

## Effect of Ethanol as an Adjuvant to Extended Curettage on Recurrence Rate of Unicameral Bone Cyst

### Abstract

**Background:** To assess the efficacy of ethanol as an adjuvant in the treatment of unicameral bone cyst (UBC). **Materials and Methods:** Surgically treated patients with UBC lesion were reviewed. Definite treatment of UBC lesions was conducted using a combined four-step alcohol-using approach, consisted of curettage, burring, ethanol 96%, and electrocauterization of the lesion, consecutively. **Results:** Twenty-one patients (mean age 14, range: 2–30, male 62%) were followed from 1 to 10 years. Among 18 cases, only one recurrence was seen in a 5-year-old boy with UBC of the left calcaneus. **Conclusions:** Using ethanol as an adjuvant may be a good choice for treatment of UBC lesions.

**Keywords:** Alcohol, ethanol, neoplasm, tumor, unicameral bone cyst

### Introduction

Unicameral bone cyst (UBC), also known as simple or solitary bone cyst, is a primary benign bone lesion. Radiographically, it appears as a centric single cavity in the metaphysis of long bones such as in the proximal humerus and femur. Furthermore, it could be developed in flat bones (e.g., calcaneus). UBCs are almost exclusively seen in the first and second decades of life with male predominance. Often, UBCs are asymptomatic and may resolve spontaneously with skeletal maturity.<sup>[1-3]</sup> Radiographically, the UBC could be classified as active or latent based on its distance to the growth plate. When UBC is placed within 0.5 cm from the physis, it is termed as active, and if the distance is more than 0.5 cm, it is labeled as latent.<sup>[4,5]</sup> Although the exact etiology of UBC is unknown, several theories such as trauma, elevated levels of prostaglandins, and venous congestion have been proposed.<sup>[6-8]</sup>

These ambiguities regarding the pathogenesis of UBC cause different methods of treatment and many controversies about the choice of the best treatment.<sup>[6,9]</sup> Management options include observation, injection, decompression, and surgical techniques such as curettage and bone grafting in combination with different adjuvants.

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The aim of this study was to evaluate the usefulness of ethanol as an adjuvant in a combined four-step procedure including curettage, high-speed burring, ethanol 96%, and electrocauterization followed by grafting to reduce local recurrence of UBCs.

### Materials and Methods

#### Study design

In this retrospective cross-sectional study, medical records of all the patients with UBC lesion treated from 2003 to 2013 were reviewed, retrospectively. Eligibility criteria were patients with histological diagnosis of UBC lesion and full documented medical, surgical, and follow-up records. The protocol of this study was conformed to the tenets of the Helsinki Declaration of 1975, as revised in 1983, and was approved by the Local Ethics Committee at our university.

Based on the patients' medical records, demographic data (age at the time of the surgery and gender), the primary symptom of the patient, exact location of UBC lesion, pathologic reports, and further surgeries were reviewed. Furthermore, the most recent available images were studied to determine any possible recurrences.

#### Surgical technique

Suspicious lesions were treated with biopsy and curettage to determine the exact

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pathology. Definite treatment of UBC lesions was conducted using our approach, called the combined four-step alcohol-using approach, consisted of extended curettage, high-speed burring, ethanol 96%, and electrocauterization of the lesion, consecutively.<sup>[10]</sup> Extended curettage was performed to remove all abnormal tissues. After using high-speed burr on the walls of the lesion, the defect was irrigated by normal saline. In the third step, ethanol 96% was carefully poured in the lesion with a syringe to fill it completely. Any possible spill of ethanol in the surrounding tissues was suctioned immediately. After 1 min, ethanol was evacuated by suction tube followed by irrigation with normal saline. This cycle was repeated three times. Following irrigation to eliminate the risk of explosion, electrocauterization of the lesion with monopolar coagulation diathermy set to 50 W was performed on the whole wall of the lesion. The protocol of combined four-step alcohol-using approach was carried out in lesions of any bone of the body irrespective of the size or location except in the spinal region. Finally, the void would be filled by autograft or allograft. We routinely used autograft from the iliac crest to fill the defect, but allograft should be used for larger defects in the children. Treating of pathological fractures was a little different; after extended curettage, the fracture was reduced and fixed. After covering the periphery of the fracture by multiple gauzes and using a suction tube to reduce the risk of ethanol leakage, ethanol was spilled in the lesion. After electrocauterization, a bone graft was impacted in the defect.

### Statistical analysis

Data were entered into the Statistical Package for the Social Sciences software version 15.0 (SPSS Inc., Chicago, IL, USA). Demographic data and characteristics of lesions were presented using descriptive statistics.

### Results

During the study period, 21 patients with histological diagnosis of UBC were involved. The follow-up period was 1–10 years. The mean age of the patients at the time of surgery was 14 (range: 2–30 years). As demonstrated in Table 1, nearly half of the cases were between 10 and 20 years of age, and most of them were male (62%). About 62% of lesions were inactive and mostly seen on the left-sided limbs of the body (57%). Humerus was the most common location of UBC lesions (62%), followed by femur (28%). The most common presentation of lesions was a pathologic fracture (43%).

Totally recurrence has been observed in one patient among cases treated using combined four-step alcohol-using approach [Table 2]. This case was a 5-year-old boy with UBC of the left calcaneus treated using extended curettage with allograft insertion. He developed local recurrence of lesion 4 years after surgery. The recurrent lesion was treated again as the same as the first procedure. There is

**Table 1: Demographic data of patients and characteristics of unicameral bone cyst lesions**

Variables	n (%)
Age (years)	
≤10	6 (28)
10-20	10 (48)
≥20	5 (24)
Gender	
Male	13 (62)
Female	8 (38)
Anatomic site of lesions	
Femur	6 (28)
Humerus	13 (62)
Fibula	1 (5)
Calcaneus	1 (5)
Side of lesions	
Left limbs	12 (57)
Right limbs	9 (43)
First presentation of lesions	
Pathologic fracture	10 (43)
Pain	6 (31)
Incidental	4 (21)
Mass	1 (5)

**Table 2: Treatment methods and recurrence rate**

Treatments	Subject, n (%)	Recurrence, n (%)
Biopsy and curettage	3 (14)	0
Extended curettage + autograft	13 (62)	1 (7.7)
Extended curettage + allograft	5 (24)	0

no evidence of recurrence in 5 years following the second operation.

### Discussion

The main goals in the treatment of UBC lesions are complete healing without any recurrence, resolving pain, and decreasing the risk of pathologic fracture.<sup>[11]</sup> Although there is no any consensus on the best therapeutic modalities of UBC lesions, invasive interventions and surgical treatments are preferred instead of medical therapies such as diphosphonates and botulinum toxins.<sup>[6,12]</sup> Intralesional injection of steroid or autologous bone marrow with or without demineralized bone marrow may be a useful technique to treat UBC lesions.<sup>[1,13,14]</sup> Decompression and drainage of cyst fluid using cannulated screws are another choice to treat UBCs.<sup>[15]</sup>

The classic management of UBC lesions is open curettage and bone grafting using autograft, allograft, or bone substitute. Instrumentation after curettage and bone grafting could be used to increase the stability.<sup>[9,12,16]</sup> Recurrence rate following open curettage and bone grafting or its substitute is about 25%–37%.<sup>[15,17]</sup> Hence, using an adjuvant can reduce the risk of recurrence.

Hou *et al.* used ethanol cauterization as an adjuvant in a minimally invasive curettage approach in addition to synthetic calcium sulfate bone-graft substitute. They described shorter time to solid union in UBC lesions treated by ethanol as an adjuvant in comparison to the patients treated by open curettage and grafting. Moreover, no recurrence was seen in cases for which ethanol was used.<sup>[17]</sup>

Nowadays, intracystic injection of alcohol is the best choice of UBC treatment with low complication in some centers.<sup>[18]</sup> Moreover, the efficacy of ethanol to reduce recurrence rate after treatment of giant cell tumor, aneurysmal bone cyst, osteoid osteoma, skeletal metastasis, and other bone lesions has been described in the literature.<sup>[10,19-22]</sup> To the best of our knowledge, the efficacy of ethanol as an adjuvant therapy in UBC lesions has not been described yet. In our study, we evaluated healing and recurrence rate of UBC lesions after ethanol usage as an adjuvant with curettage and bone grafting. We had only one recurrence among 18 cases (5.5%) received combined four-step alcohol-using approach followed by grafting, either autograft or allograft.

The main limitation of our study was the number of patients. Hence, we could not assess the effect of other variable factors such as the patients' demographic data and tumor characteristics on healing or recurrence rate.

## Conclusions

The four-step alcohol-using approach may be a good choice of treatment with low recurrence in patients with UBC lesions. However, certainly, studies with better design and more sample size as well as extended follow-up are necessary.

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## Conflicts of interest

There are no conflicts of interest.

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