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Corresponding Author
Mukul Bhattacharyya,
Department of Orthopedics, IPGMER and SSKM Hospital, AJC Bose Road Kolkata-20, India
drmukulbhattacharyya@gmail.com

Author Designation
[1]Associate Professor
[2]Assistant Professor
[3]MOTR
[4]Head of the Department

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Clinicoradiological Outcome of Extended Curettage of GCT of Bones as Per Recurrence and Metastasis

[1]Abir Kumar Ghosh, [2]Bhaskar Sen, [3]Anindya Nath Bandyopadhyay and [4]Mukul Bhattacharyya
[1-4]Department of Orthopaedics, IPGMER and SSKM Hospital, AJC Bose Road Kolkata-20, India

ABSTRACT
Giant cell tumour (GCT) of bone is generally a benign tumour composed of mononuclear stromal cells and characteristic multi nucleated giant cells that exhibit orthoclastic activity. It usually develops in long bones but can occur in unusual locations. The typical appearance is a lytic lesion with a well-defined but no sclerotic margin that is eccentric in location, extends near the articular surface and occurs in patients with closed physics. My aim is to determine the efficacy of extended curettage in the treatment of GCT. The present study was Observational Study from a prospectively maintained database. This Study was conducted from December 2022 to JULY 2024 (20 months Duration) at orthopaedics-OPD and Emergency with GCT, attending at SSKM and H. Total 30 patients were included in this study. In without Recurrence, the mean MSTS score (mean±s.d.) of patients was 22.6296±2.6624. In with Recurrence, the mean MSTS score (mean±s.d.) of patients was 18.3333±.5774. Distribution of mean MSTS score with Recurrence was statistically significant (p=0.0104).The value of Pearson Correlation Coefficient (r) was -.456. The Negative correlation was found between MSTS Score vs Lesion Size. The P-Value was .011. The result was statistically significant. Extended curettage for GCT of bones is an effective treatment method with a low recurrence rate when performed with appropriate techniques. Adjuvants such as phenol, liquid nitrogen, or cementation may enhance local tumor control. Recurrence, when it occurs, is often detected early via regular clinical and radiological follow-ups, allowing timely intervention. The incidence of metastasis, particularly to the lungs, remains low but underscores the need for long-term surveillance. Multidisciplinary management and tailored treatment strategies further optimize patient outcomes.

INTRODUCTION

First identified in 1818, giant cell tumor of bone (GCTB) is a benign primary bone tumor characterized by multi nuclear large cells. Following therapy, it has a high likelihood of returning locally[1]. On rare occasions, it may transform into a malignant form. In the second decade of life, when multi centric tumors and spine tumors are more prevalent, 10% of cases are diagnosed. These enormous cells promote bone resorption., however they are not the actual cancer cells. It is believed that multi nucleated "giant cell" growth from the stromal cells-which are believed to be the actual neoplastic cells-forms the osteolytic lesion that is typical of this tumor[2]. GCTB is composed of reactive round or multi nucleated giant cells with an osteoclast-like morphology and neoplastic mononuclear stromal cells with spindled fibroblast-like morphologies. According to research, mononuclear stromal cells are more common in GCTB than multi nucleated large cells. They also show higher proliferative capacity, genetic abnormalities and expression of important cytokines and differentiation markers. These findings demonstrate that mononuclear stromal cells are indeed neoplastic components[3]. It is uncommon for GCT to involve the metatarsal bone in patients with underdeveloped skeletons[4]. Additionally, GCT in the little bones of the hand and foot is rare. Usually, the main lesion measures 2.9x2.6x2.6 centimeters[5]. Soft tissue GCTs are more likely to spread and result in death, but they have a lower local recurrence rate than bone GCTs[6]. GCTB does not show any distinctive clinical or imaging features of malignancy when compared to other prevalent aggressive illnesses. Historically, malignant GCTs of the bone have had a poor prognosis, which worsens in the presence of subsequent malignancies[7]. GCT of the left femur was discovered in a total body CT scan of an adult female who was partially mummified and dated to the eighteenth century[8]. Central giant cell granuloma (CGCG), another benign bone tumor rich in giant cells, is believed to be the result of a local reparative reaction in the majority of individuals between the ages of 10 and 25[9]. Determining the effectiveness of prolonged curettage in the management of GCT is my goal. To evaluate the clinical results of prolonged GCT curettage alone in the 15-65 age range using physical examination in MSTS Score and to evaluate the radiological results of prolonged GCT curettage for metastasis and recurrence using chest and affected site X-rays.

MATERIALS AND METHODS

Type of Study: This is an Institution based Retrospective and Observational Study.

Place of Study: The proposed study was institution based, Conducted at the Orthopaedics department of I.P.G.M.E.R. and S.S.K.M. Hospital, Kolkata.

Duration: From December 2022 to July 2024 (20 months Duration).

Sample Size: 30 patients.

Inclusion Criteria:

- All patients aged >15years and <65years, who have been done Extended curettage in GCT OF BONES Status correlating with Clinical and Radiological investigations.
- Patients who are diagnosed with giant cell tumour.....using radiological and laboratory examinations, including X-ray, MRI and histopathology.
- Companacci radiological grade (I) and grade (II).
- Those who had extended curettage of GCT of bone in this institute willing to participate in the study through signing of consent form.

Exclusion Criteria:

- PT with pathological fracture before surgery.
- Companacci radiological grade III.
- Cases previously intervened.

Statistical Analysis: For statistical analysis, data were initially entered into a Microsoft Excel spread sheet and then analyzed using SPSS (version 27.0., SPSS Inc., Chicago, IL, USA) and Graph Pad Prism (version 5). Numerical variables were summarized using means and standard deviations, while categorical variables were described with counts and percentages. Two-sample t-tests, which compare the means of independent or unpaired samples, were used to assess differences between groups. Paired t-tests, which account for the correlation between paired observations, offer greater power than unpaired tests. Chi-square tests (χ^2 tests) were employed to evaluate hypotheses where the sampling distribution of the test statistic follows a chi-squared distribution under the null hypothesis., Pearson's chi-squared test is often referred to simply as the chi-squared test. For comparisons of unpaired proportions, either the chi-square test or Fisher's exact test was used, depending on the context. To perform t-tests, the relevant formulae for test statistics, which either exactly follow or closely approximate a t-distribution under the null hypothesis, were applied, with specific degrees of freedom indicated for each test. P-values were determined from Student's t-distribution tables. A p-value ≤ 0.05 was considered statistically significant,

leading to the rejection of the null hypothesis in favour of the alternative hypothesis.

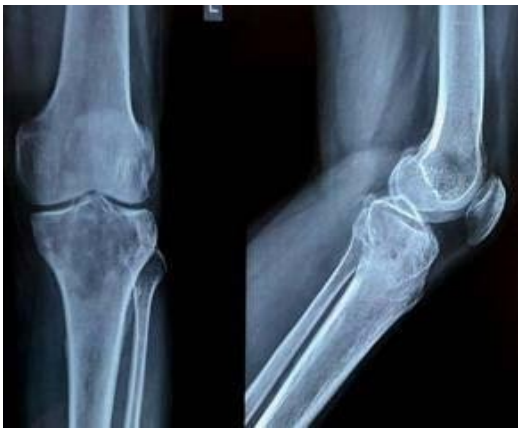

Fig. 1: GCT of Proximal Tibia

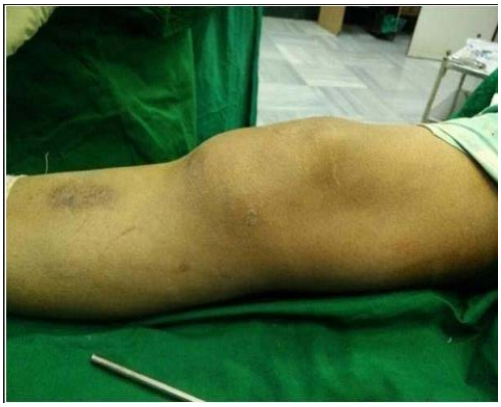

Fig. 2: Clinical Image

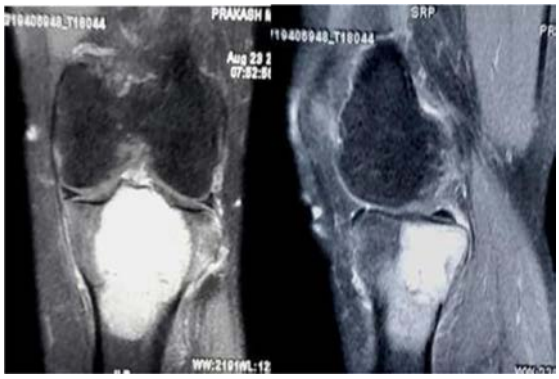

Fig. 3: MRI Images of GCT of Proximal Tibia

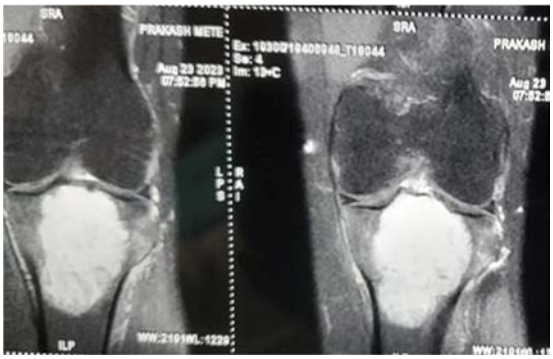

Fig. 4: MRI of Proximal Tibia GCT

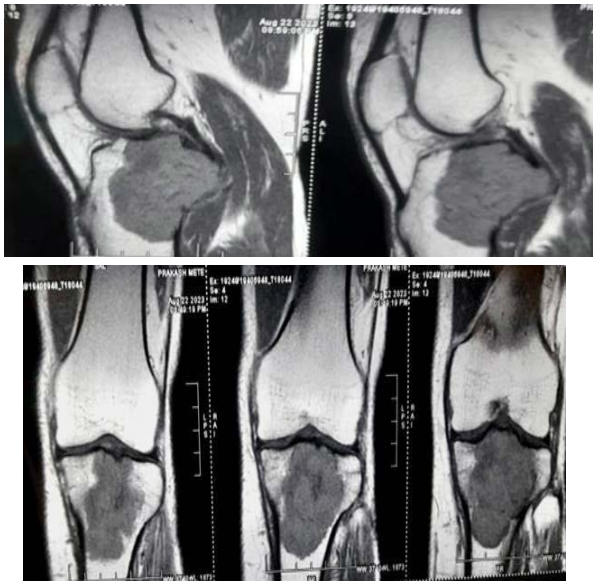

Fig. 5: CT Scan Images Showing Extension of Proximal Tibia GCT for Campanacci Grading

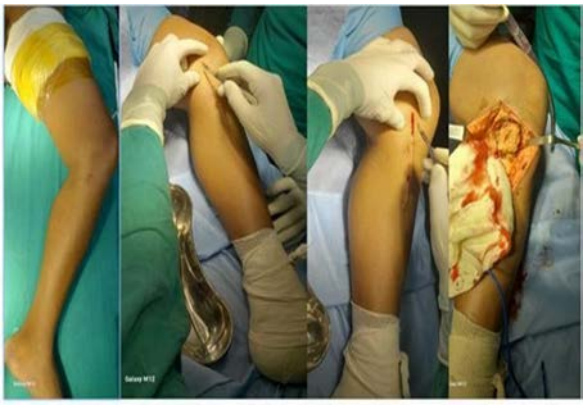

Fig. 6: Surgical Images of Limb Positioning Applying Pneumatic Tourniquet, Incision Including Previos Biopsy Scar, Making the Exposure of the Tumor

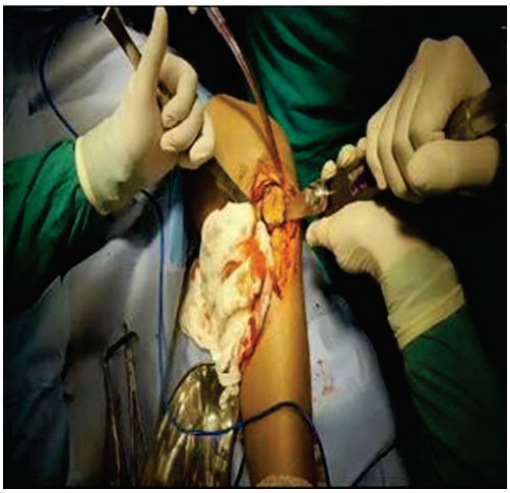

Fig. 7: Making a Cortical Door

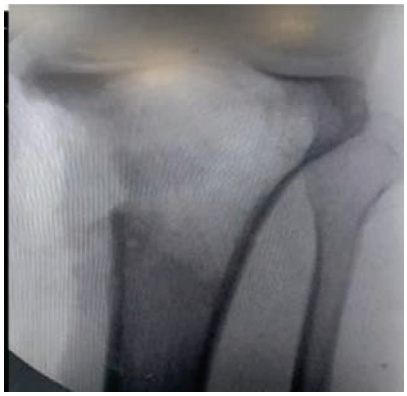

Fig. 8: CARM Image After Extended Curettage Showing Extension of Curettage Adequacy

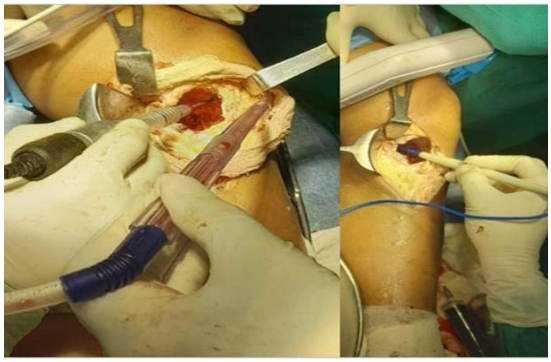

Fig. 9: Application of High-Speed-Burr, Thermal Cautery as Adjuvants

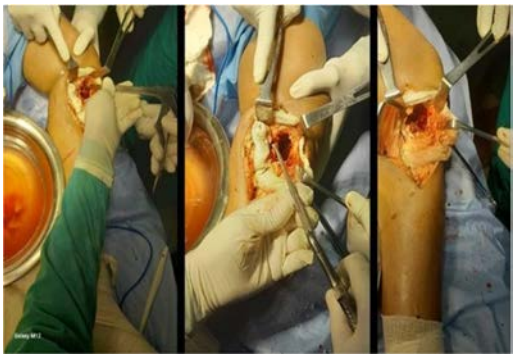

Fig. 10: Application of Hydrogen Peroxide Soaked Gauze for Seeding Prevention in Surrounding Soft Tissue During Extraction of Tumor

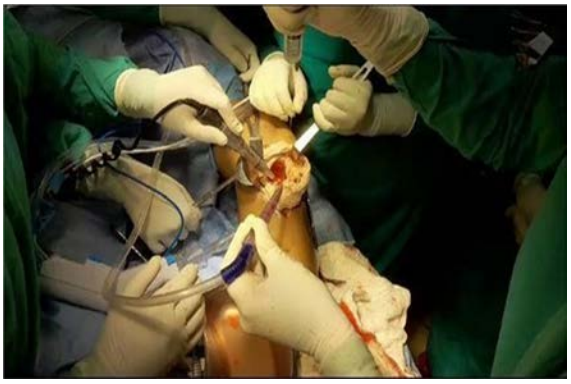

Fig. 11: Extended Curettage with High Speed Burr with Continuous Irrigation of Saline Water

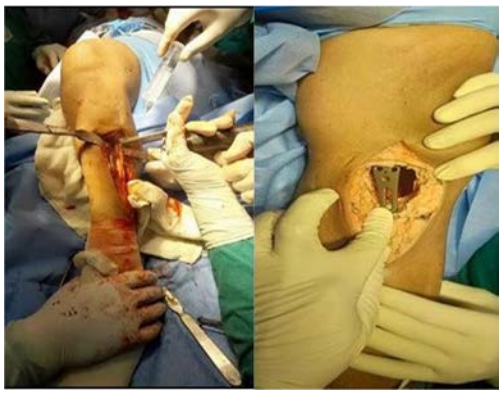

Fig. 12: Bone Graft Harvesting from Fibula and Application of Proximal Tibia Anatomical Locking Plate for Mechanical Support

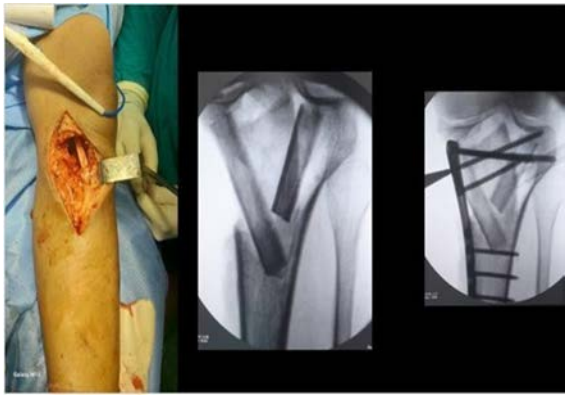

Fig. 13: Bone Graft Allocation with Plate Fixation

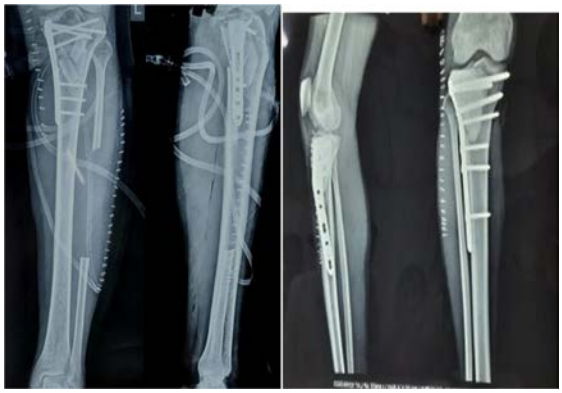

Fig. 14: Left-Post Op X-Ray of Extended Curettage and Bone Graft with PTALP Fixation Right-Post Op X-Ray of Extended Curettage and Filling with Bone Cement and PTALP Fixation

RESULTS AND DISCUSSIONS

In our study, 5 (16.7%) patient had LT. Proximal Tibia, 8 (26.7%) patients had LT. Distal Femur, 1 (3.3%) patient had LT. Proximal Femur, 1 (3.3%) patient had Proximal Humerus, 1 (3.3%) patient had Proximal Humerus, 2 (6.7%) patients had rt. DISTAL FEMUR, 1 (3.3%) patient had RT. Ankle, 10 (33.3%) patients had RT. Distal Femur, 1 (3.3%) patient had RT. Hip and 3 (10.0%) patients had RT. Proximal Tibia. The value of z

is 3.0028. The value of p is .0027. The result is significant at p<.05. In our study, 1 (3.3%) patient had Hypertrophied Scar, Occasional Pain, 1 (3.3%) patient had Implant Failure, 3 (10.0%) patients had Local Reccurance, 10 (33.3%) patients had Pain, 2 (6.7%) patients had Pathological Fracure Intraarticular Preoperative, 4 (13.3%) patients had Rom Restriction, and 1 (3.3%) patient had Wound Infection. The value of z is 3.0028. The value of p is .0027. The result is significant at p<.05. In above table showed that the mean Surgical Time (IN minutes) (mean±s.d) of patients was 239.0000±149.2822. In above table showed that the mean MSTS Score (mean±s.d.) of patients was 22.2000±2.8454. In above table showed that the mean Follow Up in Months (mean±s.d.) of patients was 38.4667±24.5550. In Hypertrophied Scar, Occasional Pain, the mean MSTS Score (mean±s.d.) of patients was 20.0000±.0000. In Implant Failure, the mean MSTS Score (mean±s.d.) of patients was 16.0000±.0000. In Local Recurrence, the mean MSTS Score (mean±s.d.) of patients was 18.3333±.5774. In None, the mean MSTS Score (mean±s.d.) of patients was 23.8000±2.9364. In Pain, the mean MSTS Score (mean±s.d.) of patients was 23.6250±.9161. In Pathological Fracture Intraarticular Preoperative, the mean MSTS Score (mean±s.d.) of patients was 20.0000±.0000. In Rom Restriction, the mean MSTS Score (mean±s.d.) of patients was 22.0000±1.4142. In Wound Infection, the mean MSTS Score (mean± s.d.) of patients was 20.0000±.0000. Distribution of mean MSTS Score with Complications was statistically significant (p=0.0016). The value of Pearson Correlation Coefficient (r) was -.456. The Negative correlation was found between MSTS Score vs Lesion Size. The P-Value was .011. The result was statistically significant. In our study, the mean follow up in months all patients were 89.320 months with a standard error of 5.534. The 95% confidence interval range was 78.473-100.167 months. In our study, the mean follow up in months all patients were 89.320 months with a standard error of 5.534. The 95% confidence interval range was 78.473-100.167 months.

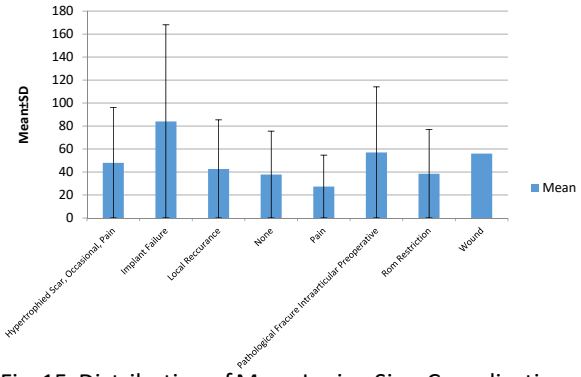

Fig. 15: Distribution of Mean Lesion Size: Complications

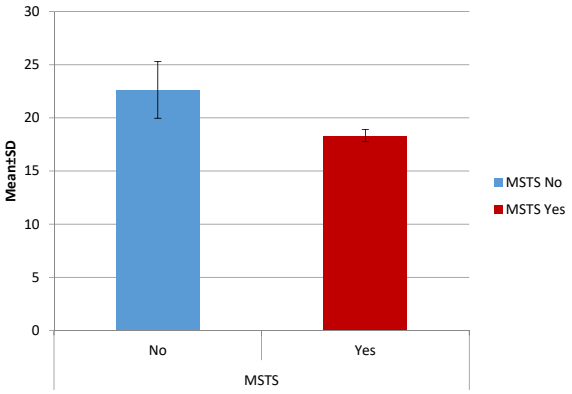

Fig. 16: Distribution of Mean MSTS Score: Recurrence

The present study was Observational Study from a prospectively maintained database. This Study was conducted from DECEMBER 2022 to JULY 2024 (20 months Duration) at orthopaedics-OPD and Emergency with GCT, attending at SSKM and H. Total 30 patients were included in this study. **Saikia**[10] examined that the mean age at operation was 32.4 years (range, 18.5-40 years. In our study, out of 30 patients most of the patients were 31-40 years old [15 (50.0%)]. Which was statistically significant (p=.0002), (z=3.7244). **Kafchitsas**[11] showed that 14 male and 24 female patients were included in this study (mean age 28 years, range 13-56 years). We found that, male population was higher [16(53.3%)] than the female population [14(46.7%)]. Male: Female ratio was 1.1:1 but this was not statistically significant (p=.60306). **Saikia**[10] examined that the proximal tibia was involved in 13 cases (40.6%), followed by distal femur (n=11) 34.4% distal tibia (n=3) 9.4%, proximal femur (n=2) 3.2% and distal radius (n=3) 9.4%. Eleven patients (34.4%) had local recurrence, of which eight were of Campanacci's Grade III. We found that, most number of patients had LT. Distal Femur [8 (26.7%)] it was statistically significant (p=.0114), (z=2.5309). We showed that, most number of patients had No Recurrence [27 (90.0%)] this was statistically significant (p<.00001), (z=6.1968). We found that, lower number of patients had Ocassional Pain in Long Walk Complications [6 (20.7%)] it was statistically significant (p=.00544), (z=2.7809). **Tiwari**[12] found that At a median follow up of 46 months, two patients out of the 17 operated had a local recurrence. In our study, the mean Age (Year) of patients was [31.0000± 8.2921], the mean Campanacci Type of patients was [2.0000±.0000], the mean Surgical Time (IN minutes) of patients was [239.0000±149.2822], the mean MSTS Score of patients was [22.2000±2.8454] and the mean Follow Up in Months of patients was [38.4667±

Table 1: Distribution of Anatomical Location and Complications

		Frequency	Percent	p-value
Anatomical Location	**LT. Proximal Tibia**	5	16.70%	.0027
	LT.Distal Femur	8	26.70%	
	LT.Proximal Femur	1	3.30%	
	Proximal Humerus	1	3.30%	
	RT. Ankle	1	3.30%	
	RT. Distal Femur	10	33.30%	
	RT.Hip	1	3.30%	
	RT.Proximal Tibia	3	10.00%	
Complications	**Hypertrophied Scar, Occasional Pain**	1	3.30%	3.0028
	Implant Failure	1	3.30%	
	Local Reccurance	3	10.00%	
	None	10	33.30%	
	Pain	8	26.70%	
	Pathological Fracure Intra articular Preoperative	2	6.70%	
	Rom Restriction	4	13.30%	
	Wound Infection	1	3.30%	

Table 2: Distribution of Mean Surgical Time (In Minutes), MSTS Score and Follow Up in Months

	Number	Mean	SD	Minimum	Maximum	Median
Surgical Time(IN minutes)	30	239	149	120	960	190
MSTS Score	30	22.2	2.85	16	27	23
Follow Up in Months	30	38.4667	24.6	12	96	30

Table 3: Distribution of Mean MSTS Score: Complications

		Number	Mean	SD	Minimum	Maximum	Median	p-value
MSTS Score	Hypertrophied Scar, Occasional Pain	1	20	0	20	20	20	0.0016
	Implant Failure	1	16	0	16	16	16	
	Local Recurrence	3	18.3333	0.577	18	19	18	
	None	10	23.8	2.936	18	27	24	
	Pain	8	23.625	0.916	22	25	24	
	Pathological Fracture Intra articular Preoperative	2	20	0	20	20	20	
	Rom Restriction	4	22	1.414	20	23	22.5	
	Wound	1	20	0	20	20	20	

Table 4: Correlation of MSTS Score in Lesion Size

	MSTS Score	Remarks
Pearson Correlation Coefficient (r)	-.456*	Negative correlation
p-value	0.011	Significant
Number	30	30

Table 5: Means and Medians for Survival Time

Means and Medians for Survival Time							
Mean[a]				Median			
Estimate	Std. Error	95% Confidence Interval		Estimate	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound			Lower Bound	Upper Bound
89.32	5.534	78.473	100.167	96	0	0	0

a. Estimation is limited to the largest survival time if it is censored.

24.5550]. We found that, mean MSTS score was more in without Complications [23.8000±2.9364] compared to Pain [23.6250±.9161], Rom Restriction [22.0000± 1.4142], Wound Infection [20.0000±.0000], Pathological Fracture Intraarticular Preoperative [20.0000±.0000], Hypertrophied Scar, Occasional Pain [20.0000±.0000], Local Recurrence [18.3333±.5774] and Implant Failure [16.0000±.0000] but this was statistically significant (p=0.0016). We showed that, mean Lesion Size was more in with Recurrence [42.6667±21.9393] compared to without Recurrence [39.0000±16.6132], but this was not statistically significant (p=0.7264). We observed that, mean Lesion Size was more in Implant Failure [84.0000±.0000] compared to Pathological Fracture Intra articular Preoperative [57.0000±12.7279], Wound Infection [56.0000±.0000], Hypertrophied Scar, Occasional Pain [48.0000±.0000], Local Recurrence [42.6667±21.9393], Rom Restriction [38.5000±12.0416], without Complications [37.8000±15.4114] and Pain [27.3750± 6.5670] but this was statistically significant (p=0.0152). We showed that, mean MSTS score was more in without Recurrence [22.6296±2.6624] compared to with Recurrence [18.3333±.5774] but this was statistically significant (p=0.0104). In our study, The MSTS score vs lesion size was Negative Correction (-.456) but this was statistically significant (.011). In our study, the follow-up in month and Recurrence patients was mean survival time 89.320 months, with a standard error of 5.534 months. The range of the 95% CI was 78.473-100.167 months.

CONCLUSION

In GCT of bones, extended curettage still proves itself an ideal treatment [campanacci Gr II]. Low rate of recurrence and satisfactory postoperative outcome can be achieved if curettage and grafting is done meticulously with appropriate adjuvants in properly

selected cases in a well-planned surgical approach after assessing clinic-radiologically. Longer follow up for at least 6 years and larger sample size is essential for more commendable conclusion.

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