Optimal Treatment of Pediatric Unicameral Bone Cysts includes Curettage and Synthetic Bone Grafting: A Retrospective Multi-Center Cohort Study

Leonardo Enrique Albertini Sanchez, Eric Rong Zhao, Peter M Cirrincione, Erikson Nichols, Akshitha Adhiyaman, Keza Levine¹, John H Healey², Emily Dodwell¹

¹Hospital For Special Surgery, ²Memorial Sloan Kettering Cancer Center

INTRODUCTION:

Controversy remains regarding optimal treatment of pediatric unicameral bone cysts (UBCs), with healing ranging 23-80% and recurrence ranging 18-80% for various treatment methods. The primary aim of this study was to determine how cyst healing varied between observation, and curettage with or without internal fixation. Secondary aims were to determine how recurrence and subsequent fracture rates varied across treatments, and to determine whether type of bone graft impacted rates of healing, recurrence, and fracture.

METHODS:

Patients ages 0-17 with UBCs were identified using ICD-9 and ICD-10 diagnostic codes at two tertiary care high volume institutions 01/01/2010-12/31/2020. Patients with aneurysmal bone cyst, non-ossifying fibroma or other pathology, or with <2 year follow up were excluded. Age at presentation, age at treatment, the bone affected, bone region, and treatment type (observation, curettage + bone grafting, or curettage + bone grafting + internal fixation) were recorded. Descriptive statistics evaluated patient demographics, follow-up time, treatment choice, cyst healing status, cyst recurrence, and fracture event after treatment. Chi-squared tests were used to compare recurrence, healing, and fracture occurrence after treatment according to treatment modality and type of graft used. Significance was set at p <0.05.

RESULTS: 78 patients mean age 10.1 ± 3.6 at diagnosis and mean follow-up of 5.6 ± 3.0 years were included. Cysts were most commonly in the metaphysis of long bones, the humerus being the most affected bone (53.8%). 44.8% underwent curettage with bone grafting, 26.9% curettage with grafting and fixation, 17.9% were observed, and 10.4% underwent other combinations of surgical treatment. Of the grafts evaluated, 59.6% were autograft or allograft and 40.4% were synthetic.

Close to 70% experienced complete cyst healing when treated with curettage with or without internal fixation, while 85% had at least partial healing. No significant differences were observed in rates of recurrence (p = 0.649) or post-treatment fracture incidence (p = 0.615) across treatments. Patients treated with synthetic bone graft experienced fewer recurrences (21.7%) than patients treated with allograft or autograft (52.9%) (p=0.018). No significant difference was found between the graft types with regards to cyst healing (p=0.227) or fracture after treatment (p=0.498) (Table 1).

DISCUSSION AND CONCLUSION: Curettage, bone grafting with or without internal fixation resulted in high rates of healing, 70% complete healing and 85% with at least partial healing. The use of synthetic bone graft was associated with a lower recurrence rate compared with allograft or autograft. Curettage, synthetic bone grafting, with or without internal fixation should be considered first line treatment for pediatric bone cysts to optimize healing and minimize the risk of recurrence. Prospective studies are warranted to further investigate clinical and patient reported outcomes for pediatric UBCs.

	Table 1. The proportion of	each treatment a	roup that healed (not h	aalad partially or full	v)			
	experienced cyst recurrence after treatment, and experienced at least one fracture after treatment							
9	sub-categorized as treatment type of grant.							
		Observation	Curettage with	Curettage, Bone	p-value			

		Observation (n=14)	Curettage with Bone Graft (n=35)	Curettage, Bone Graft, and Fixation (n=21)	p-value
Healing status	Not Healed, n (%)	8 (57.1%)	4 (11.4%)	0 (0%)	< 0.001
	Partial, n (%)	5 (35.7%)	6 (17.1%)	7 (33.3%)	
	Full, n (%)	1 (7.1%)	25 (71.4%)	14 (66.7%)	-
Recurrence, n (%)		4 (28.6%)	15 (42.9%)	8 (38.1%)	0.649
Fracture A n (%)	Fracture After Treatment n (%)		5 (14.3%)	2 (9.5%)	0.615

		Synthetic (n=23)	Allograft/Autograft (n=34)	p-value
Healing status	Not Healed, n (%)	0 (0%)	4 (11.8%)	0.227
	Partial, n (%)	6 (26.1%)	7 (20.6%)	7
	Full, n (%)	17 (73.9%)	23 (67.6%)	
Recurrence, n (%) Fracture After Treatment n (%)		5 (21.7%)	18 (52.9%)	0.018
		2 (8.7%)	5 (14.7%)	0.498