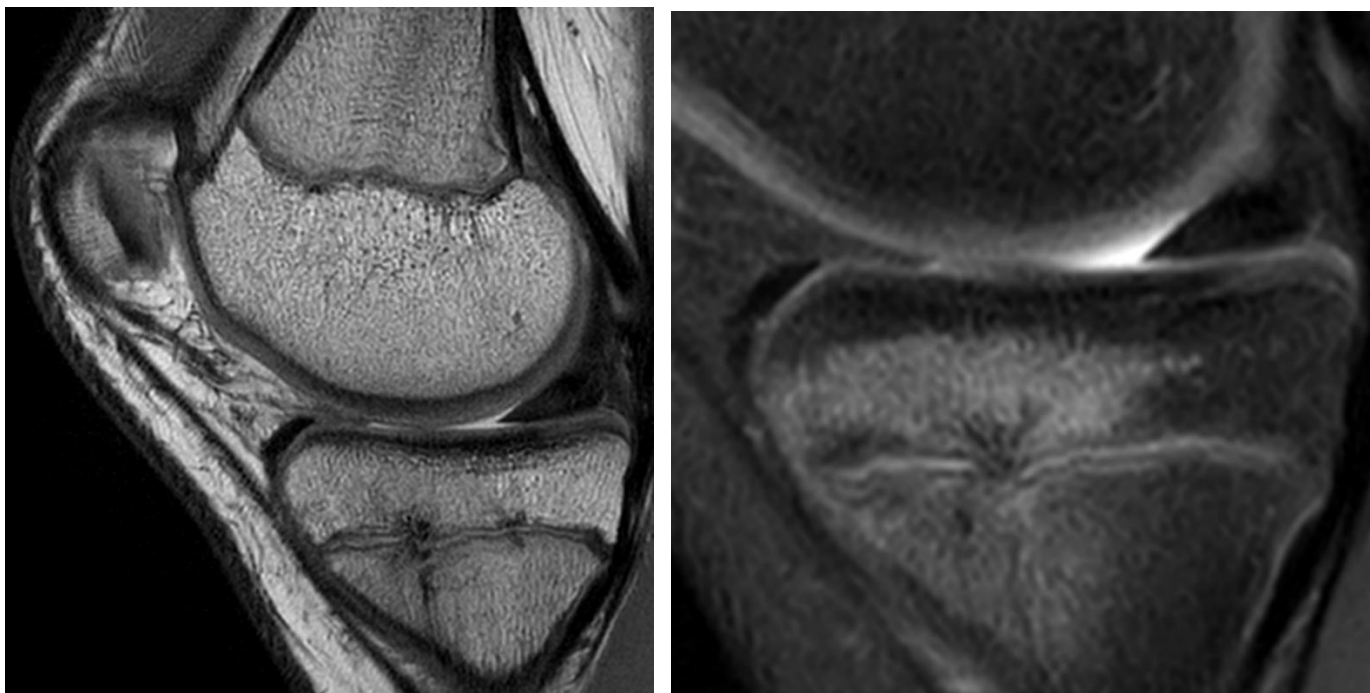
MRI Findings:

- Centred around proximal physis of the medial tibia, there is mod- high grade marrow hyperintensity/oedema
- Focal/irregular partial bone bridging across the physis is noted medially
- Marrow oedema is most prominent in the anteromedial aspect of the tibial plateau/epiphysis but does not reach the subchondral bone plate and the medial compartment hyaline cartilages are preserved
- No joint effusion, fracture, physal widening/fluid, intra-osseous fluid collection or periosteal reaction detected



PD and PD SPAIR coronal and axial (below) – periphyseal marrow oedema surrounds focal region of (low signal) physal bone bridging





PD and PD SPAIR sagittal – periphyseal marrow oedema surrounds focal region of (low signal) physeal bone bridging; subchondral bone plate is preserved.

Discussion

- Case has the features of **Focal Periphyseal Edema (FOPE) Zone** a rarely reported entity initially described in 2011 by Zbojniewicz and Laor
- Hypothesis that FOPE represents load-induced localized microtrauma with small bony bridging bars (before complete fusion) that act as anchors to the surrounding bone and alter local mechanics, producing small amounts of vascular damage and bleeding in physically active adolescents (with resultant inflammation and pain)
- FOPE zones seen in both sexes: F ~11-12 and M ~13-14 (around the time of expected skeletal maturation)
- Present with pain, with or without a history of acute injury
- Cases have been reported at the distal physis of the femur and proximal physis of the femur and tibia
- Should be recognized as a **benign self-limited entity** and not mistaken for an aggressive process crossing the physis

XR / CT

- Usually negative
- Excludes fractures and aggressive osseous lesions (infection; osteosarcoma/Ewing sarcoma) in most cases

MR

- PDFS or STIR sequences sensitive for marrow oedema
- Focal site of irregular low signal bone bridging identifiable in an immature weight bearing long bone
- Excludes fractures and aggressive osseous lesions

DDx

- Contusional bone marrow oedema and Salter Harris injuries
- Stress response / fracture
- Osteomyelitis / CRMO (usually metaphyseal due to physeal barrier-vascular supply in this age group)
- Infiltrative bone tumour (usually on one side of physis only)

Further Reading:

Zbojniewicz AM, Laor T. Focal Periphyseal Edema (FOPE) zone on MRI of the adolescent knee: a potentially painful manifestation of physiologic physeal fusion?. *AJR Am J Roentgenol.* 2011;197 (4): 998-1004.

Giles, E et al: Focal Periphyseal Edema: Are We Overtreating Physiologic Adolescent Knee Pain? *JAAOS Global Research & Reviews:* April 2018 - Vol2 – Issue 4.
 Beckmann, N et al: Unusual Presentations of Focal Periphyseal Edema Zones: A Report of Bilateral Symmetric Presentation and Partial Physeal Closure. *Case Reports in Radiology*, vol. 2015, Article ID 465018, 8 pages, 2015.

Bochmann, T et al: Case report: imaging the clinical course of FOPE—a cause of adolescent knee pain. *Journal of Surgical Case Reports.* Vol 2016: Issue 11.