Learning objectives

To familiarise the reader with unusual presentations of gout and the multimodlity imaging approach to diagnosis.
Background

The presence of monosodium urate crystals in joints and peri-articular soft tissues is the hallmark of gout, the most common of the crystal arthropathies.

Clinical presentation is typically that of a mono-articular arthritis often leading to a relatively straight forward diagnosis. However occasionally unusual anatomical locations and atypical presentations can mimic other pathologies and lead to a diagnostic dilemma.

The radiological assessment of these unusual presentations frequently involves multi-modality imaging including radiographs, ultrasound, MRI and increasingly dual energy CT.

The presence of monosodium urate crystal deposition within the soft tissues is termed tophaceous gout. Plain films will demonstrate tophaceous gout as increased, usually peri-articular soft tissue denity. Tophaceous gout is also more likely to occur in the setting of renal insufficiency.

While CT and MRI are not specific investigations for gout they add useful information when there is an unclear diagnosis. CT shows soft tissue densities in keeping with tophi and also excellent charactererisation of bone erosions. Monosodium urate crystalline deposits have a specific density of approximately 160 to 170 Hounsfield units.

On MRI, tophi are hypointense on T1 weighted images and vary from hypointense to hyperintense on T2 weighted images.

Dual energy CT is now increasingly becoming the imaging modality of choice in ambiguous cases. It is advantageous as it can detect the burden of crystal deposition non-invasively. It also provides shorter scanning times, the ability to scan multiple joints simultaneously while providing a picture which is reproducible. In the setting of an acute initial presentation of presumed gout, dual energy CT may provide a false negative result. Dual energy CT can also be positive in other pathologies; for example it has been identified in low volumes in the presence of well established osteoarthritic joints.

Aspirate of monosodium urate crystals and demonstration of negatively birefringent crystals on polarized light microscopy remains the gold standard for diagnoses.
Imaging findings OR Procedure Details

Using a multi-modality approach, the presentation of gout in the axial skeleton, atypical joints and extra-articular locations will be reviewed using cases from a tertiary MSK/Orthopaedic referral centre.

In particular we aim to demonstrate cases of gout occurring in atypical locations such as the facet joints of the spine, patellar and quadriceps tendon, posterior tibial tendon, peroneal tendon and a typical case involving the MTPJ of the hallux to display common features of gout observed on imaging.

Case 1:

A 60 year old male patient presented with acute on chronic knee pain and swelling. Initial radiograph showed erosions and a dense soft tissue swelling in the projection of the patellar tendon (Figure 1).
Fig. 1: Plain radiograph of the knee demonstrates erosions of the inferior aspect of the patella and the proximal tibia (red arrows) secondary to gouty involvement.

References: - Oxford/UK

A subsequently performed MR demonstrated low signal intensity thickening of the patellar tendon with bone marrow oedema in the inferior patellar pole, a low intensity mass on T1 and a heterogenous mass on STIR imaging in the substance of the patellar tendon (Figure 2,3). CT reveals a high density mass like expansion of the patellar tendon with bony erosion of the adjacent inferior pole of the patella and tibial tuberosity (Figure 4).

Dual energy CT confirms monosodium urate deposition in the patellar tendon (Figure 5,6).
Intra-tendinous tophaceous gout may mimic infectious, neoplastic and other causes of tendinitis. Extra-articular gout may present as tendinopathy, often affecting the tendons of the wrist and Achilles tendon. The patellar tendon is a more unusual location. If patellar tendon pain is associated with a mass, the differential diagnosis should be broadened to include crystalline arthropathy.

Fig. 2: PD fat saturated sagittal image of the knee demonstrates an expanded patellar tendon with erosive changes in the inferior aspect of the patella (red arrow) and tibial insertion (blue arrow)

References: - Oxford/UK
Fig. 3: T1 sagittal MR image of the knee. Expanded patellar tendon with soft tissue involvement and erosions at the patellar and tibial insertions (red arrows).

References: - Oxford/UK
Fig. 4: 2D sagittal reconstruction of the knee on bone window settings demonstrates the expanded patellar tendon (red arrows) and erosions (blue arrow)

References: - Oxford/UK
Fig. 5: Coronal colour-coded, post-processed 3D rendered image. Monosodium urate deposition is depicted in green, which is seen in the projection of the patellar tendon.

References: - Oxford/UK
Fig. 6: Sagittal colour-coded, post-processed 3D rendered image. Monosodium urate deposition is depicted in green, which is seen in the projection of the patellar tendon. 

References: - Oxford/UK

Case 2:

A 40 year old ultra-marathon runner presented with anterior knee pain worse on extension. A painful swelling was palpated at the superior pole of the patella. In view of this a MRI was performed. A low T1 signal soft tissue mass was seen within the distal quadriceps extending into the superior aspect of the patella (Figure 7). The mass was slightly heterogeneous and hyperintense on fat saturated sequences (Figure 8). In view of the aggressive appearance of this intra-tendinous lesion, an ultrasound guided biopsy
was performed in order to exclude a neoplastic process. The biopsy specimen showed the presence of monosodium urate crystals, confirming tophaceous gout.

![Sagittal T1 weighted MR image of the knee](image)

**Fig. 7:** Sagittal T1 weighted MR image of the knee shows a low signal mass associated with the distal quadriceps tendon (red arrows) with erosive change in the proximal pole of the patella.

**References:** - Oxford/UK
**Fig. 8:** Sagittal PD fat saturated MR image of the knee demonstrates a heterogenous predominantly high T2 signal mass associated with the distal quadriceps tendon (red arrows)

**References:** - Oxford/UK

**Case 3:**

A 50 year old presented with medial ankle pain. A CT of the ankle (figure 9) demonstrates high density material in the tendon sheath of tibialis posterior tendon. This eccentric high-density soft tissue swelling in the tendon sheath results from chronic granulomatous response to monosodium urate crystals in keeping with tophaceous gout deposition. Dual energy CT confirms monosodium urate crystal deposition (Figure 10).
**Fig. 9:** Axial CT of the ankle showing high density material in keeping with tophaceous gout deposition along the posterior tibial tendon sheath.

*References:* - Oxford/UK
**Fig. 10:** Colour-coded, post-processed 3D rendered image. Monosodium urate deposition is depicted in green, which is seen projected along the course of the posterior tibial tendon sheath.

**References:** - Oxford/UK

Tophaceous gout appears on CT as a hyperdense lesion with specific density allowing differentiation from other hyperdense lesions. While the density is less than that of calcifications it is more than that of soft tissues.

Similarly, increased attenuation is seen in a separate case presenting with lateral compartment pain and demonstrating topaceous gout deposition along the peroneal tendon sheath (Figure 11).
Fig. 11: Axial CT of the ankle showing high denstiy material in keeping with tophaceous gout deposition along the posterior tibial tendon.

References: - Oxford/UK

Case 4:

A 65 year old man presented with acute onset lower back and systemically displayed evidence of inflammation/infection. A MRI was performed demonstrating inflammatory changes within a left lumbar facet joint with a small associated epidural collection (Figure 12, 13). Septic arthritis was the presumed diagnosis until a biopsy was positive for monosodium urate crystal deposition.
**Fig. 12**: Axial T2 MRI sequence showing oedema within the left facet joint with peri-articular soft tissue changes. A thin epidural collection is also present.

**References**: - Oxford/UK
Fig. 13: Sagittal MRI STIR of the spine showing a thin epidural collection.

References: - Oxford/UK

Case 5:

A 50 year old man presented with a typical history of severe pain in his big toe with erythema and swelling. As this is the most common presentation of an acute attack of gout this was the presumed clinical diagnosis. A X-ray showed juxta-articular erosions which are typical findings in chronic tophaceous gout (Figure 14). In acute gout initial x-ray findings show soft tissue swelling. In longstanding gout the typical findings are well defined, 'punched-out' erosions with overhanging edges, gouty tophi which may be calcified and typically an asymmetric involvement.
Fig. 14: Plain radiograph of the first metatarsophalangeal joint. Red arrow points to a punched out 'rat bite' juxta-articular erosion typical of gout

References: - Oxford/UK

An ultrasound was performed to exclude septic arthritis which is the most important differential of an acutely swollen and tender joint. Ultrasound demonstrates a synovitis with hyperechoic debris in a 'snowstorm' appearance which is quite typical of gout although not specific (Figure 15). Synovitis in gout is most commonly seen in the first metatarsalphalangeal joint, knee, ankle, wrist and second metacarpophalangeal joint.
Fig. 15: Doppler ultrasound of the first metatarsophalangeal joint demonstrates hyperechoic changes in the joint with associated hyperaemia in keeping with acute tophaceous gout.

References: - Oxford/UK

Although the first metatarsophalangeal joint is the most common location for gout we have included this in our review to demonstrate the typical radiographic and ultrasound findings which should be kept in mind when evaluating other less commonly affected joints.
Fig. 1: Plain radiograph of the knee demonstrates erosions of the inferior aspect of the patella and the proximal tibia (red arrows) secondary to gouty involvement.

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Fig. 2: PD fat saturated sagittal image of the knee demonstrates an expanded patellar tendon with erosive changes in the inferior aspect of the patella (red arrow) and tibial insertion (blue arrow)

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Fig. 12: Axial T2 MRI sequence showing oedema within the left facet joint with peri-articular soft tissue changes. A thin epidural collection is also present.

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**Fig. 13:** Sagittal MRI STIR of the spine showing a thin epidural collection.

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Fig. 14: Plain radiograph of the first metatarsophalangeal joint. Red arrow points to a punched out 'rat bite' juxta-articular erosion typical of gout
Fig. 15: Doppler ultrasound of the first metatarsophalangeal joint demonstrates hyperechoic changes in the joint with associated hyperaemia in keeping with acute tophaceous gout

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Conclusion

Crystal arthropathies such as gout can present in atypical locations and are an important differential to consider so as they are not overlooked or mistaken for more concerning pathologies.
References


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For questions and/or comments about this poster, please contact me at: