CASE REPORT

Fracture of the calcium phosphate bone cement which used to enchondroma of the hand: a case report

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Abstract Enchondroma of a hand is a common benign tumor. Enchondroma commonly presents as a pathological fracture associated with pain, deformity, and swelling. Dysfunction of the fingers occurs as a result of the fracture. Curettage is the mainstay of surgical treatment for enchondroma.

Keywords Enchondroma · Calcium phosphate bone cement · Bone conduction

Introduction

Enchondroma of a hand is a common benign tumor. Enchondroma commonly presents as a pathological fracture associated with pain, deformity, and swelling. Dysfunction of the fingers occurs as a result of the fracture. Curettage is the mainstay of surgical treatment for enchondroma. The bone defect is then filled with bone chips and bone substitutes, such as calcium phosphate bone cement (CPC) and hydroxyapatite [1, 4–8]. We treated enchondroma of the 5th middle phalanx by curettage and filled the defect with CPC. However, fracture of CPC was caused by slight injury. Therefore, we removed this broken CPC and filled the defect with autologous bone graft. After 1 year, patient had achieved good functional and radiographic results.

A case report

A 14-year-old girl developed pain and swelling of the ulnaris of her right hand that persisted for one month. When she presented to our institution, pain had become severe. She had full range of motion of all fingers. Radiograph showed rarefaction of the bone and a radiolucent lesion in the 5th middle phalanx (Fig. 1). The cortex was thinned. We diagnosed enchondroma and performed curettage of the intramedullary canal, then filled the defect with CPC (biopex; Mitsubishi Materials Corp. Tokyo, Japan).

We approached the lesion from the dorsal side. The bone cortex was fenestrated and tumor was curetted. The tumor was like sorbet, in places was found calcification. Part of the bone defect was filled with CPC (Fig. 2). Postoperatively, she returned to playing basketball, because she had regained good hand function.

Thirty-one months postoperatively, she ran into another player while playing basketball. When she presented to our institution again, she complained of pain in the ulnaris of her right hand and the little finger appeared crossed. Radiograph showed fracture of her 5th middle phalanx that was filled with CPC (Fig. 3). She was admitted to our institution for further surgery.

A longitudinal skin incision was made over the 5th middle phalanx. Rarefaction of the cortical bone was remarkable. CPC was curetted by high-speed burr drilling, and the defect was filled with morselized autologous bone from the iliac crest. The 5th middle phalanx was fixed by external fixation with the cap of injection needle and C-wire (Zimmer, Tokyo, Japan.) (Fig. 4). Stability of bone was obtained. 6 weeks postoperatively, the external fixation was removed. Three months postoperatively, radiograph showed bone healing (Fig. 5). One year after the second operation, she

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Fig. 1 Radiograph shows rarefaction of the bone and a radiolucent lesion in the 5th middle phalanx

Fig. 2 Part of the bone defect was filled with CPC

Fig. 3 Radiograph showed fracture of her 5th middle phalanx that was filled with CPC

had regained good functional results and returned to playing basketball.

Discussion

Enchondromas are predominantly seen in the skeleton of the hand and are the most frequent osseous tumors of the hand. In treating enchondromas, surgeons aim to prevent pathological fracture and remove the tumor. There are numerous reports presenting results after operative treatment of enchondromas [1, 4–8]. Enchondromas are treated by curettage and the bone defect is then usually filled with morselized autologous bone chip from the iliac crest or with an allograft. Recently, bone substitutes, such as calcium phosphate bone cement (CPC) and hydroxyapatite, have also been used instead of autologous or allogenic bone grafts [1, 5, 6, 8].

It is well-known that a fresh fracture is surrounded by hematoma, and this hematoma will be invaded by multi-potent mesenchymal cells which differentiate into osteoblasts, a pre-requisite for bone healing [7]. Therefore, curettage has recently become the mainstay of surgical treatment for enchondroma. However, patients who have undergone

Fig. 4 The 5th middle phalanx was fixed by external fixation with the cap of injection needle and C-wire

Fig. 5 Three months postoperatively, radiograph showed bone healing

curettage alone must restrict their activity with the operated hand. We treated our case by curettage and part of the bone defect was filled with CPC during the first operation, because this technique provides immediate mechanical stability and allows early mobilization and force transmission around the adjacent joint [8].

CPC offers advantages over polymethylmethacrylate (PMMA), such as eventual osseous resorption and eutermic consolidation reaction. In vitro, comparing the strength of CPC with that of PMMA in subchondral bone defects, CPC is stronger than PMMA [2]. Regarding bone conduction, CPC is inferior to beta tricalcium phosphate (beta-TCP). Beta-TCP appeared to be a bone replacement material with optimal biocompatibility, resorption characteristics and bone conduction properties for clinical use [3]. However, bone conduction does not occur with CPC.

Yasuda et al. reported outcome of treating enchondroma of the hand by curettage and CPC grafting [8]. The average follow-up period was 41 months that study. They considered CPC a good candidate for treatment of enchondroma of the hand.

The primary stability of CPC is very strong, however, there is no bone conduction of CPC. This is a limitation of using CPC as a bone substitute. Therefore, in our case, we

think fracture of CPC was caused by a slight injury sustained 31 months post-operatively.

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