

High Dose rate brachytherapy boost in the treatment of extremity soft-tissue sarcomas

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Purpose/Objective

Retrospective review of our experience with high dose rate brachytherapy (HDR BT) as a radiation boost following limb sparing resection for extremity soft tissue sarcomas (STS) with a median follow up of five years.

We examined toxicity, local recurrence, metastatic disease development, and survival.

Materials/Methods

Twelve patients were treated between April 1994 and September 1995 for extremity sarcomas.

Nine men and three women (n=12)

Age range: 31 to 73 years (median=60)

All were candidates for limb sparing surgery.

Histology of Tumors

Ten had high grade tumors, and two had low grade tumors on initial biopsy:

Malignant fibrous histiocyoma (n=6)

Liposarcoma (n=2)

Leiomyosarcoma (n=1)

Synovial sarcoma (n=1)

Malignant schwannoma (n=1)

Spindle cell sarcoma (n=1)

Sites of Tumor Origin

Eight in the lower extremity

One in the buttock

Two in the upper extremity

One with a lesion in both the upper and lower extremities.

Treatment

Ten of the twelve patients received external beam radiation therapy (EBRT)

One received postoperative EBRT

All received HDR EBRT after en bloc resection of the sarcoma.

Neoadjuvant chemotherapy was given in eight of twelve patients.

Eight of twelve received neoadjuvant chemotherapy:

- Either Ifosfamide/Mesna with or without Adriamycin
- Or MAID for 3 to 4 cycles
- One patient also received Cisplatinium

Radiation Doses

EBRT Range: 40 to 59.4 Gy in daily fractions of 1.8- 2 Gy.

Interstitial radiation dose through interstitial catheters sutured into the resected tumor bed: 13 - 30 Gy at a depth of 5 to 7.5 mm from the center of the Ir-192 high dose rate source.

The HDR EBRT was delivered in multiple fractions, b.i.d. with at least a 5 hour separation minimally.

Results: Toxicity

Eleven of twelve had treatment-related toxicities:

1. Wound healing (n=1)
2. Grafts or flaps required (n=4)
3. Neurologic impairment (n=2)
4. Chemotherapy- related neutropenia (n=4)

Results: Recurrences

With a median follow-up of 63 months:

One developed local recurrence (37 months)

One developed both local and distant disease (24 months)

Two developed distant metastases early (at 5 and 12 months), both have died.

Summary Table of Results

Summary of 12 Patients with Sarcoma Treated with HDR-BT

			Recurrence				
Age/Sex	Tumor Grade	Chemo-Therapy	Local	Distant	Recurred (Months)	Status	Follow-up (Months)
59/M	High	Yes	No	Yes	12	Dead	50
62/M	High	Yes	Yes	No	37	Alive	79
64/M	High	Yes	Yes	Yes	24	Alive	77
40/M	High	Yes	No	No		Alive	60
38/M	High	Yes	No	No		Alive	52
64/M	High	Yes	No	No		Alive	52
73/M	High	Yes	No	No		Alive	71
67/F	High	No	No	Yes	5	Dead	23
59/F	High	No	No	No		Alive	60
31/M	High	No	No	No		Alive	60
73/M	Low	Yes	No	No		Alive	60
38/M	Low	No	No	No		Alive	78

Five-Year Probability of Survival/Recurrence for the Entire Group

Estimated Survival: 0.83 ± 0.17 (s.e.)

Estimated Recurrence: 0.33 ± 0.14 (s.e.)

Conclusions:

1. HDR IBT as part of a combined modality program reduces local recurrence of STS following en bloc resection.
2. Local failure rate of 20% in high grade lesions is comparable to the 19% local failure rate in the MSKCC.
3. Neoadjuvant chemotherapy may play a role in local control as well as in overall and distant free survival.

Recommendations:

1. Limit the pre-operative EBRT dose to 40 Gy with chemotherapy.
2. Do not deliver the HDR BT until postoperative day 5 at the earliest.
3. HDR BT dose for negative margins to 15 Gy in five fractions of 3 Gy each 75 mm from the center of the source.
4. HDR BT dose for positive margins to 3 Gy in 3 Gy twice daily (75 mm from the center of the source).