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Title

OUTCOMES AFTER FLAP RECONSTRUCTION FOR EXTREMITY SOFT TISSUE SARCOMA: A CASE-CONTROL STUDY USING PROPENSITY SCORE ANALYSIS

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Abstract

Background

Limb-preserving surgery has become the standard of treatment for extremity soft tissue sarcoma (STS), as advances in imaging modalities and adjuvant therapy enable adequate margins to be achieved without the need for amputation. The limb-preserving approach often creates complex soft tissue defects that are vulnerable to wound healing problems. Flap reconstruction is the most complex method in the reconstructive ladder and is frequently used for these complex soft tissue defects. However, the inherent difficulties in flap reconstruction, such as vascular vulnerability and donor/recipient site morbidity, may have an added impact on the potential unfavorable outcomes intrinsic to complex soft tissue defects in limb-preserving surgery for extremity STS.

Because of the complexities of flap reconstruction and the magnitude of soft tissue defects, patients undergoing flap reconstruction for extremity STS are generally expected to have increased morbidity compared to patients undergoing primary closure. Moreover, prolonged wound healing, resulting in delayed adjuvant therapy, may have a detrimental impact on oncologic outcomes. A few studies have compared the characteristics and outcomes of patients receiving flap reconstruction versus primary wound closure for limb-preserving surgery for STS. However, to accurately examine the impact of flap reconstruction on treatment and outcomes of extremity STS patients, the potential bias introduced by confounding factors should be minimized.

Questions

In this study, we used propensity score analysis to select a case-matched control group among patients who underwent primary closure. We sought to compare the surgical, functional, and oncologic outcomes between patients undergoing flap reconstruction and those receiving primary wound closure for limb-preserving surgery for STS.

Methods

We used propensity score analysis to match 37 patients who underwent flap reconstruction to 111 patients who underwent primary closure (1 to 3 ratio) based on patient and tumor characteristics at presentation. Patient age, gender, histologic grade, tumor size, tumor depth, anatomic site (proximal/distal part of the upper/lower extremity), preoperative performance status, and previous surgical status were investigated and used for matching. Treatment, functional, and oncologic outcomes were compared between the two groups.

Results

The flap reconstruction group showed a lower MSTS score ($P < 0.001$), higher wound complication rate ($P < 0.001$), and longer hospital stay ($P < 0.001$) than the primary closure group. Regarding wound complications, secondary surgery for wound repair was significantly more frequent in the flap group ($P < 0.001$). Although failing to reach the statistical significance, the flap group tended to secure a wider surgical margin than the control group ($P = 0.051$). Among the patients who underwent postoperative radiotherapy, there was no difference in the time interval from surgery to radiotherapy between the flap and control groups (51 days versus 47 days, respectively, $P = 0.579$).

For the oncologic outcomes, only 3 (8.1%) patients in the flap reconstruction group developed local recurrence whereas 31 (27.9%) patients developed local recurrence in the primary closure group ($P = 0.013$). On Kaplan–Meier analysis, patients in the flap reconstruction group showed significantly better local recurrence-free survival than those in the primary closure group ($P = 0.015$) (Fig. 1). However, there was no significant difference in disease-specific survival ($P = 0.318$) between the two groups.

Conclusions

Patients who underwent flap reconstruction had increased morbidity associated with flap reconstruction, but better local control. These findings may have implications for treating extremity STS patients.