

Osteoblastoma of the Radial Shaft Mimicking Parosteal Osteosarcoma: A Case Report

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Learning Point of the Article:

Osteoblastoma of the radial shaft may mimic parosteal osteosarcoma clinically, radiologically, and histologically, requiring careful clinicoradiological correlation for accurate diagnosis and management.

Abstract

Introduction: Osteoblastoma is a rare benign osteogenic tumor accounting for approximately 1% of primary bone tumors. Involvement of the radial shaft is uncommon and may pose a diagnostic challenge because of overlapping radiological and histopathological features with surface osteosarcomas. We report a rare case of radial shaft osteoblastoma initially suspected to be parosteal osteosarcoma and managed with wide excision and biological reconstruction.

Case Report: A 17-year-old male presented with progressive pain and swelling over the middle third of the right forearm for the preceding 6 months. Radiographs and magnetic resonance imaging demonstrated a surface-based lesion involving the radial shaft with aggressive radiological features. Core biopsy was suggestive of parosteal osteosarcoma. Due to the clinicoradiological suspicion of malignancy, wide excision of the involved radial segment was performed. Reconstruction was achieved using an ipsilateral non-vascularized fibular autograft stabilized with plate fixation. The pronator quadratus was excised en bloc with the lesion, and pronator teres was reattached to the fibular graft using a 2.8-mm suture anchor. Histopathological examination of the excised specimen demonstrated histomorphological features of a benign osteogenic tumor consistent with osteoblastoma, with no nuclear evidence of malignancy. Follow-up demonstrated satisfactory function and no evidence of recurrence.

Conclusion: Radial shaft osteoblastoma may mimic parosteal osteosarcoma clinically, radiologically, and on biopsy. Definitive diagnosis may require examination of the entire excised specimen. Biological reconstruction with ipsilateral fibular autograft can provide satisfactory functional outcomes.

Keywords: Osteoblastoma, Radius, Fibular autograft, Parosteal osteosarcoma, Bone tumor.

Introduction

Osteoblastoma is a rare benign bone-forming neoplasm accounting for approximately 1% of all primary bone tumors [1,2]. It predominantly affects adolescents and young adults and most commonly involves the vertebral column and long bones [2,3]. Involvement of the radius is uncommon, with only a

limited number of cases reported in the literature [4]. The diagnosis of osteoblastoma may be challenging because its clinical, radiological, and histopathological features can overlap with those of low-grade osteogenic malignancies, particularly parosteal osteosarcoma [2,5,6]. Accurate diagnosis therefore requires careful clinicoradiological correlation and

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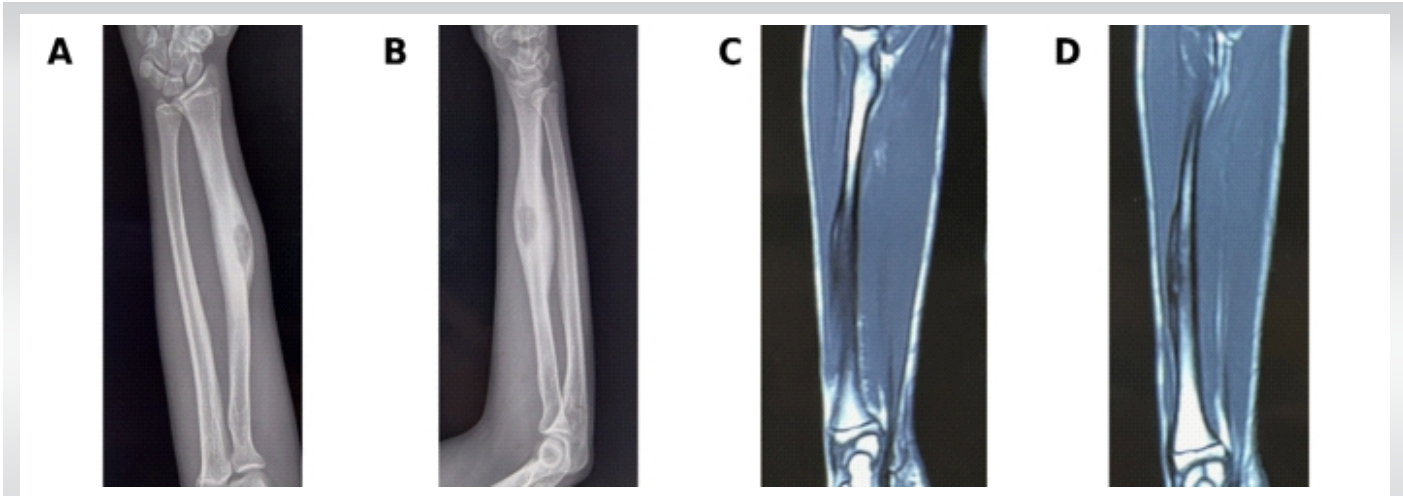


Figure 1: Pre-operative radiological evaluation of radial shaft lesion. (a and b) Pre-operative anteroposterior and lateral radiographs of the right forearm demonstrating an expansile surface-based lesion involving the middle third of the radial shaft, associated with cortical thickening and periosteal reaction. (c and d) Coronal magnetic resonance imaging demonstrating cortical involvement with adjacent soft-tissue extension along the radial shaft. The clinicoradiological appearance raised suspicion for a surface osteogenic malignancy, and subsequent biopsy was suggestive of parosteal osteosarcoma.

histopathological evaluation [5,7].

We report a rare case of osteoblastoma involving the radial shaft that was initially suspected to be parosteal osteosarcoma based on imaging and biopsy findings. The lesion was managed with wide excision and biological reconstruction using an ipsilateral fibular autograft.

Case Report

A 17-year-old male presented with progressive pain and swelling over the middle third of the right forearm for the preceding 6 months. Clinical examination revealed a firm

swelling over the radial aspect of the forearm without distal neurovascular deficit.

Plain radiographs demonstrated a surface-based lesion involving the radial shaft associated with cortical thickening and periosteal reaction. Magnetic resonance imaging revealed cortical involvement with surrounding soft-tissue extension, raising suspicion for a surface osteogenic malignancy (Fig. 1).

A core needle biopsy was performed and was suggestive of parosteal osteosarcoma (Fig. 2). Considering the clinicoradiological findings and biopsy report, wide excision was planned.

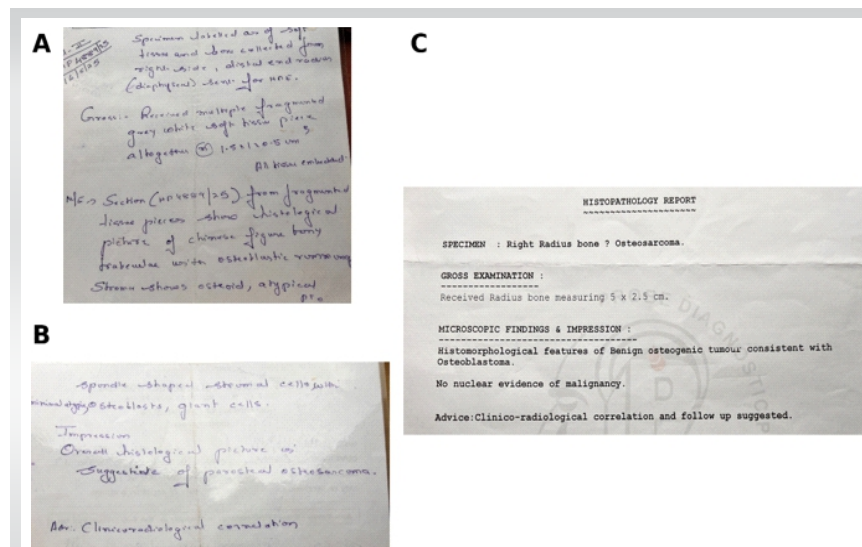


Figure 2: Histopathological diagnostic discrepancy between biopsy and final specimen. (a and b) Pre-operative biopsy reports demonstrating histological findings suggestive of parosteal osteosarcoma and advising clinicoradiological correlation. (c) Final histopathological examination of the excised specimen demonstrating histomorphological features of osteoblastoma with no nuclear evidence of malignancy, confirming the benign nature of the lesion.

Through a Henry approach, the involved segment of the radius was excised en bloc. The pronator quadratus was excised along with the lesion to obtain adequate margins. Reconstruction of the resulting bony defect was performed using an ipsilateral non-vascularized fibular autograft stabilized with locking plate fixation. To restore forearm function, the pronator teres tendon was reattached to the fibular graft using a 2.8-mm suture anchor (Fig. 3).

Histopathological examination of the resected specimen demonstrated histomorphological features of a benign osteogenic tumor consistent with osteoblastoma. No nuclear evidence of malignancy was identified. The pathologist advised clinicoradiological correlation and follow-up.

The post-operative period was uneventful (Fig. 4). At 12-month follow-up, radiographs

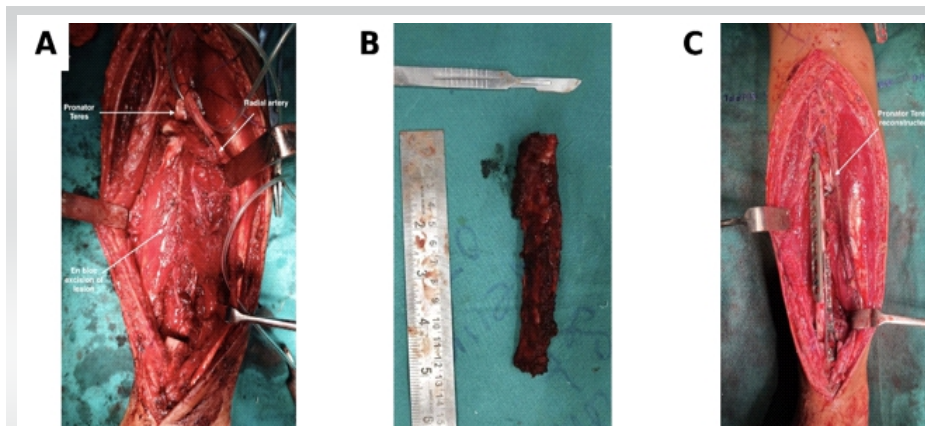


Figure 3: Wide excision and fibular graft reconstruction. (a) Intraoperative exposure of the radial shaft lesion demonstrating preservation of the radial artery and identification of the pronator teres during en bloc excision. (b) Excised radial shaft lesion following wide resection. The specimen measured approximately 5 cm in length and was submitted for definitive histopathological examination. (c) Reconstruction of the radial defect using the fibular autograft stabilized with plate fixation. The pronator teres tendon was reattached to the graft using a 2.8-mm suture anchor to restore forearm pronation following excision of the pronator quadratus.

occasionally mimic malignant bone lesions both radiologically and histologically [2,5,6]. Distinguishing osteoblastoma from parosteal osteosarcoma can be particularly challenging because both lesions may demonstrate osteoid production, cortical involvement, and varying degrees of mineralization [5,6,7,8].

In the present case, imaging findings and core needle biopsy favored a diagnosis of parosteal osteosarcoma. However, final histopathological examination of the excised specimen demonstrated histomorphological features of a benign osteogenic tumor consistent with osteoblastoma, with no nuclear evidence of malignancy. This discrepancy highlights

the limitations of small biopsy samples and emphasizes the importance of correlating clinical, radiological, and pathological findings before establishing a definitive diagnosis [2, 5]. Sampling error remains a recognized limitation of core needle biopsy in surface osteogenic lesions, particularly when benign and low-grade malignant entities share overlapping histological features.

The rarity of osteoblastoma involving the radius further contributed to the diagnostic challenge. Bertoni et al. reported that involvement of the radius and ulna is uncommon compared with the more frequently affected vertebral column and long bones [4]. Because of the suspicious clinicoradiological features and biopsy findings in our patient, an oncological approach with wide excision was considered appropriate to avoid undertreatment of a potentially malignant lesion. The differential diagnosis of osteoblastoma includes osteoid



Figure 4: Immediate post-operative radiographic appearance. Immediate post-operative anteroposterior and lateral radiographs demonstrating fibular autograft reconstruction, restoration of radial continuity, and stable implant fixation.

demonstrated maintained alignment and progressive graft incorporation without evidence of local recurrence (Fig. 5). Clinically, the patient achieved wrist flexion of 75°, wrist extension of 70°, forearm pronation of 80°, and forearm supination of 85°. The patient had satisfactory functional recovery and returned to activities of daily living without significant limitation (Fig. 6).

Discussion

Osteoblastoma is a rare benign osteogenic tumor that may

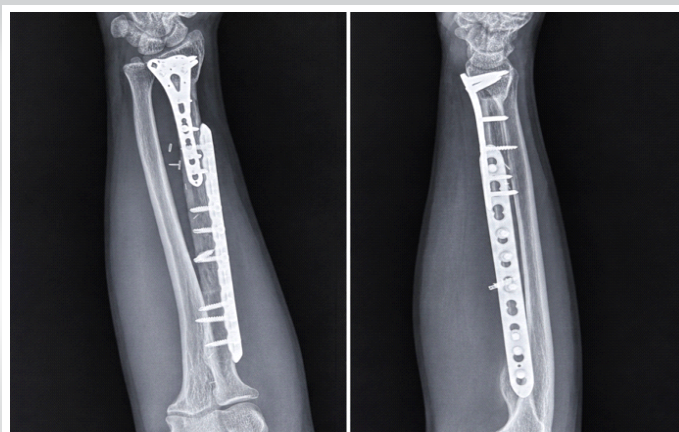


Figure 5: Follow-up radiographs showing fibular graft incorporation. Twelve-month follow-up radiographs demonstrating graft incorporation, maintained alignment, stable fixation, and absence of local recurrence.

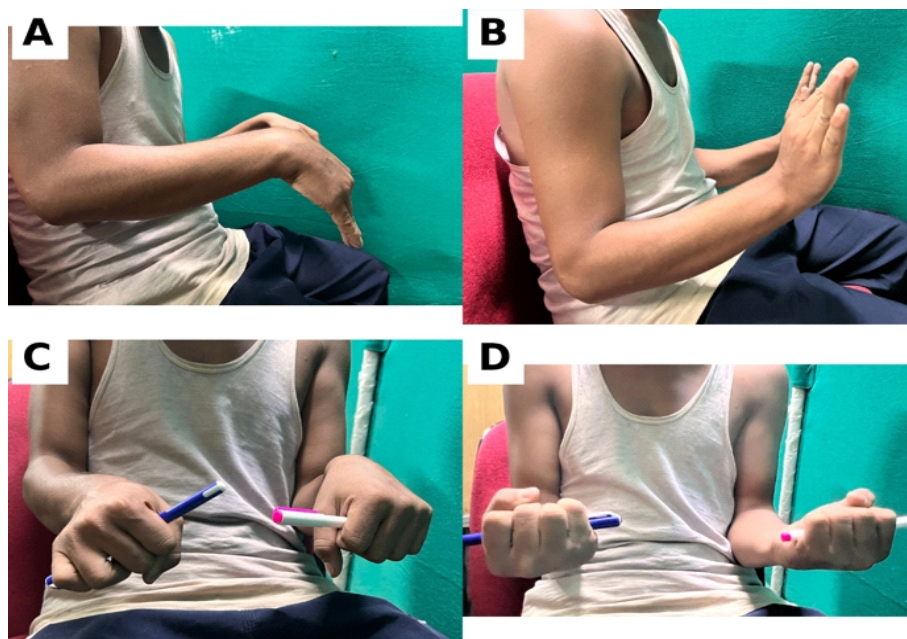


Figure 6: Clinical functional outcome at 12-month follow-up. Clinical photographs obtained at 12-month follow-up demonstrating satisfactory functional recovery following en bloc excision of the radial lesion and reconstruction with a non-vascularized fibular autograft. (a) Wrist flexion. (b) Wrist extension. (c) Forearm pronation. (d) Forearm supination. The patient achieved wrist flexion of 75°, wrist extension of 70°, forearm pronation of 80°, and forearm supination of 85°, with return to activities of daily living without significant limitation.

A unique aspect of the present case was reattachment of the pronator teres to the fibular graft using a 2.8-mm suture anchor following excision of the pronator quadratus with the tumor. This technique was intended to preserve dynamic forearm pronation and optimize functional recovery. At 12-month follow-up, the patient achieved wrist flexion of 75°, wrist extension of 70°, forearm pronation of 80°, and forearm supination of 85°, with no evidence of local recurrence. These findings suggest that biological reconstruction using a non-vascularized fibular autograft, combined with tendon reattachment, can provide satisfactory functional and oncological outcomes in selected patients with radial shaft tumors.

This case highlights the importance of maintaining a broad differential diagnosis when evaluating surface lesions of the radius. It also demonstrates that biological reconstruction with an ipsilateral fibular

autograft, combined with tendon reattachment techniques, can provide satisfactory oncological, radiological, and functional outcomes following excision of complex radial lesions.

Conclusion

Osteoblastoma of the radial shaft is a rare entity and may closely mimic parosteal osteosarcoma on imaging and biopsy. Definitive diagnosis may only become evident following examination of the excised specimen. Wide excision followed by ipsilateral fibular autograft reconstruction and pronator teres reattachment can provide satisfactory functional and radiological outcomes.

Clinical Message

Radial shaft osteoblastoma may present with clinicoradiological features suggestive of parosteal osteosarcoma. Accurate diagnosis requires careful clinicopathological correlation, and biological reconstruction using an ipsilateral fibular autograft can provide excellent limb preservation and functional recovery.

osteoma, aggressive osteoblastoma, and low-grade osteosarcoma, as described in standard orthopaedic oncology literature [9,10].

Management of osteoblastoma ranges from intralesional curettage to en bloc excision depending on tumor location, biological behavior, and suspicion of malignancy [2,11]. In lesions where malignancy cannot be confidently excluded, wide excision remains a reasonable treatment option. In the present case, complete excision allowed definitive diagnosis and reduced the risk of local recurrence.

Reconstruction of segmental radial defects following tumor excision remains technically demanding because restoration of forearm stability and rotation is essential for optimal upper-limb function [12,13]. Autologous fibular graft reconstruction has been widely used following tumor resection because it provides biological incorporation, long-term structural support, and satisfactory functional outcomes [14,15]. In our patient, an ipsilateral non-vascularized fibular autograft successfully restored skeletal continuity and demonstrated progressive incorporation during follow-up.

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

Conflict of interest: Nil **Source of support:** None

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