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A study on factors affecting the functional outcome in patients with soft tissue sarcoma: experience from a tertiary care centre

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ABSTRACT

Background: Soft tissue sarcoma (STS) patients undergoing surgery may experience reduced functional outcome compared to the general population. The aim of this study is to evaluate the functional outcome and to determine important predictive factors that affect the post-operative functional outcomes in patients who had undergone surgery for STS.
Methods: Authors retrospectively analysed patients who had undergone surgery between January 2016 to November 2023, in our institution and assessed for post-operative functional outcomes, at the end of 6 months and one year. To evaluate the functional outcomes, Musculoskeletal Tumor Society Score (MSTS) was used. Established predictive factors like age, size of the tumor and time since surgery were analysed with Multivariate regression analysis.
Results: In the study, a total of 51 patients were assessed with median age of 50 yrs. Age (MSTS score–80 versus 74, p=0.01), size of the tumor (MSTS score–79 versus 74, p=0.03). Time since surgery (significant linear association between functional scores at the end of 6 months and one year, p value=0.0004) were identified as significant predictive factors. Patients who are younger than 40 years, tumor less than 10 cm have better functional outcomes.
Conclusion: Functional outcomes in patients who underwent surgery for STS, improve with time. Patients can be reassured that final functional outcome will be better than early post-operative outcome. Age of the patient, size of the tumor and time since surgery were the most consistent and significant determinants of functional outcome.

Keywords: Soft tissue sarcoma, MSTS score, Functional outcomes

INTRODUCTION

Soft tissue sarcomas are uncommon malignant tumors, accounting for approximately 1% of all cancers in adults.[1] Limb salvage surgery is generally preferred over amputation for treating patients with soft tissue sarcomas.[2-4] Multimodal treatment strategies, which often combine surgery with or without adjuvant radiation therapy, are commonly used. However, the success of surgery should not only be evaluated based on oncological outcomes but also by functional recovery. Self-reported metrics, such as the MSTS, are frequently utilized to assess functional outcomes in patients with sarcomas.[5] In those treated for soft tissue sarcoma, a decline in functional abilities negatively affects overall quality of life.[6,7] While functional outcomes following surgical intervention are of significant importance to both surgeons and patients, they remain underreported. This study aims to evaluate functional outcomes and identify key factors that predict postoperative functional recovery in patients who have undergone surgery for soft tissue sarcoma.

METHODS

This is a retrospective analysis of soft tissue sarcoma patients, who were treated in surgical oncology department, Tamilnadu Government Multisuperspeciality Hospital, Omandurar Estate, Chennai between January

2016 to November 2023 (n=51). All patients were assessed for post operative functional outcomes at the end of 6 months and one year. To evaluate the functional outcomes, MSTS was used. The MSTS score evaluates functional impairment after treatment and consists of 6 categories pain, function, and emotional acceptance in the upper and lower extremities; supports, walking, and gait in the lower extremity; and hand positioning, dexterity, and lifting ability in the upper extremity.[8]

Hospital medical records were used to collect data on clinical parameters, details of the surgical procedure, histopathological staging, outpatient follow up records and questionnaires. Patients of age more than 18 years with ECOG 0-2 and no contraindications for anaesthesia were included in the study. Patients who were unfit for anaesthesia, who had ECOG more than 2 were excluded from the study.

Statistical analysis was calculated using Statistical Package for Social Sciences (SPSS) software version 23. Analytical statistics was done with Multivariate regression to analyse the established predictive factors such as age, size of the tumor and time since surgery. P value of less than 0.05 was considered significant.

RESULTS

In the study, a total of 51 patients were assessed with a mean age of 50 years. The predominant histological subtype was spindle cell tumor (30%), followed by liposarcoma (24%). Thirty-five patients (69%) were older than 40 years of age and sixteen patients (31%) were younger than 40 years. Twenty-seven patients had tumor size of more than 10 cm (53%) and twenty-four patients (47%) had tumor size of less than 10 cm.

Thirty-two patients (62%) presented with STS in the lower extremity, whereas nineteen patients (38%) presented with STS in the upper extremity. It was observed that there was significant mean difference between population aged younger than 40 years and older than 40 years, when comparing MSTS score at the end of 6 months and one year. Mean MSTS score at the end of 6 months and one year were 69 and 80 for patients aged younger than 40 years whereas, it was 61 and 74 respectively for patients aged older than 40 years, which was significant with p value of 0.01 (Table 1 and 2).

Table 1: Age range vs Mean MSTS score.

Characteristics	Mean MSTS score		P value
	6 months	1 year	
Age <40 years	69	80	0.01
Age >40 years	61	74	

Table 2: Size vs Mean MSTS score.

Characteristics	Mean MSTS score		P value
	6 months	1 year	
Size <10 cm	68	79	0.03
Size >10 cm	62	74	

Table 3: Age vs MSTS at 6 months and 1 year.

Estimates					
Dependent variable	Age range (in years)	Mean	Std. Error	95% Confidence Interval	
				Lower bound	Upper bound
MSTS (6 months)	<40	68.571	3.159	62.159	74.984
	>40	61.156	2.381	56.322	65.989
MSTS (1 year)	<40	79.786	3.431	72.820	86.751
	>40	73.594	2.586	68.344	78.845

Table 4: Tumor size vs MSTS at 6 months and 1 year.

Estimates					
Dependent variable	Size of tumor	Mean	Std. error	95% Confidence interval	
				Lower bound	Upper bound
MSTS (6 months)	<10 cm	67.870	2.857	62.070	73.670
	>10 cm	61.857	2.735	56.304	67.410
MSTS (1 year)	<10 cm	79.416	3.104	73.115	85.716
	>10 cm	73.964	2.971	67.932	79.997

In the studied population with tumor size less than 10 cm had mean MSTS score 68 and 79 at the end of 6 months and one year, whereas it was 62 and 74 respectively for patients who had tumor size of more than 10 cm, which was significant with p value of 0.03 (Table 3 and 4). With respect to time since surgery, there was a significant linear association between functional scores at the end of six months and one year, with p value of 0.0004. There is a

significant linear association between MSTS score (6 months) and MSTS score (1year) with p value <0.001. The correlation coefficient is 0.86 showing excellent strength of association between the above-mentioned scores showing a positive association (Figure 1).

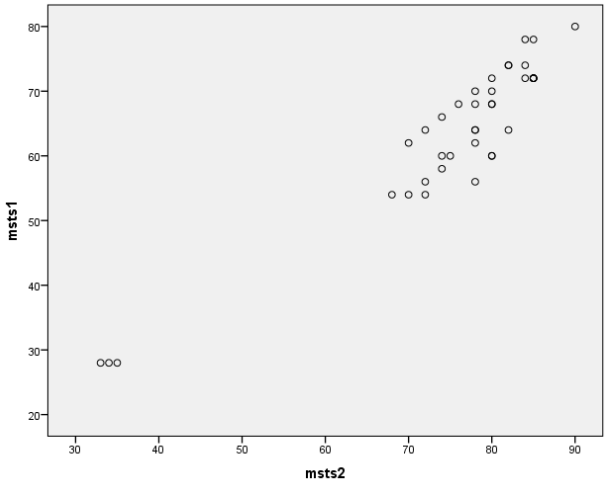

Figure 1: Scatter plot showing relationship between MSTS1 (6 months) and MSTS 2 (1year).

DISCUSSION

The evaluation of functional outcomes has gained significant attention in the management of extremity soft tissue sarcomas. A range of assessment tools, both subjective and objective, have been developed for this purpose. Among these, the MSTS score and the TESS are the most widely utilized. In our study, we selected the MSTS score to assess patients' functional recovery.

The timing of functional outcome assessment varies across retrospective studies, with evaluation periods ranging from 6 months to 5 years postoperatively.[9] In the study, functional outcomes were assessed at two fixed time points: 6 months and 1 year after surgery. Patients with soft tissue sarcoma who underwent limb-sparing procedures commonly experienced an initial decline in functional status, followed by notable improvement within the first postoperative year.

The objective of this study was to identify predictive factors influencing functional recovery in patients treated surgically for extremity soft tissue sarcoma. Our analysis revealed that patient age at the time of surgery, tumor size, and the time elapsed since surgery were significant predictors of functional outcome. Previous studies have reported that MSTS scores tend to improve progressively up to the second year after surgery and then plateau.[10] In contrast, our study included data only up to the first postoperative year, during which we observed a significant improvement in functional status. Among the variables studied, the time since surgery was found to be an independent predictor of functional recovery. However, further longitudinal studies are required to establish the timing of the plateau phase in functional outcomes

Davis et al identified patient age at the time of surgery as an independent predictive factor for functional outcomes.[4] In the study, a cutoff age of 40 years was used. Patients younger than 40 demonstrated better functional outcomes, as measured by the MSTS score, compared to those aged 40 and above. This disparity may be attributed to the presence of more comorbid conditions and age-related decline in muscle strength among older patients. Tumor size also emerged as an independent predictor of functional recovery. A cutoff of 10 cm was established in our analysis. Patients with tumors exceeding 10 cm had significantly poorer MSTS scores than those with smaller tumors. This difference is likely due to the necessity for more extensive surgical resection in larger tumors, which often involves removal of greater muscle mass and, at times, adjacent anatomical structures.

The limitations of the study were the period of assessment, which was limited to one year after surgery and we did not include the pre operative functional score and the post operative complications which can potentially affect the functional outcomes. Therefore, more research is needed for better understanding of the overall recovery of the patients.

CONCLUSION

Functional outcomes in patients who underwent surgery for soft tissue sarcomas improve with time. Patients can be reassured by the treating surgeons that final functional outcome will be better than early post operative outcome. Patients who were younger than 40 years, tumor size less than 10 cm had better functional outcome. Age of the patient, size of the tumor and time since surgery were the most consistent and significant determinants of functional outcome.

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