Diagnosis and treatment of Bone Tumors and Soft Tissue Lesions

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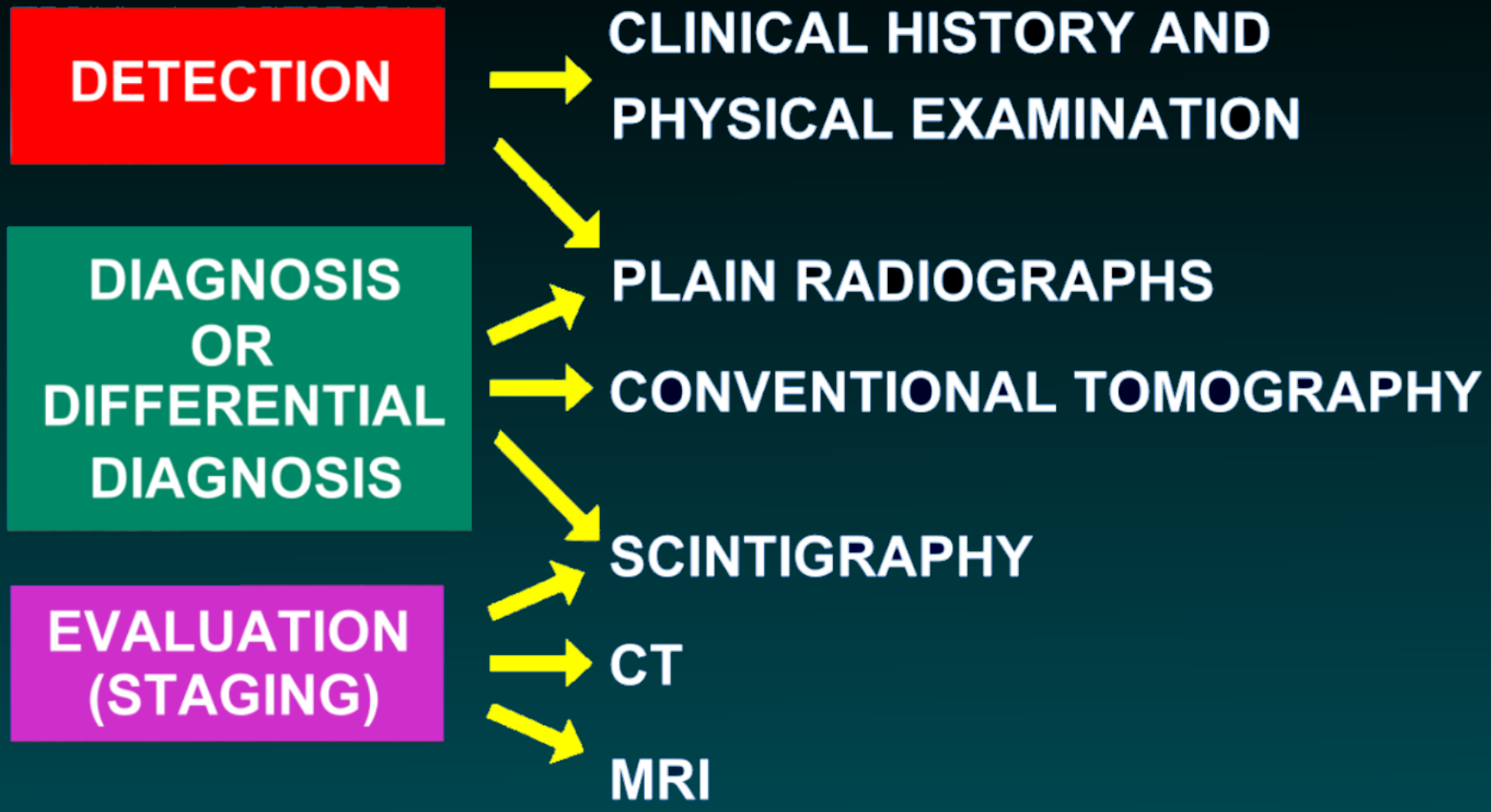
CHANG GUNG UNIVERSITY,COLLEGE OF MEDICINE

TAIWAN


ORTHO
CGMH

Bone Tumors

- Soft Tissue Tumors
- Metastatic Tumors
- Primary Bone Neoplasms

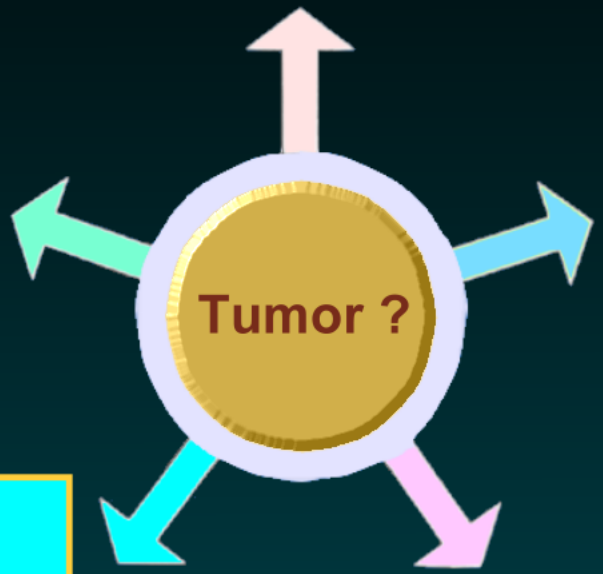

DETECTION
DIAGNOSIS OR DIFFERENTIAL DIAGNOSIS
EVALUATION (STAGING)
CLINICAL HISTORY AND PHYSICAL EXAMINATION
PLAIN RADIOGRAPHS
CONVENTIONAL TOMOGRAPHY
SCINTIGRAPHY
CT
MRI

Radiographic Evaluation

- Routine plain films
- Tomography
- Computed tomography (CT scan)
- Magnetic resonance imaging (MRI)
- Angiography
- Others

AGE, SEX

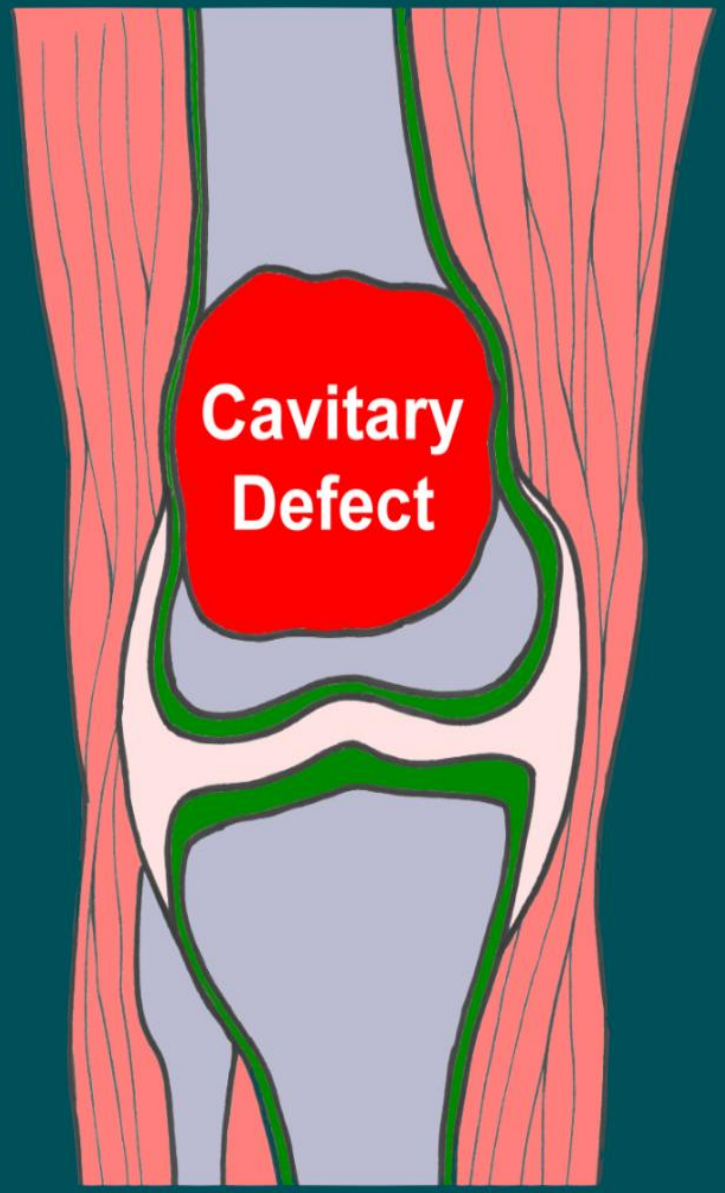
MORPHOLOGY
- Border
- Bone Destruction
- Periosteal Reaction
- Matrix
- Soft Tissue Mass



SINGLE
MULTIPLE

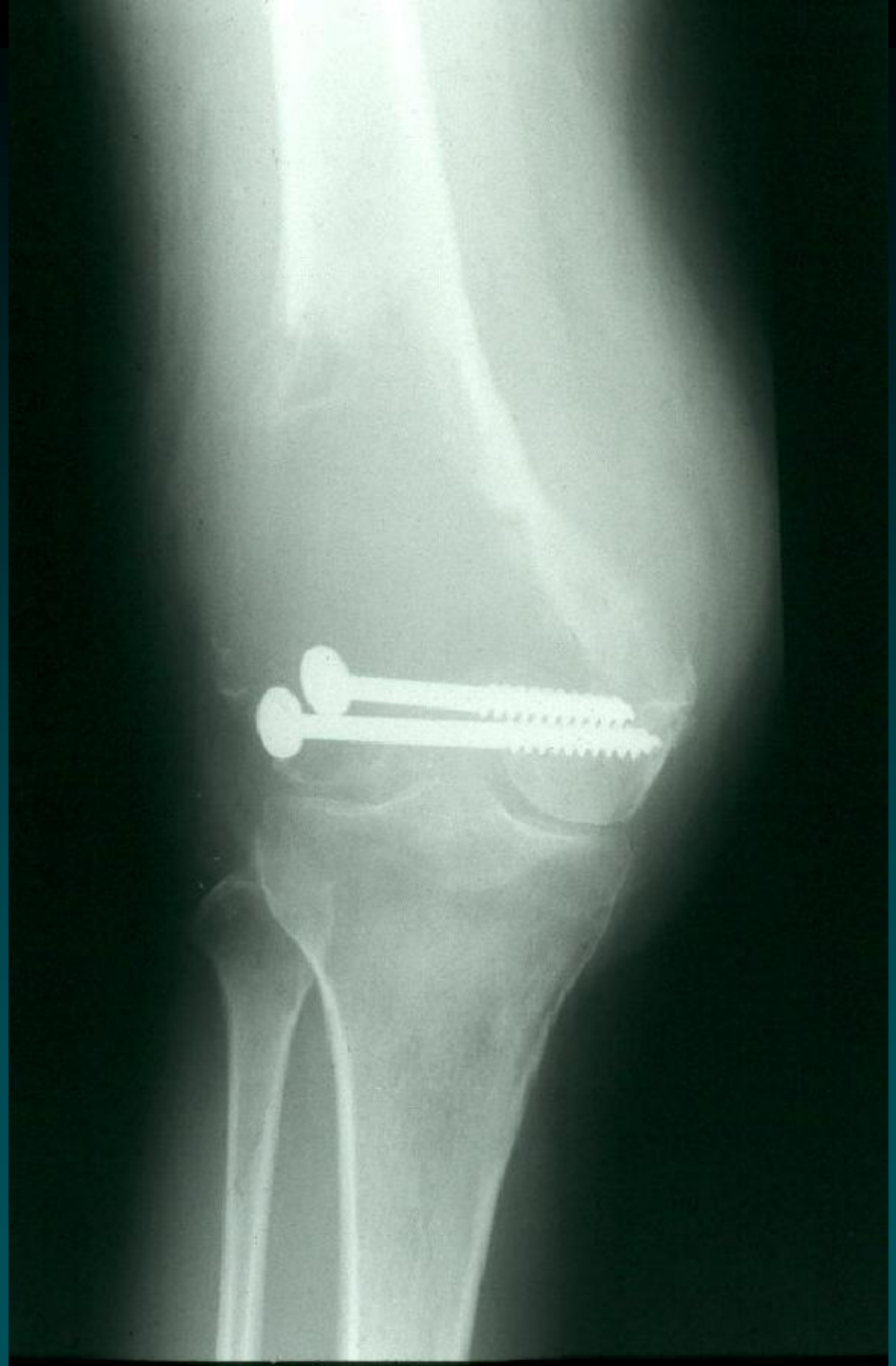
LOCATION
IN PARTICULAR BONE:
What Part of Bone?
(Epiphysis, Metaphysis,
Diaphysis, Central,
Eccentric)

LOCATION
IN THE
SKELETON:
What Bone?


Cavitary
Defect

Differential Diagnosis

- New growth
- Bone infection
- Metabolic bone disease
- Fracture healing
- Bone necrosis
- Others



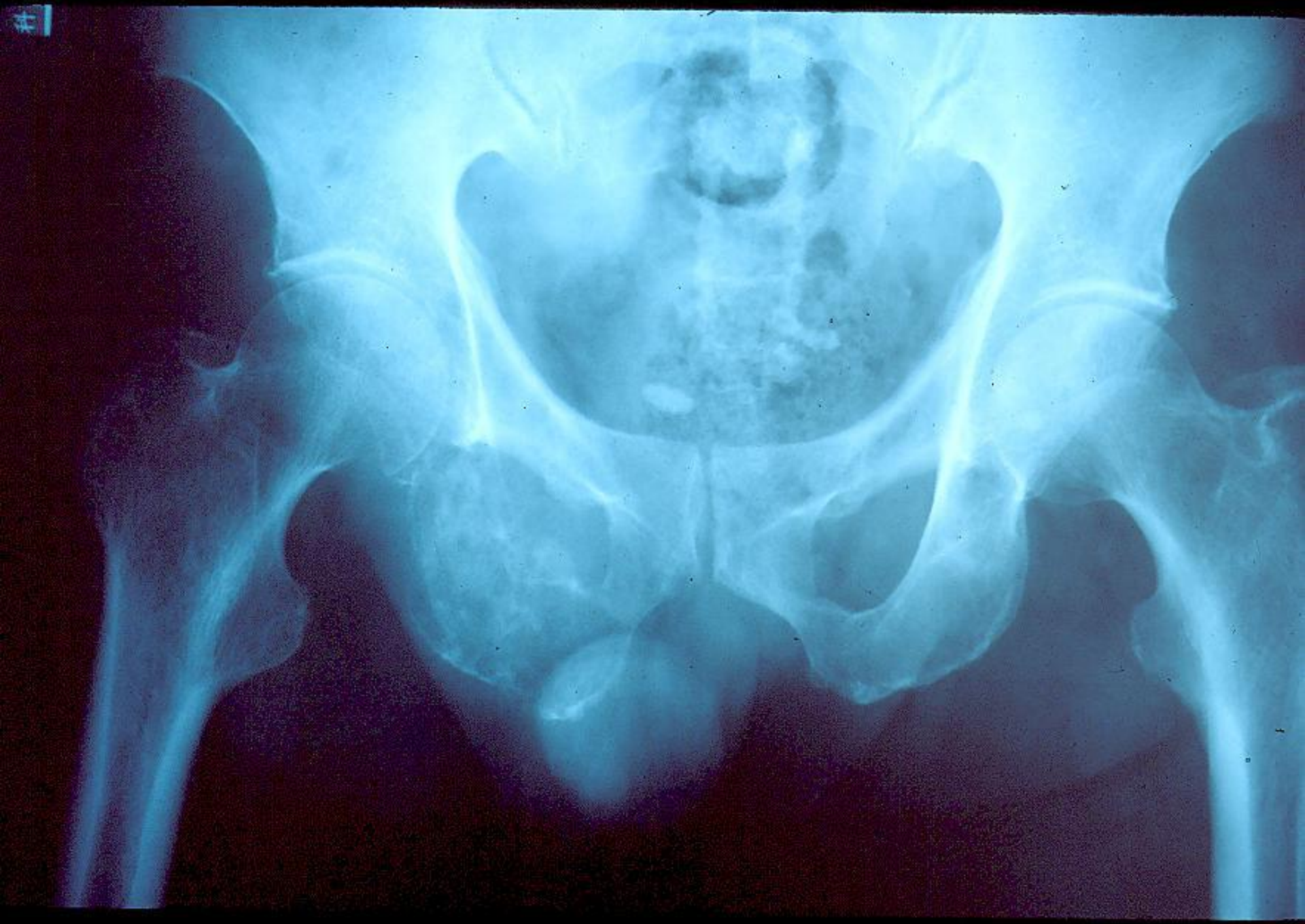
Goal of Orthopedic Oncology

- Tumor itself (benign or malignant)
- Fracture
- Deformity (Length discrepancy)
- Neurologic complications
- Cosmetic
- Pain

Biopsy

Medical Oncology

- Chemotherapy
- Radiotherapy

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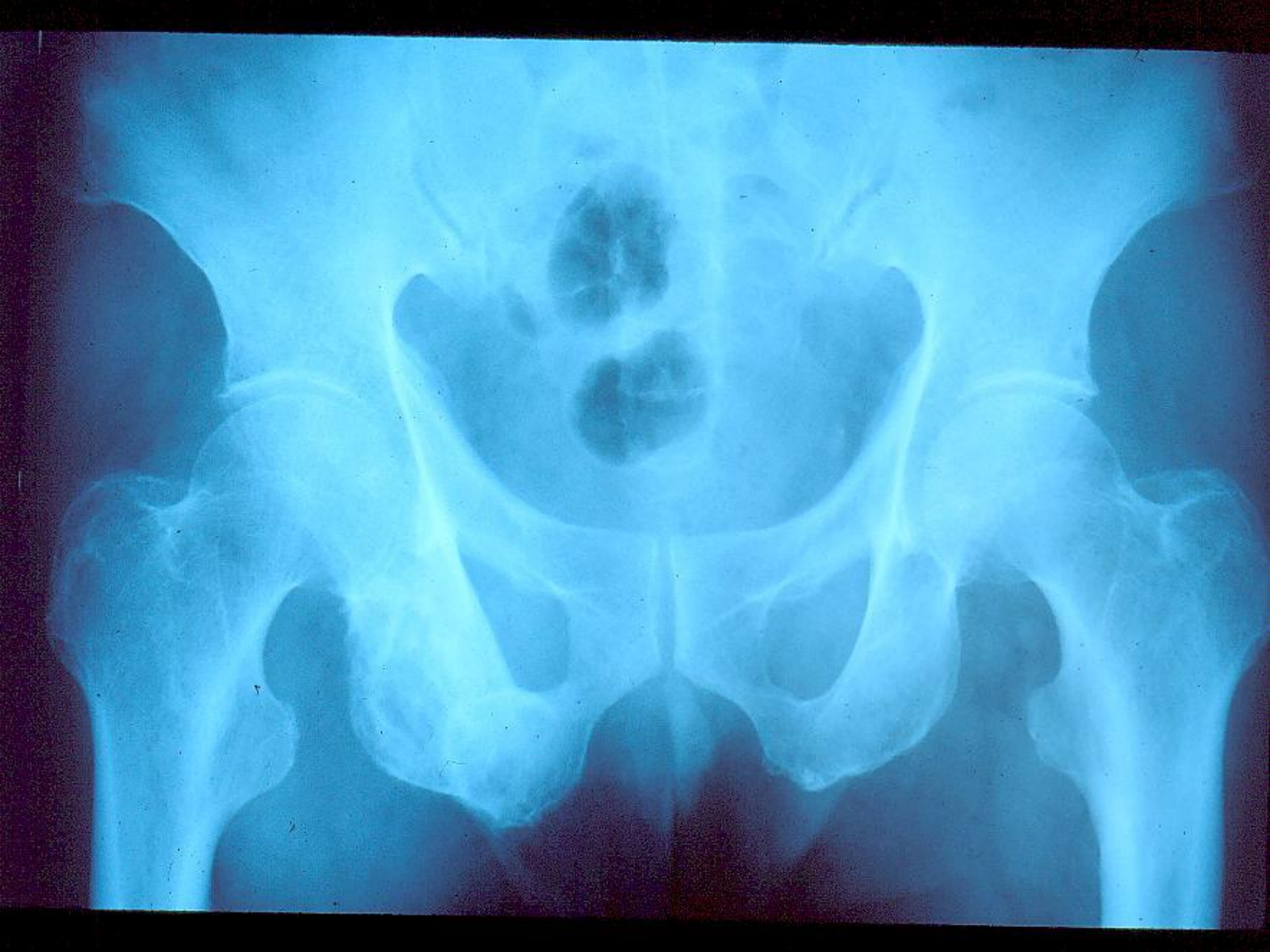


Surgical Oncology

Radical Excision
and
Reconstructive Procedure

Orthopedic Oncology

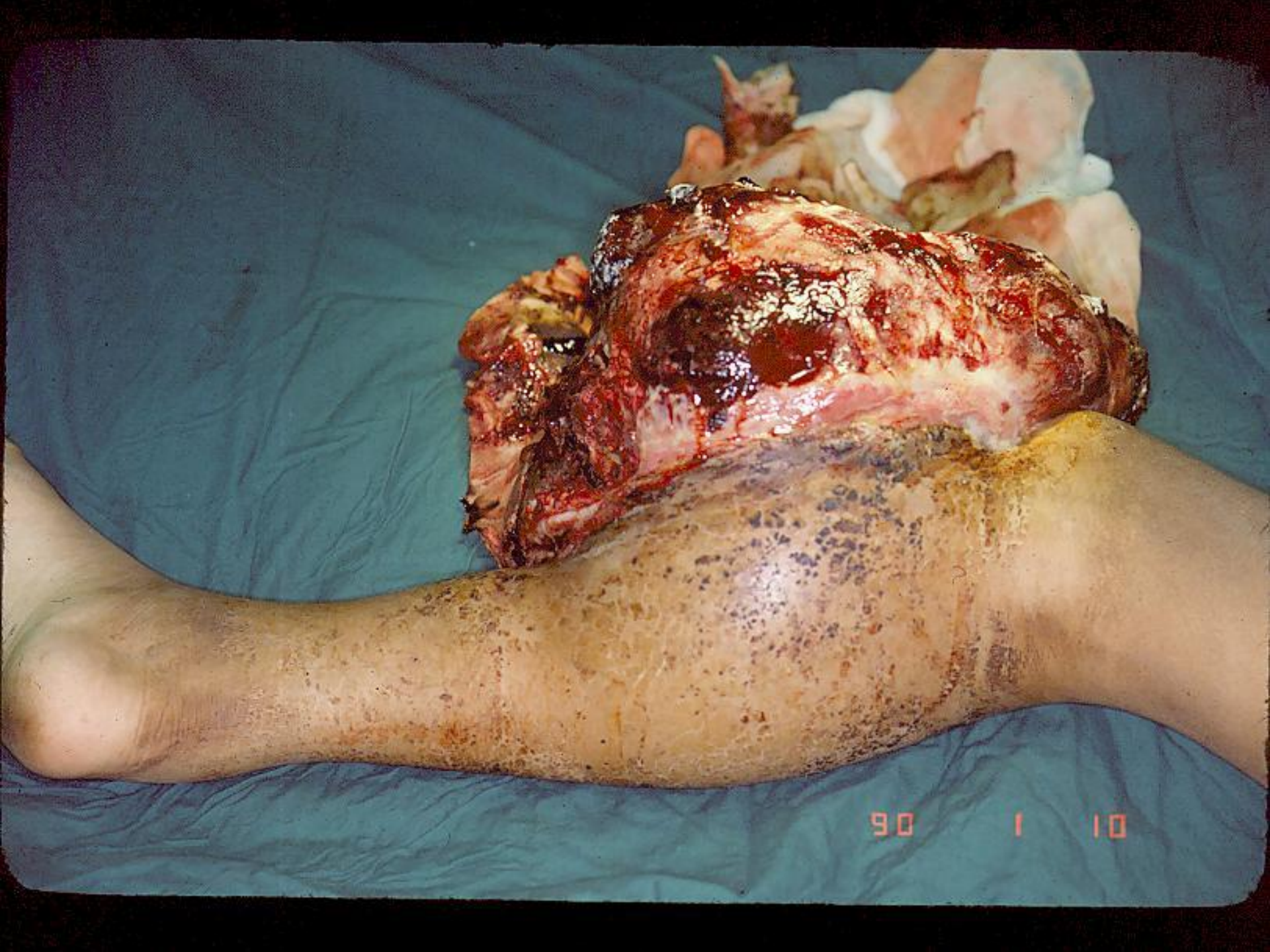
- Benign → Aggressive → Malignancy
- Surgery VS Conservative
- Curettage VS Resection
- Amputation VS Limb Salvage
- Mobile Joint VS Arthrodesis
- Reconstructive Procedures and Materials

Surgical Oncology

Amputation

or

Limb Salvage


90 1 10

Limb Salvage Surgery

Oh! No!
No AMPUTATUON

Limb Salvage Surgery

Oh! Yes!
LIMB
SALVAGE
SURGERY!!

Orthopaedic Oncology
Benign lesions

- Observation
- Conservative treatment
- Simple excision
- Steroid injection
- Chemical agents
- Curettage (±Bone grafting or bone cement)
- Radiation ?

Orthopaedic Oncology

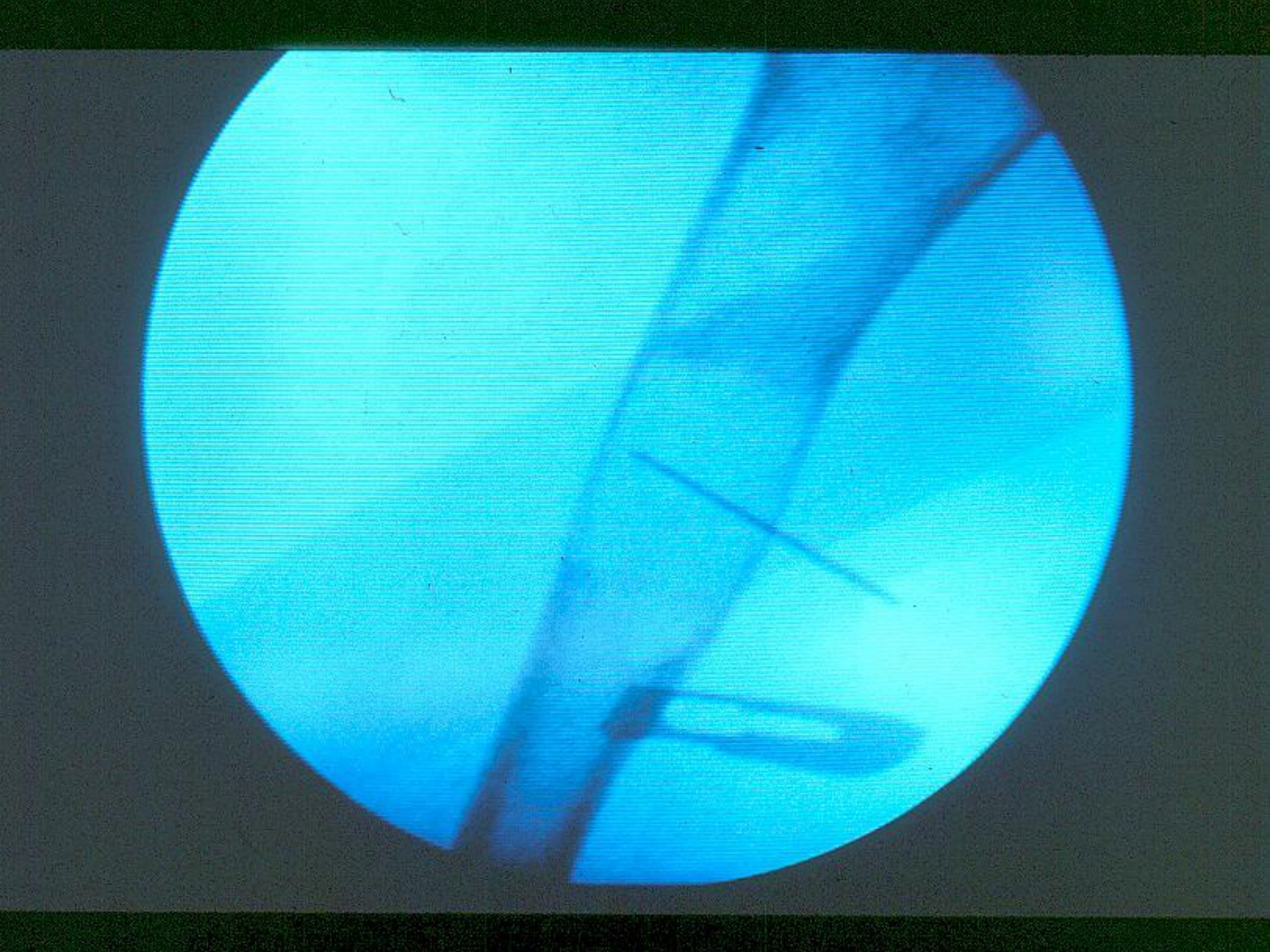
Aggressive benign or malignant lesions

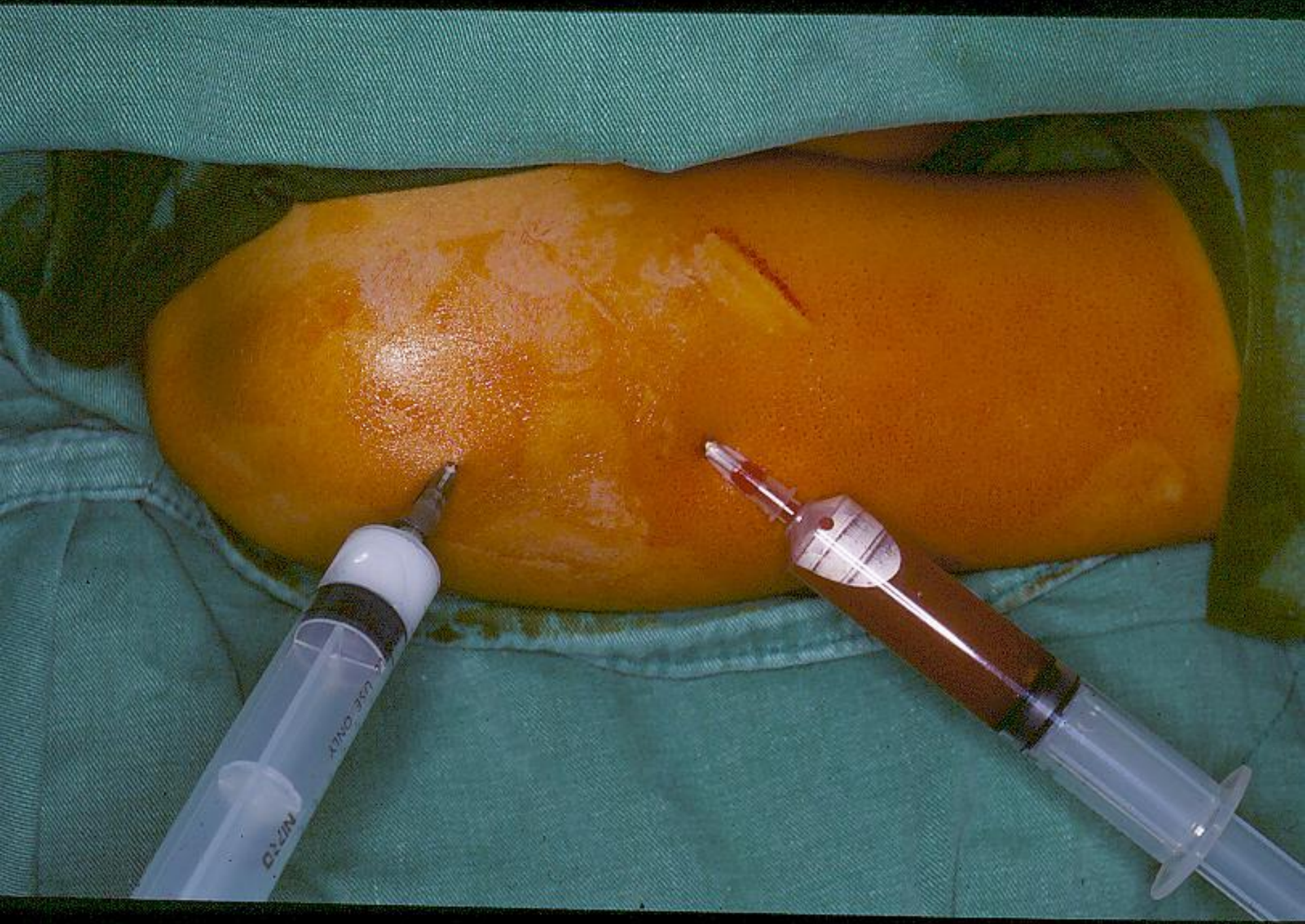
- Radical resection and reconstructions
  - Autogenous bone graft
  - Banked bone graft
  - Custom-made prosthesis
  - Soft tissue reconstruction
  - Combination
- Amputation


82 6 18


82 6 18


R

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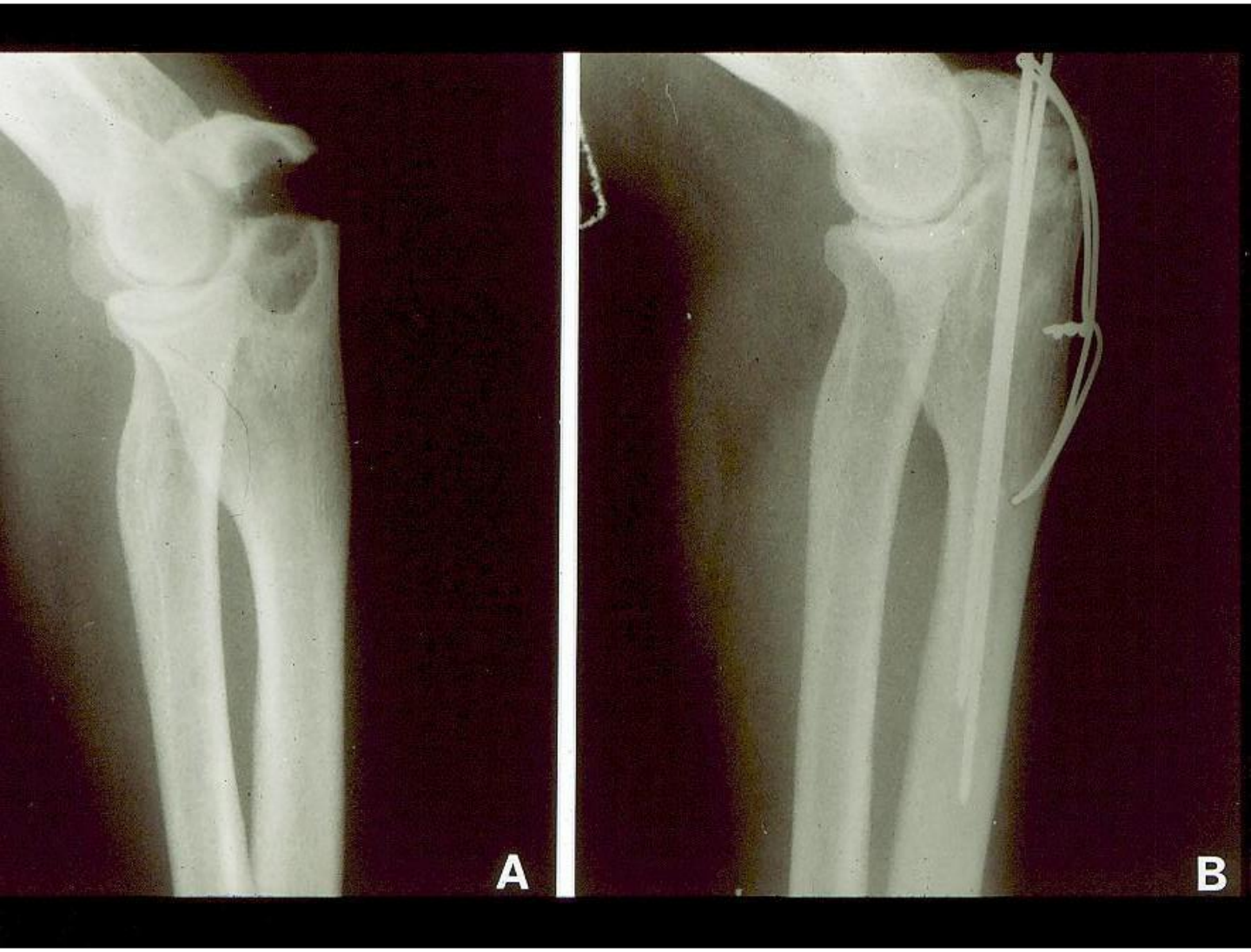
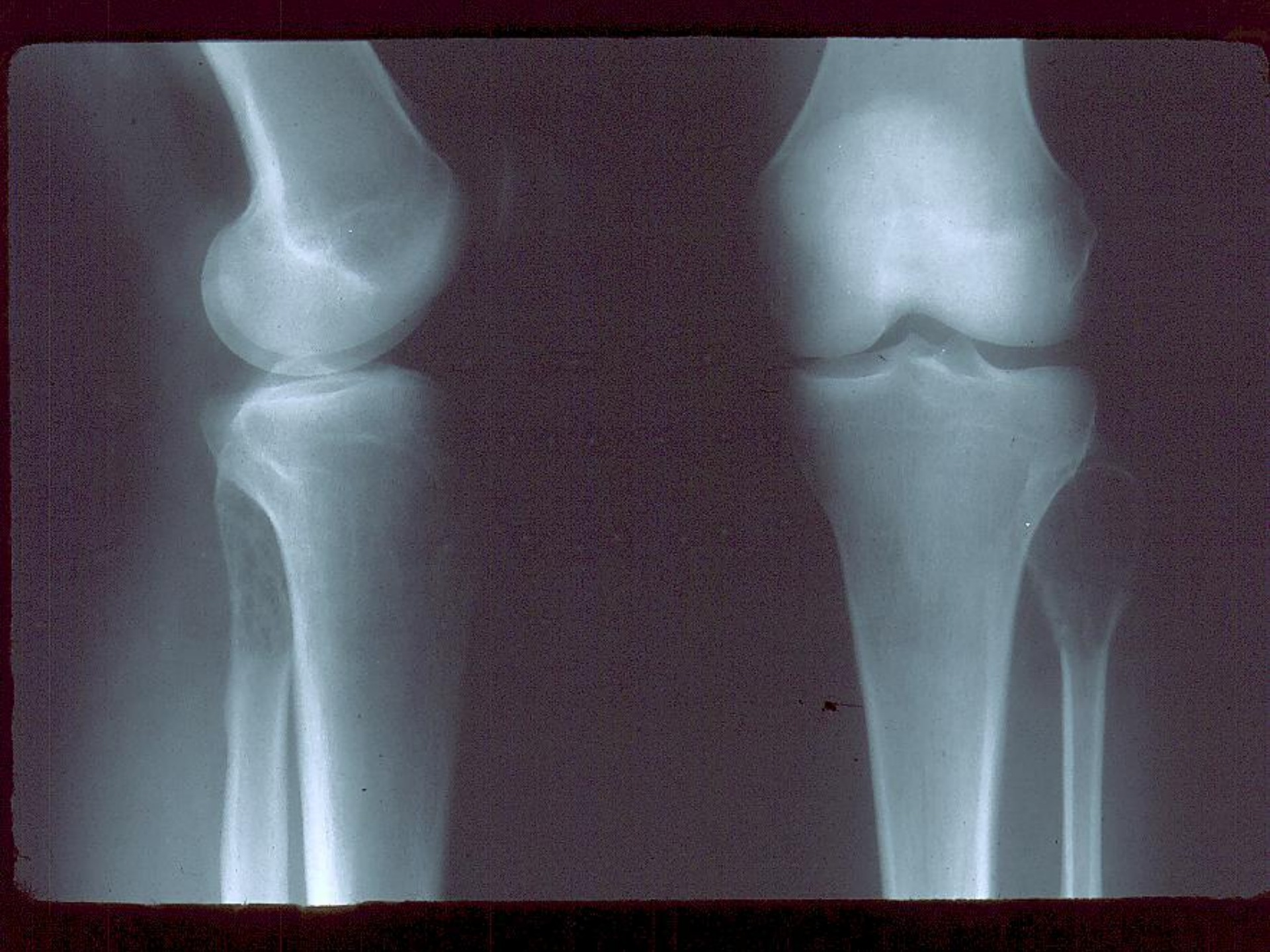
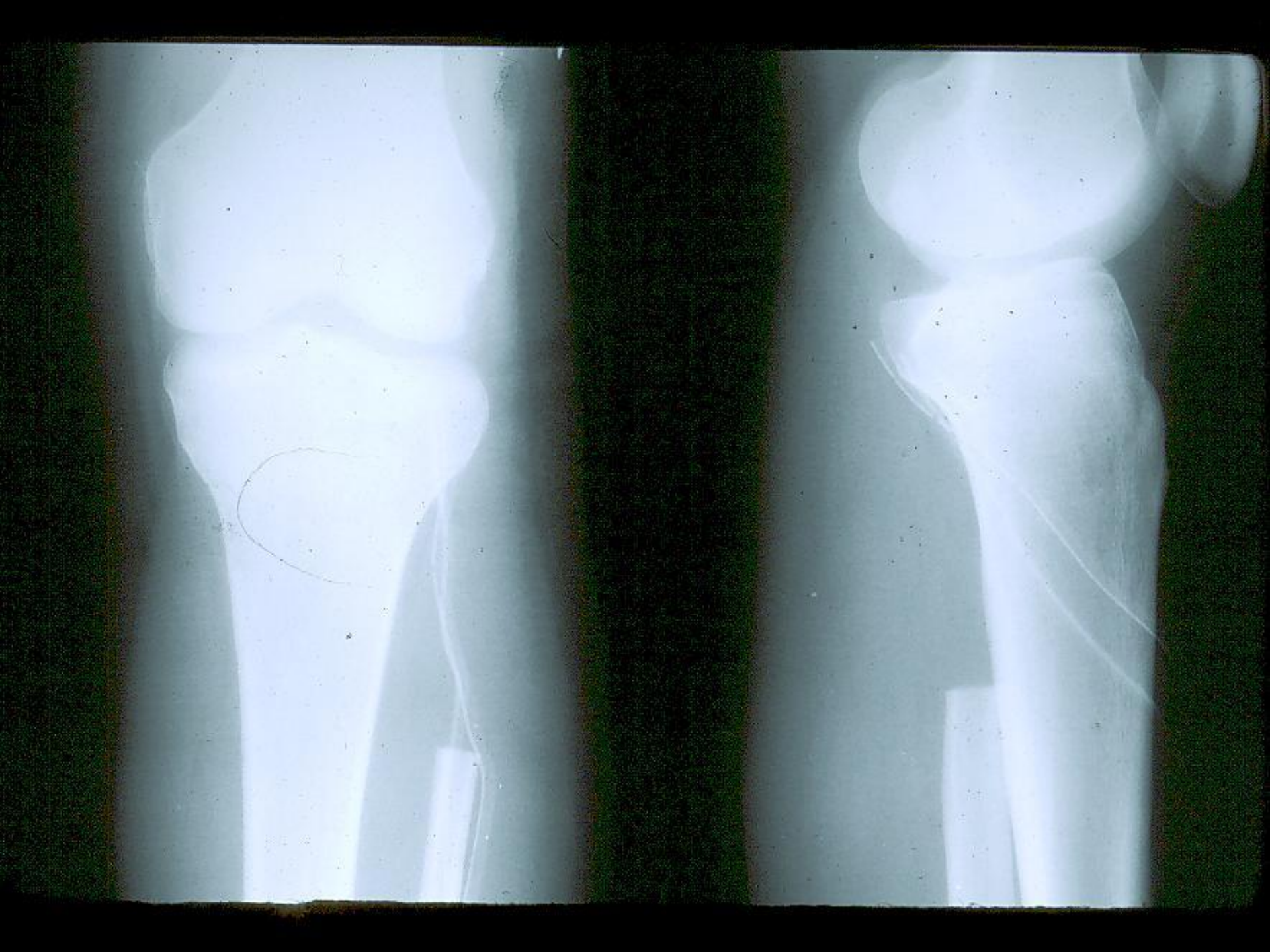

A
B

Expendable Bones

- Proximal radius
- Distal ulna
- Clavicle
- Rib
- Iliac wing
- Fibula
- Toes or fingers


7



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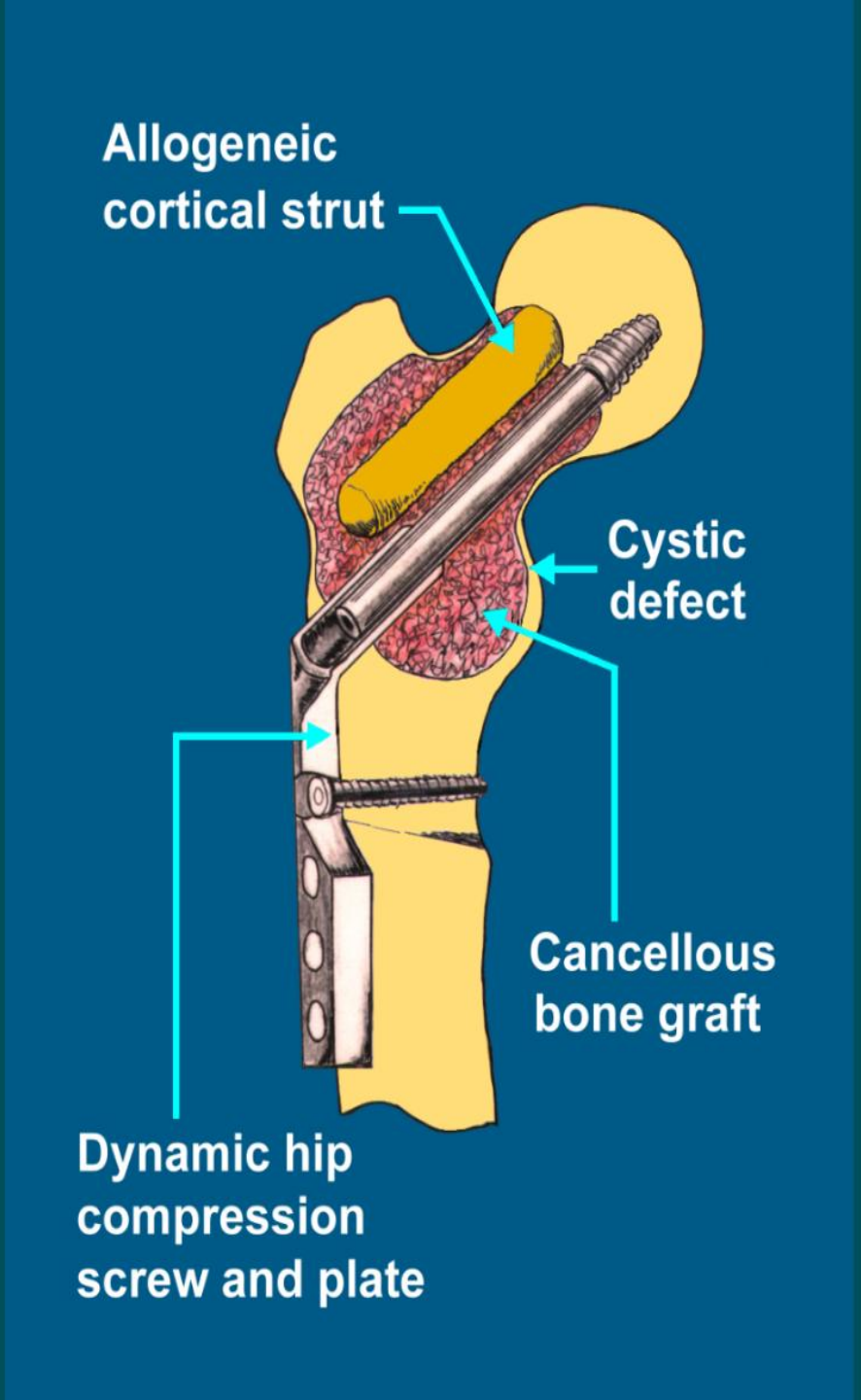
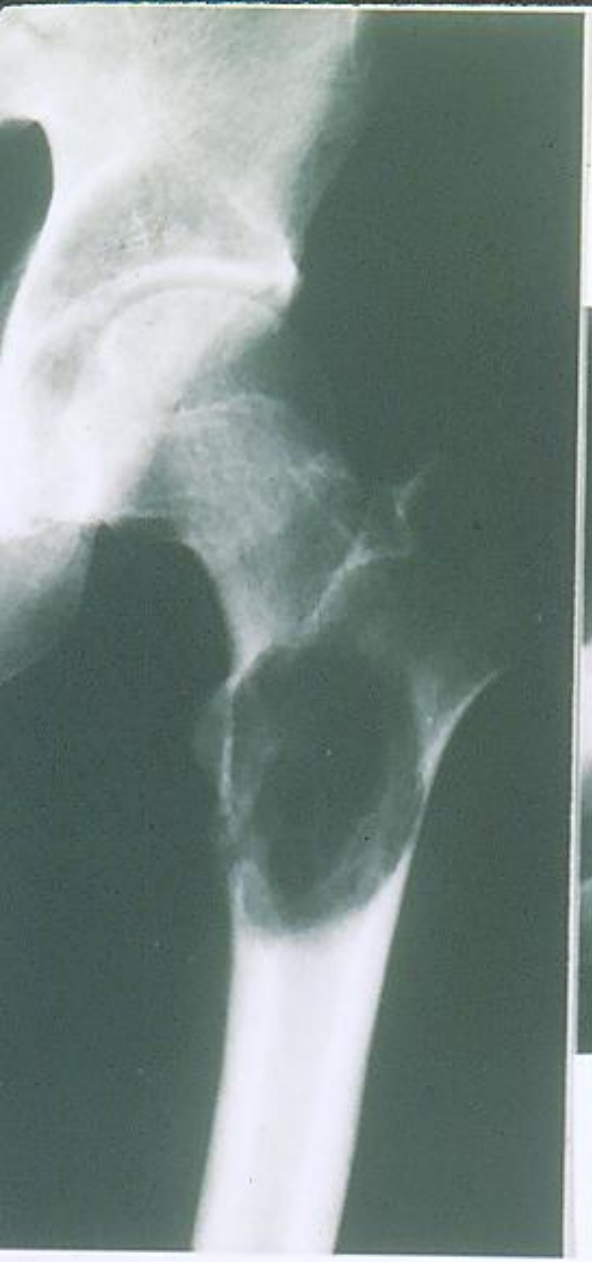
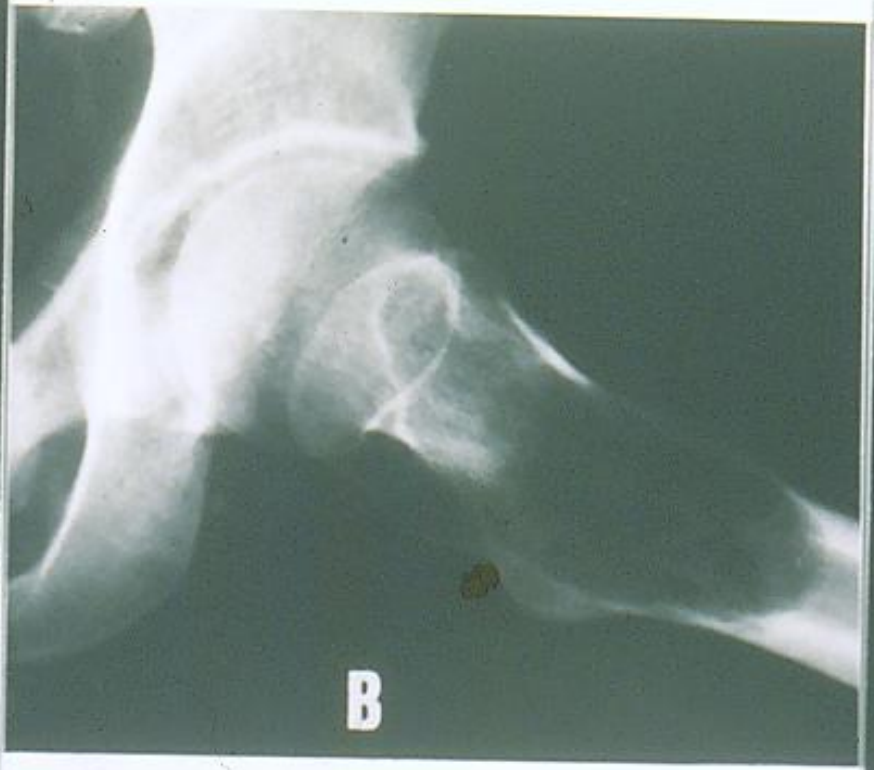

Allogeneic
cortical strut
Cystic
defect
Cancellous
bone graft
Dynamic hip
compression
screw and plate

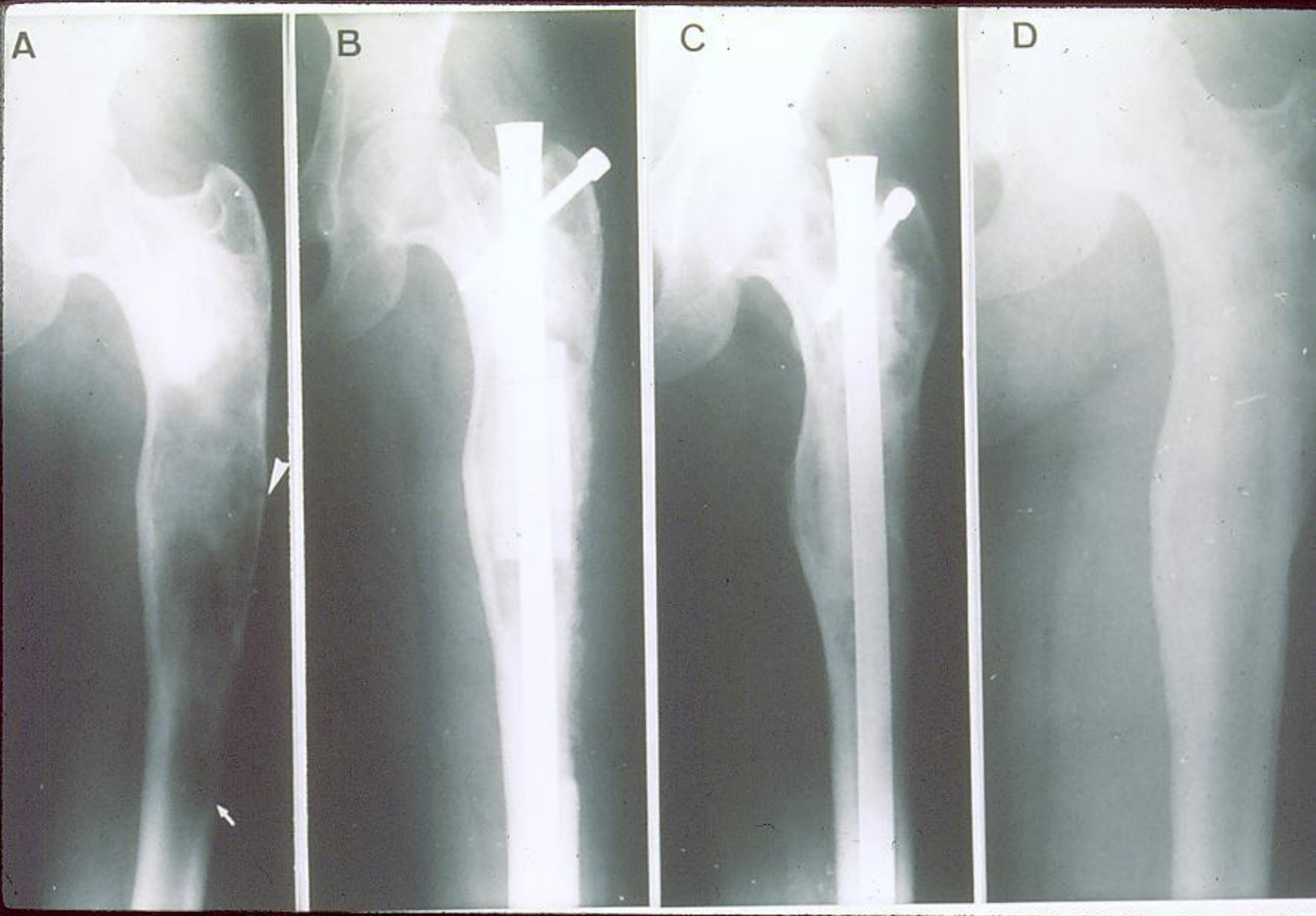
- **Treatment of the Femoral Neck and Trochanteric Benign Lesions.**
  Clinical Orthopedic and Related Research 1996

- **Treatment of Fibrous Dysplasia Involving the Proximal Femur.**
  Orthopedics, International ed 1998




B


C


A
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C
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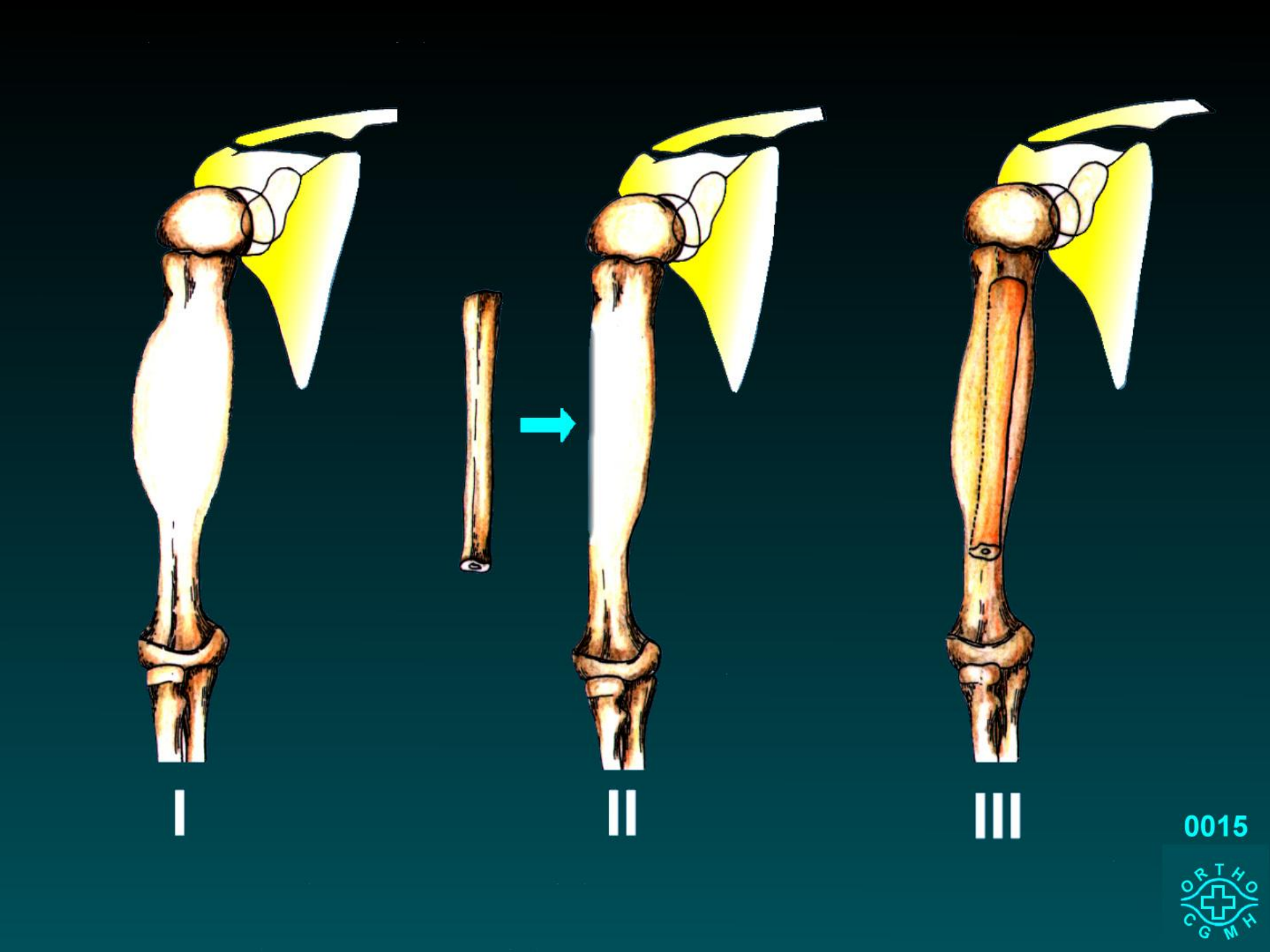
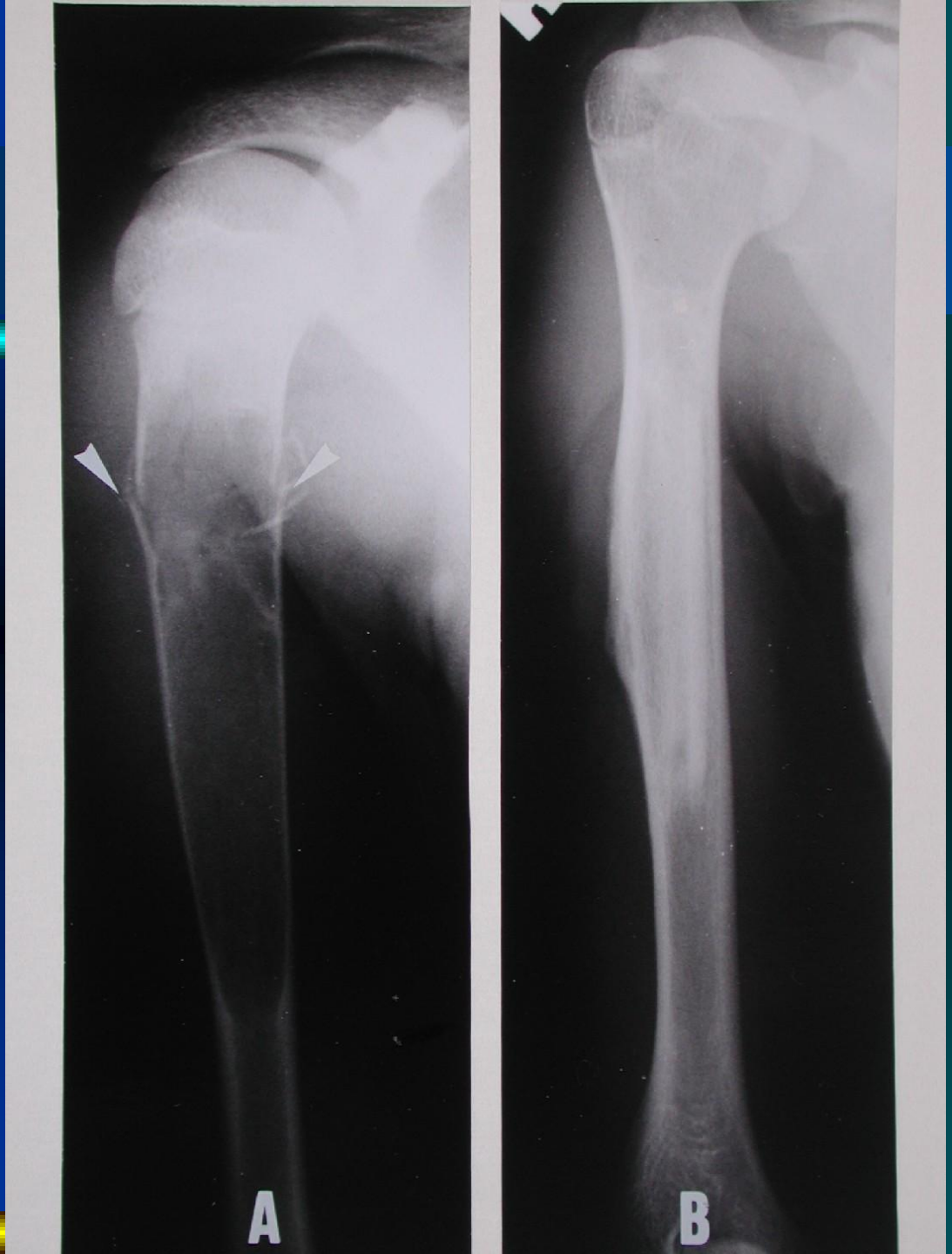
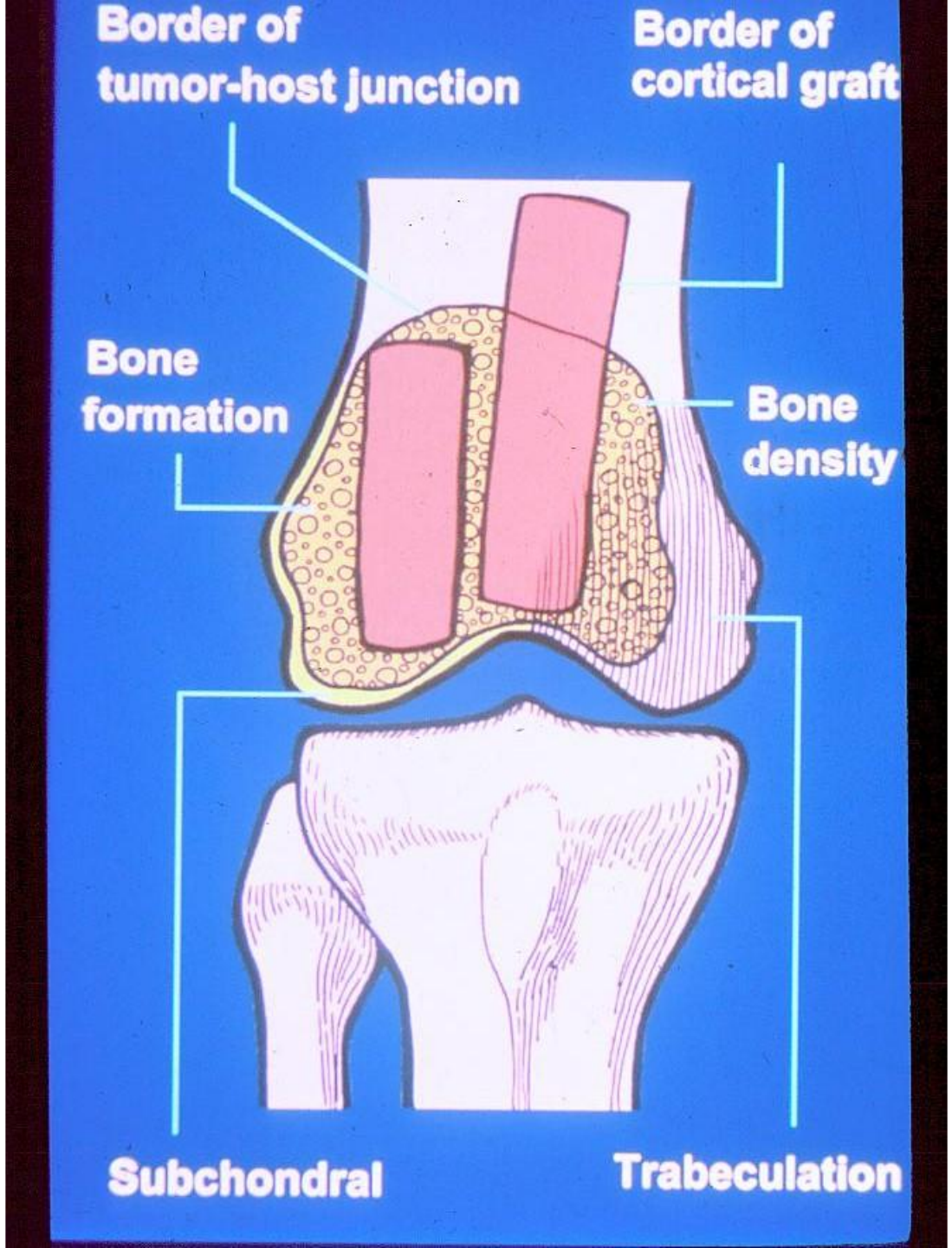

I
II
III


A
B


A
B

Allogeneic cortical strut for the benigh lesions of the humurus in adolescent
J. Pediatric Orthopedics 1997

Reconstructing Humerus Defects after Tumor Resection using an Intramedullary Cortical Allograft Strut.
Chang Gung Medical Journal 2002


Border of tumor-host junction
Border of cortical graft
Bone formation
Bone density
Subchondral
Trabeculation

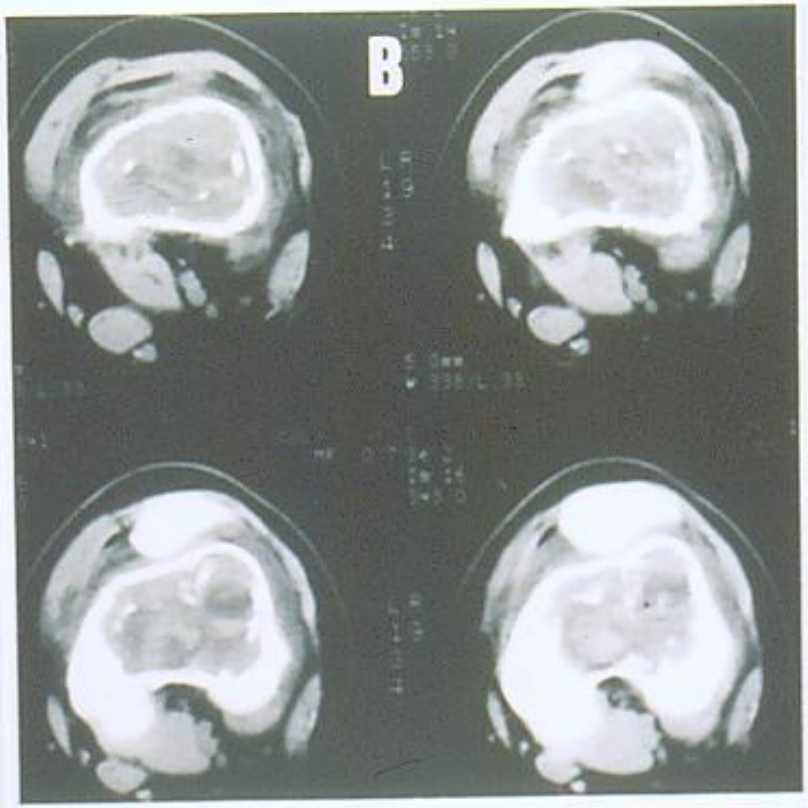
Treatment of Giant Cell Tumor

- **Adjuvant Method**
  - Chemical cauterization phenol + acid alcohol
  - Methylmethacrylate
  - CO_2 laser cauterization
  - Cryotherapy

Excision Curettage and Allografting of Giant Cell Tumor.

World Journal of Surgery 1998


A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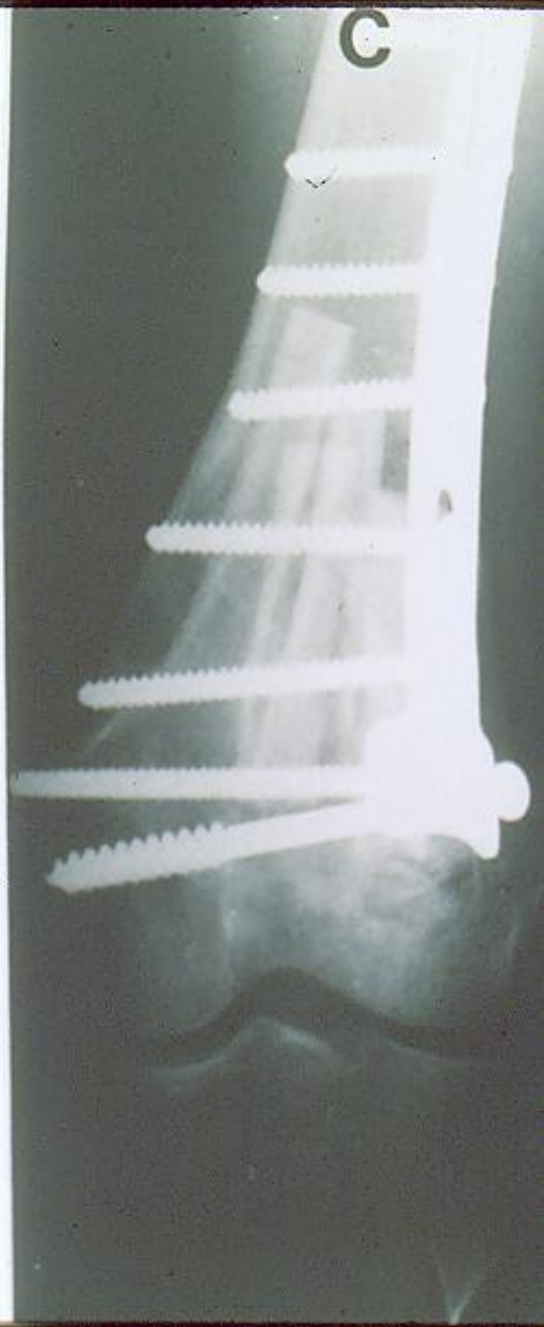
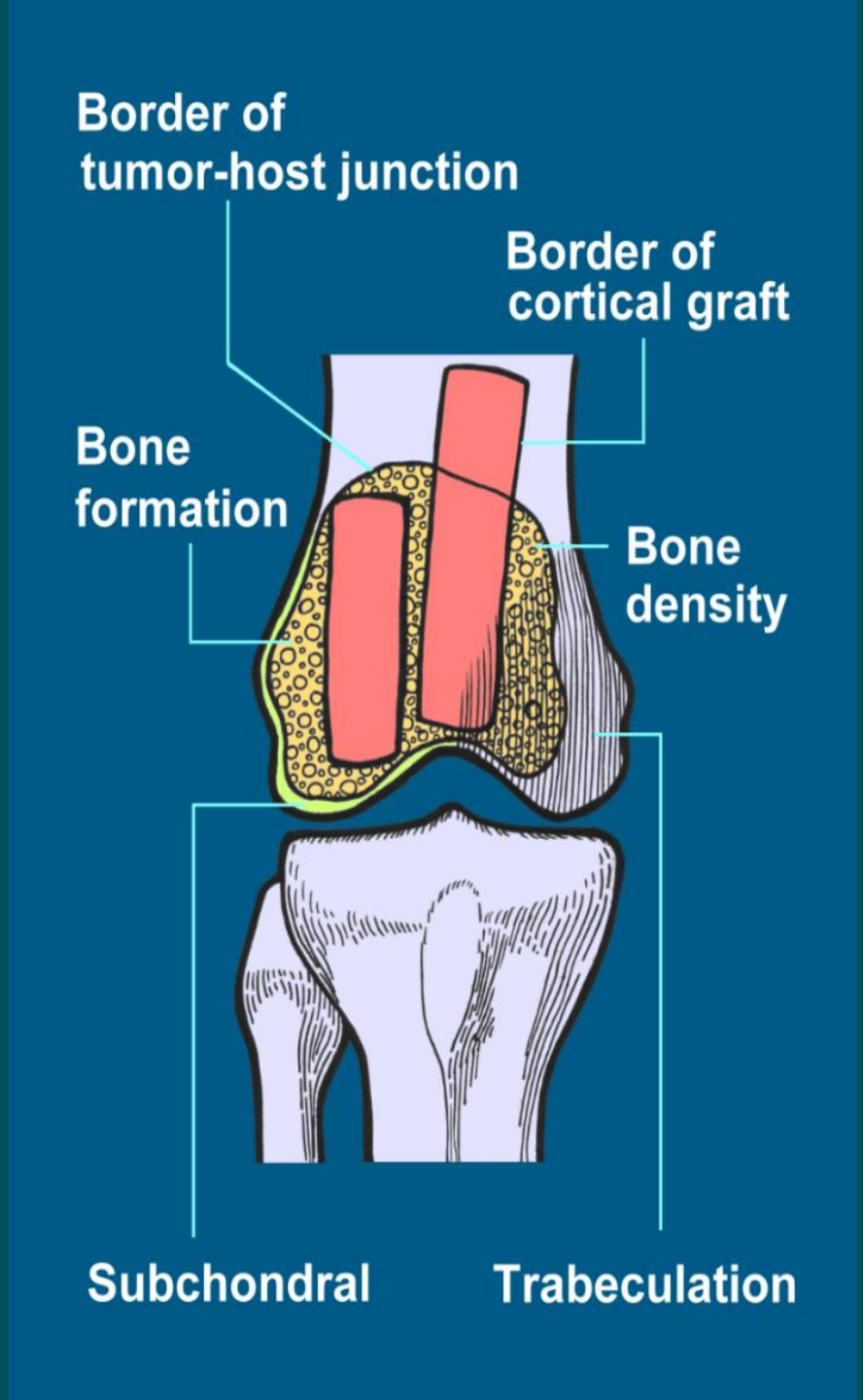

C


Border of
tumor-host junction
Border of
cortical graft
Bone
formation
Bone
density
Subchondral
Trabeculation

Radiologic Evaluation of Bone Incorporation of Strut Allografting in Bone Defects after Curettage of Benign Bone Tumors.

Journal of Musculoskeletal Research 1997


A
B
C

The Average Bone Graft Incorporation Score

15.1 (range 11-17) at 2 yrs No=104

15.5 (range 11-18) at 3 yrs No=82

- Overall result
- 16.3 (range 11-18) FU Av. 50 month

	No=104
Clear Incorporation	86 cases
Delayed Incorporation	12 cases
Sclerosis of the graft	6 cases

Conclusion

- 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.

Semistructural Allografting in Bone Defects after Curettage.

Journal of Surgical Oncology 1998


12 2 96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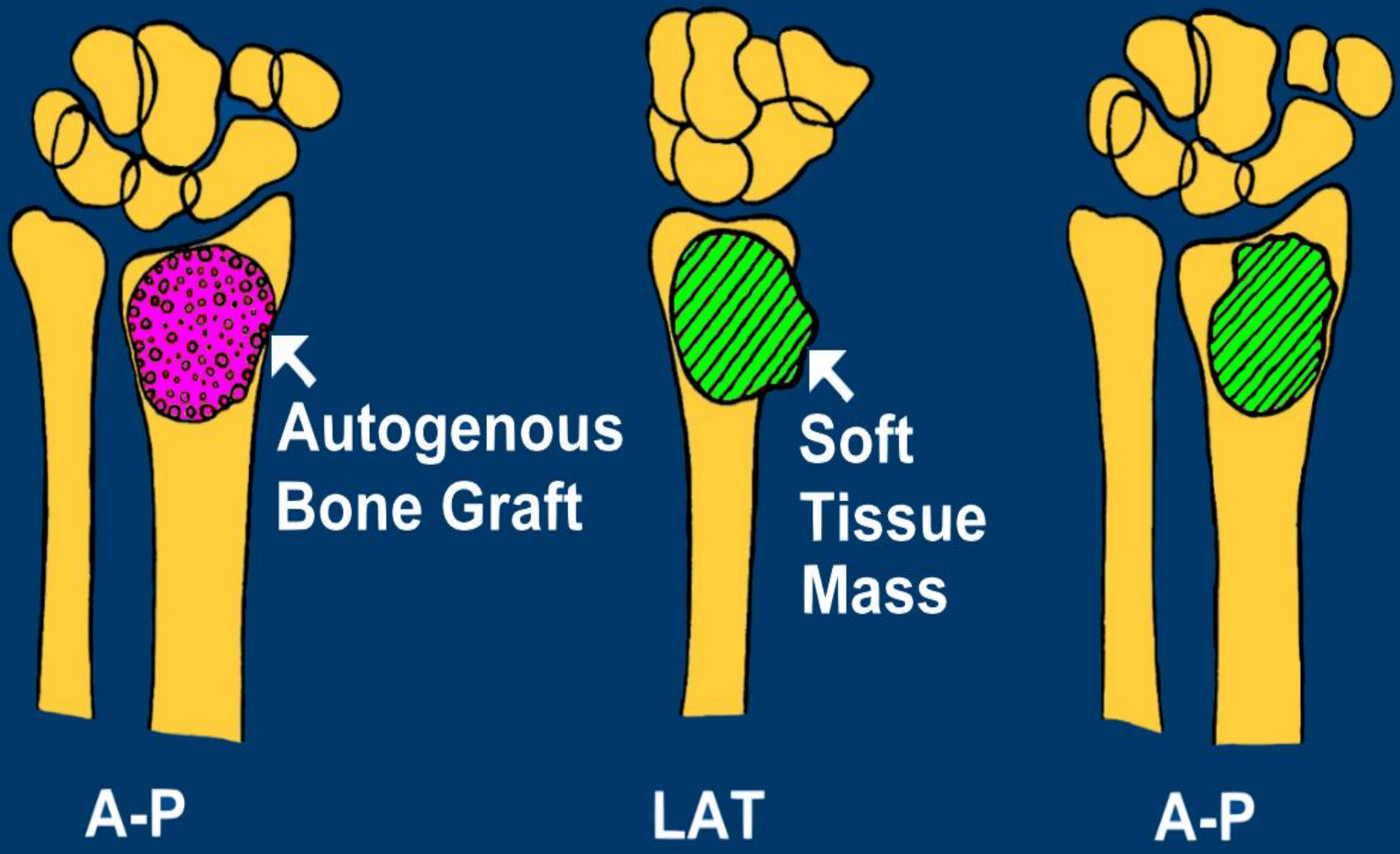
Autogenous
Bone Graft
Soft
Tissue
Mass
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A-P


12 16.


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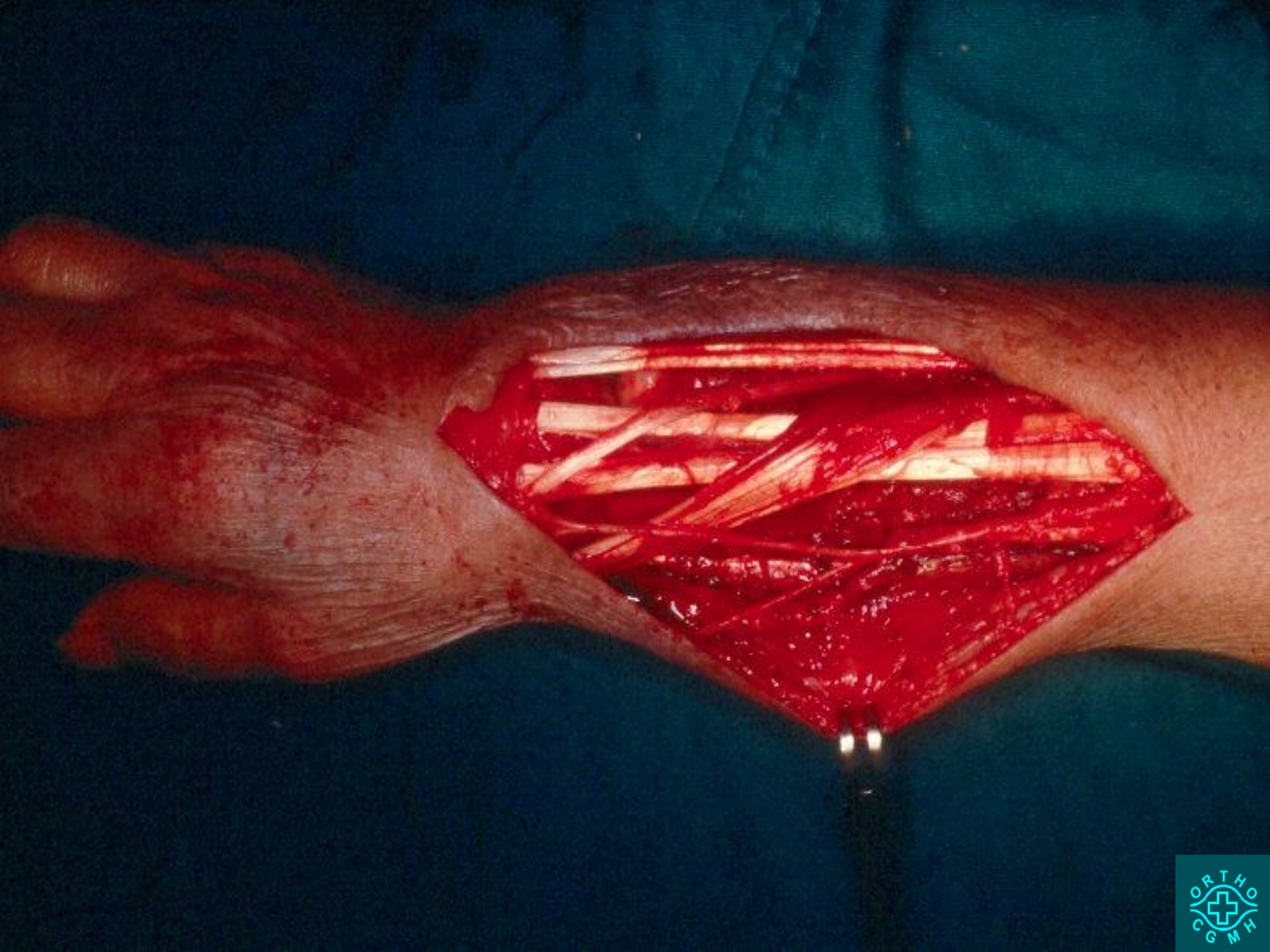
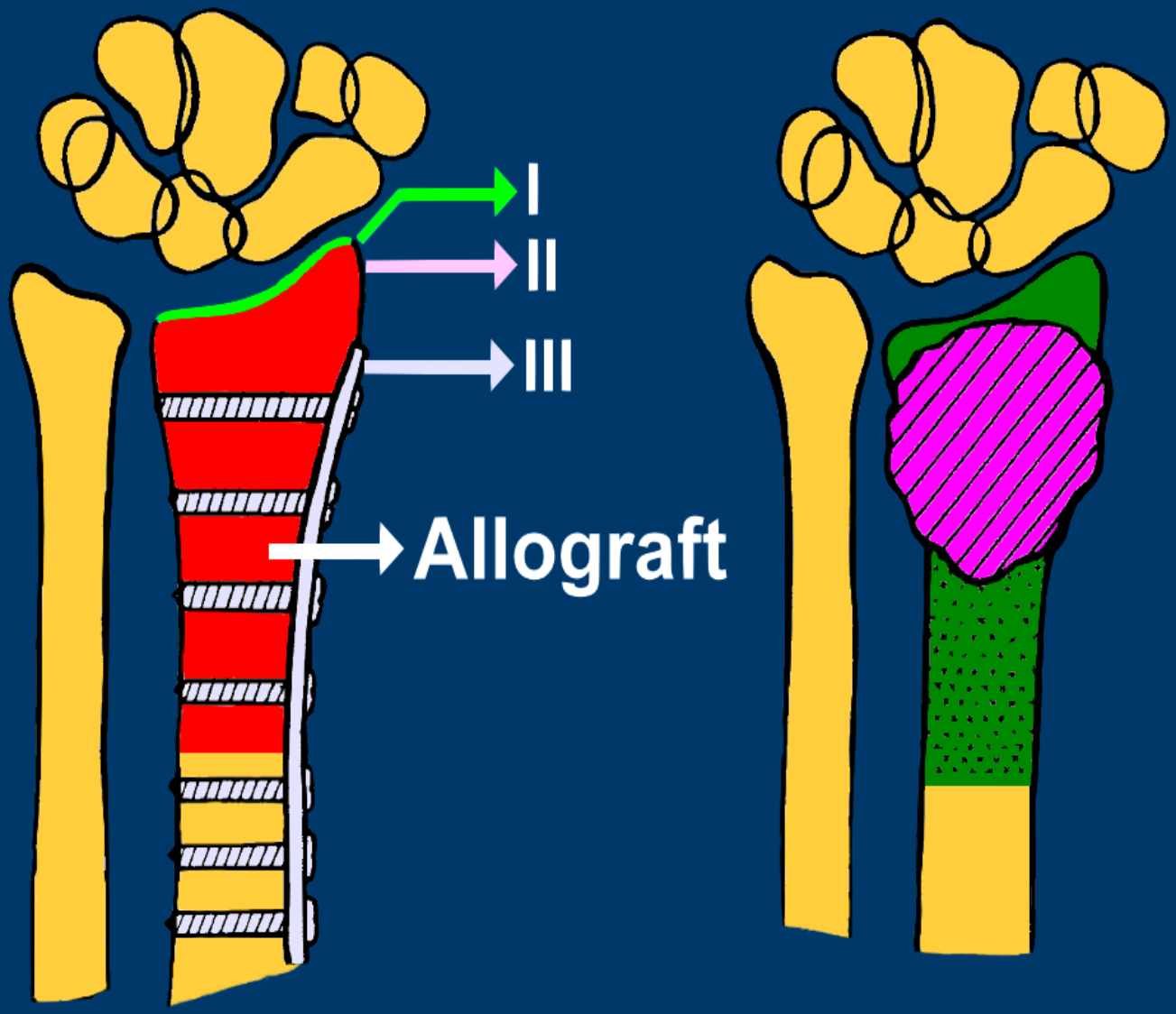
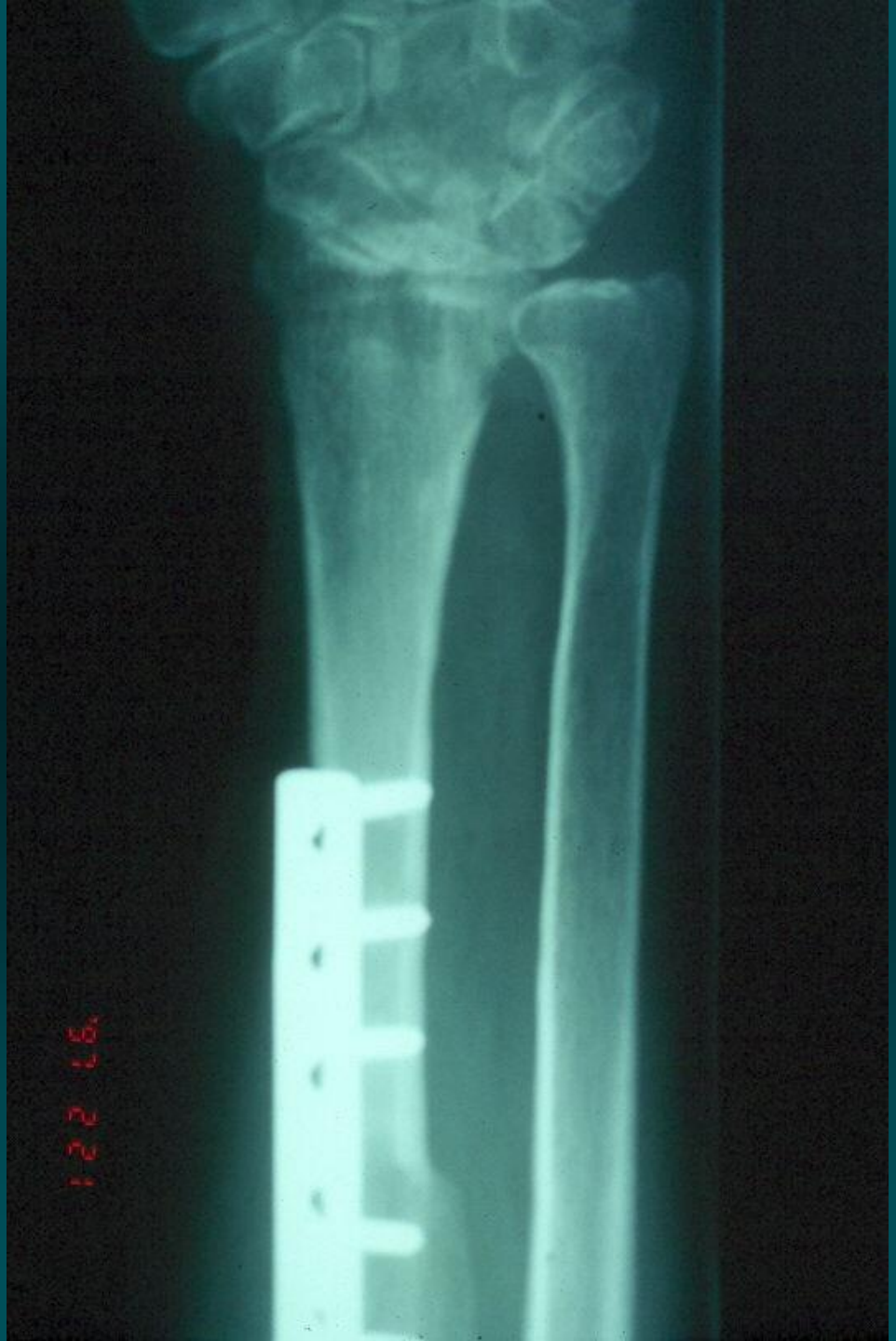



I
II
III
Allograft


1 22 95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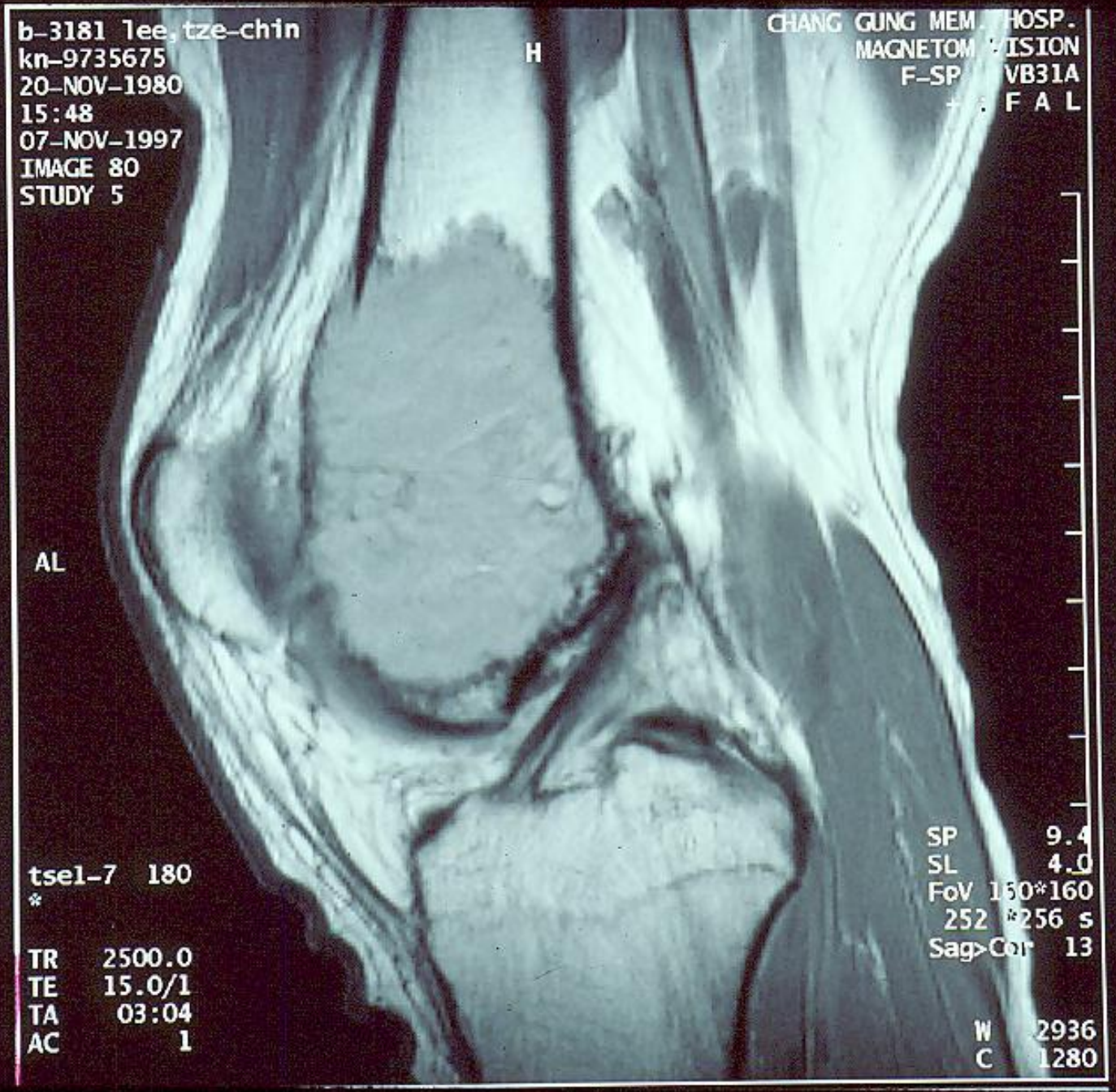
Treatment of Giant Cell Tumor of the Distal Radius.

Clin Orthop Related Research 2001

ALLOGRAFT . . . A CHANCE TO SAVE A LIMB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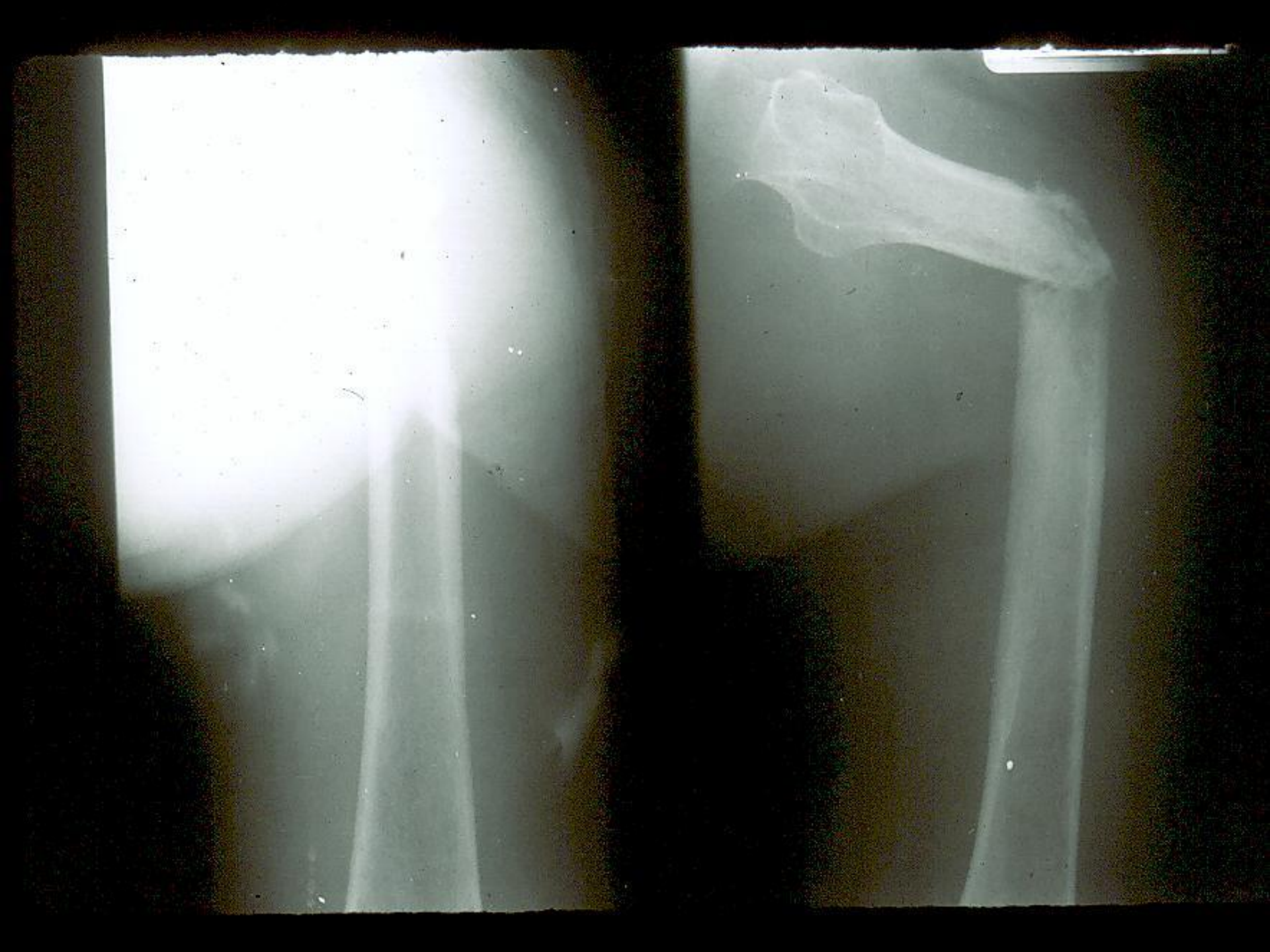
Limb Salvage Surgery

Allograft ?
Bone substitute ?
Tumor prosthesis ?
Autograft ?
Others?

Orthopaedic Oncology

Reconstructive surgery in bone tumors

- Autogenous bone graft
  - Non-vascularized cortical or cancellous
  - Vascularized fibula, ilium, rib etc
- Banked bone graft
  - Larged segmental cortical
  - Massive cancellous
- Custom-made prosthesis
- Soft tissue reconstruction
- Combination



Reconstruction of Segmental Bone Defect

- **Intercallary**

  allograft, (vascularized) autograft, lengthening, segment metal device, antoclaved graft, extracorporeal radiated graft

- **Articular joint**

  total or hemicondylar allograft, custom made prosthesis, allograft and conventional prosthesis

- **Arthrodesis**


7 7 11 1

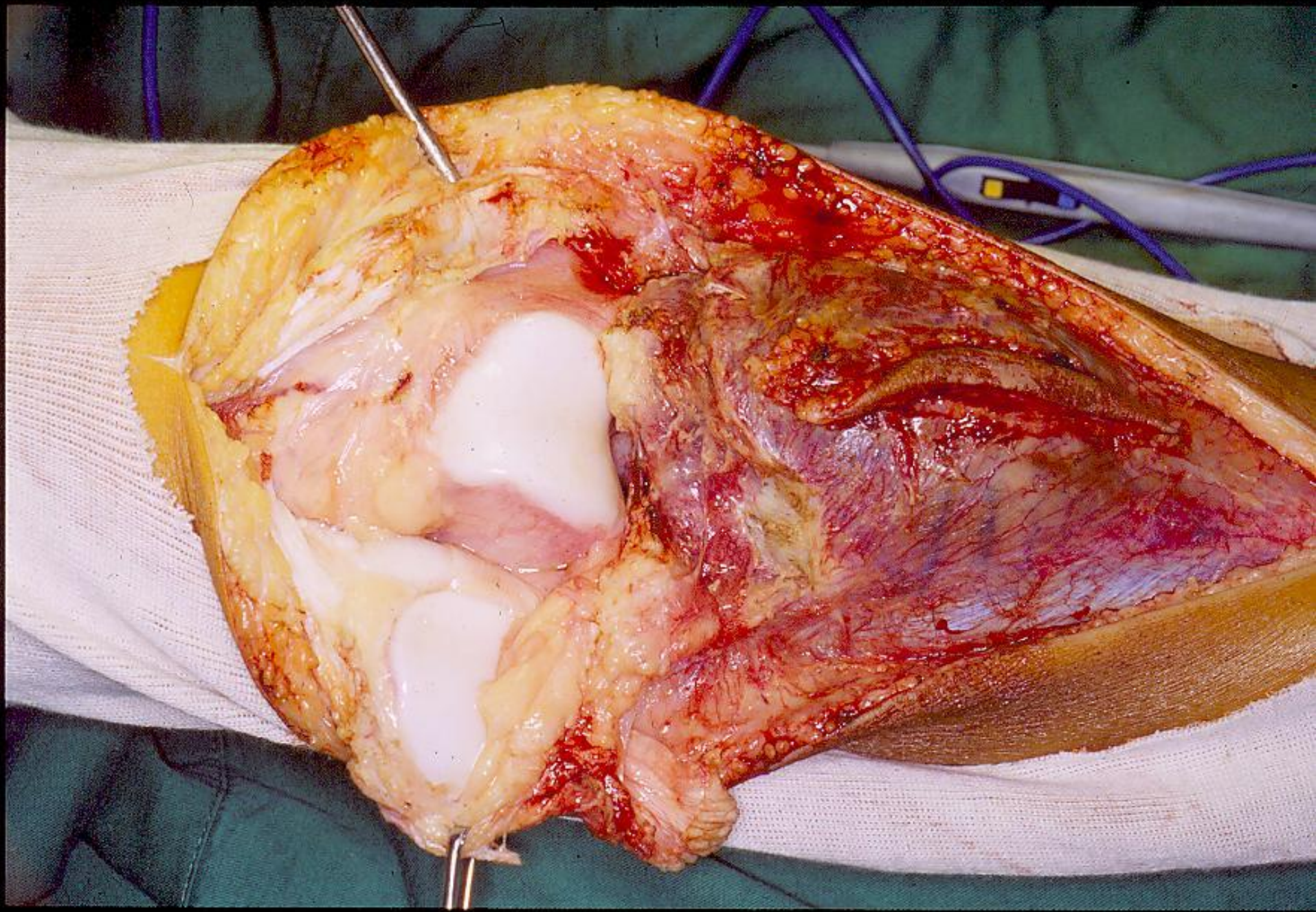

78 7 30

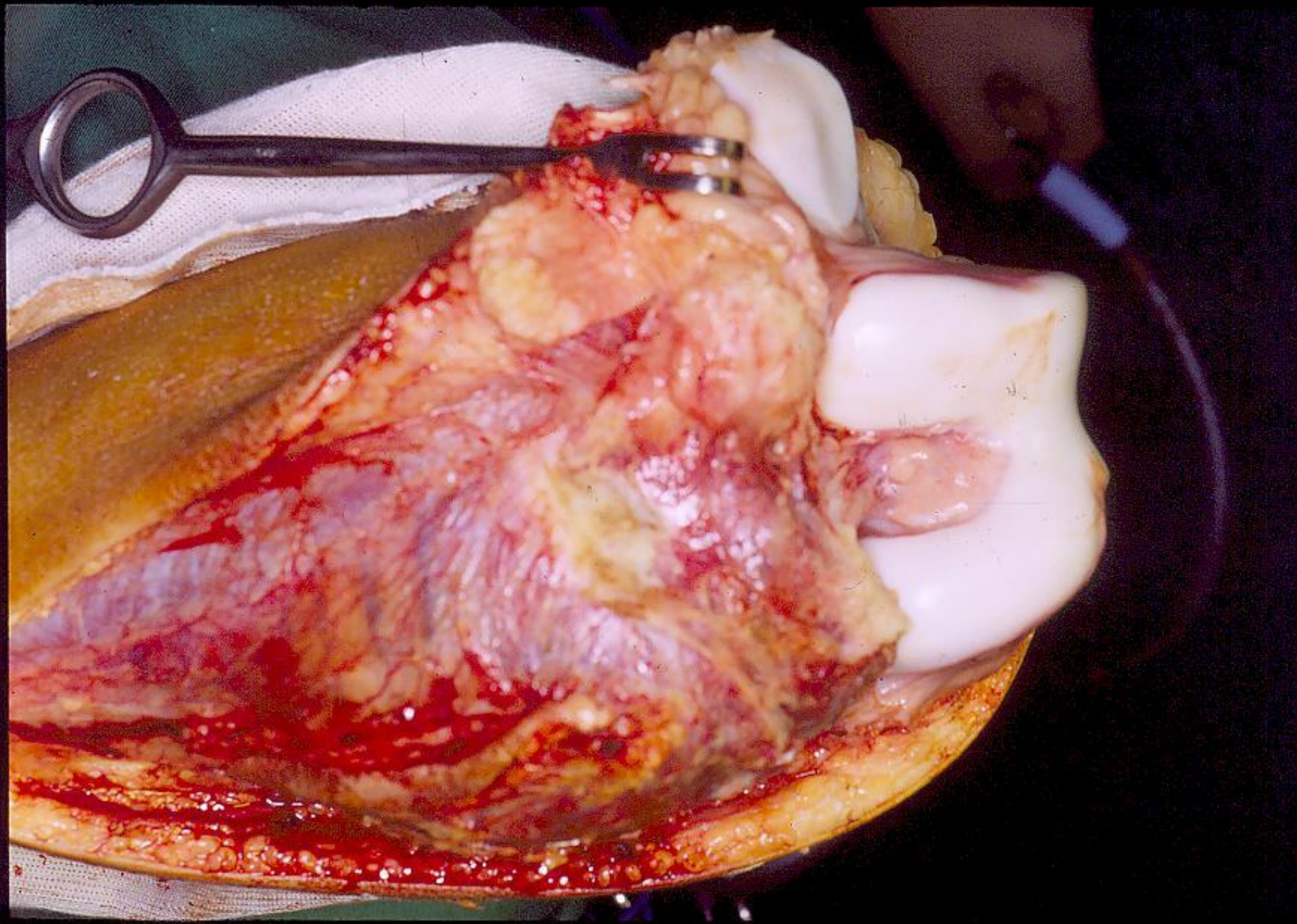
Custom Prosthesis for Bone & Joint Reconstruction

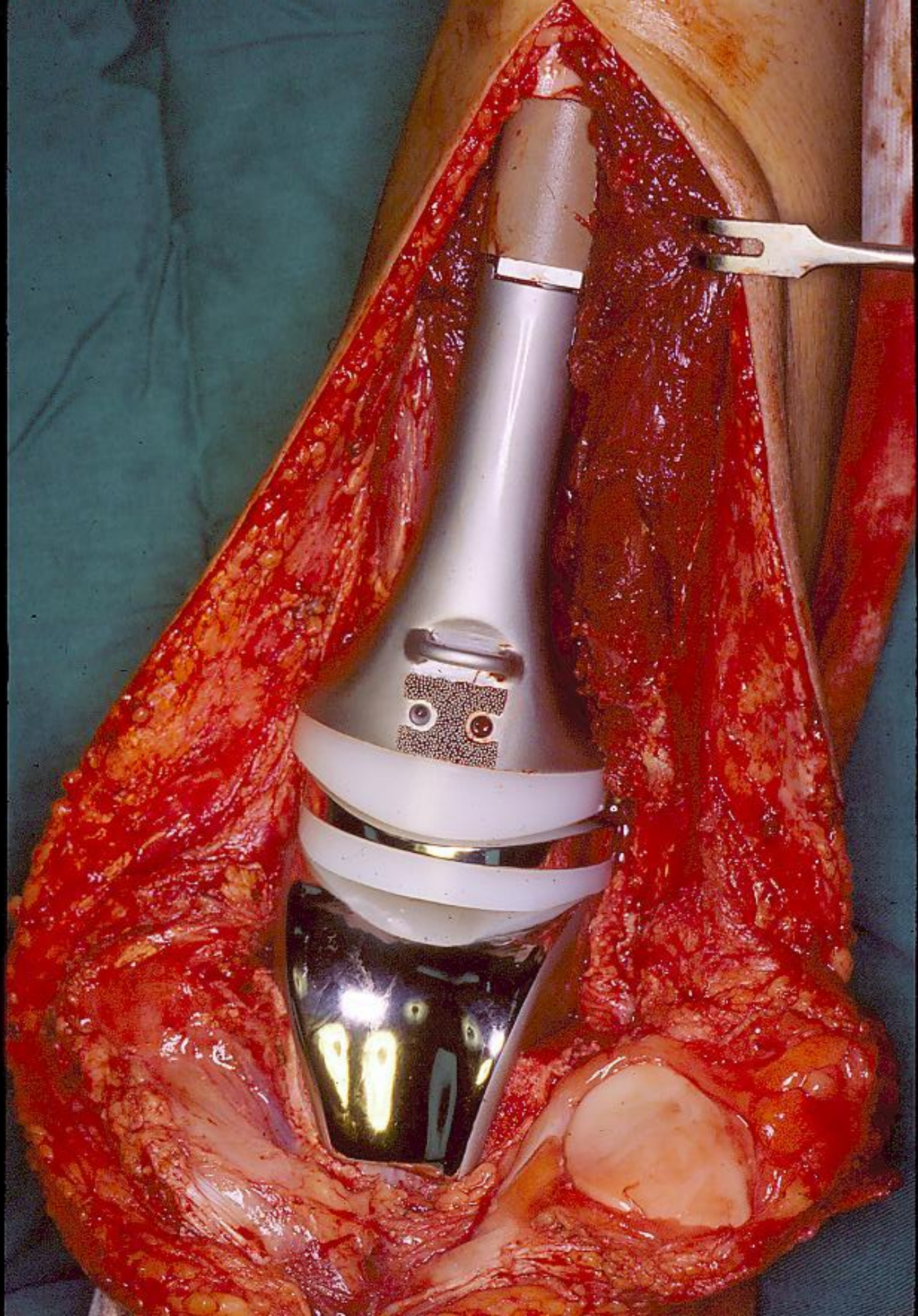
- **Potential Advantages**
  - Ease of patient care
  - Simple rehabilitation
  - Sufficient supply
  - Relatively less complication
  - Restore joint function

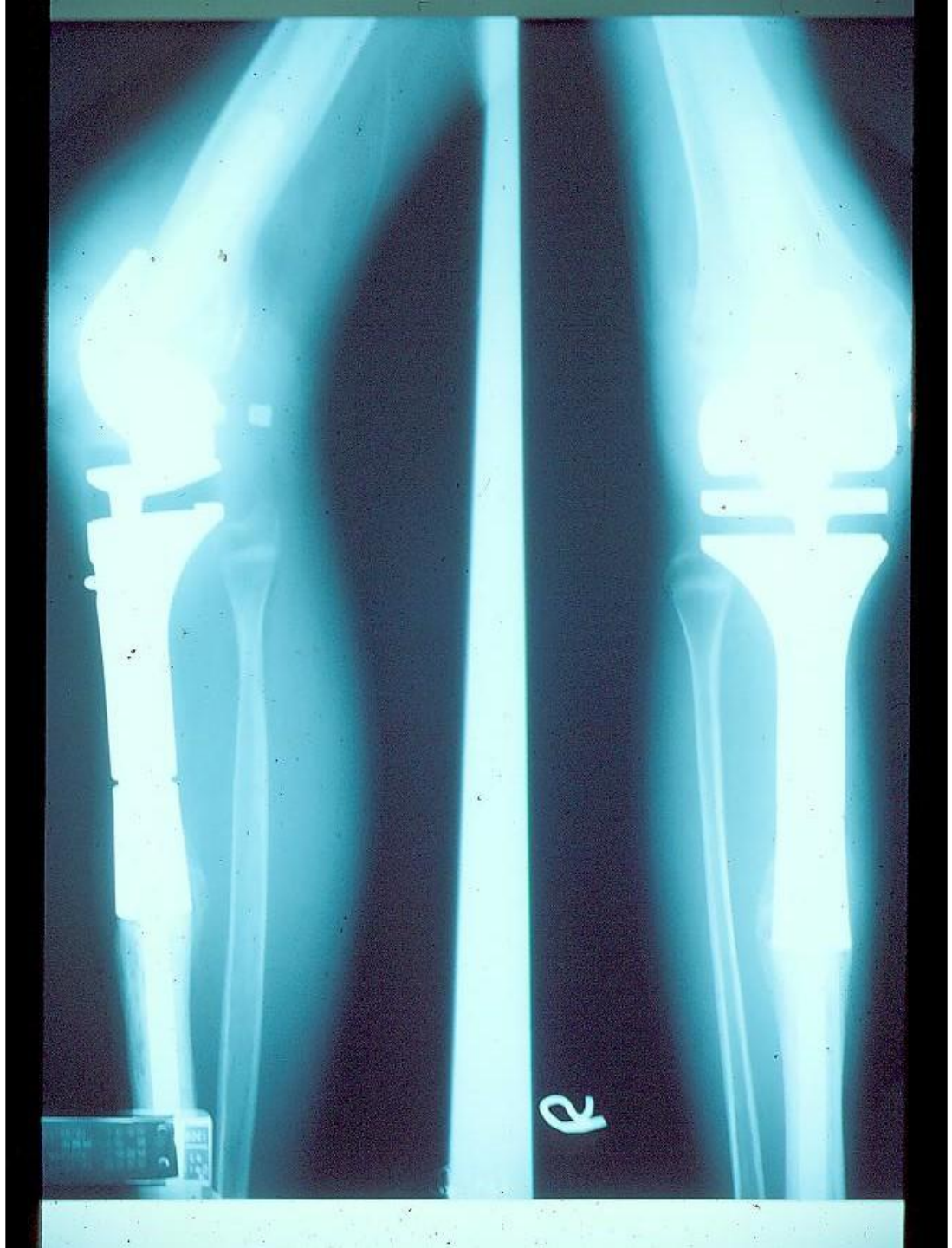
Custom Prosthesis
Design Problems

- Time Consuming
- High Cost
- Hard to Custom Fit
- Securing Soft Tissue and Bone Fixation





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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

Custom-Made Mobile Prosthesis

- Long-term Problems
  - Loosening
  - Fracture
  - Dislocation
  - Wear

Limb Salvage Surgery

LSS !!

Fusion ?

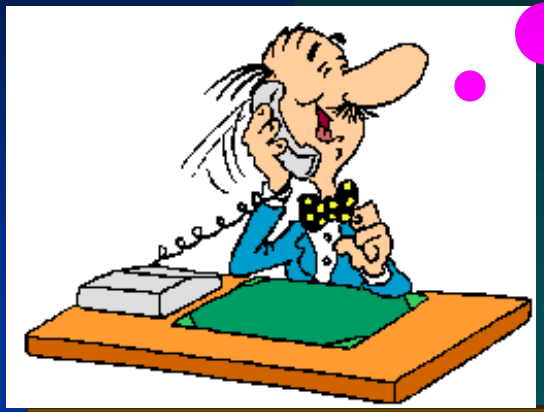
Oh ! NO !!

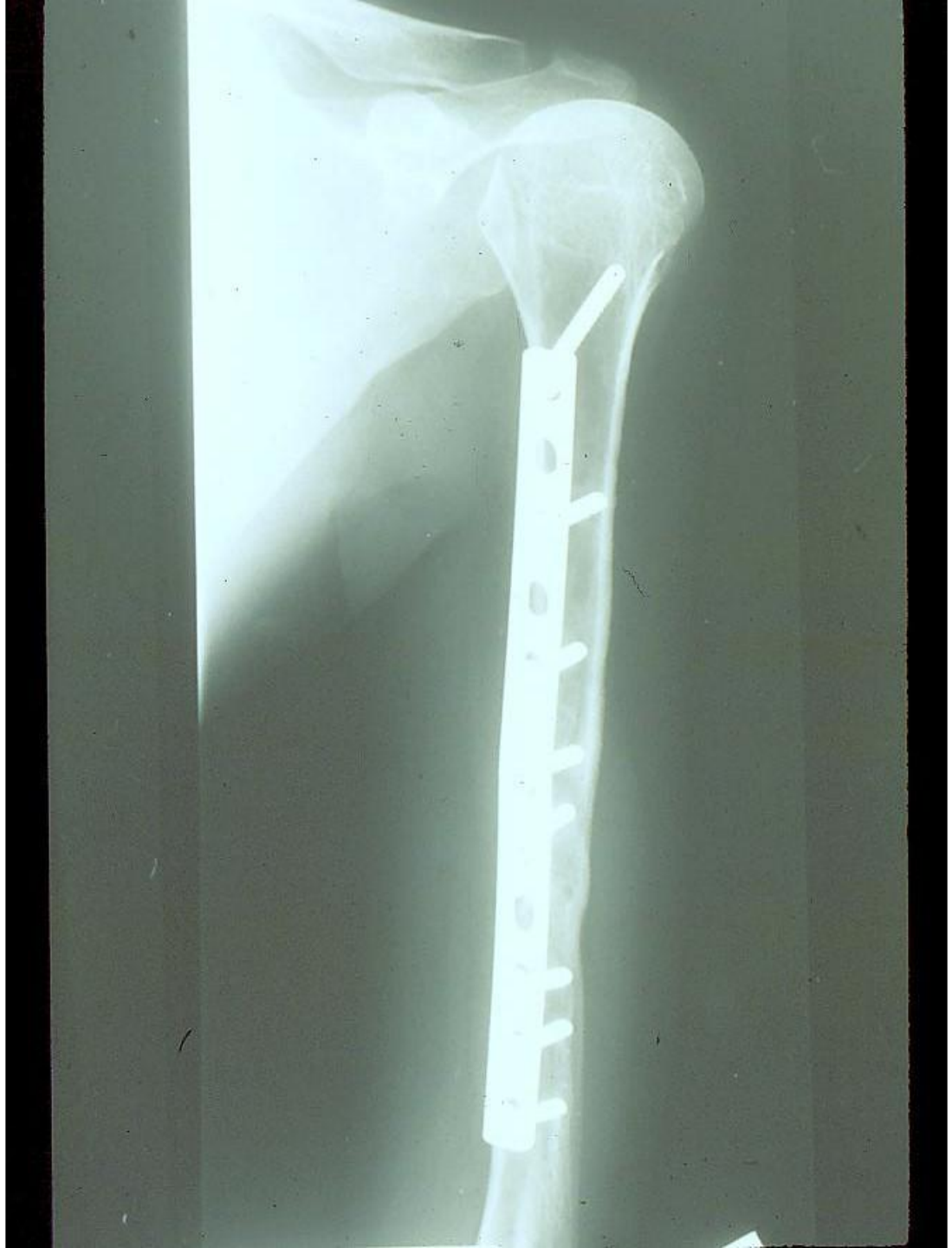
Limb Salvage Surgery

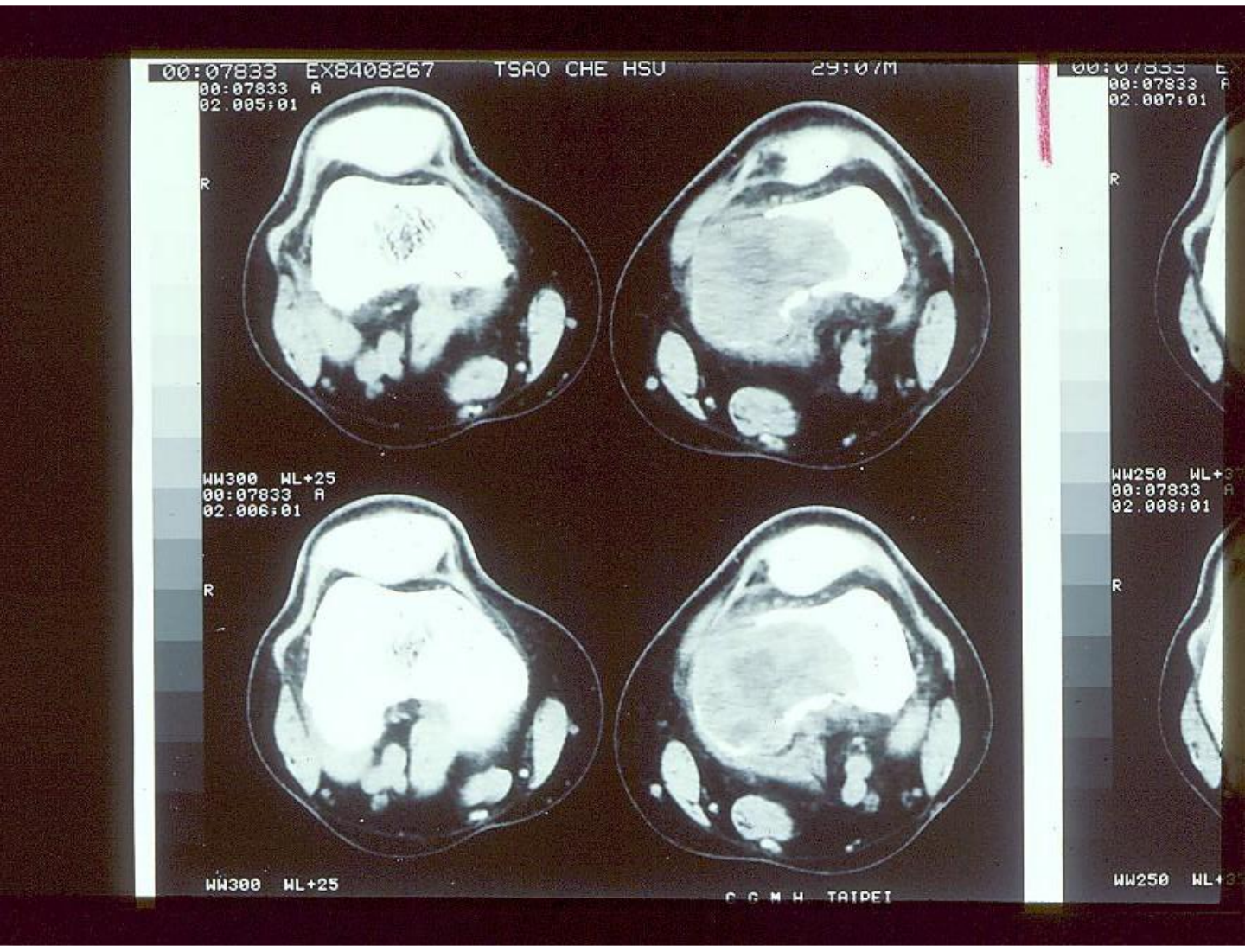
LSS !!

Mobile joint ?

Oh ! Yes !!



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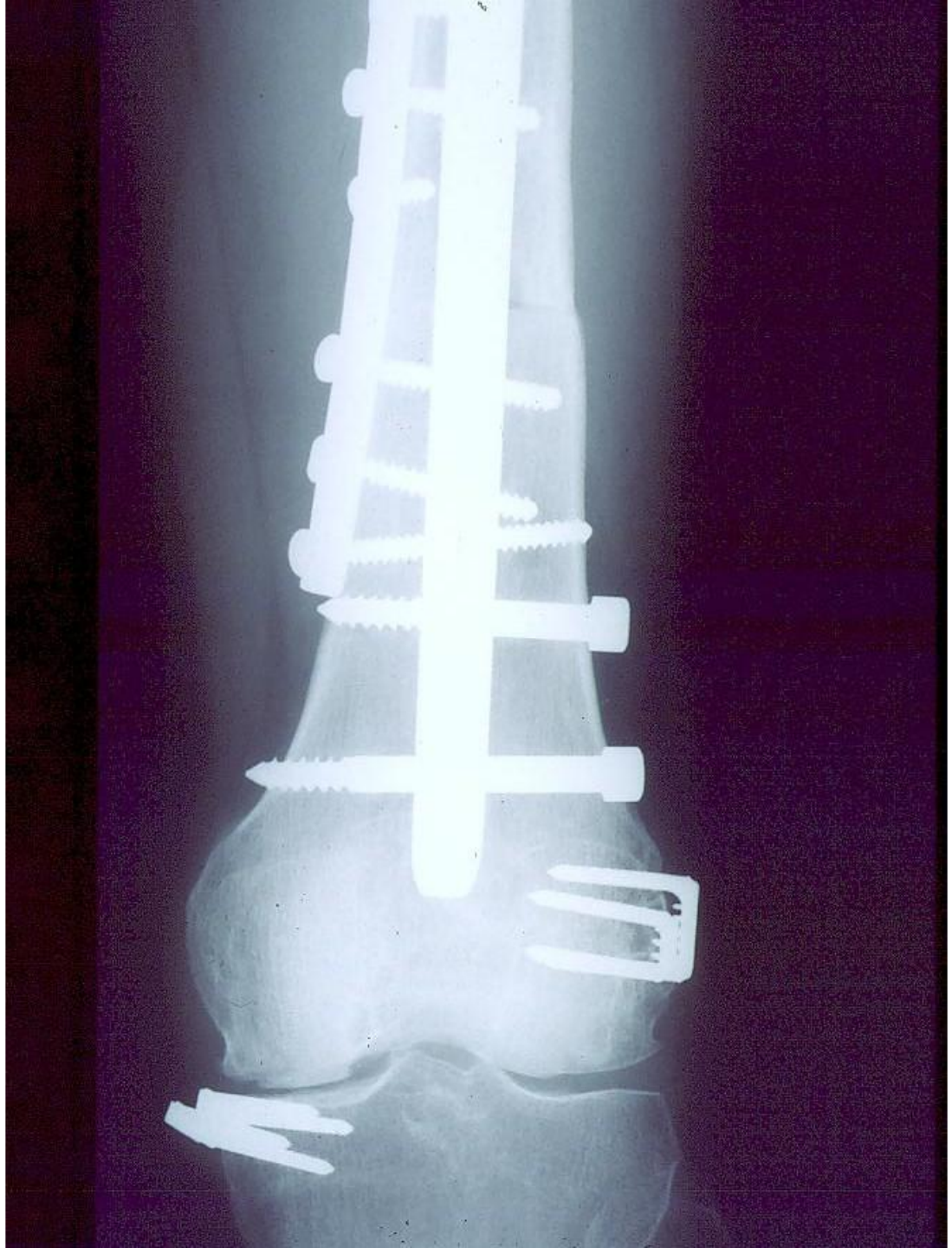


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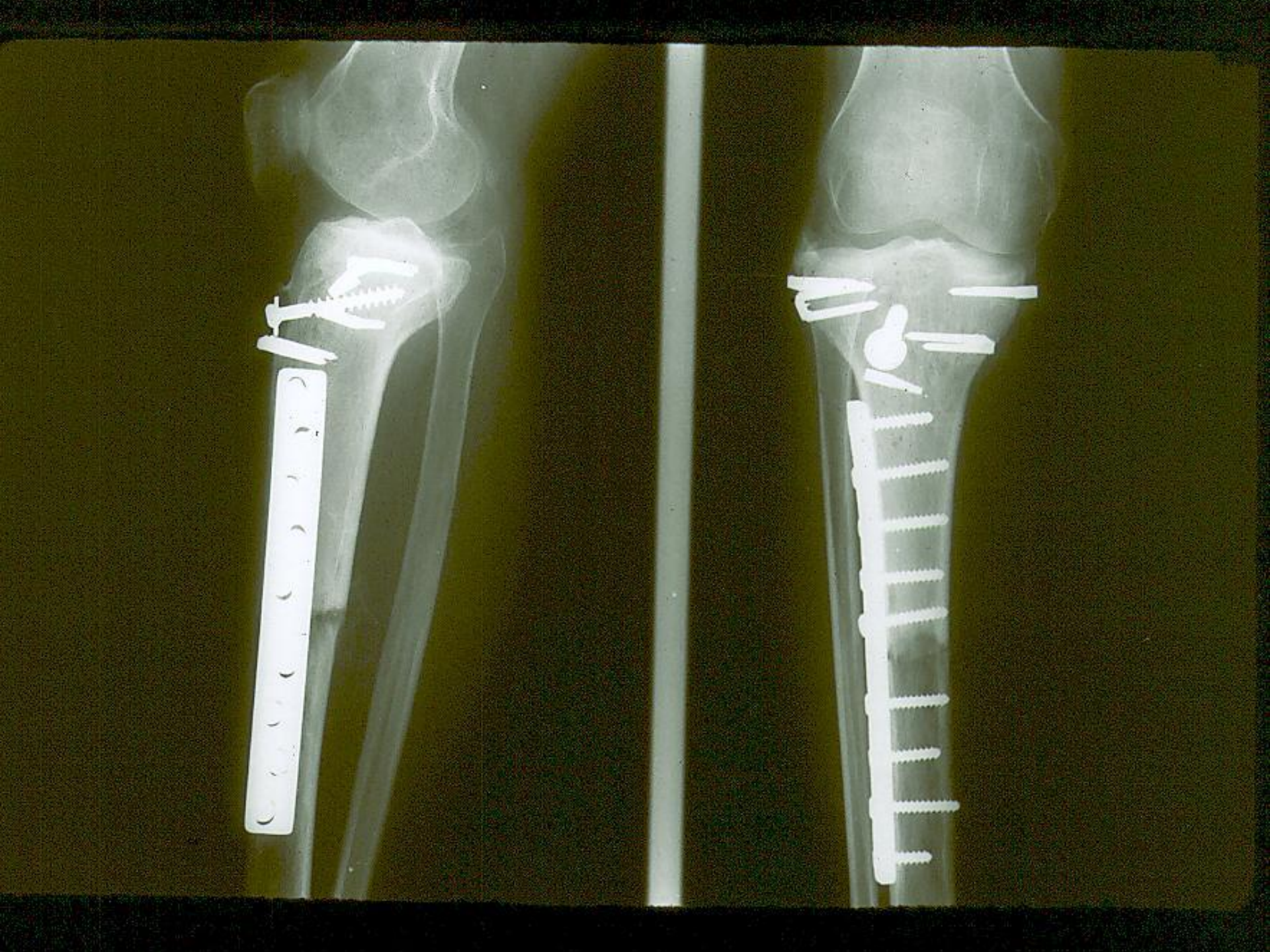

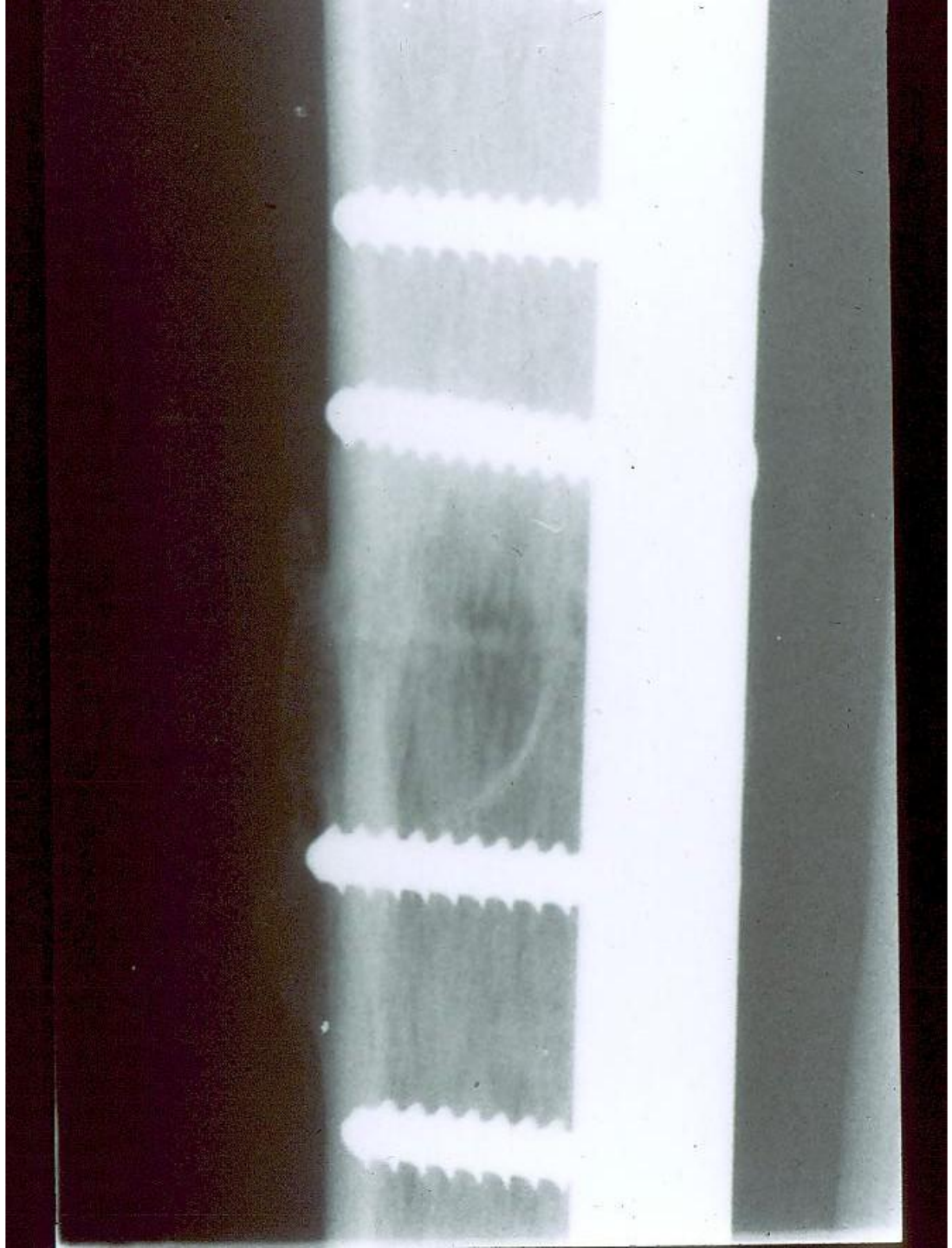


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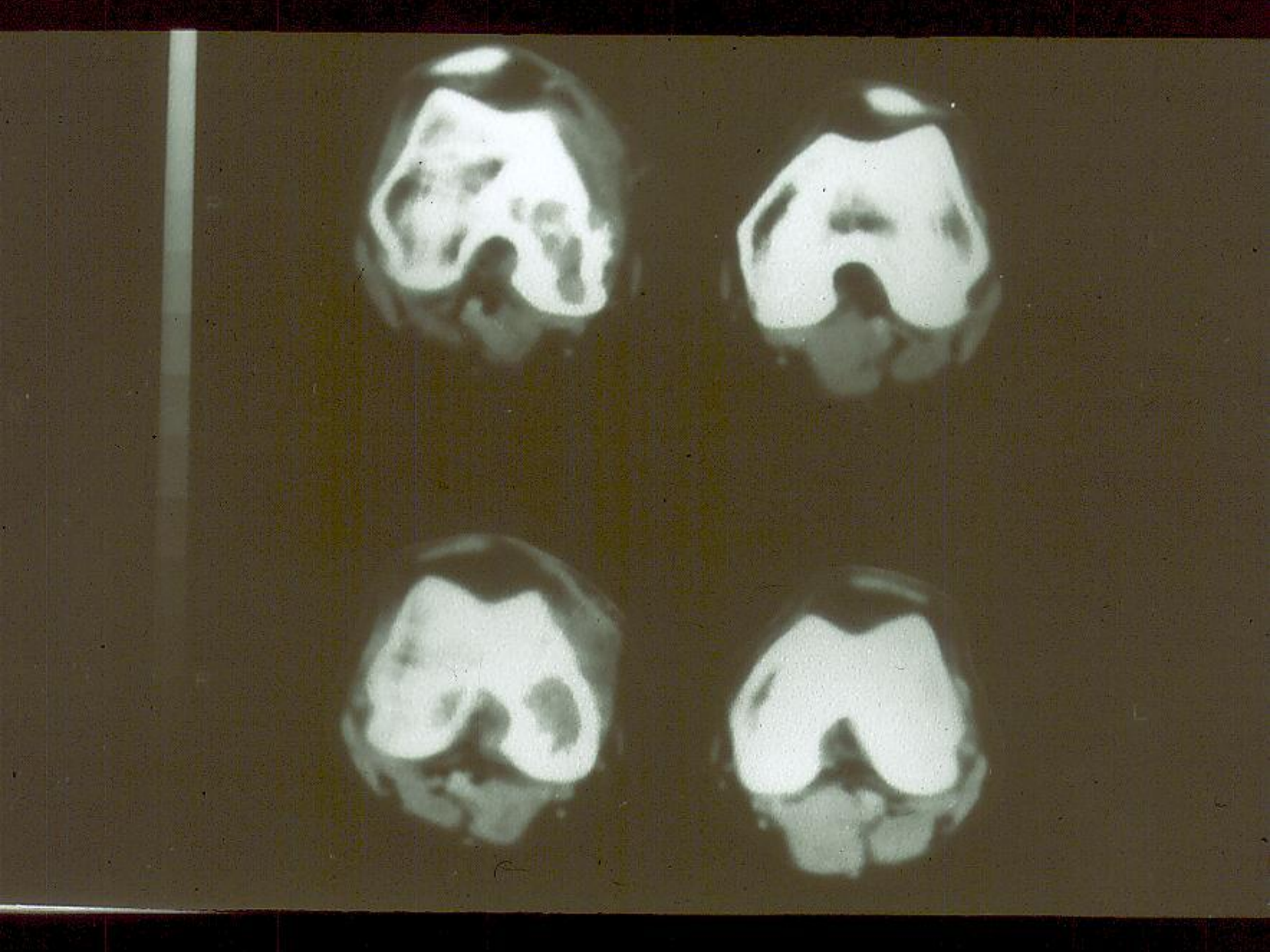

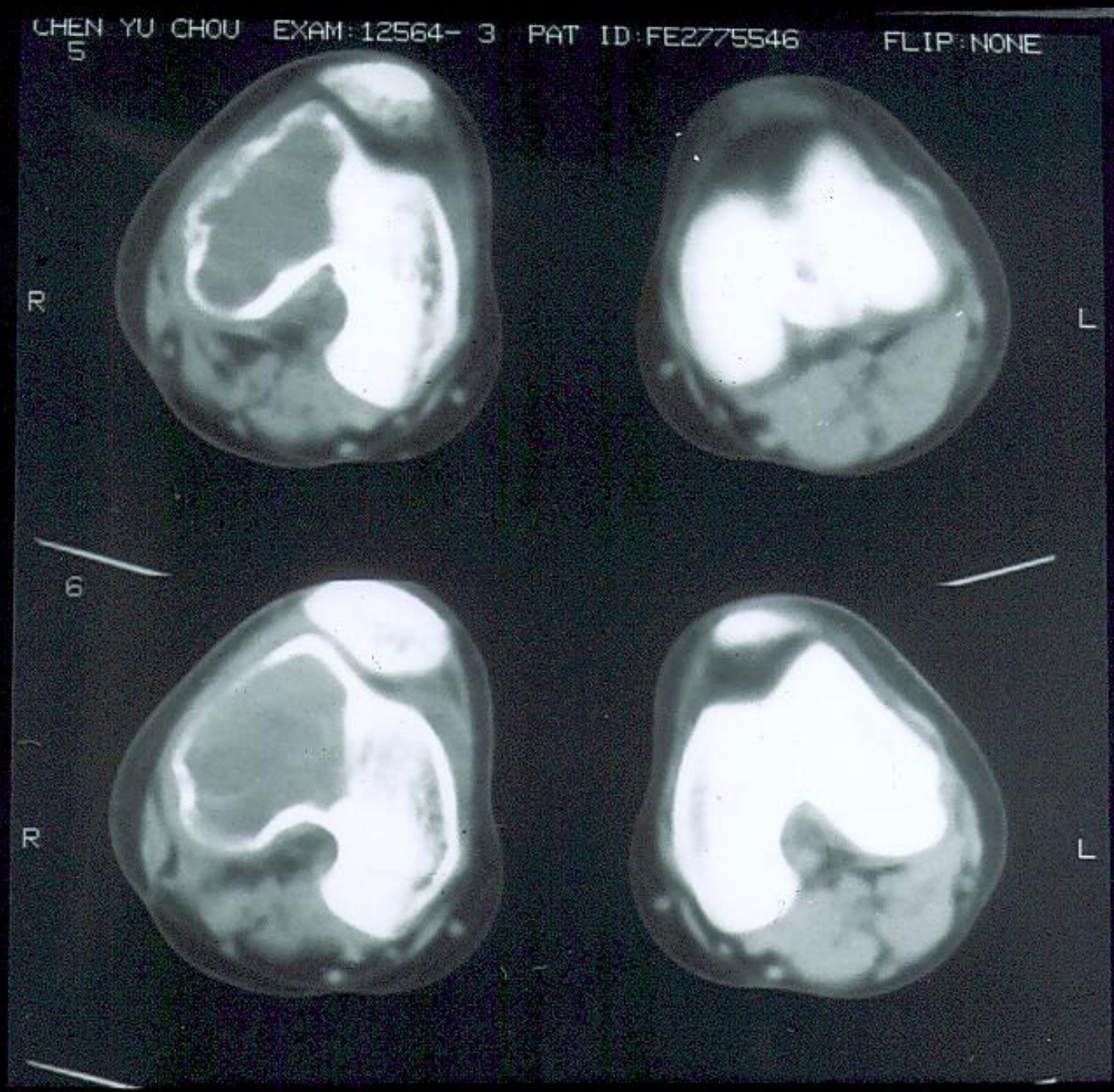
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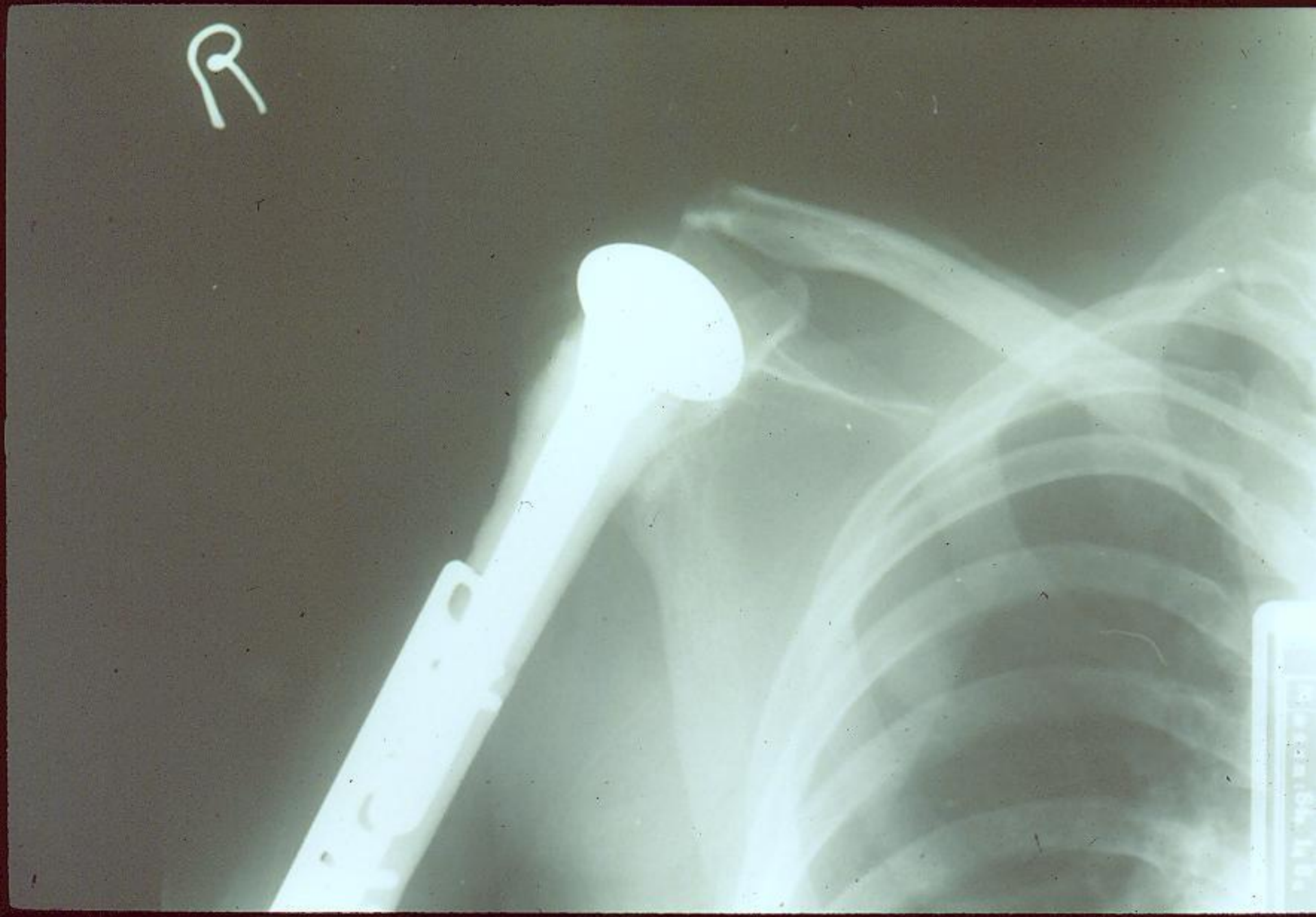
Allografting in Bone Tumor Surgery

- Infection 10% (1 year)
- Fracture 19% (3 years)
- Joint replacement 16% (6 years)
  (for osteoarticular grafts)
- 75% success (> 20 years)

- *1971-1995 MGH, Harvard. U.*
- *H.J. Mankin CORR 1996 JBJS 1997*


ALLOGRAFT . . .
A CHANCE TO SAVE A LIMB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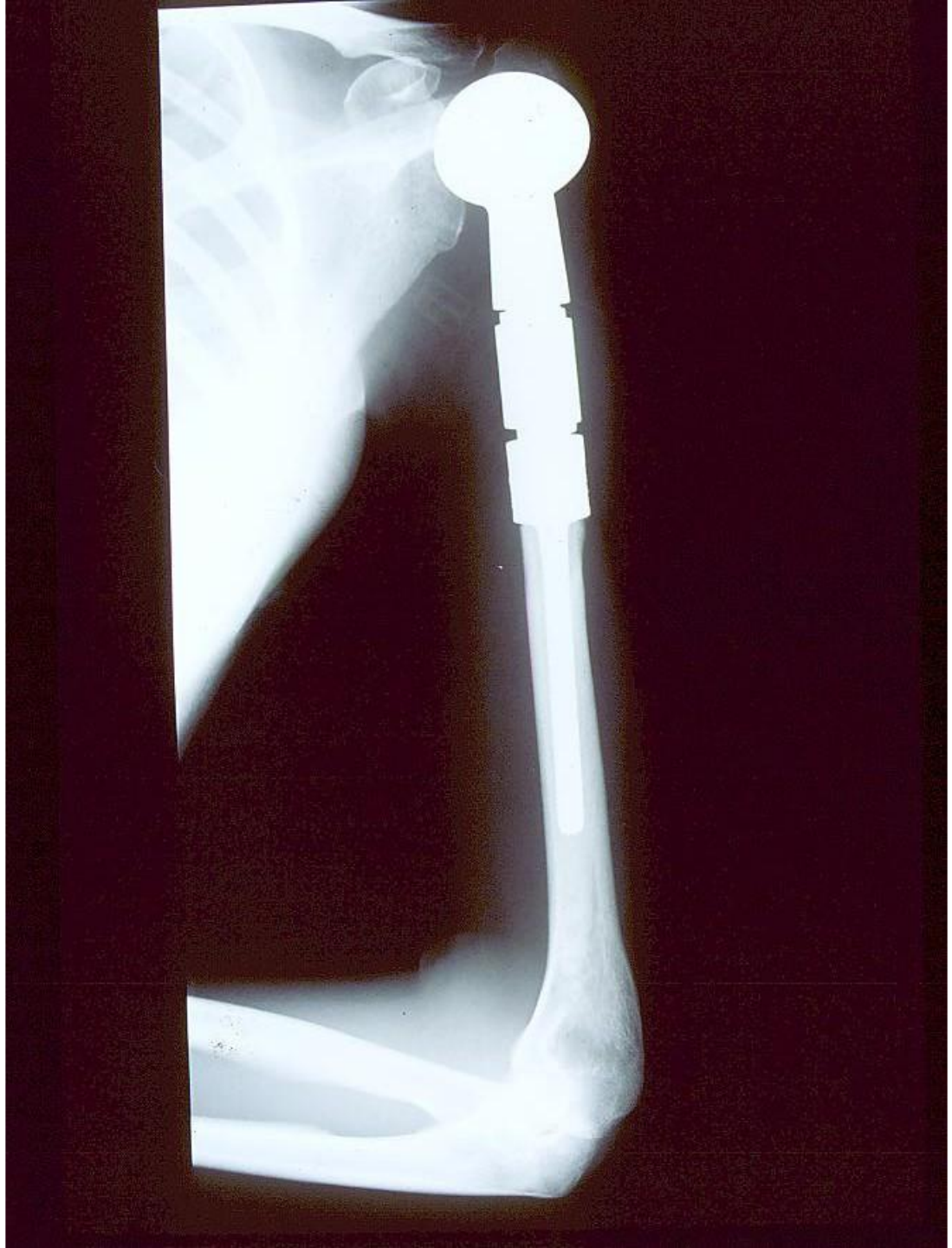
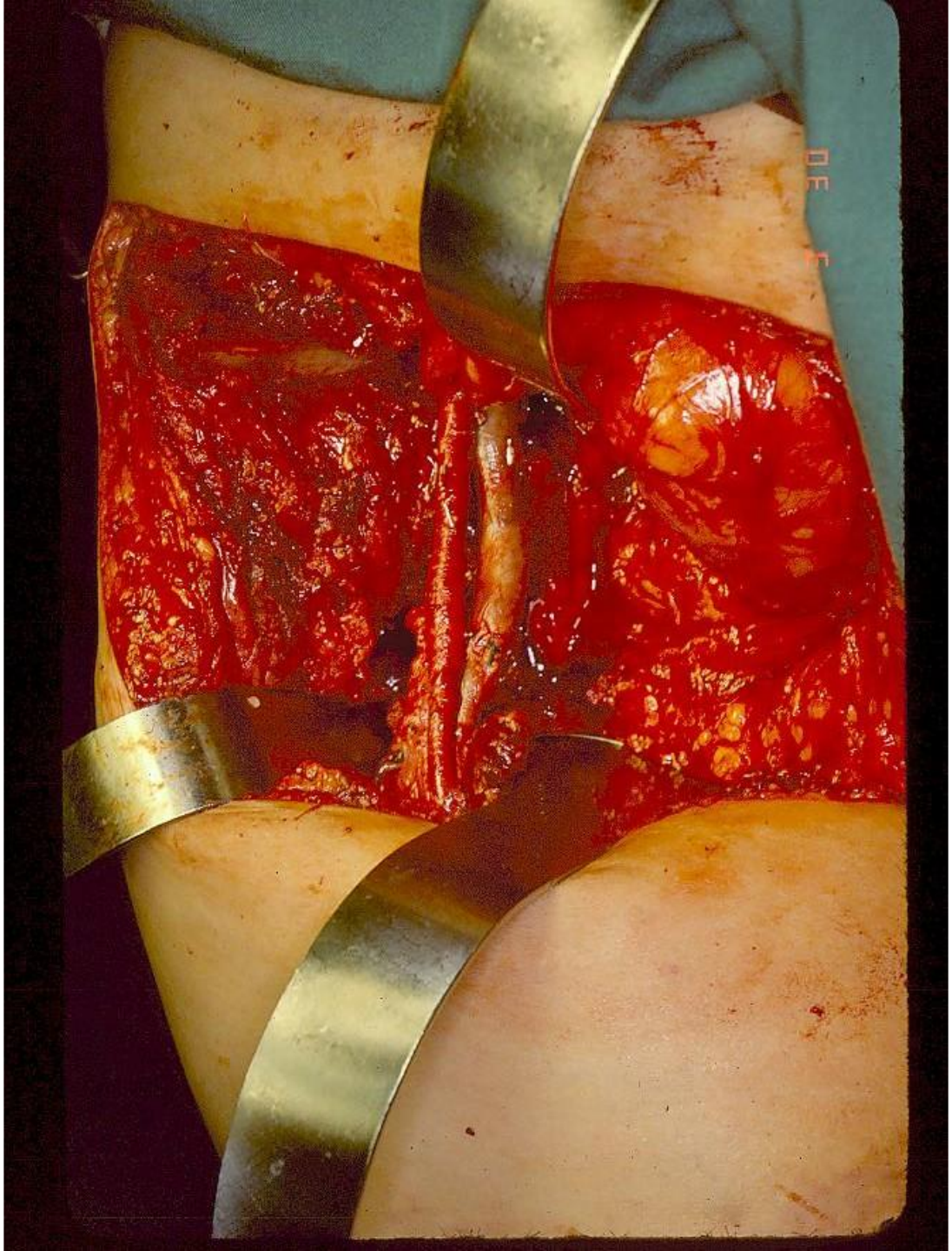
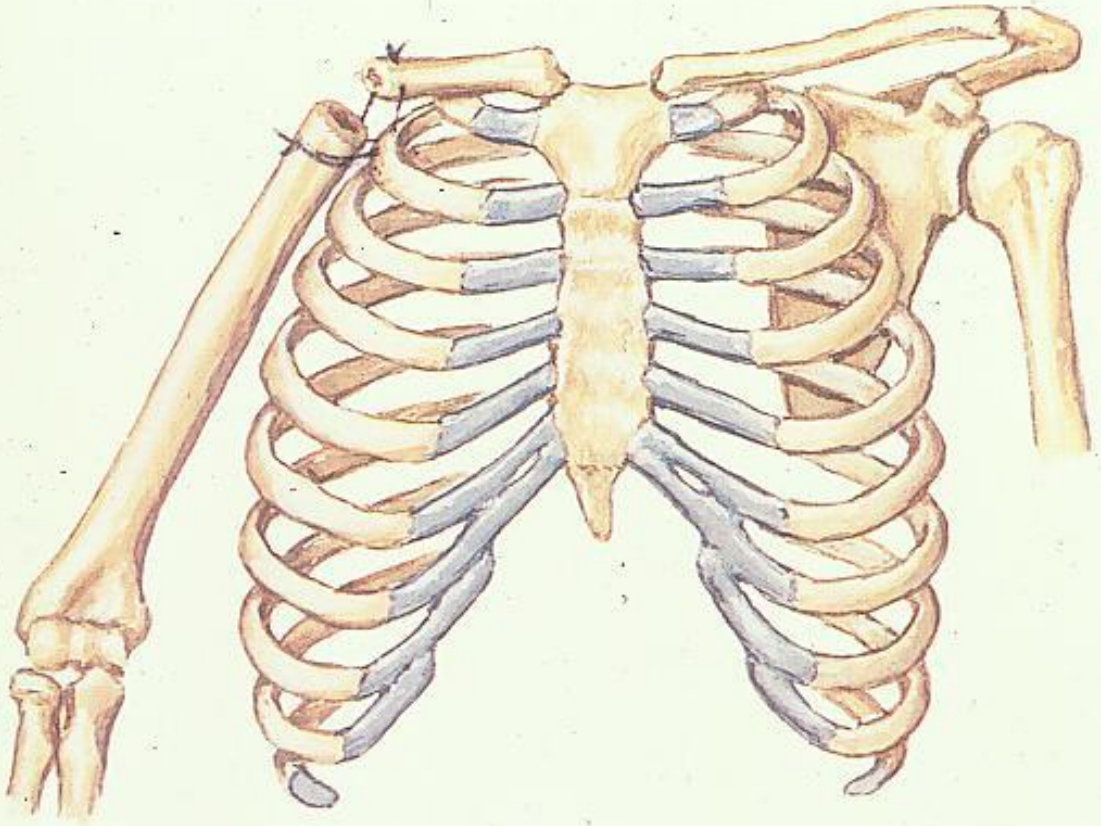


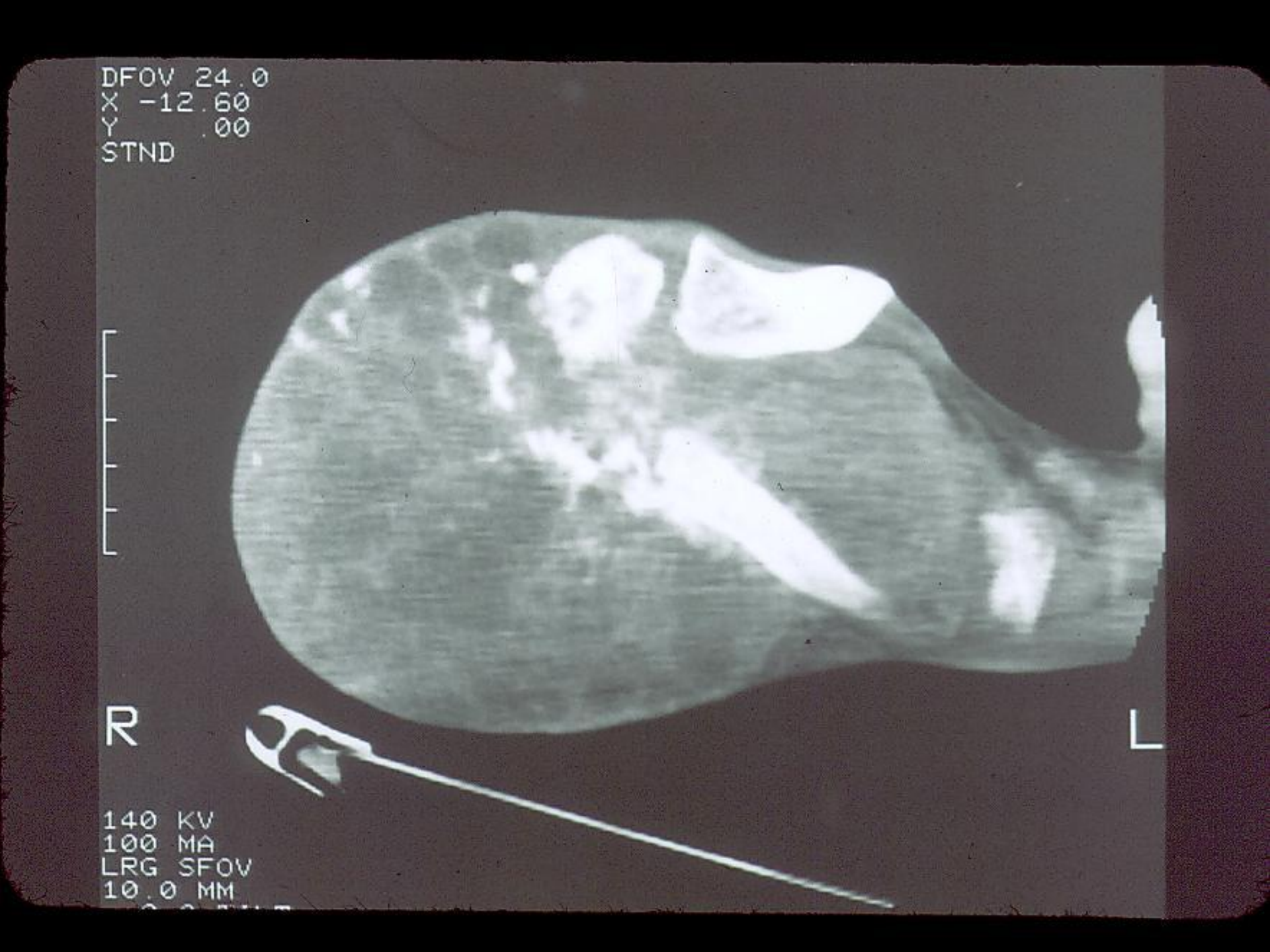


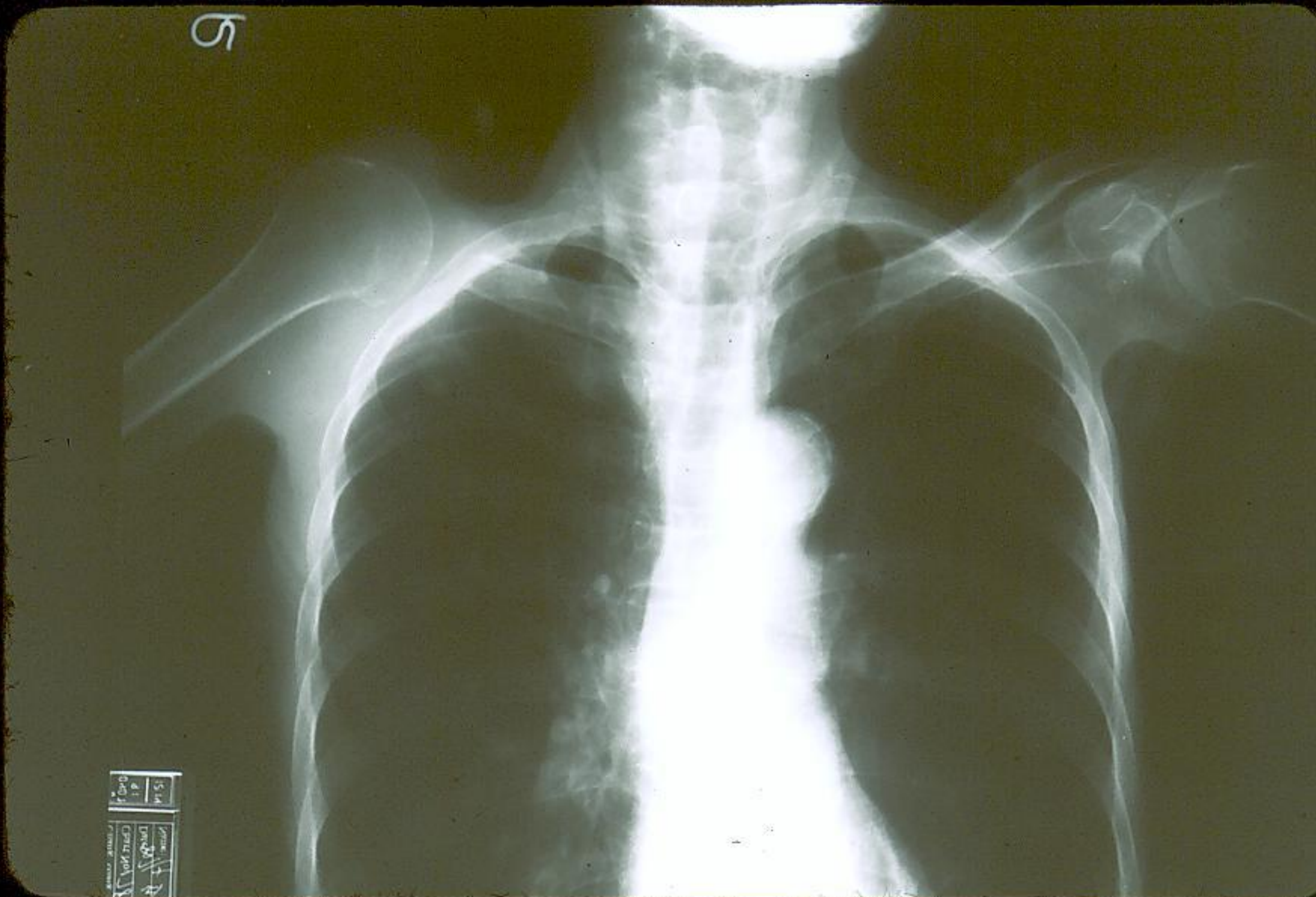
Tikhoff-Linberg Procedure for Tumors of Scapula and Proximal Humerus

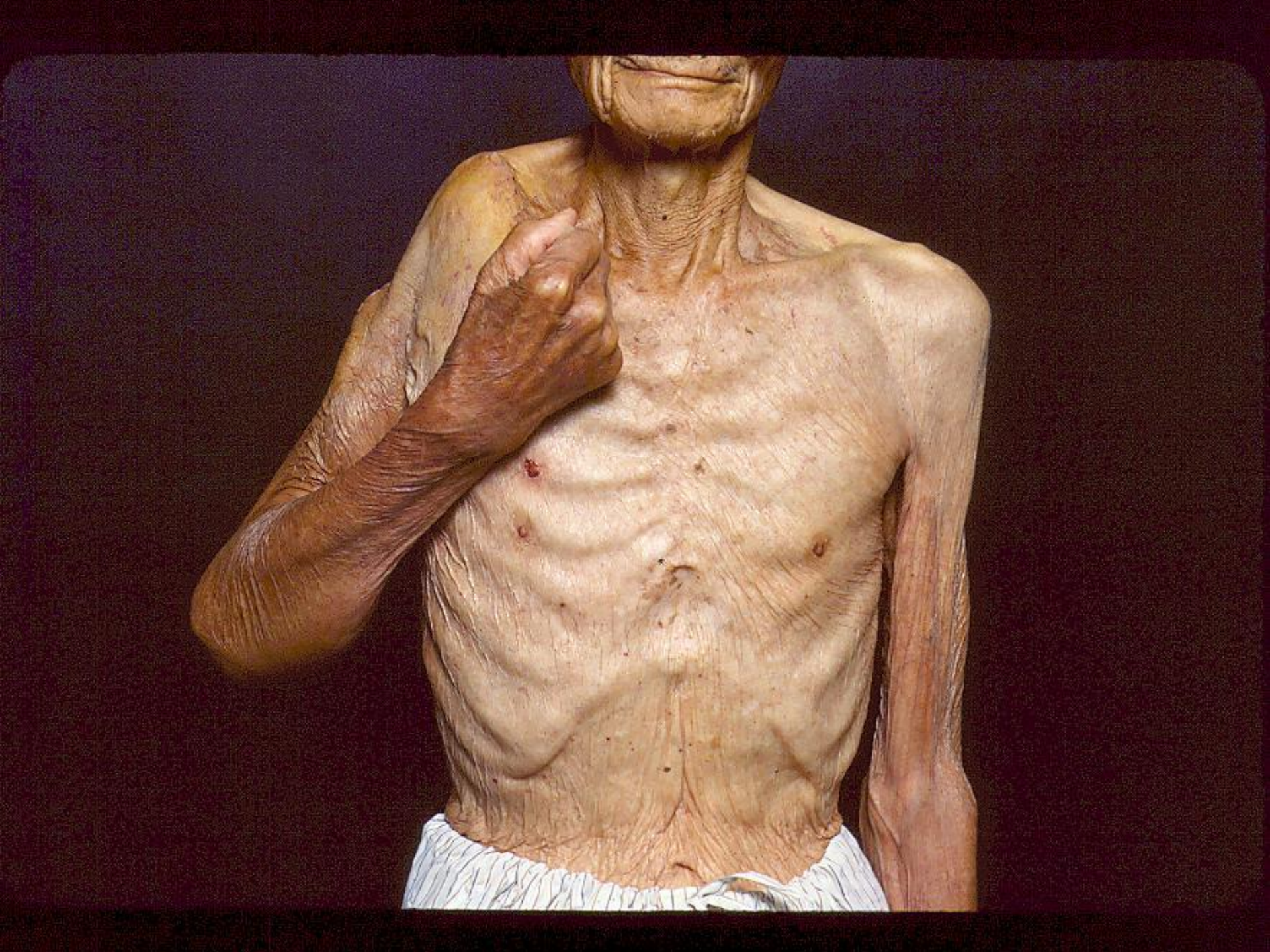


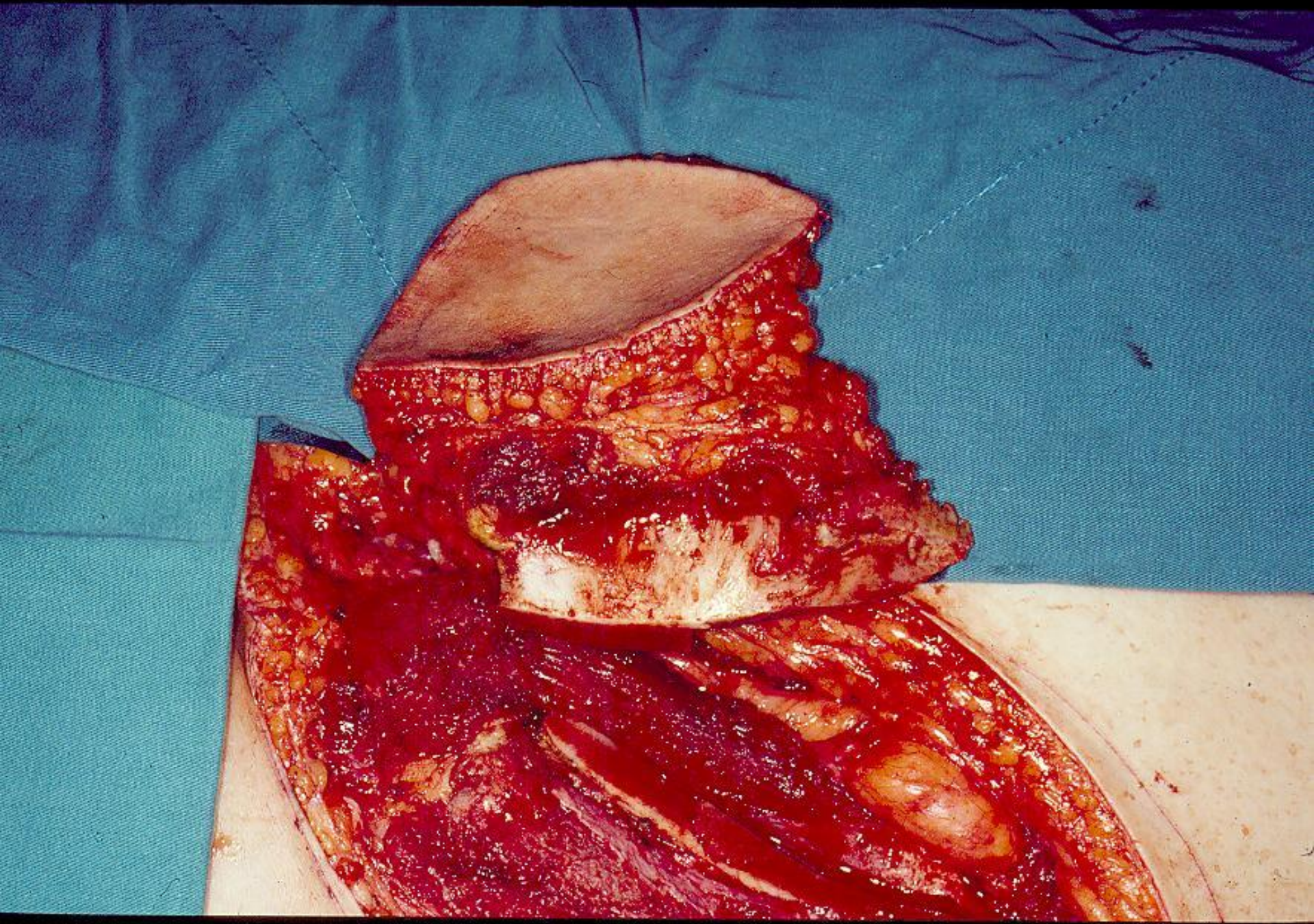
Scapula and proximal humerus removed. Remaining humerus stabilized by suturing to clavicle and 2nd rib

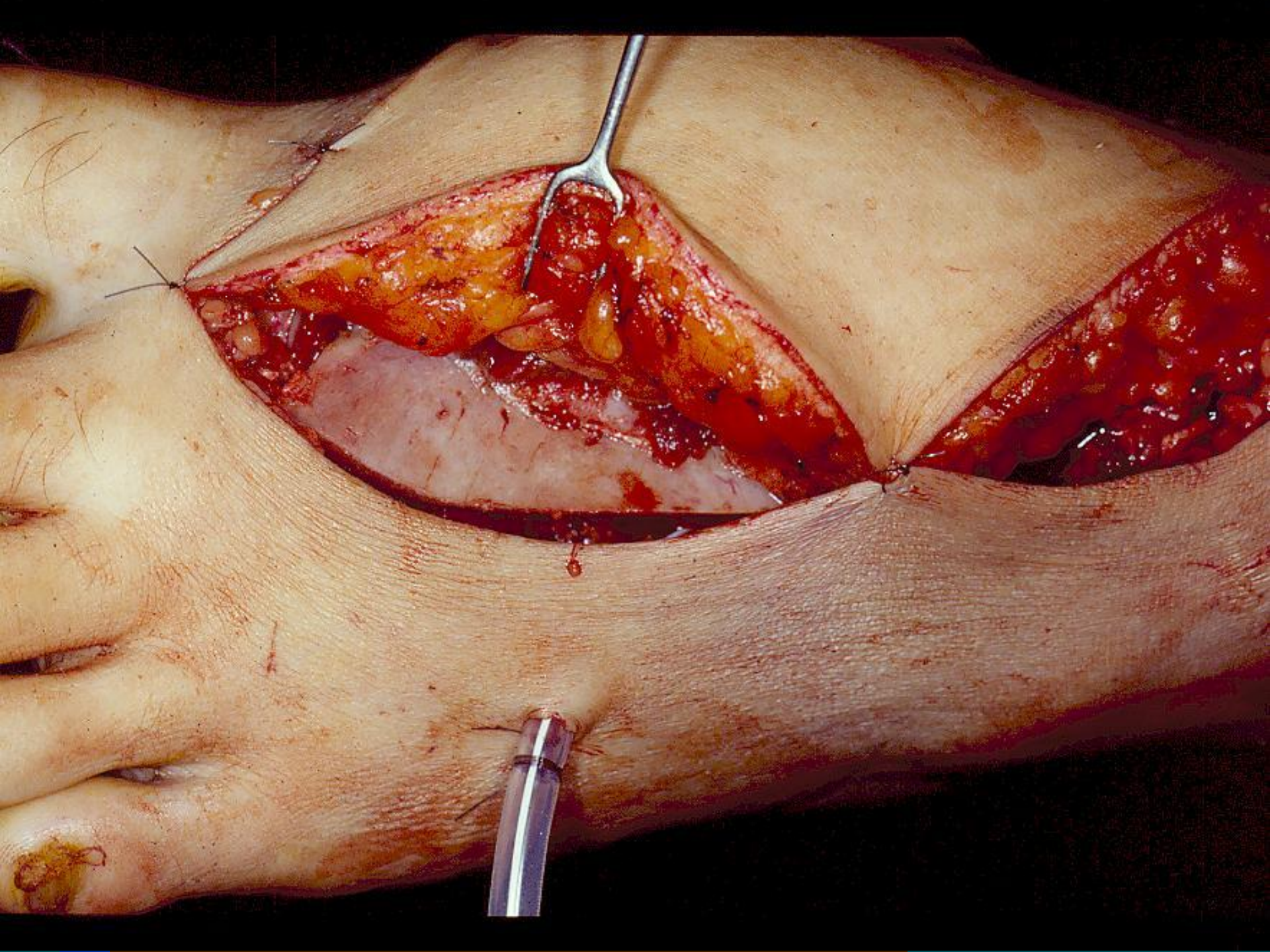
Patient now has flail shoulder but acceptable elbow flexion and good hand and finger function


DFOV 24.0
X -12.60
Y .00
STND
R
L
140 KV
100 MA
LRG SFOV
10.0 MM







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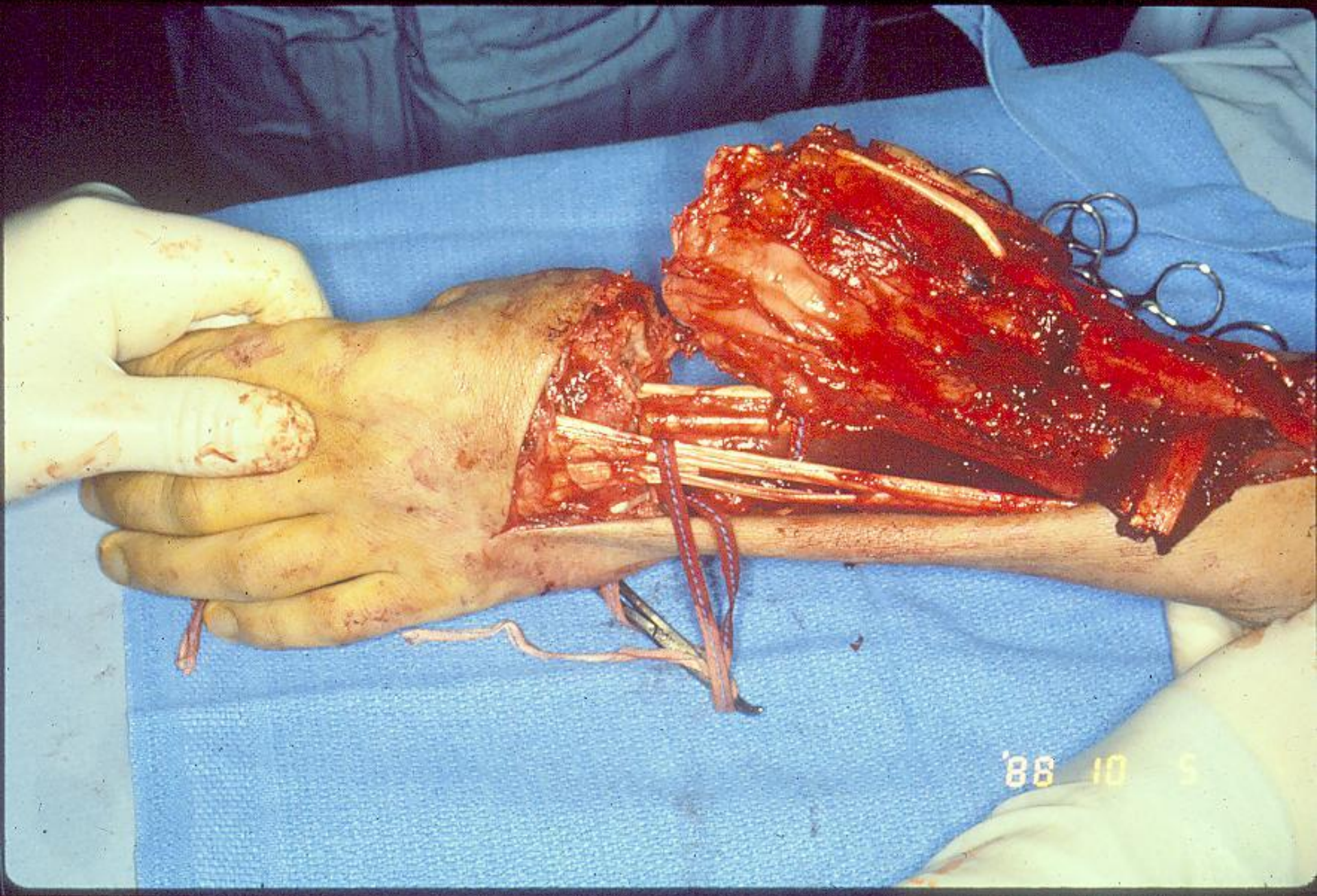
'86 10


3.5
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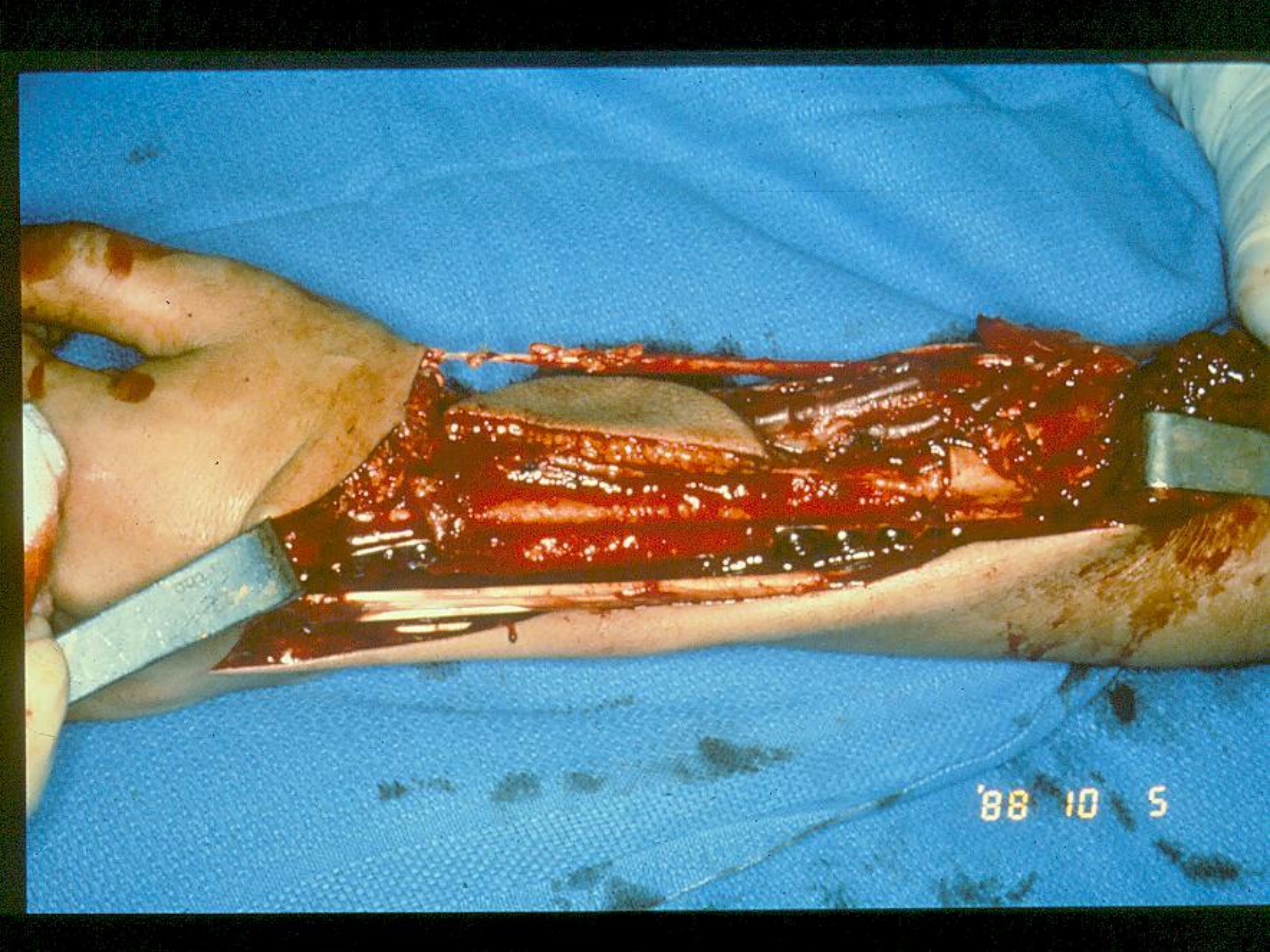
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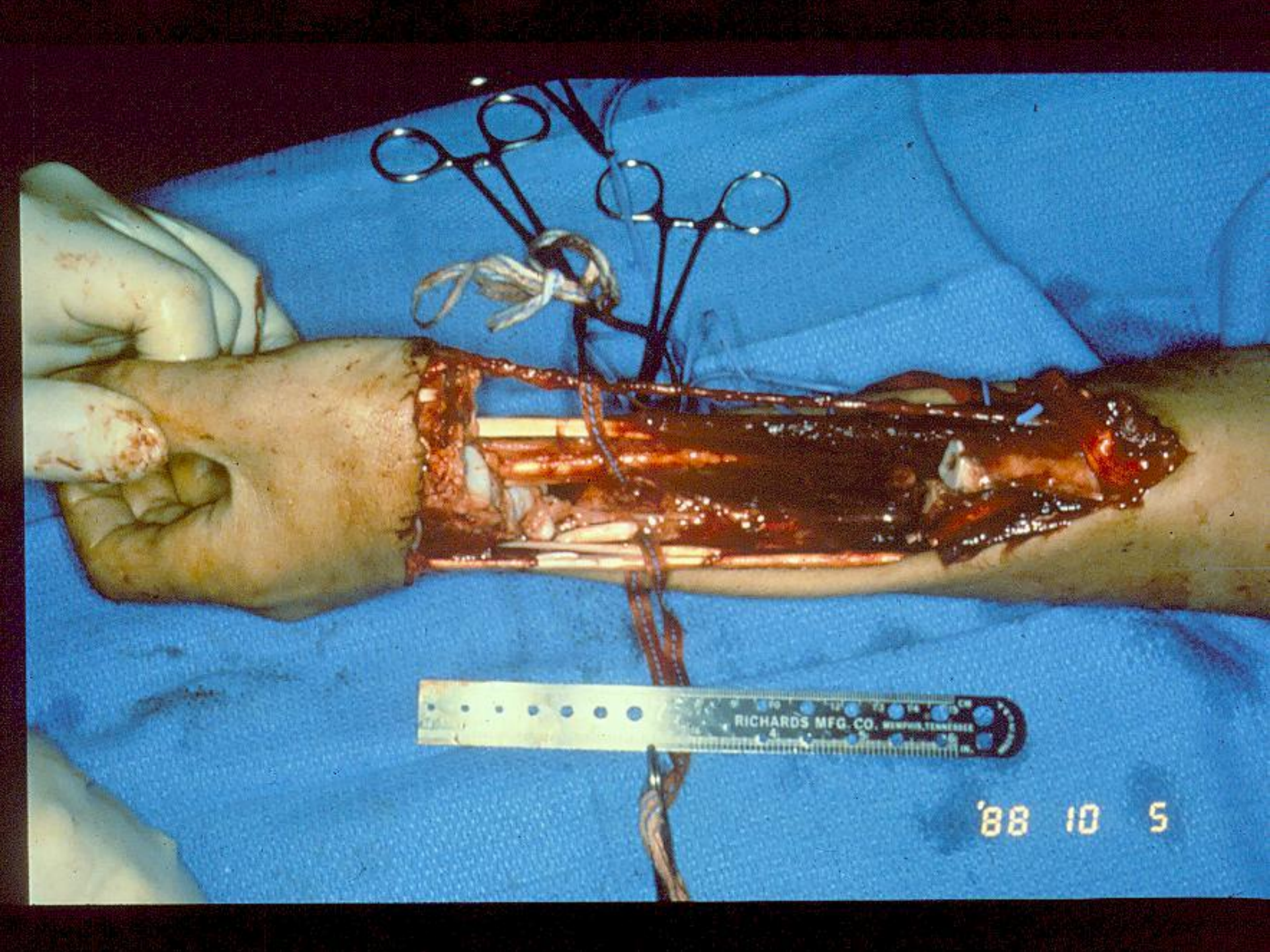
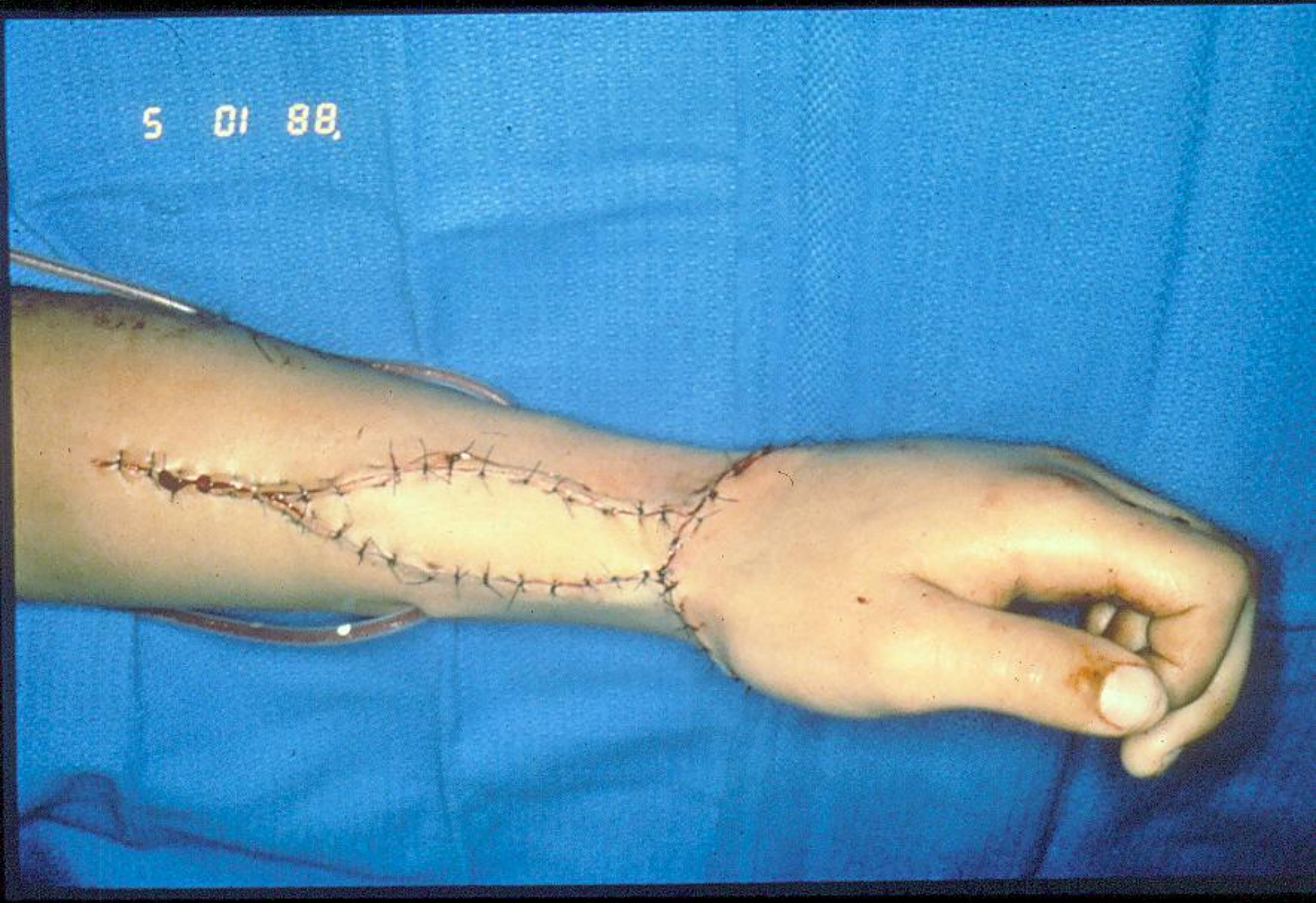

RICHARDS MFG. CO.
'88 10 5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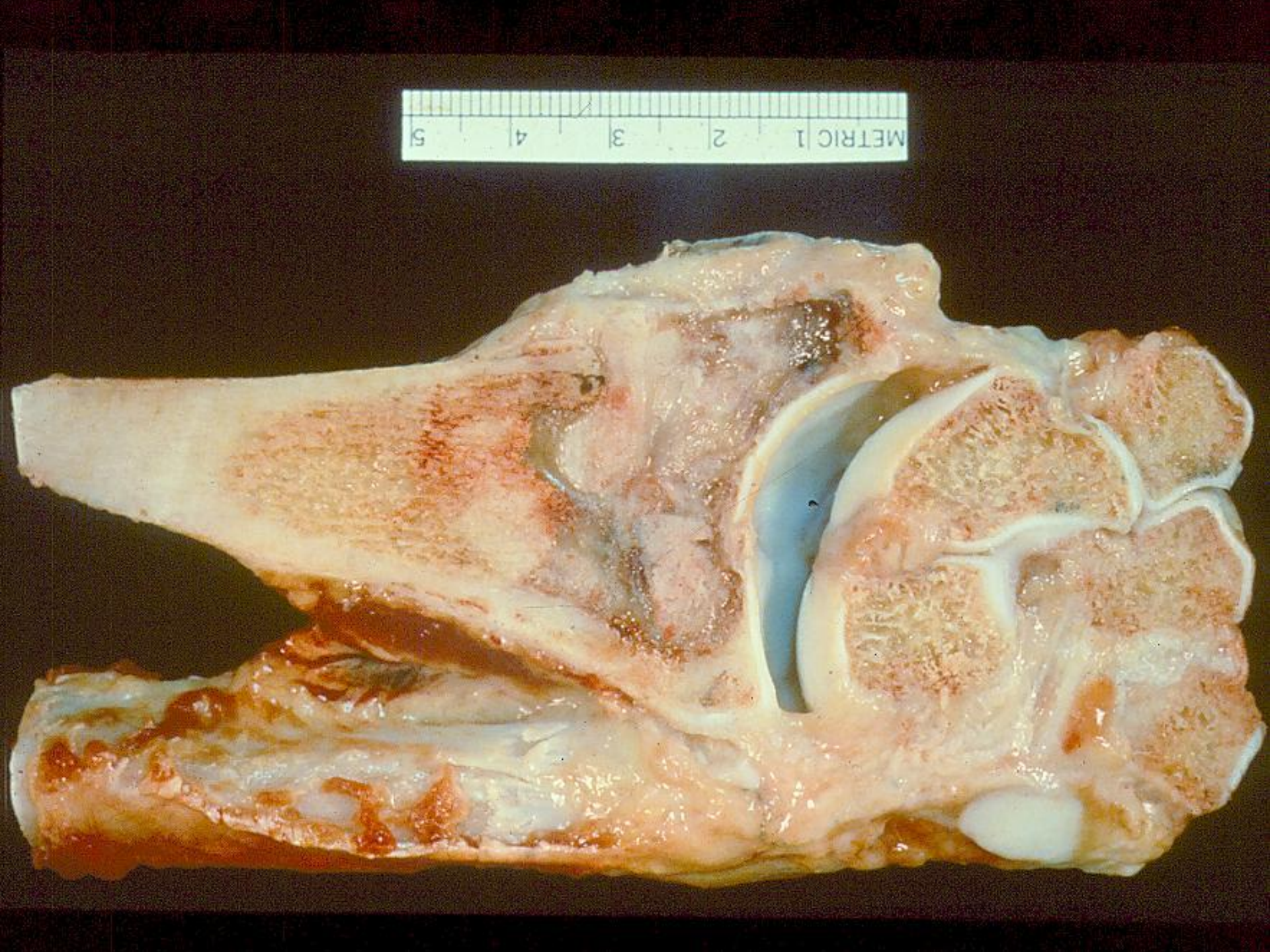
METRIC 1 2 3 4 5


3694
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HUANG.Y.Q. 20325370 .F.83. SEP.2001


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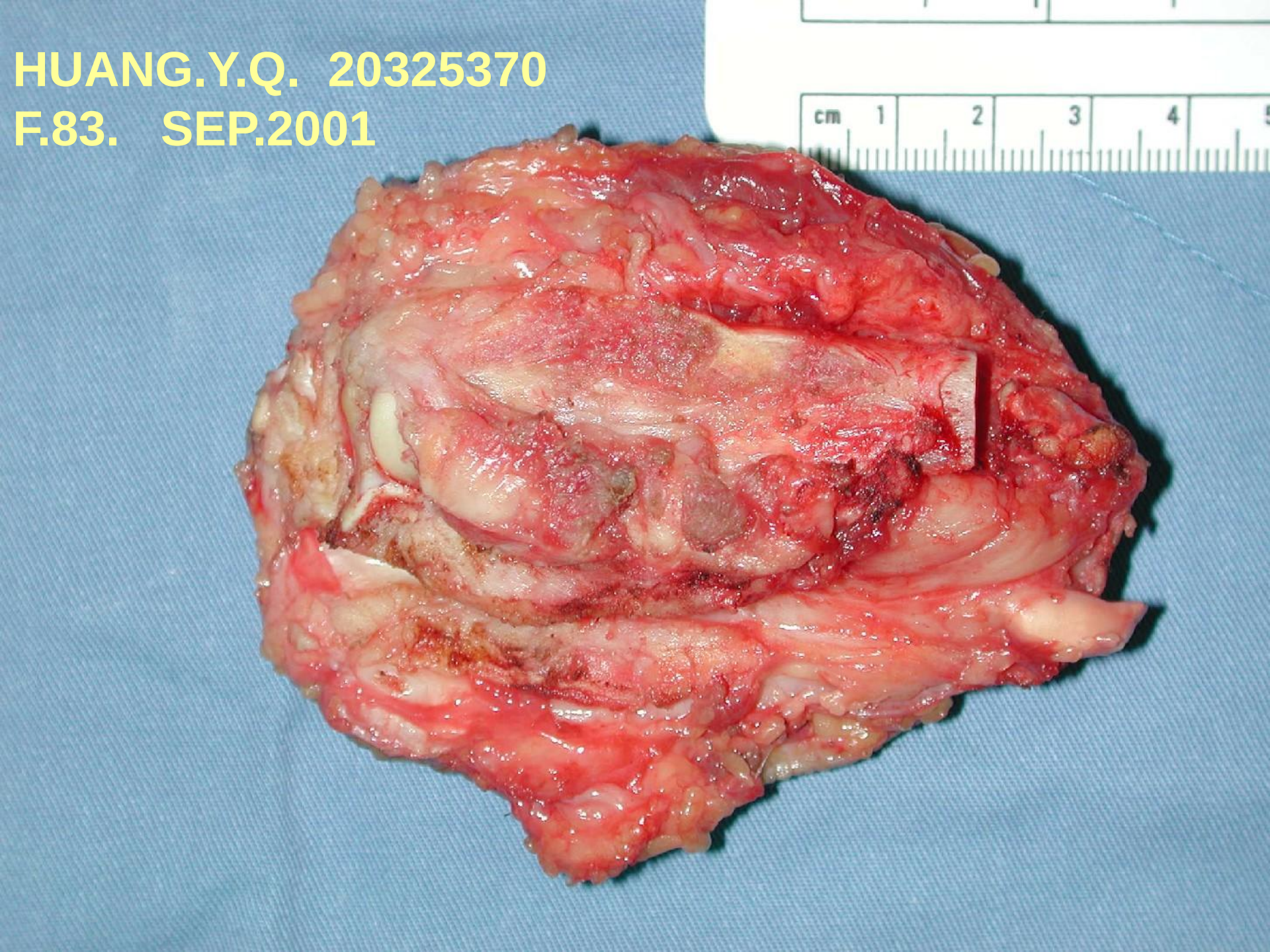
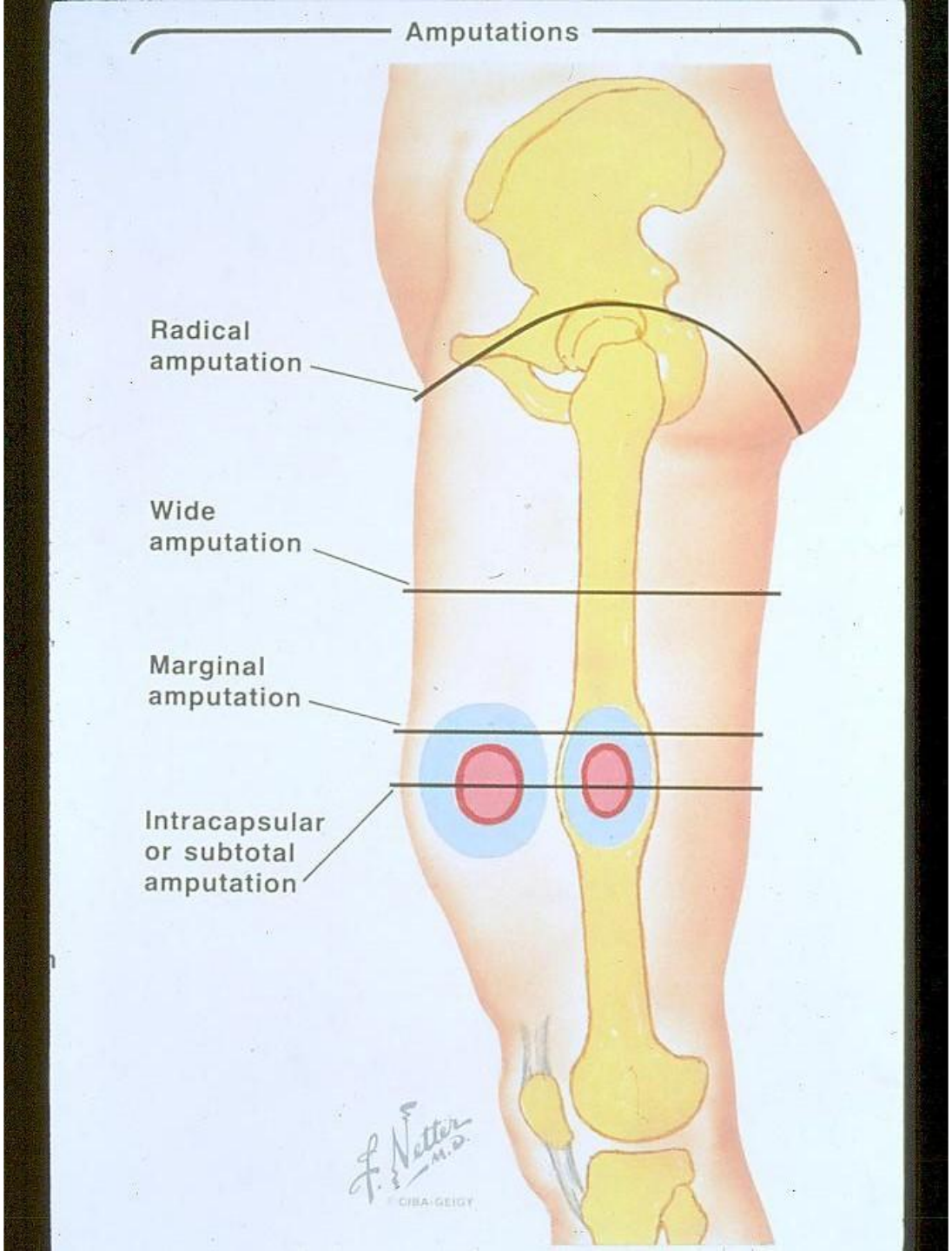
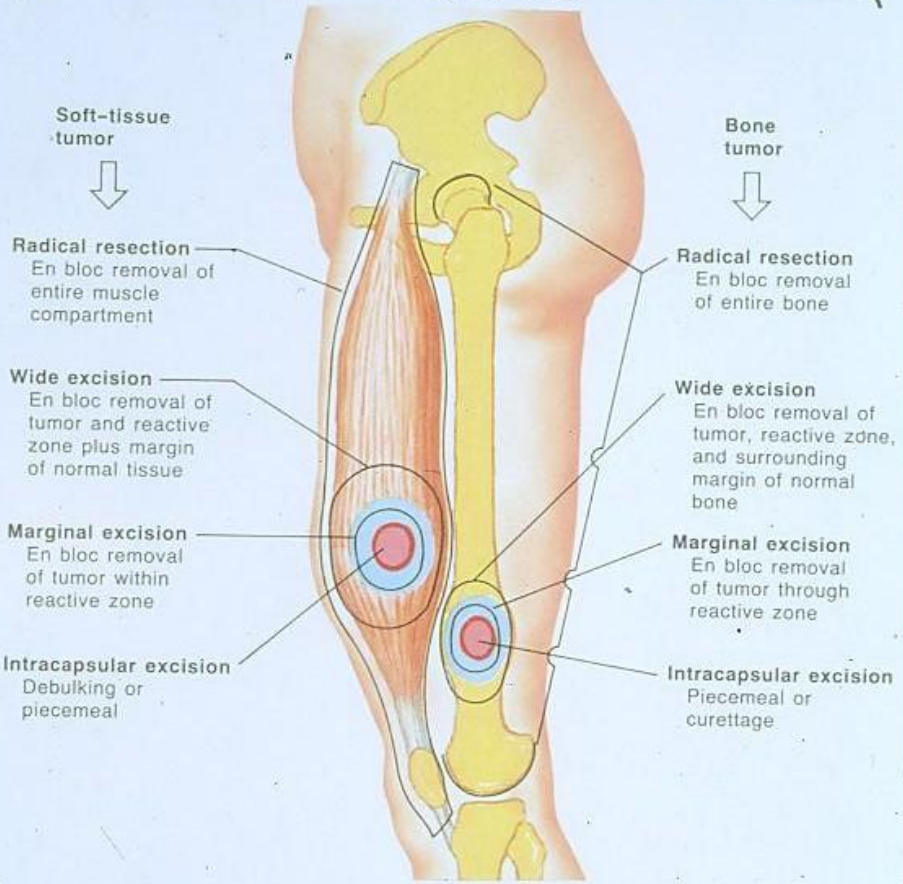
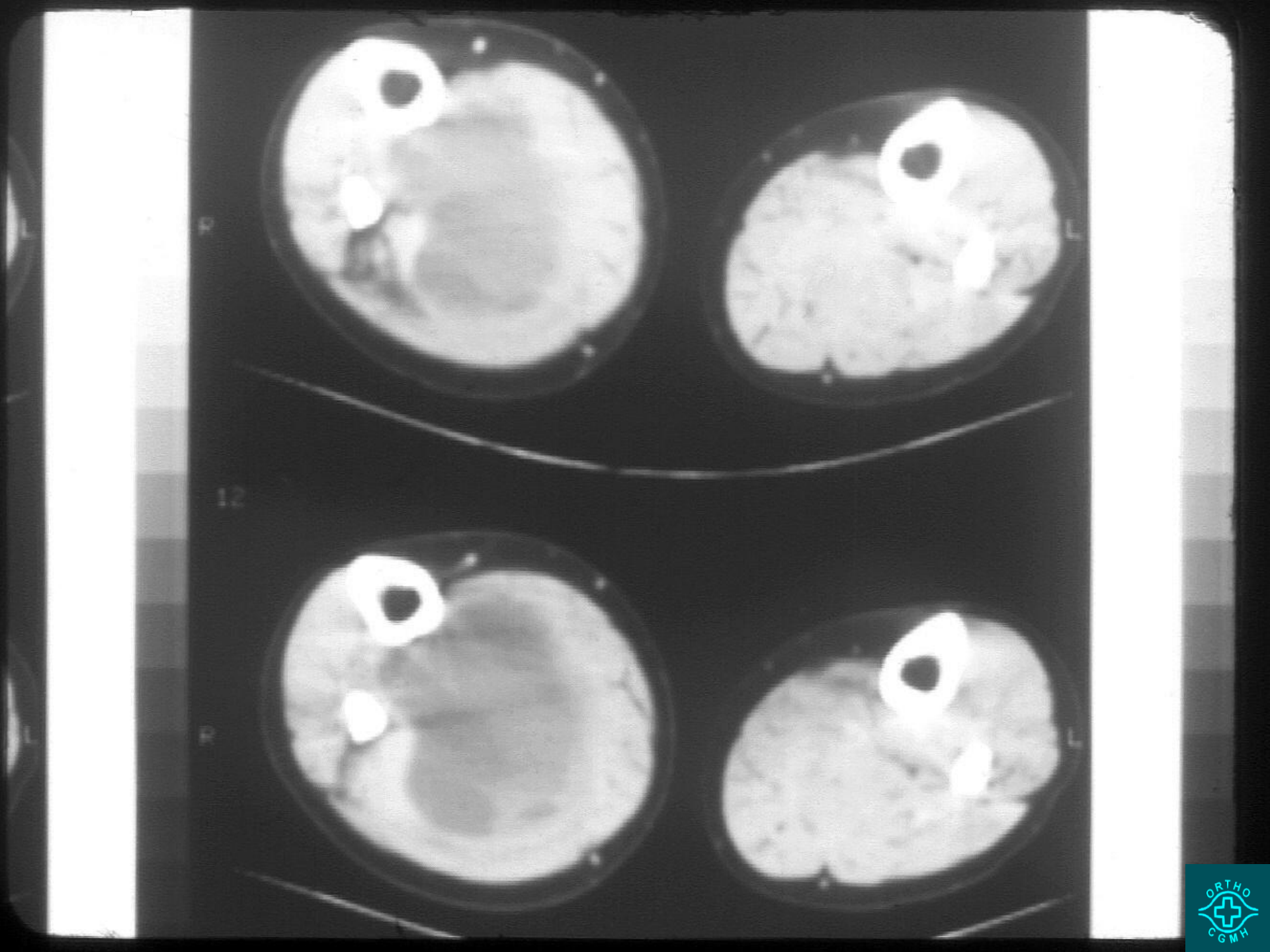



Amputations
Radical amputation
Wide amputation
Marginal amputation
Intracapsular or subtotal amputation
F. Netter M.D.
CIBA-GEIGY

Limb-salvage procedures

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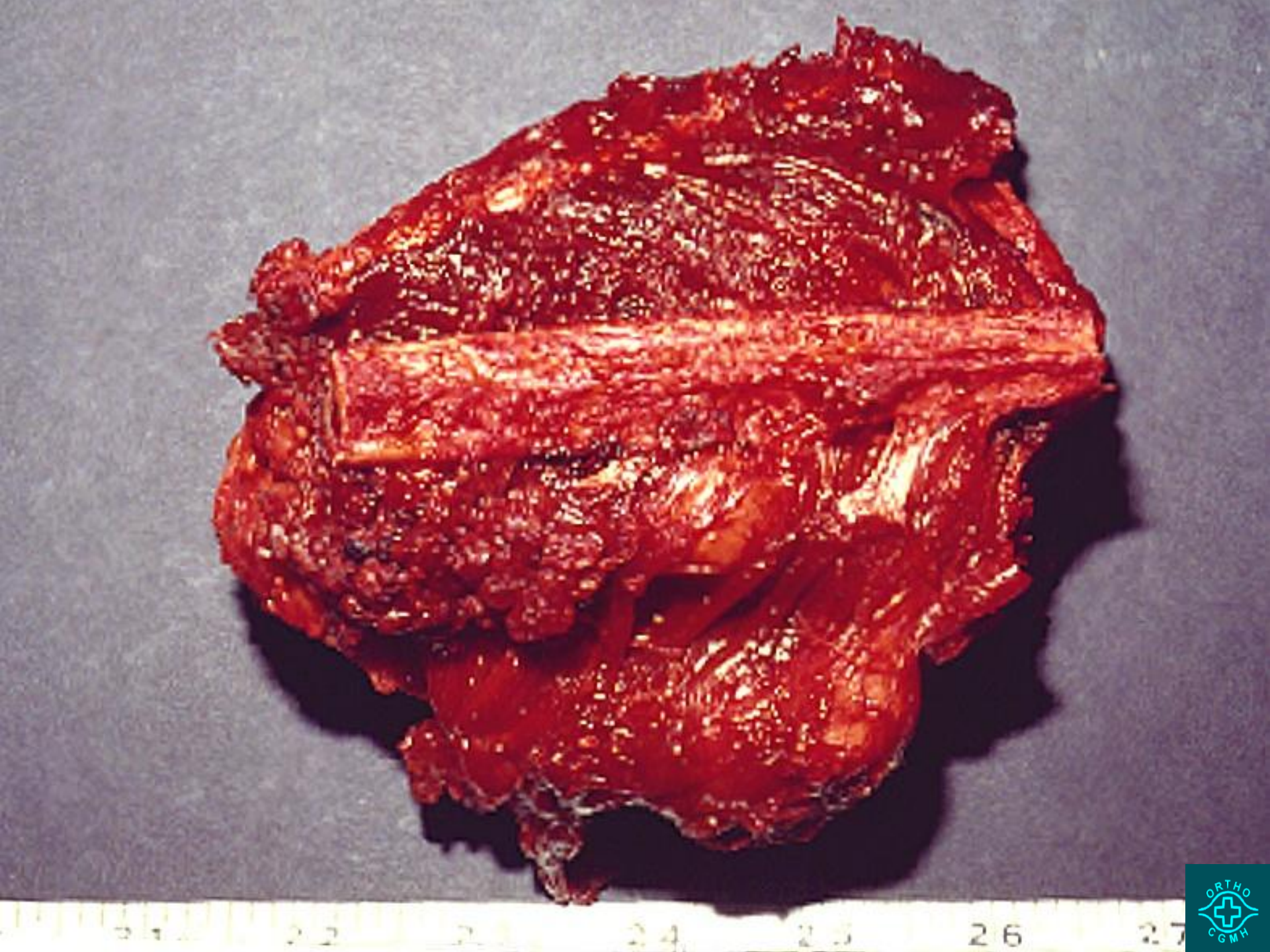
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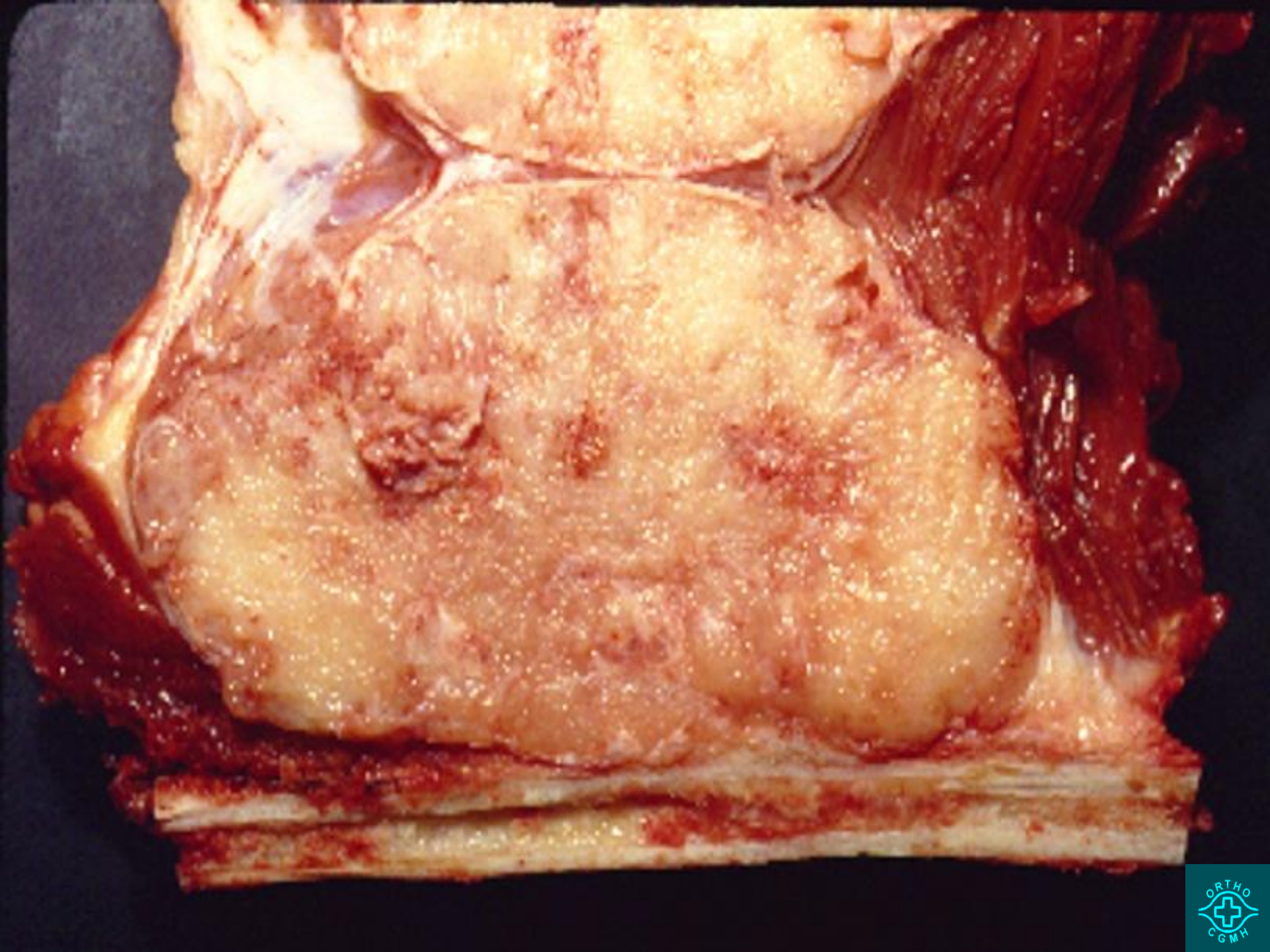


Thank you !

Allogeneic cortical strut for benign lesions of the humerus in adolescents.

Shih HN, Su JY, Hsu KY, Hsu RW.

J Pediatr Orthop. 1997 Jul-Aug;17(4):433-6.

Allogeneic cortical strut associated with or without cancellous bone grafting for benign adolescent humeral shaft lesions is an alternative management option offering a good chance of stabilization and healing. This study monitored 16 patients who had been treated with this surgical method from 1988 to 1993. There were nine boys and seven girls between the ages of 11 and 16 years (average, 14). Eleven patients had unicameral bone cysts; two had aneurysmal bone cysts; and three had fibrous dysplasia. All 16 patients received fresh-frozen (-70 degrees C) cortical strut inlay grafts in the humeral shaft defect after subtotal excision of the large lesions. No intramedullary rod or plate was used. The follow-up period ranged from 26 to 58 months (average, 41). There were no local recurrences or fractures of the shaft or allograft implants. The radiographs of all humeri revealed the cortical grafts to be well incorporated with new bone formation in the cavity. The overall functional results were good and excellent. This reconstruction with biologically safe and active material provided increased strength and prevented refracture.

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 allogeneic cortical strut with cancellous bone graft can be used safely and is effective for grafting cavitary lesions created after complete removal of the tumor.

Reconstructing humerus defects after tumor resection using an intramedullary cortical allograft strut.

Chang Gung Med J. 2002 Oct;25(10):656-63.

Shih HN, Shih LY, Cheng CY, Hsu KY, Chang CH.

BACKGROUND:

The humerus is a frequent involvement site of benign bone lesions. Various reconstruction methods have been adopted to restore the defect after excavating the lesion and/or to treat associated pathological fractures. In this study, we reviewed the clinical outcomes of using allogenous cortical struts to the treatment of patients with large humeral defects resulting from benign bone lesions, and investigated the mid-term fate of implanted allografts.

METHODS:

From 1988 through 1997, 29 patients with space-occupying humeral lesions were treated by eradication of the tumor and reconstruction with an intramedullary allogenous cortical strut. No additional internal fixation was needed for support. Clinical data were recorded, and functional and radiographic results were evaluated.

RESULTS:

The sizes of defects after eradication of the lesions ranged from 61 to 122 ml (mean, 92 ml). The patients were followed for a mean of 8.8 years. One local recurrence was noted and was successfully treated by repeating the procedure. All patients achieved good to excellent functional results. Follow-up radiographs showed complete healing of the defects, with partial to complete incorporation of the allografts into the host bones. Children had a better chance of complete allograft incorporation than adults.

CONCLUSION:

Intramedullary allogenous cortical struts act as internal splint mechanically and bone graft material biologically. The combined use of intramedullary allogenous cortical struts and chipped cancellous bone grafts provided good stability and healing probability for large osseous defects in the humerus without the need for implant fixation. Allograft incorporation occurred slowly in adults and might not achieve complete incorporation in adults.

The Treatment of Benign Bone Lesions in the Proximal Femur

Chun-Ying Cheng; Hsin-Nung shih; Yeung-Jen Chen; Wei-Pin Ho; Robert Wen-Wei Hsu

Journal of Orthopedic Surgery Taiwan 12:164-169, 1995

Allogenous segmental fibular (strut) graft might be useful in the treatment of benign lesions in the proximal femur. It not only served as space filling function in addition to autogenous bone graft, but also provided an immediate mechanical strength in lesions sites. Between 1988 and 1991, thirty-five patients with proximal femoral lesions treated allogenous fibular strut inlay graft, supplemented with autogenous cancellous bone graft and transfixed with hip compression screw and plate fixation was retrospectively analyzed. The age of patients ranged from 18 to 54 years; sixteen were males and nineteen were females. The mean follow-up time was 3.5 years (ranged from 2 to 5 years). The diagnosis included 14 fibrous dysplasia, 11 simple bone cysts, 8 aneurysmal bone cysts and 2 giant cell tumors. Eleven patients (31%) suffered from pathologic fractures. All patients restored full weight bearing walking without limping gait within 6 months. From the serial radiographic evaluation, all cancellous graft was repaired within 6 months and strut graft need more than 2 years to achieve consolidation. There were no tumor recurrence, infection, avascular necrosis of femoral head or nonunion at the last follow-up. There are many factors to affect the repair of bone graft, the success of strut graft may warrant further clinical

Treatment of fibrous dysplasia involving the proximal femur.

Shih HN ; Chen YJ ; Huang TJ ; Hsu KY ; Hsu RW.

Orthopedics. 1998 Dec;21(12):1263-6.

Twenty-two patients with fibrous dysplasia in the femoral neck or trochanteric area were treated with curettage and bone grafting with a sliding hip compression screw and plate. Follow-up ranged from 2 to 6 years (average: 4 years). Fourteen patients had monostotic and 8 had polyostotic disease. Four patients had pathologic fractures. Bone grafting included a deep-frozen allogeneic cortical strut and cancellous bone. After implanting the lag screw and cortical strut, the remaining defect space was filled with iliac bone. Postoperatively, all patients had good bone healing and complete incorporation of the implanted graft. There were no recurrences or complications, and functional results were rated as good and excellent.

Treatment of the femoral neck amd trochanteric benign lesions.

Shih HN, Cheng CY, Chen YJ, Huang TJ, Hsu RW.

Clin Orthop Relat Res. 1996 Jul;(328):220-6.

Thirty-five patients with a benign lesion of the femoral neck or trochanter were treated and seen in followup at the authors' institution from 1988 to 1991. Sixteen men and 19 women between the ages of 18 and 54 years (average, 27 years) were seen at an average followup of 3 years 6 months (range, 2-5 years). Eight patients had aneurysmal bone cyst; 14 had monostotic fibrous dysplasias; 2 had giant cell tumors; and 11 had simple bone cysts. Eleven patients had pathologic fractures. All patients were treated with curettage and bone grafting in conjunction with a sliding hip compression screw and plate. The bone grafting included a combination of a deep frozen allogenic cortical strut with autogenous iliac cancellous bone to fill the remaining defect space after lag screw and cortical strut had been implanted. At followup, all patients had good bony healing and incorporation of the implanted graft. There were no complications and no local recurrences. All of the functional results were excellent.


C.G.J.R
長庚關節重建
CHANG-GUNG MEMORIAL HOSPITAL
LINKOU MEDICAL CENTER
TAIWAN
THANK YOU !!
ORTHO
CGMH