Case Report

# Osteoid Osteoma of the Proximal Humerus: A Case Report and Literature Review

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## Abstract

Osteoid osteoma is a common benign primary bone tumor, but it is very uncommon in the proximal humerus. This case report describes the clinical course and treatment of a patient with shoulder pain and osteoid osteoma of the proximal humerus and provides a review of the literature. A 22-year-old healthy male patient presented to our clinic with a 2-year history of constant throbbing right shoulder pain. The patient was referred for orthopedic consultation. A series of plain radiographs, bone scintigraphy, and a magnetic resonance imaging were done and revealed an osseous lesion at the medial aspect of the proximal meta diaphyseal region of the right proximal humerus, with a diagnosis of osteoid osteoma. The patient underwent radiofrequency ablation of the tumor nidus, which was successful and resulted in resolution of symptoms with minimal pain at follow up. This case demonstrates that osteoid osteoma can present with clinical features that mimic various causes for shoulder pain.

**Keywords:** Osteoma, osteoid; bone neoplasms; shoulder pain; ablation, proximal humerus

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## INTRODUCTION

Osteoid osteoma is the third most common benign primary bone tumor. It can be found in various parts of the musculoskeletal system but is most commonly found in the proximal femur followed by the tibia, posterior spine element, and humerus. The different types of osteoid osteoma are as follows: cortical, cancellous, and sub-periosteal.[1] Of these, the cortical type is found in >90% of the cases. This benign lesion has no known etiology and is mostly found in young males during adolescence and early adulthood. Presentation is usually pain in the involved site that increases at night and is relieved by nonsteroidal anti-inflammatory drugs or salicylic acid (aspirin).[2]

Osteoid osteoma in the proximal humerus is very uncommon and can be misleading, as it mimics various causes for shoulder pain and other underlying pathologies such as stress fractures, gout, or infectious/rheumatoid arthritis.[3] Osteoid osteoma can be treated either by a

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percutaneous radiofrequency ablation (RFA), which is minimally invasive and highly effective, or surgical excision and curettage.[4] We present a case of a young adult with proximal humerus osteoid osteoma that was treated with RFA.

## CASE REPORT

A 22-year-old healthy male patient presented to our clinic with a 2-year history of constant throbbing right shoulder pain. The pain radiated to the axilla and to the right proximal arm. The pain increased at night and was relieved by salicylates. There was no history of trauma or infection. The pain started after a period of participating in a high intensity overhead throwing sport.

On examination, vital signs were normal. There were no skin changes, swelling or muscular atrophy. The patient had mild tenderness over the right biceps tendon and a slightly reduced range of motion of the right shoulder. The remainder of the clinical examination was unremarkable. Laboratory investigation showed normal inflammatory markers and metabolic profile. Shoulder radiography, bone scintigraphy, and MRI revealed a multifocal osteoid osteoma in the medial aspect of the proximal meta-diaphyseal region of the right proximal humerus [Figures 1 and 2]. Histological examination of the lesion confirmed the diagnosis of osteoid osteoma [Figures 3-6]. The patient failed a period of conservative treatment, and thus RFA treatment was planned.

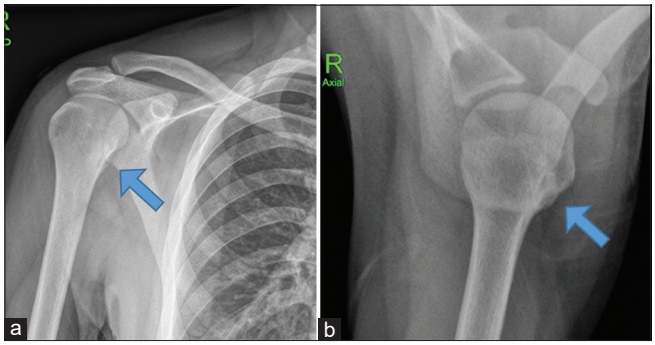


**Figure 1:** (a) Frontal and (b) axillary views of the right shoulder demonstrate a small radiolucent nidus within the area of cortical thickening and reactive sclerosis within the proximal humeral shaft (arrows)

The patient was admitted to the hospital at the day of the procedure. A written informed consent was obtained from the patient. The patient was placed under general anesthesia and transferred to the CT scanner (Somatom Definition Flash, Siemens, Germany) and placed in supine position [Figure 7]. After positioning, grounding pads were attached to the patient's back and thighs. Initial axial images through the right shoulder using a slice thickness of 1 mm for lesion localization demonstrated the 7-mm intracortical nidus within the proximal humeral shaft. A suitable trajectory for the procedure was established and the skin was marked anteriorly at the access point. The skin overlying the right shoulder was prepped and draped in the usual sterile fashion. The skin and subcutaneous soft tissues were anesthetized with 1% lidocaine solution. Under CT guidance, a 12-guage coaxial bone biopsy system (Bonopty; Apriomed) was advanced into the nidus and one core biopsy sample was obtained. The biopsy needle was removed, and the introducer sheath was left in position [Figure 8]. Then, a 16.5-guage monopolar RFA probe with a 9-mm active tip (Soloist, Boston Scientific, Natick, MA) was inserted through the coaxial biopsy sheath and the tip was positioned within the nidus centrally. The probe was connected to the radiofrequency generator and the generator was turned on. The power was incrementally increased to 7 W, at which "roll-off" occurred at about 7 minutes. The ablation was repeated after 2 minutes to allow for cooling, which was performed for approximately 3 minutes. The total ablation time was about 10 minutes. The RFA probe as well as the coaxial biopsy needle was then removed, and hemostasis was achieved.

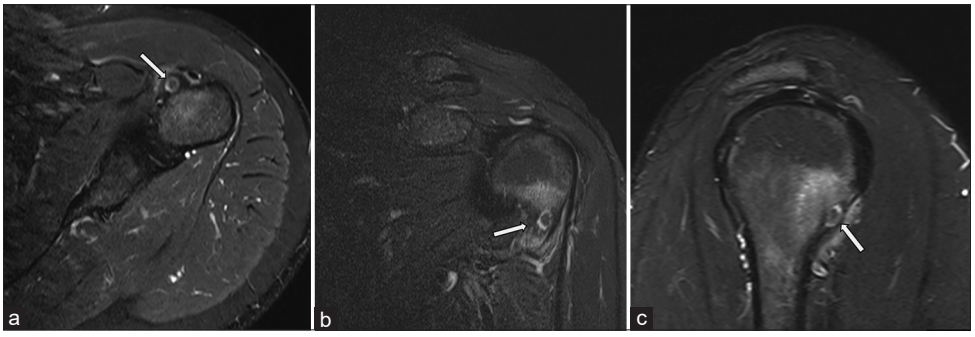


**Figure 2:** (a) Axial T2 fat saturated, (b) Coronal T2 fat saturated, and (c) Sagittal T2 fat saturated MRI of the right shoulder demonstrate a small 7-mm rounded intracortical lesion within the proximal humeral shaft anteriorly (arrows) demonstrating heterogenous signal intensity. The center of the lesion appears hypointense within thin hyperintense margin. This is associated with surrounding reactive bone marrow edema. MRI – Magnetic resonance imaging

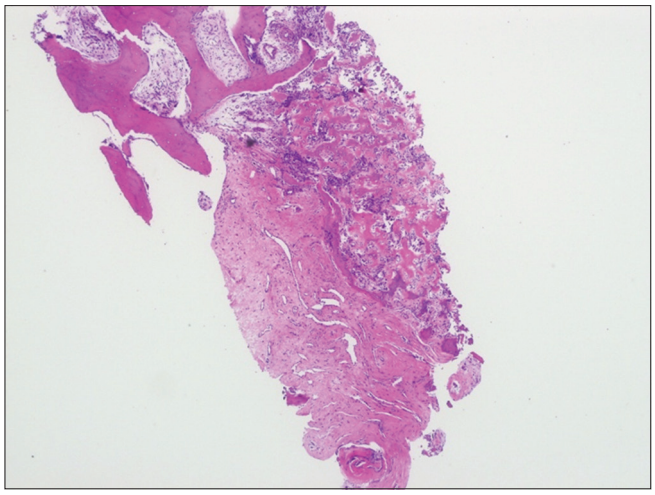

**Figure 3:** Osteoid osteoma (H and E, ×50): A low power view shows an ovoid nidus surrounded. peripherally by reactive bone

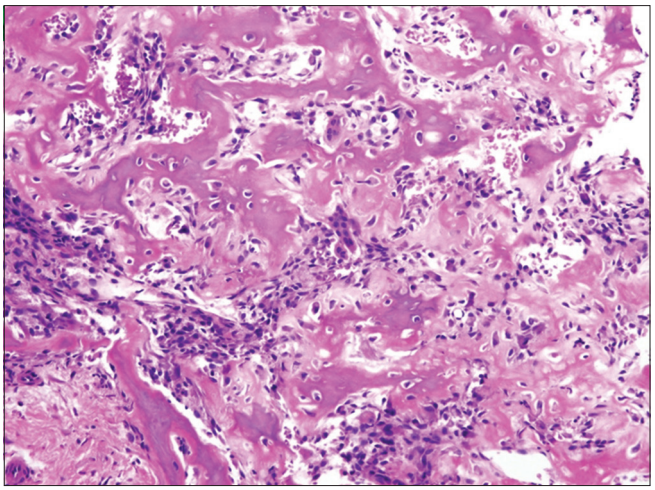

**Figure 4:** Osteoid osteoma (H and E, ×200): The bone trabeculae are rimmed by osteoblasts. The intertrabecular spaces are filled with vascularized loose connective tissue

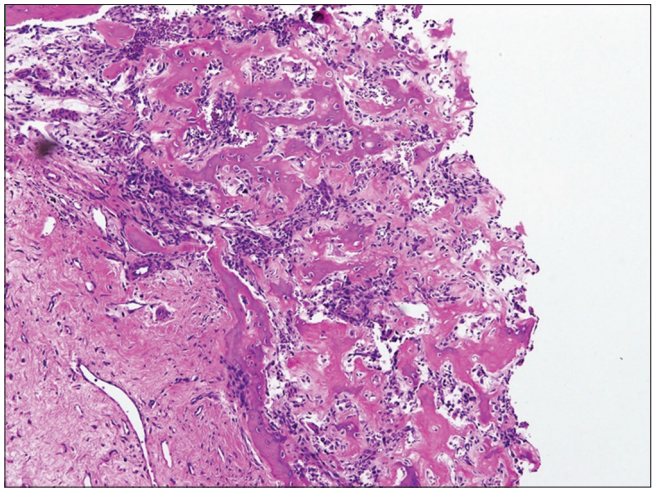

**Figure 5:** Osteoid osteoma (H and E, ×100): Haphazard, anastomosing trabeculae of woven bone rimmed by osteoblasts with intervening vascularized connective tissue stroma

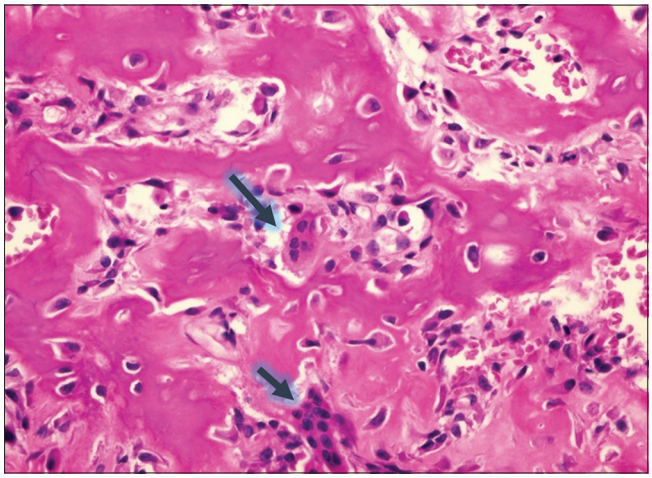

**Figure 6:** Osteoid osteoma (H and E, ×400): Scattered osteoclasts are seen on surfaces of trabeculae (arrows)

The patient was followed-up in the clinics 1 month after the procedure. His pain had completely resolved, and his physical examination was normal. Thereafter, the patient was followed-up in the clinics for 1 year with no complaints.

## DISCUSSION

Osteoid osteoma is a primary benign bone tumor that is usually diagnosed in patients between the ages of 10 to 30 years. It is more common in males than females, with a ratio of 2:1. This lesion is mostly found in the lower extremity, involving the femur and tibia in about 80% of the cases. The frequency of osteoid osteoma in the upper extremity is around 19% to 31%. Diagnosing such a lesion can be difficult, and thus establishing a diagnosis is often delayed with a mean interval of 1–2 years.[3]

Case reports of osteoid osteoma in other parts of the skeletal system have been linked to shoulder pain including the scapula, glenoid, coracoid, acromion, humeral shaft, and distal clavicle. This can be misdiagnosed as shoulder pathology.[5-10] Diagnosis is usually established based on a comprehensive history, physical examination, and radiological imaging, and sometimes, a resection of the tumor is performed for histological examination.

A total of 10 cases of proximal humerus osteoid osteoma were found in the literature with the exclusion of cases without a comprehensive history [Table 1].[3,11-18] In most of these cases, the diagnosis was initially missed and the patients were treated for other conditions because it can mimic other shoulder pathologies such as shoulder impingement, rotator cuff tears, calcific tendinitis, glenohumeral instability, C5-C6 radiculopathy, bicipital tendinitis, fractures, and infection.

**Table 1: Cases of proximal humerus osteoid osteoma in the literature**

| Case number | Sex | Age (years) | Side | Location | Initial diagnosis | Diagnostic test | Findings on physical examination | Relieved by drugs | Treatment method | Last follow up |
|---|---|---|---|---|---|---|---|---|---|---|
| 1[11] | Male | 28 | Right | Proximal metadiaphysial | - | X-ray, MRI | - | - | Radiofrequency ablation | 4 years postoperative asymptomatic |
| 2[3] | Male | 22 | Right | Greater tuberosity | - | X-ray<br>CT<br>MRA<br>Fine needle curette and histological | Normal | Yes | Surgical | 3 years postoperative pain free and no recurrence |
| 3[12] | Female | 50 | Right | Lesser tuberosity | | X-ray<br>CT<br>MRI<br>Bone scan<br>Biopsy | Tenderness over right bicep tendon and slightly reduced ROM | - | - | - |
| 4[13] | Female | 34 | Right | Medial metaphysis | Subacromial bursitis-frozen shoulder | X-ray<br>CT<br>Bone scintigraphy<br>Frozen section | Positive Impingement | Yes | | - |
| 5[14] | Female | 37 | Right | Medial border of bicipital groove | Calcifying tendinitis | X-ray<br>Histological | | | Surgical | - |
| 6[14] | Male | 42 | Right | Inferior border of humeral head | Calcifying tendinitis | X-ray<br>histological | | Yes | Surgical | - |
| 7[15] | Male | 24 | Right | Multifocal<br>1-GT<br>2-proximal diaphysis | - | X-ray<br>MRI<br>Bone scintigraphy<br>Histological | | Yes | Surgical | - |
| 8[16] | Male | 21 | Right | Proximal metaphysis | Rotator cuff tendinopathy | X-ray<br>Bone scintigraphy<br>histology | | Yes | Surgical | - |
| 9[17] | Male | 22 | Right | - | Rotator cuff tendinitis | X-ray<br>MRI<br>histology | Tenderness over subacromial space and AC joint limited ER | No | Surgical | - |
| 10[18] | Male | 30 | Left | Diaphysis of left proximal humerus | - | X-ray, CT<br>Biopsy | - | - | Radiofrequency ablation | - |

CT – Computed tomography; MRI – Magnetic resonance imaging; AC – Acromioclavicular; ROM – Range of motion; ER – External rotation; MRA – Magnetic resonance arthrogram; GT – Greater tuberosity

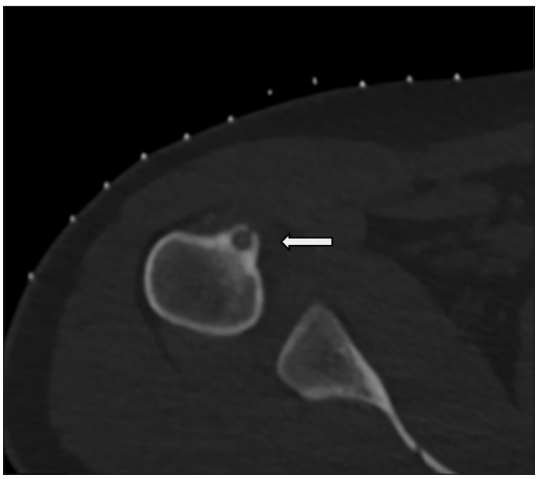

**Figure 7:** Axial CT of the right shoulder demonstrating a small 7-mm well-defined round lucent nidus within the anterior cortex of the proximal humeral shaft (arrow) with surrounding periosteal sclerosis and thickening of the anterior cortex. A small central calcification is seen within the nidus. CT – Computed tomography

Radiographic findings are a small lucent lesion of the cortex with surrounding sclerosis and cortical reaction. One quarter of these lesions are not identified by a plain X-ray and may require bone scan, or computed tomography scanning for identification. The differential diagnosis includes Brodie's abscess, stress fracture, osteoblastoma, benign bone cyst, or eosinophilic granuloma.

The pathology of the lesion typically demonstrates red granular tissue, a nidus that is distinct from the surrounding bone, and is usually sized <1 cm. Microscopically, an interlacing network of osteoid trabeculae is seen, with variable mineralization. There is no cartilage, but a loose, fibrovascular connective tissue with multinucleated giant cells may be seen. Osteoblasts are uniform with round, regular nuclei, and abundant nucleoli.

Treatment modalities vary from nonsurgical/ pharmacological treatment to interventional RFA or a

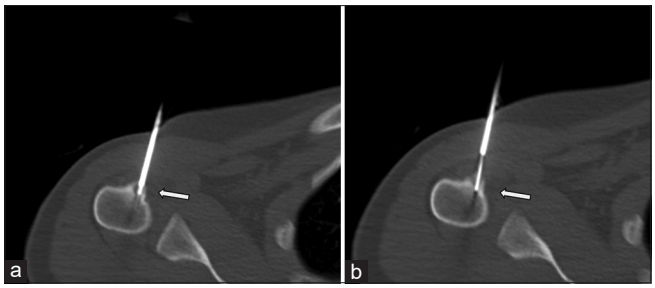


**Figure 8:** (a and b) Axial CT images of the right shoulder taken during the RFA procedure demonstrate biopsy needle within the nidus (arrow in a). The second image shows position of the RFA probe within the nidus (arrow in b). RFA – Radiofrequency ablation; CT – Computed tomography

complete surgical resection of the nidus and bone graft. Some cases of osteoid osteoma resolve spontaneously with time. In our case, RFA was used given the size and location of the lesion and to avoid surgical intervention because of the possible complications such as infection, bleeding, and post-operative pain. RFA is a quick procedure with fewer complications and the patient has a faster recovery with this treatment modality compared with surgical resection.

In summary, osteoid osteoma is a benign skeletal tumor in which the clinical and radiological picture may be unclear, thus delaying diagnosis. Patient complaints alone are often diagnostic: with night pain predominance that is relieved by nonsteroidal anti-inflammatory drugs. If the initial radiographs are equivocal, bone scintigraphy is recommended. Although nonspecific, scintigraphy can locate the lesion. A conventional CT is used for precise location of the nidus and surgical guidance.

## CONCLUSION

This case demonstrates that osteoid osteoma may present with clinical features that mimic common musculoskeletal conditions of the shoulder. The patient history, physical examination and diagnostic imaging are important for diagnosis and appropriate management.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

### Peer review

This article was peer-reviewed by two independent and anonymous reviewers.

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### Conflicts of interest

There are no conflicts of interest.

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