

Enchondroma in the distal phalanx of the finger

An observational study of 34 cases in a single institution

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Abstract

The goal of our study was to report the clinical presentation, treatment, and complications of enchondroma in the distal phalanx of the finger. This was a retrospective study of 34 patients (19 women and 15 men) who underwent surgery between May 2004 and September 2012 for enchondroma in the distal phalanx of the finger. The average age of the patients was 39.38 ± 10.97 years old (range 14–59). The presenting symptoms and imaging features were recorded. The surgical procedure was performed under regional or general anesthesia. The surgical technique involved removal of tumors by opening a cortical window and curetting the cavity. The defects were filled with an injectable calcium phosphate cement. All patients received follow-up in our outpatient clinic every 6 months. Expansion of bone or thinning of the cortex present in the radiological imaging, including anteroposterior and lateral plain radiographs of the fingers, was used to assess for tumor recurrence. The observational end-point was reoperation.

All tumors were confirmed as enchondromas by the pathological results. None of the patients had a tumor recurrence. Three patients (9% of cases) developed an infection. After antibiotic treatment, 2 patients were cured, and 1 patient required an amputation. Enchondroma in the distal phalanx of the finger presents with a variety of clinical symptoms. Injectable calcium phosphate cement is adequate for bone grafting. Postoperative infection is more common than tumor recurrence. If patients have an infection or bilateral bone cortex defects, bone grafting is challenging.

Level of Evidence: Therapeutic study, Level IV

Abbreviations: AP = anteroposterior, MRI = magnetic resonance imaging, SD = standard deviation.

Keywords: distal phalanx of finger, enchondroma

1. Introduction

Enchondroma is the most common benign tumor of the tubular bones of the hands. The most frequent location for this tumor is

the proximal phalanx, followed by the middle phalanx and the metacarpals.^[1,2] The tumor arises in the medullary cavity and grows into the cortex, forming a prominent endogenous mass in the bone.^[3] Because this tumor type has no unique clinical symptoms, an enchondroma is always difficult to diagnose.^[4] This tumor is often not discovered until patients require radiographs after a trauma. The treatment for this tumor type is usually surgery.^[5] Surgical resection includes curettage, curettage with bone grafting, or amputation. Tumor recurrence^[6] and malignant transformation represent <1% of cases.^[4,7] Enchondroma is rarely involved in the distal phalanx of the hand.^[1,8] No previous study has reviewed the clinical presentation, treatment, differential diagnosis, tumor features, rate of recurrence, or complications of enchondroma in the distal finger. The medullary cavity and the nail in the fingertip are small, and an enchondroma in the distal finger is distinct from enchondromas occurring in other parts of the body precisely because of these characteristics. The particular details of the clinical presentation (clubbing or mallet finger deformity) and the intraoperative treatment with curettage and/or bone grafting will be discussed in this paper.

2. Methods

This was a retrospective study with 34 patients (19 women and 15 men) presenting with an enchondroma in the distal phalanx of the finger who underwent an operation between May 2004 and September 2012 (Table 1). The exclusion criteria were patients with type 2 diabetes, autoimmune diseases, or Ollier disease; those receiving steroids or immune suppressant medications; and patients with a history of injury. We recorded the age, gender, tumor location, initial symptoms, types of surgery received,

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Table 1**Summary data of patients.**

Gender	Age	Location	Initial symptoms
M	26	4	I
M	53	2	P
F	44	2	C
F	52	2	M
F	29	4	C
M	23	3	M
M	14	4	i
F	49	2	M
M	30	2	P
F	43	3	I
F	37	1	P
F	39	5	C
M	36	4	P
M	33	3	P
F	45	1	I
F	46	4	P
M	54	3	P
F	47	2	C
M	39	1	M
M	34	4	C
F	46	5	P
F	29	1	I
M	51	2	P
M	32	3	P
F	27	2	C
M	37	4	P
F	24	1	P
F	39	2	C
M	59	3	I
M	43	4	P
F	47	3	C
M	26	3	P
M	49	2	C
F	57	3	P

Location: thumb=1, index=2, middle=3, ring=4, little=5.
Initial symptoms: infection=I, Clubb=C, Mallet=M, pain=P.

follow-up period, recurrence, and complications. Data are expressed as the mean \pm standard deviation (SD). The average patient age was 39.38 ± 10.97 years (range 14–59). Presenting symptoms and imaging features were recorded. A fine-needle biopsy was performed before the operation as an elective procedure. The surgical procedure was performed under regional or general anesthesia. A brachial tourniquet was used, and the

procedure was carried out with surgical loupes. The surgical technique involved removal of tumors by opening a cortical window and curetting the cavity. After curettage, saline was used for medullary cavity brushing with a syringe needle, and dehydrated alcohol was instilled to kill the tumor cells. The defects were filled with an injectable calcium phosphate cement. All patients received follow-up in our outpatient clinic every 6 months. Bony nonunion was diagnosed when radiographic evidence of grafting absorption was present 6 months after the surgery. Radiological imaging, including anteroposterior (AP) and lateral plain radiographs of the finger, was used to assess for expansion of the bone and thinning of the cortex as a tumor recurrence standard. The observational end-point was reoperation.

Written informed consent was obtained from each patient for publication of this article and any accompanying images. Ethical approval was provided by the medical ethics committee of the First Affiliated Hospital, College of Medicine, Zhejiang University.

3. Results

The enchondroma was located roughly equally in the index finger (10 patients [29% of cases]), middle finger (9 patients [26% of cases]), and ring finger (8 patients [24% of cases]) and appeared less often in the thumb (5 patients [15% of cases]) and the little finger (2 patients [6% of cases]). The presenting initial symptoms of patients included pain in 15 patients (44% of cases), a clubbing finger deformity in 9 patients (26% of cases), an infection in 6 patients (18% of cases), and a mallet finger deformity in 4 patients (12% of cases) (Fig. 1). AP and lateral x-ray films were performed for all patients. A CT scan and 3-dimensional reconstruction were necessary if the patients had cortical bone defects (Fig. 2). In total 15 patients (29% of cases) had cortical thinning and enlargement, 12 patients (35% of cases) had unilateral bone cortex defects, and 6 patients had bilateral bone cortex defects (both volar and dorsal sides, 18% of cases). Patients received 2 types of surgery, curettage (10 patients [29% of cases]) and curettage with bone grafting (24 patients [71% of cases]). An injectable calcium phosphate cement was chosen for bone grafting. The pathological results confirmed each tumor as an enchondroma. The mean follow-up period was 7.18 ± 2.17 years (range 3–11). None of the patients were lost to follow-up or had a tumor recurrence. Surgical complications included delayed unions and infections. A delayed union occurred in 1 patient (3% of cases), but bone union was achieved 1 year later after the patient underwent conservative treatment with bracing. Three patients (9% of cases) had an infection treated by curettage

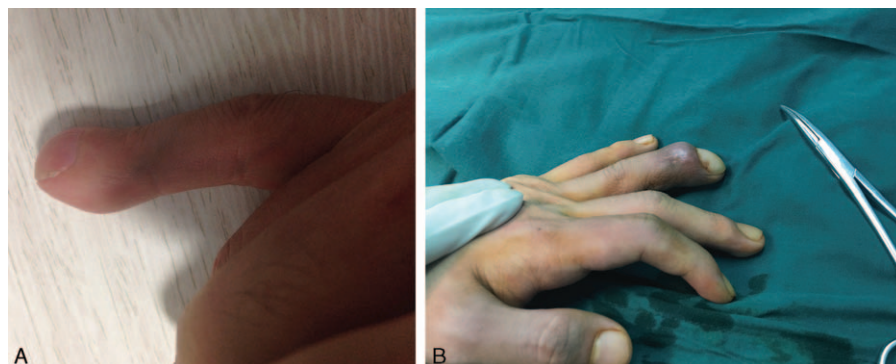


Figure 1. Patient examples are presented with the different initial symptoms (A) clubbing finger deformity and (B) mallet finger deformity.

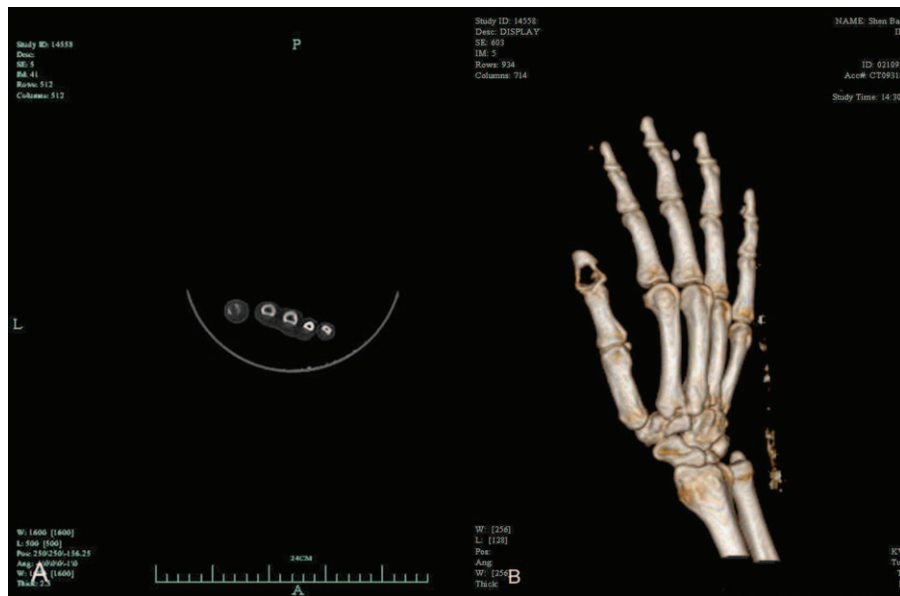


Figure 2. These images show enchondroma in the distal phalanx of the finger. (A, B) The preoperative CT shows bilateral bone cortex defects. CT = computed tomography.

without bone grafting. After antibiotic treatment these 2 patients healed successfully. One patient who developed chronic osteomyelitis twice received surgical debridement and ultimately underwent an amputation.

4. Discussion

An enchondroma in the distal phalanx has different clinical symptoms relative to other parts of the body. Clubbing of the fingers, also known as Hippocratic fingers, is part of a syndrome that includes hypertrophic osteoarthropathy and endocrine, pulmonary, neoplastic, and multisystem diseases.^[9] A neoplastic disease, such as an osteoid osteoma,^[10] mucoid cyst,^[11] or enchondroma,^[12] usually causes a bilateral clubbing deformity, but clubbing can rarely occur in a single finger. Pain can be present in the presence or absence of an infection. A cortical bone

defect can lead to a local subcutaneous infection; the tumor body was completely composed of liquefactive necrosis in some of our patients. Antibiotics and NSAIDs can only alleviate these symptoms. The diagnosis should be differentiated from offending organisms,^[13] acute leukemic infiltration,^[14] cutaneous *Mycobacterium marinum* infections,^[15] and metastases of various carcinomas.^[16,17] Tearing off the attachment of the terminal extensor tendon can also cause a mallet finger deformity. The presence of a typical expansile lytic lesion with cortical thinning in AP and lateral plain radiographs and intra-operative bone necrosis are helpful to differentiate an enchondroma from other diseases. An MRI may contribute to the differential diagnosis and treatment in patients with an infection (Fig. 3). An MRI can identify soft tissue infections, abscess formation, or osteomyelitis in the distal finger and can also provide guidance for clinical antibiotic therapy.



Figure 3. These images show enchondroma in the distal phalanx of the finger. (A, B) A T2-weighted MRI image shows an enchondroma with hypersignal intensity, with the tumor invading the soft tissue leading to an infection of the whole finger.



Figure 4. These images show a 51-year-old male with an enchondroma in his distal ring finger. (A, B) Preoperative radiography and (C, D) 1-year postoperative radiography after tumor curettage with a calcium phosphate cement graft shows bone union and no tumor recurrence.

The surgical incision to treat an enchondroma can be palmar, dorsal, lateral, or fish mouth.^[18] In our experience, the advantage of a palmar incision is that this approach allows the tumor to be fully exposed, but a painful scar remains. A dorsal incision can easily injure the terminal extensor tendon. Based on the imaging, especially the results of CT 3-dimensional reconstruction, we prefer to choose the side with the defective bone cortex because this surgical approach is convenient for bone grafting. Standardized management of an enchondroma in the distal finger is important, especially when dealing with such rare tumors. A high-speed burr or hypercator cauterization is not suitable for cavity curettage because the finger cavity is too small.^[19] We used saline for medullary cavity brushing and dehydrated alcohol instillation to kill the tumor cells. Such operations can be performed with a syringe needle.

For patients with an infection, bone grafting will increase the possibility of graft absorption. In our study, patients received antibiotic therapy preoperatively and debridement during the

operation. Manchio et al^[20] and Schaller and Baer^[21] deemed bone grafting not to be necessary. However, if patients have large osseous defects or a pathological fracture, bone grafting is helpful for their early exercises and functional recovery.^[22,23] Considering the difficulty of a grafting operation in such a small cavity, we did not choose an autogenous bone graft. Instead, we found that an injectable calcium phosphate cement was an acceptable alternative. For patients that had bilateral cortical bone defects, bone grafting will irritate the soft tissue and cause a postoperative infection. We selected bone grafting only for patients with a controlled infection and unilateral defects (Fig. 4).

There are some limitations to our study. First, we had a relatively small group of patients available to assess due to the disease's rarity. Therefore, a prospective multicenter study is needed. Second, making a definitive diagnosis for the patients who present with pain or infection takes time, so those patients typically have more complications and a higher recurrence rate.

In conclusion, enchondroma in the distal phalanx of the finger has different clinical symptoms and features. Delayed treatment will result in serious consequences to patients, like amputations. Individualized surgery contributes to a good postoperative result. If patients have large osseous defects and a controlled infection, we recommend a bone graft. An injectable calcium phosphate cement is adequate for this purpose. Based on the results of CT 3-dimensional reconstruction, we prefer a surgical approach involving the side with the defective bone cortex. If patients have an infection or bilateral bone cortex defects, bone grafting is challenging.

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