
EDITORIAL

Musculoskeletal Diseases: Imaging and Radiotherapy

MK Yuen

Deputy Editor-in-Chief, *Hong Kong Journal of Radiology*

Developments in the management of musculoskeletal disease have led to a greater demand for more accurate and specific imaging diagnosis. Accurate and specific determination of the pathology and anatomic location of a disease process are prerequisites for surgeons to perform personalised and minimally invasive procedures. To reach an accurate imaging diagnosis, adoption of an appropriate imaging modality and the ability to understand various disease processes at a microscopic or biochemical level are an advantage.

Musculoskeletal disease processes may have different imaging properties, depending on the imaging modality. Current magnetic resonance imaging (MRI) acquires more parameters than traditional radiographic density or attenuation values in computed tomography (CT) to interpret and differentiate normal tissue from diseased tissue. Advanced and novel techniques enable acquisition of different imaging parameters to correlate with a disease process or its related biochemical changes in addition to the traditional parameters such as T1, T2, and proton density. In this issue, Xiao and Yuen¹ review the advances in digitalisation in MRI, rapid three-dimensional imaging techniques, and metal-related artefact reduction; all result in better images. Both ultrashort echo time imaging (giving high resolution of structures) and T2 / T2* mapping for cartilage imaging are also important in the assessment of joint disease. Nonetheless, not all of these advanced techniques are currently available or used in daily practice in non-academic imaging departments or institutes.

Chu et al² highlight the MRI of ligamentous injuries in ankle sprain with a standard 1.5 T MRI scanner. With excellent illustrations and demonstration of the common ligaments around the ankle, one may familiarise with the normal MRI anatomy that forms the basis of interpretation of pathology in injured patients. The more precise anatomical localisation of any abnormality in a chronic painful ankle following sprain is particularly

useful information for pain management.

Dual-energy CT (DECT) can improve image quality and reduce metal-related artefacts. Previous in-vitro study showed that the optimal monoenergetic level for presentation of images differed on implant types and materials.³ Lee et al⁴ further reveal that monoenergetic extrapolation is superior to traditional filtered back projection in processing data acquired through in-vivo qualitative and quantitative assessment.

DECT (or ultrasonography) is increasingly applied to identify monosodium urate crystals in soft tissue and articular structures. Its imaging evidence of urate deposition is one of the eight domains in the classification criteria of gout.⁵ Chan et al,⁶ however, demonstrate a case that DECT failed to detect monosodium urate in a patient with intraosseous gout; this implies that general use of this new technology and interpretation should be cautious. With increasing experience it may be possible to overcome this potential pitfall.

In addition to imaging findings, clinical findings are also important in diagnosis of disease. Chin and Tse⁷ show that body temperature $\geq 38.5^{\circ}\text{C}$ and serum C-reactive protein level ≥ 10 mg/l are predictors of septic arthritis in children. An ultrasound finding of predominant synovial (capsular) thickening relative to joint effusion at the anterior femoral recess is also an important predictor. At present, most clinicians consider aspiration mandatory if clinical variables favour septic arthritis or if the diagnosis is unclear.⁸ Ultrasonography is a useful alternative when parents are reluctant to let their child to undergo an invasive procedure.

Familiarising with ultrasound features is crucial for prompt and accurate interpretation of imaging findings. Nung et al⁹ summarise the ultrasound findings in patients with a suspected retained foreign body in soft

tissue. This facilitates the diagnosis and management of the retained foreign body with or without image guidance.

Many benign musculoskeletal conditions (such as Dupuytren's disease of hand, plantar fibromatosis, plantar fasciitis, Peyronie's disease, heterotopic ossification of hip, pigmented villonodular synovitis, vertebral haemangiomas, and aneurysmal bone cyst) have been treated with radiotherapy. Radiotherapy has low toxicity in elderly patients when radiation-induced cancer is clinically irrelevant. Modern techniques enable better conformity to complex target volume and minimise the volume of normal tissue irradiated. The management of these conditions has been reviewed thoroughly.¹⁰ Kodiyan et al¹¹ review their cases of pigmented villonodular synovitis treated with radiotherapy and recommend surgery and adjuvant radiotherapy for recurrence, and radiotherapy for incomplete excision.

Nonetheless, surgery and adjuvant radiotherapy may not result in good treatment outcome in malignant conditions. This is particularly true when a tumour is located near complex anatomy and vital neural structures such as the skull base and sacrum where both complete resection and high-dose radiotherapy are often not feasible. Chan et al¹² conclude that the management of chordoma in these locations is suboptimal.

Imaging features of musculoskeletal diseases are gathered through experience and meticulous observations, and their patterns can be identified and clinically applied. Ng et al¹³ describe MRI features of three patients with mild recessive *RYR1* gene-related congenital myopathies. In contrast, more common imaging features can be present in a spectrum of diseases, as illustrated by Lee et al¹⁴ in bone surface tumours and tumour-like conditions.

The advances in imaging techniques, knowledge, and features of musculoskeletal diseases for diagnosis and clinical application have grown parallel with the advances in treatment. We must continue to contribute

to research related to the speciality of musculoskeletal imaging and therapy.

REFERENCES

1. Xiao L, Yuen MK. State-of-art musculoskeletal magnetic resonance imaging: technical review. *Hong Kong J Radiol.* 2017;20:6-16. [crossref](#)
2. Chu PY, Chan WS, Lee HC, Hon YW, Chan JC, Lo KK. Magnetic resonance imaging of ligamentous injuries in ankle sprain. *Hong Kong J Radiol.* 2017;20:17-27. [crossref](#)
3. Chan WC, Tsang JP, Wong WY, Chu PY, To VY, Lee CY, et al. Metal artefact reduction by dual-energy computed tomography using monoenergetic extrapolation: in-vitro determination of optimal monoenergetic level with different metallic implants using a phantom body. *Hong Kong J Radiol.* 2016;19:35-42. [crossref](#)
4. Lee JC, Shiu CK, Lai KC, Chan MK. Metal artefact reduction for orthopaedic devices using monoenergetic extrapolation from dual energy computed tomography. *Hong Kong J Radiol.* 2017;20:34-40. [crossref](#)
5. Neogi T, Jansen TL, Dalbeth N, Fransen J, Schumacher HR, Berendsen D, et al. 2015 Gout Classification Criteria: an American College of Rheumatology/European League Against Rheumatism Collaborative Initiative. *Arthritis Rheumatol.* 2015;67:2557-68. [crossref](#)
6. Chan CY, Tsang KW, Lai KC, Chan MK. Dual energy computed tomography for diagnosis of gouty tophus of tibia with pathological fracture simulating malignancy. *Hong Kong J Radiol.* 2017;20:59-63. [crossref](#)
7. Chin TW, Tse KS. Clinical and radiological differentiation of septic arthritis and transient synovitis of the hip. *Hong Kong J Radiol.* 2017;20:41-6. [crossref](#)
8. Rutz E, Spoerri M. Septic arthritis of the paediatric hip - A review of current diagnostic approaches and therapeutic concepts. *Acta Orthop Belg.* 2013;79:123-34.
9. Nung RC, Lee RK, Ng AW. Ultrasonographic findings of suspected retained foreign body in soft tissue following penetrating injury: a pictorial essay. *Hong Kong J Radiol.* 2017;20:76-83. [crossref](#)
10. A review of the use of radiotherapy in the UK for the treatment of benign clinical conditions and benign tumours. London: The Royal College of Radiologists; 2015:85-107.
11. Kodiyan J, Zlotecki RA, Scarborough M, Reith J, Mendenhall WM. The role of radiotherapy in the treatment of pigmented villonodular synovitis. *Hong Kong J Radiol.* 2017;20:47-52. [crossref](#)
12. Chan JC, Leung AK, Fong ST, Chiu HM, Ngan RK. Management of chordoma in a tertiary hospital in Hong Kong. *Hong Kong J Radiol.* 2017;20:28-33. [crossref](#)
13. Ng GH, Ip JJ, Chan SH, Ho RS, Lam WW. Magnetic resonance imaging in mild recessive *RYR1* gene-related congenital myopathies: genetic and histopathological correlation. *Hong Kong J Radiol.* 2017;20:53-8. [crossref](#)
14. Lee AC, Tse KS, Lai KC, Chan MK, Tsang WK, Shiu CK, et al. Bone surface tumours and tumour-like conditions. *Hong Kong J Radiol.* 2017;20:64-75. [crossref](#)