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Original Research Paper

Complications and Survival Outcome Following Custom Mega Prosthesis Reconstruction for Bone Tumours-A Single Institution-15 Years Study

Medical Science

KEYWORDS : Custom mega Prosthesis, joint instability, implant survival rate,extremity bone tumours.

Prof Subbiah Shanmugam	M.S.,MCh, Prof and HOD, surgical oncology,, Centre For Oncology, Government Royapettah Hospital, Chennai-600014.
Dr Sujay Susikar	M.S.,MCh, Assistant Professor in Surgical Oncology, Centre For Oncology, Government Royapettah Hospital, Chennai-600014.
DrSatish kumar Maheswaran	Post Graduate in Surgical Oncology, Centre For Oncology, Government Royapettah Hospital, Chennai-600014.

ABSTRACT

Limb salvage surgery has become the standard of care in the management of extremity bone tumours. In a resource limited settings like our's, custom made megaprosthesis provides an excellent option for limb salvage surgery. ***Aims And Objectives:*** *To analyse, the various complications, rates of implant survival, median survival in patients undergoing custom megaprosthesis reconstruction for extremity bone tumours .* ***Materials And Methods:*** *Fifty eight patients who underwent custom megaprosthesis reconstruction in our "Centre for Oncology", between 2002 and 2016 for extremity bone tumours were analysed using kaplan Meier analysis and log rank test.* ***Results:*** *Type I Failure(Soft tissue) –I. Joint instability was observed in 24 patients(42%), with median time of occurrence at 3.7 months, II Aseptic wound dehiscence /superficial infection was observed in 19 (33.3%), with median time of 10 days. Type III (structural)failure in form of prosthesis fracture was seen in 4 patients(7.01%). Disclocation of the implanted prosthesis occurred in 3 patients(5.26%) Deep infection(Type IV) occurred in 3 patients (5.2%) .Our Implant survival rate was 89.48%. Local reccurence(Type V) occurred in 4 patients (7.01%),median time 11.2months, distal recurrence(lung metastasis) was observed in 13 patients(22.80%), with median time to occurrence of 19.3months. Median survival for lower extremity sarcoma was 28.3months and upper extremity sarcoma was 31.9months.* ***Conclusion:*** *From our study,we found that* ***Type I*** *failure in form of joint instability and aseptic wound dehiscence are commonest complications .*

Introduction: Limb salvage surgery has become the standard of care in the management of extremity bone tumours[1]. The ultimate aim is to achieve good oncological clearance with a functionally useful limb .This can be achieved with either a modular or custom made mega prosthesis[2]. Eventhough modular prosthesis has become the standard of care now a days[3],in a resource limited settings like our's, and more so in a government setting, custom made megaprosthesis provides an excellent economical option for limb salvage surgery.

Aims And Objectives: To analyse, the various complications, rates of implant survival, median survival in patients undergoing custom megaprosthesis reconstruction for extremity bone tumours .

Materials And Methods : Fifty eight patients who underwent custom megaprosthesis reconstruction in our "Centre for Oncology", between 2002 and 2016 for extremity bone tumours were analysed in detail. Resections included 24 cases of distal femur, 4 cases proximal femur, 2 cases of total femur, 17 cases of proximal tibia, 1 case of distal tibia,8 cases of proximal humerus, 2 cases of distal humerus.Out of these 58 cases, 51 were osteosarcoma,1 was fibrosarcoma,6 were giant cell tumours(3 were recurrent giant cell tumours). Complications were classified as type I- V by the system proposed by Henderson et al.[9,10]

Statistical Methods: Statistical analysis of each parameters(complications) were made using Kaplan Meier analysis and Log Rank Test .

Results: **Type I** Failure(Soft tissue) –I. Joint instability was observed in 24 patients(**42%),** with median time of occurrence at **3.7 months**, II Aseptic wound dehiscence /superficial infection was observed in **19** (33.3%), with median time of **10 days**. **Type III** (structural)failure in form of prosthesis fracture was seen in 4 patients(7.01%). Disclocation of the implanted prosthesis occurred in 3 patients(5.26%) ,of which two cases were treated with closed reduction and one by open reduction. Deep infection(**Type IV**) occurred in **3 patients** (5.2%) which was salvaged with amputation in 2 cases, conservatively in 1 patient. Our Implant survival rate was **89.48%.** Local reccurence(**Type V**) occurred in 4 patients (7.01%),median time **11.2months**, distal recurrence(lung metastasis) was observed in 13 patients(22.80%), with median time to occurrence of **19.3months**. Median survival for lower extremity sarcoma was **28.3months** and upper extremity sarcoma was **31.9months.**

Kaplan-Meier Survival Analysis for Joint space instability

Bone	Total N	N of Events		Censored	
		N	%	N	%
Femur	30	14	48.3%	15	51.7%
Tibia	18	7	38.9%	11	61.1%
Humerus	10	3	30.0%	7	70.0%
Overall	58	24	42.1%	33	57.9%

Mean Survival (event) Time (in months)

Bone	Mean survival time (months)			
	Estimate	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Femur	24.119	3.822	16.627	31.611
Tibia	35.156	5.908	23.576	46.735
Humerus	31.810	5.029	21.953	41.667
Overall	33.459	3.367	26.859	40.058

Overall Comparisons between Bones

	Chi-Square	df	P-Value
Log Rank (Mantel-Cox)	1.801	2	0.0553
Test of equality of survival distributions for the different levels of Bone.			

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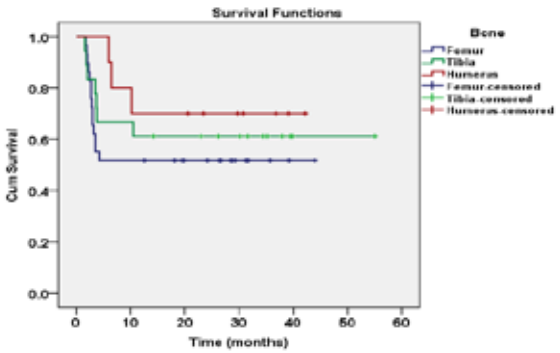


Kaplan-Meier Survival Analysis for Aseptic wound dehiscence

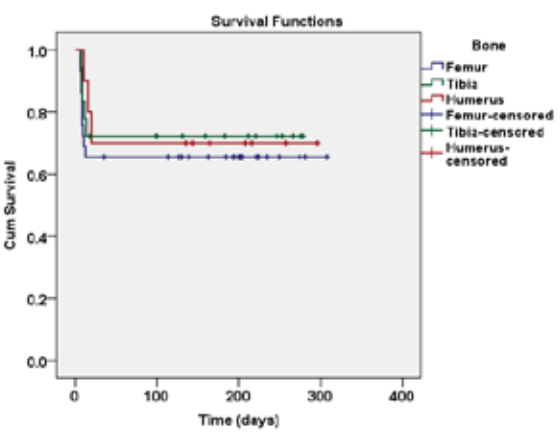
Bone	Total N	N of Events		Censored	
		N	%	N	%
Femur 30 10 34.5%				19	65.5%
Tibia	18	5	27.8%	13	72.2%
Humerus	10	3	30.0%	7	70.0%
Overall	58	18	31.6%	39	68.4%

Mean Survival (event)Time (in days)

Bone	Mean survival time (days)			
	Estimate	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Femur	204.931	26.383	153.221	256.641
Tibia	204.100	28.316	148.601	259.599
Humerus	211.480	40.542	132.017	290.943
Overall	213.941	18.339	177.997	249.885

Overall Comparisons between Bones

	Chi-Square	df	P-Value
Log Rank (Mantel-Cox)	.453	2	0.0928
Test of equality of survival distributions for the different levels of Bone.			



Kaplan-Meier Survival Analysis for Locoregional recurrence

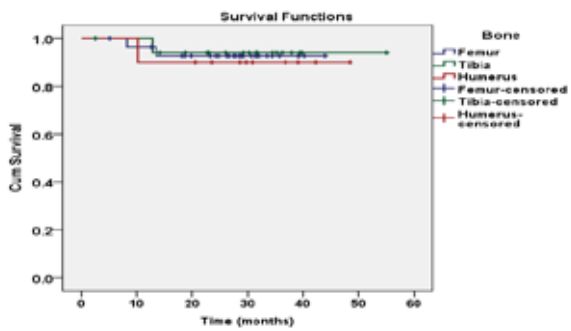
Bone	Total N	N of Events		Censored	
		N	%	N	%
Femur 30 26.9%				27	93.1%
Tibia	18	1	5.6%	17	94.4%
Humerus	10	1	10.0%	9	90.0%
Overall	58	4	7.0%	53	93.0%

Mean Survival Time (months)

Bone	Mean Survival Time (months)			
	Estimate	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Femur	41.594	1.642	38.375	44.812
Tibia	52.612	2.414	47.880	57.343
Humerus	44.580	3.624	37.477	51.683
Overall	51.878	1.552	48.835	54.920

Overall Comparisons between Bones

	Chi-Square	df	P-Value
Log Rank (Mantel-Cox)	.168	2	0.999
Test of equality of survival distributions for the different levels of Bone.			

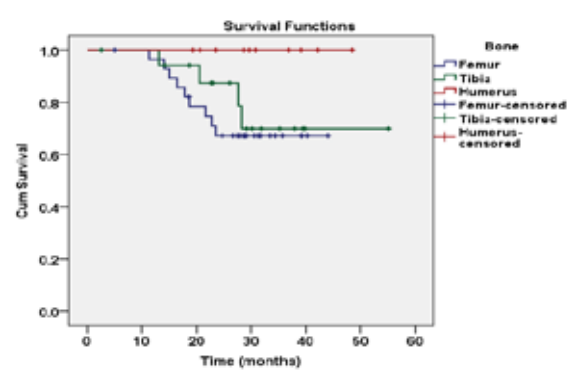


Kaplan-Meier Survival Analysis for Distal recurrence(Lung metastasis)

Bone	Total N	N of Events		Censored	
		N	%	N	%
Femur 30 9 31.0%				20	69.0%
Tibia	18	4	22.2%	14	77.8%
Humerus	10	0	0.0%	10	100.0%
Overall	58	13	22.8%	44	77.2%

Overall Comparisons between Bones

	Chi-Square	df	P-Value
Log Rank (Mantel-Cox)	3.689	2	0.143
Test of equality of survival distributions for the different levels of Bone .			



Discussion: Endoprosthesis failure was classified into five types by Henderson et al [9]

Type I : Soft-tissue failure- Instability, tendon rupture, aseptic wound dehiscence .

Type II : Aseptic loosening .

Type III: Structural failure in form of Periprosthetic or prosthetic fracture, defi cient bony supporting structure .

Type IV: Infection where the Infected endoprosthesis is not amenable to retention .

Type V: Tumor progression Recurrence or progression of tumor with endoprosthesis contamination.

Types I-III are mechanical failures and types IV and V are non-mechanical failures[10]. Although in literature aseptic loosening is the commonest complication[4], in our study , Type I (soft tissue) failure is common .The routine use of bone cement has advantages of providing early stability and ambulation, tumoricidal effect by heat production and probably less chance of aseptic loosening in the implanted prosthesis[5].

Successful limb salvage surgery is based on the following basic principles, I-Resection of tumour with oncological principles and adequate margins. II- Reconstruction of bone defect with prosthesis or allograft. III-Adequate soft tissue cover and muscle transfer to cover the prosthesis and to restore motor power[11]. Prosthesis related complications are of major concern and is associated with poor functional outcome ,poor quality of life and decreased survival[8,12]. Our study is one of the long term analysis of various complications associated with custom mega prosthesis reconstruction. Our study also reveals that soft tissue and structural failures are more common in lower extremity probably due to effect of weight bearing .

Conclusion:From our study,we found that **Type I** failure in form of joint instability and aseptic wound dehiscence are commonest complications .. Limb salvage surgery has become the standard of care for management of extremity bone tumours today ,because of better understanding of the tumour biology, sound oncological skills, leading to improved quality of life and better disease free survival. However the only hurdle is the availability of prosthesis and the cost factors.Custom megaprosthesis is an excellent economical option in resource limited sitting , with acceptable complications and better functional outcome.

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