

# 가

가

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: (cover  
 age), (knee extensor apparatus),  
 가 , 가  
 : 1992 4 1998 10  
 11 가 6 , 가 5  
 , 15 65 23.7 1 4  
 6 , 2 5 가 1993 (International  
 Symposium On Limb Salvage; ISOLS)  
 (functional activity), (emotional acceptance), (use  
 of external support), (walking ability), (gait) 가  
 가 0 5 1,  
 2, 3, 4 (%)  
 : 가 86.7% 53.3% 68.3%  
 , 82.5%, 62.5%, 가 67.5%,  
 77.5%, 62.5%, 57.5% .  
 5 , 85 , 5 5 , 15 , 10 (extension lag)  
 . 2 1  
 1 :  
 가  
 extension lag , ,  
 가 .  
 : , , , 가

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. 10  
 (medial head of gastrocnemius)

6  
 가

, 4 6-9  
 Rosen T-10 T-14

가 protocol  
 가 6 , 가 5 , 15  
 65 23.7 , 1  
 1.11) 4 6 2 5

가 1993 (International  
 Symposium On Limb Salvage; ISOLS)

(arthrodesis), (osteoarticular  
 (rotationplasty), (allograft-pros activity), (functional  
 allograft), - (allograft-pros (emotional accep-  
 theses composite) (tumor pros- tance), (use of external sup-  
 theses) (tumor pros- tance), (walking ability),  
 (gait) 가 가 .

0 5  
 coverage, (extensor  
 apparatus) 1,2,3,4  
 (%) .

가 가 .  
 (patellar tendon)

extension lag 86.7% 53.3% 68.4%  
 , 83.6%, 61.8%,  
 가 67.3%,  
 (medial gastrocne- 78.2%, 61.8%, 57.2%  
 mius rotation flap) (Table 1). , ,  
 가 , ,

5, 85, , 5  
 5, 15, 10,  
 2 (18.2%)

1992 4 1998 10  
 , . 1  
 가 53.3% ,

11 . 1  
 가 stage II B , 가 56.7% .

가 1  
 Kotz endoprosthesis 가가 56.7% , 2

**Table 1.** Functional Results evaluated by ISOLS score

Patient No.	Pain	Function	Emotional acceptance	Supports ability	Walking	Gait	Total
1	3	3	3	3	2	2	16(53.3%)
2	5	4	4	5	4	4	26(86.7%)
3	4	2	3	3	3	2	17(56.7%)
4	5	3	4	4	4	3	23(76.7%)
5	3	3	3	3	3	3	15(60%)
6	3	3	3	3	3	2	17(56.7%)
7	5	3	3	5	3	3	22(73.3%)
8	5	4	4	5	3	4	25(83.3%)
9	4	3	4	4	2	3	20(66.7%)
10	4	3	3	4	3	3	20(66.7%)
11	5	3	3	4	4	3	22(73.3%)
Total	46(83.6%)	34(61.8%)	37(67.3%)	43(78.2%)	34(61.8%)	32(58.2%)	68.5%/68.4%

가 .  
 (loosening) ,  
 . 2 (dead of dis- , Mankin <sup>10)</sup>  
 ease; DOD) , 2  
 (alive with disease; AWD) , 7 , 1983 Dubousset Missenard<sup>2)</sup> Mala-  
 (continuous disease wer<sup>7)</sup>가 (medi-  
 free; CDF) . al gastrocnemius rotation flap)  
 Malawer<sup>8,9)</sup>  
 .  
 2 ,  
 가 .  
 Eckardt <sup>3)</sup>  
 (dehiscence) ,  
 가 ,  
 Malawer McHale<sup>8)</sup> 3~4  
 ,  
 가 가 가  
<sup>5,6)</sup> , 6~9 Knee-ankle-foot orthosis  
 가 . Eckardt <sup>3)</sup>  
 ,  
 가 .  
 ,  
 extension lag  
 3~4  
 . Eilber<sup>4)</sup> 가 . 4~6

90

REFERENCES

, 6~9 (hamstring) 가  
 가 53.3% , 68.3% 86.7%  
 가 53.3% , 1 가 56.7% 가  
 7 10, 30, 15, 85( , exten-  
 sion lag 가  
 6~9

- 1) **Dahlin DC** : Bone tumors: General aspects and data on 6,221 cases, ed. 3. Springfield, Illinois, Charles C Thomas, 1978.
- 2) **Dubousset J, Messenard G** : Reconstruction of quadriceps insertion by aponeurotic and muscular plasties after proximal tibial replacement in osteogenic sarcoma. Presented at the 2nd International Workshop on the Design and Application of Tumor Prostheses for Bone and Joint Reconstruction, Vienna, Austria, September 3-5, 1983.
- 3) **Eckardt JJ, Matthews, II, JG, Eilber FR** : Endoprosthetic reconstruction after bone tumor resections of the proximal tibia. *Orthop Clinics North America*, 22(1):149-160, 1991.
- 4) **Eilber FR** : Limb salvage for high grade sarcomas: UCLA experience. Presented at the NIH Consensus Development Conference, Limb-Sparing Treatment, Adult Soft-Tissue and Osteogenic Sarcomas. Bethesda, Maryland Dec. 3-5, 1984
- 5) **Larsson SE, Lorentzon R, Wedren H and Boquist L** : The prognosis in osteosarcoma. *Inter Orthop*, 5: 305-310, 1981.
- 6) **Lockshin MD, Higgins ITT** : Prognosis in osteogenic sarcoma. *Clin Orthop*, 58:85-103, 1968.
- 7) **Malawer MM** : The use of gastrocnemius transplantation flap with limb-sparing surgery for knee sarcomas: Presented at the 2nd International Workshop on the Design and Application of Tumor Prostheses for Bone and Joint Reconstruction, Vienna, Austria, September 3-5, 1983
- 8) **Malawer MM, McHale KA** : Limb-sparing surgery for high-grade malignant tumors of the proximal tibia. *Clin Orthop*, 239:231-248, 1989.
- 9) **Malawer MM, Price WM** : Gastrocnemius transposition flap in conjunction with limb-sparing surgery for primary bone sarcomas around the knee. *Plast Reconstr Surg*, 73:741-750, 1984.
- 10) **Mankin HJ, Doppelt SH, Sullivan TR et al** : Osteoarticular and intercalary allograft transplantation in the management of malignant tumors of bone. *Cancer*, 50:613-630, 1982.
- 11) **Sim FH, Chao EYS** : Prosthetic replacement of the knee and a large segment of the femur or tibia. *J Bone Joint Surg*, 61-A:887-892, 1979.

## Functional Result of Limb Salvage Surgery with Tumor Prosthesis for Osteosarcoma of Proximal Tibia

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**Purpose** : Limb salvage for osteosarcoma of proximal tibia is challenging problem due to difficulties in mobilizing or retracting the main neurovascular structure, inadequate soft tissue coverage, and unsolved problem of patellar tendon reattachment to endoprosthesis. The authors analyzed the functional result of limb salvage using tumor prosthesis with medial gastrocnemius rotation plasty for osteosarcoma of the proximal tibia.

**Materials and Methods** : Eleven patients with histologically proven osteosarcoma of the proximal tibia, treated with adjuvant and neoadjuvant chemotherapy and limb salvage operation with tumor prosthesis between January 1992 and December 1998 at our Medical Center, were selected. There were 6 male and 5 female. Age ranged from 15 years to 23.7 years with an average of 23.7 years. Follow-up period ranged from 1 year to 4.5 years with an average of 2.5 years. The final functional result was evaluated using the method by ISOLS, 1993. The factors include pain, functional activities, emotional acceptance, use of external supports, walking ability and gait. Each of the factors has been scored from 0 to 5 depending on the appropriate description or data. The rating score is determined by dividing the individual factor scores into the total score and indicates percentage of normal function.

**Results** : The overall functional result ranged from 53.3% to 86.7% with an average of 68.3% of normal function. In details, the averages were 82.5% for pain, 62.5% for functional activities, 67.5% for emotional acceptance, 77.5% for use of external supports, 62.5% for walking ability, and 57.5% for gait. The average range of motion of the knee joint was 5° extension and 85° flexion. Five patients have extension lag ranged from 5° to 15° with an average of 10°. Two patients suffered postoperative infection. One was treated with antibiotics injection only, but the other needed removal of the prosthesis and knee fusion. Both of them showed unsatisfactory result.

**Conclusion** : The overall functional result after limb salvage using tumor prosthesis with medial gastrocnemius rotational flap for osteosarcoma of the proximal tibia was relatively satisfactory in case of no postoperative infection. The patients were less satisfactory in functional activities, emotional acceptance and gait than pain, use of external supports due to limitation of motion and extension lag. More aggressive postoperative physical therapy and protection with brace for 6~9 months as well as surgical technique is mandatory for more satisfactory result.

**Key Words** : Proximal tibia, Osteosarcoma, Tumor prosthesis, Medial gastrocnemius rotational flap

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