



# GIANT CELL TUMOR of BONE

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TAIWAN



# Benign Giant Cell Tumor Of Long Bone

## History Aspects

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- ❖ 1818 Sir Asteley Cooper Benign nature
- ❖ 1860 Nelaton Aggressive
- ❖ 1865 Virchow Recurrence, malignant
- ❖ 1879 Gross Aneurysmal
- ❖ 1910 Bloodgood Benign GCT
- ❖ 1922 Stewart Osteoclastoma
- ❖ 1981
- ❖ 1985 Inscrutable high incidence in China

# Giant Cell Tumor of Bone

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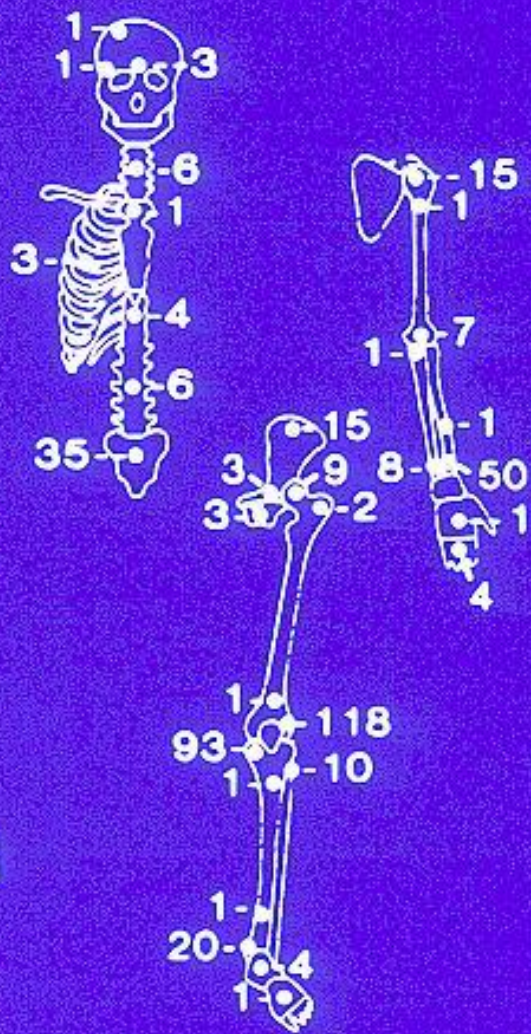
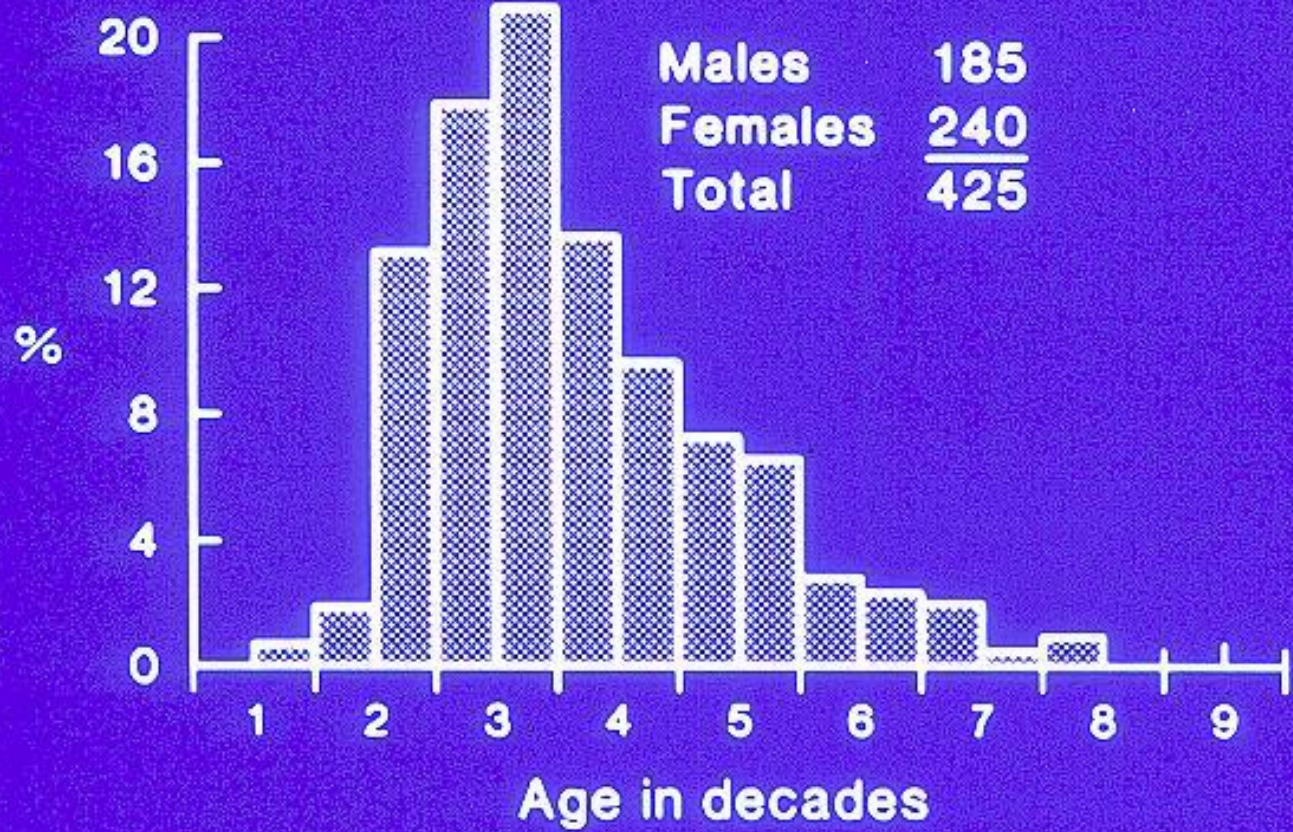
- ❖ Benign
- ❖ Aggressive
- ❖ Common (18.2% of benign lesion)
- ❖ F > M
- ❖ 85% > 20 yrs age

# **Giant Cell Tumor Of Bone**

## **Signs and Symptoms**

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- ❖ **Aching pain, local swelling, tenderness, limited motion**
- ❖ **Neurologic disturbances**  
**Not characteristic**
- ❖ **Joint effusion**



# The Age Different Between ABC And GCT

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- ❖ 78% < 20 yrs age in ABC
- ❖ 80% > 20 yrs age in GCT
- ❖ -- Dahlin 1978

# **Benign Giant Cell Tumor Of Bone**

## **Roentgenographic features**

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- ❖ **Expanding zone of radiolucency**
  - ❖ **Eccentric**
  - ❖ **Metaphysis + Epiphysis**
  - ❖ **No reactive sclerosis**
  - ❖ **No periosteal reaction except pathologic fracture**
  - ❖ **Cystic**
  - ❖ **Thin trabeculae**
-





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# **Benign Cell Tumor Of Bone**

## **Differential Diagnosis**

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- ❖ **Aneurysmal bone cyst**
- ❖ **Chondroblastoma**
- ❖ **Non-ossifying fibroma**
- ❖ **Giant cell reparative granuloma**
- ❖ **Brown tumor of hyperparathyroidism**
- ❖ **Pigmented villonodular synovitis**

# Trabeculated Lesions In Soap Bubble Tumor

## Lesion

## Pattern

GCT

Delicate, thin

Chondromyxoid fibroma

Coarse, thick

Non-ossifying fibroma

Loculated

Aneurysmal bone cyst

Delicate, horizontally oriented

Hemangioma

Striated, radiating

# Benign Giant Cell Tumor Of Bone

## Radiographic Differential Diagnosis

	Location	X-ray	Gross
GCT	M+E	Eccentric expanded radiolucency	Freshy soft tissue
NOF	M	Eccentric oval defect	
ABC	M	Eccentric blow-out, soap bubble	Bloody cavity
Chondroblastoma	E	Radiolucency+spotty opacities	Firm to fleshy tissue
Brown tumor	Any	Absent lamina dura, thin cortex	Fleshy, Cystic

E: Epiphysis M: Metaphysis

# Giant Cell Tumor

## Campanacci's Radiographic Classification

**Radiographic**

**Criteria**

**Grade**

- |            |   |
|------------|---|
| <b>I</b>   | <b>Quiescent, intraosseous</b>          |
| <b>II</b>  | <b>Active, periosteum intact</b>        |
| <b>III</b> | <b>Aggressive, soft-tissue invasion</b> |

# Benign Giant Cell Tumor

Radiographic grade Campanacci 1987

- ❖ Grade I Well marginated thin rim border cortex intact, slight thin, not deformed
- ❖ Grade II Well marginated without rim present thin expanded cortex
- ❖ Grade II + fracture
- ❖ Grade III Fuzzy borders, rapid  $\pm$  permeative growth, soft tissue mass

# **Benign Giant Cell Tumor Of Bone**

## **Enneking benign tumor staging system**

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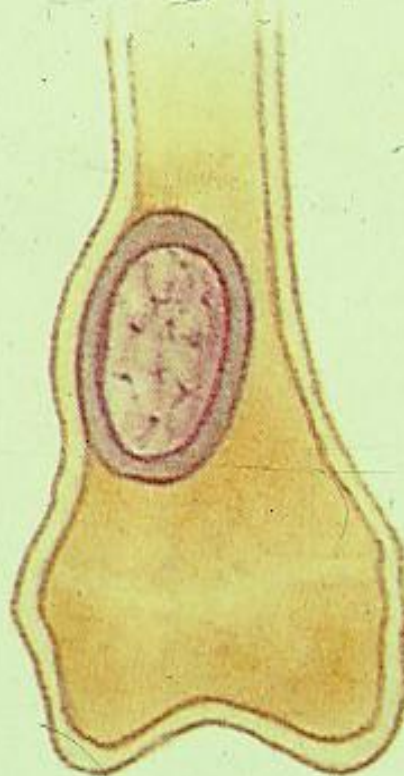
- ❖ **Latent**
  - ❖ **Active**
  - ❖ **Aggressive**
- 
- **Clinical + X-ray + Bone scan +  
Angiogram + CT scan +  
macroscopic + microscopic study**

Stage 1



Latent

Stage 2



Active

Stage 3



Aggressive





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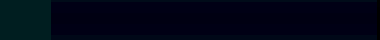
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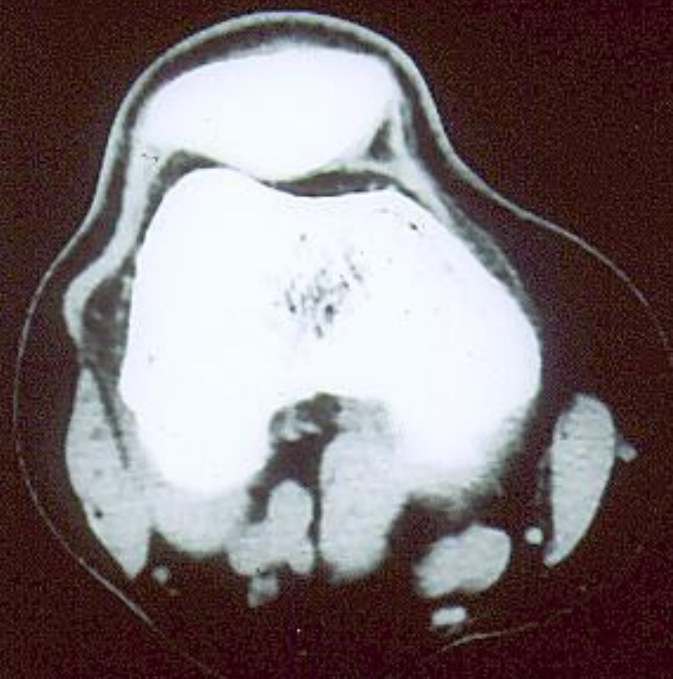
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C.G.M.H.(1) LINKOU





5.0mm  
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x= +0.00cm  
y= +0.00cm  
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<2> M= +61.0  
SD= 0.0  
A= 0.00cm<sup>2</sup>  
M= 100.0



姓名	张
性别	男
年龄	45
职业	教师
科室	骨科
床号	102
日期	2023.10.27















# **Benign Giant Cell Tumor Of Bone**

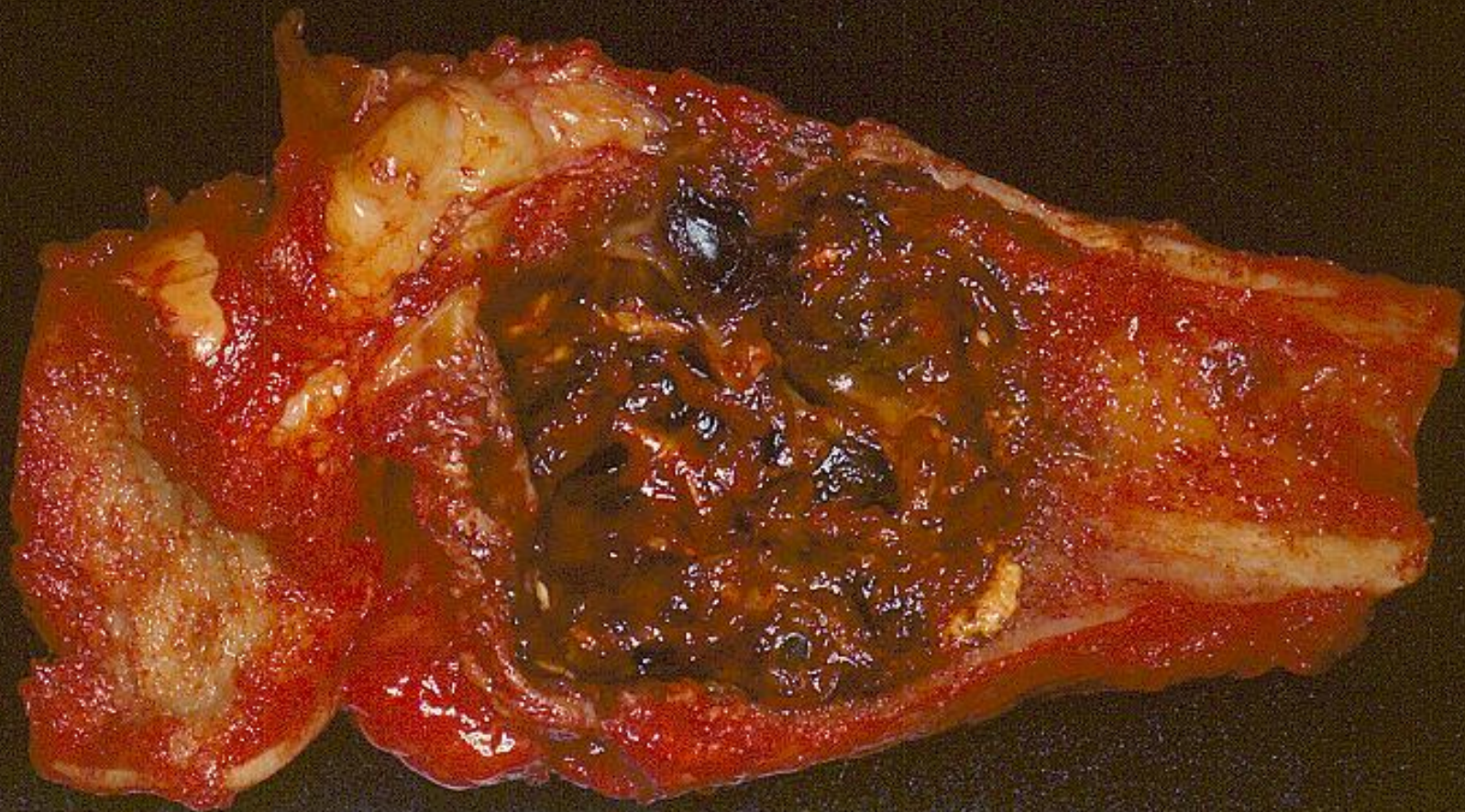
## **Gross pathologic features**

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- ❖ **Soft, friable, gray to red-brown cystic or necrotic, bloody space yellow foci, lipid-laden histiocytes**



ASCOT INDUSTRIES, INC. EAST MANASSAS, VA 20108





# Aneurysmal Bone Cyst-like Area In Benign Bone Tumors

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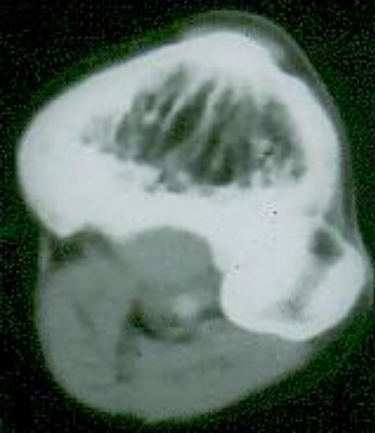
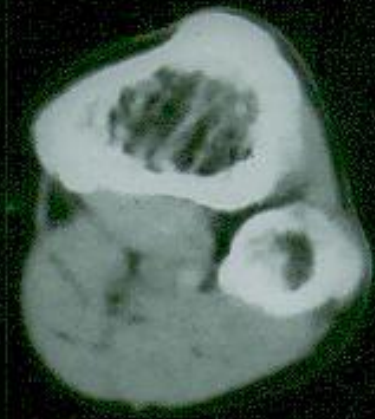
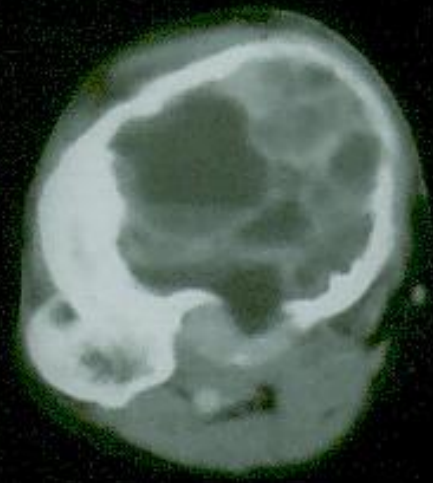
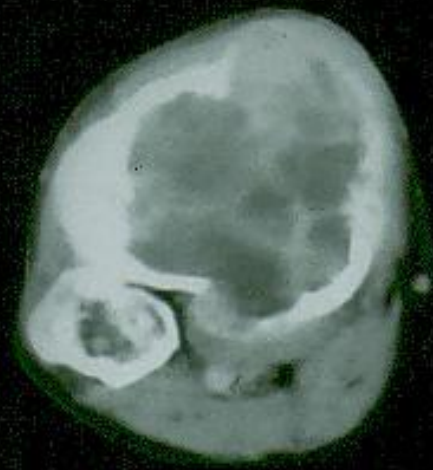
- ❖ Unicameral bone cyst
- ❖ Giant cell tumor
- ❖ Chondroblastoma
- ❖ Chondromyxoid fibroma
- ❖ Fibrous dysplasia





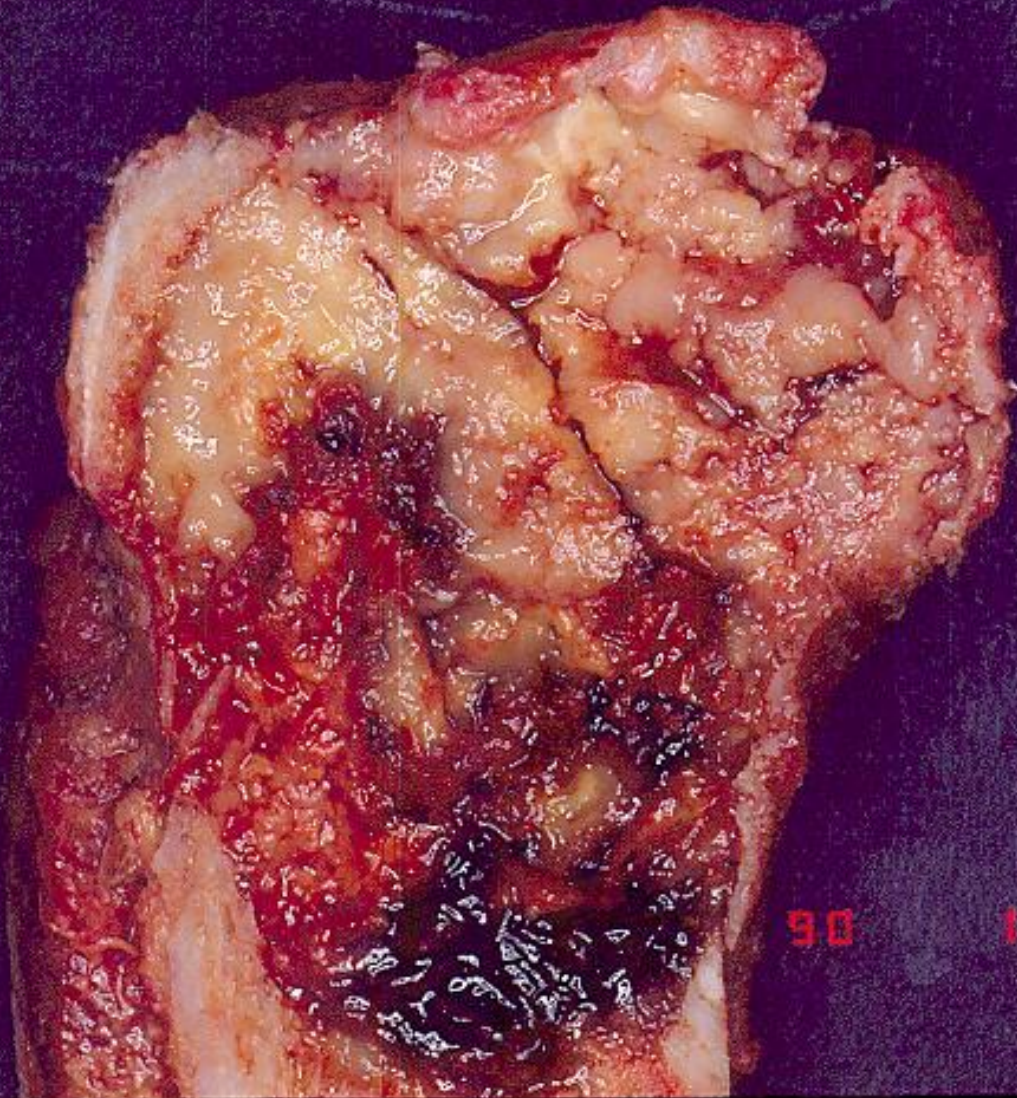
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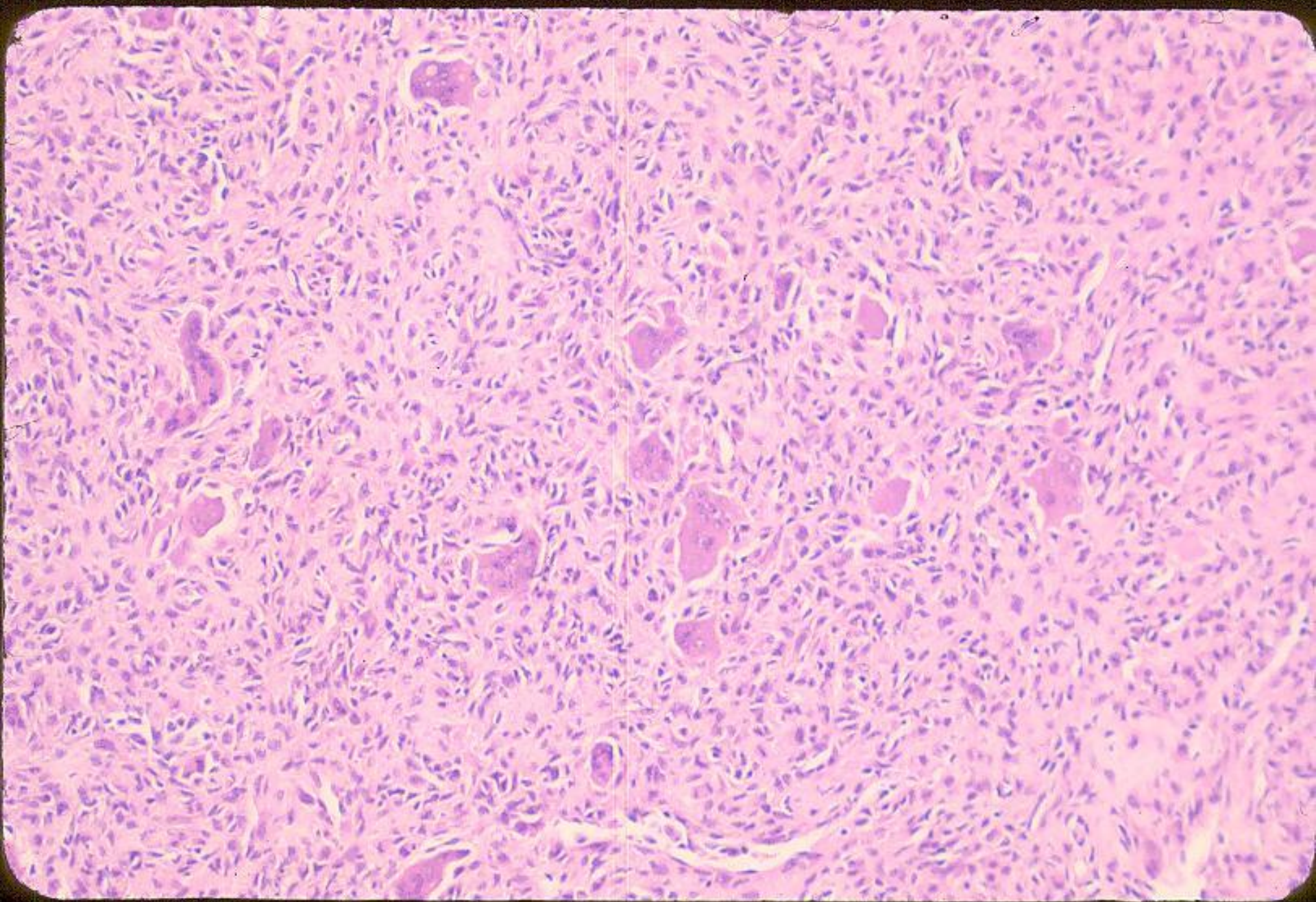
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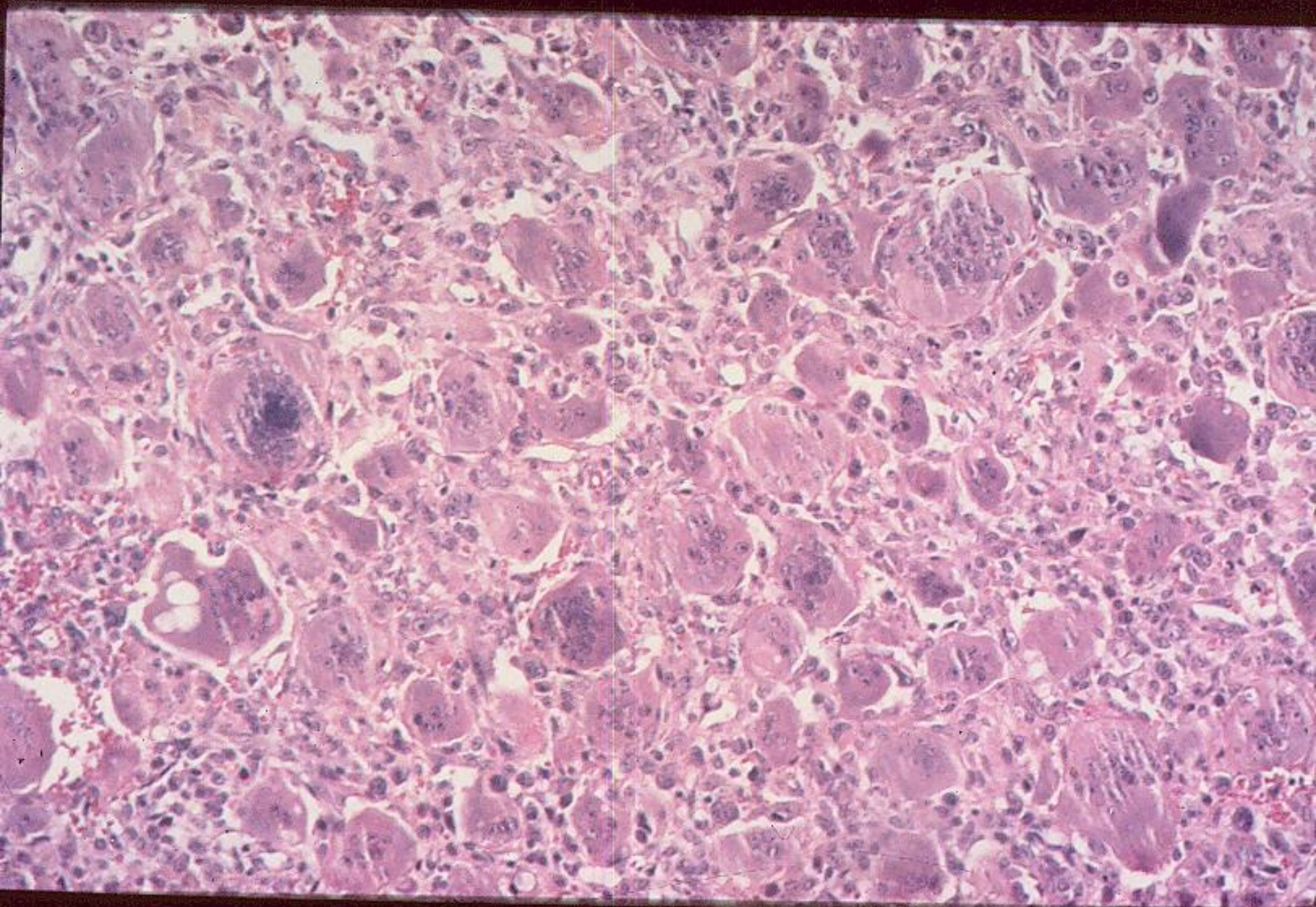
# Benign Giant Cell Tumor Of Bone

## Microscopic histologic features

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- ❖ Round to oval mononuclear cells,
- ❖ Nuclei lack hyperchromatism,
- ❖ Ill-defined cytoplasmic zone,
- ❖ Similar nuclei multinucleated giant cell,
- ❖ Mitotic, all uniform





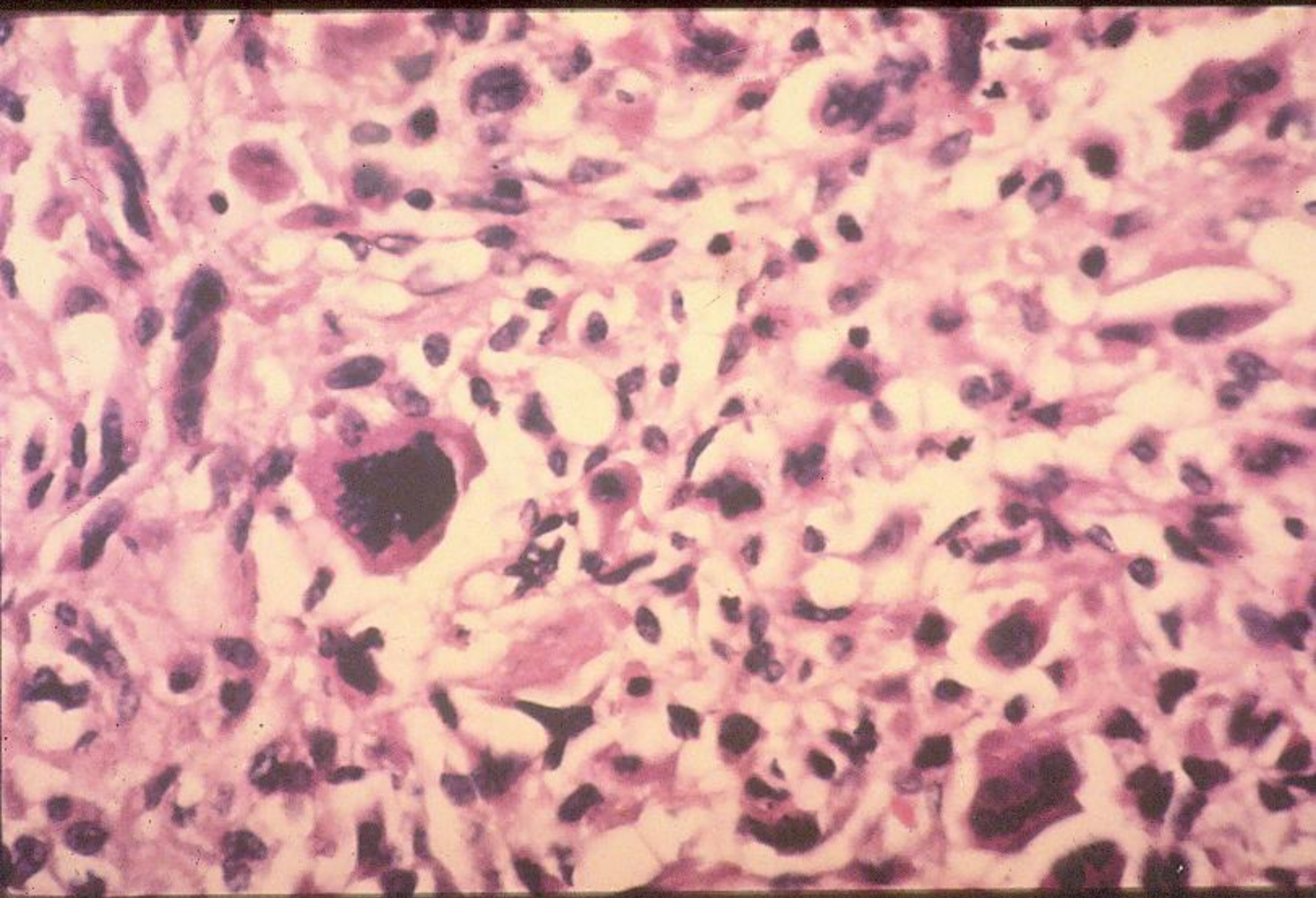
# **Benign Giant Cell Tumor Of Bone**

## **Histologic grading**

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- ❖ **Grade I Stroma inconspicuous Giant cells plentiful**
- ❖ **Grade II Stroma prominent Giant cells decrease**
- ❖ **Grade III Stroma overtly sarcomatous Giant cell space**
- ❖ **A.G. Huvos 1991**





# Giant Cell Tumor

## Pre-op Evaluation

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- ❖ Routine medical evaluation  
metastatic disease ? Brown tumor ?
- ❖ Routine roentgenograms
- ❖ Arteriograms for knee lesions
- ❖ CT scan in sarcoma or pelvis
- ❖ Bone scan not particularly

# Giant Cell Tumor

## Treatment Consideration

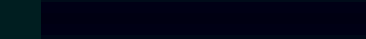
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- ❖ Anatomic site
- ❖ Extent
- ❖ Aggressiveness
- ❖ Recurrent lesions
- ❖ Recurrent lesions
- ❖ Risk of recurrence
- ❖ Functional deficit resulting from surgery
- ❖ Malignant transformation or metastasis are essentially negligible

# Expendable Bones

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- ❖ **Fibula, ulna, rib bone of the hand and foot**
  - **A. Complete resection**
  - **B. Curettage and grafting**



C.G.M.H. (2) LINKOU

MAG:1.3 X = +0.75cm V = +0.32cm A

120 KV  
138 mA  
2.0 sec  
25-cAL



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C.G.M.H. (2) LINKOU

MAG:2.0 X = -5.05cm V = +1.30cm H

120 KV  
180 mA

C.G.M.H. (2) LINKOU

MAG:1.3 X = +0.75cm V = +0.32cm A

120 KV  
138 mA  
2.0 sec  
25-cAL



R

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x = -5.99cm  
14.8cm  
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y = +8.08cm  
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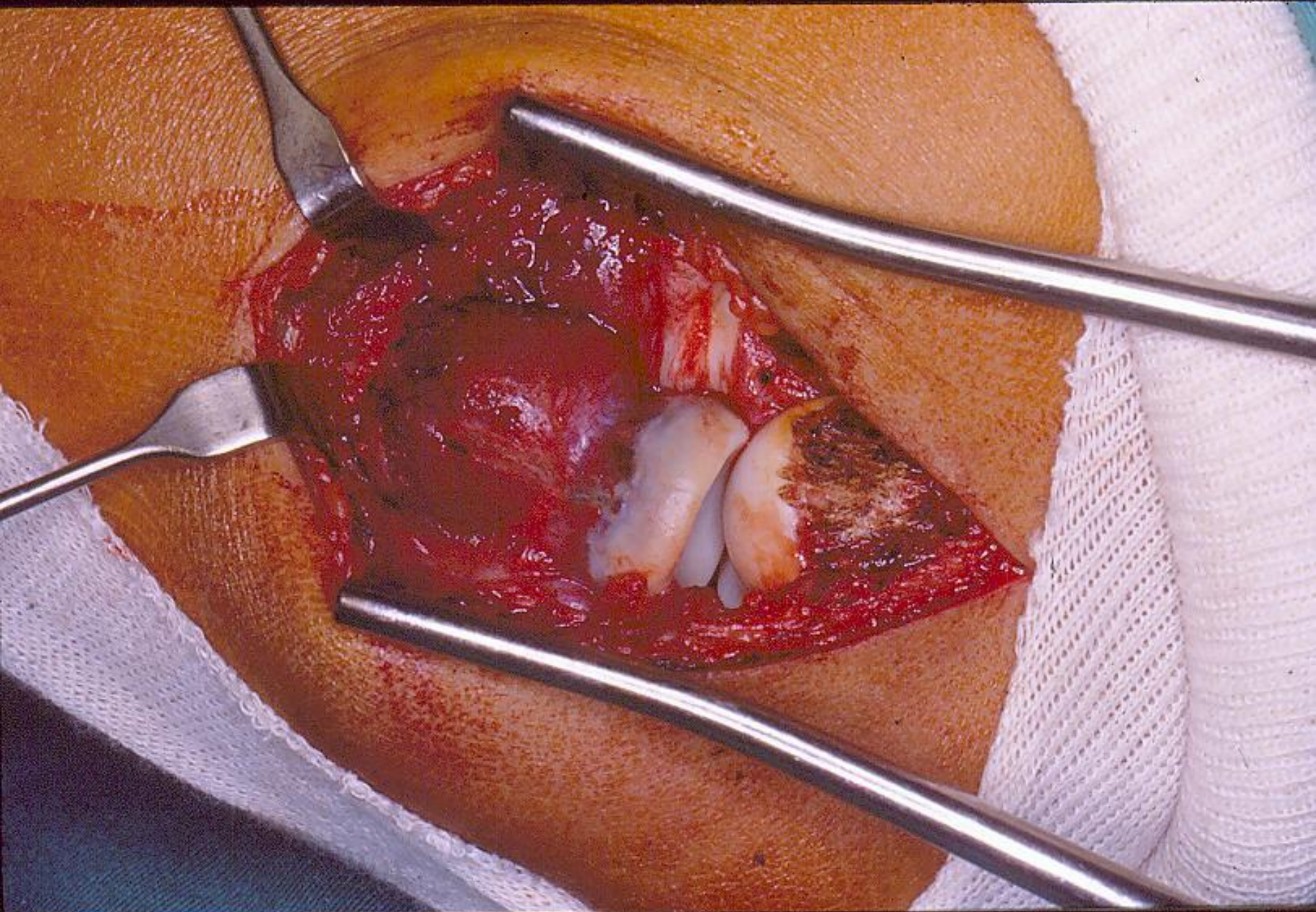
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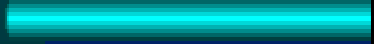
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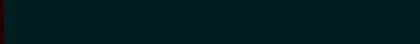
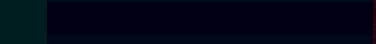
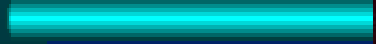


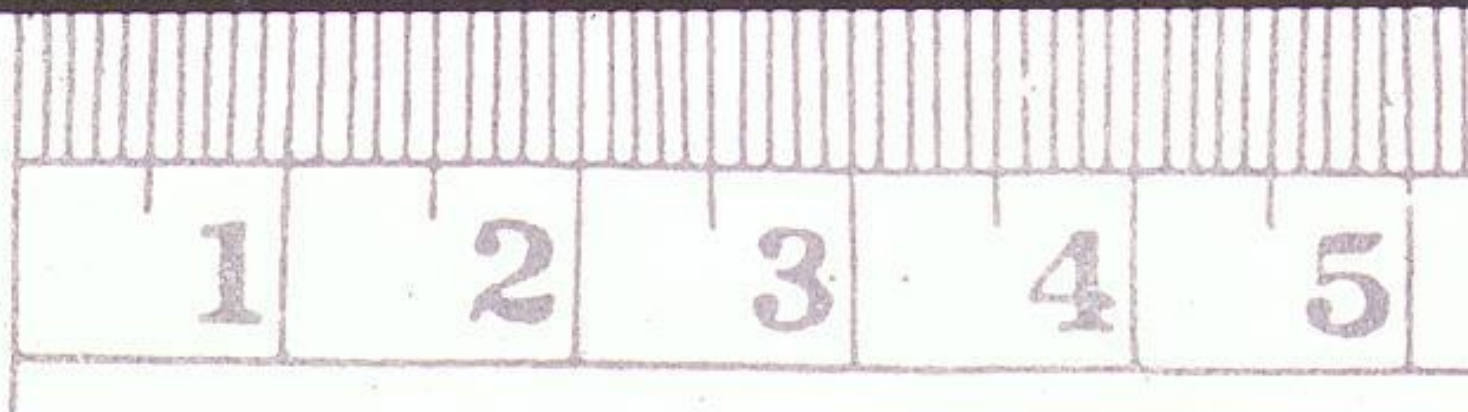
















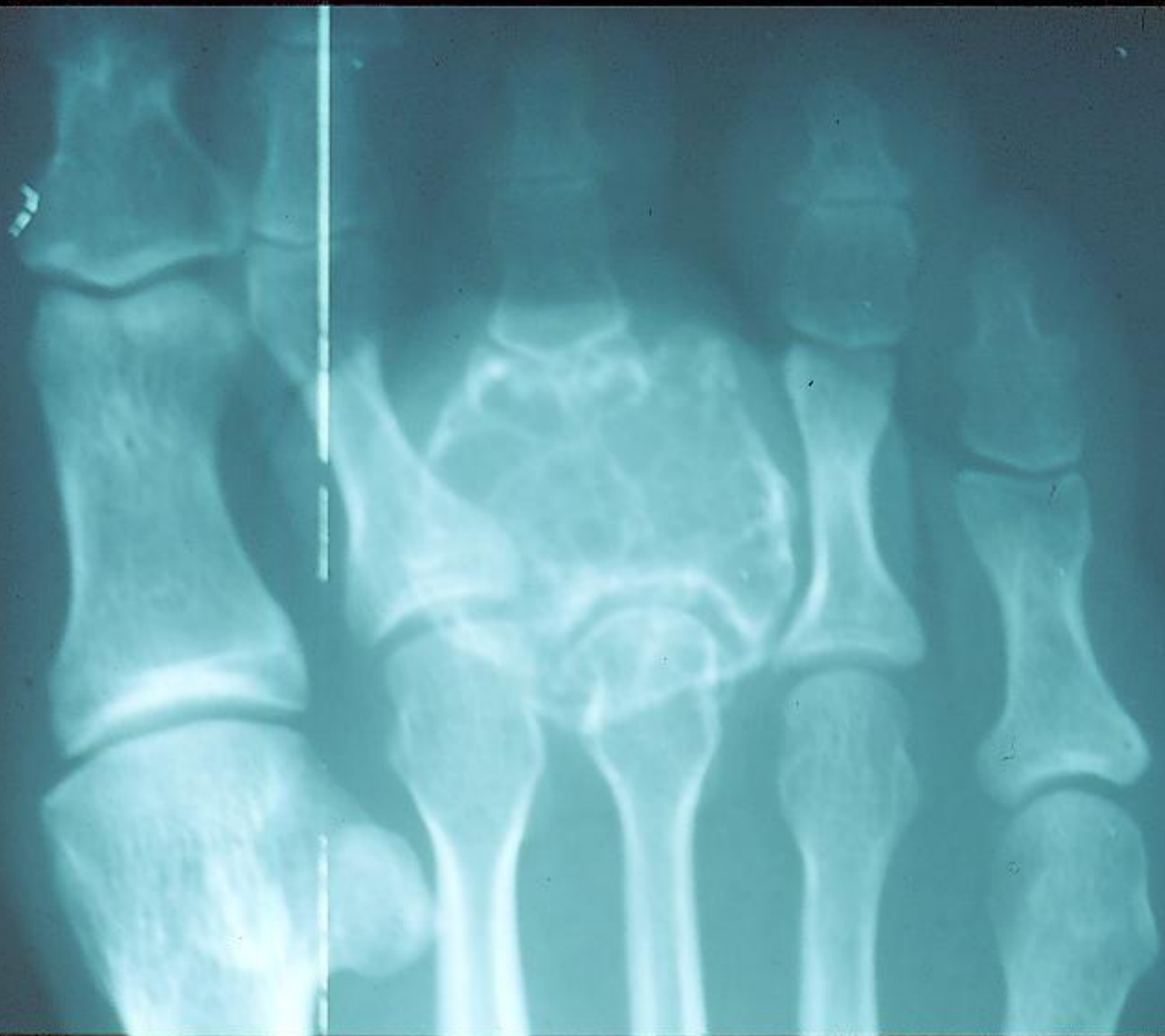














# Giant Cell Tumor

## Surgical Alternatives

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Curettage

v.s.

Resection

# Giant Cell Tumor Curettage

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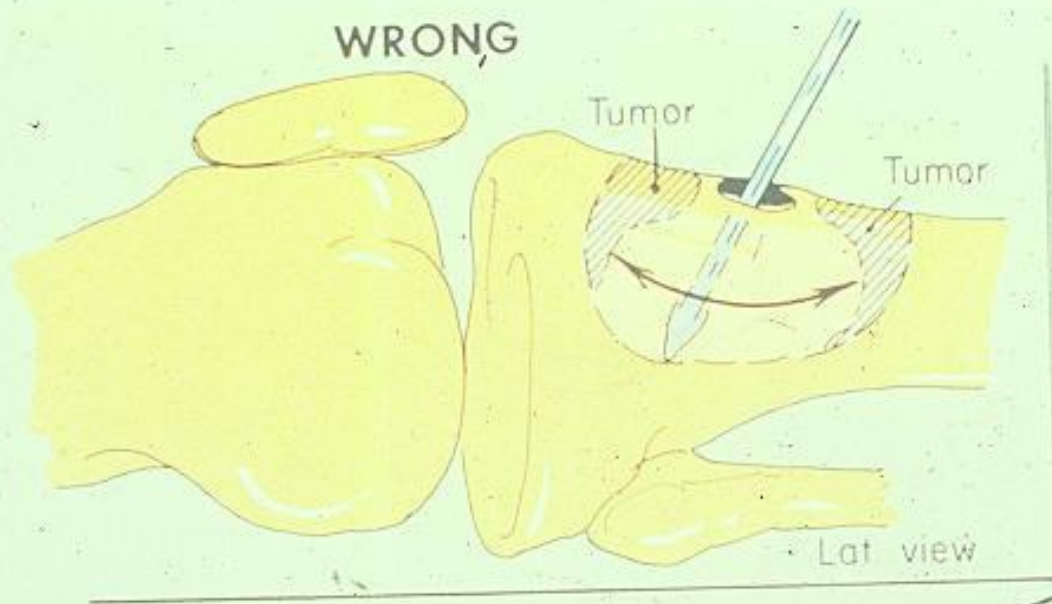
- ❖ Offers best functional of restoration
- ❖ High incidence of local recurrence

# Treatment Of Giant Cell Tumor

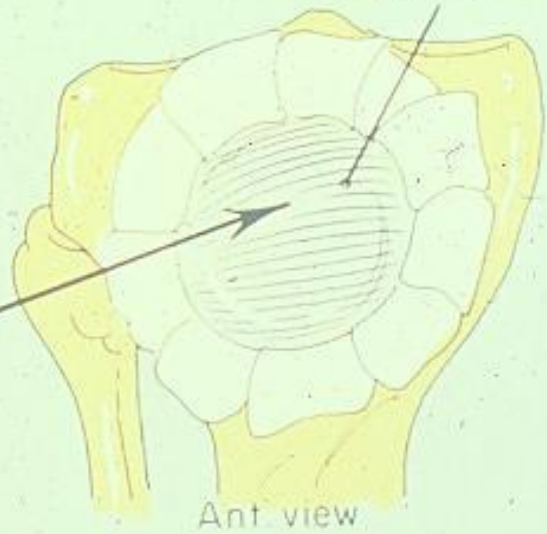
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- ❖ Curettage
- ❖ Obtain adequate exposure
- ❖ Excision of tumor with sharp curette
- ❖ Use BURR to extend margins

WRONG

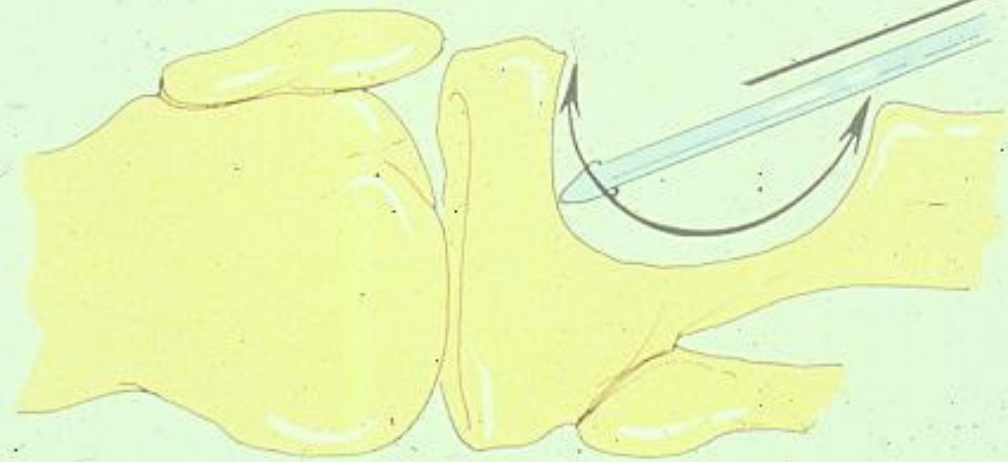


Phenol & alcohol

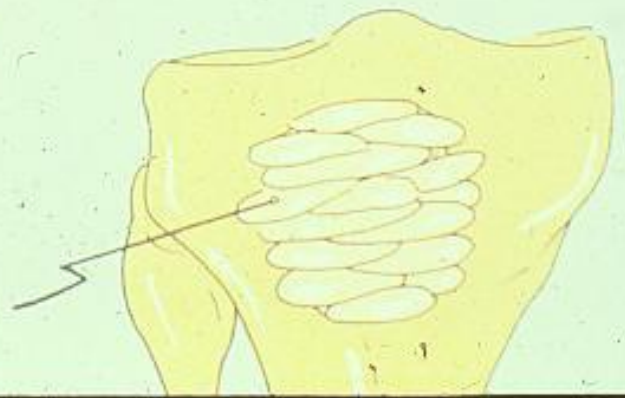


Ant view

CORRECT



Bone chips



# Giant Cell Tumor

## Curettage Technique

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- ❖ Avoid contamination soft tissue, donor site
- ❖ Consider adjuvant treatment
- ❖ Restore integrity of bone bone graft; methylmethacrylate



# Treatment of giant cell tumor of long bone.

*Shih HN, Chen YJ, Huang TJ, Ho WP, Hsueh S, Hsu RW.*

Changgeng Yi Xue Za Zhi. 1996 Mar;19(1):16-23.

~~From 1981 to 1991, sixty-eight patients with giant cell tumors of their long bones were treated and followed-up at Chang Gung Memorial Hospital. Thirty-three males and thirty-five females between the ages of 14 and 76 (average, 32 years) were followed for an average duration of 3.5 years (range, 2.5 years to 7.3 years). Forty-five primary lesions and 23 cases of recurrent lesions were diagnosed. Seventeen patients were classified as grade II while 51, as grade III. Surgical procedures included intralesional curettage and wide resection. The local recurrent rate following surgery was 13% (9/68). The overall outcome was 85% (58/68) good or excellent results. Complications included one superficial infection, 9 local recurrences and 3 fractures of fixation devices. In addition, one patient with a lung metastasis was noted. In the primary lesion group, there were 9 grade II and 10 grade III lesions treated by curettage and grafting. Of these 4 grade II and 5 grade III patients had local recurrences. The recurrent rate was 47% (9/19) following intralesional curettage with cancellous bone graft (8/16) or bone cement (1/3). The average period before local~~

recurrence was 10.4 months. Seven of the 9 recurrent patients received radical resections and allograft reconstruction with good results at short-term follow-up. The other two patients were lost in follow-up. The cases in the curettage group had shown low recurrent rate (1/10) after 1989 and high recurrent rate (8/9) before 1989 ( $p < 0.001$ ). The most important factor for local recurrence appeared to be inadequate curettage with similar recurrence rates regardless of the type of bone graft used. A careful approach to the surgical margin including use of a dental burr and local adjuvant treatment with phenol, the rate of local recurrence may be decreased. There were no recurrences in the wide resection group. Although radical resection yield a best chance for cure, the sacrifice of the joint with subsequent arthroplasty resulted a compromise of the joint function.

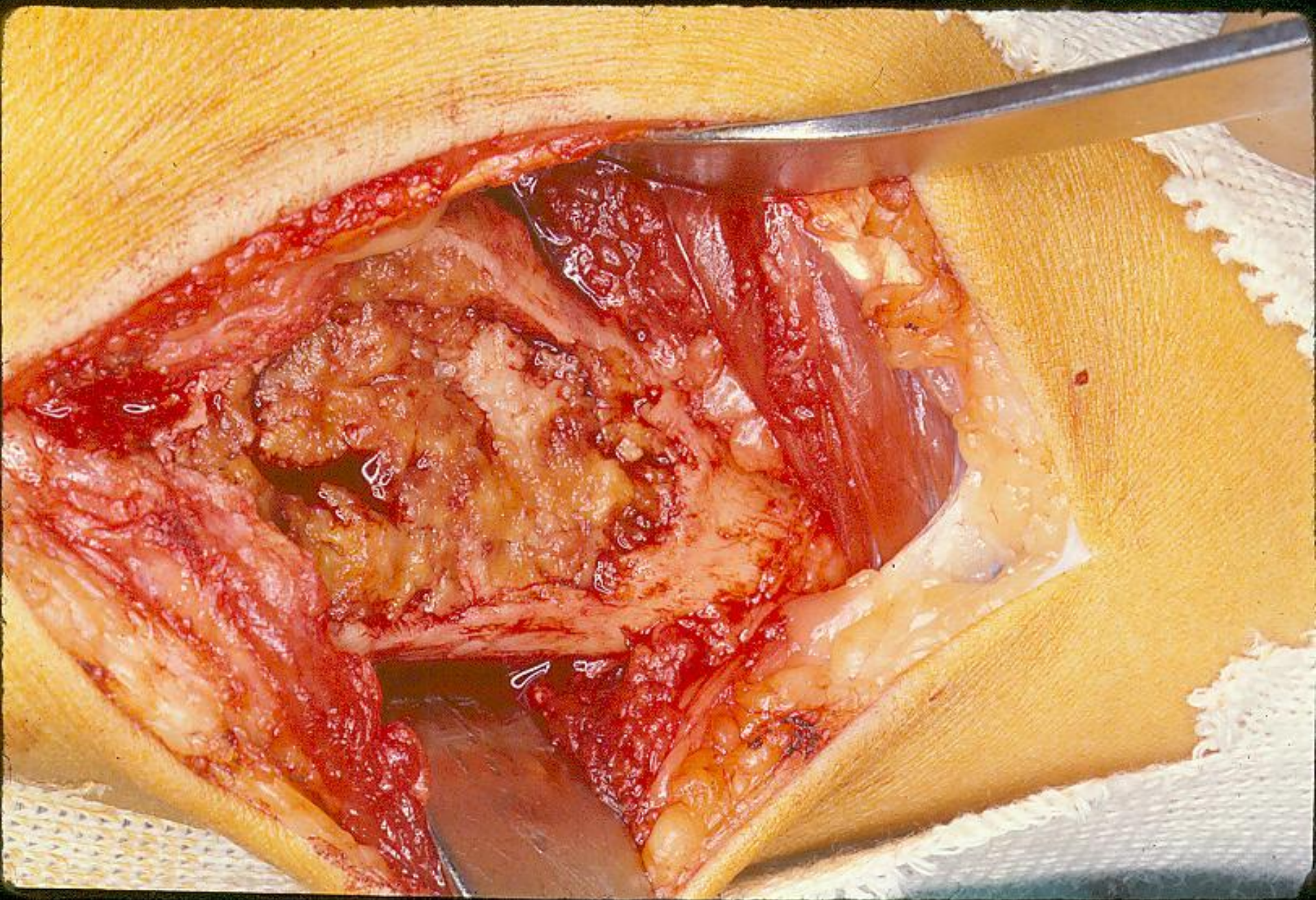


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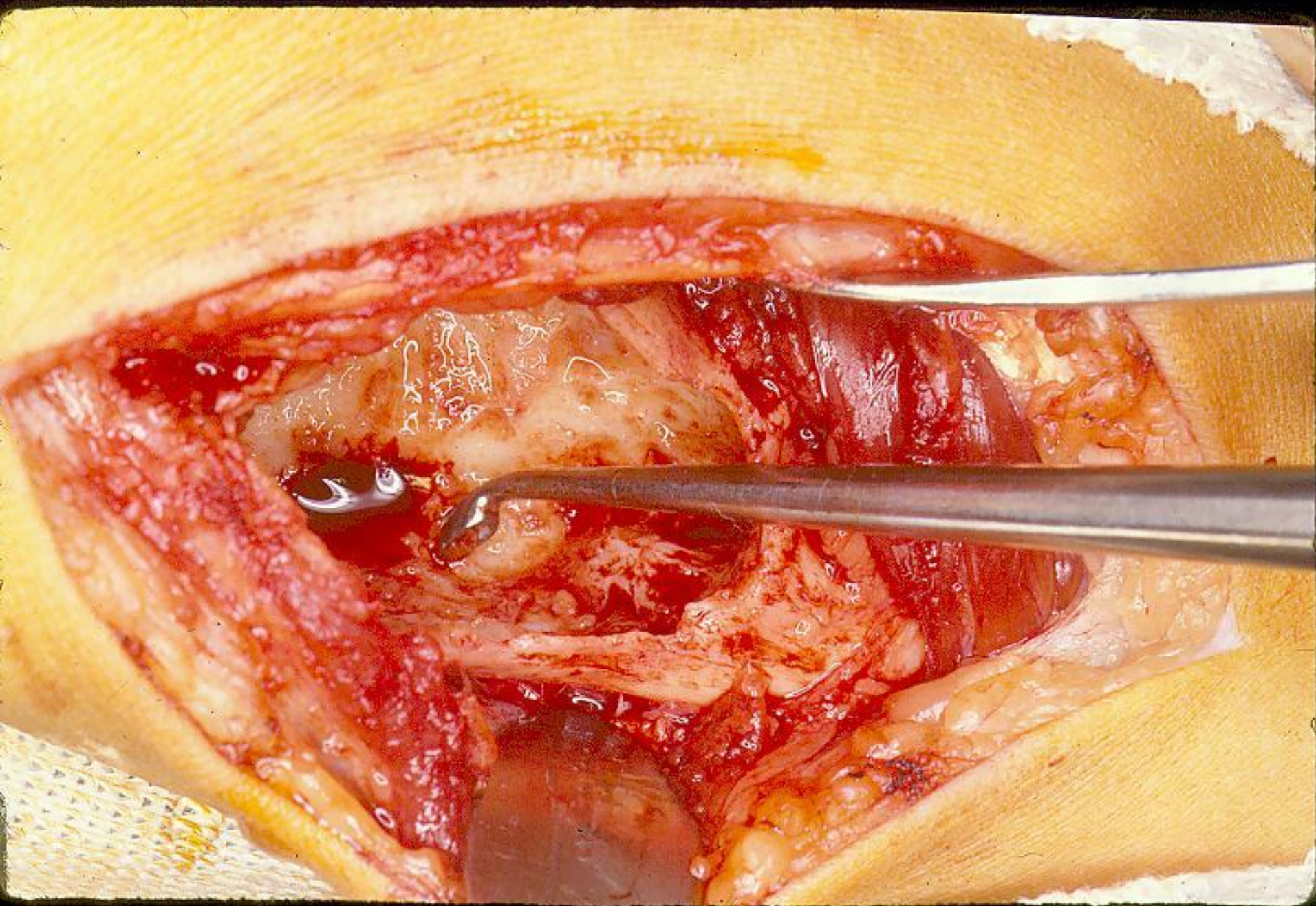


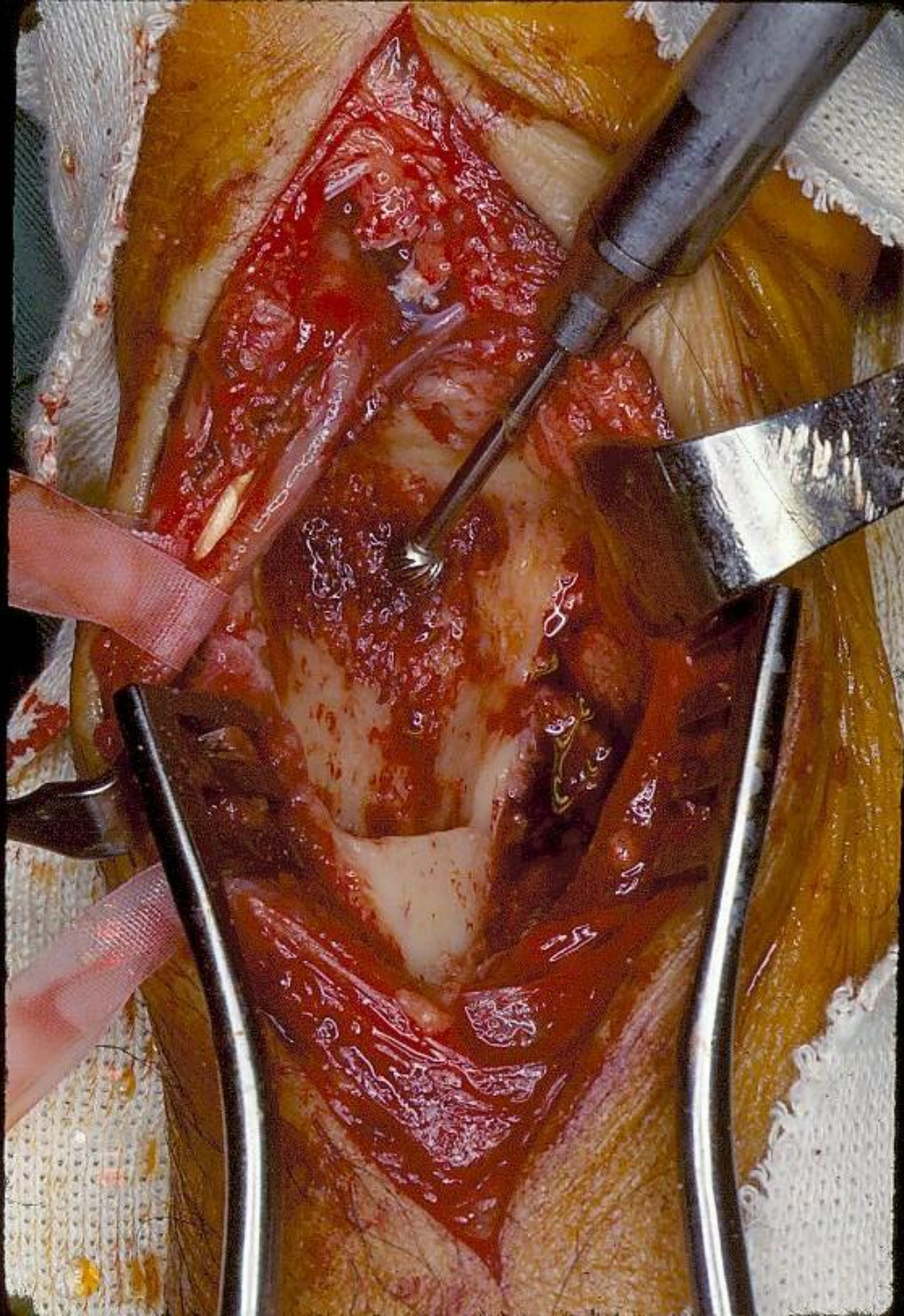
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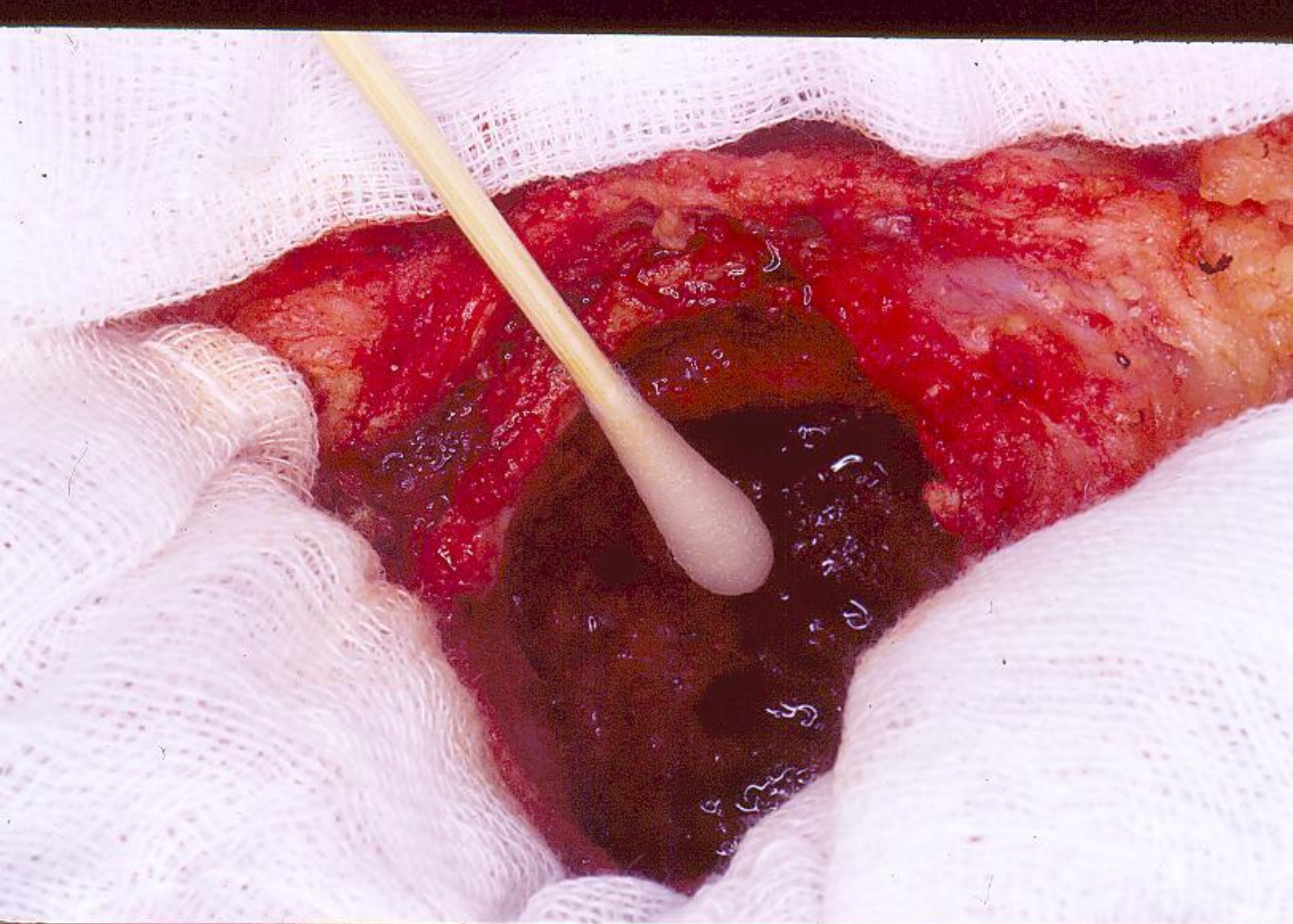


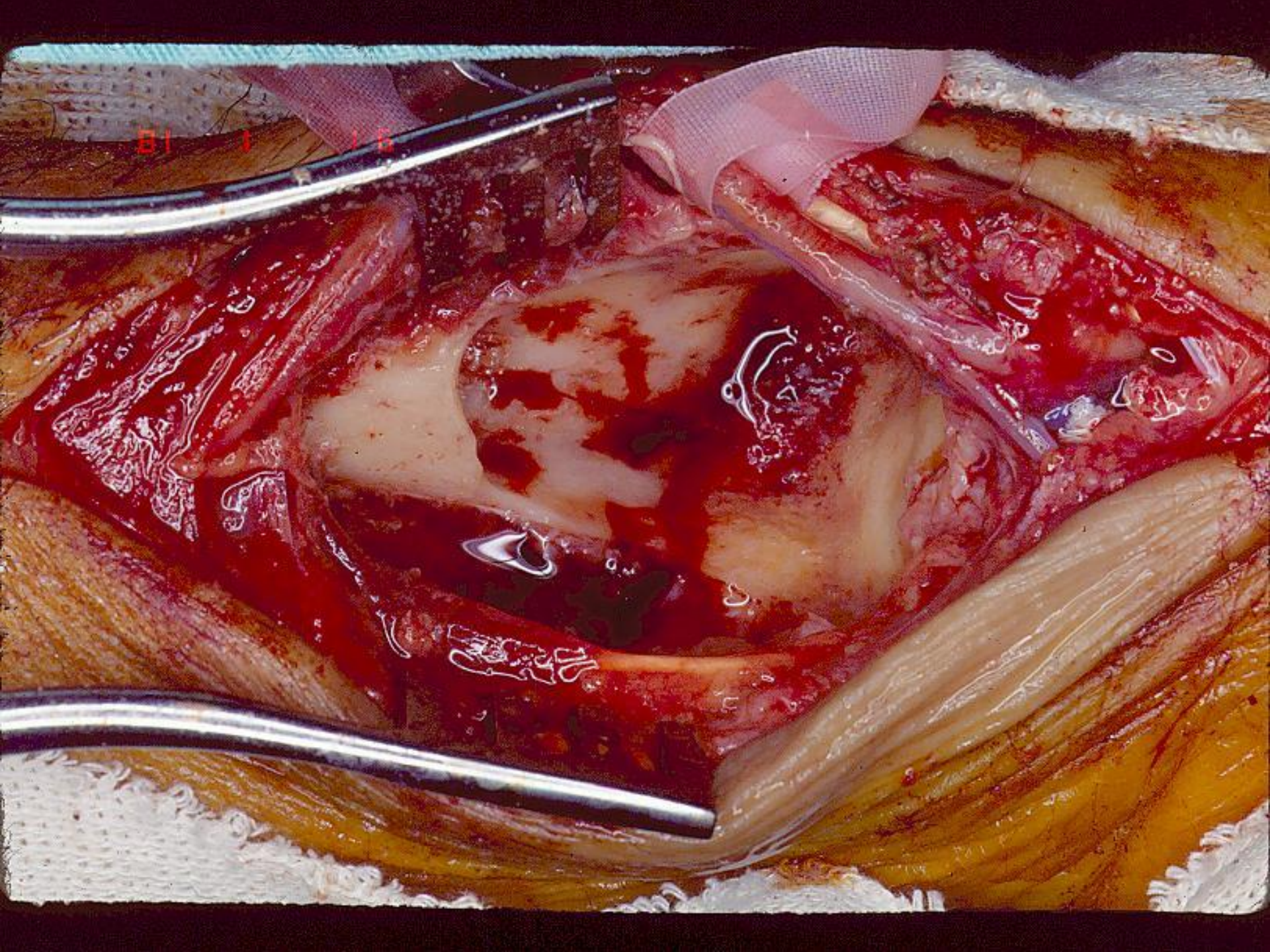




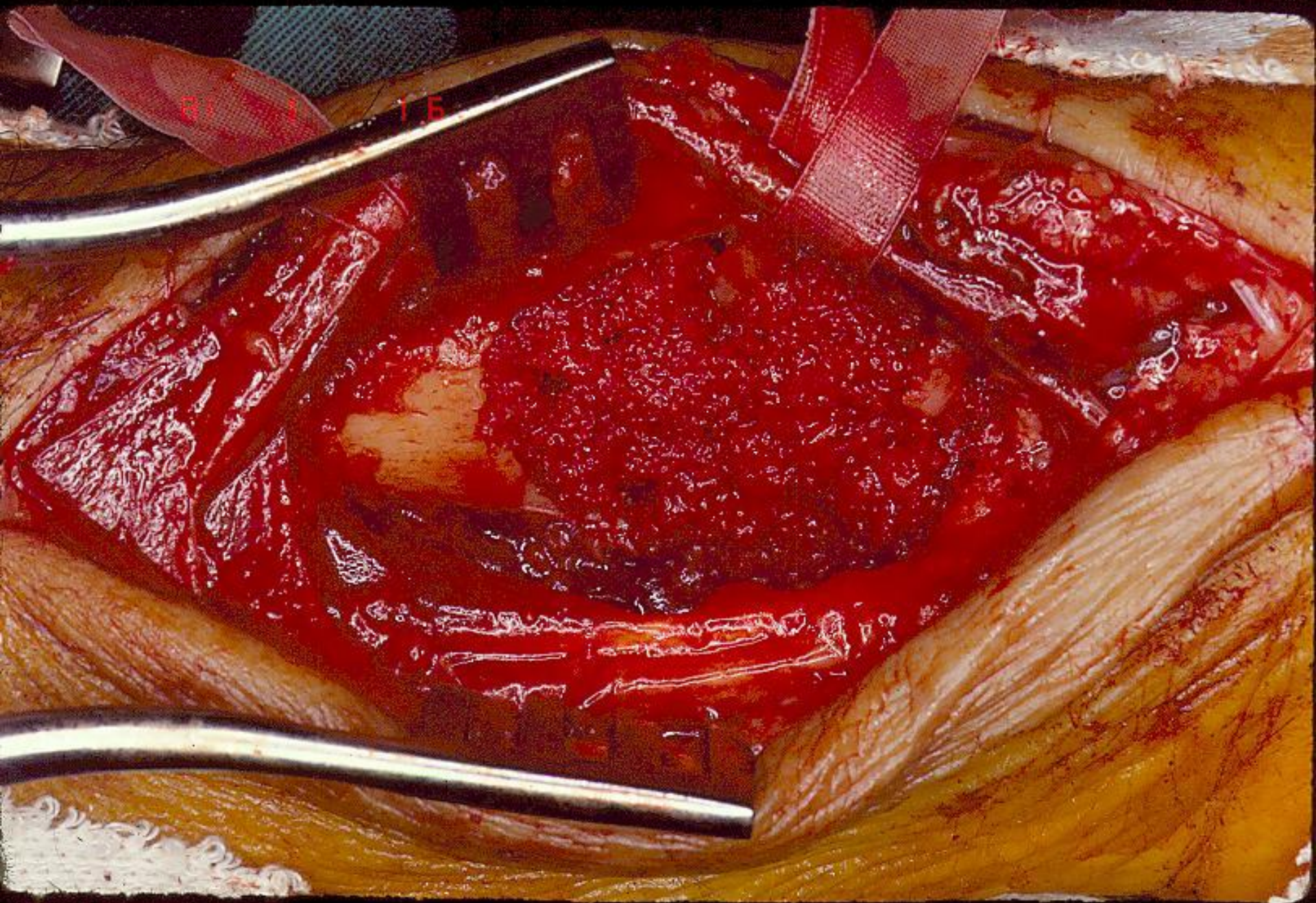




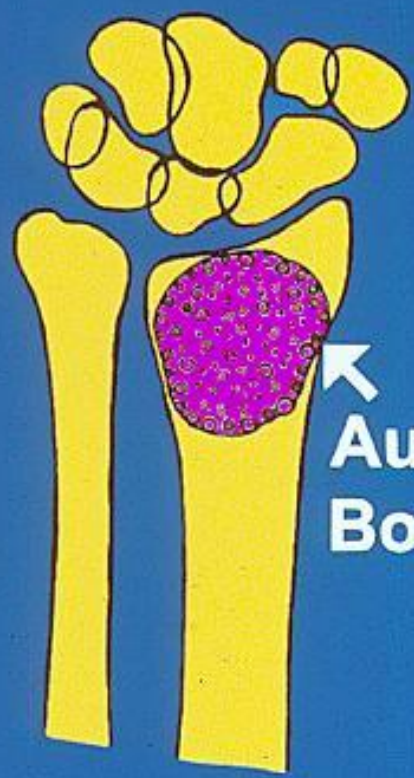












Autogenous  
Bone Graft

A-P



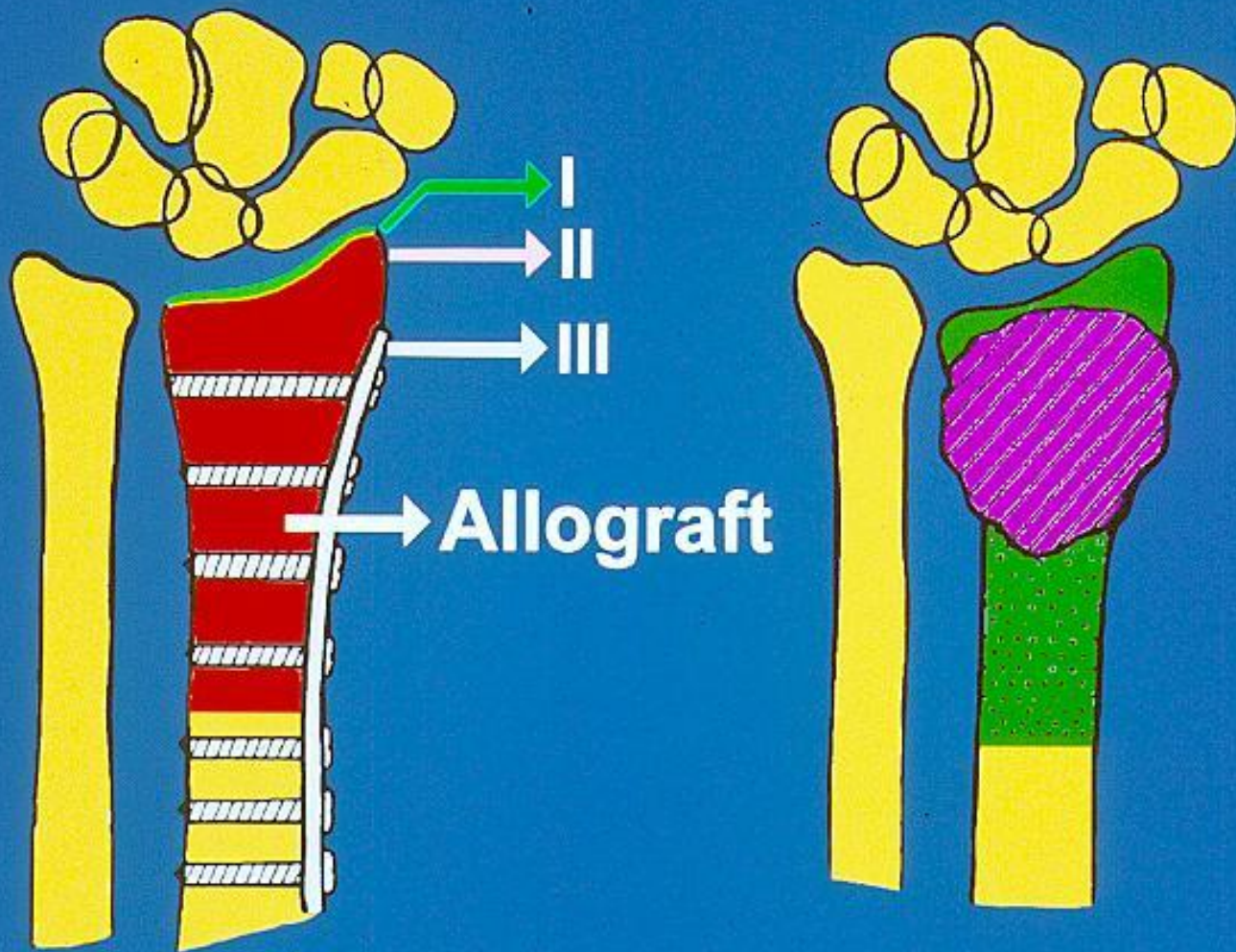
Soft  
Tissue  
Mass

LAT



A-P











# Treatment Of Giant Cell Tumor

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## Adjuvant Method

- ❖ Chemical cauterization phenol + acid alcohol
- ❖ Methylmethacrylate
- ❖ CO2 laser cauterization
- ❖ Cryotherapy





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Post CM

A

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STUDY 7

CHANG GUNG MEM. HOSP.  
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SL 4.0  
FOV 160\*160  
256 \*2560s  
Sag

W 1258  
C 062

H



# Bone Cementing

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## ❖ Subchondral bony change

- ❑ Comparative analysis of subchondral replacement with PMMA or autogenous bone grafts in dogs
- ❑ Frassica FJ, Gorski, Pritchard, Sim and Chao – CORR 293, 1993

# In Vivo, Reduction of Subchondral Stiffness

- ❖ Subchondral stiffness in both gr, 3 wks
- ❖ 12 wks Normal of bone graft 79% of PMMA
- ❖ No deleterious effect on the articular cartilage (histological and biochemical)
- ❖ In new bone formation and subchondral porosity in PMMA group
- ❖ F.J. Frassica – CORR 293, 1993

# Giant Cell Tumor Resection

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- ❖ Best chance for cure
- ❖ Creates large osseous and soft tissue defect

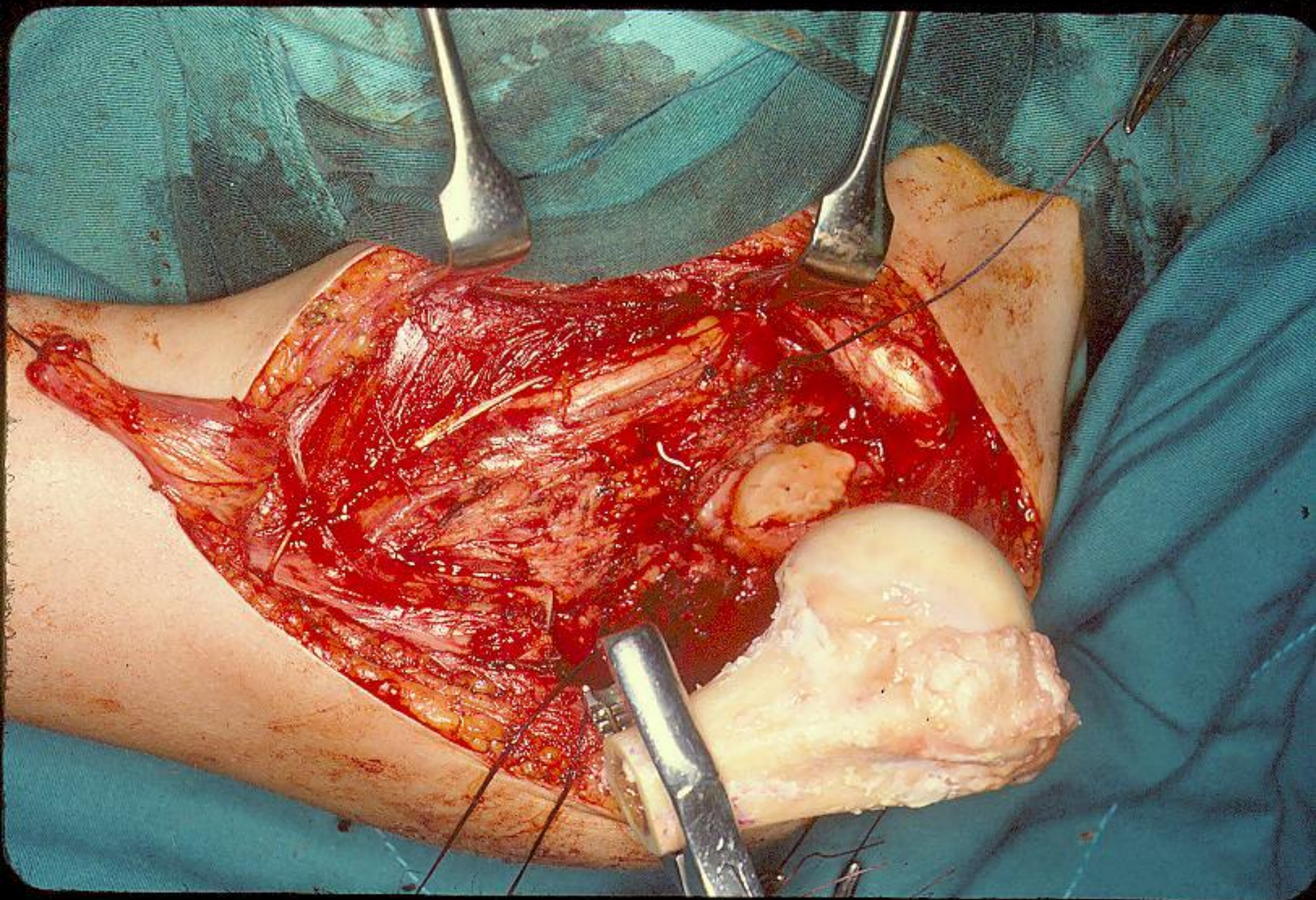


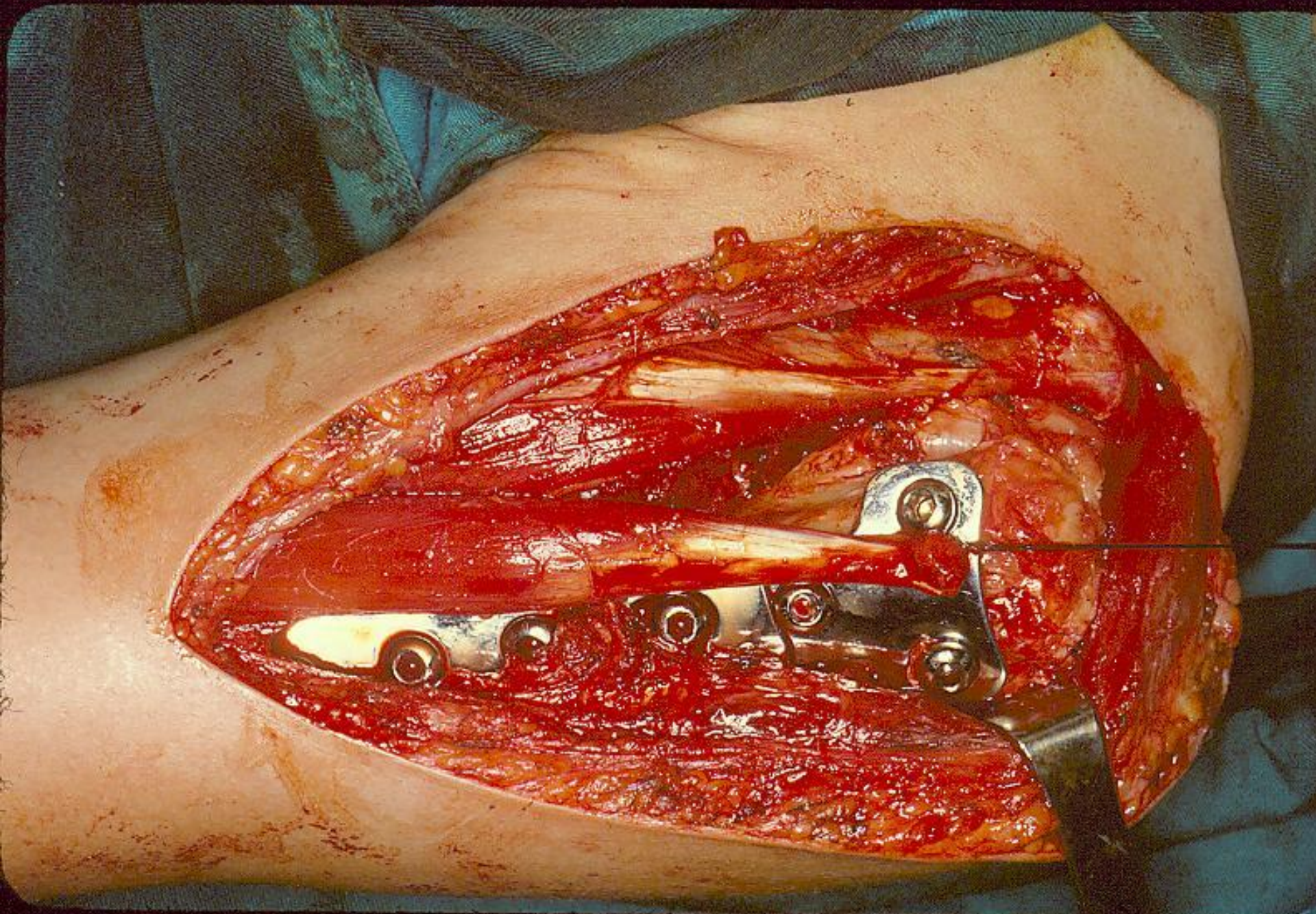
# Giant Cell Tumor Resection

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- ❖ Low incidence of local recurrence
- ❖ Major functional deficit

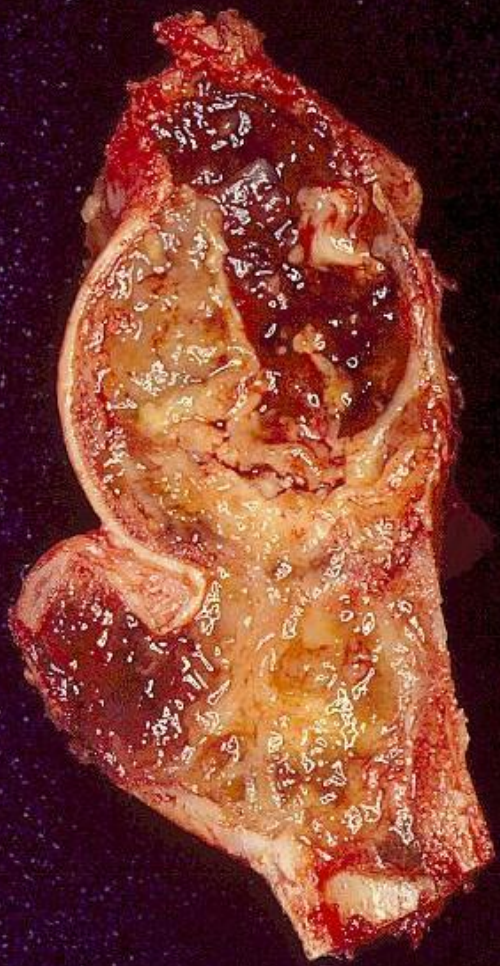








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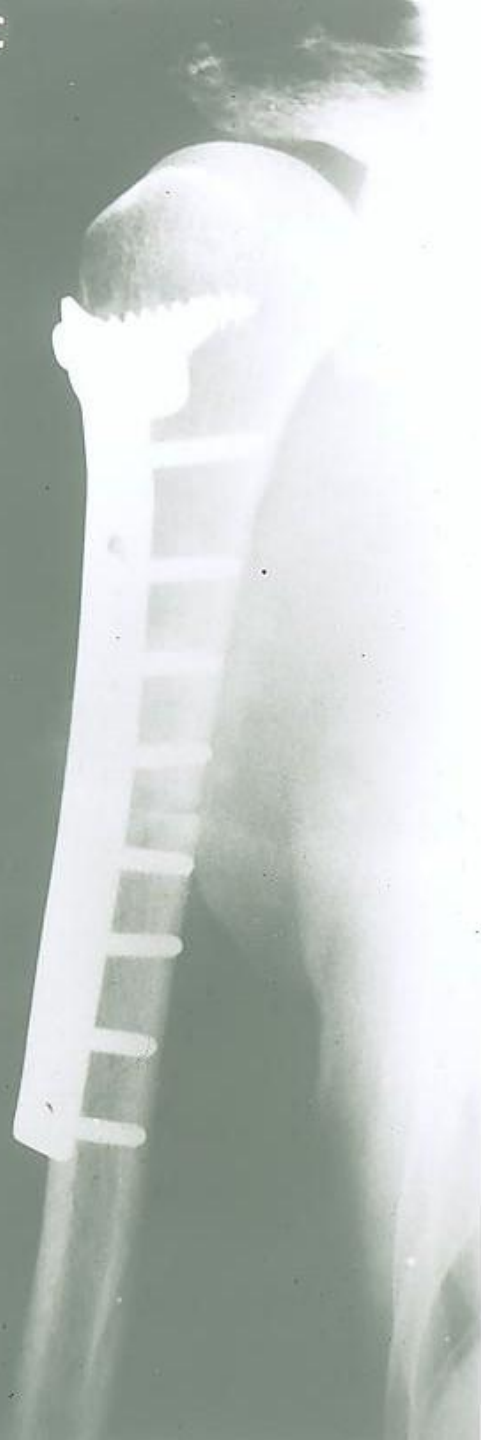




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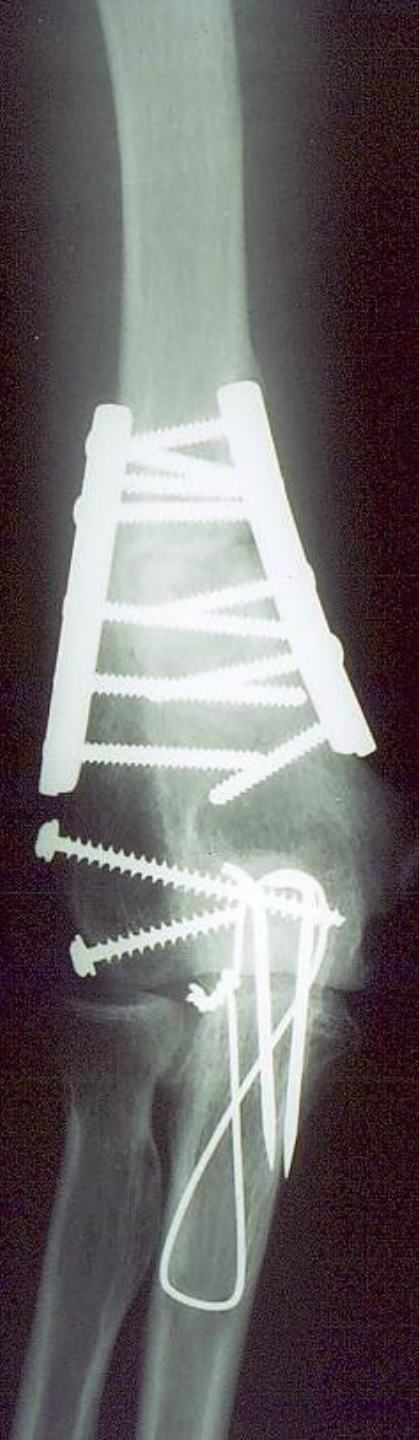


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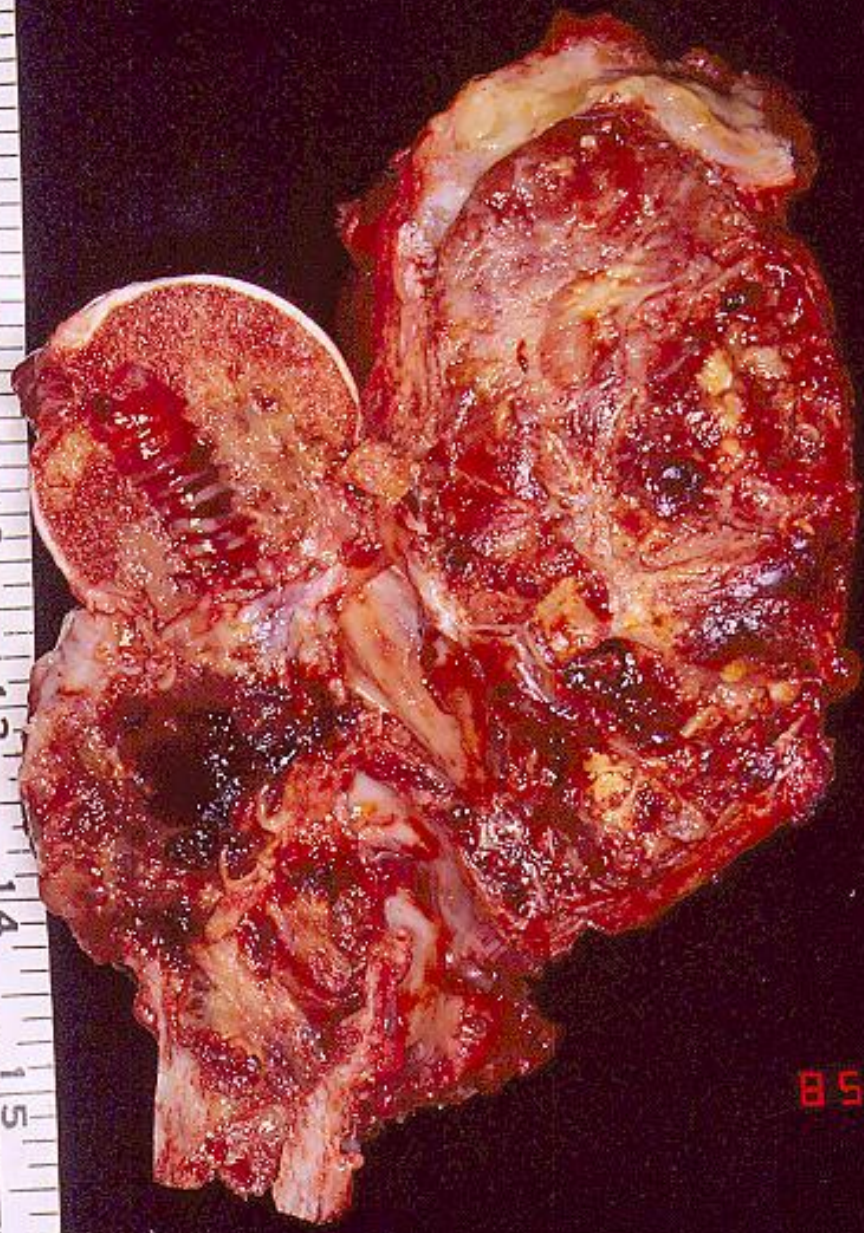












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Name: 李淑蘭  
Date: 08.12.16  
⑤











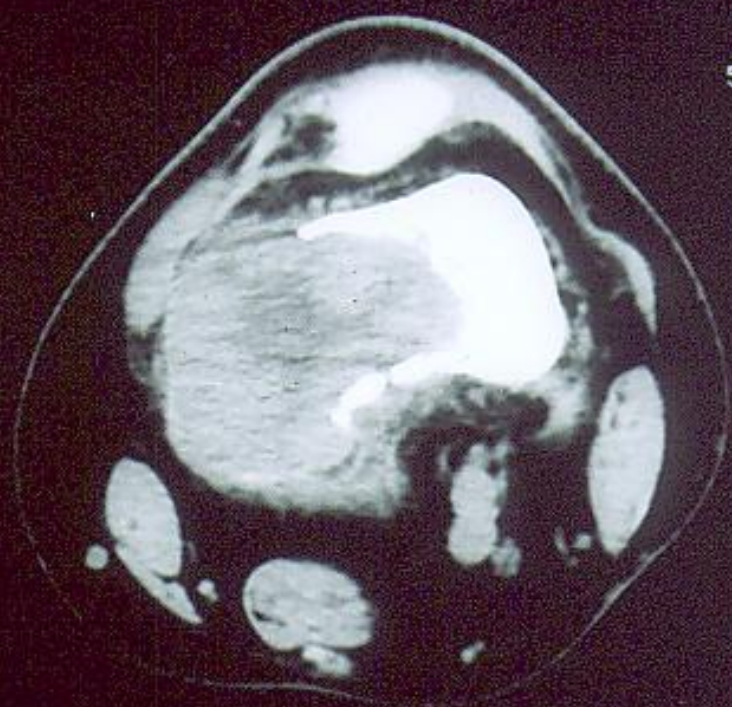




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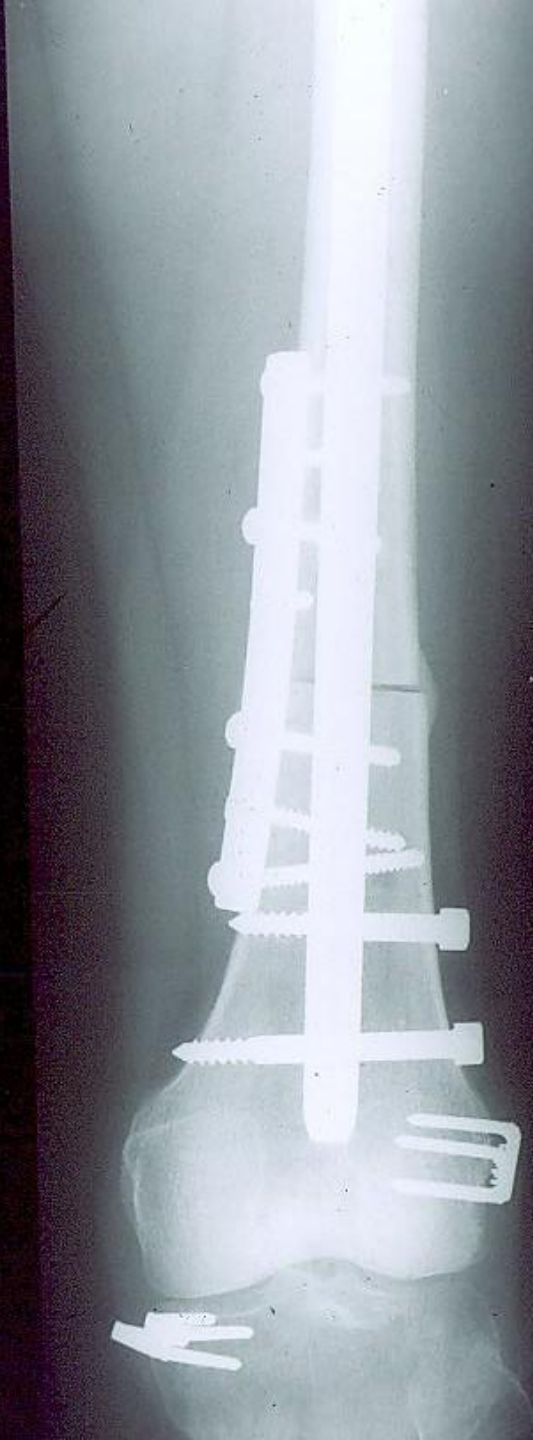
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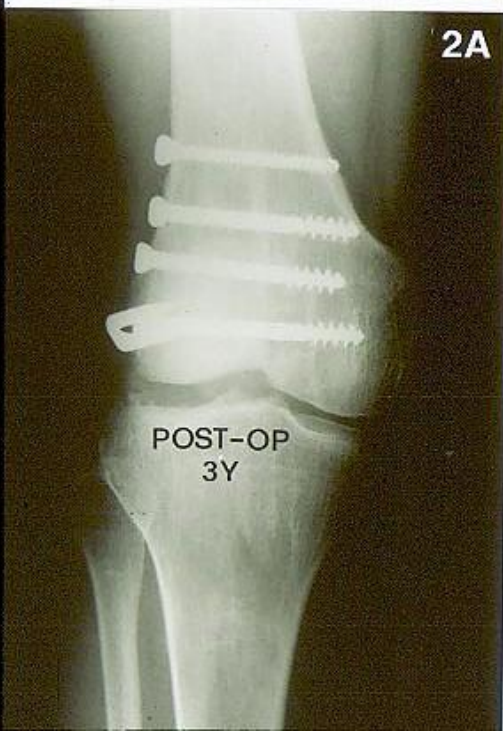




1A



1B



2A

POST-OP  
3Y



2B

POST-OP  
3Y

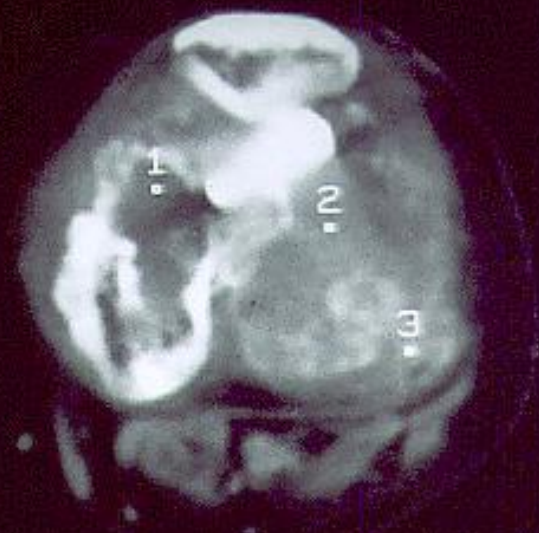
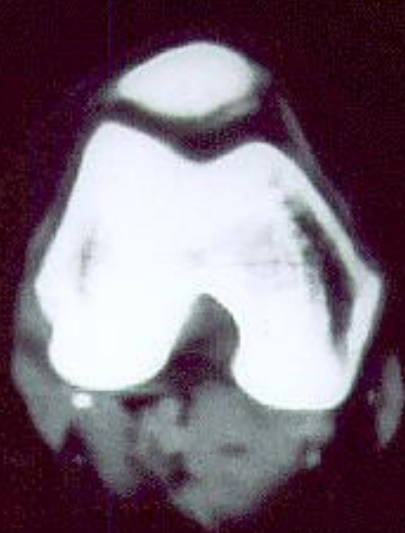




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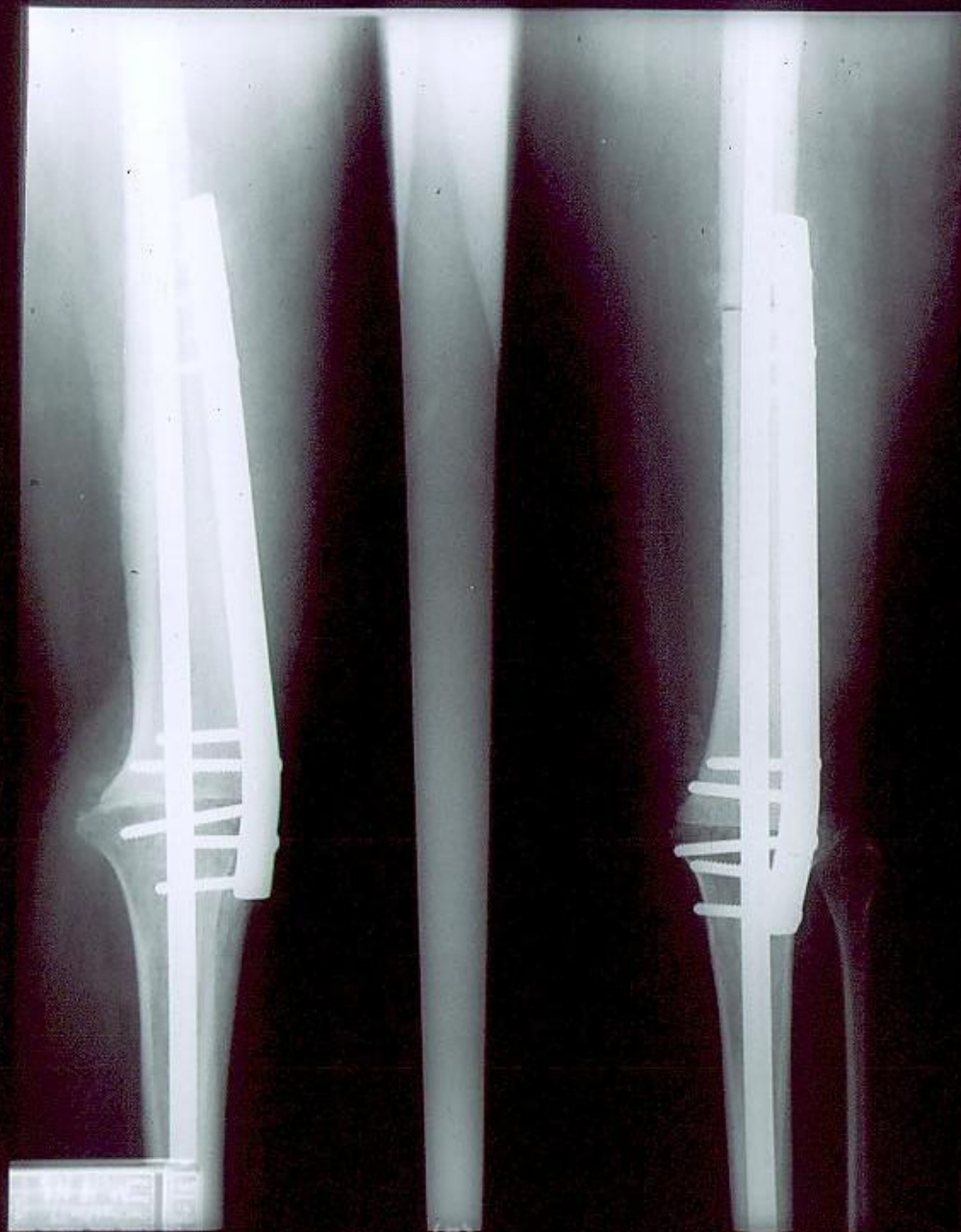
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CHANG GUNG MEM HOSPITAL  
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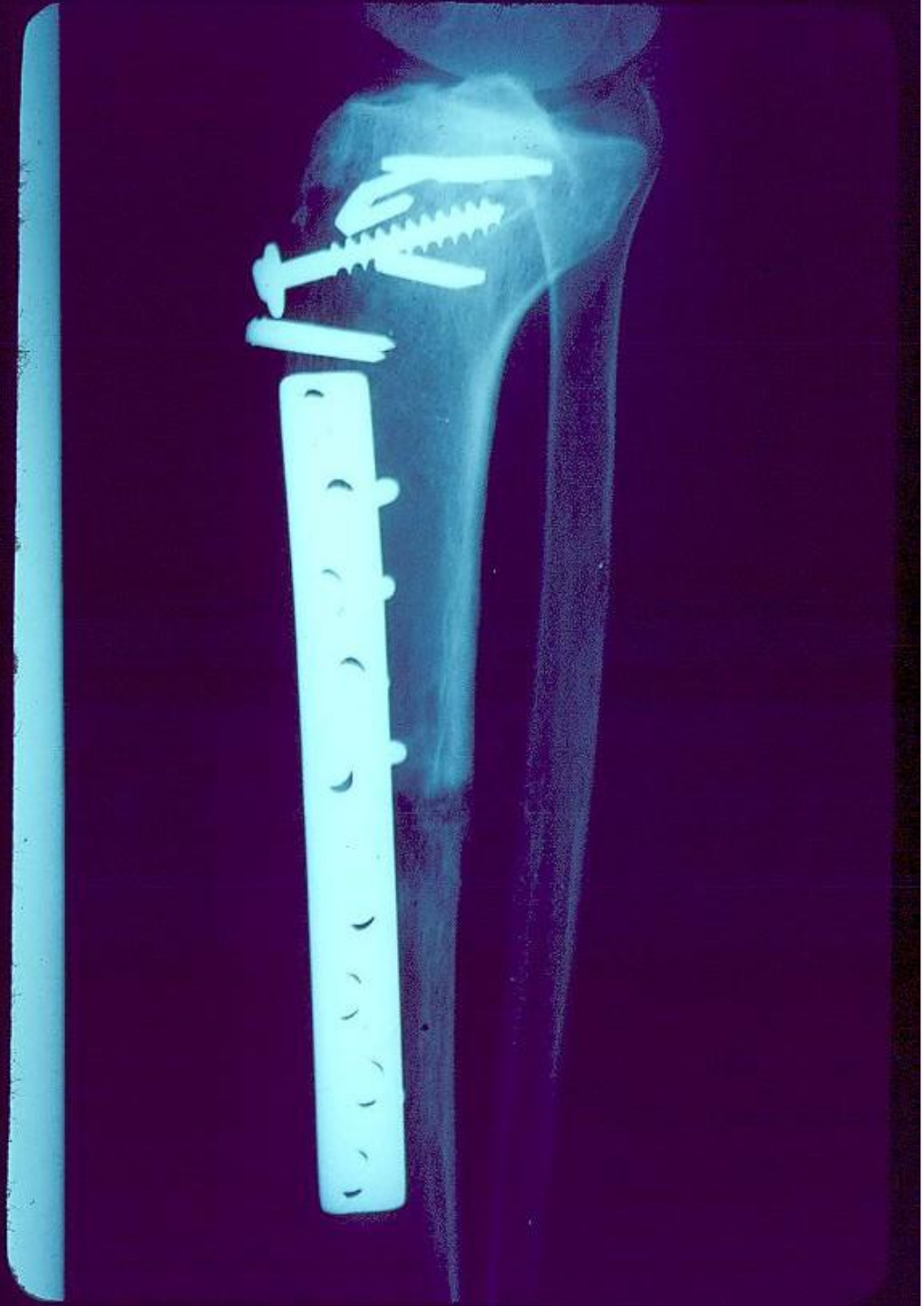
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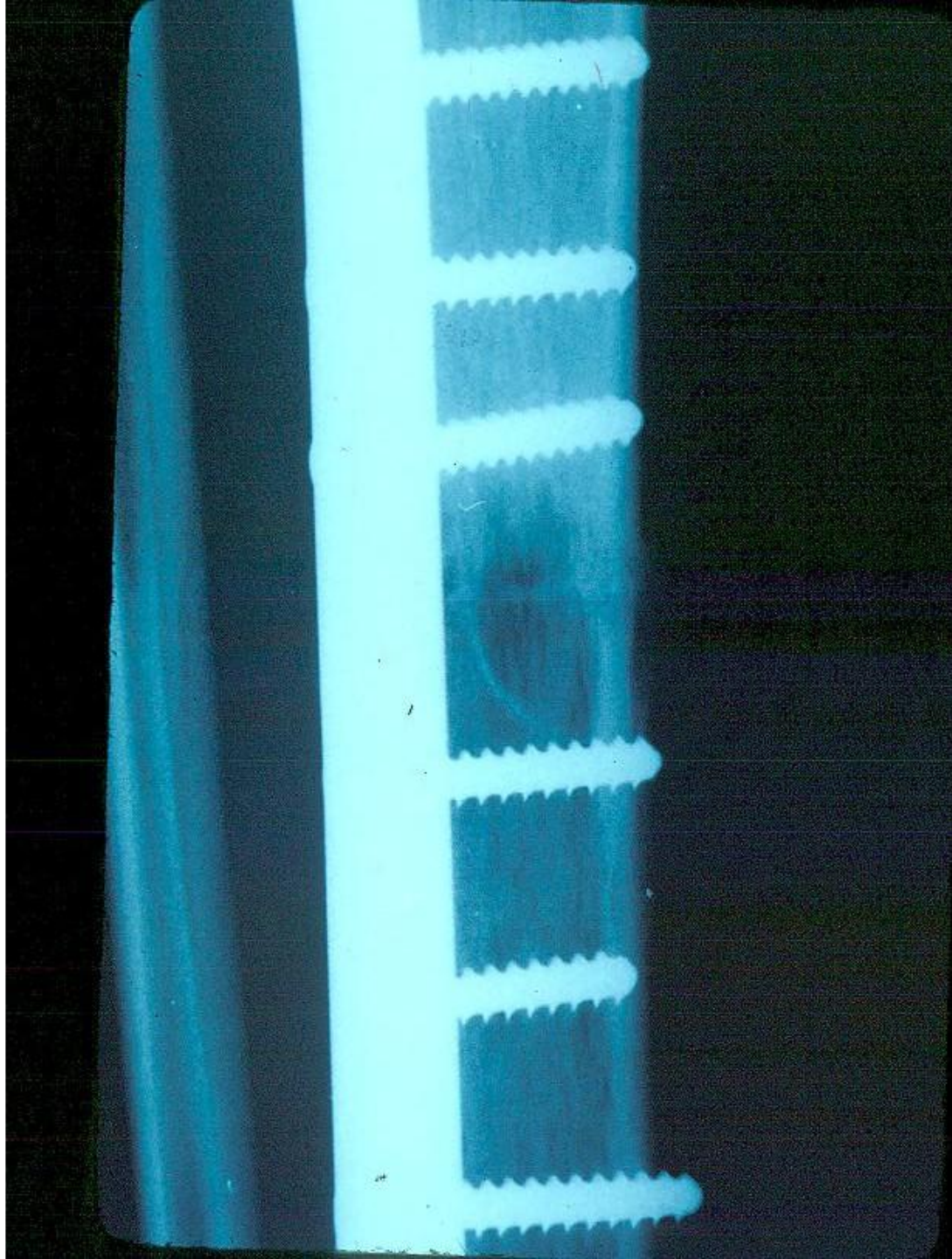
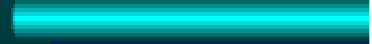
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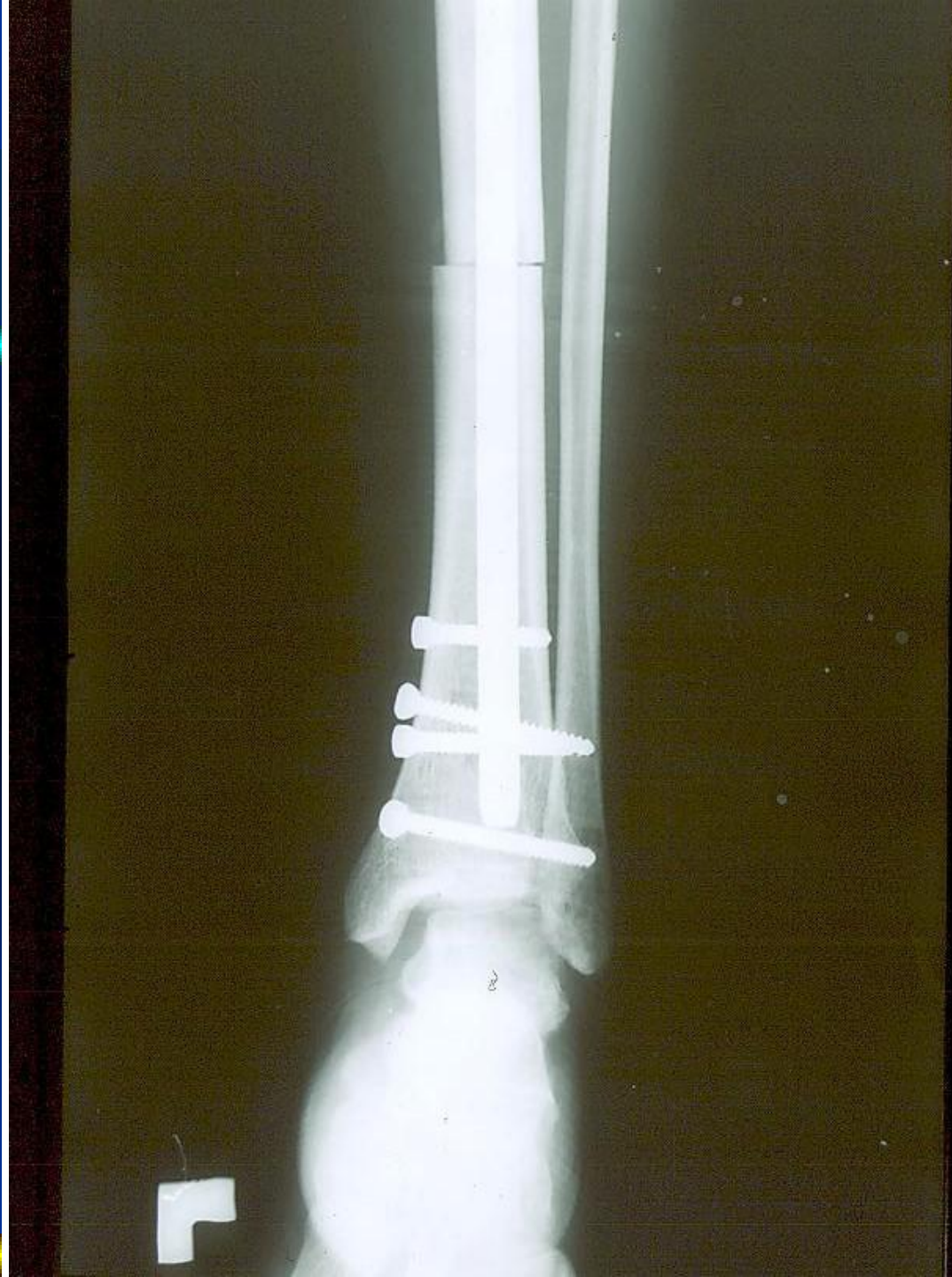








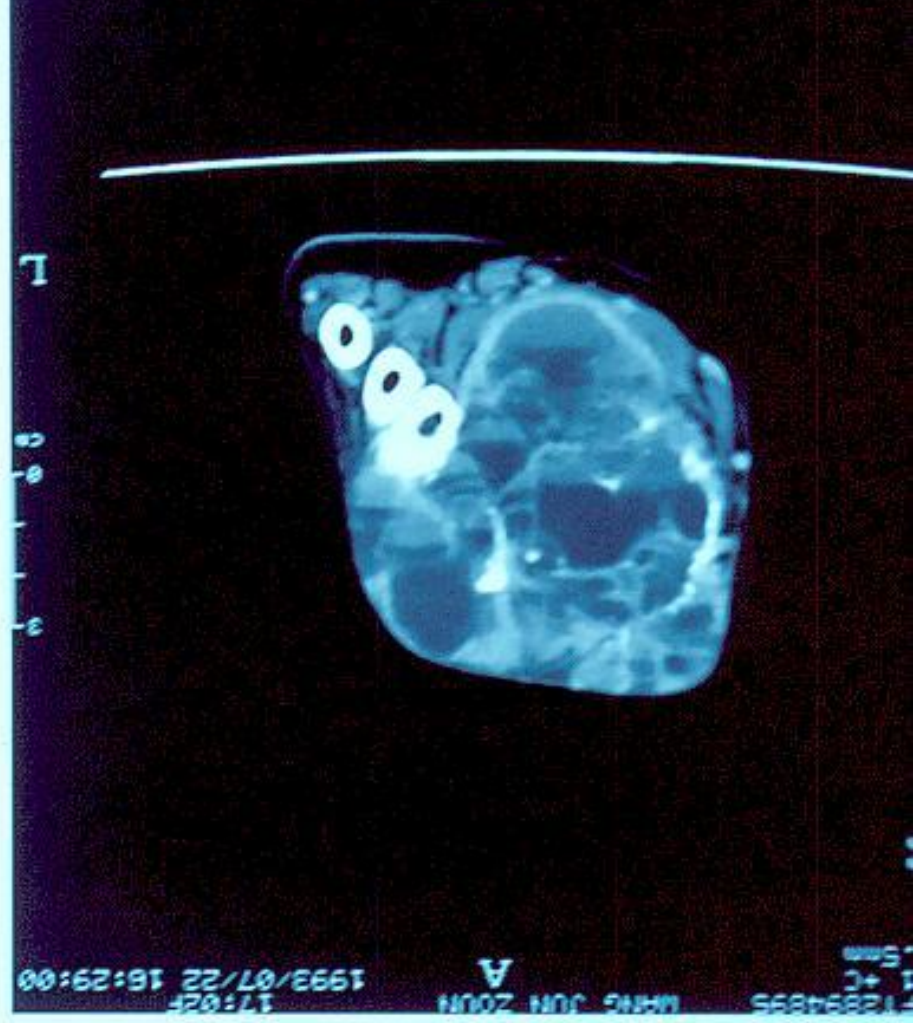






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C.G.M.H. TAIPEI

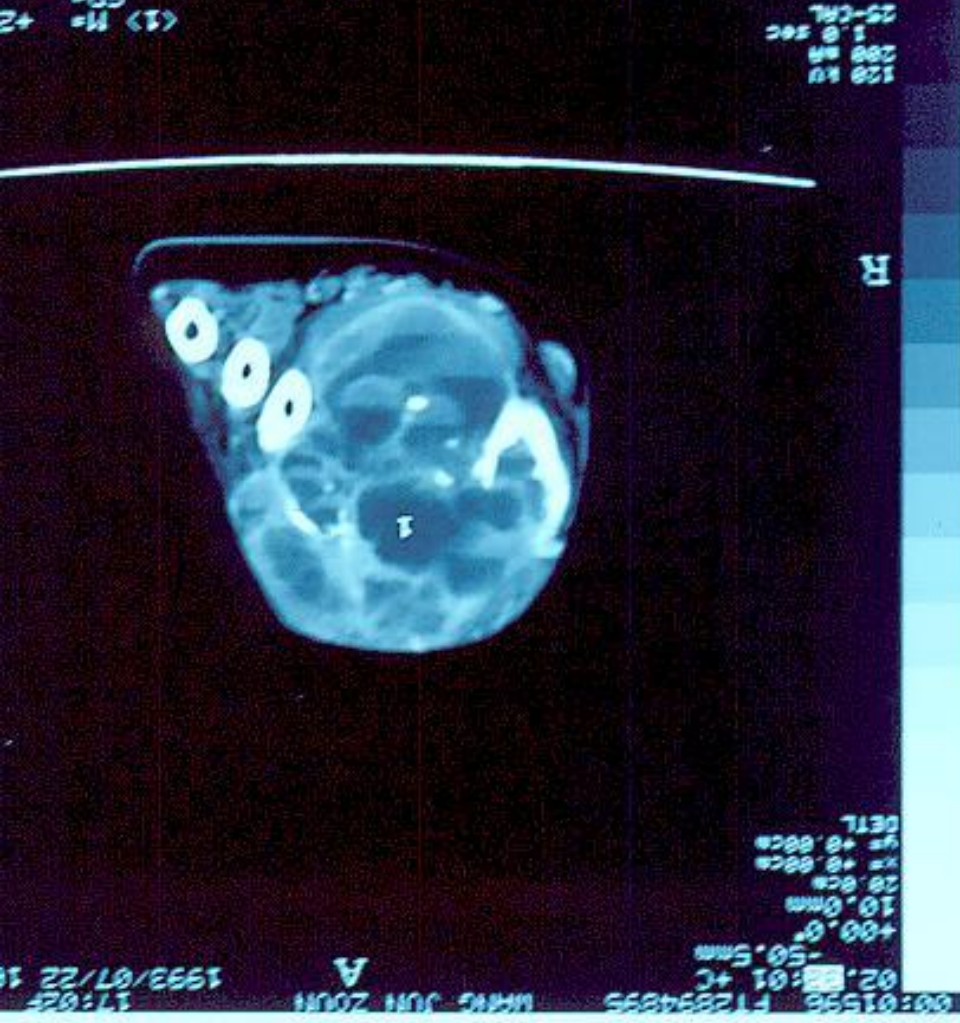


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C.G.M.H. TAIPEI



70 ML+69  
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C.G.M.H. TAIPEI

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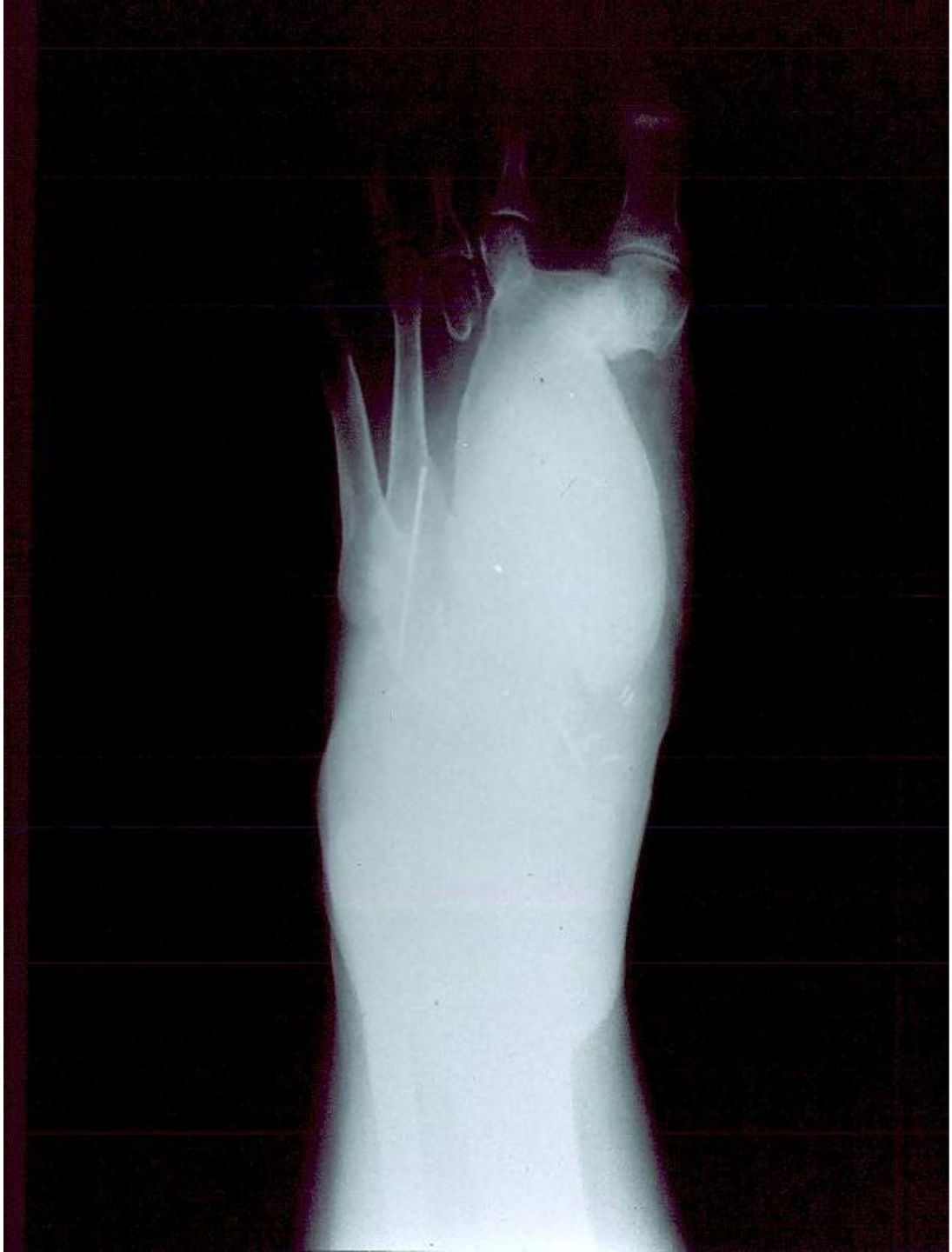






121 16





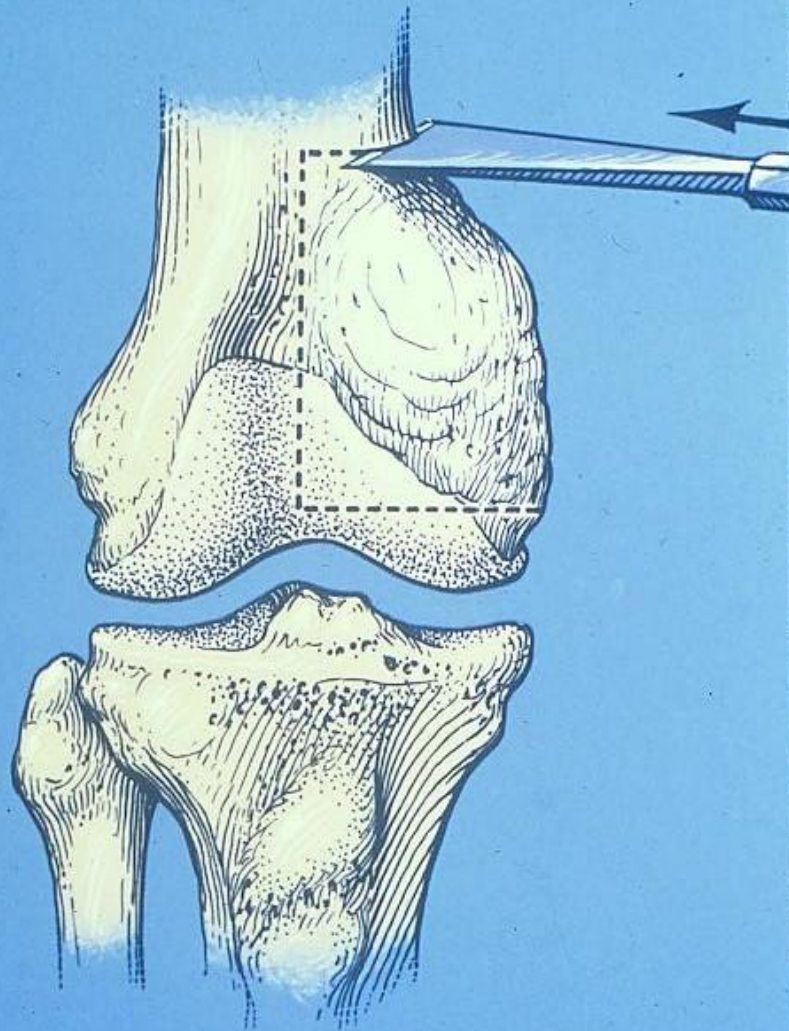
# Giant Cell Tumor

## Treatment Guidelines

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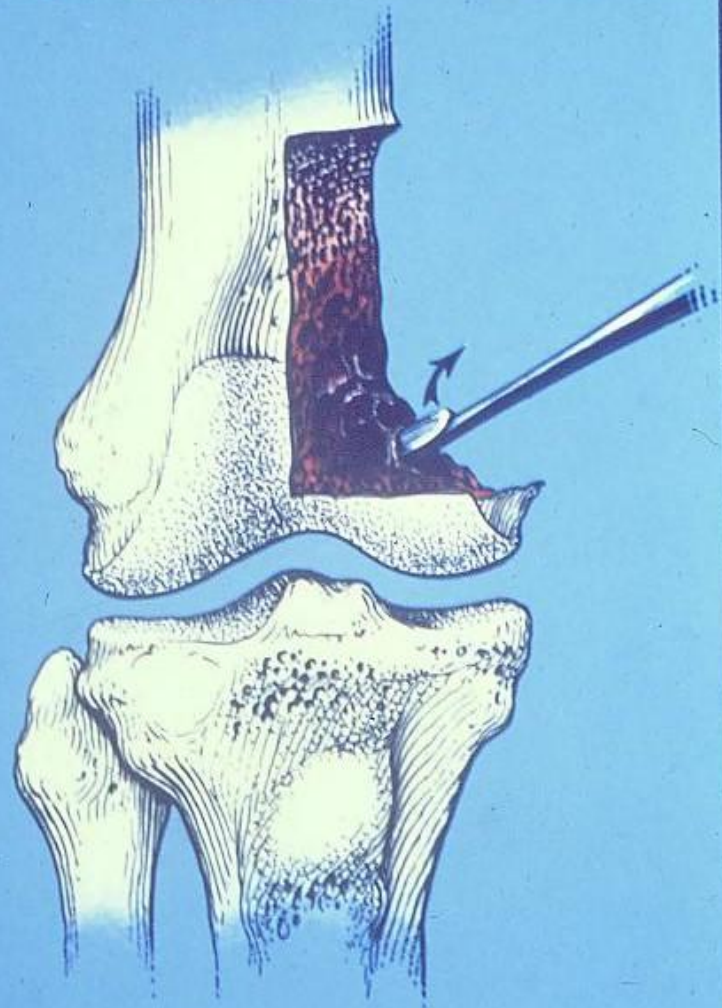
- ❖ Less extensive ... curettage and graft
- ❖ Borderline ... alternative
- ❖ Very extensive ... resection and reconstruction

## Excision and Curettage



B.

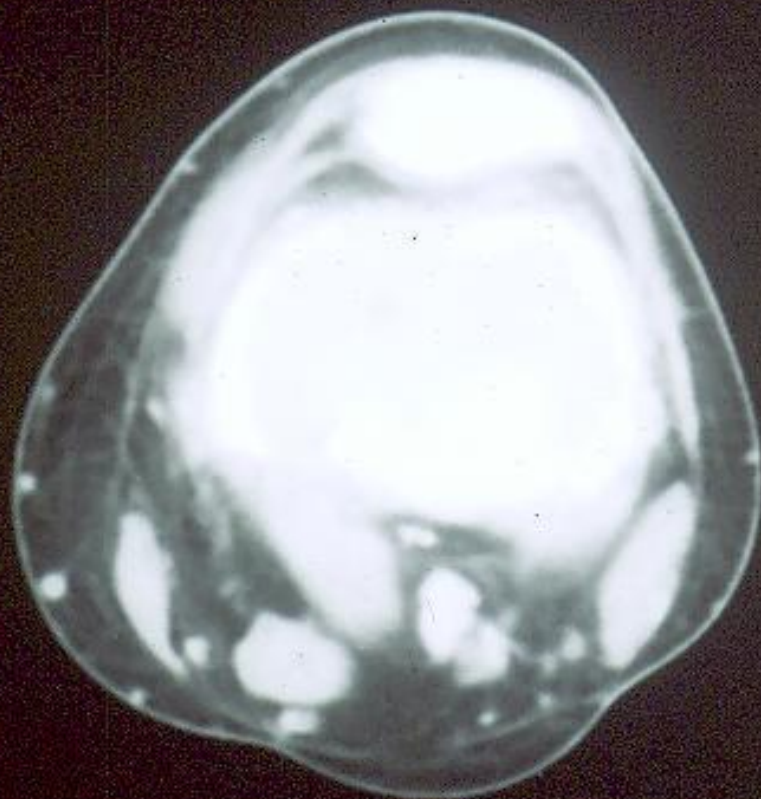
# Excision and Curettage



C.



9- 70.00CM  
STND



5  
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8-  
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L

148 KII







# Excision curettage and allografting of giant cell tumor.

*Shih HN, Hsu RW, Sim FH.*

World J Surg. 1998 May;22(5):432-7.

Between 1987 and 1994 we followed 22 patients with giant cell tumors involving the long bones. Their average age was 31 years (range 17-50 years). Five patients had grade II tumors and the other 17 grade III lesions. The average volume of lesions after curettage was 231 ml (range 56-450 ml). All of the patients underwent a modified excisional curettage, and the cavity was filled with deep-frozen allogenic corticocancellous bone graft with supplementary fixation. Two patients developed postoperative complications including a superficial wound infection in one case and a traumatic tibial plateau fracture in one case. The overall outcome was good or excellent in 91% of the patients (i.e., 20/22 cases). There was no degenerative joint arthritis and, surprisingly, no instance of tumor recurrence. Allograft infection and fracture were not present. An allogenic cortical strut with cancellous bone graft can be used safely and is effective for grafting cavitory lesions created after complete removal of the tumor.

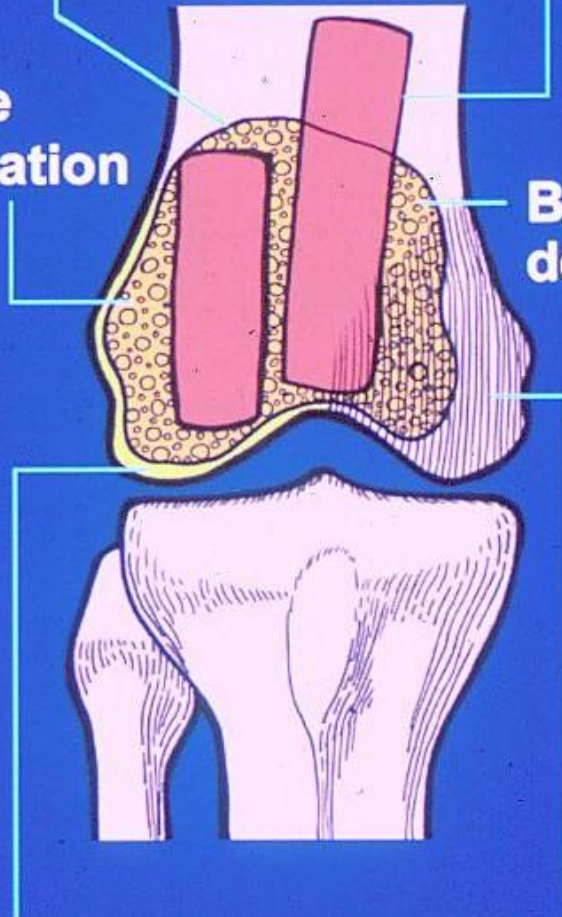


**Border of  
tumor-host junction**

**Border of  
cortical graft**

**Bone  
formation**

**Bone  
density**



**Subchondral**

**Trabeculation**

# Treatment Of Giant Cell Tumor Bone Allograft

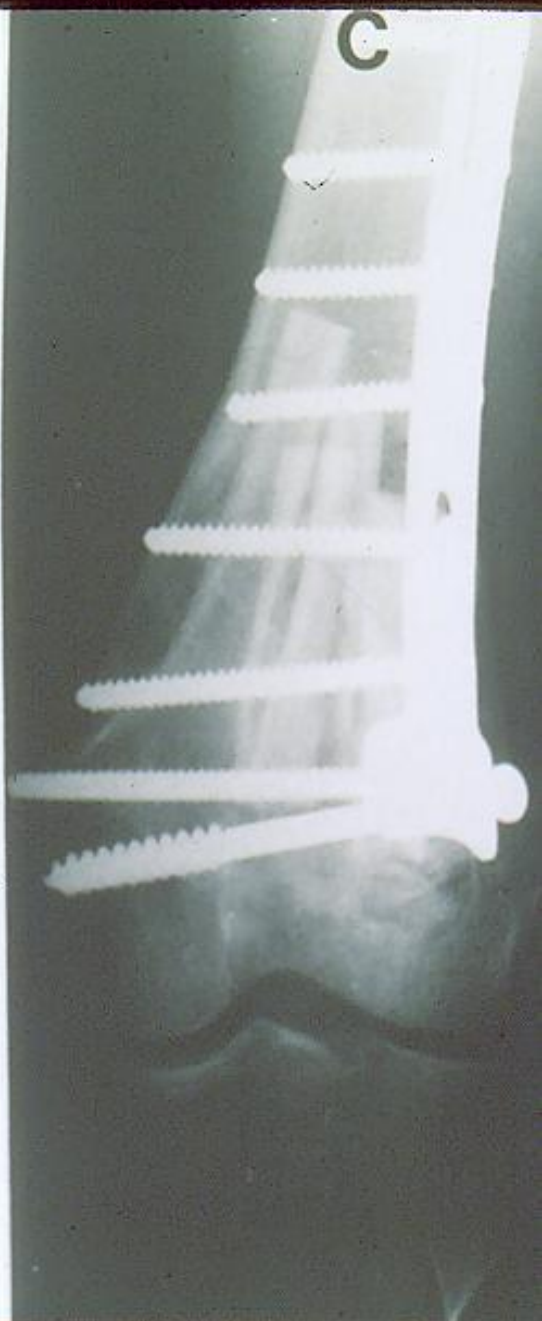
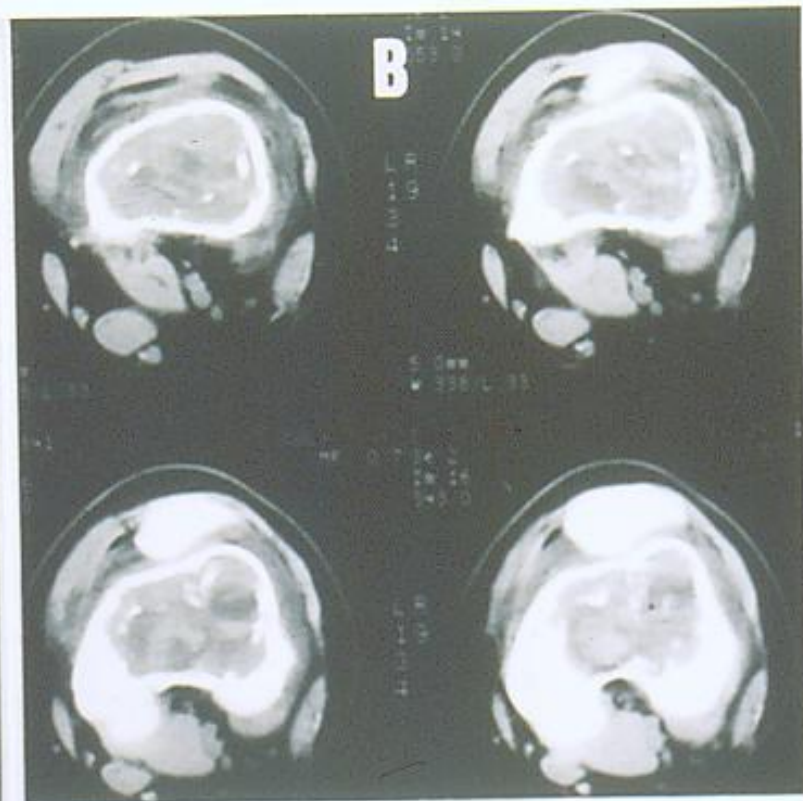
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- ❖ Advantage
- ❖ Eliminates need to sacrifice normal structures
- ❖ Avoids donor site morbidity
- ❖ Overcome limitation of size, shape and quantity

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# Excision Curettage and Allografting of Giant Cell Tumor.

*World Journal of Surgery 1998*







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# Semistructural Allografting in Bone Defects after Curettage.

*Journal of Surgical Oncology 1998*

# Conclusion

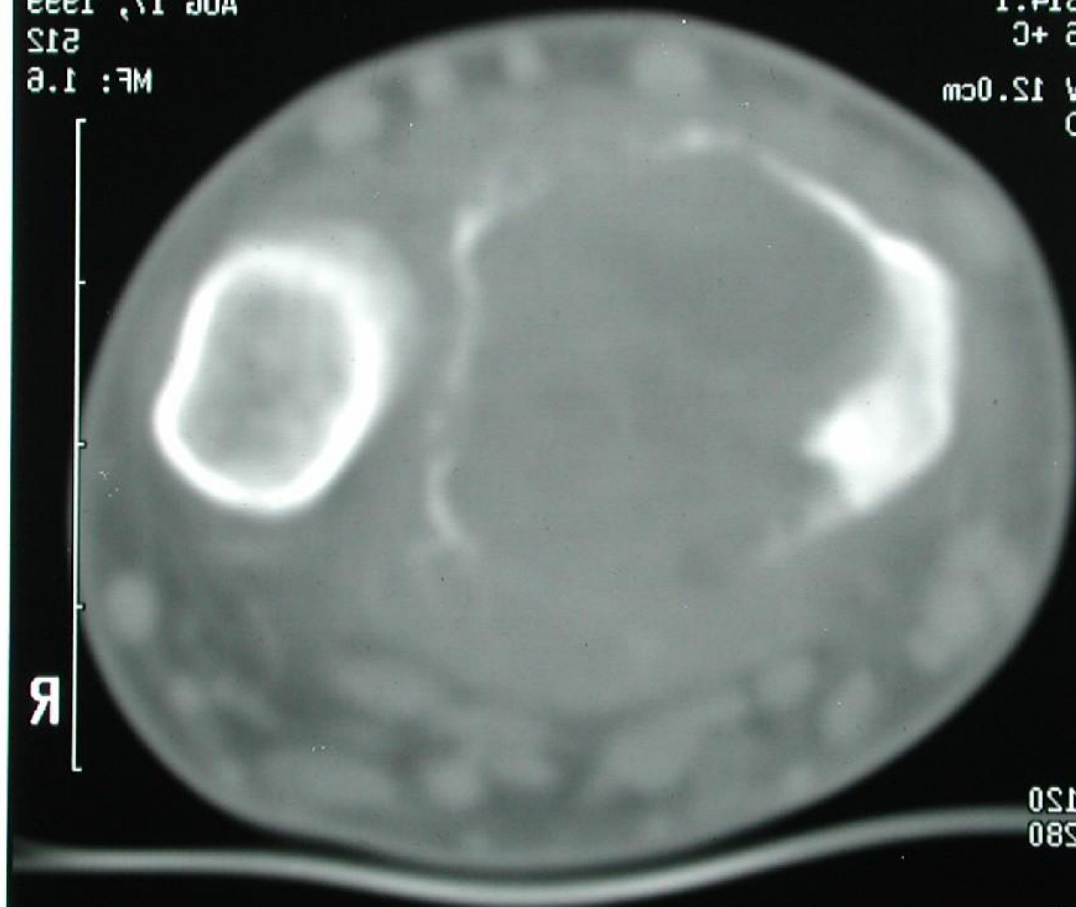
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- ❖ Cortical stent allograft provides increased strength, easy fixation, remodeling of the cystic defect, healing of the fracture and preventing deformity.
- ❖ Remodeling occurs slowly and may never be complete.



C.G.M.H. LINKOU 17 ROOM  
HONG SHIH HSUAN  
23 M 8892993  
AUG 17, 1999  
212  
MF: 1.8

CT H12geed Adv 2Y2WH20C  
Ex:12739  
Se:3  
EL 214.1  
Im:8 +C  
DFOV 12.0cm  
STND



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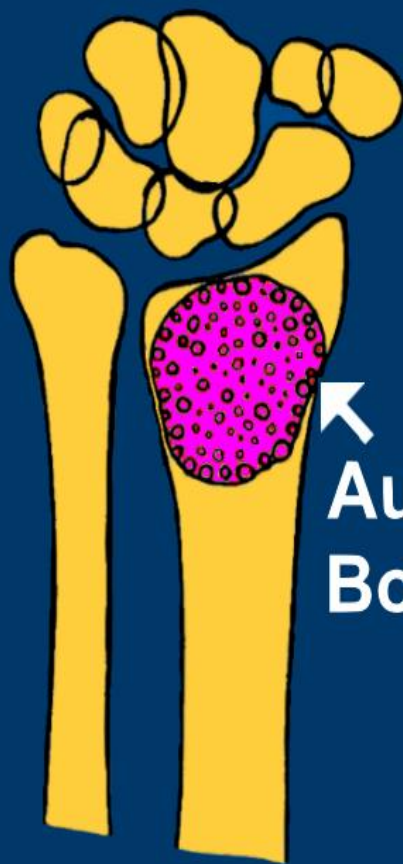
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8892993





Autogenous  
Bone Graft

A-P



Soft  
Tissue  
Mass

LAT



A-P



122 16.



4 2'38







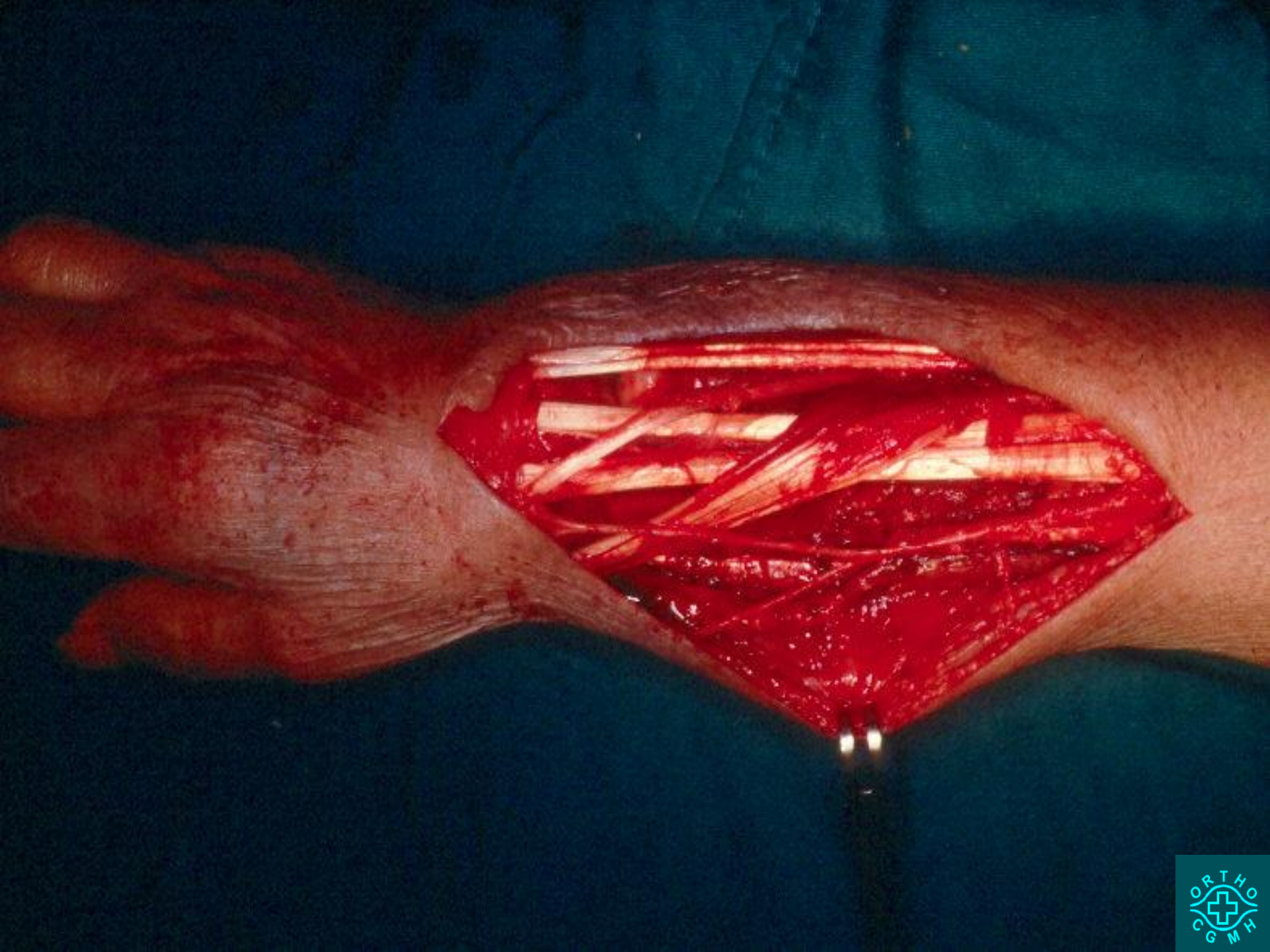


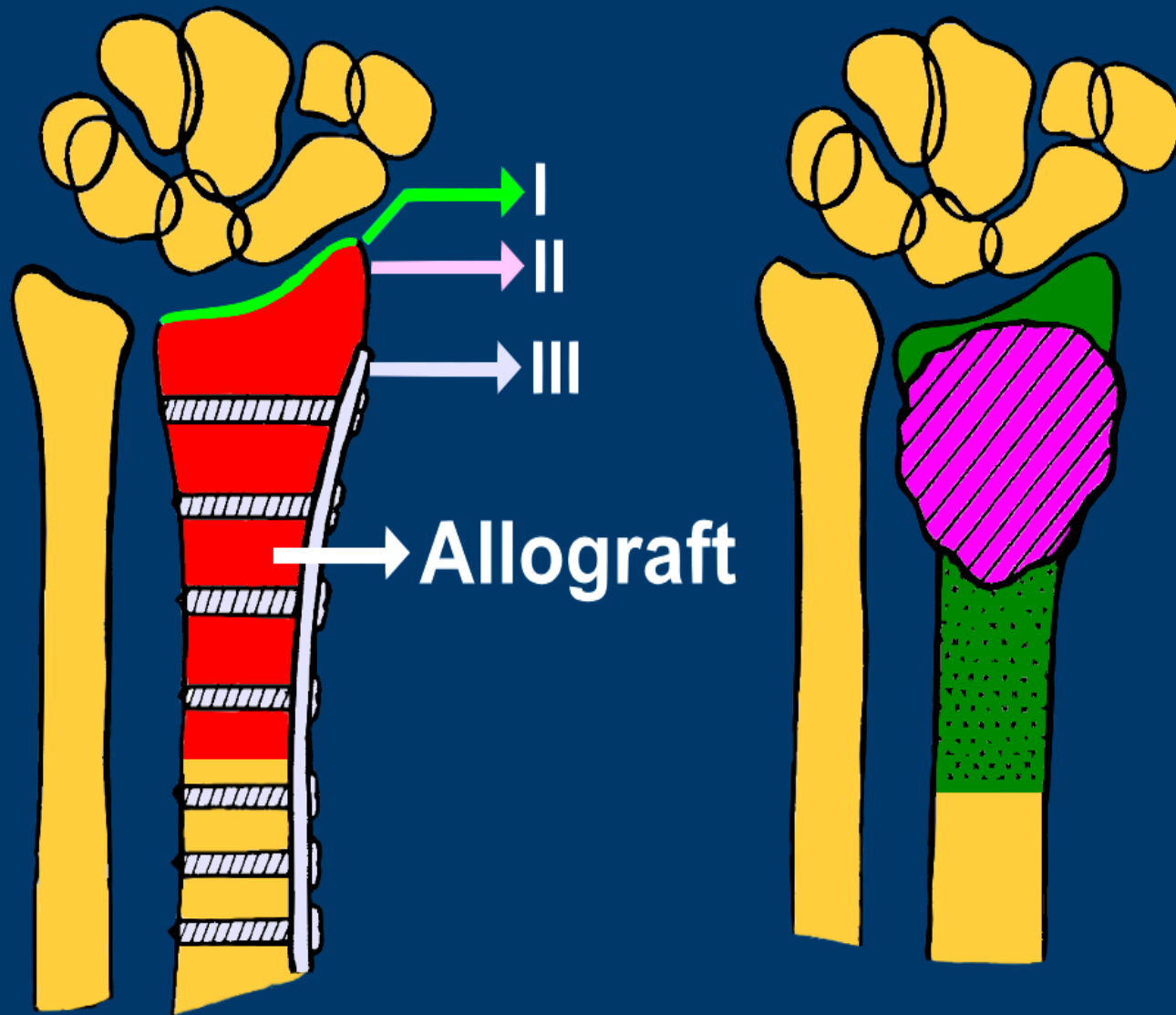
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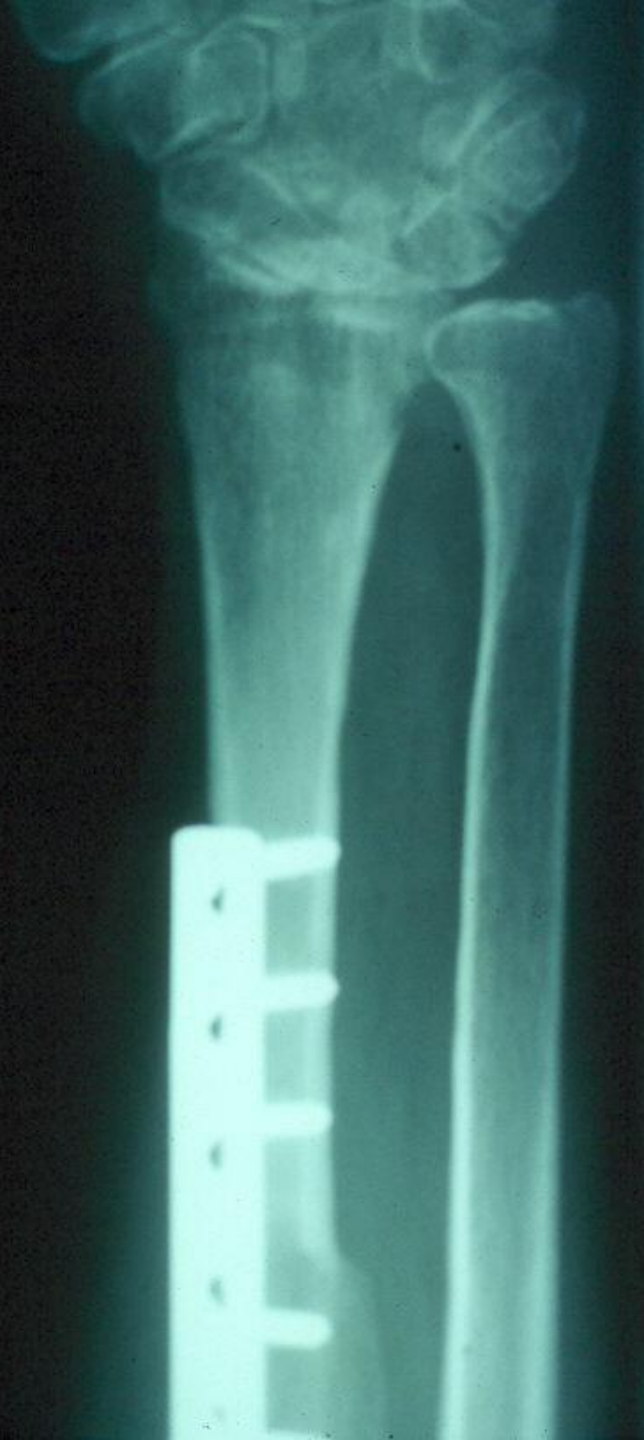








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# Treatment of Giant Cell Tumor of the Distal Radius.

*Clin Orthop Related Research 2001*



# Treatment of giant cell tumor of the distal radius.

*Cheng CY, Shih HN, Hsu KY, Hsu RW.*

*Clin Orthop Relat Res. 2001 Feb;(383):221-8.*

The results of surgical treatment of giant cell tumors of the distal radius were reviewed in 12 patients between 1982 and 1995. All 12 patients had Grade III lesions. Six of the 12 patients were treated using intralesional curettage with local excision, and the other six patients underwent en bloc resection with total condyle (four of the six by osteoarticular allograft, and the other two by fibular autograft) reconstruction with the aim of preserving the functional joint. There were no early or late complications such as infection, graft fracture, implant failure, or nonunion. No local tumor recurrence was seen in either group during the average followup of 6 years (range, 3-16 years). The best functional result was seen in the patients treated with intralesional curettage. The functional result of the resection group was good, achieving an average of 69% (range, 56%-83%) of their range of motion and 70% (range, 63%-77%) of their grip strength on the contralateral side. Intralesional excision should not be excluded as a possible treatment of Grade III lesions, although en bloc resection was used more commonly for these lesions because of tumor surgery reasons. Grade III lesions were treated with curettage when the tumor did not invade the wrist, destroy more than 50% of the cortex, or break through the cortex with an extraosseous mass in more than one plane. Reconstruction with osteoarticular allograft after en bloc resection is recommended in this non-weightbearing joint when there is contraindication for curettage of the lesion.



# Giant-cell tumor of the patella: report of two cases.

*Wang IC, Shih HN, Hsueh S, Hsu RW.*

Changeng Yi Xue Za Zhi. 1998 Sep;21(3):338-42.

Two patients with giant-cell tumors of the patella are presented in this report. Both patients were young females who were noted to have had nonspecific anterior knee pain and mild swelling of 1 to 12 months' duration prior to admission to our hospital. Local tenderness over the peripatellar area and slight limitation of full flexion were noted during physical examination. The radiographic presentation of each patella appeared as an expansile and lytic lesion with a thin cortex, without evidence of intra-articular involvement. Chest radiography and routine laboratory examination results were normal. After biopsy, intralesional curettage with phenol cauterization and allograft reconstruction was the preferred treatment in these two patients, with both tumors considered to be stage 2 according to Enneking's staging system. Following surgery, range of motion exercise was started after 6 weeks of immobilization with a long leg splint. Both patients regained full range of motion and were pain free. Radiographically, boneremodeling without evidence of recurrence was noted in both patients 2 years postoperatively.

# Recurrence Of Giant Cell Tumor

## Post-op of bone graft

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- ❖ Roentgenographic features
- ❖ Lucency at graft site
- ❖ Resorption of bone grafts
- ❖ Calcified deposits – soft-tissue recurrences

# Benign Giant Cell Tumor Of Bone Recurrence

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- ❖ Campancci Mayo Clinic CGMH
- ❖ Intralesional 27% 25-30%
- ❖ Marginal 8% 61%
- ❖ Wide or Radical 0% 0%
- ❖ Total 15% 16%

# Benign Giant Cell Tumor Of Bone

## Local Recurrence

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- ❖ Campanacci 1978 2M-9yrs (Ave. 19M)  
90% in first 3 yrs
- ❖ CGMH 1991 10.4M
- ❖ Recurrence ? Radiography grade
- ❖ Recurrent cases v.s. primary cases











# Giant Cell Tumor

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- ❖ Amputation
- ❖ Advanced lesion with massive destruction includes joint
- ❖ Multiple recurrences
- ❖ Secondary infections

# **Giant Cell Tumor**

## **Sacrum, ilium, spinal column**

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- ❖ **Difficult diagnosis**
- ❖ **Center in the spinal body**
- ❖ **Purely lytic lesions**



# CHANG-GUNG MEMORIAL HOSPITAL LINKOU MEDICAL CENTER TAIWAN

**THANK YOU !!**

