CASE REPORT

Type I complex regional pain syndrome: MRI may be misleading

D. Marsland, A. Konyves, R. Cooper, S.K. Suvarna

Sheffield Teaching Hospitals NHS Trust, Northern General Hospital, Orthopaedic Department, Herries Road, Sheffield S5 7AU, United Kingdom
Sheffield Teaching Hospitals NHS Trust, Northern General Hospital, Radiology Department, Herries Road, Sheffield S5 7AU, United Kingdom
Sheffield Teaching Hospitals NHS Trust, Northern General Hospital, Department of Histopathology, Herries Road, Sheffield S5 7AU, United Kingdom

Accepted 19 September 2007

Introduction

Complex regional pain syndrome (CRPS) was first described in 1864 by Mitchell et al. The variety of symptoms associated with this condition are reflected in the names commonly used in the past, such as reflex sympathetic dystrophy, sympathetic maintained pain syndrome, causalgia, Sudek's atrophy, algodystrophy, algoneurodystrophy and post-traumatic osteoporosis. The condition is poorly understood and has many causes. Most commonly it results from injury and may follow surgery. CRPS is characterised by four cardinal features: pain out of proportion to the initial injury, swelling, stiffness and discoloration. Two types are recognised; type I is without and type II with a nerve lesion.

The diagnosis is usually clinical. Imaging including radiographs, MRI, bone scintigraphy and thermography have been used, but there is no consensus as to their clinical validity. We describe two cases in which imaging in the diagnosis of type I CRPS lead to errors in treatment.

Case reports

Case 1

A 42-year-old man presented with a 2-month history of a constantly painful, swollen right foot after a low energy fall. The patient was systemically well. Clinical examination revealed a diffusely swollen mid and hind foot with tenderness on deep palpation. Range of movement was not significantly restricted.

Radiographs showed marked patchy bone loss particularly within the mid and hind foot that was severe enough to suggest a destructive process. MRI revealed extensive signal on T2 weighted images within the talus and cuneiforms, and the adjacent soft tissue areas showed marked enhancement following gadolinium. These features were suspicious of an infiltrative neoplasm. Bone scintigraphy demonstrated isolated increased uptake in the region of the ankle and the mid foot on delayed images. Haematological tests including liver functions and inflammatory markers were within normal limits.

An open biopsy was performed taking specimens from the dorsum of the foot including the skin, fascia and bone from the talar neck. Microscopy of this revealed features of chronic inflammation, synovitis and normal bone with fibrosis around the periostium, which suggested a non-specific inflammatory synovitic reaction rather than a neoplastic process.
The diagnosis of complex regional pain syndrome was made. Two weeks after the biopsy, the patient started to show improvement without specific treatment and by 6 weeks he was asymptomatic with a good range of movement in the ankle, subtalar and midtarsal joints. Radiographs showed resolving osteopenia (Fig. 1B).

Case 2

A 48-year-old woman sustained a full thickness pre-tibial laceration approximately 4 by 4 cm in a road traffic accident which was treated with debridement, vacuum dressings and a split skin graft. She was referred to our service 4 months following the initial injury with a painful, swollen and stiff knee. Despite physiotherapy her range of motion had not improved and she found weight bearing difficult. The initial clinical diagnosis was complex regional pain syndrome.

Six months after injury inflammatory markers were marginally elevated and repeat radiographs showed a large joint effusion and bone erosions at the articular margins, appearances suspicious of a low grade infection (Fig. 4). MRI demonstrated a joint effusion and synovial thickening with marrow oedema centred around the marginal erosions (Fig. 5). The patient underwent treatment for assumed septic arthritis.

Examination under general anaesthesia revealed a severely restricted range of movement with 5 degrees short of full extension and 30 degrees of flexion. Arthroscopy showed extensive arthrofibrosis, which was broken down with a shaver. Tissue samples were sent for microscopic analysis and culture. Following the debridement the knee was manipulated to achieve a good range of movement. Continuous passive motion and physiotherapy was commenced after surgery. Extended cultures of tissue samples showed no growth. Histological examination demonstrated synovium with vascular proliferation and mild chronic inflammatory infiltrate.

The patient was referred to the chronic pain clinic and underwent a lumbar sympathectomy followed by intensive physiotherapy. Symptoms slowly improved over 2 months although she did not regain full range of movement.

Discussion

There are a wide variety of reported histological abnormalities in CRPS including synovitis and a variety of bone changes such as trabecular necrosis, vacant lacunae and fibroadipose deposition. Most of these changes are non-specific.

Radiographs often demonstrate bone demineralisation, but these changes are not always present, particularly at initial presentation. Bone scintigraphy may demonstrate increased uptake on early and or late phases but these changes are often not present and the technique has a low sensitivity. In one of our cases radiographic changes were so gross as to raise the possibility of malignancy while in the other they were absent.

A variety of MRI features have been reported including skin thickening, oedema, synovial hypertrophy, joint effusions and bone marrow oedema. Many of these features are inconsistently associated with CPRS and are non-specific. There is particular disagreement over the presence of bone marrow signal changes that probably reflect oedema. The discrepancies are likely to be partly due to differences in diagnostic criteria for the condition and imaging at different stages of the disease process. There appears to be a significant proportion of cases where routine MRI sequences are...
normal. Our two cases demonstrated a variety of the reported features including bone marrow changes, skin and subcutaneous thickening, synovial thickening and enhancement. The marginal bone erosions seen in the second case have not been previously reported but they presumably occur as a result of synovitis.

In our patients MRI lead to false diagnoses resulting in surgical intervention. This is of concern because surgery may aggravate CRPS.

CRPS may be a difficult diagnosis to make presenting with a wide spectrum of clinical manifestations. The role of MRI is

---

**Figure 2** T2 weighted fat saturated (A) and T1 weighted post-intravenous gadolinium GDPA fat saturated (B). High signal on the T2 fat saturated images indicates increased fluid within the tissues while on the post-gadolinium images there is marked enhancement. Both features are usually associated with neoplastic or inflammatory pathology.

**Figure 3** Histology (A) oedematous soft tissue is seen with a moderate increase in vascularity and metachromatic connective tissue matrix (H&E 200×). (B) Mild chronic synovitis with patchy chronic inflammation (H&E 200×).

**Fig. 4** (A) Antero posterior radiograph shows small marginal erosions (arrows). (B) Lateral radiograph demonstrates a joint effusion (arrow).
unclear and it may confuse the diagnosis. We suggest that it should be used with caution and that the diagnosis of type I CRPS is ultimately based on clinical criteria.

Acknowledgements

The authors wish to thank Mr. P. Sutton and Mr. C. Blundell for their guidance in producing this work.

References


