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Comparison between bone graft & cement as reconstruction modality after intralesional curettage for Giant cell tumors with respect to the functional result & local recurrence

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Abstract

Background:- Intralesional curettage is the primary treatment for giant cell tumors (GCTs). Bone grafting or cementing is used to fill the defect after curettage. In this study, we evaluated the outcome of surgical intervention for primary GCT after intralesional curettage using either bone graft or cementing and their functional outcome based on Enneking MSTS(Musculoskeletal tumour scoring) and SF-36 scoring and their local recurrence after treatment. Since there are currently no studies who have enumerated SF-36 for functional outcome in view of quality of life in intralesional treatment of tumour, we have expressed our results in this study.

Method:-Twenty-seven consecutive patients (15 males and 12 females) with GCT were recruited with the mean age of presentation were 29.17 ± 8.63. Out of these 3 were excluded from the study as it was treated with resection and 1 patient was lost to follow up. So we have included only 23 patients (11 males and 12 females). There were total 8 patients of Grade I, 12 of Grade II and 3 of Grade III Campanacci radiological classification. All were treated with intralesional curettage and either bone grafting or cementing. The results were evaluated using Enneking MSTS scoring system and SF-36 scoring and the recurrence was calculated.

Results:- The mean follow up interval of 38.65 ± 17.07 months. The mean MSTS scoring for bone grafting was 28.6 and for cementing were 29.41. The mean MSTS scoring for the upper limb is 29.25 whereas for the lower limb is 29.21. Mean PCS score for bone grafting and cementing including sandwich technique were 53.89 and 53.86 & the mean MCS score for them were 53.34 and 53.15 respectively. Also the local recurrence rates (9.09%) of bone grafting after intralesional curettage is slightly higher than cementing (8.69%) which is not stastically significant.

Conclusion:-There is no difference in the functional outcome by MSTS scoring amongst the treatment modality used for reconstruction after the intralesional curettage of Giant cell tumor. In general GCT has very good to excellent functional outcome without any significant disability irrespective of modality used for treatment. There is no difference in local recurrence rates after intralesional curettage of GCT when either bone grafting or cementing used

Keywords: bone grafting, cementing, sandwich technique, intralesional curettage.

Introduction

Giant cell tumors(GCTs) represent 4-5% of primary bone tumors and 20% of biopsy analyzed bone tumors[1] which

shows slight female predominance, with a peak incidence in young adults aged 20-40 years[2,3]. Intralesional curettage of GCT is less morbid & limb function preserving method with good patient compliance.

The advantages[4,5] of bone grafting is that bone graft undergoes remodeling along stress lines and once incorporated, reconstruction is permanent. The advantage of cementing[4, 5]is that methylmethacrylate monomer is cytotoxic & its thermal effect - hyperthermia may help extend the boundary of tumor kill. Immediate structural support and rapid weight-bearing ambulation can be started. Also radiographic detection of recurrence is easier.

These 2 modalities of treatment have been compared in various studies[6, 7] & was found that whatever modality is used intralesional curettage have been in general outweigh the disadvantage of a higher local recurrence and re-operation rate and that both bone grafting or cementing have almost same result in evaluating functional outcome after surgery.

In our study we have studied the functional outcome and also the local recurrences in intralesional treatment of GCT by bone grafting &or cementing. Functional outcome is studied by Enneking's MSTS scoring and by SF-36 scoring. Since there are currently no studies who have enumerated SF-36 for functional outcome in view of quality of life in intralesional treatment of tumour, we have expressed our results in this study. We begin our study to find out the functional outcome after extended curettage and reconstruction using either bone grafting or cementing or both(sandwich technique) with or without internal fixation and to fnd out the rate of local recurrences in them.

Materials & methods

This was retrospective study from October 2005 to October 2012.During this period, all patients with biopsy proven GCT of bone and who had followed up for atleast 1 year were included. Both new as well as local recurrent cases affecting only appendicular skeleton were included.Patients in which curettage is not the choice of treatment such as patients who has damaged joint cartilage or poor bone stock where reconstruction is not possible, soft tissue involvement in more than 2 planes, arthritic joint were excluded from the study. Twenty-seven patients (15 males and 12 females) with GCT were recruited with the mean age of presentation was 29.17 ± 8.63 years. Out of these 3 were excluded from the study as they belong to Grade III Campanacci & were treated with resection. 2 of them were the GCT of 1st metatarsal & treated with resection & bone grafting and 1 was GCT of distal end radius treated with resection & cementing.1 patient was lost to follow up a case of GCT lower end tibia treated eith intralesional curettage & cementing.. So we have included only 23 patients (11 males and 12 females). There were total 8 patients of Grade I, 12 of Grade II and 3 of Grade III Campanacci radiological classification. Grade I lesion has well emarginated border of thin rim of mature bone with the cortex being intact or slightly thinned but not deformed. Grade II lesion has relatively well defined margins but no radio opaque rim with the rim being thin & moderately expanded but still intact. Grade III tumor has fuzzy borders with extension into soft tissues which did not follow the contour of bone & was not limited by an apparent shell of reactive bone. We tabulated the SF-36 according to grading by Sanderson & Andrews[9] as 50 or >50 = No disability, 40-49 = Mild disability, 30-39 = Moderate disability, <30 = Severe disability and thus calculated our results.

Surgical technique

Under appropriate anesthesia, incision was taken to include the scar of previous surgery that is the scar of biopsy. This is an important step as soft tissue recurrence of Giant Cell Tumor is known to occur if it is not done. It is necessary to obtain adequate exposure of the lesion.

This was achieved by making a large cortical window to access the tumor as to avoid having to curette under overhanging shelves or ridges of the bone. A dental mirror can be used which help for better visualization. The part of the wall of the cavity which is composed of soft tissue or a thin bony shell should be excised. Multiple angled curettes help to identify and access small pockets of residual disease which may otherwise result in recurrence. The remaining cristae and septa in the cavity should also be excised due to in order to eliminate the space which is inaccessible using a curette. When the wall of the cavity contains many small holes caused by local invasion of the tumor, each hole should be meticulously cleared. They usually do not penetrate the periosteum but a dead space may easily form between them & periosteum. A high power burr to break the bony ridges helps extend the curettage & is used. A pulsatile lavage system used at the end of the curettage helped to bare raw cancellous bone & physically washes out tumor cells. Adjuvants such as hydrogen peroxide are used in most of the cases. Reconstructing the defect after curettage was done with either bone graft alone or cementing. In some case were the cortical thinning were present after curettage, a thin layer of morsellized bone graft was also used. Gel foam used over the bone graft. Cement was then used to fill the entire cavity so as to offer the anatomical shape of the bone. Any internal fixation required was decided intraoperatively. In case of pathological fracture too, the steps of surgery remains the same. Closure of the soft tissue, subcutaneous tissue and skin was done in layer. Post-operatively patient was given immobilization support in the form of plaster slabs. The patients treated with only bone grafting were mobilize after 5-7 days for lower limb on an average 3 weeks of non weight bearing walking & then gradual weight bearing was started with full weight bearing after 4 months. For patients treated with cementing they were mobilize earlier around 2-3 days post operatively and on an average partial weight bearing after 1 week and then gradual weight bearing was started with full weight bearing after 3 weeks.

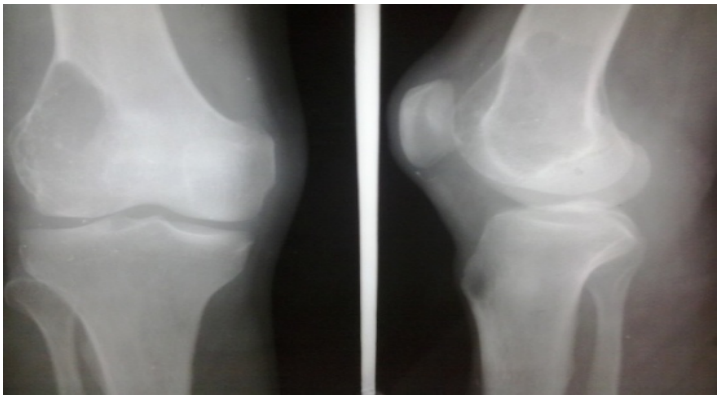
Results

A total number of 23 patients were included in the study, including 11 males and 12 females. The age of the patient varied from 15 to 54 years with the mean age of 29.17 ± 8.63 years and the mean follow up interval of 38.65 ± 17.07 months. There were total 8 patients of Grade I, 12 of Grade II and 3 of Grade III Campanacci radiological classification. 11 patients underwent only bone grafting, 3 only cementing and 9 were treated with both (cementing + bone grafting) i.e. sandwich technique.4 patients having upper limb affection and 19 patients having lower limb affection the mean MSTS (Musculoskeletal tumour society) scoring for the upper limb is 29.25 whereas for the lower limb is 29.21. The mean MSTS scoring for the upper limb is 29.25 whereas for the lower limb is 29.21. The mean MSTS scoring for bone grafting was 28.6 and for cementing were 29.41. Mean PCS (physical component summary) score for bone grafting and cementing including sandwich technique were 53.89 and 53.86 & the mean MCS (mental component summary) score for them were 53.34 and 53.15 respectively. No other complications except recurrence were found in 2 patients in our study. Also the recurrence rate in cases operated with bone grafting alone was 9.09% and in cementing including sandwich technique was found to be 8.69%.

Modality	Enneking Msts Scoring	Sf-36 Scoring			Local Recurrence
		PCS	MCS	Disability	
BONE GRAFTING	28.6 (95.34%)	53.89	53.34	NO	9.09%
Cementing (Including Sandwich Technique)	29.4 (98.00%)	53.86	53.15	NO	8.69%
p Value	0.437 p>0.05	0.989 p>0.05	0.782 p>0.05	---------- ---------- -	0.951 p>0.05

Cases

1) **PURE CEMENTING** (Lower end left femur)



Pre-op

Post-op (41 months follow-up)

Knee range of movements at 41 months follow up interval

2**) PURE BONE GRAFTING + FIXATION WITH LCP** (Lower end left femur)

Pre-op

Post-op (21 months follow-up)

Knee range of movements at 21 months follow up interval

3) **BOTH CEMENT & BONE GRAFTING (SANDWICH TECHNIQUE)** (Lower end right femur)

Preop

Post-op (48 months follow-up)

Knee range of movement at 48 months follow up interval.

Discussion

In our series the most common site of predilection was also around the knee joint, and most patients were in their third and females slightly outnumbered the males. Blackley et al[4] in 1999 in their study of 59 patients found out the risk of local recurrence after curettage with a high speed burr & reconstruction with autogenous graft with or without allograft bone is similar to that observed after use of cement & other adjuvant treatment. It is likely that the adequacy of the removal of tumor rather than the use of adjuvant modalities is what determines the risk of recurrence. In our study the functional outcome was calculated using MSTS scoring system which has very good to excellent outcome in all the groups irrespective of the modality used for treatment. Though there exists little differences but they are not of significance. We also calculated SF-36 scores and graded them accordingly to Sanderson and Andrews[9], 2002 but we found that irrespective of whatever modality of treatment was used there was no disability or limitation of function. Both the physical or mental component summary in both the groups were almost comparable and found no stastical significance in the modality of treatment used for reconstruction of GCT.

Although there are few reported series, local recurrences after such wide resections have been predictably quite low. For example, Gitelis et al[19] reported no local recurrence after the treatment of 20 long bone GCT patients with en bloc resection after a mean follow up of 92 months. Recently, Mankin and Hornicek[53] reported a local recurrence rate of 6% in such cases. O'Donnell et al[9] reported a 25% local recurrence rate after the treatment of 60 GCT patients with curettage & packing with PMMA. However acceptable rates of local control are still reported with autograft or allograft packing[4, 11, 12, 13] , or even no packing. In our study we have total 2 recurrences in 23 patients, one in bone grafting group and another in combined cementing & sandwich group, the recurrence rate in cases operated with bone grafting alone was 9.09% and in cementing was found to be 8.69% which was stastically insignificant.

Conclusion

Thus there is no effect in treatment of modality used after intralesional curettage for the treatment of GCT. Also the local recurrence rates (9.09%) of bone grafting after intralesional curettage is slightly higher than sandwich technique(8.33%). But as our sample size was small further study may be needed to evaluate the recurrence rate.

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Table

SR.NO	AGE	SEX	Campanacci grading	SITE	SIDE	bone graft	cementing	both	recurrent cases	FOLLOW UP	LOCAL RECURRENCE	MSTS		
										months			PCS	MCS
1	19	F	I	l/e tibia	L	icbg	no	no	no	24	none	26	44.3	51.9
2	36	M	I	l/e humerus	L	icbg	no	no	yes(9 months)	18	NONE	28	51.6	47.3
3	22	F	II	femur	L	fibula & icbg	no	no	no	21	none	30	48.6	53.5
4	18	M	I	tibia	R	icbg	YES	yes	yes (14 months)	36	yes	30	56.4	56.1
5	25	M	I	radius	L	none	yes	no	yes (18 months)	36	none	29	55.8	54.4
6	28	M	I	radius	L	icbg	no	no	yes (21 months)	48	yes	30	58.9	52.8
7	21	F	II	femur	L	icbg	YES	yes	no	48	none	28	54.9	56.7
8	31	F	I	femur	R	icbg	yes	yes	no	36	none	30	56.1	55.7
9	22	F	II	tibia	L	NO	YES	no	no	54	none	29	46.3	50.4
10	35	F	II	TIBIA	L	icbg+FIBULA	no	no	no	62	none	30	55.5	53.6
11	30	M	II	ring finger	L	icbg	no	no	no	51	none	30	54.5	57.1
12	33	M	I	femur	R	icbg	n0	no	no	48	none	30	53.4	56.9
13	32	M	II	femur l/e	L	icbg	Yes	yes	yes (6 months)	45	NONE	30	59.7	50.2
14	25	M	II	femur u/e	R	icbg & fibula	Yes	yes	no	31	NONE	29	48	51.8
15	33	M	III	femur l/e	L	icbg	Yes	yes	no	41	NONE	29	49.9	50.3
16	37	F	I	L/E TIBIA	L	NO	Yes	no	no	12	NONE	29.5	58.2	52.3
17	15	F	II	L/E TIBIA	L	icbg	NO	NO	no	24	NONE	30	54.7	54.3
18	27	F	III	L/R FEMUR	R	icbg	YES	yes	no	40	NONE	29.5	48.6	49.8
19	30	F	II	L/E FEMUR	R	ICBG	Yes	yes	no	84	NONE	30	58.3	53.3
20	24	M	II	u/e femur	L	icbg	No	no	no	18	NONE	26	54.9	55
21	54	M	I	L/E FEMUR	R	ICBG+FIBULA	NO	NO	no	56	none	29	59	51.8
22	42	F	I	u/e tibia	L	icbg	No	no	no	18	none	30	57.4	52.5
23	32	F	I	TIBIA	R	icbg	YES	yes	no	38	NONE	30	54.2	56.8