



ENCHONDROMA OF METACARPAL WITH PATHOLOGICAL FRACTURE TREATED WITH MARGINAL RESECTION AND RECONSTRUCTION WITH ILIAC CREST GRAFT: A CASE REPORT

Orthopaedics

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ABSTRACT

Background: An enchondroma is a benign tumour in the medullary cavity of bone, which is composed of mature hyaline cartilage. It generally develops in the third and fourth decades of life and is one of the most common benign bone tumours of the hand. Aim of the study is to discuss a case of enchondroma initially presenting as a pathologic fracture in a metacarpal bone and review the outcome of its recommended treatment. **Methodology:** A 50 years old female presented with complains of pain and swelling over right hand following trivial trauma. Radiographs showed a pathological fracture of the fifth metacarpal. Fracture occurred through a well-defined, geographic, lucent lesion in the proximal metaphysis consistent with enchondroma. Written consent was taken from patient regarding use of these materials for academic publication keeping her identity undisclosed. **Result:** The patient underwent marginal resection of tumour with reconstruction of the metacarpal with iliac crest autograft and k-wire fixation. Post operatively below elbow slab was given to the patient to promote wound and fracture healing for 4 weeks. Later slab was removed and finger and wrist ROM was started. Upon radiographic union at 6 weeks K-wire was removed and physiotherapy was encouraged. **Conclusion:** Enchondroma of the hand has a non-specific clinical presentation and a variable radiographic appearance. Nevertheless, controversy surrounds the roles of post-curettage surgical adjuncts, immediate versus delayed grafting and fixation, and void management. Surgical management involving lesion excision and autograft reconstruction demonstrated excellent results, enabling complete healing and restoration of function within 12 weeks post-operatively. This approach highlights the efficacy of marginal resection and reconstruction with iliac crest graft combined with structured post-operative rehabilitation in achieving optimal patient outcomes.

KEYWORDS

Enchondroma, Bone auto graft, K-wire fixation, Rehabilitation.

INTRODUCTION:

An enchondroma is a benign tumour in the medullary cavity of bone, which is composed of mature hyaline cartilage.¹⁻³ It generally develops in the third and fourth decades of life and is one of the most common benign bone tumour of the hand.³⁻⁵ It has a predilection for the ulnar-sided tubular bones of the hand and occurs most commonly in the proximal phalanx, and less commonly in the middle phalanx and metacarpals, and rarely in the distal phalanx.³⁻⁵

The tumour is usually asymptomatic and is detected accidentally in radiographs.⁶ When enchondromas become symptomatic, the pain is most commonly due to an increase in pressure due to the expansion of the lesion impacting the cortex of the affected bone. The patient may notice gradual enlargement of the affected digit. Other clinical presentations include pathological or stress fracture of the lesion, with a history of trauma or strenuous physical activity, or malignant conversion of the tumor.^{2,6} Secondary malignant transformation of a solitary enchondroma into a chondrosarcoma is extremely rare and may not be easily distinguishable with enchondroma radiologically and clinically.⁷⁻¹³

The treatment options for enchondromas include conservative regular follow-up or surgery.³ Whether the surgical removal of solitary enchondromas is necessary remains controversial.³ However, surgery provides histological diagnosis, eliminates clinical symptoms, prevents malignant degeneration, and ensures mechanical stability of the bone and prevents the development of pathologic fractures and deformity.³ The standard surgical method is complete tumour removal in order to prevent local recurrence.¹⁶ This is achieved by opening a cortical window followed by full curettage of the cavity, and in most cases, filling the bone defect with either cancellous bone graft, bone substitute, or cement injection.^{3,5,6,14}

Excision along with reconstruction with autograft is a more effective treatment for very large lesions with pathological fractures or recurrent lesions. We have reported this case of enchondroma of right 5th metacarpal shaft treated with excision of the segment and successful reconstruction of metacarpal with simple iliac crest bone graft with excellent result.

Case Report:

A 50-year female, housewife by occupation, presented with sudden onset pain and diffuse swelling over dorsum of right hand over 5th metacarpal region with history of trivial trauma. On examination, there

was tenderness present over shaft of 5th metacarpal with crepitus. There was partial loss of grip due to lack of complete flexion at 5th MCP joint. There was no warmth over the swelling. Sensory and motor function was intact with no other constitutional symptoms.

Plain X ray revealed well marginated bony swelling arising from 5th metacarpal shaft with pathological fracture. There was punctate calcification all around the tumour mass. There was no evidence of periosteal reaction. There was no involvement of the metacarpophalangeal (MCP) joint.



Figure 1: Pre-operative X-ray showing well marginated lytic lesion in the shaft of 5th metacarpal

Operative Technique:

Patient was explained about the disease nature, treatment plan and prognosis. Since tumour was large enough with paper thinned cortex, excision of the segment along with lesion with reconstruction of the metacarpal with tricortical iliac crest graft was planned instead of just curettage and bone graft.

The patient was laid in a supine position on a radiolucent table with the right upper limb on the side arm board under spinal anaesthesia and brachial block with a tourniquet. The right forearm and left iliac region was cleansed with 10% betadine scrub and was draped in a sterile manner. Dorsal incision over metacarpal shaft with marginal excision of the tumour, excavation of the cavity was done while isolating and protecting extensor tendons and digital vessels and nerves. The excised segment in block was measured and same length of tricortical iliac crest graft was harvested from the contralateral iliac crest. This was used to reconstruct the segmental defect of metacarpal and fixed

with K-wire under C-arm guidance. Haemostasis was achieved, wound was closed and cockup slab given.

Tissue was sent for histopathological examination and was suggestive of lobules of hyaline cartilage encased by a zone of reactive bone with calcification; chondrocytes have nuclei with condensed chromatin. There was no evidence suggestive of malignancy such as chondrosarcoma.

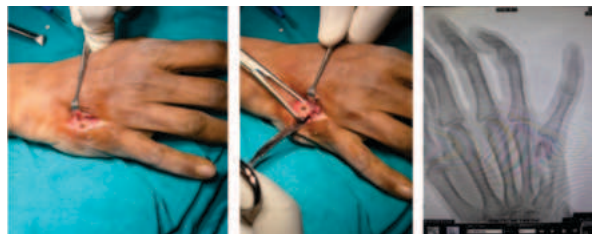


Figure 2: Intra-operative photo and C-arm image showing surgical resection of lesion.



Figure 3: Intra-operative photo and C-arm image showing metacarpal reconstruction with autograft with k-wire fixation.

Post-operative Rehabilitation:

Post-operatively below elbow slab was given for the patient to promote wound healing and fracture healing for 4 weeks. Regular antibiotics were given post-operatively. Upon radiographic union on follow up, slab and k-wire was removed at 4 weeks and ROM exercise was started. There was complete union of the graft at 6 weeks with full ROM and normal grip at 12 weeks. There was no wound complication, pain or evidence of local recurrence. Patient had no post operative stiffness resulting in good functional outcome.



Figure 4: Post operative radiograph



Figure 5: Post operative ROM

DISCUSSION:

The most prevalent benign hand tumor is enchondroma. It is composed of hyaline cartilage lobules, which are thought to be the remains of a closed physis and occasionally have foci of calcifications.¹⁵

Radiographs of hand enchondromas demonstrate a well-demarcated lucent lesion typically centrally located in the diaphysis of the involved tubular bone. The lesion may extend to the end of a small tubular bone. The contour of the lesion is usually lobular and associated with endosteal scalloping that may be quite extensive and deep in this location. A calcified matrix with typical "arcs and rings" or "pebble" appearance confirms the diagnosis of a chondroid lesion.¹⁶ While

enchondromas can occur in the metaphysis, diaphysis, or epiphysis of the hand's 201 tubular bones, or they might cover the entire phalanx, they are typically observed in the long bones' metaphysis.¹⁷ The definitive diagnosis requires a histopathological examination.

Takigawa has advanced a radiographic categorization scheme for chondromas that includes five categories: (1) "central, (2) eccentric, (3) associated (i.e., multiple lesions in the same bone in distinct locations), (4) polycentric (i.e., including the majority of the medullary canal of the tubular bone), and (4) along with giant form".¹⁸ A monostotic lesion is another term for a solitary lesion, while polyostotic enchondromas or multiple enchondromatosis are terms used to define multiple lesions that affect different bones.¹⁹

A well-defined, somewhat hypocellular specimen having lacunae-bound, dark-stained chondrocytes lodged in a cartilaginous matrix is what microscopically identifies enchondroma (Fig.6). There is limited engulfment of the nearby cortical as well as lamellar bone. Chondrosarcoma is the primary histologic differential diagnosis, characterized by a higher number of binucleated chondrocytes and a more cellular appearance than enchondroma. Furthermore, mucoid alterations, pleomorphism, trapping of the host bone by tumour, cortical degradation, and uneven cellular distribution are characteristics that set chondrosarcoma apart.²⁰

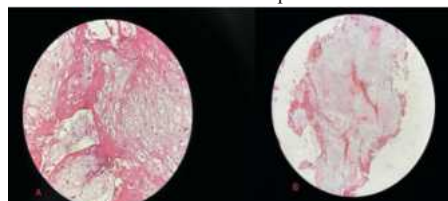


Figure 5: Histopathology sample showing features suggestive of enchondroma.

CONCLUSION:

Enchondroma, the most prevalent benign tumour of the hand, is distinguished by the presence of lobules of hyaline cartilage and is typically present in the metaphyseal region of tubular bones. Hand is the common site for this tumour with prevalence in proximal phalanx, middle phalanx, metacarpal, and distal phalanx in descending order of frequency. Treatment in symptomatic, large tumour or impending pathological fracture is curettage with or without filling the cavity. Small cavity with structurally insignificant enchondroma can be left unfilled and observed in a process to heal itself. But larger cavity needs filling with bone graft while large segmental defect or recurrent lesion needs reconstruction with graft to preserve the function and motion of fingers and hand. In our case, we treated the above-mentioned case with marginal excision instead of only curettage as the size was large enough with papery thin cortex and to avoid chance of recurrence and preserve the function at the same time.

Reconstruction with bone cement and hardware has drawback of some loss of function of hand with stiffness in many cases. Yalcinka et al has reported successful reconstruction of 5th metacarpal with pathological fracture with structural allograft in recurrent enchondroma treated initially with curettage and bone graft.²¹ Sassu et al. has reported a large enchondroma of 3rd metacarpal treated successfully with excision and reconstruction with vascularized fibular graft.²² Our case has been managed well with simple surgical technique of segmental resection of tumour and reconstruction of the defect with tricortical iliac crest graft resulting in full range of motion with normal grip without any cosmetic issue. The reconstructed graft united in such a good manner that it resembled normal metacarpal.

This case underscores the importance of timely diagnosis through imaging and histopathology to differentiate enchondromas from other potential lesions or malignancies. This approach highlights the efficacy of precise surgical techniques combined with structured post operative rehabilitation in achieving optimal patient outcomes.

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