CASE REPORT

Nepal Orthopedic Association Journal
NOAJ

Parosteal osteosarcoma of scapula with wide resection and non vascularised fibula strut graft reconstruction: A Case Report

Dipendra Maharjan[1], Janith Lal Singh[2]

[1] Department of Orthopedics, Nepal Army Institute of Health Sciences (NAIHS)
[2] Department of Orthopedics, National Academy of Medical Sciences (NAMS)

https://doi.org/10.59173/noaj.20261203m

Abstract

A 53-year-old gentleman was found to have a lobulated mass over the left scapula during his annual health checkup and was referred to a musculoskeletal oncologist. The mass was provisionally diagnosed as parosteal osteosarcoma (PaOS) of the scapula, and upfront surgery was performed with wide-margin resection and reconstruction using a non-vascularised fibula graft. Histopathological evaluation confirmed low-grade parosteal osteosarcoma, with no significant nuclear atypia, hypercellularity, or mitotic figures. The postoperative recovery was uneventful, and the patient was kept on regular follow-up with physiotherapy. This case highlights that wide surgical excision with preservation of the scapula, followed by reconstruction using a non-vascularised fibular autograft, is a viable surgical strategy that can achieve satisfactory oncological clearance while preserving shoulder function. Careful preoperative planning, meticulous surgical technique, and long-term surveillance are essential to optimize functional outcomes and minimize the risk of local recurrence.

Keywords: Parosteal osteosarcoma, Fibula strut graft, Reconstruction

Introduction

Osteosarcoma (OS) is a notorious primary malignant bone tumor characterized by malignant spindle cells producing osteoid and bone.[1] Most of the OS are categorized as primary OS, a de novo disease process of bone, and subcategorized into intramedullary subtypes and surface subtypes.[2] A surface subtype is parosteal osteosarcoma, which is a low-grade osteosarcoma that originates from the periosteum. Parosteal OS represents 4-6% of OS and mostly affects the posterior surface of the distal femur. [3,4] Flat bones are rarely affected, and parosteal osteosarcoma of the scapula is exceptionally rare, with very few cases reported in the literature.[9]

The peak incidence of parosteal OS is around the third decade of life with female predominance.[5] Radiographically, parosteal OS shows a densely ossified and lobulated mass, while the medullary cavities are spared.[6] Parosteal OS is a low-grade, well-differentiated fibrous stroma with osseous components on histopathological examination. The bony trabeculae with a parallel orientation and a “pulled steel wool” pattern is the presentation. About 25% to 30% of these tumors will show an additional cartilaginous differentiation cap.[6]

Address of correspondence

Dipendra Maharjan, Department of Orthopedics, Nepal Army Institute of Health Sciences (NAIHS), Tel: 98607489314, Email: protonzephyr583@gmail.com

Copyright © 2026 Nepal Orthopedic Association Journal. Published by The Nepal Orthopedic Association. This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License (CC Y-NC-ND 4.0), which permits unrestricted downloading and sharing of the work provided the original author and source are properly cited. The work may not be modified or used for commercial purposes.

The tumor is mostly located on the posterior aspect of the distal femur in approximately 70% of cases, followed by the proximal tibia and proximal humerus, although rare locations such as the cranium, mandible, rib, clavicle, and tarsal bones have been reported.[7,8] A review of the available literature identified only one previously reported case of parosteal osteosarcoma involving the scapula. Unlike the present case, scapular reconstruction using a non-vascularised fibular autograft was not performed following tumor excision.[9] Written informed consent was obtained from the patient prior to publication of this case report, including the use of relevant clinical information and imaging.

Case Report

A 53-year-old gentleman presented with a radiographic film showing bony outgrowth in the left chest, which was incidentally found out during an annual medical check-up and referred for orthopaedic consultation. The patient didn't give any history of pain, swelling, or discomfort on the left chest, posteriorly over the scapular region. The x-ray findings were initially noted and referred for musculoskeletal oncologist consultation.

History and physical examination were unremarkable as there was no visible and palpable swelling and no tenderness over the scapular region. The x-ray film of the left shoulder posteroanterior view and scapula Y view showed dense, lobulated opacity over the anterior aspect of the scapula just below the scapula spine without any soft tissue swelling and periosteal reaction. Computed Tomography scan of the scapula showed a densely ossified mass over the anterior aspect of the scapula with no evidence of cortical destruction. On Magnetic Resonance Imaging, the mass showed a hypointense signal in T1W and T2W images, with no signal enhancement in contrast enhancement. Hypointense signal intensity over the mass was seen, suggesting a soft tissue component without any oedematous changes. The mass was noted posterior to the subscapular muscle without changes over adjacent structures. With history, clinical findings, and radiological investigations, parosteal osteosarcoma of the scapula was diagnosed, and upfront surgery was planned. The patient underwent a wide margin resection with scapula retention, and a dual-strut fibula autograft was used for reconstruction of the lateral border of the scapula and mid-portion of the scapula assisted by a reconstruction plate. (Fig. 1 & 2)

The resected bone with a soft tissue component was sent for histopathological examination, and the diagnosis was confirmed as parosteal osteosarcoma of the scapula. The histopathological examination

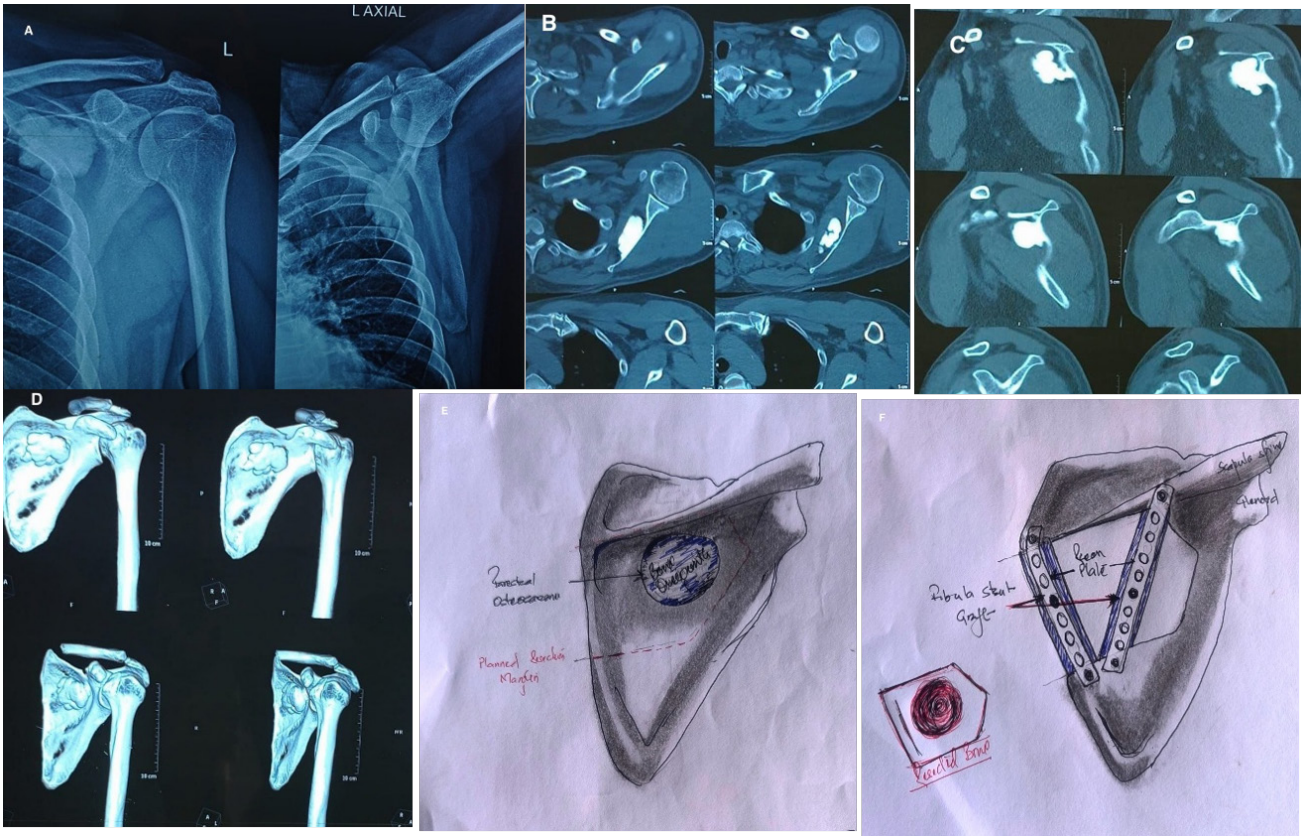


Figure 1 A 53-year-old gentleman with a lobulated mass over the scapula. (A). CT scan of the scapula shows a hyper-dense mass over the anterior aspect of the scapula with a 3D reconstruction of the scapula (B,C,D). The diagrammatic sketch of the scapula shows the pre-op scapula and post-op plan after resection (E,F).

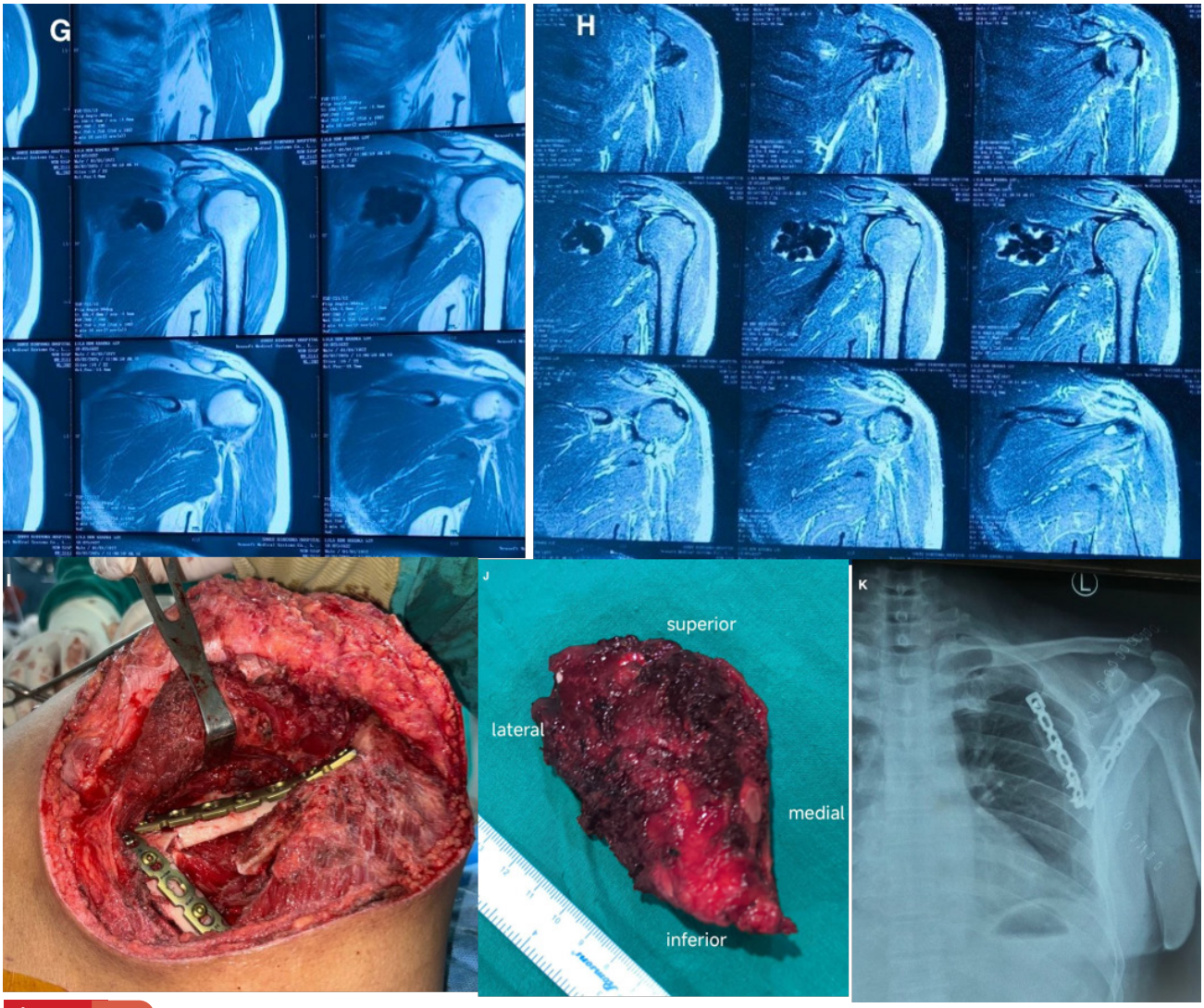


Figure 2 MRI of the scapula shows a hypointense signal intensity of the lesion over the scapula (G,H). Intra-operative photo of the scapula post-resection, fibula autograft fixation with reconstruction plate (I) with the resected specimen (J) and post-operative x-ray film of the scapula (K).

revealed no significant nuclear atypia, hypercellularity, or mitotic features. The postoperative period was smooth, and the patient was advised to remain on regular follow-up without adjuvant chemotherapy.

Discussion

Osteosarcoma (OS) is a primary malignant bone tumor characterized by malignant spindle cells of mesenchymal origin depositing osteoid and bone.[10,11] It is the most common primary malignancy of bone in children.[12-14] OS incidence has a bimodal distribution across age, with an initial peak between 14-16 years and a second peak at 60 years or beyond.[15] OS may arise within the medullary cavity or along the cortex or periosteum; parosteal osteosarcoma is the most common juxtacortical subtype, constituting approximately 1-6% of all osteosarcomas.[16]

medullary sarcoma, can arise at or along the cortex or periosteum. Parosteal sarcoma is the common juxtacortical lesion, constituting about 1–6% of all OS cases.[16]

Parosteal osteosarcoma is a rare, low-grade malignancy arising from the bone surface, most commonly involving the metaphyseal region of long bones, particularly the distal femur. It is generally slow-growing and typically spares the medullary cavity. Histologically, it consists of well-differentiated fibrous stroma containing osseous components and may contain a cartilage cap.[17,18] In the present case, the radiological appearance of a densely ossified, lobulated surface mass without cortical destruction or medullary involvement was consistent with the typical imaging characteristics of parosteal osteosarcoma. The lesion was located on the anterior aspect of the scapula, an exceptionally uncommon site, which made correlation with the imaging and clinical findings particularly important.

Parosteal OS is slow-growing and has a relatively low metastatic potential. The 10-year survival rate exceeds 80% when adequately treated with

planned wide resection.[19] Although most lesions remain low grade, dedifferentiation can occur at presentation or recurrence and is associated with a poorer prognosis and increased metastatic risk.[19] In our patient, histopathology demonstrated a low-grade lesion without significant nuclear atypia, hypercellularity, or mitotic activity, and there was no evidence of dedifferentiation. These findings supported the decision for definitive surgical management without systemic chemotherapy.

Wide surgical excision remains the principal treatment for parosteal osteosarcoma, with the aim of achieving adequate oncological clearance while preserving function whenever feasible.[20] In the present case, the tumor was amenable to wide-margin resection with preservation of the remaining scapula. Because resection involved the lateral border and mid-portion of the scapula, structural reconstruction was required. A dual-strut non-vascularised fibular autograft supported by a reconstruction plate was therefore used to restore scapular continuity and provide a stable construct while preserving the native scapula.

Neoadjuvant and adjuvant chemotherapy, as used for conventional high-grade osteosarcoma, is generally not indicated for low-grade parosteal osteosarcoma. Chemotherapy may be considered when there is dedifferentiation or other high-grade histological features.[21] This approach was applicable to our patient because the resected specimen showed low-grade histology without atypia, hypercellularity, or mitotic figures. The patient therefore did not receive adjuvant chemotherapy and was kept on regular follow-up with physiotherapy focused on scapular and shoulder range of motion. The only previously reported scapular parosteal osteosarcoma by Park and Ryu also involved surgical excision, but scapular reconstruction with a non-vascularised fibular autograft was not performed.[9] In contrast, our case required reconstruction because of the extent and location of the resection, and the fibular struts were used to preserve the scapular framework and facilitate functional recovery. Thus, although both cases support wide excision as the mainstay of treatment, the present case demonstrates an additional reconstructive option for maintaining scapular function after extensive resection.

In summary, this case closely reflects the low-grade radiological and histopathological features described for parosteal osteosarcoma, while its scapular location represents an exceptionally rare presentation. The absence of dedifferentiation or other high-grade features supported treatment with wide excision alone. Unlike the previously reported scapular case, our patient underwent reconstruction with a non-vascularised fibular autograft because preservation of the remaining scapula required restoration of the resected bony segments. This case therefore emphasizes that individualized reconstruction can complement wide oncological excision and may help preserve shoulder function in rare scapular parosteal osteosarcoma.

Conflict of Interest: None
Acknowledgement: None
Source of Funding: None

References

1. Messerschmitt PJ, Garcia RM, Abdul-Karim FW, Greenfield EM, Getty PJ. Osteosarcoma. J Am Acad Orthop Surg. 2009;17(8):515-27. https://doi.org/10.5435/00124635-200908000-00005

2. Fletcher CDM, Unni KK, Mertens F, editors. Pathology and genetics of tumours of soft tissue and bone. Lyon: IARC Press; 2002. (WHO Classification of Tumours, 3rd ed, vol 5).

3. Johnson K, Davies AM, Mangham DC, Grimer RJ. Parosteal osteosarcoma of a metatarsal with intramedullary invasion. Skeletal Radiol. 1999;28(2):111-5. https://doi.org/10.1007/s002560050485

4. Hewitt KM, Ellis G, Wiggins R, Bentz BG. Parosteal osteosarcoma: case report and review of the literature. Head Neck. 2008;30(1):122-6. https://doi.org/10.1002/hed.20658

5. Klein MJ, Siegal GP. Osteosarcoma: anatomic and histologic variants. Am J Clin Pathol. 2006;125(4):555-81. https://doi.org/10.1309/UC6K-QHLD-9LV2-KENN

6. Okada K, Frassica FJ, Sim FH, Beabout JW, Bond JR, Unni KK. Parosteal osteosarcoma: a clinicopathological study. J Bone Joint Surg Am. 1994;76(3):366-78. https://doi.org/10.2106/00004623-199403000-00007

7. Kumar R, Moser RP Jr, Madewell JE, Edeiken J. Parosteal osteogenic sarcoma arising in cranial bones: clinical and radiologic features in eight patients. AJR Am J Roentgenol. 1990;155(1):113-7. https://doi.org/10.2214/ajr.155.1.2112831

8. Kumm DA, Rütt J, Hackenbroch MH. Parosteal osteosarcoma of the tarsus. Arch Orthop Trauma Surg. 1997;116(6-7):437-9. https://doi.org/10.1007/BF00434010

9. Park YK, Ryu KN. Parosteal osteosarcoma of the scapula. J Korean Med Sci. 1999;14(5):586-8. https://doi.org/10.3346/jkms.1999.14.5.586

10. Campanacci M. Bone and soft tissue tumors: clinical features, imaging, pathology and treatment. 2nd ed. Vienna: Springer; 1999. https://doi.org/10.1007/978-3-7091-3846-5

11. Sissons HA. The WHO classification of bone tumors. In: Malignant bone tumors. Berlin: Springer; 1976. p. 104-8. https://doi.org/10.1007/978-3-642-80997-2_8

12. Damron TA, Ward WG, Stewart A. Osteosarcoma, chondrosarcoma, and Ewing's sarcoma: National Cancer Data Base report. Clin Orthop Relat Res. 2007;459:40-7. https://doi.org/10.1097/BLO.0b013e318059b8c9

13. Dorfman HD, Czerniak B. Bone cancers. Cancer. 1995;75(1 Suppl):203-10. https://doi.org/10.1002/1097-0142(19950101)75:1+%3C203::AID-CNCR2820751308%3E3.0.CO;2-V

14. dos Santos Silva I, Swerdlow AJ. Sex differences in the risks of hormone-dependent cancers. Am J Epidemiol. 1993;138(1):10-28. https://doi.org/10.1093/oxfordjournals.aje.a116773

15. Mirabello L, Troisi RJ, Savage SA. Osteosarcoma incidence and survival rates from 1973 to 2004: data from the Surveillance, Epidemiology, and End Results Program. Cancer. 2009;115(7):1531-43. https://doi.org/10.1002/cncr.24121

16. Fox MG, Trotta BM. Osteosarcoma: review of the various types with emphasis on recent advancements in imaging. Semin Musculoskelet Radiol. 2013;17(2):123-36. https://doi.org/10.1055/s-0033-1342969

17. Clayer M. Many faces of osteosarcoma on plain radiographs. ANZ J Surg. 2015;85(1-2):22-6. https://doi.org/10.1111/ans.12836

18. Grimer RJ, Carter SR, Spooner D, Sneath RS. Diagnosing musculoskeletal tumors. Sarcoma. 2001;5(2):89-94. https://doi.org/10.1155/s1357714x01000172

19. Toki S, Kobayashi E, Yoshida A, Ogura K, Wakai S, Yoshimoto S, et al. A clinical comparison between dedifferentiated low-grade osteosarcoma and conventional osteosarcoma. Bone Joint J. 2019;101-B(6):745-52. https://doi.org/10.1302/0301-620X.101B6.BJJ-2018-1207.R1

20. Bacci G, Longhi A, Versari M, Mercuri M, Briccoli A, Picci P. Prognostic factors for osteosarcoma of the extremity treated with neoadjuvant chemotherapy: 15-year experience in 789 patients treated at a single institution. Cancer. 2006;106(5):1154-61. https://doi.org/10.1002/cncr.21724

21. Bielack S, Carrle D, Casali PG; ESMO Guidelines Working Group. Osteosarcoma: ESMO clinical recommendations for diagnosis, treatment, and follow-up. Ann Oncol. 2009;20 Suppl 4:iv137-9. https://doi.org/10.1093/annonc/mdp154