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Functional Outcomes and Quality of Life in Patients with Extremity Soft Tissue Sarcoma: A Longitudinal Analysis at a Tertiary Care Teaching Hospital

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Abstract

Background: Soft tissue sarcomas (STS) of the extremities are rare malignancies whose treatment prioritizes both oncologic control, preservation of limb function and quality of life (QoL). Conventional survival metrics inadequately capture the functional and psychosocial impact of limb-salvage surgery and adjuvant therapies.

Objective: To evaluate postoperative functional outcomes and QoL in patients with extremity STS treated by limb-salvage surgery at a tertiary care centre, and to identify associated clinical factors.

Methods: This cross-sectional observational study enrolled 46 consecutive patients with extremity STS who underwent surgical management at Maharaja Yashwantrao Hospital (MY Hospital), Indore, between 2023 and 2024. Functional outcome was assessed with the Toronto Extremity Salvage Score (TESS) and QoL with the EORTC QLQ-C30 questionnaire at 1 week, 2 weeks, 4 weeks and 3 months postoperatively. Patient demographics, tumour factors, treatment methods and complication data were recorded. Statistical analysis used descriptive statistics, correlation coefficients, multivariate linear regression and ANOVA (SPSS; significance $p < 0.05$).

Results: Mean age was 43.3 ± 16.9 years; 54 % were male. Upper-limb tumours predominated (57 %). Surgery alone was performed in 83 % of cases; flap reconstruction was required in 65 %. Mean TESS scores remained high and stable (80.4 at 1 week to 80.6 at 3 months). Mean QLQ-C30 scores showed an initial decline followed by stabilisation (82.1 at 1 week to 77.0 at 3 months). Multivariate regression demonstrated significant negative associations of age ($\beta = -0.21$, $p = 0.03$) and BMI ($\beta = -0.34$, $p = 0.02$) with TESS, and of age and BMI with QoL scores at 3 months. Postoperative complication rate was low (16 %). Local recurrence and distant metastasis rates were not the primary focus of the reported analyses.

Conclusion: Limb-salvage surgery for extremity STS yields high and relatively stable functional scores and acceptable QoL in the early postoperative period. Older age and higher BMI independently predict poorer functional and QoL outcomes, underscoring the need for individualised rehabilitation and weight-management strategies. Larger prospective multicentre studies with longer follow-up are warranted.

Keywords: Soft Tissue Sarcoma; Extremity; Limb Salvage; Toronto Extremity Salvage Score; Quality of Life; TESS, QLQ-C30

Abbreviations: STS: Soft Tissue Sarcomas; QoL: Quality of Life; TESS: Toronto Extremity Salvage Score.

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Introduction

Soft tissue sarcomas (STS) of the extremities are a heterogeneous group of rare malignancies arising from mesenchymal tissues. The primary goal of treatment is local tumor control while preserving a functional limb [1,2]. Historically, radical amputation was the standard; however, advancements in surgical techniques and adjuvant therapies have shifted the paradigm toward limb-salvage surgery [3,4]. Despite the surgical success of limb preservation, the impact of these interventions on a patient's functional capacity and health-related quality of life (HRQoL) remains a critical area of concern for clinicians and survivors alike [5,6]. Functional outcomes are increasingly measured using patient-reported outcome measures (PROMs) such as the Toronto Extremity Salvage Score (TESS), which focuses on physical tasks and emotional acceptance [7,8]. Simultaneously, HRQoL instruments like the EORTC QLQ-C30 provide insight into the broader impact of the disease and its treatment on a patient's social, emotional, and physical well-being [6,9]. Understanding the relationship between these two metrics is essential for developing comprehensive rehabilitation strategies that address the multifaceted needs of sarcoma patients.

Methods

Study Design and Setting

This research was conducted as an observational cross-sectional and longitudinal analytical study at the Department of General Surgery, MY Hospital, M.G.M. Medical College in Indore, India. The study period spanned 12 months following ethical approval.

Participant Selection

A total of 46 patients diagnosed with extremity STS were enrolled using sequential sampling. Inclusion criteria encompassed patients of all ages and genders with localized disease undergoing surgical management who provided informed consent. Exclusion criteria included incomplete surgeries, pre-existing joint deformities, inoperable cases, and significant systemic comorbidities such as coronary heart disease or stroke.

Data Collection and Instruments

Patients underwent baseline demographic and clinical evaluation (age, BMI, tumor characteristics). Post-operative assessments were conducted at four specific intervals: 1 week, 2 weeks, 4 weeks, and 3 months. Functional outcomes were measured using the TESS, which evaluates pain, function, and emotional acceptance across 29–30 items, where higher scores indicate better function [8,10]. HRQoL was assessed using the EORTC QLQ-C30 questionnaire. Statistical analysis was performed using SPSS, with $p < 0.05$ considered significant.

Results

Forty-six patients fulfilled inclusion criteria. Mean age was 43.26 ± 16.93 years (range 19–70). Males comprised 54.3 % (n = 25). Age distribution was relatively even across decades 18–69 years. Mean BMI was 28.15 ± 4.74 kg/m^2; 39% were overweight and 39% obese. Upper-extremity tumours accounted for 56.5% of cases, lower extremity for 43.5% cases. Primary surgery was performed in 82.6% of patients; flap reconstruction, either for skin or soft tissue defects, was required in 65.2 % cases. Adjuvant radiotherapy was needed in 8 (17.3%) cases. Postoperative complications occurred in 15.2 % of operated patients (wound infection 10.8 %, wound dehiscence 4.3 %).

Mean TESS scores remained high and essentially stable:

- 1 week: 80.35 ± 11.32
- 2 weeks: 79.76 ± 9.99
- 4 weeks: 79.83 ± 10.81
- 3 months: 80.57 ± 11.70

Mean QLQ-C30 scores showed a modest early decline followed by stabilisation:

- 1 week: 82.09 ± 11.83
- 2 weeks: 79.24 ± 12.40
- 4 weeks: 78.13 ± 12.28
- 3 months: 77.04 ± 11.11

ANOVA confirmed significant change in QLQ-C30 scores over time ($F = 23.45$, $p = 0.0001$). Pairwise comparisons indicated a statistically significant difference between the 1-week and 3-month QLQ-C30 scores ($p = 0.039$); TESS scores did not differ significantly across time points.

Age and BMI exhibited weak-to-moderate negative correlations with both TESS and QLQ-C30 at all time points; none reached statistical significance on univariate testing. Multivariate regression at the 3-month assessment, however, identified age (TESS $\beta = -0.21$, $p = 0.03$; QoL $\beta = -0.18$, $p = 0.04$) and BMI (TESS $\beta = -0.34$, $p = 0.02$; QoL $\beta = -0.28$, $p = 0.03$) as independent negative predictors. Comorbidities showed a borderline association with TESS ($p = 0.05$). Gender and treatment modality were not significant.

Discussion

Functional Outcome Trends (TESS)

In the Indore cohort, the mean TESS scores remained relatively stable over the three-month follow-up period, starting at 80.35 ± 11.32 at one week and reaching 80.57 ± 11.70 at three months. This suggests that patients who underwent limb-sparing procedures maintained high levels

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of baseline functionality during the early post-operative phase.

Comparatively, Gazendam, et al. reported lower mean TESS scores in patients undergoing endoprosthetic reconstruction: 63.5 preoperatively, 67.9 at 3 months, and improving to 81.1 at 12 months [7]. Green, et al. similarly observed TESS scores improving from 80.9 at 16.7 months to 89.1 at 26.7 months [1]. Systematic reviews indicate that functional outcomes often decline initially up to 6 months postoperatively before plateauing and returning to baseline after one year [4,11]. The high initial scores in our study may reflect a cohort with less radical resections or a higher proportion of early-stage disease.

Quality of Life Trends (QLQ-C30)

Our study reported mean QLQ-C30 scores of 82.09 at one week, which slightly declined to 77.04 at three months. This downward trend in HRQoL despite stable physical function highlights a potential psychological or social adjustment phase following surgery. Kask et al. reported a similar mean QLQ-C30 score of 73 at a median follow-up of 62 months [6].

Correlation Between Function and HRQoL

The correlation analysis in the local study revealed a weak, non-significant negative relationship between TESS and QLQ-C30 scores (r ranging from -0.119 to -0.234; p=0.117 to 0.422). This implies that a patient's perceived physical function does not directly dictate their overall quality of life during the early recovery period. In contrast, other studies have found that lower functional outcomes are significantly associated with poorer HRQoL in the long term [6,12].

Impact of Age and BMI

Advanced age was identified as a significant predictor of poorer functional outcomes in both the local Indore cohort and global literature. Gazendam et al. found that older age (per 10-year increase) was associated with worse TESS scores [7], and Oh, et al. noted that patients older than 47 years had significantly poorer functional recovery [11]. Similarly, higher BMI was strongly associated with lower TESS and QLQ-30 scores in our study, a finding corroborated by Kask, et al., who linked high BMI to both lower functional outcomes and lower HRQoL [6].

Treatment Modalities: Limb Salvage vs. Amputation

Literature consistently demonstrates that patients undergoing limb-salvage surgeries achieve superior functional scores and HRQoL compared to those undergoing amputation [3,12,13,14]. For instance, Thoms, et al. reported significantly higher TESS scores in limb salvage groups ($p<0.001$) compared to amputation groups [12].

Role of Radiotherapy and Complications

Adjuvant treatments such as radiotherapy are known to cause temporary functional declines [2]. Götzl, et al. found that neoadjuvant radiochemotherapy was associated with significantly worse global QoL and physical functioning compared to surgery alone [5]. Wound complications also play a critical role; Ramu et al. noted that post-operative wound issues correlate with increased disability and lower functional scores for up to 24 months [2]. Our study reported a low incidence of wound infection, which may contribute to the relatively high functional stability observed.

Study Limitations

Short Follow-Up Duration: The three-month follow-up period in our study is insufficient to capture long-term functional plateaus or late effects of radiotherapy, which typically manifest after one year [4,11]. Sample Size and Setting: The sample of 46 patients from a single tertiary center limits the generalizability of the findings to broader populations or varied healthcare settings. Demographic Gaps: The study lacked representation of the 70–79 age group, limiting insights into the outcomes of the most elderly and potentially frail patients [15].

Future Directions

There is a need for prospective, multicenter longitudinal studies that follow patients for 5–10 years to understand the long-term interaction between aging, late treatment toxicities, and quality of life. Furthermore, research should explore the psychological factors that decouple physical functionality from overall quality of life during early recovery.

Conclusion

Limb-salvage surgery for extremity soft tissue sarcoma yields high and stable early functional scores and acceptable quality of life. Older age and elevated BMI independently predict poorer outcomes and should prompt intensified perioperative optimisation and rehabilitation. Larger prospective multicentre studies with longer follow-up and standardised oncologic endpoints are required to refine patient selection and treatment algorithms in the Indian context.

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