Reporting the Pooled Last Follow Up Musculoskeletal Tumor Society Score Score Underestimates Functional Improvements Seen Overtime

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INTRODUCTION: The Musculoskeletal Tumor Society Score (MSTS) is one of the most widely used functional outcome tools in the orthopaedic oncology literature. A recent systematic review by our institution found variation in the way clinicians administer, analyze, and report MSTS scores, with most only publishing data from the patient's last follow-up evaluation. We aim to examine the impact of reporting MSTS scores at standardized postoperative intervals versus reporting pooled last follow-up data.

METHODS: Upper and lower extremity MSTS scores were collected at patient visits between January 1, 2014, and April 15, 2022. All patients underwent either an open reduction internal fixation (ORIF) or insertion of an intramedullary nail (IMN) for impending or pathologic fractures. Demographic data and functional outcome scores were collected preoperatively, when possible, and postoperatively at 2 weeks, 6 weeks, 3 months, 6 months, and annually thereafter. Mean with standard deviations were calculated at standardized postoperative intervals and compared with pooled mean last follow-up data. A one-way ANOVA was performed to compare the effect of time on the MSTS scores. Significance was set at $p < 0.05$.

RESULTS:

MSTS 93 scores for the upper extremity (UE) and lower extremity (LE) were obtained for 247 patients. Eight patients were excluded for preop only scores. An additional 8 UE patients followed up beyond 2 years but could not be included because a minimum of 5 patients were required at each timepoint for analysis. A total of 231 patients over 529 visits were included in this analysis. The study population was 49.8 % (n=115) male, 70.1% (n=162) white, 12.5% (n=29) African American, 2.6% (n=6) Asian; with a mean age of 58.42 ± 17.8 years at the time of surgery. Most patients had metastatic disease, 69.4% (n=175), with renal cell carcinoma and multiple myeloma being the most common primary diagnoses. Only 6.7% (n=17), had metastatic sarcoma. A one-way ANOVA was performed to compare the effect of time on the MSTS 93 score. There was a statistically significant difference in time between at least two groups for both upper extremity($F(7,167) = 5.792$, $p < .000$) and lower extremity ($F(12,521) = 4.309$, $p < .000$). Patients undergoing upper extremity procedures demonstrated an improvement from their preop MSTS score by 3 months postop without significant change thereafter ($p=0.0177$). The mean UE MSTS 93 score for pooled last follow-up data is similar from 3 months to 1 year. The mean LE MSTS 93 pooled last follow-up score approximates the LE MSTS 93 score at 6 months and underestimates most timepoints beyond that visit ($p<0.0001$ at 1 year and $p= 0.0047$ at 3 years). The range of last follow up varies greatly between patients with a mean postop day 508.95 days ± 632.61.

DISCUSSION AND CONCLUSION:

Reporting the pooled mean MSTS 93 score at last follow-up masks the important functional improvements patients make during their recovery. In most LE cases, the pooled last follow-up score underestimates functional improvement seen beyond 6 months postop. We recommend reporting MSTS 93 at standardized postoperative intervals rather than pooled last follow-up data.