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Predictors of functional recovery among musculoskeletal oncology patients undergoing lower extremity endoprosthetic reconstruction

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Cover Letter: Young Investigator Award

I am currently a fourth-year orthopaedic surgery resident and will be undergoing a fellowship in musculoskeletal oncology at the University of Toronto in 2023-24. With respect to the current abstract, I was the lead author who conceived the idea, analyzed the data and wrote the abstract/manuscript.

Abstract

Background: Functional outcomes are important for oncology patients undergoing lower extremity reconstruction; however, there remains important knowledge gaps. We characterized patient reported function after surgery and identified predictors of postoperative function in musculoskeletal oncology patients undergoing lower extremity endoprosthetic reconstruction.

Methods: We acquired functional outcome data from the recently completed *Prophylactic Antibiotic Regimens in Tumor Surgery* (PARITY) trial; specifically, the 100-point Toronto Extremity Salvage Score (TESS) which was administered preoperatively and at 3, 6 and 12 months postoperatively. Higher scores indicate better physical functioning, and the minimally important difference is 11-points. We calculated mean functional scores at each timepoint after surgery and developed a logistic regression model to explore predictors of failure to achieve excellent postoperative function (TESS ≥80) at 1-year after surgery.

Results: The 555 patients included in our cohort showed important functional improvement from pre-surgery to 1-year post-surgery (mean difference 14.9 points, 95% CI 12.2 to 17.6; p<0.001) and 64% achieved excellent post-operative function (Figure 1, Table 1). Our adjusted regression model found that poor (TESS 0-39) preoperative function (odds ratio [OR] 3.3, 95%CI 1.6 to 6.6); absolute risk [AR] 24%, 95%CI 8% to 41.2%), older age (OR per 10-

year increase from age 12, 1.32, 95%CI 1.17, 1.49; AR 4.5%, 95%CI 2.4% to 6.6%), and patients undergoing reconstruction for soft-tissue sarcomas (OR 2.3, 95%CI 1.03 to 5.01; AR 15.3%, 95%CI 0.4% to 34.4%), were associated with higher odds of failing to achieve an excellent functional outcome at 1-year follow-up. Patients undergoing reconstruction for giant cell tumors were more likely to achieve an excellent functional outcome postoperatively (OR 0.40, 95%CI 0.17 to 0.95; AR -9.9%, 95%CI -14.4% to -0.7%).

Conclusions: The majority of patients with tumors of the lower extremity undergoing endoprosthetic reconstruction achieved excellent function at 1-year after surgery. Older age, poor preoperative function, and endoprosthetic reconstruction for soft tissue sarcomas were associated with worse outcomes; reconstruction for giant cell tumors were associated with better post-operative function.

Figure 1. Changes in the TESS scores over time with points indicating means and error bars indicating standard deviations
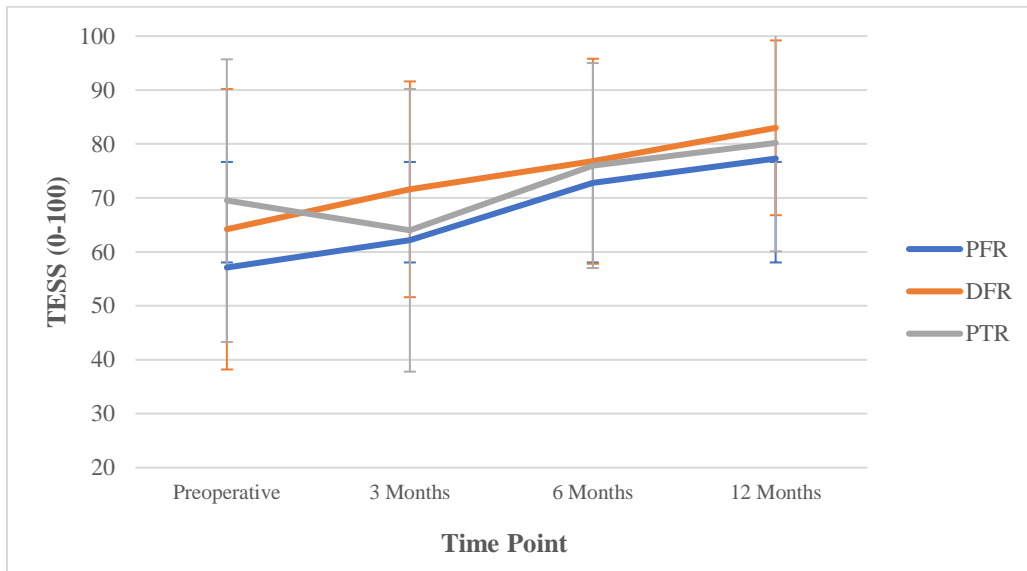
PFR: proximal femur reconstruction, DFR: distal femur reconstruction, PTR: proximal tibia reconstruction

Table 1. TESS change scores over time.

Functional Score	Mean Differences (95% CIs)					
	0– 3 months	P-value	0 – 6 months	P-value	0 – 12 months	P-value
TESS						
Overall	3.4 (0.7, 6.2)	0.015	10.0 (7.4, 12.6)	<0.001	14.9* (12.2, 17.6)	**<0.001**
PFR	2.7 (-3.7, 9.0)	0.410	12.3* (6.1, 18.6)	<0.001	16.6* (10.6, 22.6)	**<0.001**
DFR	7.1 (3.8, 10.5)	**<0.001**	10.8 (7.5, 14.0)	<0.001	16.5* (13.0, 20.0)	**<0.001**
PTR	-7.0 (-13, -0.5)	0.034	4.8 (-1.1, 10.7)	0.11	8.2 (1.8, 14.6)	0.013
TESS = Toronto Extremity Salvage Score; CI = confidence interval; PFR = proximal femur reconstruction; DFR = distal femur reconstruction; PTR = proximal tibia reconstruction; **bolded** = statistically significant when evaluated with paired t-tests; *exceeds minimal important difference cut-off.						