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Factors Affecting Recurrence in Chondroblastoma: Retrospective Analysis of 48 Cases

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Chondroblastoma is an infrequent benign cartilaginous bone tumor. The gold standard surgical treatment is intralesional curettage with or without local adjuvant therapy, such as high-speed burring, electrocauterization, or intralesional phenol application. Bone grafting or cementation is usually applied to fill the defective area after curettage. This study aimed to retrospectively review a 36-year experience with chondroblastoma at our institution and to investigate the factors affecting recurrence rates. The medical records of 48 consecutive patients who were treated between April 1986 and October 2020 were retrospectively analyzed, with a mean follow-up of 48.3 months. The study included 29 male (60.4%) and 19 female (39.5%) patients, with a mean age of 18.5 years. All patients underwent intralesional curettage; the resulting cavity was filled with bone grafting in 40 cases (83.3%) and with bone cement in 4 cases (8.3%). Arthrodesis was performed in 4 patients (8.3%). Adjuvant therapy with electrocauterization or high-speed burring was used in 25 cases (52.1%). The overall local recurrence rate was 16.7% (8 cases). The recurrence rate was significantly lower in patients who received adjuvant therapy (p=0.020), whereas it was higher (75.0%) in those older than 30 years (p=0.012). No correlation was found between tumor size, radiologic stage, and recurrence rates. In conclusion, intralesional curettage followed by bone grafting was effective for local control in most cases, while electrocauterization or high-speed burring as local adjuvant therapy was associated with lower recurrence rates.

Keywords: Chondroblastoma; intralesional curettage; recurrence; high-speed burring; electrocauterization.

INTRODUCTION

Chondroblastoma is a rare benign cartilaginous bone tumor. It accounts for around 1-2% of all primary bone tumors[1-3]. Kolodny initially described this tumor in 1927 and named it as a cartilage-containing giant cell tumor (GCT). In 1942, Jaffe and Lichtenstein designated this tumor as "benign chondroblastoma". They emphasized for the first time that chondroblastoma is a different type of tumor from GCT[1,4,5].

Chondroblastoma is more frequently observed in males than in females. In the literature, it has been reported that most of the patients were under 20 years old[3,4,6]. Chondroblastoma lesions commonly originate from the secondary ossification centers. It typically occurs in the epiphysis of long bones and less frequently in the apophysis. In rare cases, it can also arise from a metaphyseal location[1,4,7]. The most frequently affected body regions by chondroblastoma are the hip, knee, and shoulder. It is known that the most involved bones are the femur, humerus, and tibia. The tumor may also be observed in flat bones such as the skull or facial bones[1-3,8,9].

The most common symptom associated with the involved bone is pain, followed by a reduction in range of motion. Joint effusion, soft tissue mass and pathologic fracture may also be seen[8,10,11]. Direct radiography is used for diagnostic purposes in all patients. The typical radiographic presentation of chondroblastoma is a well-defined radiolucent bone lesion in an epiphyseal or apophyseal location. Computed tomography (CT) and magnetic resonance imaging (MRI) may also be applied to support differential diagnosis[1,4,8].

The potential for spontaneous healing is low, and surgery is the primary treatment[1,3]. The gold standard surgical treatment is intralesional curettage and filling of the bone defect. Autogenous/allogenic bone

grafts or polymethylmethacrylate (PMMA) bone cements are usually used to fill the defective area after curettage[1,3,4]. High-speed burring, electrocauterization and intralesional phenol application are the most preferred adjuvant treatments. It is known that postoperative recurrence is not uncommon, and the rates of recurrence are reported to range from 10% to 36% in the literature[1,3,9,12].

The aim of this research was to retrospectively review a 36-year experience with chondroblastoma at our institution and investigate the factors associated with the recurrence rates.

MATERIALS AND METHODS

We retrospectively analyzed the records of 48 consecutive patients with chondroblastoma who had been treated at our institution during the period April 1986 to October 2020. A total of 48 patients were included in the study, consisting of 44 patients who received their initial treatment at our clinic after diagnosis and 4 patients who were referred to our clinic after recurrence. We examined the files in the hospital archive of all patients who received treatment with the diagnosis of chondroblastoma within the specified date range. We included all patients in the study whose diagnosis of chondroblastoma was verified histologically according to the pathology report.

The preoperative radiological images of the patients were examined. Preoperative plain radiographs of all patients (48 patients) were obtained from hospital records. CT views were available for 37 patients, while MRI images were available for 26 patients. By evaluating radiological images, data regarding parameters such as the size and location of the lesion, sclerotic rim, cortical destruction, calcification, and lesion activity were recorded. Radiological measurements were performed using a DICOM viewer (RadiAnt DICOM Viewer; Medixant, Poznan, Poland). The linear dimensions of the tumors (length, width, and height) were recorded. Lesions were classified as large if they involved more than 50% of the bone diameter in long bones, or if their maximum diameter exceeded 5 cm in flat bones. The growth plate was evaluated on direct radiographs and classified as open, closing, or closed. The Enneking Staging system was used to perform tumor staging. Preoperative radiographs were evaluated and the lesions were classified as latent, active, or aggressive. Lesions with well-defined rims and confined to the bone were classified as latent. Lesions that were confined to the bone with incomplete reactive rims were classified as active lesions. Tumors with a poorly defined margin were categorized as aggressive.

Surgical procedures were categorized by examining the operation reports in hospital records. Patients were also classified based on whether adjuvant treatment (high-speed burring or electrocauterization) was administered following curettage. High-speed burring was used to enhance curettage by mechanically removing residual tumor tissue and extending the resection margin into healthy bone. Electrocauterization was applied to the cavity wall to eradicate microscopic tumor remnants through thermal coagulation. Both methods were applied as adjuvant techniques following curettage, with the aim of achieving local tumor control. However, the use of these techniques depended on the surgeon's preference, and since our study has a retrospective design, there was no randomization between the groups. As our study covered an extensive time period between 1986 and 2020, patients were analyzed according to the year of surgery in order to investigate a potential era effect. The median year of surgery was 2003, and patients were therefore compared in two groups: those operated before 2003 and those operated thereafter.

The presence of recurrence was investigated by examining postoperative radiographic images and medical records. Recurrences were defined as cases with a persistent radiolucent lesion showing progression on follow-up radiographs. Data regarding the time of recurrence and treatment after recurrence were recorded. Postoperative complications such as wound problems and implant failure were investigated.

Statistical analysis was performed using SPSS v.22.0 (SPSS Inc.,Chicago, IL). Descriptive statistics were used to characterize demographic variables of patients. Mean, median and standard deviation values were used to show descriptive statistics. The impact of factors such as adjuvant therapy, age, tumor size, tumor stage, and growth plate status on the recurrence rate was analyzed. Fisher's exact test and Chi-square test were used to evaluate potential differences. Kaplan–Meier analysis was used to assess recurrence-free survival, and multivariate Cox regression analysis was conducted to identify risk factors associated with recurrence. Variables with a p value < 0.15 in univariate analyses were entered into the multivariate Cox regression model to identify independent risk factors for recurrence and recurrence-free survival. A p-value of less than 0.05 was considered statistically significant. The research was performed in accordance with the Declaration of Helsinki and was approved by

the ethics committee of our institution (Decree No: İ03-165-23).

RESULTS

29 male (60.4%) and 19 female (39.5%) patients with a mean age of 18.5 were included in the study. Mean follow up period was 48.3 months. The most common symptoms were pain and decreased range of motion. All 48 patients (100%) had complaints of pain. 41 patients (85.4%) were observed to have limited range of motion. 15 patients (31.3%) had effusion in joint and 8 patients (16.7%) had soft tissue swelling (Table I).

5 lesions (10.4%) were located in flat bones, while 43 lesions (89.6%) were located in long bones. Of the 43 lesions, 23 (53.5%) were located in the epiphysis. 17 lesions (39.5%) were located in the epimetaphysis. It was observed that 3 lesions (6.9%) were located in the apophysis (Table II).

Enneking staging was performed based on the radiological characteristics of the lesions, and it was observed that 41.7% of 48 cases were latent, 47.9% were active, and 10.4% were aggressive. In our series, the physis was open in 9 patients (18.7%). Growth plate was closing in 8 cases (16.7%) and it was closed in 31 patients (64.6%) (Table II). Proximal humerus (25.0%), proximal tibia (22.9%), proximal femur (16.7%) and distal femur (12.5%) were the most common sites of localization (Figure 1).

All patients underwent intralesional curettage. The resulting cavity was filled with bone grafting in 40 cases (83.3%) (Case examples are presented in Figures 2, 3 and 4). Bone cement was applied in 4 cases (8.3%). Arthrodesis was performed in 4 patients (8.3%) (Figure 5). Adjuvant therapy with electrocauterization or burring was used in 25 cases (52.1%) (Table III).

The initial surgery of 4 patients was performed at another center, and they were referred to our clinic after developing a recurrence. Upon reviewing the operation reports, it was found that curettage and bone grafting were performed on all 4 patients. It was

Table I. — Demographic variables and characteristic details of patients.

Age		
Mean	18.54	
Median	16	
Min-Max	(10-57)	
Standard deviation (SD)	9.09	
Sex (n,%)		
Male	29	60.42%
Female	19	39.58%
M / F	1.53	
Follow up period (months)		
Mean	48.3	
Median	41.5	
Min-Max	(12-240)	
Standard deviation (SD)	39.7	
Symptoms (n, %)		
Pain	48	100.0%
Decreased range of motion	41	85.40%
Effusion	15	31.30%
Swelling	8	16.70%
Lung Metastases (n, %)		
Present	0	0%
Absent	48	100.0%
Pathologic Fracture (n, %)		
Present	0	0%
Absent	48	100.0%
Recurrences (n, %)		
Present	8	16.70%
Absent	40	83.30%
Postoperative Complications (n, %)		
Present	3	6.20%
Absent	45	93.80%

Table II. — Radiological characteristics of the lesions.

Location (n, %)		
Flat bone lesions	5 (10.4%)	
Long bone lesions	43 (89.6%)	
- Epiphysis	23	53.50%
- Epimetaphysis	17	39.50%
- Apophysis	3	6.90%
Lesion size (n, %)		
≥ 50% of the bone diameter	22	45.80%
< 50% of the bone diameter	26	54.20%
Enneking Stage (n, %)		
Latent	20	41.70%
Active	23	47.90%
Aggressive	5	10.40%
Sclerotic Rim (n, %)		
Thick	20	41.70%
Thin	24	50.00%
Absent	4	8.30%
Cortical Expansion (n, %)		
Yes	18	37.50%
No	30	62.50%
Cortical Destruction (n, %)		
No	37	77.10%
Yes	11	22.90%
Calcification (n, %)		
Lucent	33	68.80%
Mildly calcified	12	25.00%
Heavily calcified	3	6.30%
Distance to articular surface (n, %)		
≥ 5 mm	4	8.30%
< 5 mm	38	79.20%
No intact subchondral tissue	6	12.50%
Growth plate status (n, %)		
Open	9	18.70%
Closing	8	16.70%
Closed	31	64.60%

noticed that these 4 patients referred from an outside center did not receive adjuvant methods in their initial treatments. Out of the 44 patients who received initial treatment at our hospital, 4 of them developed recurrence during follow-up. Recurrence occurred in a total of 8 patients, while no recurrence was observed in other 40 patients (Table IV). The overall local recurrence rate was 16.7% (8 cases). The mean time of recurrence was 28.7 months.

Factors associated with recurrence and recurrence-free survival are presented in Table V. Among the variables analyzed, adjuvant treatment and age showed statistically significant associations with both recurrence and recurrence-free survival. Patients who underwent adjuvant treatment (high-speed burring or electrocauterization) showed a significantly lower recurrence rate (4.0% vs. 30.4%, p=0.020) as well as longer recurrence-free survival (p=0.002) compared with those treated without adjuvants. Additionally, being older than 30 years was strongly associated with worse outcomes, with a recurrence rate of 75.0% compared to 11.4% in younger patients (p=0.012) and a substantially shorter recurrence-free survival (p<0.001). Other parameters, including tumor size, Enneking stage, distance to the joint, and era of surgery, did not demonstrate statistically significant associations with recurrence or recurrence-free survival (Table V).

Multivariate Cox regression analysis for recurrence is presented in Table VI. Variables with a p value < 0.15 in the univariate analyses shown in Table 5 were entered into the multivariate model. In this analysis, both adjuvant treatment and age > 30 years were found to be independent predictors of recurrence-free survival. Adjuvant treatment significantly reduced the risk of recurrence (HR = 0.08, 95% CI: 0.01–0.77, p

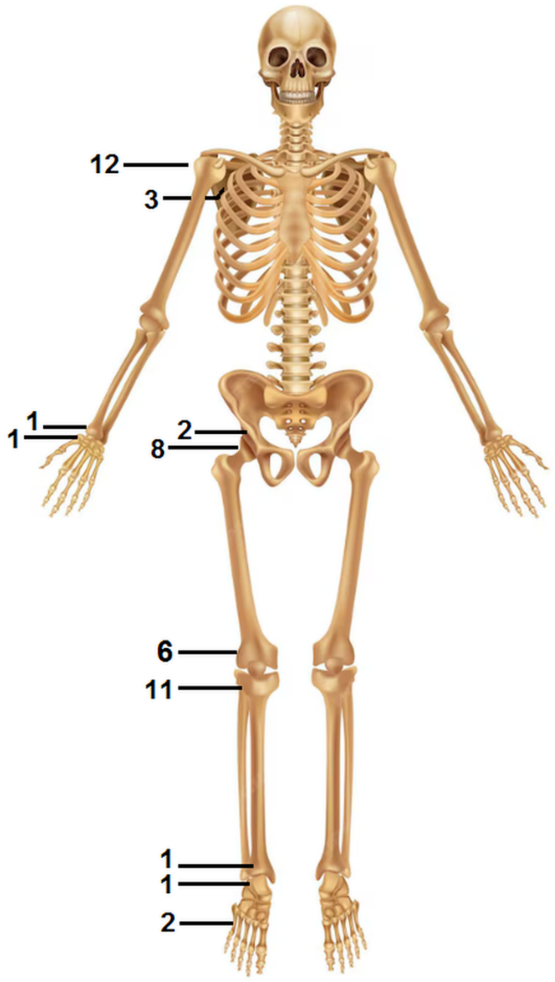

Fig. 1 — Anatomical locations of the lesions.

Table III. — Evaluation of the treatment methods.

TREATMENT METHODS	(n)	(%)
Curettage + autograft	14	29.2%
Curettage + cauterization + autograft	10	20.8%
Curettage + cauterization + high speed burr + autograft	6	12.5%
Curettage + cauterization + high speed burr + allograft	5	10.4%
Arthrodesis	4	8.3%
Curettage + cauterization + allograft	2	4.2%
Curettage + cauterization + cement	2	4.2%
Curettage + allograft	2	4.2%
Curettage + cement	2	4.2%
Curettage	1	2.1%
Adjuvant Treatments (cauterization / high speed burr)		
- Present	25	52.1%
- Absent	23	47.9%

= 0.029), whereas age > 30 years was associated with a markedly increased risk of recurrence (HR = 9.91, 95% CI: 1.91–51.51, p = 0.006).

Lung metastasis and pathological fracture was not observed in any of the 48 patients during follow-up period. Postoperative complications were observed in 3 patients (6.2%) (Table I). Superficial debridement was performed in one patient at postoperative 8th week due to dehiscence. In two patients who underwent knee arthrodesis with femoro–tibial Kuntscher nail due to large lesions located near the knee joint, the intramedullary nail broke in postoperative period

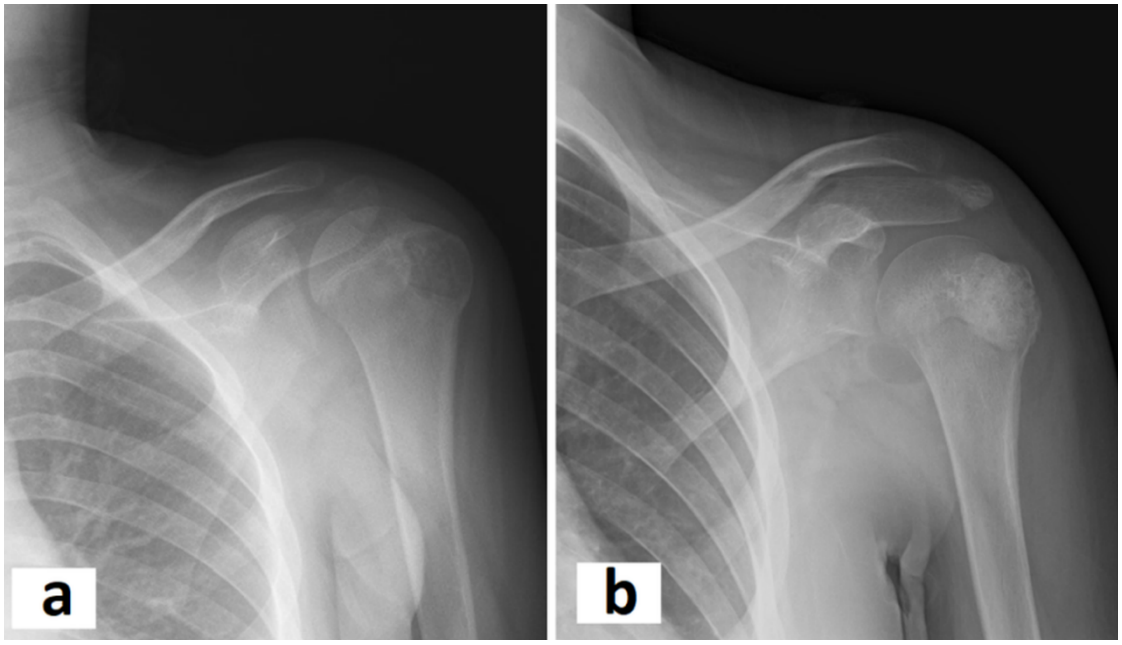

Fig. 2 — Curettage and bone grafting of a chondroblastoma of the left proximal humerus in an 14-year-old girl (2a:preoperative radiography, 2b:postoperative radiography).

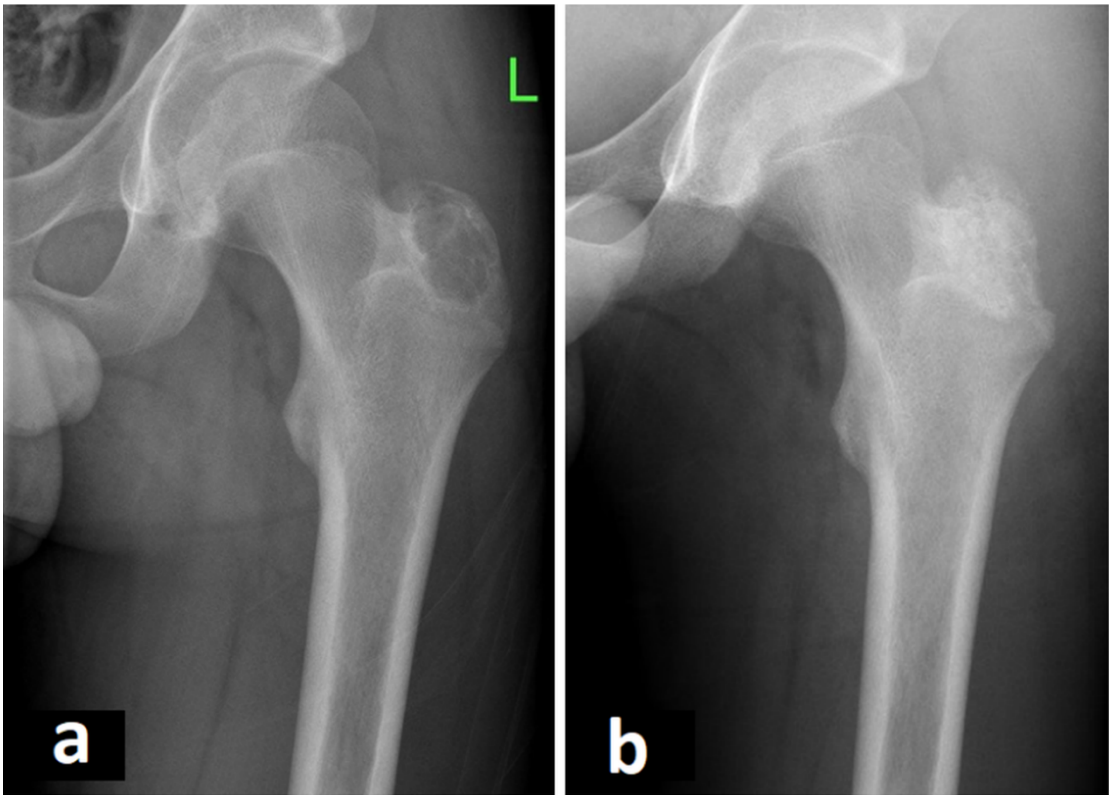

Fig. 3 — Curettage and bone grafting of a chondroblastoma of the left proximal femur (apophysis of the greater trochanter) in an 15-year-old boy (3a:preoperative radiography, 3b:postoperative radiography).

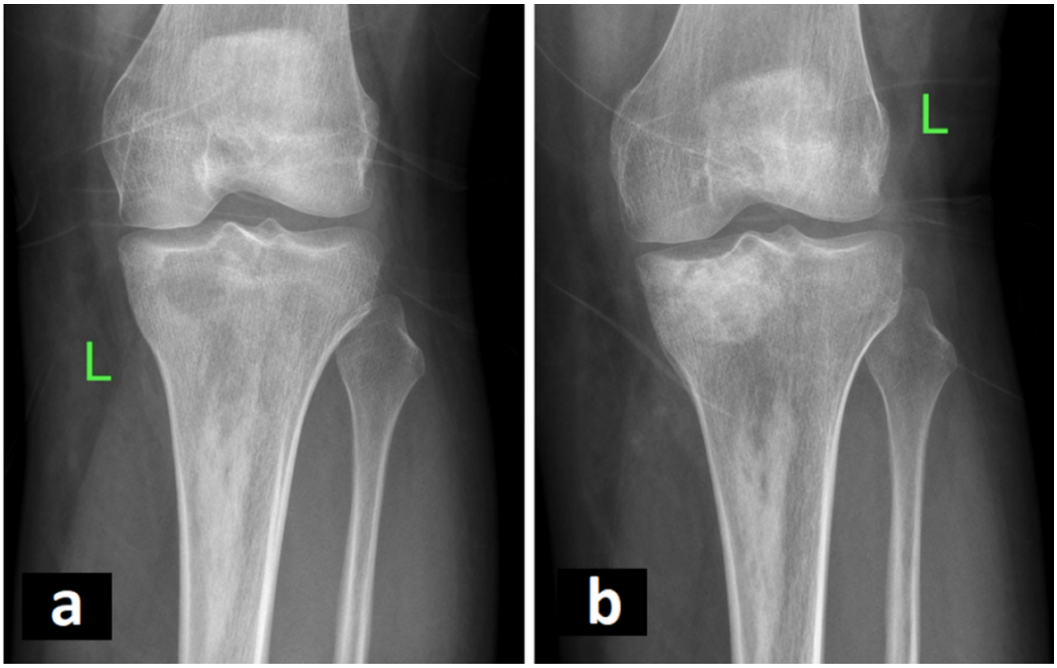

Fig. 4 — 18-year-old male with chondroblastoma of the left proximal tibia treated by curettage and bone grafting (4a:preoperative radiography, 4b:postoperative radiography).

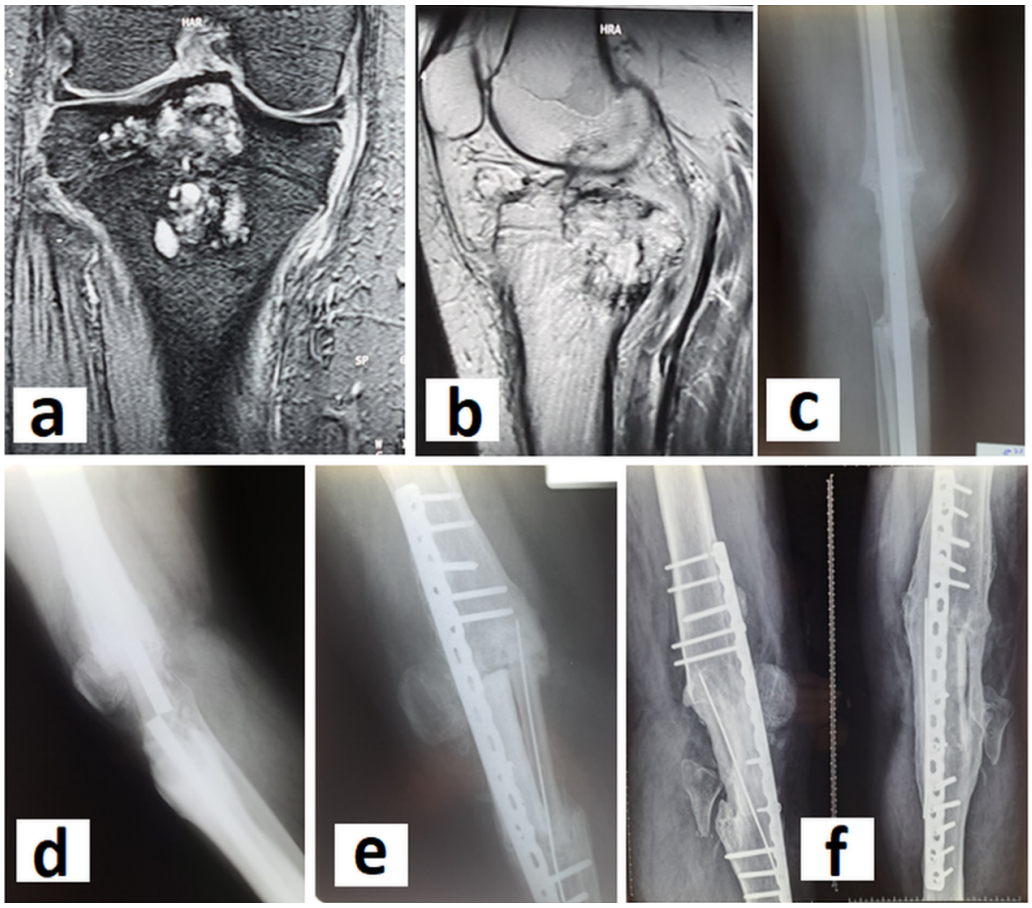

Fig. 5 — MRI scans of a 16 years old male with chondroblastoma in the right proximal tibia (5a, 5b). Resection and arthrodesis of the knee with a long intramedullary nail was performed (5c). The intramedullary nail broke at post-operative 18 months (5d). Knee arthrodesis was performed using a nonvascularized fibular graft (5e, 5f)..

Table IV. — Analysis of the recurrences.

RECURRENCES				
Case	Location	Primary Treatment	Time of recurrence	Treatment after recurrence
1	Proximal tibia	Curettage + autograft	12 months	Curettage + cauterization + high speed burr + autograft + chips allograft
2	Acromion	Curettage + autograft	36 months	Curettage + cauterization + cement
3	Distal tibia	Curettage + cauterization + high speed burr + autograft	70 months	Curettage + autograft + ankle arthrodesis
4	Proximal femur	Curettage + autograft	50 months	Curettage + cauterization + allograft
5	Proximal humerus	Curettage + autograft	12 months	Curettage + autograft
6	Proximal humerus	Curettage + autograft	14 months	Curettage + autograft
7	Proximal humerus	Curettage + autograft	12 months	Excision + non-vascularized fibular graft
8	Proximal humerus	Curettage + autograft	24 months	Conservative treatment

Table V. — Factors associated with recurrence and recurrence-free survival.

		Recurrence		p value for recurrence Mean (±SD), [95% CI]	Recurrence-free survival (months)	Log-rank p value
		Yes (n=8)	No (n=40)		(RFS)	
Adjuvant treatment	Yes	1 (4.0%)	24 (96.0%)	**0.020**	167.6 (±21.8), [124.8-210.4]	**0.002**
	No	7 (30.4%)	16 (69.6%)		136.0 (±34.6), [68.1-203.9]	
Age	≤ 30 years	5 (11.4%)	39 (88.6%)	**0.012**	189.9 (±25.2), [140.5-239.3]	**<0.001**
	> 30 years	3 (75.0%)	1 (25.0%)		24 (±7.3), [9.6-38.4]	
Size	≥50% of the bone diameter	4 (18.2%)	18 (81.8%)	1.000	194.8 (±20.6), [154.4-235.3]	0.880
	<50% of the bone diameter	4 (15.4%)	22 (84.6%)		66.4 (±4.0), [58.5-74.2]	
Enneking Stage	Latent	4 (20.0%)	16 (80.0%)	0.703	150.0 (±19.1), [112.5-187.5]	0.592
	Active or Aggressive	4 (14.3%)	24 (85.7%)		174.7 (±34.3), [107.4-241.9]	
Distance to joint	≥5 mm	1 (25.0%)	3 (75.0%)	1.000	70.0 (±0), [70.0-70.0]	0.883
	<5 mm	7 (15.9%)	37 (84.1%)		196.3 (±15.8), [165.3-227.2]	
Time of surgery	Before 2003	5 (20.8%)	19 (79.2%)	0.701	187.7(±21.0), [146.6-228.9]	0.580
	2003 and later	3 (12.5%)	21 (87.5%)		66.6(±3.4), [59.9-73.3]	

*Chi-square or Fisher's exact tests were used to compare categorical variables between groups. Kaplan-Meier analysis was performed for recurrence-free survival. Statistically significant p-values (<0.05) are indicated in bold.
** Abbreviations: CI, confidence interval; RFS, recurrence-free survival.

Table VI. — Multivariate Cox regression analysis for recurrence.

COVARIATES	Coefficient (B)	Standard error	p value	Hazard ratio (HR)	Confidence Interval (95% CI)
Adjuvant treatment (0:no, 1:yes)	-2.44	1.11	**0.029**	0.08	0.01-0.77
Age (0:≤ 30 y, 1:>30 y)	2.29	0.84	**0.006**	9.91	1.91-51.51

*For the Cox regression model, overall model significance was assessed using the likelihood ratio test, which showed a statistically significant result (χ^2 (2) = 26.03, p <0.001).
**Statistically significant p-values (< 0.05) are indicated in bold.
*** Abbreviations: CI, confidence interval; HR, Hazard ratio.

(postoperative 7th and 18th months, respectively). Both patients underwent re-arthrodesis using fibular graft (Figure 5).

DISCUSSION

Similar to the literature, chondroblastoma lesions were observed with a higher frequency in male patients in our series. Turcotte et al reported the M/F ratio as 1,7[2]. De Mattos et al stated this ratio as approximately 2[1]. In our study, it is observed that the M/F ratio is 1,53. According to the literature, chondroblastoma is commonly observed during the adolescent period and the peak incidence is in the second decade of life[4,8,13]. Similar to the findings reported in other series, the median age of the patients was 16 and 38 patients (79,1%) were in the second decade of life. The most common three tumor locations in our patients were the proximal humerus, proximal tibia, and proximal femur. It is seen that this result is also compatible with the literature[1,2,4]. Pain and decreased range of motion were the most common two symptoms in our series, which is compatible with other reports[1,8,10,11].

The literature presents varying reports on the activity of chondroblastoma. Springfield et al reported that 14% of the lesions were latent, 53% were active, and 33% were aggressive in their study[3]. On the other hand, Garin and Wang stated that latent lesions were 40%, active lesions were 30%, and aggressive lesions were 30%[5]. In our study, it was observed that 41.7% of cases were latent, 47.9% were active, and 10.4% were aggressive. Assessing the activity of the lesion by evaluating direct radiographs may not always be objective. Differences in the results of studies may have arisen due to interobserver variability.

In the differential diagnosis, chondroblastoma should be distinguished from other lesions such as giant cell tumor (GCT), chondromyxoid fibroma, enchondroma, aneurysmal bone cyst (ABC), simple bone cyst, eosinophilic granuloma, fibrous dysplasia, clear cell chondrosarcoma and subacute osteomyelitis[1,4,10,14,15]. Due to its epiphyseal location, chondroblastoma can be confused with giant cell tumor (GCT). It should be noted that GCT is typically observed after physeal closure[4,16]. Clear cell chondrosarcomas are usually located in the epiphyseal-metaphyseal region of long bones and it can be confused with chondroblastoma. Clear cell chondrosarcomas have a higher incidence in middle-aged patients, while chondroblastomas are more commonly observed in youngs. In chondroblastoma, the surrounding bone marrow edema is prominent on MRI scans. This condition facilitates the differential diagnosis[1,4,17,18].

According to the literature, 15% to 32% of cases of chondroblastoma may be associated with a secondary aneurysmal bone cyst[3,4,6,7]. Fluid-fluid levels can be observed on MRI scans in cases with a secondary aneurysmal bone cyst[19-21]. We observed a secondary aneurysmal bone cyst in 4 patients (8,3%) in our series. This rate is lower compared to other series.

Extended curettage and grafting of the defective area is the recommended treatment for chondroblastoma[6-8,10,11]. We applied grafting after curettage to 83.3% of the patients (40 cases) in our series. Recurrence rates ranging from 8% to 40% have been reported in the literature[1]. The recurrence rate has been reported as 14% by Springfield et al, 14% by Gallardo et al, and 16% by Bloem et al[3,22,23]. Similarly, in our study, it was observed that the recurrence rate was 16.7%.

Inadequate curettage is considered one of the most important causes of recurrence[1,4,8]. It is thought that the fear of damaging the physis and joint cartilage can lead to incomplete curettage [9]. Some authors have mentioned that an open physis may hinder aggressive curettage and increase the risk of local recurrence. Sailhan et al. reported a recurrence rate of 32% in their series consisting of 87 pediatric patients with an open physis. They associated the high recurrence rate with the open physeal plate[11]. However, there is no consensus on this matter. There are also authors who argue that there is no relationship between growth plate status and recurrence[6]. In our series, 9 patients with open physis underwent surgery and no recurrence developed in any of these patients. The applying of adjuvant treatment (high-speed burring/ electrocauterization) to most of our patients may have been effective in this regard.

High-speed burring, electrocauterization, phenol and liquid nitrogen are the main adjuvant methods in the literature[9,24,25]. Some publications consider cementing, which is used to fill the defect after curettage, as an adjuvant treatment due to its heat effect[25,26]. In our series, high-speed burring or electrocauterization was applied as adjuvant treatment to 52.1% of the patients (25 cases). Cementing was performed on 4 patients (8,3%) after curettage. Phenol and liquid nitrogen applications were not preferred in our patients. The using of high-speed burr helps to extend curettage, especially in hard-to-reach areas. The aim of electrocauterization is to kill residual tumor cells through the heat effect. During bone cementing, the similar heat effect of polymerization is also utilized.

The application of cryotherapy with liquid nitrogen aims to freeze and destroy residual tumor cells. Phenol or ethanol applications are intended to eliminate tumor cells through chemical mechanisms. There are many studies in the literature regarding all these local adjuvant treatment methods[1,4,9,12,27,28]. However, no comparative study has been conducted to determine the most effective local adjuvant.

Some authors have stated that local adjuvant treatment is associated with a low recurrence rate. Hsu et al reported no recurrence in any of the patients who underwent curettage and high-speed burring, in their series of 10 cases with a mean follow-up duration of 62 months[29]. Tiefenboeck et al stated no recurrence in any of the patients who underwent aggressive intralesional curettage with high-speed burring, in their series of 22 cases with a mean follow-up duration of 114 months[24]. Zekry et al applied extended intralesional curettage using high-speed burr with phenol in case series consisting of 20 patients with chondroblastoma. They reported the recurrence rate as 10.0% with a mean follow-up period of 63.3 months. They stated that local adjuvant treatment appears to be effective in reducing the recurrence rate[12]. Similarly, in our study, it was observed that the recurrence rate was lower in patient with adjuvant therapy. The recurrence rate was 4.0% (1 case) for adjuvant therapy group and 30.4% (7 cases) for the other group.

In our study, we observed a high recurrence rate in patients over the age of 30. According to some studies, younger patients with an open physis may have a higher risk of recurrence, which has been attributed to inadequate curettage[11]. On the other hand, some authors have stated that there is no statistically significant relationship between age and recurrence. There is currently no publication in the literature that supports our findings regarding the relationship between age and recurrence[4,6]. Chondroblastoma may have a more aggressive pattern in patients over the age of 30. Evaluating this issue histopathologically in larger patient groups would be informative.

Ramappa et al reported a local recurrence rate of 15%, in their series evaluating 73 patients diagnosed with chondroblastoma. Most patients who developed recurrence (5 out of 7 patients) had the lesion around the hip. They reported that the risk of recurrence was higher in the pelvis and hip region[7]. Some authors have mentioned that pelvic chondroblastoma may be more aggressive than others[1,6,30]. On the other hand, there are also studies reporting no association between tumor location and recurrence[4,8]. In our study as well, it is observed that there is no relationship between the location and recurrence. According to our findings, we also stated that there was no statistically significant association between tumor size and tumor stage with the recurrence rate.

Surgical treatment of chondroblastoma may result in limb-length discrepancy which can be attributed to the involvement of the growth plate[1,4]. In our case series, none of the patients who underwent curettage with grafting/cementing exhibited limb-length discrepancy or angular deformity. However, in one patient who underwent hip arthrodesis and two patients who underwent knee arthrodesis, limb shortening was observed.

This study is limited by its retrospective design. As it was a retrospective study, the postoperative functional scores of most patients could not be obtained. Absence of the functional scores is the one of the weaknesses of the study. However, this paper is among the largest series on chondroblastoma surgeries in a single institute and provides important information about recurrence.

CONCLUSIONS

Intralesional curettage and filling the defect with bone graft was effective for local control in most cases. Electrocauterization or high-speed burring as local adjuvant therapy leads to low recurrence rates. Recurrence rate was not statistically associated with growth plate status, location, tumor size or tumor stage. It should be kept in mind that the possibility of recurrence may be high in cases over 30 years old and these patients should be followed closely.

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