



American Brachytherapy Society consensus guidelines for sarcoma brachytherapy

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ABSTRACT

PURPOSE: To present recommendations for the use of brachytherapy (BT) in patients with soft tissue sarcoma (STS).

METHODS: A group of practitioners with expertise and experience in sarcoma BT formulated recommendations for BT in STS based on clinical experience and literature review.

RESULTS: The indications for adjuvant BT are discussed. There is no consensus on the use of BT alone or in combination with external beam radiation therapy (EBRT), but factors that influence the selection of this modality include tumor grade and size, prior surgeries, and tumor recurrence. Low-dose-rate, high-dose-rate, and pulsed-dose-rate radiation are all acceptable BT modalities to use for STS. Recommendations are made for patient selection, techniques, dose rates, and dosages. Outcome data and toxicity data are reviewed.

CONCLUSIONS: BT is a useful component of the treatment of STS. The advantages of BT are the targeted dose distribution, low integral dose, and short treatment times. Ultimately the clinician should select the modality or combination of modalities that are most familiar to the treatment team and suitable to the patient. © 2013 American Brachytherapy Society. Published by Elsevier Inc. All rights reserved.

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Introduction

Soft tissue sarcomas (STSs) may occur anywhere in the body, including the extremities, trunk, and head and neck. There are many pathologic types and histologic grades with different natural histories. Surgery is the preferred primary treatment in most cases. Radiation and chemotherapy are important treatments that are typically supplemental to curative surgery. Alternatively, they may be applied with curative or palliative intent for unresectable lesions or inoperable patients. The primary goal of treatment is cure of the

disease with preservation of the structure and function of the affected body part or organ. Conservative surgery has generally replaced amputation as the treatment of choice for extremity sarcomas because it better accomplishes these dual objectives (1–3). The combination of wide local excision (WLE) with pathologically clear margins and radiation therapy is the preferred therapy in most patients. Selected cases with lesions less than 5 cm, particularly if superficial and low grade, may be considered for surgery alone (4, 5). The use of adjuvant external beam radiation therapy (EBRT) or brachytherapy (BT) to enhance local control (LC) in patients undergoing limb-sparing sarcoma resections in the extremity is supported by Level 1 evidence from randomized prospective clinical trials (6, 7).

Radiation therapy may be administered as preoperative external beam or postoperatively as either EBRT or BT. There are no controlled studies comparing EBRT with BT. Implant catheters are typically inserted at the time of surgical excision, which allows directed catheter placement

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for disease coverage and protection of organs at risk (OARs). BT provides high radiation doses to the tumor bed and lower doses to tissues outside the implanted volume. If the target is localized to a region that can be encompassed with catheters, BT can be used as the sole therapy (8), although some data suggest improved outcome with a combination of BT and EBRT for patients with positive margins (9, 10). Source delivery can be done as low dose rate (LDR) as an inpatient or high dose rate (HDR) either as inpatient or outpatient depending on the medical and surgical care needs of the patient. In either case, BT courses are relatively short and convenient for patients. The limitations for BT in the treatment of sarcomas are the commonly large target volumes, restrictions in catheter placement because of bone or visceral organs, anatomic sites where good catheter geometry may be difficult to achieve (i.e., around the shoulder), and risk of radiation injury to nerves that are in direct contact with the BT catheters.

Methods and materials

A group of practitioners with expertise and experience in sarcoma BT were appointed by the American Brachytherapy Society (ABS) Board of Directors to provide guidelines for the use of BT in STS.

The previously published ABS guidelines were updated with a literature search, and the experts view on the state of the art was formulated. The evidence supporting BT as a component of the multidisciplinary management of sarcoma is described. Recommendations are made on radiation techniques and doses, and the expected tumor control and complication rates are provided. These guidelines were submitted to the ABS Board of Directors for approval before publication.

Results

Patient selection

Ideally, patients should be evaluated by a multidisciplinary sarcoma team, which includes surgical, radiation and medical oncologists, radiologists, and pathologists with knowledge and experience in the management of sarcomas. Preoperative staging evaluations include careful examination of the affected body site for extent of disease and the functional status of the affected body structure followed by imaging of the tumor with MRI for pelvic, extremity, and truncal lesions and CT for abdominal and retroperitoneal lesions to determine the radiologic extent of disease. Preoperative imaging delineates the gross disease and associated tissue edema, and it may reveal invasion into surrounding structures. Identification of the relationship of the lesion to adjacent critical structures, such as bone, nerves, and blood vessels, can be used to plan the extent

and nature of the surgery. It is equally important to consider whether skin, soft tissue, bone, or vascular grafting will be required to repair the surgical defect.

Chest CT should be obtained to rule out lung metastasis, which is the most common site of distant spread; patients with low-grade T1 lesions can be adequately staged with a chest X-ray. CT of the abdomen and pelvis may be valuable for patients with extremity or truncal liposarcoma, epithelioid sarcoma, angiosarcoma, or leiomyosarcoma, which have a higher rate of extrapulmonary spread (11). PET/CT may be useful for histologies with a predilection for nodal metastases, including clear cell sarcoma, angiosarcoma, rhabdomyosarcoma, epithelioid sarcoma, and synovial sarcoma. MRI of the spine for patients with myxoid liposarcoma can also be considered (12). Detection of lung metastasis should prompt consideration of chemotherapy and possibly surgical resection depending on the number, location, size, and rapidity of progression (13–15). Metastectomy for non-pulmonary metastasis has also been reported (16–18).

Treatment modality

Surgery

Patients with small (<5 cm) superficial tumors or small deep tumors that can be resected with wide margins (>1 cm) or complete resection with the investing fascial barriers are candidates for surgery without radiation therapy (4, 5, 19).

Radiation

The indications for radiation therapy are those features that put the patient at risk for local recurrence after surgical resection. These factors include narrow or positive surgical margins, local recurrence after prior surgery, tumor size of >5 cm, lesions deep to or invading the superficial fascia, high grade, and younger than 50 years (20).

BT monotherapy as an adjuvant can be considered in patients with high-grade sarcomas of the extremity or superficial trunk if they have undergone complete surgical excision with negative margins (8). There is no consensus on whether BT should be combined with EBRT in the setting of positive margins or whether one modality is sufficient. Early data from Memorial Sloan-Kettering Cancer Center (MSKCC) showed that combined BT and EBRT had better LC for patients with positive margins (9), but in subsequent reports that difference was not observed (21). Factors that may influence the use of EBRT and BT in scenarios with positive margins include the tumor grade, prior surgeries, and tumor size (22). BT in combination with external beam is recommended for cases with recurrent disease who have not been previously irradiated (10, 23–25).

Location

The location of the primary sarcoma appears to impact the clinical outcome, and it may affect treatment planning

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