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TREATMENT OF BENIGN AND BORDERLINE BONE TUMORS WITH COMBINED CURRETTAGE AND BONE DEFECT RECONSTRUCTION

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Abstract:

Background: *The management of bone defects following simple curettage of bone tumors is controversial, demands dexterity and can be mastered only through experience of oneself and others. In light of numerous emerging substitutes, the use of cancellous allograft bone in the treatment of benign and borderline bone tumors merits documentation.*

Objective: *To review the use of combine curettage and bone defect reconstruction for benign and borderline tumors.*

Methodology: *This observational, retrospective analysis was conducted upon the medical records of 164 consecutive patients with benign or borderline bone tumors treated with simple curettage at the Dept. of Orthopedic Surgery at from January 2014 to December 2018. Postoperative radiological changes were evaluated by a modified Neer's classification in defects that were subsequently reconstructed with allograft bone (n = 133). Data was recorded onto a pre-structured questionnaire. Data obtained was analyzed using SPSS version 21.0 and MS. Excel 2013.*

Results: *Simple curettage with subsequent defect filling using allograft bone was the surgical procedure performed in the majority of our patients (81%) and was associated with a low overall 2.5-year local recurrence (LR; 9.8%) and complication rate (7.5%). The radiological appearance of the grafted defects was deemed satisfactory in 85% of cases, with signs of either complete or partial healing present 6–12 months postoperatively. With respect to pathology, we found high rates of LR in giant cell tumors (GCTs) of bone, simple cysts (SCs) in children, and preexisting local recurrent disease. We did not observe any allograft-related complications.*

Conclusion: *After careful evaluation of the results, it can be safely concluded that simple curettage and bone defect reconstruction with bone allograft is a sufficient treatment for most benign bone lesions and is associated with a low complication rate. For high-risk entities, such as GCTs of bone, SCs in children, and recurrent disease, additional adjuvant treatment could be considered to avoid LR.*

Keywords: *Benign Bone Tumor, Borderline Bone Tumor, Combine Curettage, Bone Allograft & Local Recurrence.*

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INTRODUCTION:

Simple curettage is the most common surgical treatment for benign bone tumors [1–3] and has been reported as an acceptable method associated with relatively low recurrence rates, even for the treatment of low-grade chondrosarcomas (CS). [4, 5]

The management of subsequent bone defect, however, remains controversial and treatment options vary greatly from no treatment to use of various filling materials. [6] While satisfactory clinical results have also been shown in defects without grafting, [7, 8] residual fracture risk remains a concern as natural bone healing may not be sufficient for all bone defects beyond a certain size.

Autogenous cancellous bone is still widely considered the gold standard for the reconstruction of bone defects, due to its potential osteogenetic, osteoinductive, and osteoconductive abilities. However, due to its well-known disadvantages, including donor site morbidity, prolonged operating time, and limited availability, it is often augmented with or replaced by allografts, bone cements, or bone graft substitutes, particularly for larger reconstructions. [9–11]

Traditionally, cancellous allograft bone has been the graft material of choice for bone defect reconstruction at orthopedic centers all over the world for many years, and although curettage and bone grafting is commonly used for the treatment of contained defects in orthopedic tumor surgery in general, only limited data on clinical results and complication rates have been published during recent years.

With a view to eventually compare the performance of newer bone graft substitutes to conventional bone grafting in the future, we wished to review and report our experience with the use of simple curettage and cancellous allograft bone in the treatment of benign and borderline bone tumors and cysts.

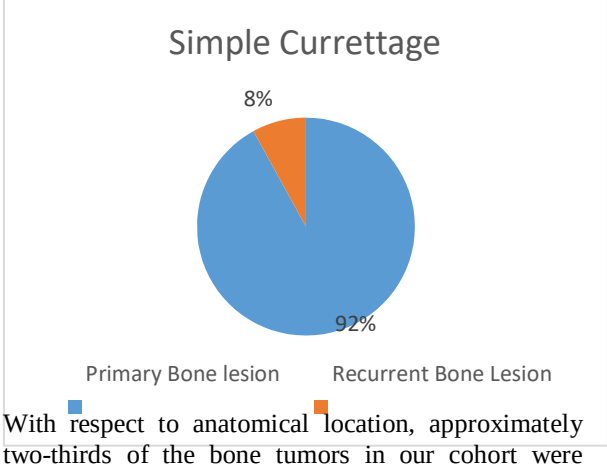
METHODOLOGY:

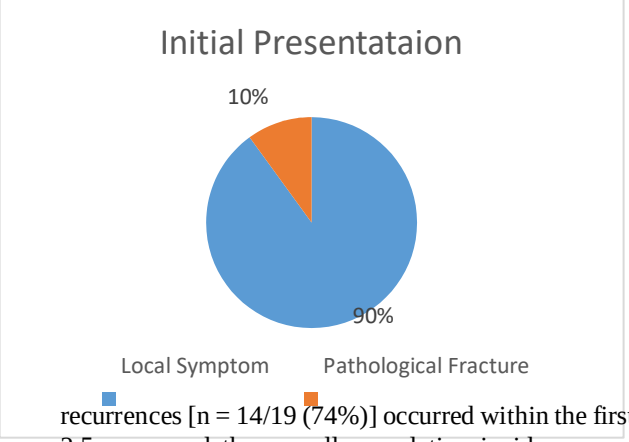
This observational, retrospective analysis was conducted upon the medical records of 164 consecutive patients with benign or borderline bone tumors treated with simple curettage at the Dept. of Orthopedic Surgery at from January 2014 to December 2018. Postoperative radiological changes were evaluated by a modified Neer's classification in defects that were subsequently reconstructed with allograft bone (n = 133). All relevant data (age, gender, histological diagnosis, grade, size and anatomical location of the lesion, details of the surgical procedure, use of orthopedic implants, weight bearing status, occurrence of postoperative complications, and local recurrence (LR)) was collected from the medical records and recorded onto a pre-structured questionnaire. Data obtained was analyzed using SPSS version 21.0 and MS. Excel 2013.

Score	Classification	Description
1	Complete Healing	Complete or almost complete filling of the initial lesion with radiological evidence of new bone formation
2	Partial Healing	Incomplete healing and/or graft resorption in an area(s) less than 50% of the initial lesion with enough cortical thickness to prevent fracture
3	Persistent Lesion	Graft resorption or persistent radiolucent area(s) greater than 50% of the initial lesion and/or with a thin cortical rim potentially at risk for fracture
4	Recurrent Lesion	Progressive lesion reappeared in a previously obliterated area or a residual radiolucent area verified by biopsy

RESULTS:

Among of 164 medical records used, there were 79 males and 85 females with a cumulative median age of 29 years and with a minimum follow-up of 2.7 years, who had undergone simple curettage for their primary [n = 151/164 (92%)] or recurrent [n = 13/164 (8%)] bone lesions. The reasons for initial presentation were either local symptoms [n = 148/164 (90%)] or a pathologic fracture [n = 16/ 164 (10%)].





With respect to anatomical location, approximately two-thirds of the bone tumors in our cohort were situated in the lower extremity [n = 105/164 (64%)]. The most common histopathological diagnosis encountered was enchondromas, comprising almost half of the study population, followed by simple (unicameral bone) cysts (SCs), aneurysmal bone cysts (ABCs), fibrous dysplasia (FD), and giant cell tumors (GCTs) of bone. LR occurred in 19 of 164 patients (11.6%), most commonly among GCT [n = 4/12 (33%)] and SC [n = 4/10 (40%)] in children. Most recurrences [n = 14/19 (74%)] occurred within the first 2.5 years and the overall cumulative incidence was 8.5%. For patients whose defects were treated with allograft bone, the overall 2.5-year cumulative incidence was 9.8%. Among SC in adults or enchondromas, no LR was observed within the first 2.5 years, whereas SC in children had a high (p = 0.002) 2.5-year cumulative incidence of 40%. As expected, LR was more common (p = 0.002) for preexisting recurrent disease compared to primary disease with 2.5-year cumulative incidences of 30.8%.

Primary Tumor	**Frequency**	**Local Recurrence**	
		Frequency	**Percentage**
Enchondroma	*57*	*2*	*4%*
SC (adult)	*20*	*0*	*0%*
ABC	*15*	*0*	*0%*
FD	*14*	*2*	*14%*
GCT	*12*	*4*	*33%*
Chondroblastoma	*6*	*1*	*17%*
SC (child)	*10*	*4*	*40%*
No-Ossifying Fibroma	*5*	*1*	*20%*
Intraosseous Ganglion	*5*	*1*	*20%*
Osteoid osteoma	*5*	*2*	*40%*
CS grade 1	*4*	*0*	*0%*
Langerhans cell histiocytosis	*2*	*1*	*50%*
Chondromyxoid fibroma	*1*	*0*	*0%*
Epithelioid hemangioma	*1*	*0*	*0%*
Giant cell granuloma	*1*	*0*	*0%*
Giant cell granuloma	*1*	*1*	*100%*
Other	*5*	*0*	*0%*

DISCUSSION:

Although the differential treatment of benign bone lesions has evolved considerably during the past two decades, the goals of treatment remain to establish a correct diagnosis, completely remove the lesion, and to relieve pain if present, while preserving and/or restoring function and minimizing complications. While emerging minimally invasive techniques such as radiofrequency ablation, embolization, and percutaneous injection techniques are gaining importance for certain entities, our results indicate that simple curettage remains an adequate treatment option for a wide spectrum of indications, particularly those with low risk of LR, such as enchondromas, where the expected rate of LR is almost nonexistent even without the use of any local adjuvants. [4, 5]

Despite the promising surgical results, non-operative treatment and radiological follow-up should be considered for patients with non-symptomatic enchondromas, hereby avoiding the risks of open surgery. [12] Extended curettage with adjuvant treatment, on the other hand, should be considered in high-risk entities such as GCTs of bone, where the risk of LR could be as high as 50% if treated without adjuvants. [13]

Our results also confirm previous reports that SCs in children display recurrence rates comparable to GCT's, [15, 16] which is why this particular patient group deserves also special attention and consideration of suitable adjuvant treatment. Surprisingly, little data are published to guide surgeons whether reconstruction of a bone defect resulting from surgical removal of a benign bone lesion is indicated and how this is technically best accomplished.

Furthermore, no precise objective criteria exist to determine when a bone defect is sufficiently healed to withstand the risk of fracture. Consequently, these decisions are based on clinical judgment, rather than objective factors. Although Wolff's law indicates that healthy bone naturally adapts to load-bearing, it cannot predict the speed of bone healing or determine which bone defects are too large for spontaneous bone healing. Therefore, the degree of radiographic consolidation observed in a bone defect may well be important to guide the physician to evaluate a persisting risk of fracture, especially in case of insufficient spontaneous bone healing.

Two recent articles demonstrate that most patients treated without bone defect reconstruction regain full weight bearing capacity and that bone defects consolidate without augmentation with bone graft. [7, 8] While the clinical results reported in these two studies are comparable with those observed in our cohort, the reported fracture rates (3.8% and 10%, respectively) are considerably higher than the fracture rate observed in our study (1.5%). There was a tendency in both studies that larger defects were associated with higher complication rates, which indicates that the omission of bone defect reconstruction may not lead to an increase in absolute fracture risk per se, but depends on other factors such as the relative defect size, anatomical location, as well as the extent of presence or absence of spontaneous bone healing of the individual defect. As the compressive strength of bone allograft is poor, the potential increase in structural integrity by grafting a bone defect is unlikely to be the explanation for the observed differences in fracture rates. [17]

CONCLUSION:

After careful evaluation of the results, it can be safely concluded that simple curettage and bone defect reconstruction with bone allograft is a sufficient treatment for most benign bone lesions and is associated with a low complication rate. For high-risk entities, such as GCTs of bone, SCs in children, and recurrent disease, additional adjuvant treatment could be considered to avoid LR.

CONFLICTS OF INTEREST:

The authors declare that there are no conflicting interests in the preparation and publication of this research work.

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