

Osteosarcoma Beyond the Long Bones: A Rare Case in the Index Finger

Abeyasinghe AHMGB¹, Jayasooriya HK¹, Pathirana NPNB¹, Abeyasinghe AHMCD²

¹ Department of Surgery, Faculty of Medicine, Wayamba University of Sri Lanka.

² Faculty of Medicine, Rajarata University of Sri Lanka.

Abstract

Osteosarcoma is the most common primary malignant bone tumor, typically arising in the metaphyseal regions of long bones. Involvement of the bones of the hand is exceedingly rare, accounting for less than 1% of cases, often leading to delayed diagnosis and treatment.

We report a rare case of high-grade osteosarcoma in the distal phalanx of the right index finger in a 78-year-old male. The patient presented with a five-month history of painless swelling, initially suspected to be benign. Radiographs revealed a lytic, destructive lesion, and an excisional biopsy confirmed high-grade osteosarcoma with malignant osteoid. Complete resection was achieved with negative soft tissue margins. After multidisciplinary review, adjuvant chemotherapy was withheld due to the patient's age, tumor localization, and clean margins. This case highlights the importance of considering osteosarcoma in the differential diagnosis of atypical finger masses, especially in elderly patients, to enable timely and effective treatment.

Keywords: Osteosarcoma, Distal phalanx, Rare bone tumor, High-grade sarcoma, Bone neoplasm.

INTRODUCTION

Osteosarcoma is the most common primary malignant bone tumor of mesenchymal origin, typically affecting adolescents and young adults, with a secondary incidence peak in individuals aged 40–50 years^{1,2}. It shows a male predominance and commonly involves the metaphyseal regions of long bones such as the distal femur and proximal tibia^{3,4}.

Osteosarcoma of the hand is extremely rare, accounting for less than 1% of all cases⁵. Its rarity often leads to delayed diagnosis, resulting in poor prognostic outcomes due to late initiation of treatment⁶. When it occurs in the hand, the phalanges and metacarpal bases are most frequently involved^{2,7}. These tumors are more prevalent in older males and are often secondary, associated with conditions like Paget's disease, prior radiation exposure, or metastasis from primary osteosarcoma elsewhere^{1,2,7}.

Limb salvage surgery is the preferred treatment, with neoadjuvant chemotherapy playing a critical role^{3,4}. Early diagnosis allows for successful limb preservation in 60–65% of cases^{4,8}. However, delayed detection common in atypical sites like the hand can result in increased morbidity and reduced survival.

This case highlights the importance of clinical vigilance for osteosarcoma in uncommon locations to enable timely intervention and optimize patient outcomes.

CASE PRESENTATION

A 78-year-old male presented with a five-month history of progressive, painless swelling localized to the distal aspect of the right index finger. The mass had gradually increased in size to approximately 5 cm, prompting medical consultation. Clinical examination at the surgical outpatient clinic revealed a firm, fusiform-shaped, non-tender mass involving the distal phalanx of the right index finger. The overlying skin appeared intact without signs of inflammation or ulceration; however, a noticeable reduction in the range of motion of the distal interphalangeal joint was noted. The initial differential diagnosis included an implantation dermoid due to the subcutaneous location and slow progression. Plain radiography demonstrated a lytic lesion with significant cortical destruction of the distal phalanx,

***Corresponding Author:** A.H.M.G.B. Abeyasinghe

Consultant Surgeon, Senior Lecturer (MBBS, MS, FCSSL),
Faculty of Medicine, Wayamba University of Sri Lanka

accompanied by faint soft tissue opacity suggestive of immature osteoid formation, raising suspicion for a malignant bone tumor (Figure 1).

An excisional biopsy was performed, serving both diagnostic and therapeutic purposes. Gross pathology identified a 2 cm pale brown intralesional mass within

the soft tissue, with the closest margin (0.1 cm) to the skin surface. Histological evaluation revealed a high-grade neoplasm composed of pleomorphic spindle cells, numerous atypical mitotic figures, and multinucleated tumor giant cells. Foci of malignant osteoid production were observed, confirming the diagnosis of high-grade



Figure1. Plain X-ray showing lytic lesion in the distal phalanx of the right index finger with faint soft tissue opacity suggestive of immature osteoid formation.

osteosarcoma. Although the tumor had invaded the bone, all soft tissue resection margins were histologically clear.

Following multidisciplinary discussion with the oncology team, adjuvant chemotherapy was withheld due to complete excision with negative soft tissue margins, and the resection was deemed therapeutically sufficient.

DISCUSSION

Osteosarcoma is a high-grade malignant bone tumor of mesenchymal origin and is the most common primary bone malignancy^{1,2}. It typically arises in the metaphyseal regions of long bones, such as the distal femur, proximal tibia, and proximal humerus^{3,4}. The disease demonstrates a bimodal age distribution, with a major peak in adolescents and young adults, and a smaller secondary peak in older adults over 40 years. There is a consistent male predominance in both age groups^{1,2}.

Osteosarcoma involving the bones of the hand is exceptionally rare, accounting for less than 1% of all cases^{3,9}. The phalanges are most commonly affected in these rare instances². Due to its indolent presentation and atypical location, the diagnosis is often delayed, and the lesion may be mistaken for benign conditions, as was initially suspected in this case.

Imaging plays a pivotal role in both diagnosis and staging. Plain radiographs typically reveal lytic or mixed lytic-sclerotic lesions with cortical destruction and periosteal reaction⁸. In this patient, radiography demonstrated a lytic lesion with significant bony destruction, raising suspicion

for malignancy. To further assess locoregional extension, particularly soft tissue involvement and neurovascular encroachment, MRI is the modality of choice². It offers superior soft tissue contrast and was instrumental in this case in excluding extensive soft tissue invasion.

Although imaging plays a critical role in raising suspicion and assessing the extent of osteosarcoma, histopathological evaluation remains the definitive method of diagnosis. This is typically achieved through either incisional or excisional biopsy. Among the two, excisional biopsy is generally preferred when feasible, as it offers a more comprehensive tissue sample and is associated with lower diagnostic error rates compared to incisional biopsy^{2,10}.

Histopathological analysis not only confirms the diagnosis but also provides essential information regarding tumor grade, which is a key prognostic indicator. Furthermore, a resection margin free of tumor involvement is the most significant independent predictor of local recurrence². Evidence suggests that a tumor-free margin greater than 1 mm is generally considered adequate for minimizing recurrence risk^{2,11}. Both margin status and histological grade are critical in guiding postoperative management, particularly decisions regarding the use of adjuvant therapy, and they collectively have a substantial impact on overall prognosis.

Poor prognostic factors in osteosarcoma include large tumor size, proximal location, metastasis at presentation, poor response to chemotherapy, and positive surgical margins. This patient, despite having a high-grade tumor,

exhibited none of these features. The lesion was confined to the distal phalanx with negative resection margins with the closest margin being 0.1 cm from the skin surface and no evidence of metastasis or locoregional spread. Based on complete excision and favorable pathology, adjuvant chemotherapy was withheld after multidisciplinary review. This case highlights the importance of early imaging and biopsy in atypical hand lesions and supports individualized treatment, particularly in elderly patients, to balance therapeutic outcomes with quality of life.

CONCLUSION

This case highlights the rarity and diagnostic challenge of osteosarcoma in the hand, particularly in elderly patients. Early recognition, prompt imaging, and histological evaluation are critical. Individualized management, including consideration of surgical margins and patient factors, is essential to optimize outcomes and avoid unnecessary morbidity from delayed diagnosis or overtreatment.

Acknowledgements

We would like to express our gratitude to the healthcare professionals involved in this case, particularly their collaborative efforts were essential in ensuring optimal care for the patient.

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Cite this article: Abeyasinghe AHMGB¹, Jayasooriya HK¹, et al. Osteosarcoma Beyond the Long Bones: A Rare Case in the Index Finger, Wayamba University of Sri Lanka. *Era Journal of Medical and Clinical Case Reports.* 2025; 3(1):20-22.

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