

# Musculoskeletal imaging of a painful knee: Diagnosis

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We congratulate Dr Dirk van der Merwe of Drs Schnetler, Corbett and Partners, Cape Town, for a detailed diagnosis for which he receives an award of R1 000 from the RSSA. Dr Misser elaborates below on the condition and its imaging. Please refer to page 39 of the February 2012 issue of the *SAJR* (<http://www.sajr.org.za/index.php/sajr/article/view/691/549>) for the presentation details.

In addition, delayed congratulations to Dr Rory Tayler, who is a consultant in the Department of Radiology at CH Baragwanath Hospital, for submitting a precise diagnosis of the December 2011 quiz case, for which he also receives a R1000 award from the RSSA. His submission fell within the stipulated cut-off date but missed publication because of the earlier-than-usual printing of the *SAJR*. Dr Misser elaborated on this case in the February 2012 issue of the journal.

## Presentation and diagnosis

(The images referred to below are not reproduced here but are in the online February 2012 *SAJR* at the above URL.)

The plain radiographs (Figs 1 and 2) demonstrate moderate background osteopaenia and osteoarthritic change involving both compartments of the femoro-tibial joint. Fig. 2 (performed at time of admission) reveals microfracture of the medial tibial plateaux with collapsed subchondral bony plate. MR images (Figs 3 - 6) show a degenerative medial meniscus tear with joint fluid and established osteoarthritic change. Articular surface hyperintensity of both femoral condyles and the medial tibial condyle with subchondral fracture at the latter is noted. The combination of features is in keeping with subchondral insufficiency microfracture or previously described spontaneous osteonecrosis of the knee (SONK).

First described in 1968 by Ahlbach *et al.*,<sup>1</sup> this entity has become a distinct form of osteonecrosis with typical clinical and radiological patterns. Generally, elderly female patients, with no preceding steroid or ethanol use, present with acute knee pain along the joint line. The differentiation from secondary osteonecrosis may be difficult on imaging alone and predisposing factors, patient profile and areas of joints involved are useful distinguishing features (see box below).<sup>2</sup>

SONK has been categorised into 5 radiographic stages.<sup>3</sup> In the immediate phase, plain radiographs are usually normal (stage 1). In stage 2, flattening of the weight-bearing surface of the femoral condyle is noted. Follow-up radiographs may demonstrate some progressive articular surface change with lucent subchondral focus (stage 3). The focus of osteonecrosis enlarges and becomes surrounded by a sclerotic halo in stage 4. Development of secondary osteoarthritic changes including osteophytes, erosions, sclerosis and joint space narrowing, as well as later tibial articular surface involvement, marks stage 5 disease.<sup>3</sup>

Fat-suppressed MRI studies, with long TR sequences (T2- and PD-weighted) characteristically demonstrate high signal intensity in the condyles with a central subchondral low signal area.<sup>2</sup> This is classically described as the bone marrow oedema pattern with central focal low-intensity necrotic zone.

Technetium-labelled isotope bone scan demonstrates focal increased tracer uptake at the affected condyle. Scintigraphy was used by Ahlbäck<sup>1</sup> in the landmark description of SONK by showing increased tracer uptake localised to one side of the joint after excluding other predisposing factors.

More recently, with histopathological correlation, the primary event leading to SONK was found to be a subchondral insufficiency fracture, and the resultant osteonecrosis was due to the microfracture.<sup>2</sup> This has led to the new descriptive terminology for this entity with improved reference to both the aetiology and variability of the outcome in patients with SONK. The importance of detection of this process on imaging studies lies in the fact that, owing to its subchondral location, the lesion may not be detectable at arthroscopy. The radiologist is therefore instrumental in making this diagnosis, which may be occult to the orthopaedic surgeon's arthroscope.

- Ahlbäck S, Bauer GC, Bohne WH. Spontaneous osteonecrosis of the knee. *Arthritis Rheumat* 1968;11:705-733.
- Yamamoto T, Bullough PG. Spontaneous osteonecrosis of the knee: The result of subchondral insufficiency fracture. *J Bone Joint Surg* 2000;82:858-866.
- Stoller DW. *Magnetic Resonance Imaging in Orthopaedics and Sports Medicine*. 3rd ed. Vol 1. Philadelphia: Lippincott Williams and Wilkins, 2007:685-692.

	SONK	Atraumatic osteonecrosis
Synonyms	Primary necrosis, osteonecrosis	Secondary, idiopathic osteonecrosis
Age group	Older patients, usually >55 years	Younger patients, usually <55 years
Patient profile	Elderly female, with moderate OA	Young active
Presentation	Acute pain/acute-on-chronic pain	Insidious onset and slow progression
Risk factors	None	Steroid/ethanol use, renal disease
Joints involved	Weight-bearing, usually unilateral	Non-weight-bearing, commonly bilateral
Location of bone involvement	Epiphyseal to subchondral surface	Diaphyseal, metaphyseal, epiphyseal
T2-weighted MRI	Increased signal at margin, decreased signal at centre of lesion	Decreased signal at margin with increased signal of inner border – double-line sign