Improve Veterinary Education

Soft Tissue Sarcomas

Introduction and Learning Objectives

This lecture focuses on soft tissue sarcomas, with particular emphasis on their biological behaviour and, most importantly, the risk of recurrence following surgical management. Central to this discussion are the implications for tumour staging, surgical decision-making, and overall treatment planning, all of which are critically important in the preoperative phase. Consideration is also given to how margin planning and the determination of which anatomical compartments to excise influence surgical outcomes and prognosis. Preoperative planning plays a decisive role in determining long-term results. Once the mass has been excised and surgical margins assessed, further decisions must be made regarding the need for adjuvant therapies, including radiotherapy or chemotherapy.

Overview and Biological Behaviour of Soft Tissue Sarcomas

Soft tissue sarcomas are often regarded as some of the most challenging tumours encountered in veterinary practice. They are among the most common tumours affecting soft tissue components, arising from connective tissues beneath the skin, and can occur almost anywhere on the body. Despite their potentially aggressive nature, many soft tissue sarcomas are relatively straightforward to investigate, provided that established diagnostic and oncological principles are followed. Adherence to the fundamentals of surgical oncology and appropriate management strategies is key to achieving long-term success.

These tumours are typically characterised by marked local invasiveness and a significant metastatic potential. A small subset may be associated with paraneoplastic syndromes that can be recognised preoperatively. Certain sarcomas, including haemangiosarcoma, synovial cell sarcoma, histiocytic sarcoma, and osteosarcoma, are classified within the broader sarcoma category but are excluded from this discussion. The focus here is specifically on connective tissue sarcomas arising in the subcutaneous tissues.

Preoperative Diagnosis and Tumour Characterisation

Effective preoperative planning requires an understanding of the nature of the tumour being managed. Once a mass is identified, determining the cellular composition of the lesion is essential. Fine needle aspiration cytology represents the least invasive initial diagnostic approach and is always considered the first-line option. However, soft tissue sarcomas are

notoriously poorly exfoliative, often yielding insufficient diagnostic material. As a result, deeper tissue sampling is frequently required.

Tru-Cut or incisional biopsies for histopathological examination are therefore commonly necessary and provide the added advantage of enabling preoperative tumour grading. Knowledge of tumour grade can significantly influence the surgical plan, particularly in cases such as feline injection site sarcomas, where wider and more aggressive resections may be warranted. Client involvement in the decision-making process is essential, particularly when owners are uncertain about pursuing surgery. A clearer understanding of tumour type and grade allows for informed consent and more realistic expectations regarding outcomes. In cases of high-grade malignancy, some clients may elect not to proceed with surgical intervention.

Clinical Assessment and Advanced Imaging

When tumour type has not yet been confirmed, a thorough clinical assessment is vital. This includes careful palpation of the mass, assessment of its mobility, evaluation of attachment to underlying tissues, and documentation with photographs. If the extent of involvement cannot be adequately determined clinically, cross-sectional imaging becomes necessary. Computed tomography and magnetic resonance imaging are both highly effective modalities in this context. When using computed tomography, intravenous contrast administration is recommended, with both arterial and venous phase imaging typically performed at approximately one and three minutes, respectively.

Tumour Staging and Metastatic Evaluation

Soft tissue sarcomas exhibit variable metastatic behaviour. While some demonstrate tropism for regional lymph nodes, others may bypass lymphatic spread and metastasise directly to the lungs. Three-view thoracic radiography is often sufficient for metastatic screening, although computed tomography provides superior resolution and enables detection of pulmonary nodules as small as two millimetres in diameter. Certain sarcomas require additional staging considerations. Osteosarcoma may necessitate nuclear scintigraphy or whole-body computed tomography. In hemangiosarcoma, echocardiography and abdominal ultrasonography are routinely performed to exclude splenic involvement. Histiocytic sarcoma often displays diffuse biological behaviour, warranting abdominal ultrasound and potentially multiple lymph node aspirates.

Surgical Planning and Principles of Excision

A critical decision in surgical management is whether to pursue marginal excision or definitive wide excision. Whenever feasible, definitive surgery is preferred. This approach must be discussed in detail with the client, taking into account financial considerations and the feasibility of adjuvant therapies. Preoperative planning should also include strategies for wound closure, particularly in cases where large defects are anticipated. Familiarity with regional anatomy and axial pattern flaps is essential, as is advance planning for donor site management.

Marginal excision is discouraged when complete excision is achievable. Partial excision or compromised margins should not be undertaken simply due to concerns about wound closure. Surgical technique must respect tissue planes, avoiding both coning in towards the tumour and excessive coning out, which can complicate closure. Although some sarcomas are surrounded by a pseudocapsule, this structure does not constitute a true barrier, and shelling out tumours along this plane is not recommended. The first surgical attempt offers the best chance for cure and should be executed with oncological intent.

Example of Definitive Wide Excision and Reconstruction

An illustrative case involves a dog with a soft tissue sarcoma on the lateral abdominal wall. Following biopsy and tumour grading, surgical margins were planned accordingly. Margins were delineated around the mass and extended proximally and distally to facilitate closure. Given the availability of adequate tissue, a wide excision was performed, extending up to three centimetres based on tumour grade. The incision was made without direct manipulation of the mass or biopsy tract, and excision proceeded peripherally before extending perpendicularly down to and including the underlying fascia. In this high-grade tumour, full-thickness excision of the abdominal wall was undertaken, including rib transection. Reconstruction required mesh placement, layered internally with greater omentum to facilitate smooth visceral movement. Closure involved securing the mesh to ribs, diaphragm, and remaining body wall. A large axial pattern flap based on the latissimus dorsi was harvested and rotated caudally to close the defect. Closed suction drains and, where indicated, chest drains were placed postoperatively.

Marginal Excision in Anatomically Constrained Sites

In contrast, a marginal excision example involved a soft tissue sarcoma on the lateral antebrachial region. Due to anatomical limitations imposed by underlying bone, wide excision was not feasible without limb amputation. The mass was therefore excised with marginal intent, extending to the antebrachial fascia and including portions of adjacent muscle as necessary. Care was taken to preserve critical vasculature, including the cephalic vein. Wound closure was

assessed intraoperatively, with options including primary closure, mesh releasing incisions, gradual closure, or rotational flaps. Minor superficial dehiscence was considered acceptable and managed by second intention healing where appropriate.

Margin Assessment and Pathological Evaluation

Local tumour control is paramount in the management of soft tissue sarcomas. Completeness of excision is the most important determinant of disease-free interval. Submitted specimens should be carefully oriented using suture tags or inked margins, and photographic documentation can assist pathologists in assessing margin status. The deep margin is often of greatest concern. Larger tumour size has been associated with poorer prognosis, potentially due to central necrosis resulting from outgrowing the blood supply. Complete excision has been associated with median survival times exceeding four years. Similar outcomes have been reported following marginal excision combined with radiotherapy.

Adjuvant Therapies and Prognostic Factors

Radiotherapy may be administered in a neoadjuvant or adjuvant setting, either palliatively with higher doses over shorter periods or definitively with lower doses over longer durations. Fractionation minimises adverse effects on surrounding tissues. Chemotherapy has limited proven benefit for most soft tissue sarcomas, although metronomic protocols targeting anti-angiogenesis have shown promise. Potential side effects, including bone marrow suppression, must be discussed with clients and managed proactively.

Tumour type and histological grade significantly influence prognosis. Well-differentiated tumours generally have better outcomes than poorly differentiated or anaplastic lesions. High mitotic index, tumour necrosis, and evidence of vascular or lymphatic invasion are all negative prognostic indicators. Metastatic disease at diagnosis, particularly to lungs or lymph nodes, is associated with poor outcomes.

Evidence from the Literature

A landmark study evaluating 75 canine cases from 1986 to 1996 demonstrated that margin status is prognostic for local recurrence, with tumour-free margins associated with lower recurrence rates. High mitotic index was linked to increased metastatic risk, and tumour necrosis correlated with reduced survival times. In this cohort, metastatic disease developed in seventy percent of dogs, and tumour-related mortality exceeded thirty percent, with a median survival of approximately 1,416 days. A subsequent review published in 2016 reported

recurrence rates of seventeen to twenty-eight percent with close or incomplete margins, compared with only eight percent when margins were clean. No diagnostic test reliably predicts the exact surgical margin required, although general recommendations range from two to three centimetres for low- to intermediate-grade tumours and up to five centimetres for high-grade lesions such as feline injection site sarcomas.

Clinical Implications and Recommendations

High-grade tumours carry an inherent risk of metastasis regardless of local control. Selection bias in primary care settings may partly explain favourable outcomes following narrow excision of smaller, less aggressive tumours. Conservative management is not recommended for aggressive sarcomas. Optimal outcomes depend on accurate tumour grading, wide and deep surgical excision, and informed discussions with clients regarding prognosis and adjuvant therapies.