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 ,  
 : 1988 2 1994 6  
 26  
 57(6 ~ 120) , 21.4(5 ~ 37) . 26 stage IIB  
 18 , 2 , 6 .  
 : 4 22 Shrine's rat-  
 ing system , 18 , 3 , 1 .  
 -11( ) ~ 80( ) 가  
 2 , 10 3  
 1 가 . 6 , 2 ,  
 1 .  
 : 10  
 가 가 ,

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가 가 가  
 가  
 3,6)

가 . 26 .

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1988 2 1994 6  
 26  
 ) , 26  
 가 12 , 21.4 (5 ~ 37 )  
 26 18 , 2

6  
 , 가 2  
 Enneking stage IIB가 16 ,  
 stage III가 2 , 2 stage  
 IIB , 6 가 stage 3  
 가  
 . 13 , 가 5 ,  
 57 (6 ~ 120 가 4 , 가 2 ,  
 가 14 , 2  
 (Table 1). 18 8 Adriamycin  
 Cis-platin

**Table 1.** Summary of cases.

Case	Sex/Age at Op	Tumor			Preop. status	Neoadjuvant ChemoTx	Date of Op	Adjuvant ChemoTx
		Dx	Site	Stage				
1	M/37	GCT	L-D-F	3	Patho. fract.		Feb, '88	
2	F/33	GCT	L-D-F	3	Patho. fract.		Jun, '88	
3	M/19	OSA	R-D-F	IIB			Nov, '88	ADR, CDDP
4	M/29	GCT	L-P-T	3	Recurred		Mar, '89	
5	F/16	OSA	L-D-F	IIB			May, '89	ADR, CDDP
6	M/18	OSA	R-P-T	IIB	Assoc. with Fib. dyspla.		Jun, '89	ADR, CDDP
7	F/28	GCT	L-P-T	3	Patho. fract.		Jul, '89	
8	F/16	OSA	R-P-T	IIB			Jan, '90	ADR, CDDP
9	F/20	OSA	R-D-F	IIB			Feb, '90	MTX, IFOS, VP-16
10	M/32	GCT	L-D-F	3	Patho. fract.		Jul, '90	
11	M/30	SSA	L-D-F	IIB			Oct, '90	ADR, DTIC
12	F/34	OSA	R-D-F	IIB			Nov, '90	ADR, CDDP
13	M/16	OSA	R-D-F	IIB		ADR, CDDP	Apr, '91	ADR, CDDP
14	F/18	OSA	R-D-F	IIB		ADR, CDDP	May, '91	ADR, CDDP
15	M/18	OSA	R-P-T	IIB		ADR, CDDP	Jun, '91	ADR, CDDP, IFOS
16	M/19	OSA	R-D-F	IIB			Sep, '91	ADR, CDDP
17	M/29	GCT	R-D-F	3	Recurred		Sep, '91	
18	M/10	OSA	L-D-F	IIB			Jan, '92	ADR, CDDP
19	M/5	SSA	R-D-F	IIB			Mar, '92	CYT, VCR, ACT-D
20	F/10	OSA	L-D-F	IIB		ADR, CDDP	Mar, '92	ADR, CDDP
21	M/14	OSA	R-D-F	IIB		ADR, CDDP	Feb, '93	ADR, CDDP
22	F/16	OSA	L-D-F	IIB		ADR, CDDP	Sep, '92	ADR, CDDP
23	F/23	OSA	L-D-F	III		ADR, CDDP	Nov, '92	MTX, IFOS, VP-16
24	F/13	OSA	L-P-T	IIB			Aug, '93	ADR, CDDP
25	F/17	OSA	R-P-T	IIB		ADR, CDDP	Jun, '94	CYT, CDDP
26	M/37	OSA	L-D-F	III	Patho. fract.		Apr, '94	ADR, CDDP

GCT, Giant cell tumor; OSA, Osteosarcoma; SSA, Synovial sarcoma; L(R)-P(D)-F(T), Left(Right)- Proximal(Distal) - Femur(Tibia); Patho. fract, Pathologic fracture; Fib. Dyspla, Fibrous dysplasia; ADR, Adriamycin; CDDP, Cis-platin; MTX, Methotrexate; IFOS, Ifosfamide; VP-16, Etoposide; DTIC, Dacarbazine; VCR, Vincristine; CYT, Cytosin(Cyclophosphamide)

Adriamycin Cis-platin 10mm,  
 Ifosfamide Methotrexate Toposide(VP-16) 5mm  
 5mm  
 1 Adriamycin DTIC, 1 Vinc-  
 ristine, Cyclophosphamide Actinomycin-D  
 5 ~ 7cm  
 가  
 16 14 (circumference)

Case	Complication	Treatment	Metz	Dur. of F/U	Status	ROM(DF/PF)	Shriner's Rate
1	malrotation	Syme		4yr 2mo		0°/90°	7
2				9yr		-30°/85°	8
3			Lung	2yr 11mo	DOD	-5°/90°	9
4	Nonunion	AIBG		6yr		-20°/90°	10
5	Nonunion	AIBG	Lung	10yr	NED	0°/75°	9
6			Lung	2yr 2mo	DOD	-20°/100°	9
7				3yr 9mo		0°/80°	10
8	Thrombosis Ulceration Nonunion	Thrombectomy Syme AIBG		9yr 9mo	CDF	0°/45°	
9	Local recur	Hip D/A	Lung, Brain	8yr 2mo	DOD	-15°/75°	9
10				3yr 4mo		5°/90°	10
11			Lung	3yr 2mo	DOD	5°/75°	9
12	Nonunion	AIBG		2yr 11mo	CDF	-10°/90°	9
13			Lung	2yr 7mo	DOD	-10°/80°	9
14				7yr 11mo	CDF	-20°/80°	10
15			Lung	1yr 7mo	DOD	-30°/90°	9
16	Nonunion Stiffness	AIBG Syme		7yr 8mo	CDF	-10°/30°	5
17	Thrombosis	AK		2yr 1mo			
18				7yr 6mo	CDF	-10°/85°	10
19	Nonunion	OREF, AIBG		7yr 8mo	CDF	0°/95°	9
20				6yr 2mo	CDF	-25°/80°	9
21	Local recur	Hip D/A	Lung	8mo	DOD	-30°/90°	9
22	Malrotation			6yr 3mo	CDF	-20°/70°	7
23			Lung	1yr	DOD	-30°/90°	9
24	Thrombosis	AK		8mo	DOD		
25				5yr 4mo	CDF	10°/70°	10
26	Sepsis, ARF		Lung	6mo	DOD		

Metz, Metastasis; Rate, Shriner's Rating System; AIBG, Autoiliac bone graft; D/A, Disarticulation; CDF, Continuous disease free survival; DOD, Dead of disease; NED, No evidence of disease; AK, Above knee amputation; OREF, Open reduction and external fixation; ARF, Acute renal failure; DF, dorsiflexion; PF, plantarflexion.

(dynamic compression plate) (8~12) 가 (mat-rotation) 2 1 (end to end anastomosis) Syme Syme 가 1 가 2 Syme 1 22 Shrine's rating system (Table 2). 18 (excellent), 3 (good), 1 (fair) -11( )~8Q( ) 가 3 , 1 8. -11. , 32, 8Q. 가 (Table 3). (prosthesis) 3 4~14 가 , 6 ,

**Table 2.** Shriner's Rating System

Category	Results	Points
Gait	Good : able to bend knee	2
	Fair : able to bend knee partially	1
	Poor : keep knee straight	0
Height of Ankle Relative to Contralateral Knee	Within 2cm	1
	Not within 2cm	0
ROM of Ankle	> 45°	1
	< 45°	0.
Rotation	Full 180°	1
	< 180°	0
Use of Prosthesis	Full time	2
	Part time	1
	Never	0
Prosthetic Fit	Good	1
	Poor	0
Use of External Support	None	2
	Unilateral	1
	Bilateral	0

Excellent, 9 to 10 ; Good, 7 to 8 ; Fair, 4 to 6 ; Poor, 0 to 3

— : —

2 , 10

9 , 1

14 (5~31 )

18 2 가

9 2 가

5 , 77 가

3 가

2 stage IIB 1

20 , 108

120 ,

1 77 , 89

96

1 stage III 2

12 . 9

(dead of disease; DOD) 8

(continuous disease free survival; CDF) , 1 가

(no evidence of disease; NED) 64

Kaplan-Meier IIB

16 5 62.5% (Fig. 1).

2 가 1 . 1

가 1

1930 Borggrevè

, 1950 Van Nes<sup>9)</sup>가

1974 Kotz<sup>2)</sup>

(resection arthrodesis),

**Table 3.** Change of Range of Motion by Physical Examination(Unit : °)

	Dorsiflexion	Plantarflexion	Total ROM
Initial	8°	32°	40°
Follow up	-11°	80°	69°

(allograft replacement),  
(endoprosthesis replacement) 가

4,7)

가

가

6)

(extendable device)

stage IIB 가

2,8,10)

10 2

Shriner 7

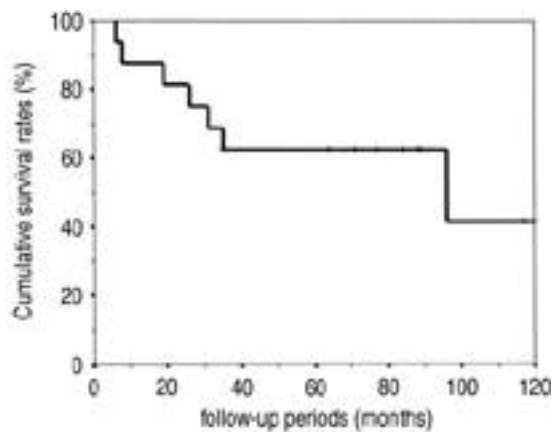
10 가 , 1 21

가 18

81.8%

-11.

~80 Hanlon Krajchick<sup>4)</sup>



**Fig. 1.** Survival of IIB osteosarcoma(5 year survival rate was 62.5%)

82. Hanlon Krajbich<sup>1)</sup> 11 .  
 21 , 1 , .  
 1 , 가 1 , 가 15 , 2  
 가 1 , 1 , 1 , , 가가 가 3  
 가 1 , , ,

9 . Gottsauner-Wolf <sup>2)</sup> 1.4cm, 2.0cm, 1.3cm .  
 7 , 가 8 , 가 1~2 .  
 4 , 가 7 , 1 , .  
 , 8 , 2 , . 가 , 10  
 2 , 가 2 . 가 , 10  
 3 2 가 , 1 6 ,  
 5 , 1  
 6 27.2% 가 . ,  
 . 2  
 . 가 2 , 가  
 가 22 10 가 ,  
 45.5% 1 .  
 2 .  
 1 . 1 (CDF)  
 1 (DOD) 가  
 . 18 2 , .  
 가 9 2 <sup>3)</sup>  
 . 9 가 가  
 , 1 가 가  
 (NED) .  
 , 가 가 가가  
 , 가

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**Abstract**

**Segmental Resection and Rotationplasty of Malignant and Aggressive Bone Tumors Around Knee**

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**Purpose** : In patients having malignant and aggressive bone tumors around knee joint requiring amputation, segmental resection and rotationplasty were performed and the clinical results were analyzed.

**Materials and Methods** : Twenty-six patients underwent segmental resection and rotationplasty between February 1988 and June 1994, because limb salvage with tumor prosthesis after removal of tumor was impossible. The mean follow-up of malignant tumors was 57(6~120) months and the average age of patients was 21.4(5~37) years old. Out of 26 patients, there were 18 osteosarcoma( stage IIB), 2 synovial sarcoma, and 6 giant cell tumor.

**Results** : Clinical results were evaluated by the Shriner 's rating system. Four patients were excluded due to death or amputation and remaining 22 patients were included for assessment. Eighteen patients had excellent result, 3 good, and 1 fair. Range of motion of ankle joint was -11 (dorsiflexion)~80(plantarflexion) degrees and daily walking activity with prosthesis was possible. Local recurrence developed in 2 patients and distant metastasis in 10. Early complications had 3 thrombosis and 1 sepsis, and late complications had 6 nonunion, 2 malrotation and 1 stiffness of ankle joint.

**Conclusion** : Rotationplasty which is functionally excellent may serve as an effective partial limb salvage procedure, especially in patients less than 10 years old that lower extremity discrepancy or loosening tumor prosthesis due to enlargement of medullary cavity are anticipated or amputation is inevitable for wide resection margin.

**Key Words** : Knee, Bone tumor, Segmental resection, Rotationplasty

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