

# Aneurysmal Bone Cyst Involving the Metacarpal Bone in a Child

Kwang Soon Song, MD, PhD, Si Wook Lee, MD, Ki Cheor Bae, MD, PhD, and Eun Seok Sohn, MD

## Abstract

Aneurysmal bone cysts associated with tubular bones of the hand occur rarely and require particular diagnostic and therapeutic management techniques. While optimal treatment has not been established, accepted treatments range from aggressive radical treatment, including en bloc resection and excision diaphysectomy with strut bone grafting, to relatively simple techniques, such as thorough curettage

followed by bone graft. Aggressive treatment approaches may be optimal for the cases with articular surface involvement, full-bone invasion of the phalanx or metacarpal, or more than 1 recurrence. We report a monocentric case of aneurysmal bone cysts involving metacarpal bone in a child who achieved favorable outcome with curettage and morselized cancellous bone grafts.

Less than 5% of aneurysmal bone cysts (ABCs) are located in the hand,<sup>1</sup> and only a few cases have been reported in the literature.<sup>2-7</sup> Unfortunately, it is impossible to predict when an ABC will exhibit aggressive behavior.<sup>4,8</sup> Aneurysmal bone cysts and giant cell bone tumors have been considered benign<sup>9</sup> lesions that can behave in a locally aggressive fashion.<sup>1</sup> Optimal treatment has not been established because treatment is variable depending on the condition of

the lesion. Several authors have recommended more radical treatment modalities, such as en bloc resection or excision diaphysectomy followed by strut bone grafting, which had a relatively low rate of recurrence. A relatively low rate of recurrence and other complications indicate that those techniques would serve as a good strategy for patients with expansile hand ABCs in terms of safety, simplicity, and reduced number of reoperations.<sup>3,7,10</sup>

**Figure 1.** (A) Anteroposterior radiograph of the hand shows a symmetrical expansile lytic lesion (22×24×25 mm) involving the distal two-thirds of the second metacarpal bone. (B) Coronal magnetic resonance imaging shows a well-defined expansile intramedullary lesion with preservation of the epiphyseal plate, shell-like periosteal reaction, and a multilocular appearance with a hemorrhagic compartment (fluid-fluid levels). (C) The lesion is made up of haphazardly arranged spindle cells, accompanied by clusters of giant cells and areas of reactive bone formation with prominent osteoblastic activity. There is no definite cytologic atypia or increased mitotic activity (hematoxylin-eosin, original magnification ×400).



**Authors' Disclosure Statement:** The authors report no actual or potential conflict of interest in relation to this article.

This article reports a case of an ABC of the second metacarpal bone of the right hand in a 12-year-old boy treated with curettage and autologous morselized iliac bone grafting. The patient's guardian provided written informed consent for print and electronic publication of this case report.

### Case Report

The patient was a right hand–dominant 12-year-old-boy, who noticed the development of a lump in the dorsum of his right hand. On examination, we found a large, firm swelling of the dorsum of his right hand over the second metacarpal. Radiographic examination showed a symmetrical expansile lytic lesion (22×24×25 mm) involving the entire second metacarpal bone (Figure 1A). Magnetic resonance imaging (MRI) showed a well-defined expansile intramedullary lesion with preservation of the epiphyseal plate, shell-like periosteal reaction, and a multilocular appearance with a hemorrhagic compartment (fluid-fluid levels) (Figure 1B).

At surgery, we found a blood-filled cyst, and the cortex was very thin. The lesion extended to the distal two-thirds of the bone to the level of the physal plate. We had considered using allograft or other bone substitutes. However, we did not have confidence in the bone-induction potential and power of osteogenesis of bone substitutes or allograft compared with autologous bone graft. Consequently, we performed autologous bone grafting, despite its being an invasive procedure, on the immature iliac crest. We performed thorough curettage of the intramedullary material without damaging the physal plate, followed by impact morselized autologous bone grafting. Histologic examination confirmed that the final diagnosis was identical to the provisional diagnosis shown on MRI (Figure 1C). A thumb spica cast was applied for 4 weeks after surgery, and regular follow-up radiographs were taken for 3 years and 6 months until confirmation of complete normalization of the lesion without recurrence (Figures 2A-2C).

### Discussion

Primary ABCs in the small tubular bones of the hands are rare. Less than 5% of aneurysmal cysts are located in the hand.<sup>1</sup> Only a few small cases of this condition have been reported in the literature.<sup>2-7</sup> Radiographic examination showed that, in all cases, the lesion was both expansile and completely lucent.<sup>7</sup> Although radiographic finding of ABC in short tubular bone characteristically shows central symmetry with expansion into the diaphysis and subarticular bone, the appearance of an ABC on radiographs and angiograms is usually not diagnostic.<sup>8</sup> Even though fluid-fluid levels are highly suggestive of ABC, only pathologic study confirms the diagnosis. MRI may be a good tool for postsurgery follow-up. On the basis of these ideas, we performed histological examination and confirmed the diagnosis of ABC of the metacarpus by radiograph and MRI.

The goals in the treatment of primary ABCs are preservation of function and avoidance of recurrence. Unfortunately, it is impossible to predict the possible aggressive behavior in ABCs. Active or aggressive character in certain localizations of ABC in children requires either curettage, which has a considerable recurrence rate, or radical segmental excision, which raises complex reconstructive challenges. Frassica and colleagues<sup>7</sup> reported no recurrences in 3 patients treated by complete excision and bone grafting. Curettage and bone grafting in 7 cases were associated with 4 recurrences.<sup>7</sup>

Because optimal treatment has not been established,<sup>3</sup> current recommendations vary, depending on the condition of the lesion. Several authors recommend more radical treatment modalities, such as en bloc resection, excision diaphysectomy, cryotherapy, and strut bone grafting, and a relatively low rate of recurrence and other complications indicates that those techniques would serve as a good strategy for patients with expansile ABCs in the hand.<sup>3,7,10</sup> On the other hand, successful results with less aggressive procedures, such as curettage and



**Figure 2.** (A) Immediate postoperative radiograph shows the lesion filled with morselized autologous bone graft. (B) Six-month follow-up radiograph shows remarkable reduction of the ballooned cortex and reshaping of the metacarpal bone with disappearance of the intramedullary radiolucent lesion. (C) At 3-years-and-6-months follow-up, the metacarpal bone has recovered completely.

autologous bone grafting, have been reported.<sup>4,5,8</sup>

In pediatric patients, surgery to preserve the growth plate is recommended.<sup>5</sup> Ropars and colleagues<sup>4</sup> suggested that aggressive treatment approaches, such as cryotherapy and resection with reconstruction, should be used only in cases when the articular surface is involved, when full-bone invasion of the phalanx or metacarpal has occurred, or in cases of more than 1 recurrence.

In conclusion, despite the high risk of recurrence of ABC treated with curettage with bone grafting, the findings of the present case show that ABC of the metacarpal bone in children can be treated successfully with curettage followed by morselized autologous bone grafting without recurrence.

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Dr. Song is Professor, Dr. Lee is Clinical Instructor, and Dr. Bae and Dr. Sohn are Associate Professors, Department of Orthopedic Surgery, Dongsan Medical Center, School of Medicine, Keimyung University, Daegu, Korea.

Address correspondence to: Kwang Soon Song, MD, Department of Orthopedic Surgery, Dongsan Medical Center, 56 Dalsungro, Jung-gu, Daegu, Korea. 700-712 (tel, 82-53-250-7729; fax, 82-53-250-7205; e-mail, [skspos@dsmc.or.kr](mailto:skspos@dsmc.or.kr)).

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## References

1. Athanasian EA. Aneurysmal bone cyst and giant cell tumor of bone of the hand and distal radius. *Hand Clin.* 2004;20(3):269-281, vi.
2. Tarazona-Velutini P, Romo-Rodriguez R, Saleme-Cruz J. Aneurysmatic bone cyst in the proximal phalanx of a finger. Case report and literature review. *Acta Ortop Mex.* 2012;26(4):245-249.
3. Jafari D, Jamshidi K, Najdmazhar F, Shariatzade H, Liaghat O. Expansile aneurysmal bone cyst in the tubular bones of the hand treated with en bloc excision and autograft reconstruction: a report of 12 cases. *J Hand Surg Eur Vol.* 2011;36(8):648-655.
4. Ropars M, Kaila R, Briggs T, Cannon S. Aneurysmal bone cysts of the metacarpals and phalanges of the hand. A 6 case series and literature review. *Chir Main.* 2007;26(4-5):214-217.
5. Sproule JA, Salmo E, Mortimer G, O'Sullivan M. Aneurysmal bone cyst of the proximal phalanx of the thumb in a child. *Hand Surg.* 2002;7(1):147-150.
6. Schwartz GB, Hammerman MZ. Aneurysmal bone cyst of the fifth metacarpal. *Orthop Rev.* 1989;18(12):1309-1314.
7. Frassica FJ, Amadio PC, Wold LE, Beabout JW. Aneurysmal bone cyst: clinicopathologic features and treatment of ten cases involving the hand. *J Hand Surg Am.* 1988;13(5):676-683.
8. Louahem D, Kouyoumdjian P, Ghanem I, et al. Active aneurysmal bone cysts in children: possible evolution after biopsy. *J Child Orthop.* 2012;6(4):333-338.
9. Lindfors NC. Treatment of a recurrent aneurysmal bone cyst with bioactive glass in a child allows for good bone remodelling and growth. *Bone.* 2009;45(2):398-400.
10. Salon A, Rémi J, Brunelle F, Drapé JL, Glorion Ch. Total replacement of a middle phalanx by free non-vascularized chondral graft, after failure of sclerotherapy for treatment of an aneurysmal bone cyst. *Chir Main.* 2005;24(3-4):187-192.