

가

:
 가 .
 : 1982 2001
 가 29 . 35 ,
 7 1 (1 2 ~ 19 9) , 7 , 14 ,
 1 , 1 , 6 .
 7 , 10 ,
 7 , 5 ,
 . 가 (Musculoskeletal Tumor Society)
 가
 : 6 , 2 , 2
 가 3 .
 88.6% , 가 (p=0.012).
 가 80% (24 , 18~30) .
 71% , 86% ,
 83% (p=0.034).
 가 1 , 가 1 ,
 1 .
 : , , , ,
 : , , , ,

: 28

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1 , 1 ,
21 , 3 ,
1
6 , 1

IIA 3 , IIB 4 ,

IA 6 , IIA 8 ,

6 III . 3 , 2

가 , 6)
가 가
가 가
1 ,
가 . 5 .
4 , 3 ,
6 ,
4 , 2

가 1 .

^{9,10)} Malawer

(Musculoskeletal Tumor

Society)

가 가 ⁸⁾.

1 , 1 ,
4 (Table 1).

2.

Malawer

(Musculoskeletal Tumor

Society) ^{3,9)} (Fig. 1),

S1 3 , S34 14 , S345 7 .

5

(,)

1. A, B 가 . A
가 , B 가

1982

2001 가 29 . 35
(11~71) 14 , 15 .

7 1 (1 2 ~19 9

) . 가 , 가
23 7 , 14 , (Table 2). 6가

Table 1. Reconstruction method

	osteosarcoma	chondrosarcoma	Parosteal osteosarcoma	hemangiopericytoma	GCT	Total
Curettage and cementing		6			1	7
Cement molding arthroplasty	4	4		1	1	10
Prosthesis Arthroplasty	3				4	7
Others		4 *	1 †			5
Total	7	14	1	1	6	29

*: resection only 1, vascularized fibular graft 1, bone graft 2

†: arthrodesis with vascularized fibular graft

Table 2. Functional rating system of the Musculoskeletal Tumor Society for the upper extremity

Rating	Pain	Function	Emotional Acceptance	Positioning of the Hand	Manual Dexterity	Lifting Ability
5	None	No restriction	Enthusiastic	Unlimited	No limitation	Normal load
4	Intermediate	Intermediate	Intermediate	Intermediate	Intermediate	Intermediate
3	Modest/nondisabling	Recreational restriction	Satisfied	Not above shoulder or no pronation or supination	Loss of fine movements	Limited
2	Intermediate	Intermediate	Intermediate	Intermediate	Intermediate	Intermediate
1	Moderate/intermittently disabling	Partial occupational restriction	Accepts	Not above waist	Cannot pinch	Helping only
0	Severe/continuously disabling	Total occupational restriction	Dislike	None	Cannot grasp	Cannot help

(pain), (function), ANOVA test .

(emotional acceptance),

(positioning of the hand), (manual dexterity), (lifting ability)

0 5 1.

(%) 3,9).

16 , 10 ,

3 (1 , 2) .

4. Kaplan-Meier 7 ,

14 , 6 5

ANOVA test 85.7%, 92.3%, 100%, 10 85.7%, 92.3%,

Kaplan-Meier 100% .

2 , 1 ,

log rank test 3 , 2 ,

T , 1 , 1

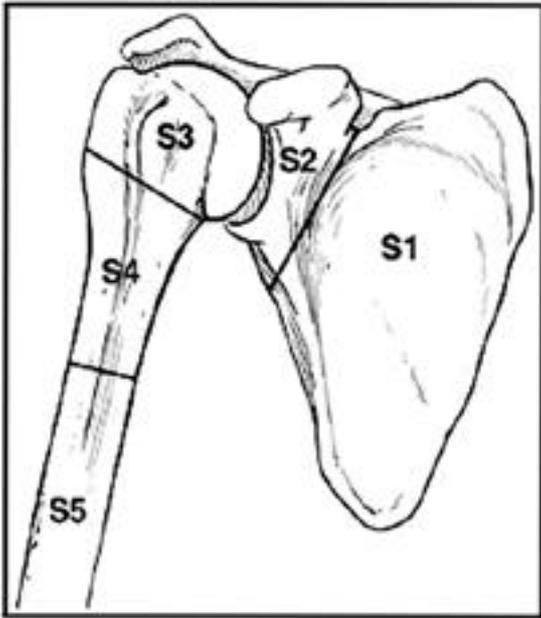


Fig. 1. Illustration of the Musculoskeletal Tumor Society classification of skeletal resection about the shoulder girdle. At least one-half of the region must be resected to be so designated. S1=the blade or spine of the scapula. S2=the acromion-glenoid cavity complex (the glenoid cavity must be removed). S3=the proximal epiphysis of the humerus. S4=the proximal metaphysis of the humerus. And S5=the proximal part of the diaphysis of the humerus.

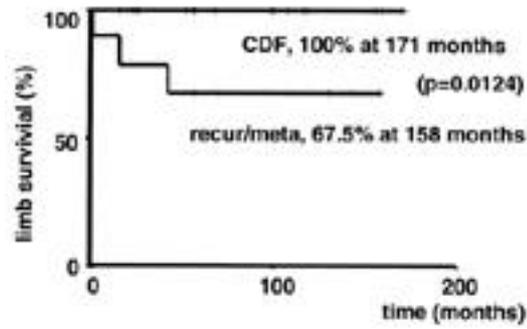


Fig. 2. Limb survival according to recurrence or metastasis. The Cases of local recurrence or lung metastasis showed poor limb survival ($p=0.012$). recur/meta: recurrence or metastasis, CDF: continuous disease free

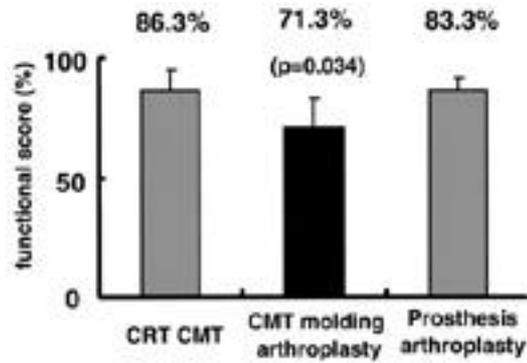


Fig. 3. Functional score according to reconstruction method. Cement molding arthroplasty showed inferior functional outcome to curettage and cementing or prosthesis arthroplasty ($p=0.034$). CRT CMT: curettage and cementing, CMT molding arthroplasty: cement molding arthroplasty

($p=0.012$)(Fig. 2).

Kaplan-Meier

171 88.6%
 71%, 10 71%,
 86% 10 86%
 ($p=0.453$).

10 100%,
 5
 5
 가

2.

가
 80%(24 ; 18 ~ 30)
 15
 76%, 15 81% 가
 ($p=0.400$),
 S34 79%, S345 76%
 가 ($p=0.569$),



Fig. 4. The radiographs of a 53 year old female who was treated by curettage and cementing due to borderline chondrosarcoma of right proximal humerus. Her functional score was 100%.

82%, 3.
 가 77%
 가 (p=0.267). 가 1
 86%,
 71%, 가 1
 83% , 1
 (p=0.034)(Fig. 3).
 1
 , 1 6
 , 10 3
 , 10
 , 가
 71% .
 . O Connor ⁹⁾ 57 5 (9%)
 , ¹⁾ 0 ~ 15%
 . Wittig ¹⁰⁾



Fig. 5. The radiographs of a 24 year old male who was treated by wide or S34 resection and cement molding arthroplasty with intramedullary nail due to grade II/III chondrosarcoma of right proximal humerus. His functional score was 60%.

8 (28%)

Connor 가

S34 A, S34B S345B, S234B

S2345B 3

가 , S34A

66%, S34B S345B

52%

S34 S345

(Musculoskeletal Tumor Society, 가

MSTS) S1234B Tikhoff-

Linberg 1,6,8,10)

가

3)



Fig. 6. The radiographs of a 18 year old male who was treated by resection and skeletal reconstruction with tumor prosthesis due to stage IIB osteosarcoma of right proximal humerus. His functional score was 80%.

, 4) , 5)
 - , 6) 가 - 가 가
 가 - 5
 83.3%, 56.8% ¹¹⁾ , ,
 1) , 2) , ,
 , 3) . Jeon ⁶⁾ , 1)
 가 , 2)
 , 3) , 4)
 가
 , 가



Fig. 7. The radiographs of a 23 year old male who was treated in multiple stages. He was treated by curettage and bone graft twice due to giant cell tumor at other hospital 3 years ago, and wide excision and skeletal reconstruction with Charnley hip prosthesis was done due to recurrence 1 year ago. Finally shoulder Hemiarthroplasty was done. His functional score was 90%.

가 . Enneking³⁾ ' , , . Gebhardt⁴⁾ 12 , 5 , 가 Kumar⁸⁾ 4 , 2 6 , 2 가 1 가 , 1 , 2 , 3 , 2 8~10 cm , . O Connor¹⁰⁾ 5 가 66% , , 가 , .

1982 2001 29

88.6%

80%

가

가

REFERENCES

- 1) **Capanna R, Giunti A, Biagini R, et al:** Modular endoprosthesis for humerus and Tikhoff-Linberg resection. In *New Developments for Limb Salvage in Musculoskeletal Tumors*, pp. 547-555. Edited by Y. Yamamuro. Tokyo, Springer, 1989.
- 2) **Enneking WF:** A system of staging musculoskele-

tal neoplasms. *Clin Orthop*,204:9-24,1986.

- 3) **Enneking WF, Dunham Wk, Gebhardt MC, Malawer M, Prichard DJ:** A system for the evaluation of reconstructive procedures after surgical treatment of tumors of the musculoskeletal system. *Clin Orthop*, 186:241-246,1993.
- 4) **Gebhardt MC, Flugstad DI, Springfield DS, Mankin HJ:** The use of bone allografts for limb salvage in high grade extremity osteosarcoma. *Clin Orthop*, 270:181-196,1991.
- 5) **Gebhardt MC, Roth YF, Mankin HJ:** Osteoarticular allografts for reconstruction in the proximal part of the humerus after excision of a musculoskeletal tumor. *J Bone Joint Surg*, 72-A:334-345,1990.
- 6) **Jeon DG, Lee JS, Kim SJ, et al:** Limb salvage for shoulder girdle neoplasm. *J Korean Orthop Assoc*, 30:1203-1209,1995.
- 7) **Jeon DG, Lee JS, Park HK, Park JW, Lee SY:** Resection, reconstruction and functional result for malignant neoplasm of humerus. *J Korean Orthop Assoc*, 35:679-682,2000.
- 8) **Kumar VP, Satku SK, Mitra AK, Pho RWH:** Function following limb salvage of primary tumors of the shoulder girdle. *Acta Orthop Scand*, 65:55-61,1994.
- 9) **Malawer MM, Meller I, Dunham WK:** A new surgical classification system for shoulder-girdle resection. *Clin Orthop*, 267:33-44,1991.
- 10) **O'Connor M, Sim FH, Chao EYS:** Limb salvage for neoplasia of the shoulder girdle. *J Bone Joint Surg*, 78-A:1872-1888,1996.
- 11) **Suk KS, Shin KH, Hahn SB:** Limb salvage using original low heat-treated tumor-bearing bone. *Clin Orthop*, 397:385-393,2002.
- 12) **Wittig JC, Bickels J, Kellar-Graney KL, et al:** Osteosarcoma of the proximal humerus: long term results with limb-sparing surgery. *Clin Orthop*, 397:156-176,2002.

Oncologic Results and Functional Assessment of Limb Salvage Surgery in Primary Bone Tumors Around the Shoulder Girdle

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Purpose: The purpose of this study was to assess the oncologic results and functional outcomes of limb salvage surgery performed in patients of primary bone tumors of the shoulder girdle.

Materials and Methods: Twenty-nine patients who underwent limb sparing resection for shoulder girdle neoplasm between 1982 and 2001 were analyzed. Follow up periods averaged 7 years and 1 month. Mean age of the patients was 35 (11~71) years. There were 14 males and 15 females. Primary malignant bone tumors of shoulder girdle (proximal humerus 21, scapula 3, both 1) were 23 cases; osteosarcomas 7, chondrosarcoma 14, parosteal osteosarcoma 1, heman-gioendothelioma 1, and giant cell tumor of proximal humerus were 6 cases. Limb salvage surgery was performed by curettage and cementing in 7 patients, by cement molding arthroplasty in 10 patients, and by tumor prosthesis in 7 patients, by other method such as resection only, bone graft, arthrodesis in 5 patients. The Musculoskeletal Tumor Society functional rating system was used to assess functional outcomes.

Results: One osteosarcoma and 2 chondrosarcoma patients died, and the survival of the salvaged limb was 88.6% at the final follow-up. There were 6 local recurrences, 2 lung metastases, 2 local recurrences and lung metastases. The functional outcome was 80%. There was statistically significant difference of functional results among the patients treated by cement filling (86%), cement molding arthroplasty and IM nailing (71%), and tumor prosthesis (83%). ($p=0.034$) There were three complications including 1 radial nerve palsy and 1 axillary nerve palsy, and 1 wound infection. Dislodgement of vascularized fibular graft in one patient was treated by internal fixation.

Conclusion: Limb salvage surgery seems to be useful method to treat bone tumors of the shoulder girdle.

Key Words : Shoulder girdle, Bone tumor, Limb salvage, Oncologic outcome, Functional results

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