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Radiofrequency ablation for osteoid osteoma – Recurrence rates and predictive factors

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ABSTRACT

Background and purpose: Osteoid osteoma is an infrequent but debilitating benign bone lesion which can be successfully managed by percutaneous radiofrequency ablation (RFA). There are few studies investigating the efficacy and follow-up of this treatment. An arbitrary upper limit of 15 mm has been used to differentiate between osteoid osteoma and osteoblastoma with surgery used for lesions above this limit.

We aimed to analyse the cases identified from our prospectively maintained database over a ten year period since adoption of this technique in our unit. The primary objectives were to investigate factors which influenced recurrence and the time period at which patients are at risk of this.

Basic procedures: Consecutive patients with confirmed osteoid osteoma were included. Patient demographics, complications, and recurrence were recorded and multiple regression analysis was performed to investigate causation.

Main findings: Within a minimum follow up of 21 months (mean 72), a recurrence rate of 16.3% was noted, higher than the published literature. Cox regression analysis to predict chance of recurrence revealed a relationship between larger lucent diameter and recurrence ($p = 0.049$, CI 95%, hazard ratio 1.33).

Conclusions: The traditional cut off between osteoid osteoma and osteoblastoma appears less rigidly defined than previously thought and probably represents a progressive scale with larger lesions responding less well to RFA. This study indicates that each millimetre increase represents a $\times 1.33$ chance of recurrence. Clinicians should counsel patients accordingly with lesions approaching the larger limits of this diagnosis.

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Introduction

Osteoid osteoma is a solitary benign osteoblastic neoplasm of bone. It was first reported by Heine in 1927,[1] described by Bergstrand in 1930,[2] and finally recognised as a unique pathological entity by Jaffe in 1935.[3] Occurring most commonly in the first two decades of life,[4] osteoid osteoma is estimated to account for 10–12% of benign and 3% of all bone tumours.[5] Whilst any bone in the appendicular skeleton may be involved, there is a predilection for the cortex of long bones and traditional reports indicate the proximal femur as a frequently affected location.[6]

There may be an enlargement of the affected bone at the site of the lesion, as well as associated tenderness and muscular atrophy. Histologically, the lesion is composed of a radiolucent central nidus less than 15 mm in diameter, usually found in the cortex of the diaphysis or metaphysis,[4] containing immature osseous tissue surrounded by an extensive zone of sclerotic bone. The overlying periosteum may also be thickened[7] as demonstrated in Fig. 1. These features are clearly demonstrated on plain radiographs and with marked surrounding oedema on MRI[8] seen in Fig. 2.

Whilst evidence suggests that the natural history of untreated osteoid osteomas tends towards spontaneous regression,[9] the inability of some patients to tolerate the severe pain, even with medical treatment, may prompt a surgical alternative. Traditionally the surgical management of osteoid osteoma has been excision and curettage, however localisation was difficult and recurrence and excessive bone removal resulting in fracture were frequent problems.[10] Minimally invasive percutaneous radiofrequency ablation (RFA) has therefore become the treatment of choice. This procedure, first introduced by Rosenthal et al. in 1992,[10] involves the insertion of a percutaneous electrode into the lesion under CT guidance,

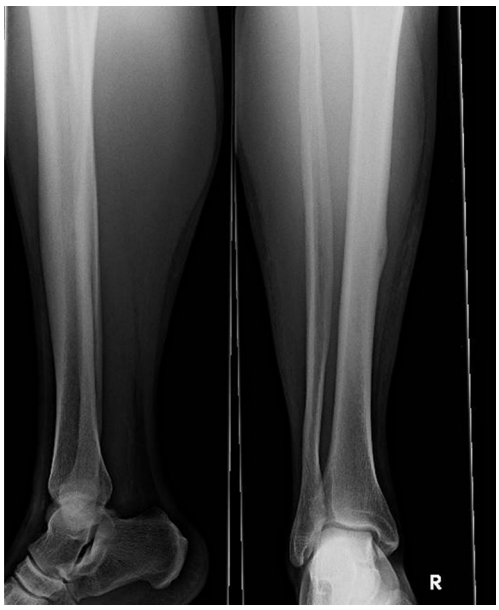

Figure 1 – AP and lateral X-ray of the tibia and fibula in an 18 year old male prior to ablation. Classical appearances of tibial osteoid osteoma with dense osteoid bone formation and a central lucent nidus.

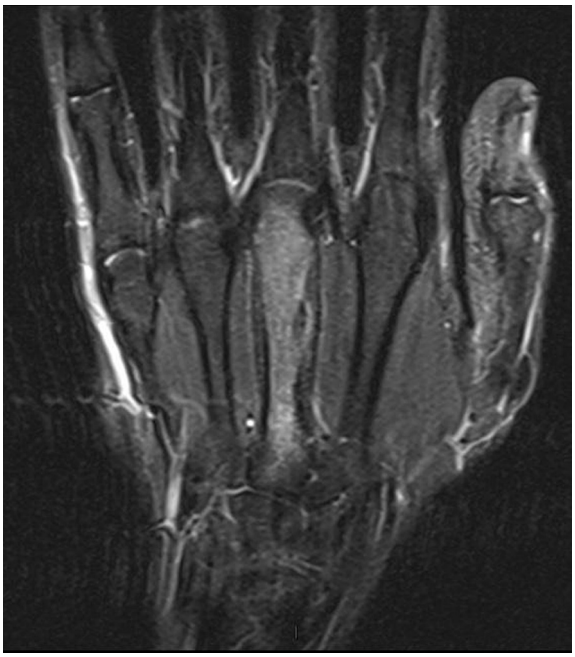

Figure 2 – Coronal MRI of a 3rd metacarpal in a 22 year old male, with a radial sided osteoid osteoma showing signal change throughout the entire bone.

where radiofrequency thermocoagulation is then used to ablate the neoplasm. This method overcomes the difficulties in accessing the lesion that exist with conventional surgical management. Moreover, RFA allows more accurate and predictable eradication of the disease, with a success rate varying between 79% and 100%[11–17] reported in the literature. For these reasons, RFA has become the standard of care for these lesions.

Although generally a very effective treatment modality, with many studies reporting 100% success rate, when RFA fails it is not always clear what the cause is. As such, a recent systematic review has suggested further evaluation of the potential causation when RFA fails,[18] and with a captive population our unit is in a position to report accurate recurrence and investigate these predictive factors.

The true incidence of benign bone tumours is difficult to estimate, as many are latent and subject only to incidental finding. We have previously published the early results from our unit,[19] and sought to improve on size and follow up of the cohort.

The aim of this work was to:

1) Establish an epidemiology of osteoid osteoma lesions in our UK population.
2) Evaluate our cohort to identify risk factors for osteoid osteoma recurrence following treatment with CT guided radiofrequency ablation.

Materials and methods

A cohort of patients with osteoid osteoma (as diagnosed by X-ray and MRI with an upper cut off of 15 mm) was identified

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