

Mapping The Course of Recovery Following Limb Salvage Surgery for Soft Tissue Sarcoma of the Extremities

Alexander Leandros Lazarides, Manit K. Gundavda, Zachary Burke¹, Marco Focaccia, Anthony M Griffin², Kim Tsoi, Peter Ferguson³, Jay Wunder

¹UCLA School of Medicine, ²Mount Sinai Hospital, ³University of Toronto

INTRODUCTION:

Wide resection, with or without adjuvant therapy, is the mainstay of treatment for soft tissue sarcoma of the extremities. Surgical options to achieve this aim include amputation or limb salvage surgery depending on the tumor location and extent of the neurovascular, bony and soft tissue involvement. Despite the goal of an acceptable functional result, the surgical treatment of soft tissue sarcoma can portend a prolonged course of recovery. However, more comprehensive data on the expected course of recovery following extremity sarcoma surgery is needed to help inform physicians and patients.

The purpose of the present study was 1) to describe the typical course of functional recovery in a large cohort of patients undergoing limb salvage resection of a soft tissue sarcoma of the extremities and pelvis 2) to identify factors associated with reduced outcomes measures and 3) to compare patients who had a “delayed” postoperative course of recovery with those who had an expected course of recovery.

METHODS:

A retrospective review of a prospectively maintained institutional database was performed of all patients undergoing surgical treatment with limb salvage of a soft tissue sarcoma of the extremities or pelvis between January 1st, 1992 and November 15, 2020. All soft tissue sarcomas of the pelvis and extremities with at least 1 year of follow up from definitive surgery were considered eligible for inclusion. All patients were required to have preoperative functional outcomes recorded for either TESS or MSTS scores and functional outcome measures at 1 year postoperatively. Exclusion criteria included amputations and well-differentiated liposarcomas. We excluded patients who died within one year of surgery. The primary outcome measure was time to maximal functional improvement, defined as failure to demonstrate improvement on two consecutive follow up appointments, as defined by the functional outcome measures of Toronto Extremity Salvage Score (TESS) and Musculoskeletal Tumor Society (MSTS) Score, or by achieving 90% of the patient’s maximum outcome score.

RESULTS:

We identified 916 patients who underwent surgical resection of a soft tissue sarcoma of the extremities. Median follow up was 74 months (range 12-352 months). Using a linear piecewise regression model, patients demonstrated a drop in all functional outcome measures from baseline preoperative measures to 3 months postoperatively, then demonstrated a rapid recovery from 3 to 6 months, with continued recovery from 6 months to 2 years’ time. Patients typically achieved a return to their baseline preoperative level of function for all functional outcome measures by ~1 years’ time postoperatively. Patients typically achieved “maximal” functional recovery of all functional outcome measures by 2 years’ time postoperatively.

We conducted a multivariable analysis to identify the patient, tumor and treatment factors that were independently associated with diminished functional outcomes measures at 1 year postoperatively. Older age and female sex were independently associated with worse TESS and MSTS scores ($p \leq 0.02$). Considering tumor factors, deep tumor location, larger tumor size and pelvic location were independently associated with worse functional outcome measures ($p \leq 0.05$). Amongst treatment factors, bony resection, motor nerve resection, free/ rotational soft coverage and postoperative complications were associated with worse TESS and MSTS scores ($p \leq 0.05$). Radiotherapy was not associated with worse functional outcomes measures. Tumor recurrence, locally or systemically, in the first year was associated with worse functional outcome measures across all domains ($p < 0.01$).

An analysis was performed to determine which patients had a prolonged course of recovery, i.e. were considered to still be “recovering”. When comparing the patients who had *not* reached their maximal recovery by 2 years to those who had achieved maximal recovery, older age and female sex was associated with a delayed course of recovery ($p \leq 0.04$). Amongst tumor factors, tumor depth below fascia and larger tumor size was associated with delayed recovery of MSTS93 scores ($p \leq 0.01$). When considering treatment factors, radiation therapy and motor nerve resection was associated with a delayed course of recovery of MSTS 87 and MSTS93 scores ($p \leq 0.04$). Complications were associated with delayed functional recovery across all domains ($p < 0.001$).

DISCUSSION AND CONCLUSION:

Most patients will recover their baseline function by 1 year and achieve “maximal” recovery by 2 years’ time following surgical resection for soft tissue sarcoma of the extremities. Older age, female sex, larger tumor size, bony involvement, motor nerve resection, post-surgical complications and tumor recurrence portend poorer functional outcomes and a delayed course of recovery. These patient, tumor and treatment factors should be used to counsel patients as to their expected recovery from these surgeries.