Rheumatology: Current Research
ISSN: 2161-1149
OPEN ACCESS Freely available online
Opinion Article

Preoperative Evaluation and Surgical Principles of Soft Tissue Sarcoma Surgery

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ABOUT THE STUDY

Soft Tissue Sarcomas (STS) are a diverse group of malignant tumors that arise in the soft tissues of the body, including muscles, fat, blood vessels, nerves, tendons, and the lining of joints. They are relatively rare, accounting for about 1% of all adult cancers and 7%-8% of pediatric cancers. Despite their rarity, they pose significant challenges due to their diverse histology, variable behavior, and the complexities involved in their surgical management. Surgery is a fundamental of treatment for soft tissue sarcomas, and achieving optimal outcomes requires a multidisciplinary approach involving surgeons, oncologists, radiologists, and pathologists.

Preoperative evaluation and planning

The management of soft tissue sarcomas begins with a thorough preoperative evaluation to establish a diagnosis, determine the extent of the disease, and plan the surgical approach. Key components of the preoperative evaluation include:

Histological diagnosis: This is typically obtained through a biopsy, either *via* Fine-Needle Aspiration (FNA), core needle biopsy, or incisional biopsy. The choice of biopsy technique depends on the location and size of the tumor, as well as the expertise of the medical team. It is important to perform the biopsy in a manner that does not compromise future surgical options.

Imaging studies: Advanced imaging techniques are necessary for staging and surgical planning. Magnetic Resonance Imaging (MRI) is the preferred modality for evaluating the local extent of the tumor, its relationship to surrounding structures, and the involvement of neurovascular bundles. Computed Tomography (CT) scans and Positron Emission Tomography (PET) scans may be used to assess distant metastases and for further characterization of the tumor.

Multidisciplinary discussion: The complexity of soft tissue sarcomas necessitates a Multidisciplinary Team (MDT) approach. The MDT typically includes surgical oncologists, medical oncologists, radiation oncologists, radiologists, pathologists, and specialized nursing staff. MDT meetings ensure comprehensive evaluation and consensus on the optimal treatment strategy.

Surgical principles

The primary goal of surgery for soft tissue sarcomas is complete resection of the tumor with negative margins, while preserving function and minimizing morbidity. The following principles guide the surgical management of STS

Wide local excision: Achieving a Wide Local Excision (WLE) with a margin of normal tissue around the tumor is critical to minimize the risk of local recurrence. The extent of the margin varies depending on the tumor grade, location, and histological subtype. In some cases, adjacent structures such as muscles, nerves, or vessels may need to be resected end block.

Limb-sparing surgery: Advances in surgical techniques and adjuvant therapies have significantly improved the feasibility of limb-sparing surgery for extremity sarcomas. Limb-sparing approaches aim to preserve limb function and avoid amputation without compromising oncological outcomes. This often involves complex reconstructive procedures using flaps, grafts, or prosthetic devices.

Oncological safety: It should never be compromised for functional preservation. Surgeons must balance the need for complete tumor resection with the goal of maintaining function. In cases where wide local excision is not feasible, amputation may be necessary to achieve oncological control.

Management of margins: Intraoperative assessment of surgical margins is critical. Frozen section analysis can provide real-time information on margin status, allowing for additional resection if needed. Permanent histopathological examination of margins postoperatively confirms the adequacy of resection.

Techniques and approaches

The surgical approach to soft tissue sarcomas depends on the tumor's location, size, and relationship to surrounding structures. Common surgical techniques include:

Radical excision: It involves removing the tumor with a wide margin of healthy tissue. This approach is often used for large,

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Received: 18-Jun-2024, Manuscript No. RCR-24-33075; **Editor assigned:** 21-Jun-2024, PreQC No. RCR-24-33075 (PQ); **Reviewed:** 01-Jul-2024, QC No. RCR-24-33075; **Revised:** 17-Jul-2024, Manuscript No. RCR-24-33075 (R); **Published:** 24-Jul-2024, DOI: 10.35841/2161-1149.24.14.415

Citation: Oliviero F (2024) Preoperative Evaluation and Surgical Principles of Soft Tissue Sarcoma Surgery. Rheumatology (Sunnyvale). 14:415.

deep-seated sarcomas where achieving clear margins is challenging. Radical excision may include resection of adjacent structures such as muscles, nerves, or blood vessels.

Compartmental resection: For sarcomas located within a specific anatomical compartment, such as the thigh or upper arm, compartmental resection involves removing the entire compartment containing the tumor. This approach aims to achieve negative margins by removing the tumor end block with the surrounding compartment.

Reconstructive surgery: Reconstructive techniques are often necessary following wide local excision or radical resection. Reconstructive options include local tissue flaps, free tissue transfer (microvascular flaps), and prosthetic reconstruction. The choice of reconstructive method depends on the size and location of the defect, as well as the patient's overall condition.

Minimally invasive surgery: In selected cases, minimally invasive techniques such as laparoscopic or robotic-assisted surgery may be used. These approaches can reduce postoperative pain, shorten hospital stays, and improve cosmetic outcomes. However, their use is limited to tumors that are accessible and suitable for minimally invasive techniques.

Adjuvant and neoadjuvant therapies

It plays an important role in the management of soft tissue sarcomas, particularly for high-grade tumors or those with a high risk of recurrence. These therapies include:

Radiotherapy: Radiation therapy can be used preoperatively (neoadjuvant) to shrink the tumor and facilitate surgical resection or postoperatively (adjuvant) to reduce the risk of local recurrence. The timing, dose, and technique of radiotherapy depend on the tumor characteristics and surgical margins.

Chemotherapy: The role of chemotherapy in soft tissue sarcomas is less well-defined compared to radiotherapy. It is often used for high-grade sarcomas, metastatic disease, or specific histological subtypes known to be chemo sensitive. Neoadjuvant chemotherapy can help shrink tumors, making them more amenable to surgical resection.

Targeted therapy and immunotherapy: Advances in molecular biology have led to the development of targeted therapies and immunotherapies for certain subtypes of soft tissue sarcomas. These therapies can be used in conjunction with surgery and other treatments to improve outcomes.

Postoperative care and follow-up

Postoperative care is necessary for optimizing recovery and monitoring for complications or recurrence. Key aspects of postoperative care include:

Wound care and rehabilitation: Proper wound care and rehabilitation are critical to ensuring optimal functional recovery. Physical therapy and occupational therapy play important roles in restoring mobility and strength, particularly for limb-sparing surgeries.

Surveillance for recurrence: Patients with soft tissue sarcomas require long-term surveillance for local recurrence and distant metastases. Follow-up protocols typically include regular clinical examinations and imaging studies. The frequency and duration of follow-up depend on the tumor grade, size, and initial stage.