

## Intralesional Curettage, Synthetic Graft Augmentation, and Pinning for Phalangeal Enchondroma : A Case Report and Review of Current Evidence

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### Abstract

**Background:** Enchondromas are benign cartilaginous tumors commonly affecting the small tubular bones of the hand and frequently present as lytic lesions with cortical thinning on imaging, sometimes associated with pain or pathologic fracture (5, 6, 9). Optimal surgical management—particularly regarding void filling and internal reinforcement—remains controversial (2, 3).

**Objective:** To present the clinical course, surgical treatment, and outcome of a 40-year-old patient with enchondroma of the distal phalanx (P3) of the left index finger treated by curettage, defect filling with a synthetic bone substitute (Biobank), and reinforcement with pin fixation.

**Methods:** Clinical, radiologic, and histopathologic features were analyzed. A literature review was conducted to contextualize surgical approaches, grafting options, and fixation strategies.

**Results:** The lesion was successfully treated with complete curettage, Biobank grafting, and intramedullary pinning. Histopathology confirmed enchondroma. The patient achieved satisfactory consolidation and pain relief with no complications at follow-up.

**Conclusion:** Intralesional curettage with graft augmentation and stabilization represents an effective treatment strategy for symptomatic phalangeal enchondromas, particularly in the presence of cortical compromise and fracture risk (2, 7).

### Introduction

Enchondromas are benign intramedullary hyaline cartilage tumors and represent the most frequent primary bone tumors of the hand's tubular bones (5, 9). Although often asymptomatic, they may present with pain, swelling, or pathologic fracture and are commonly identified as well-circumscribed lytic lesions with cortical thinning on radiographs (6). Differentiation from low-grade chondrosarcoma remains essential and relies on a combination of clinical, radiologic, and histopathologic features (5, 8).

The standard treatment for symptomatic enchondromas is intralesional curettage (2, 5). However, controversy persists regarding the necessity of filling the post-curettage cavity and the optimal choice of graft material. Several studies have compared curettage alone with augmentation using autograft, allograft, or synthetic substitutes, with no clear consensus (2, 3, 7). Additionally, the role of internal fixation to prevent postoperative fracture or to allow early mobilization remains debated (2, 7).

In this article, we describe the diagnostic and therapeutic course of a 40-year-old patient presenting with pain of the left index finger pulp and a lytic lesion in the distal phalanx

(P3), including surgical strategy using a synthetic bone graft (Biobank) and reinforcement pinning, and review the recent evidence supporting this approach.

### Methods

#### Case Presentation

A 40-year-old individual presented with progressive painful symptoms localized to the pulp of the left index finger. Clinical examination revealed tenderness over the distal phalanx without neurovascular deficits. Standard radiography and imaging demonstrated a well-demarcated lytic lesion of P3 with cortical thinning suggestive of a benign cartilaginous neoplasm.

#### Surgical Technique

Surgery was indicated based on persistent pain and imaging consistent with a solitary enchondroma. Under regional anesthesia and tourniquet control, a dorsal cortical window was created over the distal phalanx. Intralesional curettage was performed until grossly normal bone margins were achieved. The resulting cavity was filled using Biobank, a synthetic bone substitute designed to support osteoconduction. Subsequently, a fine intramedullary pin was inserted across the

distal phalangeal segment for structural reinforcement. Tissue samples were sent for histopathologic analysis.

### Literature Review

A non-systematic literature review was conducted focusing on surgical management of hand enchondromas, including curettage techniques, cavity filling strategies, use of synthetic bone substitutes, and fixation methods (2–5, 7).

### Results

#### Histopathologic Findings

Histological evaluation confirmed the diagnosis of enchondroma, revealing mature hyaline cartilage with chondrocytes in lacunae without cytologic atypia or mitoses.

#### Clinical and Radiologic Outcomes

Postoperative radiographs demonstrated good placement of Biobank and stable pin fixation. The patient experienced significant pain relief and progressive radiographic consolidation. No postoperative complications such as infection, neurovascular injury, or recurrence were observed at follow-up.

### Discussion

#### Pathophysiology and Presentation

Hand enchondromas account for most intramedullary cartilaginous tumors of the phalanges and metacarpals (5, 9). Lesions involving the distal phalanx are less common but have been described, often presenting with pain or cortical thinning (6).

#### Surgical Management

Curettage remains the cornerstone of surgical treatment (2, 5). Some authors advocate curettage alone, citing low recurrence rates, while others recommend void filling to reduce fracture risk and promote structural stability (2, 3, 7). Minimally invasive techniques, including endoscopic curettage with grafting, have also been reported with favorable outcomes in selected cases (4).

**Bone grafting vs. synthetic substitutes:** While autogenous bone grafts provide osteoconductive and osteoinductive advantages, donor-site morbidity is a concern. Comparative studies have demonstrated that synthetic and allogenic graft materials provide radiologic consolidation and functional outcomes comparable to autografts while avoiding donor-site morbidity (1, 3, 7).

**Fixation:** Prophylactic internal fixation may be beneficial in lesions with extensive cortical thinning, particularly in small bones of the hand, to prevent fracture and facilitate early rehabilitation (2, 7). Recurrence after adequate curettage is uncommon, and malignant transformation is exceedingly rare, though isolated cases have been reported (8).

#### Recurrence and Complications

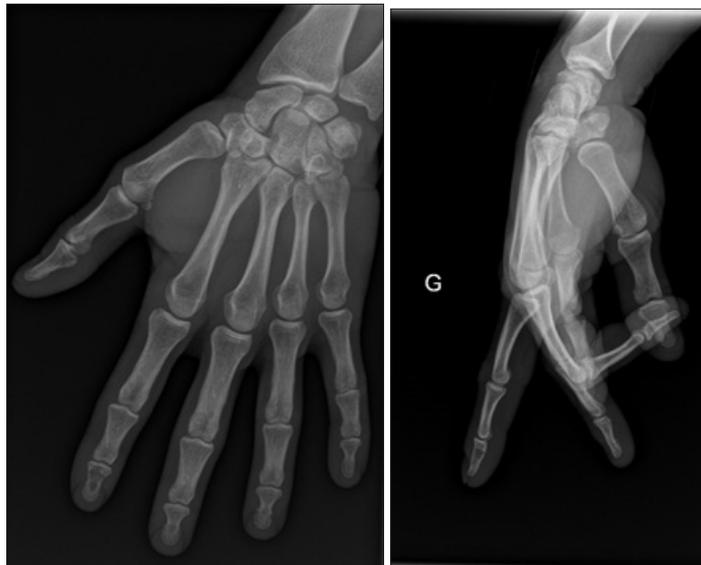
Recurrence after adequate curettage is uncommon but requires regular follow-up. Malignant transformation is extraordinarily rare but underscores the need for rigorous histopathologic evaluation.

#### Conclusion

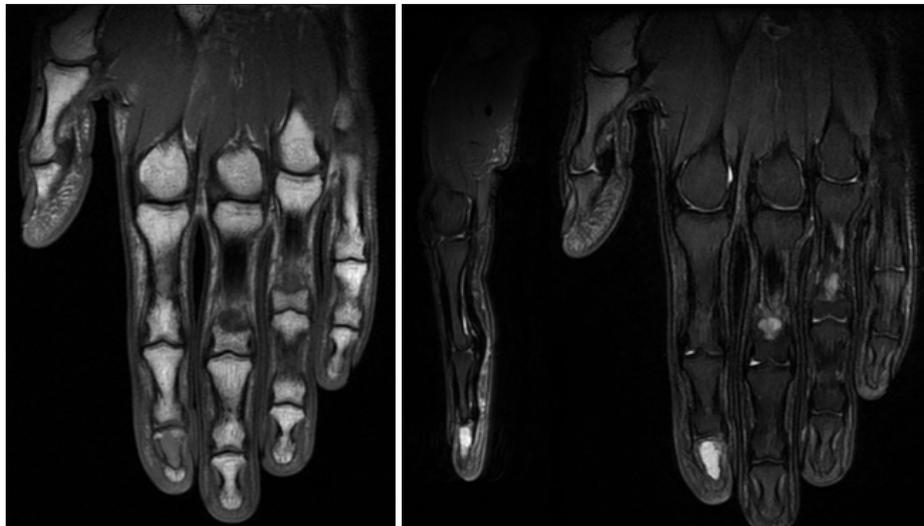
This case underscores that Intralesional curettage combined with synthetic bone graft augmentation and stabilization with pin fixation is an effective and safe treatment for symptomatic phalangeal enchondromas with cortical compromise, providing pain relief, structural stability, and satisfactory functional outcomes (1–3, 7). This approach balances structural reinforcement with biological grafting to achieve rapid consolidation and good functional outcomes. Prospective studies comparing graft materials and fixation strategies remain warranted.

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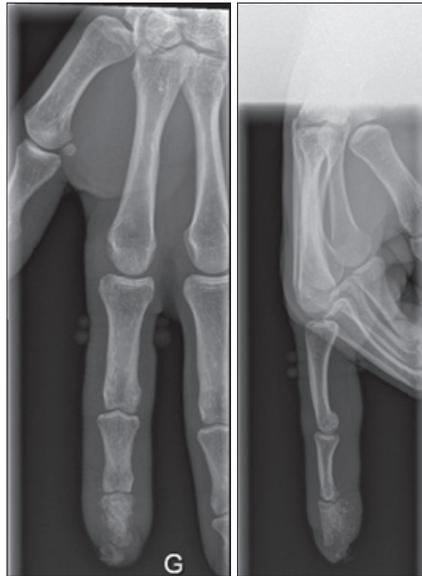
**Figure 1:** X-ray of the hand: Lesion of the 3rd phalanx of the left index finger



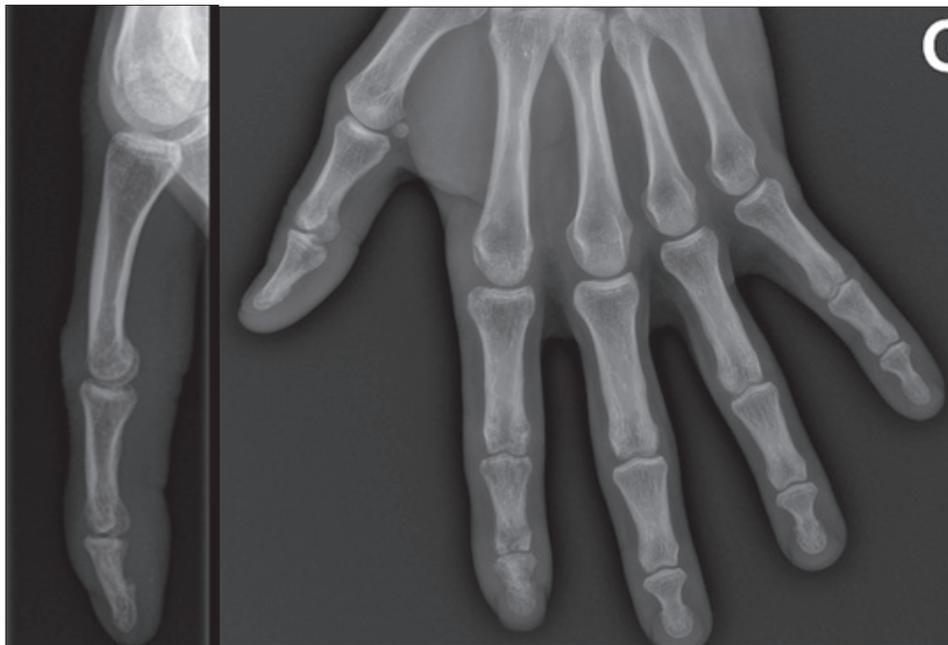
**Figure 2:** MRI of the left hand: Osteolytic lesion of P3 of the left index finger, with probable bone fissure on the ulnar side of the lesion.



**Figure 3:** Post-operative X-ray of the left hand



**Figure 4:** X-ray of the left hand at 1.5 months



**Figure 5:** X-ray of the left hand 10 months post-op

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