

## PAPER 13

### Functional Outcomes of Pediatric and Adult Patients after Endoprosthetic Reconstruction of Lower Extremity Tumors

Tina H. Tran, BS<sup>1</sup>; James B. Hayden, MD, PhD<sup>1</sup>; Aaron M. Gazendam, MD<sup>2</sup>; Michelle Ghert, MD, FRCSC<sup>2</sup>; Kenneth R. Gundle, MD<sup>1</sup>; Yee-Cheen Doung, MD<sup>1</sup>

1. Oregon Health and Science University, Department of Orthopaedics and Rehabilitation, Portland, OR, USA
2. Division of Orthopaedic Surgery, McMaster University, Hamilton, Ontario, Canada

**Background:** While the treatment of lower extremity bone tumors is similar between adult and pediatric patients, differences in functional and patient-reported outcomes are unknown. To date, there are no direct comparisons of outcomes between these two groups. The PARITY (Prophylactic Antibiotic Regimens in Tumor Surgery) trial is the largest prospective dataset assembled for patients with lower extremity bone tumors, and presents an opportunity to investigate the differences in functional outcomes between pediatric and adult patients.

#### Questions:

- Is there a difference in functional outcomes between pediatric and adult patients undergoing endoprosthetic reconstruction of lower extremity bone tumors?
- Do pediatric patients have greater potential for recovery compared to adults in this population?

#### Methods:

As a secondary analysis of the PARITY study, patient details were acquired from the prospectively collected trial database. MSTS-93 and TESS questionnaires were administered preoperatively and 3, 6, and 12 months after surgery. Continuous outcomes between groups were compared using a Student's T-test and dichotomous outcomes compared using a Pearson's Chi square test.

#### Results:

150 pediatric and 447 adult patients were included in our analysis. Pediatric patients were more likely to have primary bone tumor (146/150 vs 287/447;  $p < 0.001$ ) and adjuvant chemotherapy (140/149 vs 195/441;  $p < 0.001$ ). Reoperation rates were insignificant between the two (45/105 vs 106/341;  $p < 0.13$ ). Pediatric patients had higher MSTS-93 (64.7 vs 53.8;  $p < 0.001$ ) and TESS scores (73.4 vs 60.4;  $p < 0.001$ ) at baseline. At nearly all time points, pediatric patients scored significantly higher than adults on MSTS-93 and TESS. By one year, pediatric patients continued to have higher MSTS-93 (82.0 vs 76.8;  $p = 0.02$ ) and TESS scores (87.7 vs 78.6;  $p < 0.001$ ). Both groups demonstrated similar improvement from baseline to one year on MSTS-93 (mean differences 17.4 and 20.0;  $p = 0.48$ ) and TESS (mean differences 14.1 and 14.7;  $p = 0.83$ ).

**Table 1.** Patient Characteristics

Characteristic	Pediatric Patients N = 150	Adult Patients N = 447	P-value
Age (SD)	15.6 (1.9)	49.6 (18.7)	<0.001
<b>Gender</b>			
Male	98	260	
Female	52	187	0.12
<b>Location</b>			
Femur	117	375	
Tibia	33	72	0.11

<b>Diagnosis</b>			
Primary Bone Tumor	146	287	
Soft Tissue Sarcoma	1	61	
Metastatic Bone Disease	0	56	<0.001
Giant Cell Tumor	3	43	
<b>Preoperative Radiation</b>	0/150	22/425	0.002
<b>Preoperative Chemotherapy</b>	129/150	158/447	<0.001
<b>Muscle excised</b>			
< 50cm <sup>3</sup>	90	255	
> 50cm <sup>3</sup>	59	188	0.54
<b>Fascial tissue excised</b>			
<5cm <sup>2</sup>	125	360	
>5cm <sup>2</sup>	24	85	0.46
<b>Length of bone resected</b>			
<10cm	17	55	
>10cm	133	291	0.89
<b>Length of hospital admission (median, IQR)</b>	5 (4, 7)	6 (5, 9)	<0.001
<b>Reoperations</b>	45/105	106/341	0.13
<b>Adjuvant Chemotherapy</b>	140/149	195/441	<0.001
<b>Adjuvant radiation</b>	8/149	35/441	0.36

**Table 2.** MSTS-93 and TESS Scores at Interval Follow-up

Study Outcome	Pediatric Patients N=146	Adult Patients N=421	Mean Difference (CI)	P-value
MSTS-93 at baseline	64.7 (23.2)	53.8 (30.5)	11.0 (5.2, 16.8)	<0.001
TESS at baseline	73.4 (22.3)	60.4 (28.8)	13.0 (8.3, 17.6)	<0.001
	<b>N=127</b>	<b>N=364</b>		
MSTS-93 at 3 months	64.7 (23.2)	59.4 (21.9)	5.1 (0.6, 9.6)	0.03
TESS at 3 months	73.7 (19.8)	65.3 (21.7)	8.3 (4.1, 12.6)	<0.001
	<b>N=124</b>	<b>N=334</b>		
MSTS-93 at 6 months	74.4 (22.2)	71.0 (21.2)	3.6 (-1.0, 8.0)	0.12
TESS at 6 months	81.5 (16.2)	73 (19.9)	8.4 (4.9, 12.1)	<0.001
	<b>N=112</b>	<b>N=308</b>		
MSTS-93 at 1 year	82.0 (20.2)	76.8 (19.8)	5.2 (0.9, 9.5)	0.02
TESS at 1 year	87.7 (14.7)	78.6 (18.2)	9.1 (5.3, 12.9)	<0.001
MSTS-93 score change from baseline to 1 year	17.4 (31.0)	20.0 (33)	-2.6 (-9.9, 4.6)	0.48
TESS score change from baseline to 1 year	14.1 (24.3)	14.7 (29.3)	-0.7 (-6.9, 5.5)	0.83

### Conclusions

Pediatric patients undergoing endoprosthetic reconstruction for primary bone tumors have better functional outcomes than adults at nearly all points in time. Both adults and pediatric groups improved on MSTS-93 and TESS scores on a similar scale during the course of treatment to one year. Our study was limited by patient heterogeneity and the unclear ceiling effect in TESS and MSTS-93. These findings may guide patient expectations as they undergo endoprosthetic reconstruction of the lower extremity.

Level of evidence: I