

:

\* . \* . † . \* †

\_\_\_\_\_:

\_\_\_\_\_ :1995 5 1997 12 10

1 1.5cm tissue expander

-192가

1cm

12 15Gy(2 2.5Gy/fraction) 50 55Gy

2 3

\_\_\_\_\_:

가

25 ( 12 41 )

RTOG/EORTC

3 4

\_\_\_\_\_:

: , , , ,

가

가  
가

가

가

가 .1 5)

.2,3,6 9)

1999 1 18 1999 2 24

Tel:0331)219-5884 Fax:0331)219-5894

가

1995 5 1997 12 10  
가

2 3cm  
(suture)

9

39 ) (가 )  
1.5 15cm ( 6cm). (wide  
margin excision) 8

string suture purse  
가  
(single plane implant)

(Fig. 1).

(marginal resection)  
가  
(pleomorphic)

Table

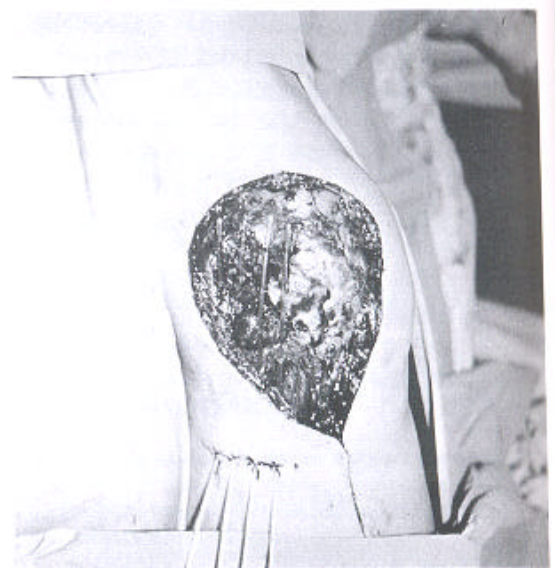
1

( 4 5 )

6F( 2mm)

가 1.0 1.5cm 가

가

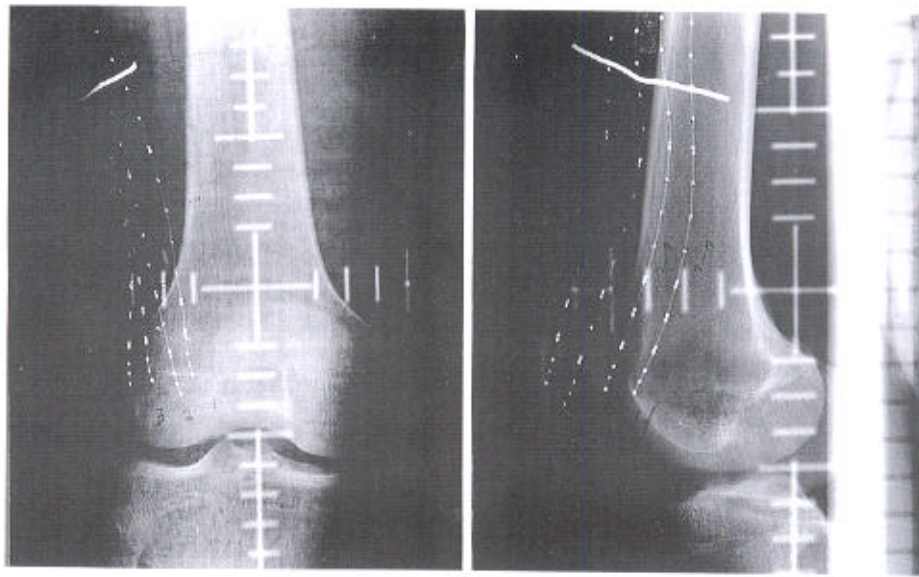


**Fig.1.** The nylon catheters were placed in the target region with chromic catgut sutures, and fixed to the skin with Purse string suture.

**Table1. Patient's Characteristics**

No	Sex/ Age	Site	Histology	Disease Status	Surgery	Tumor Size (cm)	RM* Statu s
1	F/10	inguinal LN	MFH †	recurrent	LN ‡ excision	3 × 2	(-)
2	F/32	thigh	Malignant schwannoma	primary	wide margin excision	15 × 6 × 7	(-)
3	M/49	thigh	Myxoid liposarcoma	primary	wide margin excision	7 × 4 × 2	(+)
4	M/23	thigh	MFH	recurrent	wide margin excision	1 × 1.5	(+)
5	M/40	arm	Leiomyosarcoma	primary	wide margin excision	3.5 × 3.5 × 2.5	(-)
6	M/67	abdominal wall & pelvic cavity	Pleomorphic sarcoma	recurrent, 3rd	debulking	3 × 4, 5 × 4	(+)
7	F/28	retroperitoneum	Malignant schwannoma	primary	marginal resection, rupture	13 × 12	(-)
8	M/38	groin	Myxoid sarcoma	recurrent	wide margin excision	9 × 9	(-)
9	F/40	arm	Rhabdomyosarcoma	primary	wide margin excision	1.7 × 1.5 × 1	C §
10	M/56	calf	Leiomyosarcoma	primary	wide margin excision	10.2 × 4.5	C

RM\*:resection margin, MFH † :malignant fibrous histiocytoma, LN ‡ :lymph node, C § :close to neurovascular bundle



가

(prescription point)  
 (hot spot)  
 (Gel form)  
 tissue expander  
 5mm  
 (muscle flap)  
 (feeding vessel)

5 (Fig. 3) (Fig. 2)  
 6

가  
 가  
 3 1 2 , 200 250 cGy/  
 1200 1500cGy  
 -192가  
 (Microselectron , Nucletron)  
 1cm  
 (TLD)  
 0.5 0.7cm

3

Table 2

가

가 1

가 1 (2 )

3 ( 2 8 ).  
 1200cGy(  
 900 1500cGy),  
 5400cGy(3600 5580cGy)

가  
 tissue  
 expander  
 가  
 1 1 , 300cGy/ ,  
 900cGy

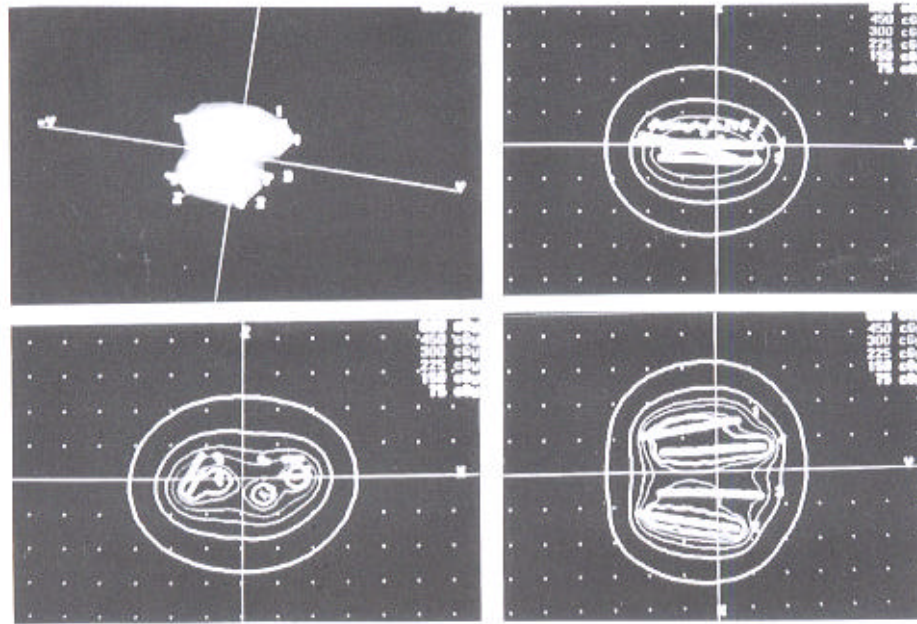


Fig. 3. The 3-dimensional treatment plan for implant is shown(3-D target volume, and X,Y.and Z directions).

**Table 2. Radiation Therapy, Treatment Results, and Complication**

No	Sex/ Age	Radiation Therapy(Gy)				Chemotherapy	F/U ‡ Durati- on(mo)	Results	Complication
		Brachy- erapy(Gy)	Prescription point (cm)	TLD*	External RT † (Gy)				
1	F/10	13.5(B §)	0.5	skin 115.4%	36	VCR ¶ + ACT-D# + CYC #8	41	NED	wound dehiscence due to tension during external RT
2	F/32	10 (B)	1	(-)	55.8		30	NED	(-)
3	M/49	12 (B)	0.7	skin 100%	55.8	(-)	29	NED	Abscess during ext RT
4	M/23	12 (B)	0.75	skin 110%	54	(-)	28	NED	(-)
5	M/40	12 (B)	0.75	(-)	55.8		25	NED	fibrosis, grade I
6	M/67	12 (B)	1	(-)	54	VP16** + CYC #2 (-)	25	NED(Metasta- sectomy for lung mass)	(-)
7	F/28	9 (D )	1	(-)	36.5	weekly ADR during RT DTIC + VP16 CYC + VCR + ACT-D #6	23	DWD(local progression during RT)	(-)
8	M/38	15 (B)	0.5	(-)	50.4		17	NED	skin pigmentation
9	F/40	12 (B)	0.5	skin 28%	50	(-)	16	NED	
10	M/56	15 (B)	0.7	ulnar n. 9.6 & 15.6% skin 51% tibial a.& n. 93.2 & 68.3%	54	ACT-D + ACR #12  weekly ADR during RT	12	NED	fibrosis, grade I

TLD\*:Thermoluminescence dosimeter, RT † :radiation therapy, F/U ‡ :follow-up, B § :BID, D :QD, VCR ¶ :vincristine, ACT-D#:actinomycin D; CYC :cyclophosphamide, VP16\*\*.: etoposide, ADR :adriamycin

adriamycin(10gm/m2) 가 5cm 10 가  
 4 가 7 가  
 가 28 115.4% 가 5  
 가  
 (tense 10 tension) (wound 40 ) (stapler)  
 dehiscence)가

12 41 ) 25 ( , .3,8,10 15)  
 10 14 5

(Table 2).

24 가

(RTOG/EORTC) (neurovascular bundle) 가  
 가 2 100% 가  
 (neuropathy)

30 가  
 가  
 가  
 가  
 가

Memorial Sloan Kettering Cancer Center(MSKCC)

(89% 66%,  $P=0.0025$ ).14) 가  
 가  
 kinetics) 가 4 6  
 가

.10,15) 1.5 2cm ( )

5 10cm

가 ( ( 44Gy ) 5  
 ( 79%, 84% )  
 3 가 , .13)

(remote afterloading device)

Gemer  
TV65/TV( ) 65Gy 1cm  
TV65/ TV가 1  
.16) , , 2  
Habrand 48 ( 60Gy)  
33%(16/48) ( .17) 2  
82 )  
(marginal recurrence).  
가 .19 22)  
(2 5cm)  
Schray  
15 20Gy 45 50Gy Wayne State University  
4%(2/56), 200 400cGy/ , 1 2 11)  
33%(3/9) .4) McGill University 500cGy/ , 1  
5 1 2 .20)  
Alekhteyar HDR Brachytherapy Working  
(45Gy) ( 15 20 Group(HIBWOG)  
Gy 45 50Gy) MSKCC 가  
5 7 300cGy/ , 1 2  
82% 90% 가 .18)  
2 (90%  
59%, P=0.08). 6 (1800cGy),  
7 (2100cGy) .23)  
200 250cGy/ , 1 2 , 1200 1500 cGy

: 1) , (infection source)  
2) 가 ,  
, 3)  
가  
가  
50Gy 가  
(button)  
가 가

가

가 가

가

가

1961 Grillo 24 48 가 가

Devereux 7 가 5 7 .24) 가 30cm 가

strength) 7 (wound breaking hydroxyproline 0 7 28 115.4% 4

.25) MSKCC 100% 1cm 100% 0.5cm, 0.75cm 가 Zelefsky 9000cGy .13)

5 .11,12) 가 9%(4/45)

(48% vs 6%) 5 8 가 4 9000cGy 가

) 가 (14% vs 10%). 5 3 Zelefsky 가

26 5 가

Hidalgo Panchal 5

(free flap) 100%가 가

가 5 8 , 14 19 ( 가 , , 가 (gel form) (muscle flap) (5 10mm)

5 7 .26,27)

3 6

7% 1 가 가

45 55Gy )

- ( )
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## High Dose Rate Interstitial Brachytherapy in Soft Tissue Sarcomas: Technical Aspect

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**Purpose:** To discuss the technical aspect of interstitial brachytherapy including method of implant, insertion time of radioactive source, total radiation dose, and complication, we reviewed patients who had diagnoses of soft tissue sarcoma and were treated by conservative surgery, interstitial implant and external beam radiation therapy.

**Materials and Methods:** Between May 1995 and Dec. 1997, ten patients with primary or recurrent soft tissue sarcoma underwent surgical resection (wide margin excision) and received radiotherapy including interstitial brachytherapy. Catheters were placed with regular intervals of 1–1.5 cm immediately after tumor removal and covering the critical structures, such as neurovascular bundle or bone, with gelform, muscle, or tissue expander in the cases where the tumors were close to those structures. Brachytherapy consisted of high dose rate, iridium-192 implant which delivered 12–15 Gy to 1 cm distance from the center of source axis with 2–2.5 Gy/fraction, twice a day, starting on 6th day after the surgery. Within one month after the surgery, total dose of 50–55 Gy was delivered to the tumor bed with wide margin by the external beam radiotherapy.

**Results:** All patients completed planned interstitial brachytherapy without acute side effects directly related with catheter implantation such as infection or bleeding. With median follow up duration of 25 months (range 12–41 months), no local recurrences were observed. And there was no severe form of chronic complication (RTOG/EORTC grade 3 or 4).

**Conclusion:** The high dose rate interstitial brachytherapy is easy and safe way to minimize the radiation dose delivered to the adjacent normal tissue and to decrease radiation induced chronic morbidity such as fibrosis by reducing the total dose of external radiotherapy in the management of soft tissue sarcoma with conservative surgery.

**Key Words:** Interstitial brachytherapy, High dose rate, Soft tissue sarcoma, Technical aspect