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MODERN SURGICAL CHALLENGES FOR MUSCULOSKELETAL SARCOMA

Vol.16

Proceeding from the 19th Annual Meeting of
Surgical Treatment for Musculoskeletal Sarcoma

SUEGICAL SOCIETY FOR
MUSCULOSKELETAL SARCOMA

CANCER INSTITUTE HOSPITAL
JAPANESE FOUNDATION FOR CANCER RESEARCH

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FOREWORD

We are pleased to present Vol. 16 of the newly edited Modern Surgical Challenges for Musculoskeletal Sarcoma. This book constitutes the proceedings of the 19th Forum of the Surgical Society for Musculoskeletal Sarcoma (SSMS) held on March 31 and April 1, 2007 at Big Sight, Tokyo.

Attendees at the Forum discussed optimum surgical procedures and surgical margins for 13 selected cases. In this session, several cut edges of the treatment for musculoskeletal sarcoma were contained. Those cases have to be assessed whether it is useful or not by following up study. Moreover, according to our established arrangement, follow-up result of previously presented cases and analysis of registered surgical margins were documented. The former is aimed at determining answers for unresolved issues in previously presented cases and the latter is aimed at clarifying the required safety margin under various adjunctive modalities.

Additionally, brief summaries are given here of instructional lectures which were presented by Prof. IL-Hyung Parkof Korea and Prof.Martin Dominkus of Austria. They are well known persons in this field, and gave us informative comments about our treatment from their experienced bases.

I think these pages contain the most foregoing information on the current trends in the treatment of musculoskeletal sarcoma. If you are able to find some useful suggestions from these case documentations, it would be highly gratifying to us.

Noriyoshi Kawaguchi

Chairman

The 19th Forum of the Surgical Society for Musculoskeletal Sarcoma

（和名：骨軟部肉腫外科研究会）

MODERN SURGICAL CHALLENGES FOR MUSCULOSKELETAL SARCOMA (VOL. 16)

Proceeding from the 19th Annual Meeting of Surgical Treatment for Musculoskeletal Sarcoma

I. CASE PRESENTATIONS AND DISCUSSIONS

CACE PRESENTATIONS AND DISCUSSIONS

CASE 1

CASE 1: 13-Year-Old Male, Osteosarcoma of the Left Femur

Shigemitsu, Toshio; Kawaguchi, N.; Matsumoto, S.; Manabe, J.; Shimoji, T.; Tanizawa, T.; Koyanagi, T.; Mimori, K.; Ae, K.; Gokita, T.; Sawaizumi, M.*

Department of Orthopaedic Oncology,
*Plastic and reconstructive surgery, Cancer Institute Hospital, Japanese Foundation for Cancer Research

Date of Operation:

September 6, 2005 (Open biopsy, another hospital)
December 21, 2005

History of Present Illness:

A 13-year-old male noticed left knee pain in playing baseball on August 27, 2005. Radiographs of the knee were taken at a nearby hospital, he was pointed out the bone tumor of distal femur. He admitted in another hospital and underwent excisional biopsy on Sempember 6, 2005. The pathological diagnosis was osteosarcoma after open biopsy. H was referred to our hospital on September 16, 2005.

Preoperative Diagnosis:

Osteoblastic Osteosarcoma (Open biopsy, borrowed specimen)

Preoperative Treatments:

CDDP×2, ADM×1, IFM×1,

Point of Discussion:

1) What kind of surgical margin should be used?
2) What kind of reconstruction should be chosen?

Fig.1 X–P (After biopsy)

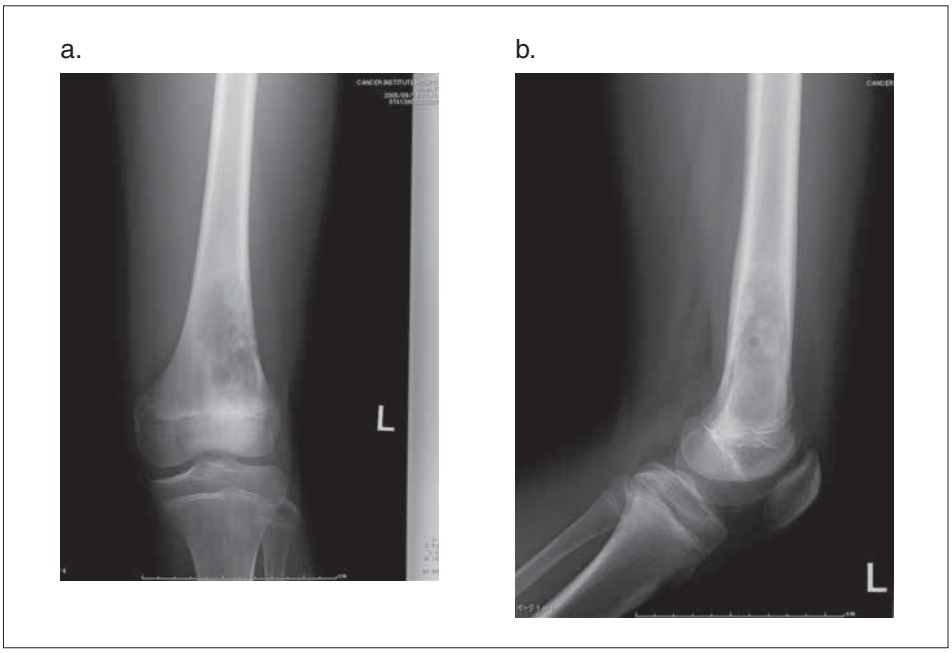


Fig.2 X–P (After CDDP 1 course)

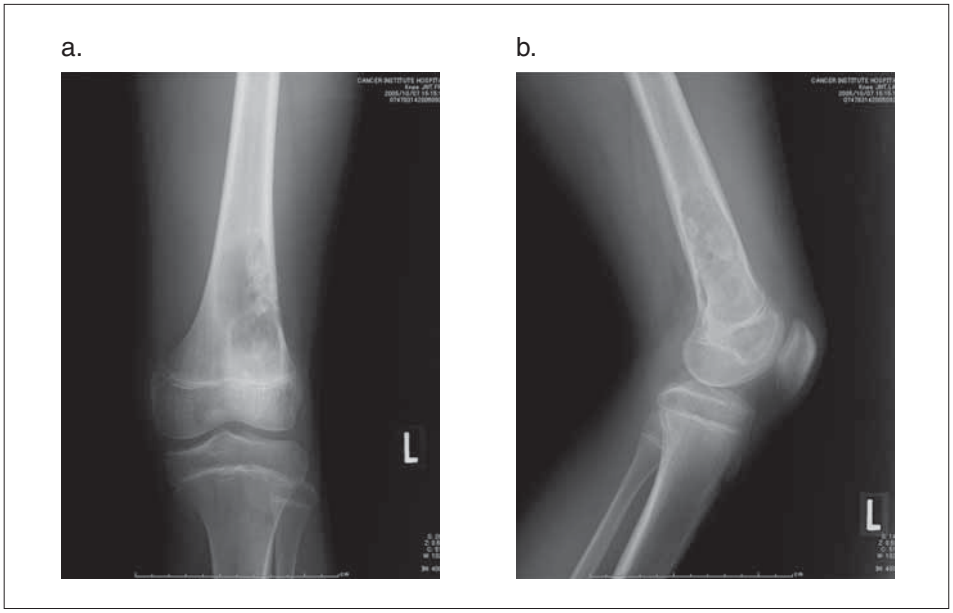
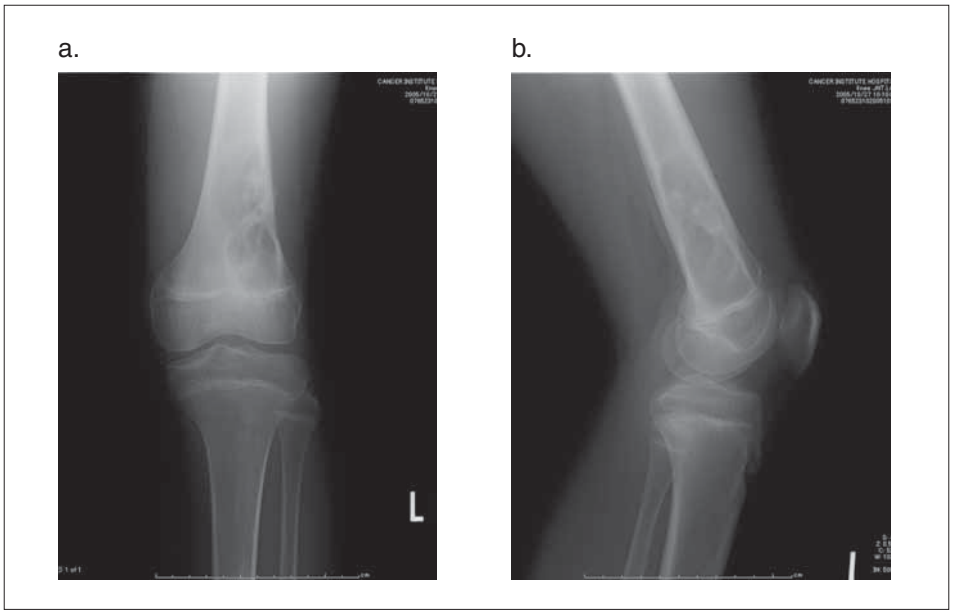


Fig.3 X–P (After CDDP 2 course)



CASE 1

CASE PRESENTATION AND DISCUSSION

Presenter (PS): Tanizawa, T. and Shigemitsu, T. (CIH)
Moderator (MD): Torigoe, T. (Juntendo University)

MD: First of all, I would nominate Dr.Nagoya from Sapporo Medical University to be a debater (DB) for this presentation. Here let's start the presentation of Case 1.

First Dr.Tanizawa would speak about the therapeutic strategy of CIH and next Dr.Shigemitsu would present Case 1

Tanizawa (1st PS. CIH): First, I would like to present the therapeutic strategy of our hospital before presentation of Case 1. For high grade sarcoma treated by surgery alone or for non-responders to preoperative treatment, adequate wide margin or more is considered to be safe. Though adequate wide margin is considered to be the safety margin for high grade sarcoma of responders, partially inadequate wide margin is accepted. For low grade sarcoma, inadequate wide margin is considered to be the safety margin. Skip metastasis, multicentric lesions, venous thrombus and lymph node metastasis are all considered as limiting factors for limb salvage operation. For the safety margin of infiltrative sarcoma, though wider margin is better, we make a surgical plan at least 3 margin wide regardless of histological grade. (Table 1)

Our preoperative treatment consists of chemotherapy and radiotherapy. Preoperative chemotherapy is performed for osteosarcoma, Ewing's sarcoma, MFH of the bone and round cell sarcoma of the soft tissue. Moreover, preoperative chemotherapy is performed for sarcoma cases with distant metastasis and locally advanced cases of soft tissue sarcoma. Radiation is permitted only where a less than marginal margin is anticipated. (Table 2)

For non-round cell soft tissue sarcoma cases, recently we performed postoperative chemotherapy for grade 3 in histological grading of FNCLCC.

Next is the total number of operated cases with musculoskeletal sarcoma from 1988 to 2005. Cases of the bone sarcoma operations were performed on total 501 cases. The number of high grade sarcomas and low grade sarcomas are 353 and 148 cases respectively. For soft tissue sarcoma, 906 cases were operated with 526 high grade sarcomas and 380 low grade sarcomas. (Table 3)

This shows the relation between the surgical margin and the local cure rate. For high grade bone sarcoma, the rate of local cure rate in curative margin was 93 %, adequate wide margin was 84 %, inadequate wide margin was 88 %, marginal margin was 75% and intralesional margin was 25% respectively. (Table 4)

MD: I thank for presentation of Dr. Tanizawa. Is there any question about the strategy just now presented ?

Kawaguchi (CIH): Can we achieve local control of infiltrative MFH with wide 3 margin?

1st PS (Tanizawa): In preoperative surgical planning, we should aim more extensive margin, because this is the least safe margin based on the result of postoperatively evaluated surgical margins.

Kawaguchi: Do you mean that we should achieve a surgery with the margin of more than 3 cm when we evaluate surgical specimens?

1st PS: Yes.

Kawaguchi: Is there any guide-line about safety margin for cases with skip metastasis?

1st PS: From the viewpoint of safe limb salvage, now we do not have any data how wide we should resect the lesion accompanying with skip metastasis lesion.

Then when a patient insist on limb saving surgery, practically we also try to do it with the margin of wide 3 at least.

MD: I thank for presentation of Dr. Tanizawa. Then please present, Dr. Shigemitsu, please present Case 1.

Shigemitsu (2nd PS, CIH): I would like to present a case of Osteosarcoma in the left femur.

A 13-year-old male noticed left knee pain while playing baseball on August 27, 2005. Radiographs of the knee were taken at a nearby hospital, he was pointed out for the bone tumor of distal femur. He admitted in another hospital and underwent incisional biopsy on September 6, 2005. The pathological diagnosis was osteosarcoma after opening biopsy. He was referred to our hospital on September 16, 2005.

Plain radiography revealed unclear margined osteolytic lesion at the distal metaphysis and adjacent to the growth plate of his left femur . (Fig.1)

CT scanning showed the intramedullary lesion without cortex destruction of the left femur. (Fig.6-a)

Axial view of MRI revealed a lesion of low intensity on the T1-weighted images, and high intensity on the T2-weighted images, with slight heterogenous enhancement by gadlinium. Same as CT, the lesion is in intramedullary lesion without cortex destruction. Axial view of MRI revealed a lesion of low intensity on the T1-weighted images, and high intensity on the T2-weighted images, with slight heterogenous enhancement by gadlinium. Same as CT, the lesion was in intramedullary lesion without cortex destruction. (Fig.8 -a,b,c)

On the coronal view of MRI, there were cystic change at the proximal side of the tumor and the low signal intensity areas of sclerosis at the distal side of the tumor. The tumor did not invade across the growth plate. The proximal end of the tumor was 11.3 cm proximal to joint surface. (Fig.9-a,b,c)

The open biopsy was performed on September 6, 2005 at another hospital. The pathlogical diagnosis was osteoblastic osteosarcoma.

Preoperative chemotherapy was planned. First, we administered two courses of CDDP followed by ADM and IFM. (Table 5)

On plain radiography after CDDP, the area of tumor had become screlosis and discrete margin. In contrast, there was no distinct changes after ADM and IFM. (Fig.2～Fig.5, Fig.10)

On CT after the chemotherapy, we could see the same changes as those radiographs. Tumor size had no change. (Fig.6, Fig.11)

The axial MR images demonstrated no distinct changes after the chemotherapy. (Fig.8, Fig.12)

The coronal MRI images after the chemotherapy demonstrated the same size as before the chemotherapy. The proximal end of the tumor was 11.3 cm proximal to joint surface. The tumor did not invade across the growth plate. (Fig.9, Fig.13)

We evaluated the effects of preoperative chemotherapy as PR. Points of Discussion.

What kind of surgical margin should be used ?

What kind of reconstruction should be performed ?

Dr. Okamoto (CIH, Pathologist): This figure from biopsy specimen displays a proliferation of atypical cells with irregular race like osteoid formation. Osteoclastic giant cells are occasionally seen. We diagnosed the tumor as osteosarcoma. When we evaluated the total resected specimen after chemotherpy, the final diagnosis was osteosarcoma, giant cell rich & osteoblastic, grade 4. Viable tumor cells are present more than 90% of the tumor, so preoperative therapeutic effect was corresponding to JOA: Grade 0, CIH: Grade 0.

MD: Is there any question from the floor?

Dr. Takeuchi (Kanazawa Univ): On coronal Gadrinium contrast MR imaging before preoperative chemotherapy, intaramedullary lesion is not much contrasted (Fig.9-c). By contrast, on Gadrinium contrast MR imaging after preoperative chemotherapy, intaramedullary lesion is much contrasted (Fig.9-f). How do you think?

PS: It is merely the conditional problem of scanning.

MD: In this case, I consider it is important whether you keep joint surface bordering the growth plate. By the way, chemotherpeutic effect of CDDP is PR. Why

ANALYSIS OF SAFETY MARGINS BASED ON REGISTRATION OF SURGICAL MARGINS IN JAPAN

ANALYSIS OF SAFETY MARGIN BASED ON THE REGISTRATION OF SURGICAL MARGIN IN JAPAN (2007)

Presenter (PS): Manabe, J. (Cancer Institute Ariake Hospital)
Moderator (MD): Beppu,Y. (National Cancer Center)

MD: Good morning. This analysis have been giving us important information on surgical treatment of bone and soft tissue sarcoma every year in this conference. Well, Dr. Manabe please start presentation.

PS: We started the evaluation of the surgical margins since 1985, and the Registration System of Surgical Margin was started in 1988, and we have reported results and analyses based on this system every year at this forum. In this forum, we will present a report based on about a 25-year follow-up of data concerning overall registered cases (Table 1).

Cases for registration are primarily bone and soft tissue sarcomas which have involved operative procedures since 1988. DFSP was excluded in this study (Table 2).

Main purposes of the analysis are as Table 3.

To investigate safety margins and the possibility of safe reduction of surgical margins combined with preoperative treatment ,and to investigate prognostic factors and improve treatment strategy.

For registration, macroscopic photographs, sketches of the section of the surgical specimen, and sketches of the surgical line of the axial and longitudinal plane are needed. And the evaluation of the surgical margin should be performed according to the Japanese Orthopedic Association's method (Table 4).

Surgical margin is classified basically by the distance from the tumor. A wide margin attached to the lesion area from 1 to 4 cm, as well as a wide margin of 1 cm or less, are defined as inadequate wide margin, and a wide margin of more than 2 cm with no attachment is defined as adequate wide margin. And more than 5cm wide margin is named as curative wide margin (Table 5).

Moreover, the surgical margin is evaluated in terms of the presence of barriers, which are converted into equivalent distance (Table 6).

The entire surgical procedure is expressed in terms of the least margin achieved by the surgery (Table 7).

Local Recurrence was defined as tumor arizing at any site of the affected limb which shows the same tumor (Table 8).

By the cooperation for this registration by many colleagues of universities and hospitals the total number of sarcoma cases registered so far is 1412 cases, 1512 surgeries (Table 9).

372 surgeries for high grade bone sarcomas ; 149 surgeries for low grade bone sarcomas, 643 surgeries for high grade soft tissue sarcomas, and 345 surgeries for low grade soft tissue sarcomas(Table 10).

Here is how they break down by sarcoma type:

Surgeries for high grade bone sarcoma cases include 272 surgeries for conventional osteosarcomas, 33 Ewing sarcomas,36 MFH and others. Surgeries for low grade bone sarcoma cases include 91 chondrosarcomas, 24 chordomas, and others (Table 11).

High Grade Soft tissue sarcomas include 272 surgeries for MFH, 89 synovial sarcomas, 63 liposarcomas, 35 rhabdomyosarcomas and others. Low Grade soft tissue sarcoma cases include 128 liposarcomas , 51 MFH , 46 well-differentiated liposarcomas, 24 alveolar soft part sarcomas and others (Table 12).

Now I will show the results of analysis.

Firstly, I show the survival curve.

The cumulative survival rates of M0N0 cases of high-grade sarcomas was 65%, and that of low-grade sarcomas was 87%. There was a statistically significant difference between the histological grade (Table 13).

The cumulative survival rates of Mo cases of High-grade sarcomas was 65%, and that of M1 cases was only 16%, and that of M0N1cases was 32% (Table 14).

The cumulative survival rates of Mo cases of low-grade sarcoma was 85%, and that of M1 cases was 0% and that of M0N1 cases was 33% (Table 15)

The survival rate of M0N0 cases of bone sarcomas were as follows.

The survival rate of chondrosarcoma was 77%, that of osteosarcoma was 69 %, that of Ewing sarcoma was 62 % and that of chordoma was 61% (Table 16).

The survival rate of osteosarcoma patients treated since 1995 were as follows.

The cumulative 10-year survival rate of M0N0 cases was 78% ,and 5-year survival rate was 80 %, and that of the M1 cases improved to 46% (Table 17).

The survival Rate of M0N0 cases of soft tissue sarcomas were as follows:

Well-differentiated liposarcoma; 100%, ASPS 86%, liposarcomas 84%, synovial sarcoma; 69%, MPNST; 69%, MFH;66%, rhabdomyosarcoma;51%, and epithelioid sarcoma ;only 21% (Table 18).

For high-grade sarcoma cases in which local recurrence occurred, survival rate was only 15 %;, and that of the locally controlled cases was 73%. There was a statistically significant difference between them (Table 19).

Similarly, there was a statistically significant difference between the survival rates of recurrent low-grade sarcomas and recurrence-free low grade sarcomas . These results suggest that local curability had a significant correlation with survival (Table 20).

The cumulative non-metastatic rates of high-grade bone and soft tissue sarcoma cases in which local recurrence occurred was only 16% and that of locally controled cases was 69%. There was also a statistically significant difference between them (Table 21).

And also non-metastatic rates of low grade sarcoma cases in which local recurrence occurred was significantly worse than for recurrence-free cases. These suggest that local curability had a significant correlation with metastasis (Table 22).

We conducted multivariate analysis by proportional hazard model on prognostic factors of bone and soft tissue sarcomas. From the analysis of 1321 cases of bone and soft tissue sarcomas, M1, local recurrence, high grade, size of over 10cm,showed high hazard ratio and statistic significance (Table 23).

The local cure rates of each background were as follows:

Local cure rate of primary surgeries was 86%, that of additional surgeries was 91%, that of recurrent surgeries was only 58% and significantly worse than primary or additional (Table 24).

The correlation between surgical margins and local cure rate of primary or additional surgeries for high grade bone and soft tissue sarcomas were as follows .

Local cure rate of Wide 5 procedures was 92%, that of Wide-3 or Wide-2 procedures was 91%, that of Wide-1 was 88%, that of Marginal procedure was 67%, and that of Intralesional-Marginal was 49% and that of Intralesional was 24% (Table 25).

The correlation between local cure rate and surgical margin of primary surgeries for low grade bone and soft tissue sarcomas were as follows.

The local cure rate of Wide-2 procedures was 99%, that of Wide 1 was 90%, that of Marginal procedures was 82%,and that of intralesional was 21%, but that of Intralesional- Marginal was 70% and significantly better than Intralesional (Table 26).

The correlation between local cure rate and surgical margin of surgeries for recurrent cases of bone and soft tissue sarcomas was as follows.

The local cure rate of Wide-5 procedures was 86%, that of Wide-4 was 80%, that of Wide-2 procedures was 72%, that of Marginal procedures was 51%,and that of Wide -1 was only 42% (Table 27).

The correlation between local cure rate and surgical margin of primary or additional surgeries for MFH were as follows.

The local cure rate of Wide-5 procedure was 98%, that of Wide-3 was 96%, but that of Wide-1 was only 71% (Table 28).

This suggests that for MFH more than Wide 3 procedures should be recommended.

MFH often shows invasive growth histhologically and more than Wide-3 procedures would be recommended in such invasive cases (Fig.1).

In contrast the correlation between local cure rate and surgical margin of primary or additional surgeries for non-invasive sarcomas such as synovial sarcomas, MPNST, and liposarcomas and leiomyosarcomas was as follows . The local cure rate of Wide-4 procedure was 100%, that of Wide-2 was 96%, and that of

Wide-1 was 97% (Table 29).

Before talking about surgical margin and preoperative treatment, I show our imaging evaluation systems of preoperative treatment.

Change of size is the main factor of evaluation (Table 30).

In marked responders of preoperative treatment, the local cure rate of Wide-1 procedures was 91%, that of Wide 2 to 4 was 93% (Table 31).

But even in Marked Responders some viable cells sometimes were observed at the surface of the tumor (Fig.2). So more than Wide 1 procedure would be safe for marked responders.

In Partial Responders, the local cure rate of Wide 2-4 procedures were 89% but that of marginal procedure was only 66% and more than Wide-2 procedures should be recommended (Table 32).

In contrast, in NC cases of high grade sarcomas, the local cure rate of Wide2 to 4 procedure was 81% (Table 33).

In PD cases,the local cure rate of Wide 5 procedures was 100% and that of Wide 2 to 4 procedures was 87% but that of Wide 1 procedure was only 75% ,and more than dequate wide procedures should be recommended (Table 34) .

In surgeries for high grade sarcomas about 80% local curability was achieved by Wide-1 or marginal procedures with radiotherapy. Radiotherapy could improve curability of inadequate wide or marginal procedures (Table 35).

CONCLUSION

Firstly about prognostic factors, M0 or M1, histological grade,local curability, size of tumor were thought to be the significant prognostic factors. And the effect of chemotherapy and local curability were thought to be the most important factors in the treatment (Table 36).

A more than Wide 2 procedure would be usually considered to be safe even for high grade , and Wide 1 procedures for low grade sarcomas basically .But for recurrent cases Wide 5 procedures are recommended (Table 37).

In the surgeries for invasive sarcomas such as MFH, more than more than Wide 3 wide procedures should be recommended independent of histological grade. But for non-invasive type sarcomas such as liposarcomas, synovial sarcomas, MPNST, and so on, more than Wide 2 procedures would be safe (Table 38).

It was suggested that for marked responder of preoperative treatment ,Wide-1 would be safe and for partial responders Wide 2 would be safe. But for poor respondrers more than Wide 3 procedures should be recommended (Table 39).

Thank you for attention.

MD: The analyses of many surgical cases were presented.

Dose anyone have comment?

Kawaguchi (Cancer Institute Arike Hospital): I'd like to reconfirm that the purpose that you used wide5cm instead of curative wide is to discuss including recurrent cases?

PS: Yes. Surgeries for recurrent cases were included in this series and I used an expression of 5cm wide margin instead of curative wide margin.

Hanaoka (Tokushima Univ.): I'd like to ask a basic question.
Why the curative margin is defined as wide of 5cm and over?

PS: We settled curative margin as 5cm wide because from our prospective study over 5cm wide procedure seemed to result in almost complete local control and after the registration system was started prospective study begun.

Kawaguchi: At first we referred to Enneking's method. He showed 5cm as safety margin from that for malignant melanoma.

And we adopted 5cm wide for curative margin and applied distance of thin and thick barrier as 2cm and 3cm . We established this system after experience of trial and error during about 10 years.

Hanaoka: Please explain again about the correlation between tumor size and survival.

PS: There was no significant difference between less than 5cm and over 5cm, but there was statistically significant difference between less than 10cm and over 10cm. There was a difference of metastasis but no difference of local recurrence.

Hanaoka: And about invasive tumor did you show that local recurrence rate of 5cmwide is rather higher than others?

PS: There was no statistically significant difference them. One reason might be local recurrence of them include skip metastases.

Mochizuki (Kyorin University School of Medicine.) : In this meeting last year you presented that the surgical scar of recurrent cases after 4 years could be disregarded. In this series did you reevaluated according to that method?

PS: No. In this presentation evaluation system was performed according to former method. But it is a problem whether there is a
true risk of local recurrence in the surgical scar. I think it would be important to investigate the recurrence risk of surgical scar pathologically again.

Kawaguchi: Much more data of registrations of surgical margins of surgeries for recurrent cases would be clarify the safety margins including surgical scars. But now our data is not enough for clarify it and so we are managing surgeries for recurrent cases, cases with skip lesion and cases with LN metastasis in different manner from primary or additional surgeries.

Kawano (University of Tokyo) : Probably you presented that in wide 1cm or marginal procedures radiotherapy could improve local curability about 10%. By the way in intralesional procedures how about the local curability with radiotherapy and how much is the dose of radiotherapy?

PS: We don't have precise data about them in the high grade sarcomas. But in low grade sarcomas it seemed that radiotherapy would be able to improve local curability of intralesional-marginal procedures.

Ueda: I have a question about the safety margin and the effect of preoperative chemotherapy. You showed that for marked responders wide 1cm would be safe and for partial responders wide 2cm would be safe, from when these strategies were established?

PS: Already from several years ago we have set these strategies and had been performing according them, and recently we can recognize by registration data that these strategies are supported by data of results and suitable.

Park, IL (Kyungpook National University Hospital): Probably you showed the local curabilities of well-differentiated liposarcomas were about 100%. It might be a silly question, but how do you make differential diagnosis between lipoma and well-differentiated lipoma-like liposarcoma?

PS: It would be a work of pathologist and cytological screeners.
But in some cases it would be difficult and so chromosomal and genomic analysis are also important.

Park : Pathologist of our institute often diagnose lipogenic tumor over 10cm size as liposarcoma even when there is no lipoblast. I think it would be very difficult to do differential diagnosis.

Hiruta (Pathologist,Toho Universuty):Almost cases were easily diagnosed but there are a few difficult cases. They could be diagnosed by genomic findings.

Kaya (Sapporo medical Univ.) :I have a question about a management of well-differentiated liposarcoma. If the tumor was diagnosed as well-differentiated liposarcoma after marginal excision do you do additional wide resection?

PS: We don't additional wide resection but do follow-

up and if local recurrence occurred , we perform wide resection.

Kaya: OK. Then, if the tumor is diagnosed as well-differentiated liposarcoma do you plan wide 1cm procedure?

PS: Yes. It means the least margin of the procedure is wide 1cm and probably if the least margin of partial area is marginal it seemed that local control would be obtained as we presented in this session last year.

MD: I'd like to ask the last question. As for invasive MFH what procedure do you recommend actually ?

PS: By imaging we evaluate invasiveness in each area and in the invasive area we recommend more than wide 5cm but non-invasive area we recommend wide 3 cm.

MD: OK. Now time is up. I have to close this session.

Thank you very much.

Table 1

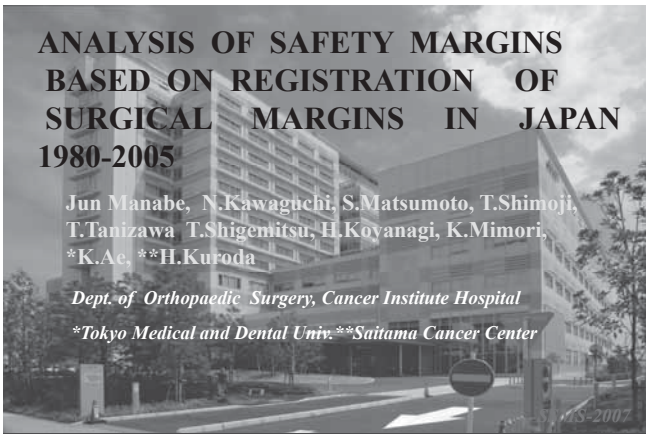


Table 2

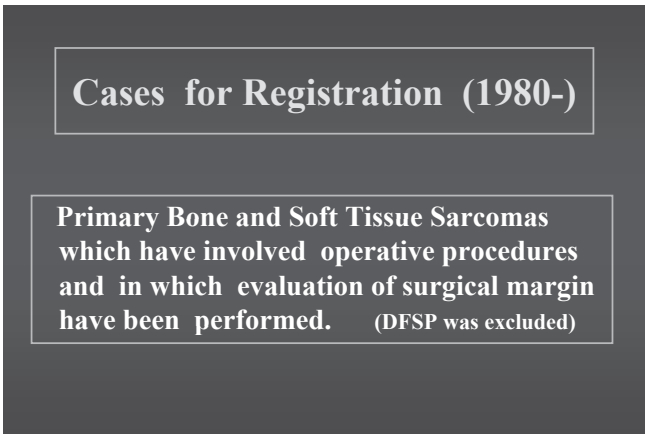
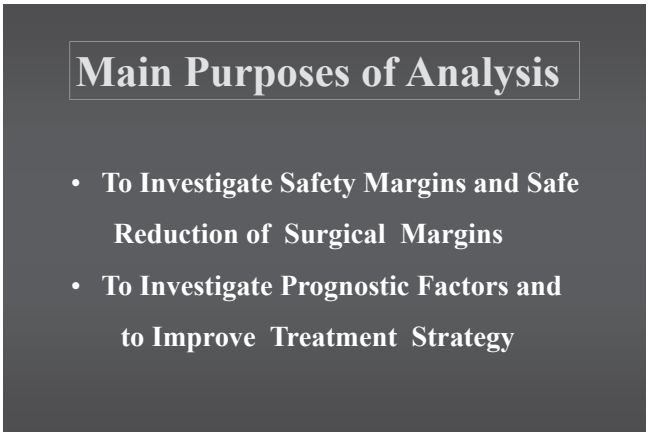


Table 3



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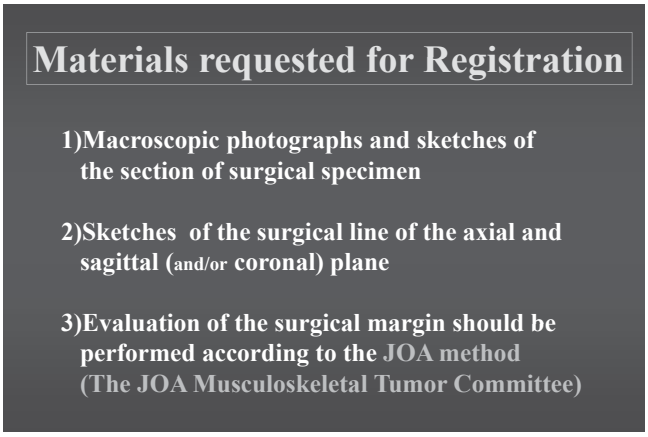

Table 5

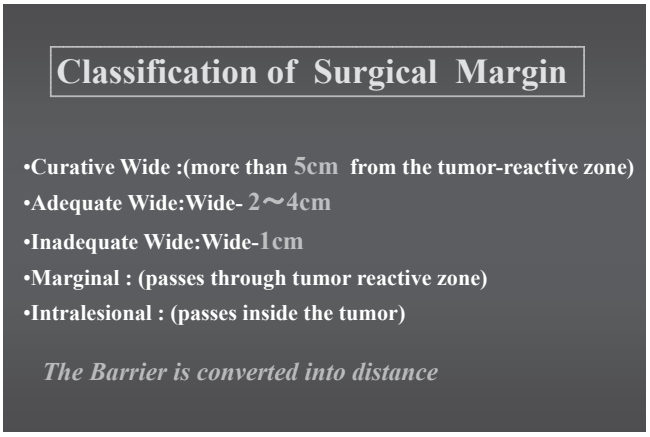

Table 6

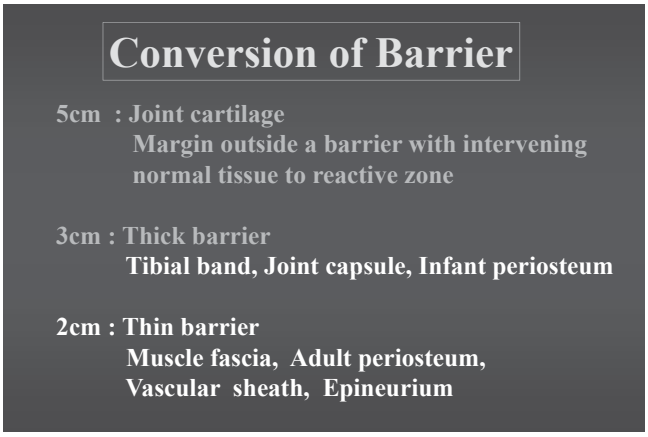

Table 7

Definition of Surgical Procedure

Classified by *the least* surgical margin *regardless of its site or range*

Example:
Mostly Curative (more than 5cm)wide margin with 1cm wide margin at small area
→1cm Wide (Inadequate Wide)Procedure

Table 8

Definition of Local Recurrence

Tumor arising at *any site of the affected limb* which shows the same histological type as primary sarcoma : (broad sense)

Table 9

Registered Surgeries of each Institution

Cancer Institute Hosp	1227	Iwate Medical Univ.	8
Teikyo Univ.	40	Shobara Red Cross Hosp.	7
National Yonago Hosp	27	University of Tokyo	20
Tokyo Medical & Dental Univ.	41	Nihon Univ.	5
Kanazawa Univ.	14	Fukui Medical Univ.	5
Kyorin Univ.	17	Sociai Insur. Yamanashi Hosp.	5
National Sapporo Hosp	14	Nagoya Univ.	3
Nagoya Memorial Hosp	9	Hyogo College of Medicine	4
Kyusyu Municipal M. C.	9	Hiroshima univ.	1
Sapporo Medical Univ.	14	Yamagata Univ.	1
Kyushu Univ.	6	Kanagawa Cancer Center	4
National Cancer Center	8	Tochigi Cancer Center	6
Aichi Cancer Center	1	Niigata Univ.	1
Toho Univ.	3	Yokohama City Univ.	2
Univ of the Ryukyus	2	Chiba Cancet Center	1
Aichi Hosp	2	Catholic Univ.(Korea)	1
Shinshu Univ.	3	Gunma Univ.	4
Yokohama City Univ.	2	Osaka City Univ.	1

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Table 10

1512 Surgeries	1412 Cases
Bone-High 372 Surgs.	Bone-High 356 Cases
Bone-Low 149	Bone-Low 140
Soft-High 643	Soft-High 593
Soft-Low 345	Soft-Low 323

SSMS-2007

Table 11

Bone High-Grade (372 surgeries)		Bone Low-Grade (149 surgeries)	
OS	272	Chondrosa.	91
Ewing's	33	Chordoma	24
MFH	36	POS	9
Ch.Sa	14	Peri.OS	3
Others	22	Others	22

SSMS-2007

Table 12

Soft High-Grade (639 surgeries)		Soft Low-Grade (352 surgeries)	
MFH	272	Liposarcoma	128
Synov. Sa.	89	MFH	51
Liposarcoma	63	Well-Diff. Liposa.	46
Rhabdo.sa.	35	ASPS	24
MPNST	22	Chondrosa.	14
Ewing's sa.	22	SFT	12
Epith. sa.	20	Leio. Sa.	11
Others	116	Others	66

SSMS-2007

INSTRUCTIONAL LECTURE COURSE

Results of tumor megaprosthesis in more than 5 years' follow-up cases — Comparison between cemented and cementless system —

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EDUCATION

Premedical	Mar. 1974-Feb. 1976	Liberal Arts & Science College, KNU
M.D.	Mar. 1976-Feb. 1980	School of Medicine, KNU
M.S.	Mar. 1981-Feb. 1983	Graduate School, KNU
Ph.D.	Mar. 1983-Feb. 1989	Graduate School, KNU

TRAINING

Intern	Mar. 1980-Feb. 1981	University Hospital, KNU
Resident	Mar. 1981-Feb. 1985	Department of Orthopaedics, KNU

PROFESSIONAL EXPERIENCE

Medical Officer	Mar. 1985-Apr. 1988	Korean Army
Full-time Faculty	May 1988-Aug. 1990	Masan Koryo General Hospital
Visiting Doctor	Aug. 1990-Sep. 1990	Endo Klinik, Hamburg, Germany
Attending Faculty	May 1988-Feb. 1991	Kosin Medical College, Pusan
Assistant Professor	Oct. 1990-Sep. 1993	Department of Orthopaedics, KNU
Visiting Doctor	Oct.1992-Nov.1992	MD Anderson Cancer Center,Houghston, Texas, USA
Traveling fellow of Asian Federation of Sports Medicine	Apr. 1993-May 1993	Tokyo(Japan), Taipai(Taiwan), Bangkok(Thailand), Manila(Phillipine) Karachi(Pakistan)
Visiting Scholar	Sep. 1993-Aug. 1994	Division Musculoskeletal Oncology University of Washington Medical Center, Seattle, USA

MEMBERSHIPS

National

Korean Medical Association,	1980-Present
Korean Orthopedic Association,	1985-Present
Korean Fracture Association,	1990-Present

International

Societe Internationale de Chirurgie Orthopedique et de Traumatologie(SICOT) And Research (SIROT)	1993-Present
American Society of Bone and Mineral Research (ASBMR)	1998-Present
International Symposium On Limb Salvages,	1993-Present
Federation of International Sports Medicine,	1993-Present
Asian Federation of Sports Medicine,	1993-Present
Asia-Pacific Musculoskeletal Tumor Society	1992-Present
Western Pacific Orthopedic Association	1995-Present
American Association for te Advancement of Science(AAAS)	1995-Present
Honorary Member of Yugoslav Orthopedic Association	2001-Present

Introduction:

The purpose of this study is to compare the survivorship of the tumor megaprosthesis between cemented and cementless system in more than 5 year's follow-up cases.

Material and Methods:

With retrospective analysis, 131 cases of tumor megaprosthesis were identified from May 1990 to September 2001. Eighty six cases were eligible with the criteria of for more than 5 years' follow-up and presence of prosthesis at the final follow up.

Sixty four were cemented, and 22 were cementless. Mean age were 26 year(14 – 68). Fifty three were male, and 33 female. Follow up period was from 61 months to 194 months (average, 93 months). Only one model (Link system) was used for all cemented prosthesis. For cementless system, Howmedica modular reconstruction system of Kotz were used in 18 cases, MP megaprosthesis of Link in 3, and other system in 1.

Diagnosis was osteosarcoma in 58 cases, chondrosarcoma in 9, Ewing's sarcoma in 3, malignant giant cell tumor in 11, polyostotic fibrous dysplasia in 2, malignant fibrous histiocytoma in 1, and metastasis in 1. Site of tumor was distal femur in 35 cases, proximal tibia in 19, proximal femur in 20, proximal humerus in 7, and pelvis in 5 cases. All operations except 4 cases were performed by one surgeon.

Prosthetic survivorship was determined by (1)radiologic findings of loosening, (2)instability of artificial joint, and (3)patient's pain. When more than two of these three signs were present, the prosthesis was considered as 'failed to survive'.

Results:

Overall survival rate of prosthesis was 84% (72/86) at the time of 5 years' follow up, and 46% (19/41) at 10 years' follow up. Five-year-survivor rate was 84% (54/64) for cemented and 82% (18/22) for cementless system. However, ten-year-survivor rate was 44% (15/34) for cemented, and 57% (4/7) for cementless system. Although there was no statistical difference between cemented and cementless group, the results showed a rapid decrease of survivorship in cemented prosthesis after 5 years in comparison to cementless system.

Discussion:

Although there was no statistical difference between cemented and cementless system of 10-year-survivor rate, data showed somewhat better outcome of cementless system than cemented prosthesis. With this concept, the author has changed the policy from cemented to cementless system since 2004. But, cemented prosthesis has still its advantages in terms of more flexibility in selection of size, less incision and dissection, less postoperative bleeding, easier handling, and less cost than cementless system.

Sarcoma treatment and its evolution of treatment modalities in a 30 years period

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EDUCATION

University of Vienna, School of Medicine	1979-1985
39. General surgery, traumatology, Neurology,	
40. paediatrics, internal medicine (Rheumatology)	1987-1990
Dept. of Orthopaedics, Univ. of Vienna	1991-present
Specialist in orthopaedic surgery	1995
Habiliation (PhD)	11.1.2000
Head of Tumor Department	1997 - present

POST-GRADUATE TRAINING

Dept. of Orthopaedics, Univ. of Vienna	1995-present
Orthopedic Rheumatology, Germany, Prof. Tillmann	1.5.1994-1.6.1994
Istituto Rizzoli, Italy, Prof. Campanacci	1. 4.1997-30.4.1997
Training in vascular surgery	November 1996

MEMBERSHIPS IN SCIENTIFIC SOCIETIES

Société Internationale de Chirurgie Orthopédique et de Traumatologie (SICOT)
Austrian Society of Orthopaedics
German Society of Orthopaedics
Austrian Society of Rheumatology
European Musculoskeletal Society of Orthopaedic Surgeons (EMSOS)
Head of the Vienna Bone Tumour Registry
President of AMSOS (Austrian Muskulo Skeletal Oncology Society)
Member of the editorial board of the Journal of Orthopaedic Science

RESEARCH ACTIVITIES AND MAIN FIELDS OF INTERESTS

Tumor surgery
Tumor prostheses in children
Pelvic reconstructions
Rheumatoid orthopaedics

In a 30 years survey of the treatment of bone and soft tissue sarcomas, a significant change from ablative surgery to limb salvage procedures could be detected. Limb salvage surgery, nowadays, became the golden standard in sarcoma treatment worldwide. Furthermore, technical improvement of implants and reconstructive techniques enabled the patients an excellent mobility and social integration. The promising results of modular tumour-endoprostheses had also an important impact on severe revision surgery of conventional endoprostheses.

The lecture will give an analysis on a 30 years experience in sarcoma treatment in our single institution and will document the decennial oncological and surgical improvement. On that basis state of the art reconstruction with megaprostheses will be presented, and especially the avoidance from pitfalls and their possible technical solution will be demonstrated. This overview lecture will be rounded up by a discussion of case presentations, operated in Japan, my advice for a possible solution and the “de facto” follow up.

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