Results of Curettage and High-speed Burring for Chondroblastoma of the Bone

Chia-Chen Hsu, MD; Jun-Wen Wang, MD; Chin-En Chen, MD; Jui-Wei Lin[1], MD

Background: Chondroblastomas of the bone are rare lesions. Most of these lesions can be successfully treated by curettage and bone grafting. However, a considerable rate of recurrence has been reported, especially in aggressive lesions. The purpose of this study was to report the results of 10 cases of chondroblastomas of the bone treated with curettage and high-speed burring.

Methods: Ten patients with histologically confirmed chondroblastoma of the bone were treated with curettage and high-speed burring between October 1991 and August 2000. There were 7 men and 3 women with an average age of 18.9 (range, 12 to 30) years. Radiographically, 3 were classified as having aggressive lesions, and 7 were classified as having non-aggressive ones. For treatment, 8 of them had defects packed with either bone grafts or bone substitutes; 1 defect was packed with bone cement; and the other was left alone because the lesion was small.

Results: At an average follow-up period of 62 (range, 8 to 112) months, all patients had painless, normal function of the affected limb without local recurrence or distant metastasis. Complete healing of the lesion was seen in 8 patients including the one without a bone graft. The lesion in 1 patient who had received bone cement remained unchanged radiographically. One patient experienced incomplete healing of the lesion, which was caused by inadequate packing of the bone substitute.

Conclusion: Curettage and high-speed burring represent an effective method for the treatment of chondroblastoma of the bone whether in the non-aggressive or aggressive stage.

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Key words: **chondroblastoma, curettage, high-speed burring.**

Chondroblastomas of the bone are benign and rare, but locally aggressive, tumors of the bone that account for approximately 1%-2% of all benign bone tumors.[1-4] In 1942, Jaffe and Lichtenstein suggested the diagnosis of "chondroblastoma" according to the histological characteristics of a variant of giant-cell tumor with cartilage.[5] Most authors reported that the tumors arise from a secondary ossification center of the epiphyseal plates and apophyses and present during adolescence and young adulthood.[1-6] The tumor typically presents as a lytic lesion on an epiphyseal or apophyseal portion. Dystrophic (chicken-wire) calcification is occasionally present but is not necessary for a diagnosis.[1,2,7,8]

From the Department of Orthopaedic Surgery, [1]Department of Pathology, Chang Gung Memorial Hospital, Kaoshiung.
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Address for reprints: Dr. Jun-Wen Wang, Department of Orthopaedic Surgery, Chang Gung Memorial Hospital. 123, Dabi Road, Niaosung Shiang, Kaohsiung, Taiwan 833, R.O.C. Tel.: 886-7-7317123 ext. 8003; Fax: 886-7-7318762; E-mail: lee415@cgmh.org.tw

Currently, the lesions are curetted and packed with autogenous, allogeneic bone chips or polymethyl methacrylate (PMMA) bone cement. However, chondroblastomas can present as aggressive lesions radiographically and clinically. Recurrence rates after curettage ranging from 10% to 35% and unusual pulmonary metastases have been reported.[1,2,9-15] Some authors have recommended phenolization or cryotherapy after curettage in order to reduce recurrence.[16-18] The purpose of this retrospective study was to evaluate the clinical results of treatment of chondroblastomas with high-speed burring after curettage.

METHODS

Between October1991 and August 2000, ten patients with a histologically confirmed chondroblastoma of the bone were treated with curettage and high-speed burring. There were 7 men and 3 women with an average age of 18.9 (range, 12 to 30) years. Locations of the tumors included the distal femur in 3, proximal femur in 2, and proximal humerus, proximal tibia, distal tibia, talus, and patella in 1 each (Table 1). In 3 patients (cases 8, 9, and 10), the physis adjacent to the tumor remained open. The locations of lesions with an open physis were the proximal tibia, distal tibia, and distal femur in 1 patient each.

Lesions are classified into latent, active, and aggressive based on the radiographic stages indicative of the lesion's activities. Latent lesions are confined to the bone, with a complete, well-defined reactive rim of bone surrounding a radiolucent lesion. Active lesions are either confined to the bone but have an incomplete reactive rim, or are contained within a rim of reactive periosteal bone. Both latent and active lesions were classified as non-aggressive lesions. Lesions with a poorly defined margin and cortical destruction or an extraosseous component that is not surrounded by periosteal bone are classified as aggressive lesions.[4] A magnetic resonance image (MRI) or computed tomographic (CT) scan study was performed if the lesion was considered radiographically aggressive.

The operative method included a large cortical window for adequate exposure, extensive curettage, high-speed burring of the tumor margin, and saline lavage, while some defects were packed with bone grafts or substitutes (OsteoSet®: calcium phosphate, Wright Medical Technology, Arlington, TN).

All of the patients were able to return for regular radiological and clinical examinations at 6 weeks, 3 months, 6 months, and yearly after the operation. The average follow-up was 62 (range, 8 to 112) months.

Local recurrence was considered if there was radiographic evidence of an enlarged radiolucent lesion at the operative site with or without histological confirmation. Patients who had persistent radiolucency at the operative site with no increase in size were not considered to have had local recurrence.[4]

Table 1. Data of Patients

Case	Gender	Age (yr)	Radiographic stage	Location	Physis status	ABC component	Filling materials	Follow-up (months)	Bone lesion
1	F	30	active	left distal femur	closed		PMMA cement	41	cemented
2	M	25	active	left distal femur	closed	-	allograft	95	healed
3	M	22	active	greater trochanter of the left femur	closed	-	OsteoSet®	42	incomplete healing
4	F	20	aggressive	right femoral head	closed	-	allograft and OsteoSet®	28	healed
5	M	19	active	left patella	closed	+	autograft	8	healed
6	M	18	aggressive	right proximal humerus	closed	-	allograft & OsteoSet®	24	healed
7	M	15	aggressive	right talus	closed	-	allograft	106	healed
8	M	15	active	right proximal tibia	open	-	none	68	healed
9	M	13	latent	right distal tibia	open	-	allograft	112	healed
10	F	12	active	right distal femur	open	-	allograft	93	healed

RESULTS

Three patients had aggressive lesions, 2 of which showed cortical destruction (Fig. 1) (cases 6 and 7) and 1 cartilage perforation (case 4). Six lesions were classified as active, while 1 lesion in the distal tibia was classified as latent. The presenting symptoms were pain in all patients, decreased range of motion of the adjacent joint in 3, weakness in 3, and swelling in 2. No patient had recognized joint effusion, except 1 who had an aggressive lesion in the femoral head (case 4).

The cavity after curettage was packed with autogenous bone grafts in one; allogeneic bone grafts in 4; allogeneic bone grafts plus OsteoSet® in 2; OsteoSet® in 1, and PMMA bone cement in 1. One defect was left alone with no filler because the lesion was small (case 8). One patient had allograft strut reconstruction in the femoral head to prevent fracture (Fig. 2). In another patient, reconstruction of the rotator cuff to the allograft was performed because the tumor had invaded into the greater tuberosity of the proximal humerus (Fig. 1). Only 1 patient with patellar involvement had an aneurysmal bone cyst component in the chondroblastoma.

Eight patients showed complete healing of the lesion radiographically. There was no radiolucency between the bone and cement interface in 1 patient (case 1) receiving PMMA bone cementation after curettage and burring in her left distal femur at a follow-up of 41 months. Incomplete healing of the greater trochanter of the left femur was noted in 1 patient (case 3) who had inadequate OsteoSet® packing of the defect. A follow-up MRI study 6 months

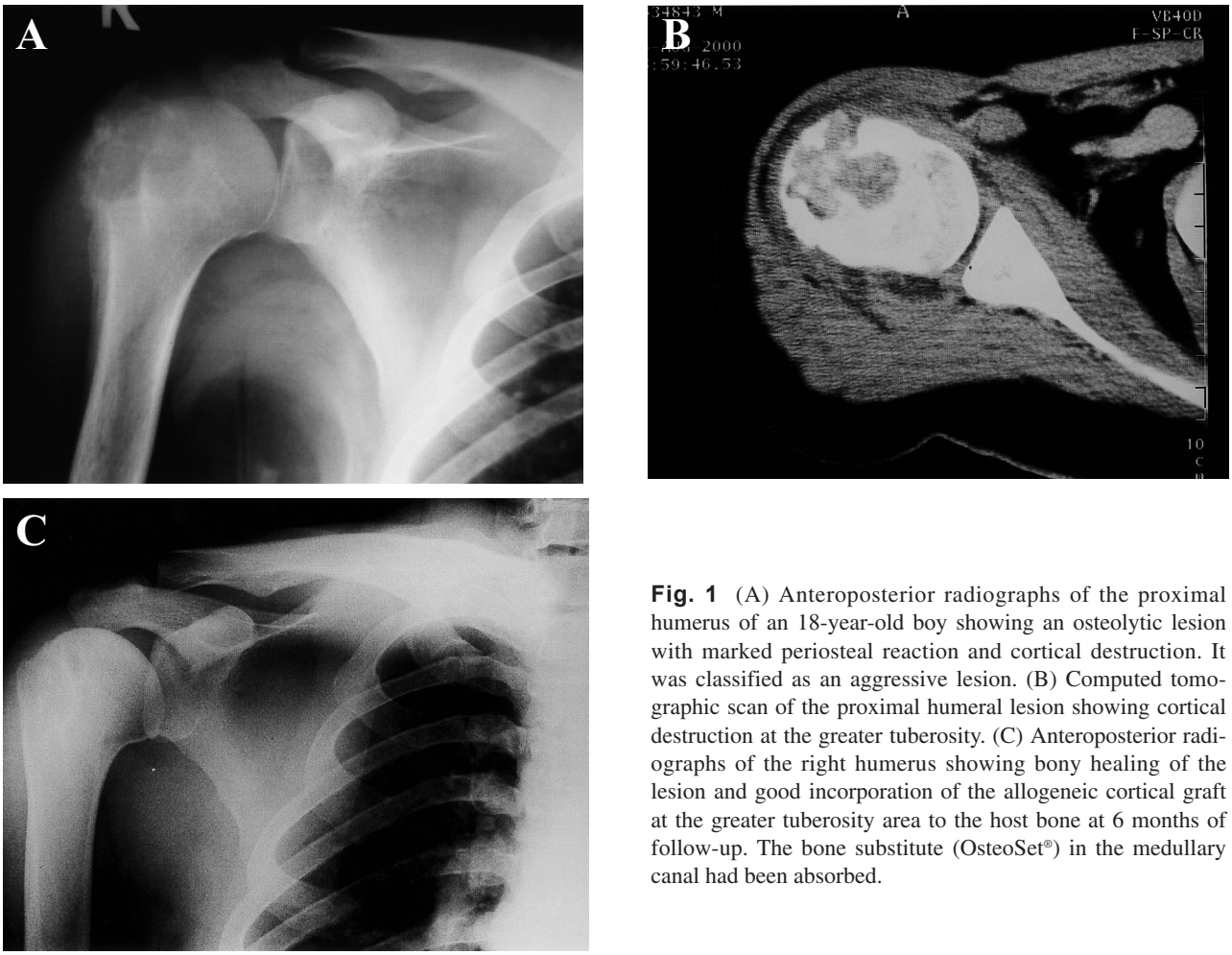

Fig. 1 (A) Anteroposterior radiographs of the proximal humerus of an 18-year-old boy showing an osteolytic lesion with marked periosteal reaction and cortical destruction. It was classified as an aggressive lesion. (B) Computed tomographic scan of the proximal humeral lesion showing cortical destruction at the greater tuberosity. (C) Anteroposterior radiographs of the right humerus showing bony healing of the lesion and good incorporation of the allogeneic cortical graft at the greater tuberosity area to the host bone at 6 months of follow-up. The bone substitute (OsteoSet®) in the medullary canal had been absorbed.

after surgery showed regressive change and a decreased size of the radiolucency. He was symptom-free at the latest follow-up. There were no recurrences or distant metastases including 3 patients with aggressive lesions (Table 1). All patients had painless, normal function with respect to activities of daily living, except for 1 patient (case 6) who underwent reconstruction of the rotator cuff to the allogeneic greater tuberosity. He subjectively felt weakness of the right shoulder. However, his right shoulder was pain-free and had a full range of motion.

DISCUSSION

Chondroblastomas of the bone are uncommon lesions and occur in the second decade of life in the vast majority of cases.[2,6] Male patients predominate.[1-4] Our patients had a similar demographic picture.

Chondroblastomas are usually located in the epiphysis or apophysis of the long bone. They are thought to arise from secondary ossification centers.[1,2,5-7] The knee and proximal humerus are the most frequently involved locations.[2-4,6] In the current report, there were 3 distal femur lesions, and 7 of 10 were in the epiphyses of the long bone. No pure metaphyseal or diaphyseal lesions were seen in this series, although they have been reported.[19-21]

Effusion of the adjacent joint around the lesion was noted in one-third of patients.[3,4] Intra-articular surgery was not suggested because the synovitis resolved without specific treatment after tumor excision.[4] In this series, the only patient (case 4) who had joint effusion was a 20-year-old woman whose lesion was located in the femoral head. An extra-articular excision of the tumor and reconstruction of the defect with an allograft strut and Osteoset® resulted in complete healing of the lesion and excellent functional recovery (Fig. 2).

Chondroblastomas of the bone may recur after curettage, and metastasis to the lung has been reported in the literature.[12-15] The age and gender of the patient, the status of growth plate, the aneurysmal-bone-cyst component of the tumor, and its location and size have been discussed and linked to recurrence.[4,6,14] In the latest report by Ramappa et al., the only statistical differences between non-recurring and recurring tumors were their anatomical locations. Lesions around the hip had the highest recurrence rate.[14] Their explanation for this phenomenon was the difficulty in gaining access to these lesions because of the concern about compromising the blood supply to the femoral head. Also, this anatomical site is known for harboring more-aggressive lesions, particularly the cartilage tumor.[1,22]

Many methods ranging from intralesional curettage to wide excision have been proposed for the treatment of chondroblastomas of the bone. Most authors agreed upon curettage and bone grafting as the treatment of choice. However, there is a consid-

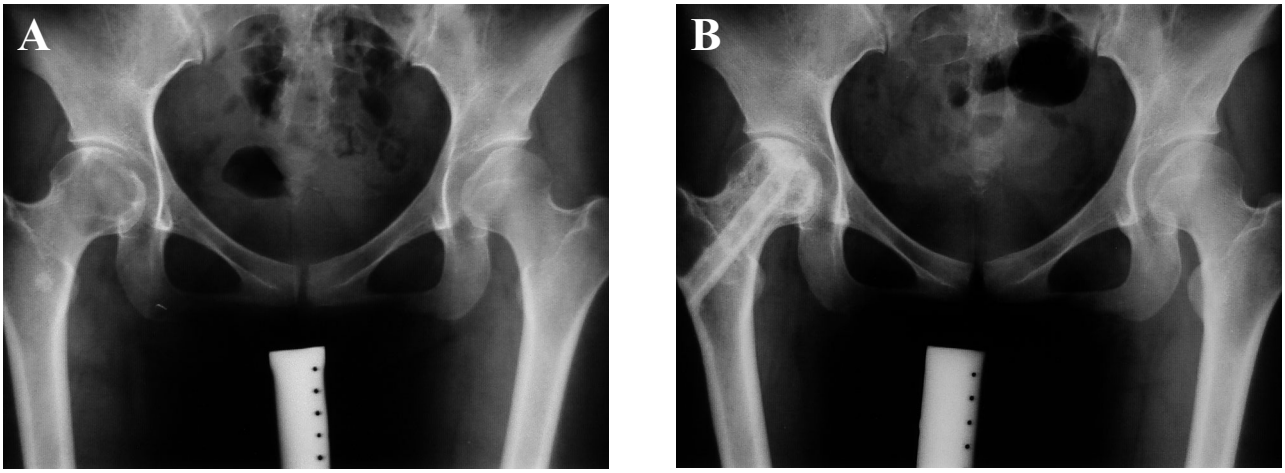

Fig. 2 (A) Anteroposterior radiographs of the pelvis of a 20-year-old woman showing a large osteolytic lesion in the proximal femur. Subchondral destruction of the femoral head can be seen; this was also classified as an aggressive lesion. (B) Anteroposterior radiographs of the pelvis showing an allograft strut graft in the proximal femur with good bone healing at 20 months of follow-up.

erable chance of recurrence (10% to 35%).[1,2,14,16] Dahlin and Ivin reported a 6.6% recurrence rate, while Schajowicz and Gallardo reported a recurrence rate of 13.8% after curettage. We think the lesions should be treated more aggressively after curettage. Some authors advocated treatment with phenolization, cryosurgery, or cementation after curettage for local control.[16-18,23] Ramappa et al. recommended that bone cement be chosen over bone grafts to fill the defect after removal of worrisome or recurrent lesions. They thought that the heat of polymerization of the cement might destroy residual tumor cells after curettage.[14] In some aggressive or recurrent lesions, wide resection with arthrodesis or even amputation was performed.[11,14,24]

In this series including 3 aggressive lesions, all lesions were treated with high-speed burring after curettage. No recurrence was found at an average of 62 months of follow-up. We agree with the views by Springfield that "thorough curettage" is the key to local control.[4] We used high-speed burring for local control after curettage, as many authors have suggested in the management of benign aggressive bone tumors such as giant cell tumors.[25,26] In most lesions, 1 to 2 mm of bone could be burred out under direct vision after curettage with an adequate cortical window. This makes the intralesional curettage approach a marginal excision, thereby enhancing tumor eradication. The recurrence rate might subsequently decrease. In our 3 aggressive lesions, some special reconstructions were needed after burring. In the patient with the right proximal humeral lesion (case 6), rotator cuff reconstruction to an allogeneic cortical bone graft was needed after aggressive burring because of the greater tuberosity had been destroyed by the tumor. Although this patient subjectively felt that his right shoulder was weak, he had full range of motion and was pain-free. More importantly, the bone defect after curettage and burring healed without local recurrence at 24 months of follow-up. In the other 2 aggressive lesions, the bone defect also healed uneventfully without local recurrence.

Growth plate violation is still of great concern in the management of chondroblastomas of the bone. A growth disturbance rate of 7% was reported in patients 14 years or younger with open growth plates.[27] However, growth disturbances and functional deficits are not common, because most patients are close to skeletal maturity.[27] In our cases, no patients with open physis at the time of the operation displayed a limb-length discrepancy.

A review of the literature indicated that simple curettage in the treatment of chondroblastomas produces a considerable recurrence rate and might be inadequate treatment. In the current study, high-speed burring after curettage was found to be an effective method. We recommend high-speed burring after curettage, especially for aggressive lesions. Care must be taken to avoid damaging the adjacent physis if it is open.

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骨之軟骨母細胞瘤

許家禎 王俊聞 陳金恩 林瑞偉[1]

背 景： 軟骨母細胞瘤是一少見之骨腫瘤。大多數可以刮除及植骨之方法成功治療。然而此腫瘤有相當程度之復發率，尤其是在較侵襲性的病灶。本研究之目的乃報告十個軟骨母細胞瘤病例以刮除、高速電銼之方法治療之結果。

方 法： 於1991年10月至2000年8月計有十例軟骨母細胞瘤病例以刮除術併以高速電銼治療。有三例女性、七例男姓病例，平均年齡18.9歲 (12歲到30歲)。有三個腫瘤在X光下被歸類於較侵襲性、另七個腫瘤被歸類於較非侵襲性。八個病例腫瘤切除後缺損以移植骨或人工代用骨充填之。一例之缺損以骨水泥充填之。另有一例因缺損較小未接受切除後充填。

結 果： 在平均62個月的追蹤所有病人之患肢均有良好之功能且沒有腫瘤復發或遠處轉移現象。八個病例 (包含一未接受切除後充填病例) X光追蹤呈現完全骨病灶癒合。一例接受骨水泥充填之病例在X光追蹤沒有改變現象，一例接受代用骨充填缺損處之病例仍有骨癒合不全現象。

結 論： 以刮除術、高速電銼治療骨之軟骨母細胞瘤是一個有效之方法。

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關鍵字： 軟骨母細胞瘤，刮除術，高速電銼。

長庚紀念醫院 高雄院區 骨科，[1]病理科
受文日期：民國92年3月11日；接受刊載：民國92年5月20日。
索取抽印本處：王俊聞醫師，長庚紀念醫院 骨科。高雄縣833鳥松鄉大埤路123號。Tel.: (07)7317123轉8003; Fax: (07)7318762; E-mail: lee415@cgmh.org.tw