

Radiographic Evaluation of Musculoskeletal Tumors

James C. Wittig, MD

Associate Professor of Orthopedic Surgery

Chief, Orthopedic Oncology

Mount Sinai Medical Center

Staging Studies

- Plain Radiograph
- MRI
- CT scan
- Chest CT
- Bone Scan

Plain Radiographs

- Evaluate:
 - Rate of tumor growth
 - Tumor interaction with surrounding non-neoplastic tissue
 - Internal composition of tumor

MRI

- Visualize entire bone and adjacent joint
- Best test for intraosseous extent and soft tissue extent
- Identify skip metastases
- Tumor proximity to neurovascular structures
- Occasionally helpful in diagnosis of bone or soft tissue tumors (experienced radiologist)

TABLE 1. *MRI signal intensities of various tissues*

Tissue	Image	
	T1-weighted	T2-weighted
Hematoma	High	High
Fat, fatty marrow	High	Intermediate
Muscle, nerves, hyaline cartilage	Intermediate	Intermediate
Cortical bone, tendons, ligaments, fibrocartilage, scar tissue, air	Low	Low
Hyaline cartilage	Intermediate	Intermediate
Red (hematopoietic) marrow	Low	Intermediate
Fluid	Intermediate	High
Tumors (generally)	Intermediate-to-low	High
Lipoma	High	Intermediate
Hemangioma	Intermediate (slightly higher than muscle)	High

CT

- Good for evaluating cortical details and destruction
- Subtle cortical erosions (endosteal;periosteal) not detectable on plain x-ray or MRI
- Subtle calcifications / ossification (Visible tumor matrix mineralization)

Pain Radiographs

- The next three slides demonstrates how plain radiographs should be utilized to evaluate a bone tumor
- There are specific characteristics that should be identified on plain radiographs that aid in the differential diagnosis of a bone tumor

Plain Radiographs

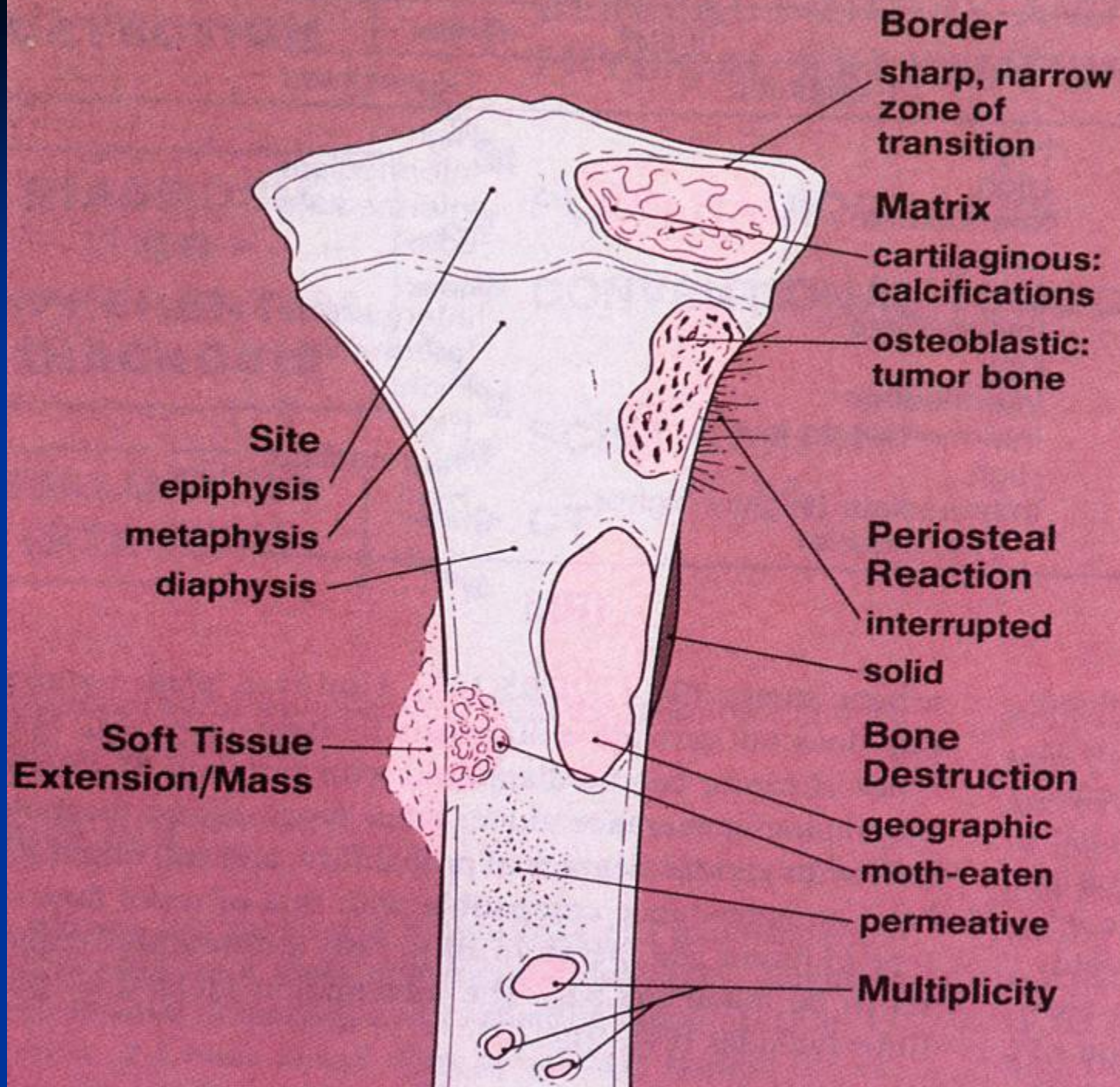
- Bone involved
- Is involved bone normal?
- What part of the bone?
- Open or closed growth plate
- Epicenter of lesion (cortex or medullary canal)
- Tumor contour and zone of transition between tumor and host bone

Plain Radiographs

- Mineralized matrix?
- Cortical destruction?
- Periosteal reaction? What type
- Involvement of joint space?
- Tumor multifocal?
- Is tumor of uniform appearance or does it have several different components?

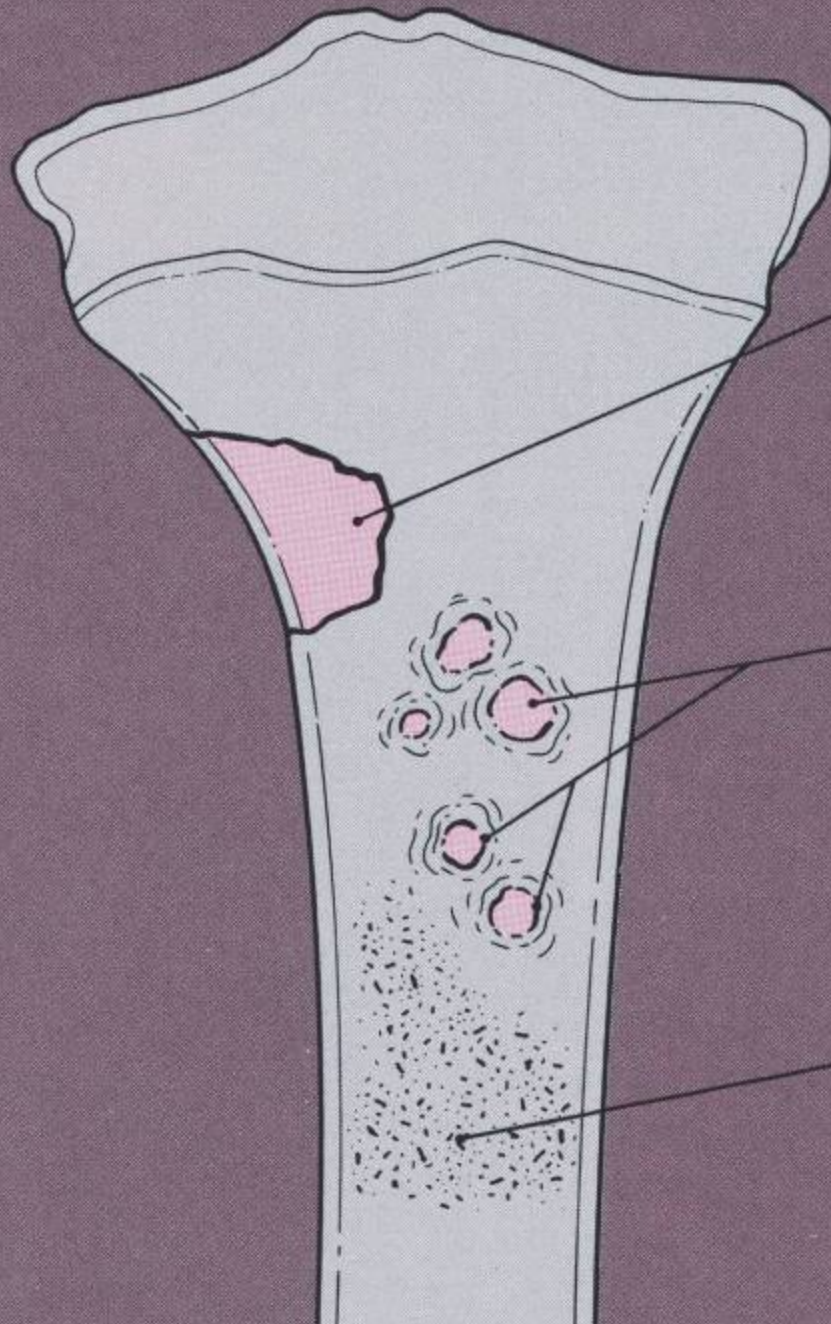
Radiographic Evaluation

- Bone Involved and Position in the Bone
- Pattern of Bone Destruction
 - Geographic, Permeative, Moth Eaten
- Margin of the Lesion
- Presence of Visible Tumor Matrix
(Calcification/Ossification)
- Internal Trabeculations
- Cortical Erosion, Penetration, Cortical Expansion
- Periosteal Response
 - Continuous or Interrupted



Patterns of Bone Destruction

- Geographic
- Motheaten
- Permeative



Benign Process

geographic—uniformly
destroyed area
with sharply
defined border

Likely Malignant Process

moth-eaten—areas
of destruction
with ragged
borders

Aggressive/Malignant Process

permeative—
ill-defined
area spreading
through marrow
space

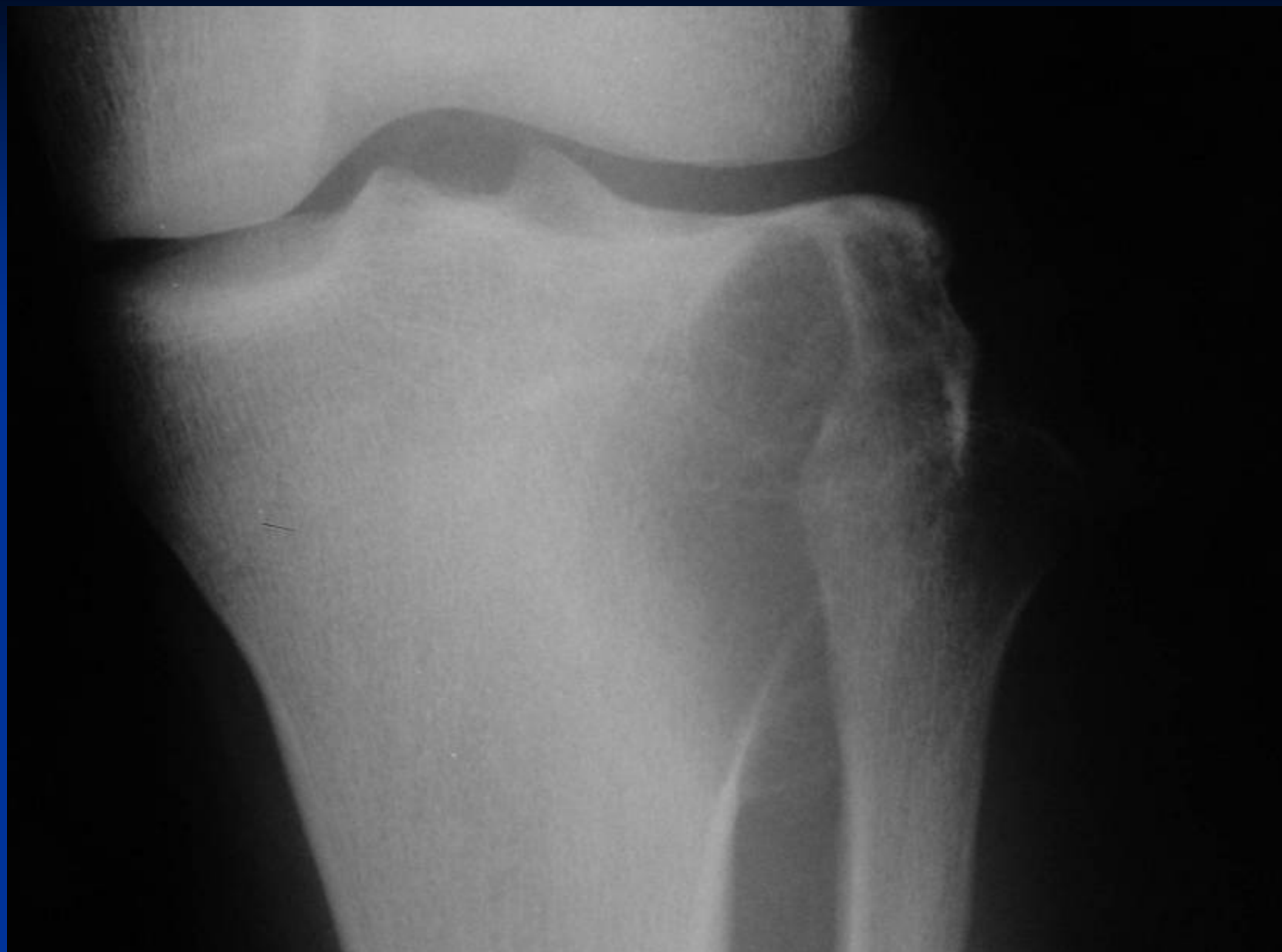
Geographic Bone Destruction

- Least Aggressive Pattern
- Slow Growing Lesion-Usually Benign
- Clearly Demarcated Lesion
 - Clearly Delineated Borders of Lesion
- Narrow Zone of Transition between Tumor and Normal Bone
- May have Sclerotic Margin
- Thicker Sclerotic Margin is Less Aggressive
- No Surrounding Sclerosis means more Aggressive/Faster Growing
- Usually Benign; also Myeloma, Mets, Osteomyelitis (Especially Granulomatous) can be Geographic



Geographic Bone Destruction

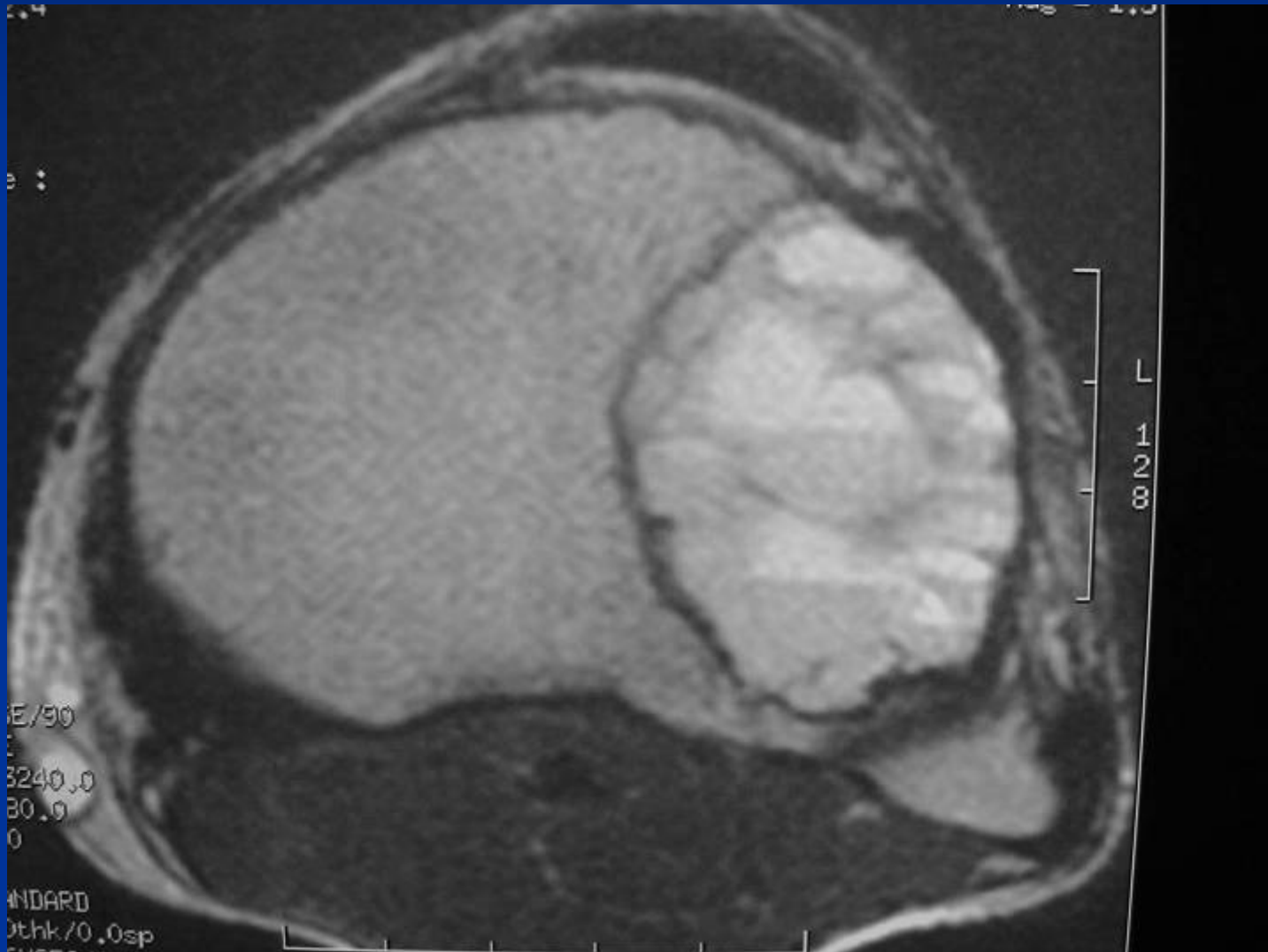




Giant Cell Tumor

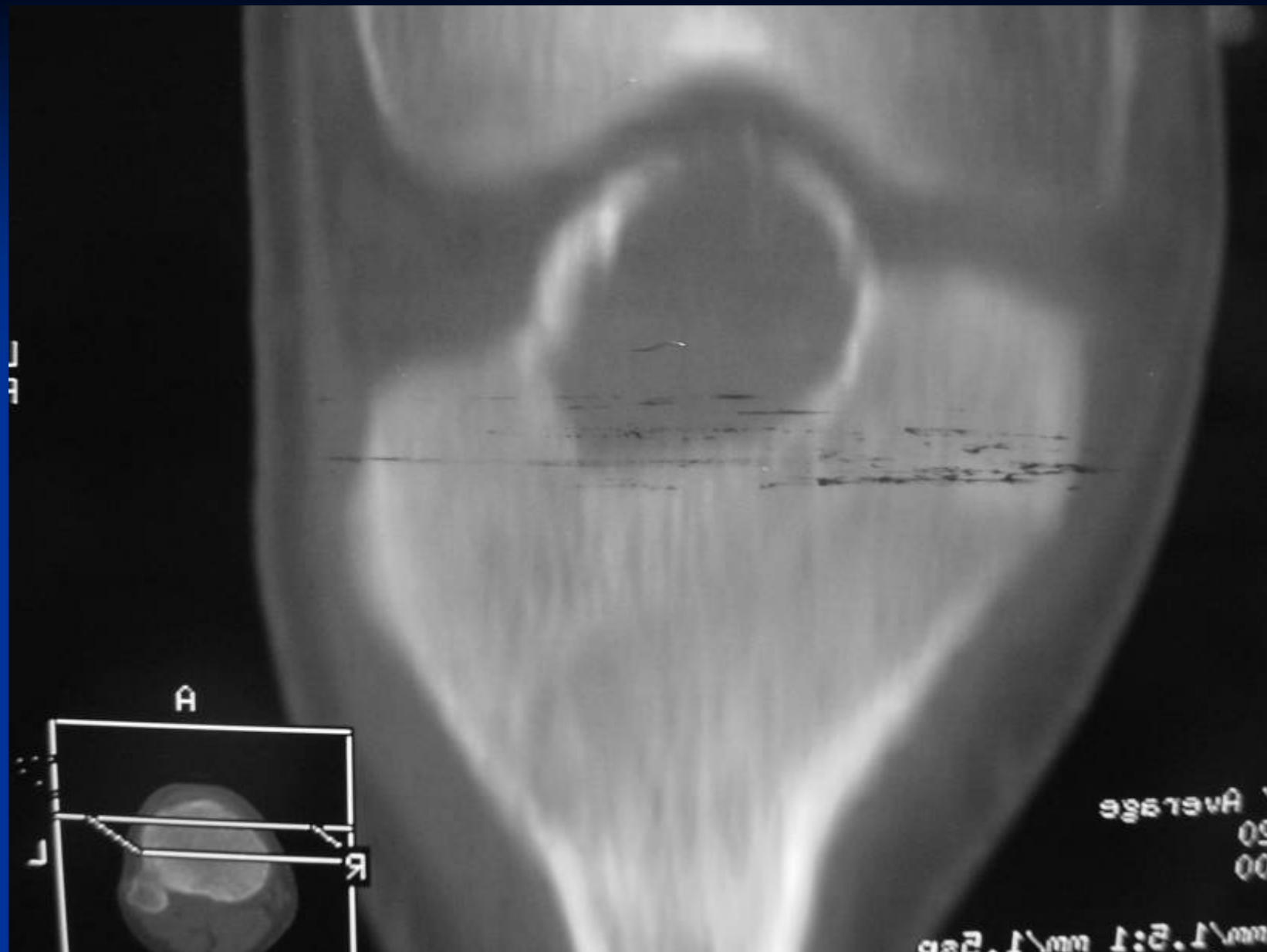


Giant Cell Tumor



Geographic Bone Destruction







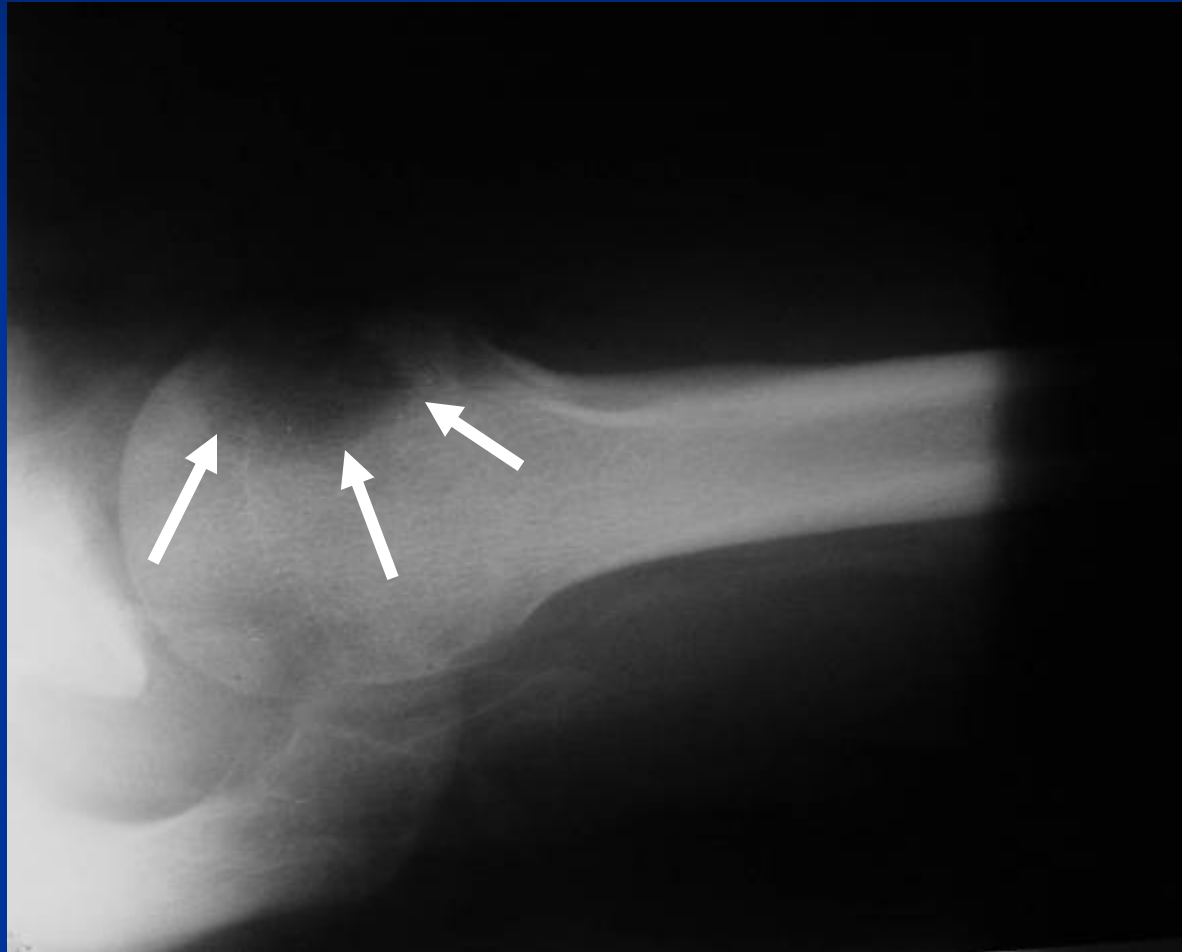
Chondroblastoma



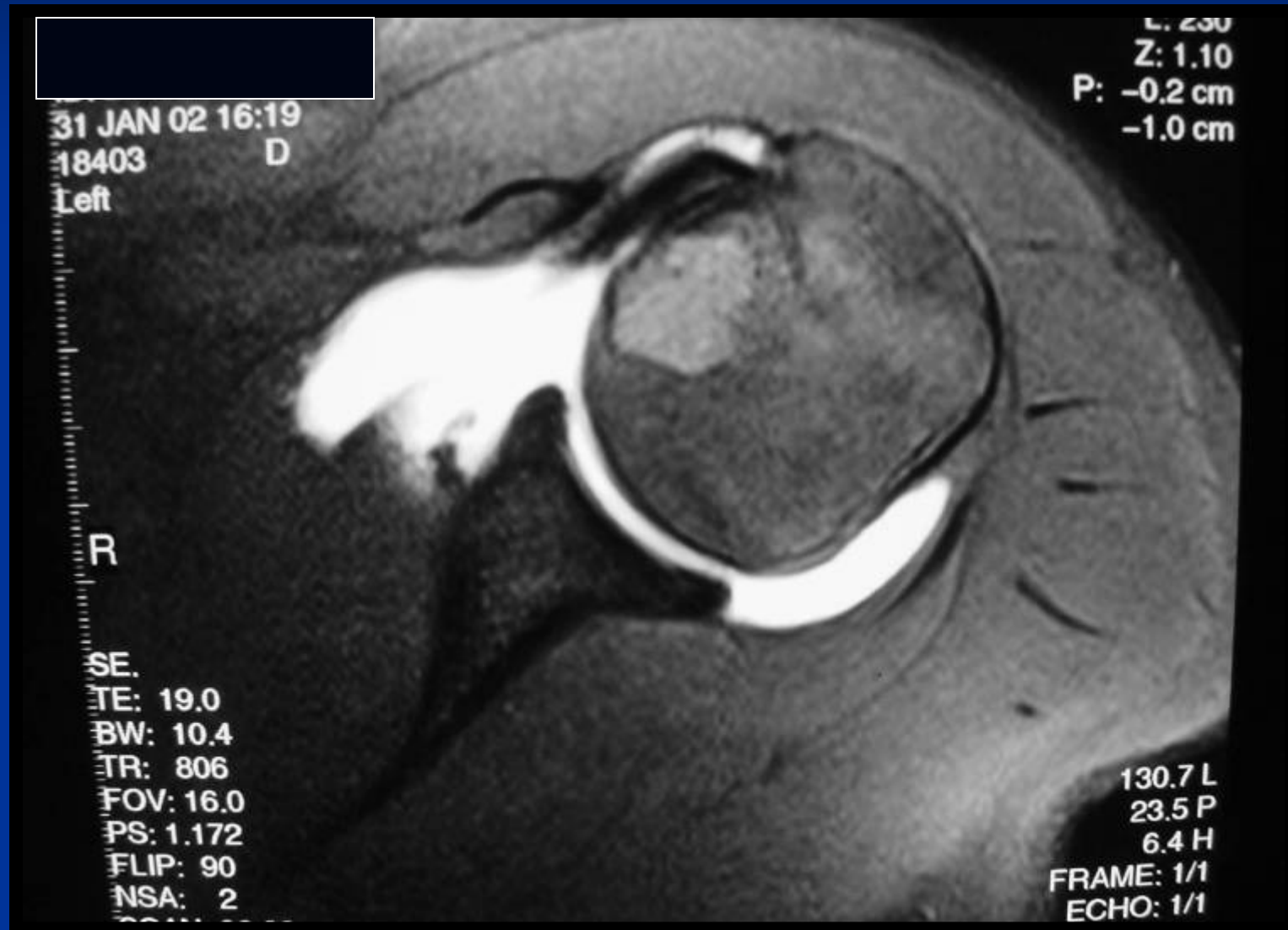
Geographic Bone Destruction



Geographic Bone Destruction



Geographic Bone Destruction



Geographic Bone Destruction

ABC- Aneurysmal Bone Cyst





Geographic Bone Destruction

Fluid-Fluid Levels on MRI

ABC





I WANT YOU!!!!!!!!!!

BE ALL THAT YOU CAN BE!!!
NYU NURSE PRACTITIONERS
GOOOO TUMORS!!!!!!!!!!



Geographic Bone Destruction Giant Cell Tumor





MRI



CT Scan



Geographic Bone Destruction

■ Types of Margins Around Lesion

■ **IA** (Thick Complete Sclerotic Margin)

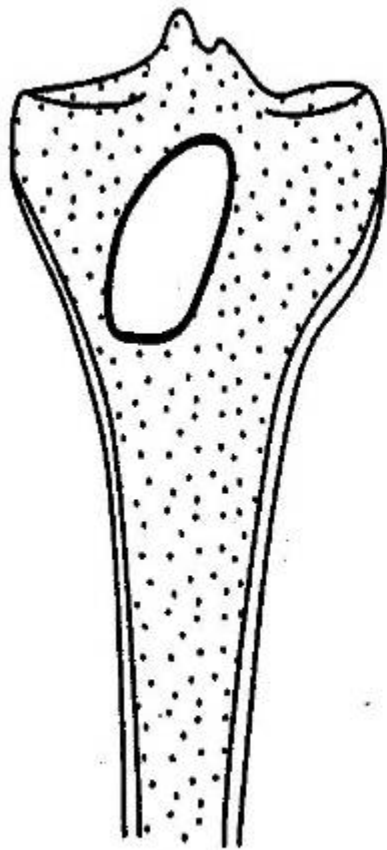
■ Indolent Lesion

■ **IB** (Thin and Incomplete)

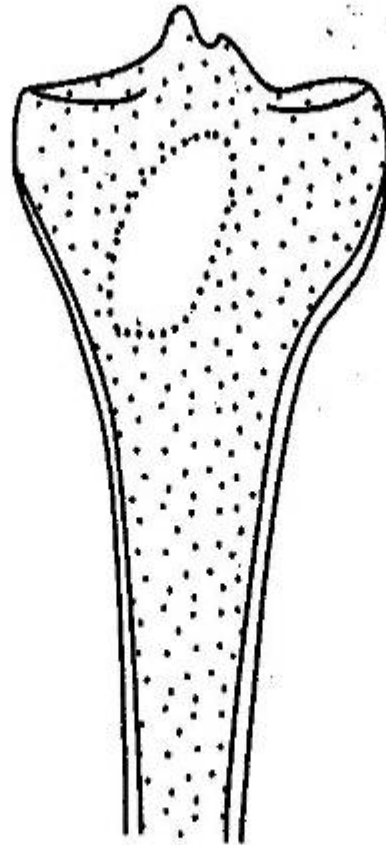
■ Active Lesion

■ **IC** (No Sclerotic Margin)

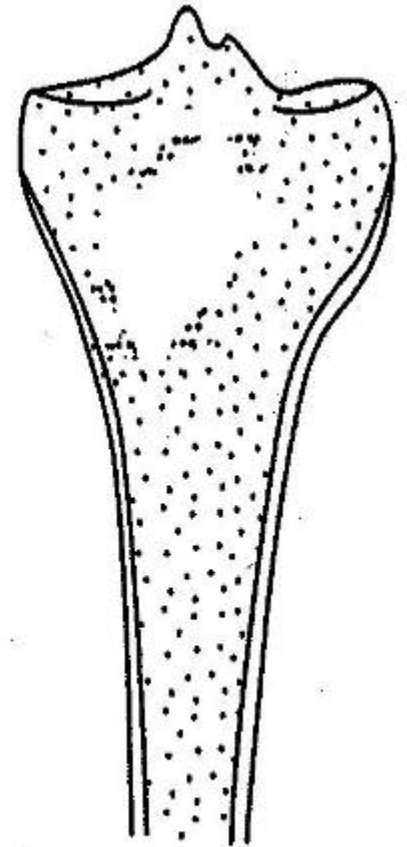
■ Aggressive Lesion



1A

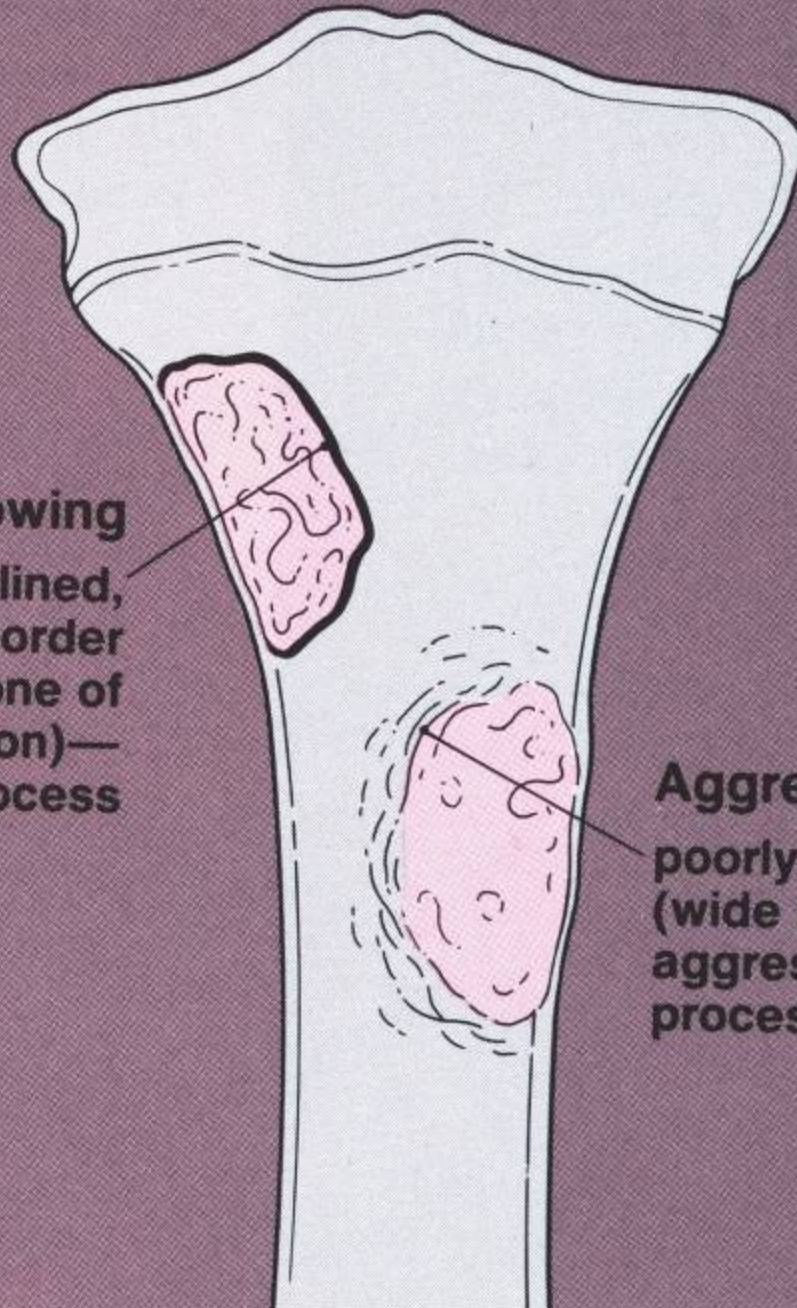


1B



1C

Slow-Growing
sharply outlined,
sclerotic border
(narrow zone of
transition)—
benign process



Aggressive
poorly defined border
(wide zone of transition)—
aggressive/malignant
process

IA



IA-Non Ossifying Fibroma



IB—Giant Cell Tumor



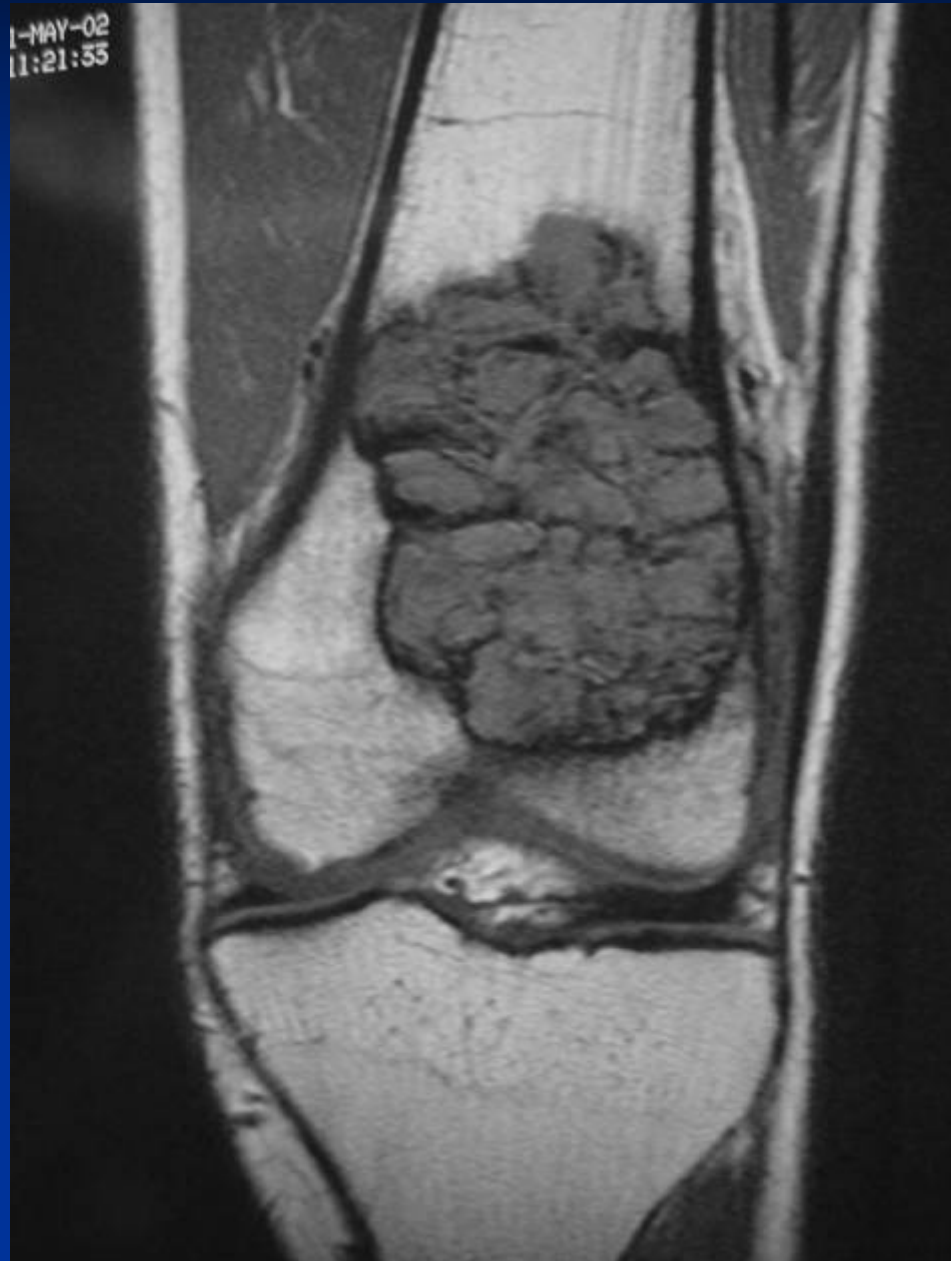
IB



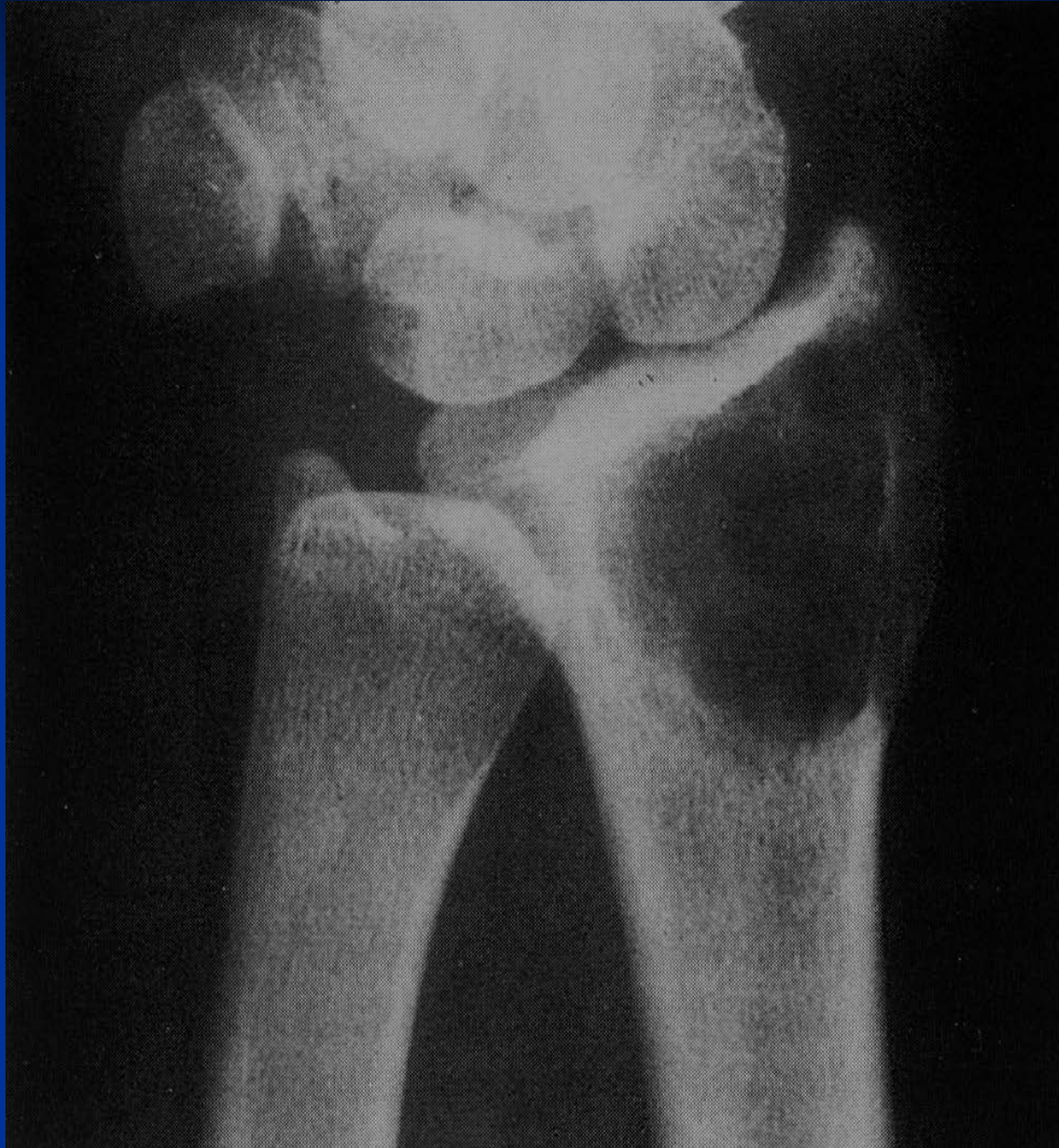
IB



IB



IC



IC



IC—Giant Cell Tumor



IB/IC



IC



IC—CT Demonstration



Moth-eaten Bone Destruction

- More Aggressive Bone Destruction
- Less Well Defined Margins
- Larger Zone of Transition From Normal to Abnormal ('Tumor')
- Multiple Punched Out Holes in the Bone
- Malignant Bone Tumors, Osteomyelitis, Eosinophilic Granuloma



Motheaten Bone Destruction

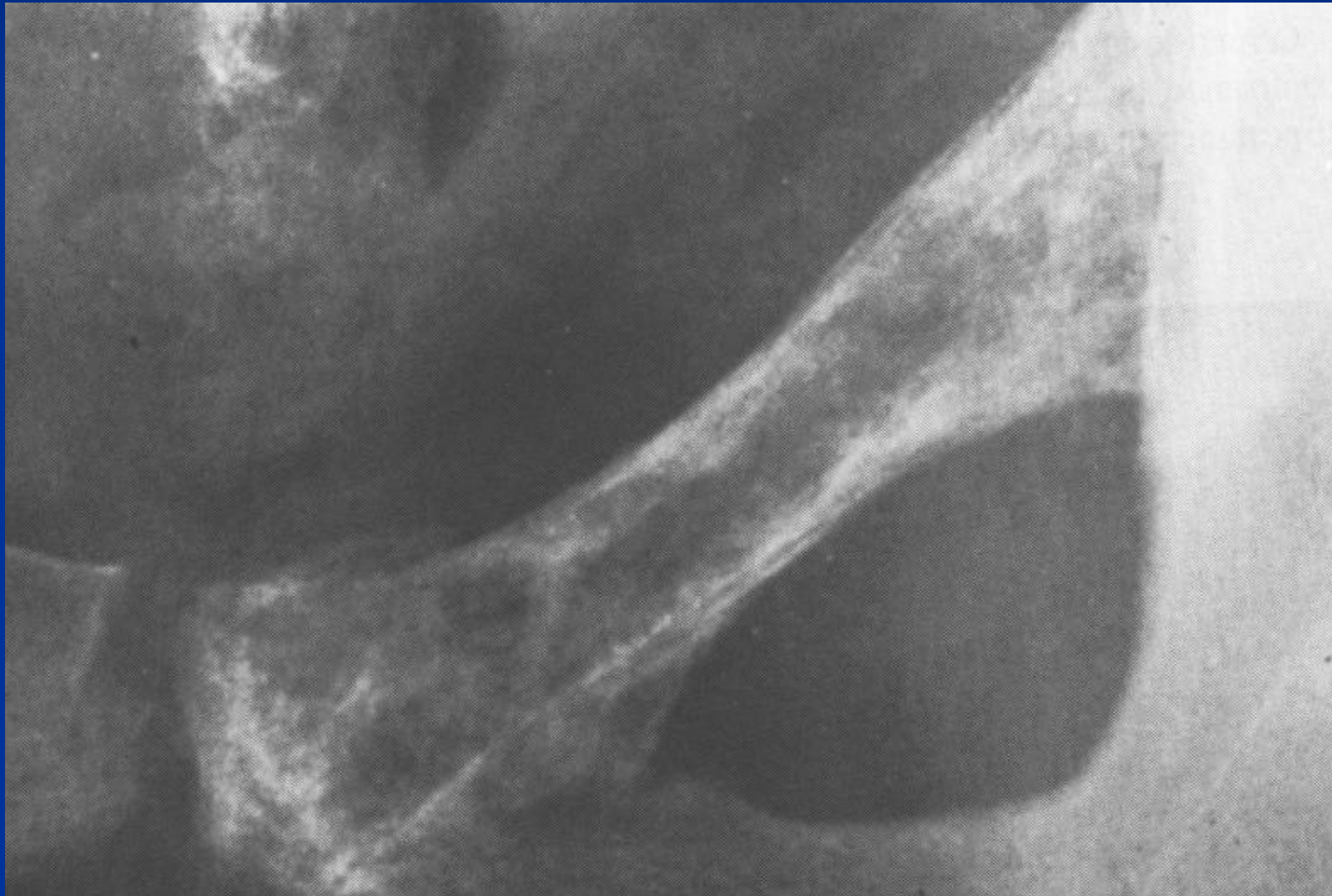


Permeative Bone Destruction

- Aggressive Lesion
- Rapid Growth Potential
- Poorly Demarcated and May Merge Imperceptibly with Uninvolved Bone
- Can Not Delineate Where Tumor Begins and Ends
- Tumor Not Clearly Demarcated From Normal Bone
- Malignant Bone Tumors (Ewings sarcoma; Osteosarcoma), Osteomyelitis, Osteoporosis

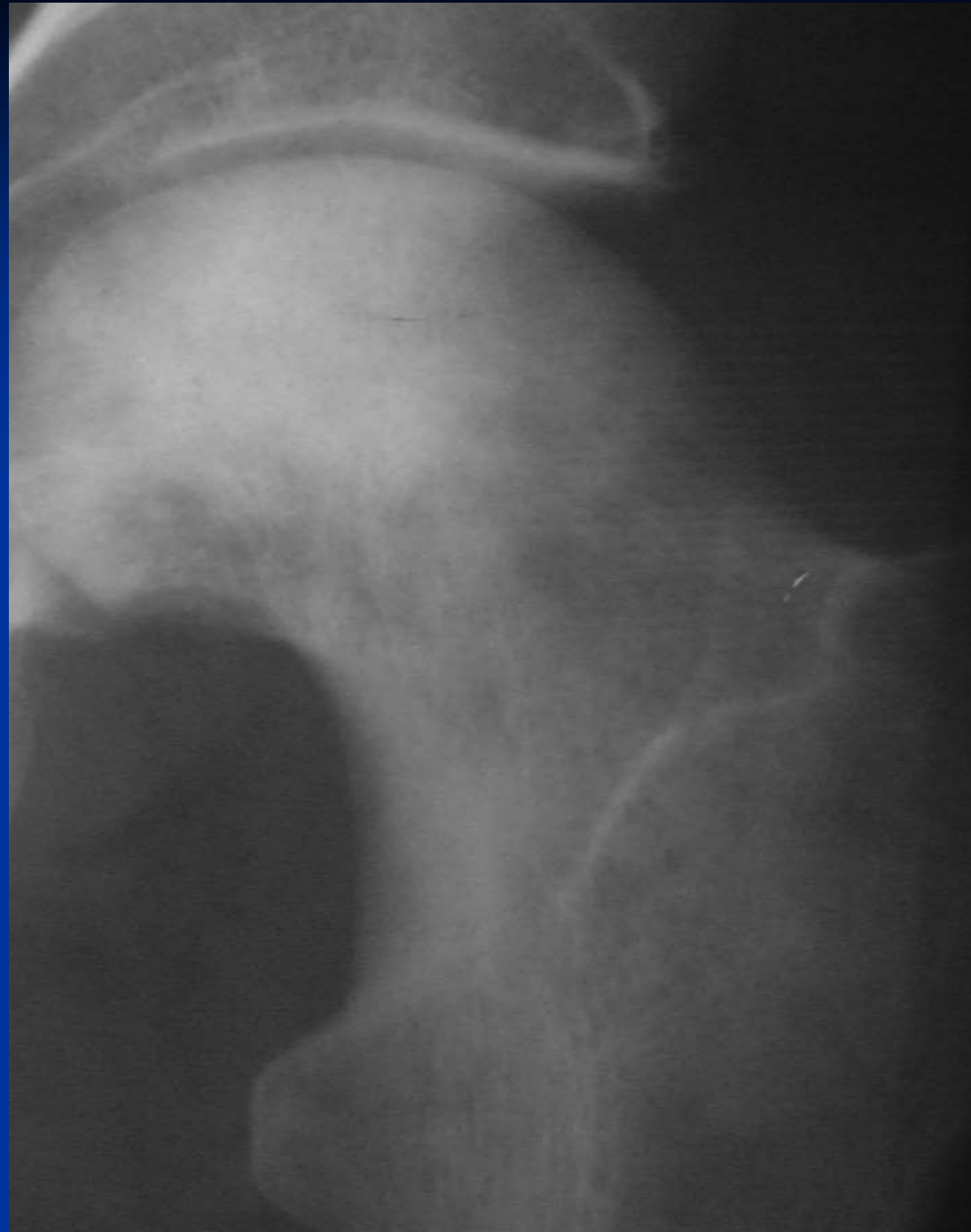


Permeative Bone Destruction Lymphoma



Permeative





Permeative--Osteosarcoma



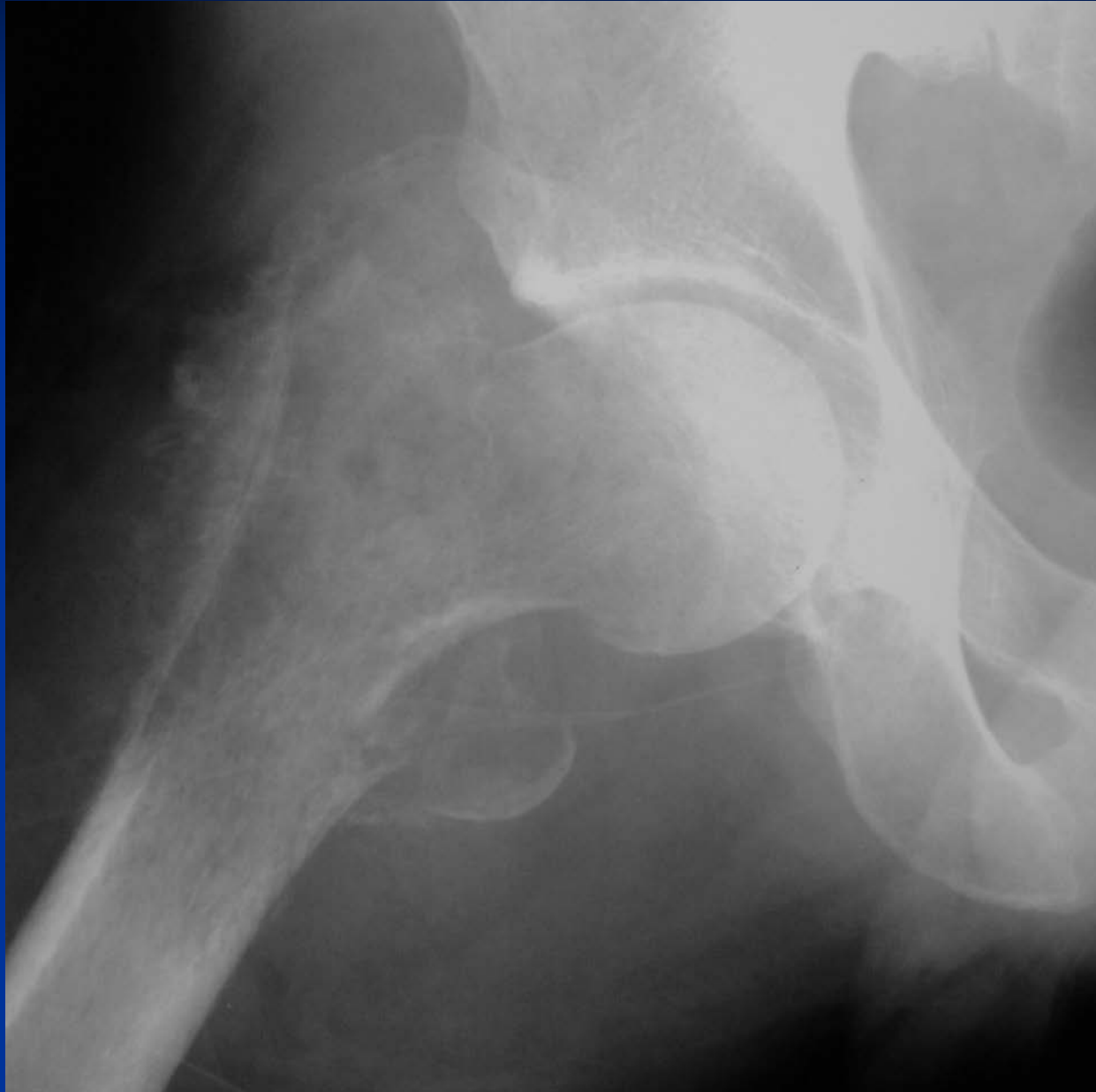


Permeative--Osteosarcoma





Permeative--Lymphoma





Permeative





Permeative



Permeative

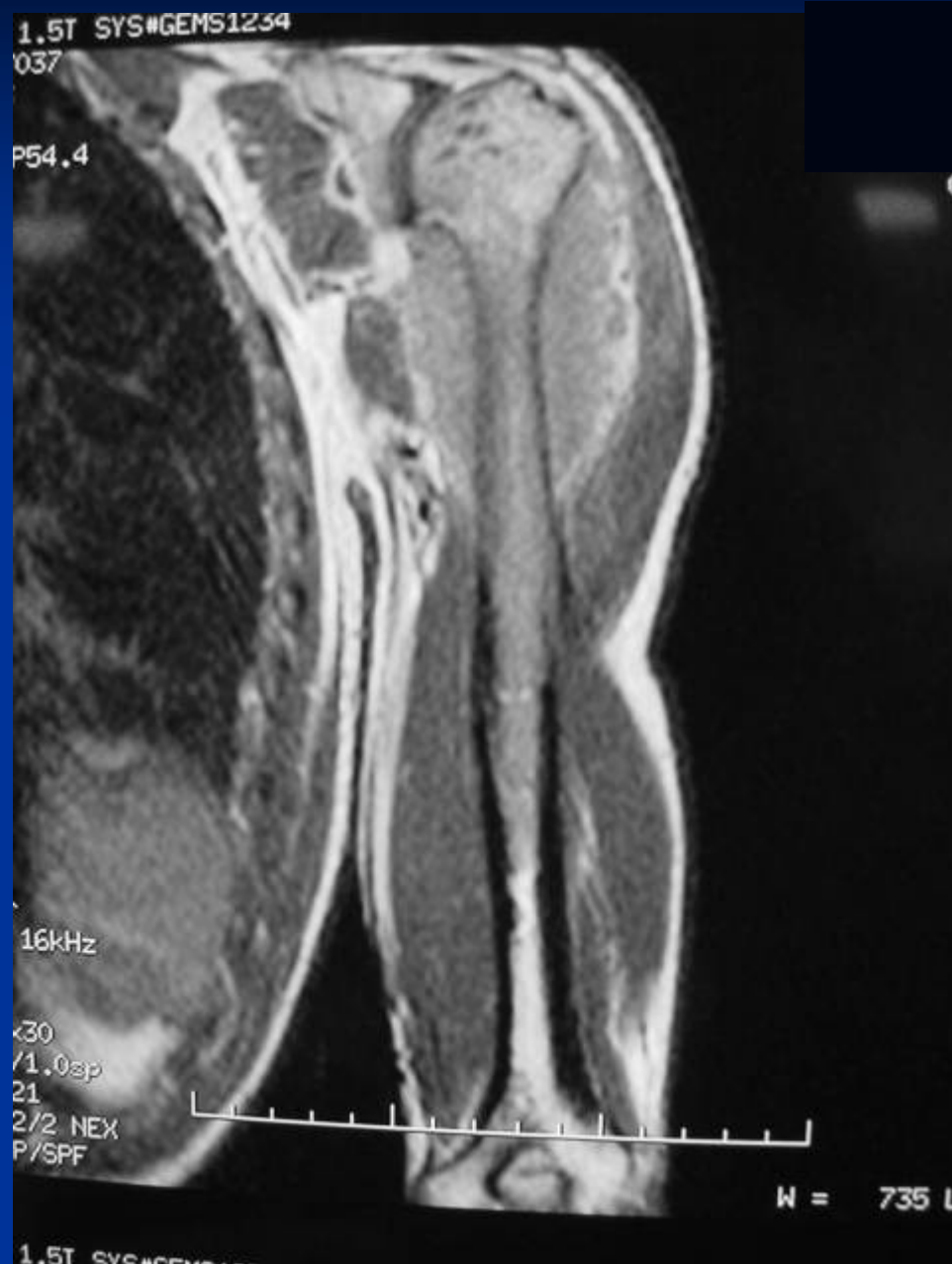








Permeative—MRI Shows Extent



Permeative Lesion Barely Perceptible on X-Ray



Permeative

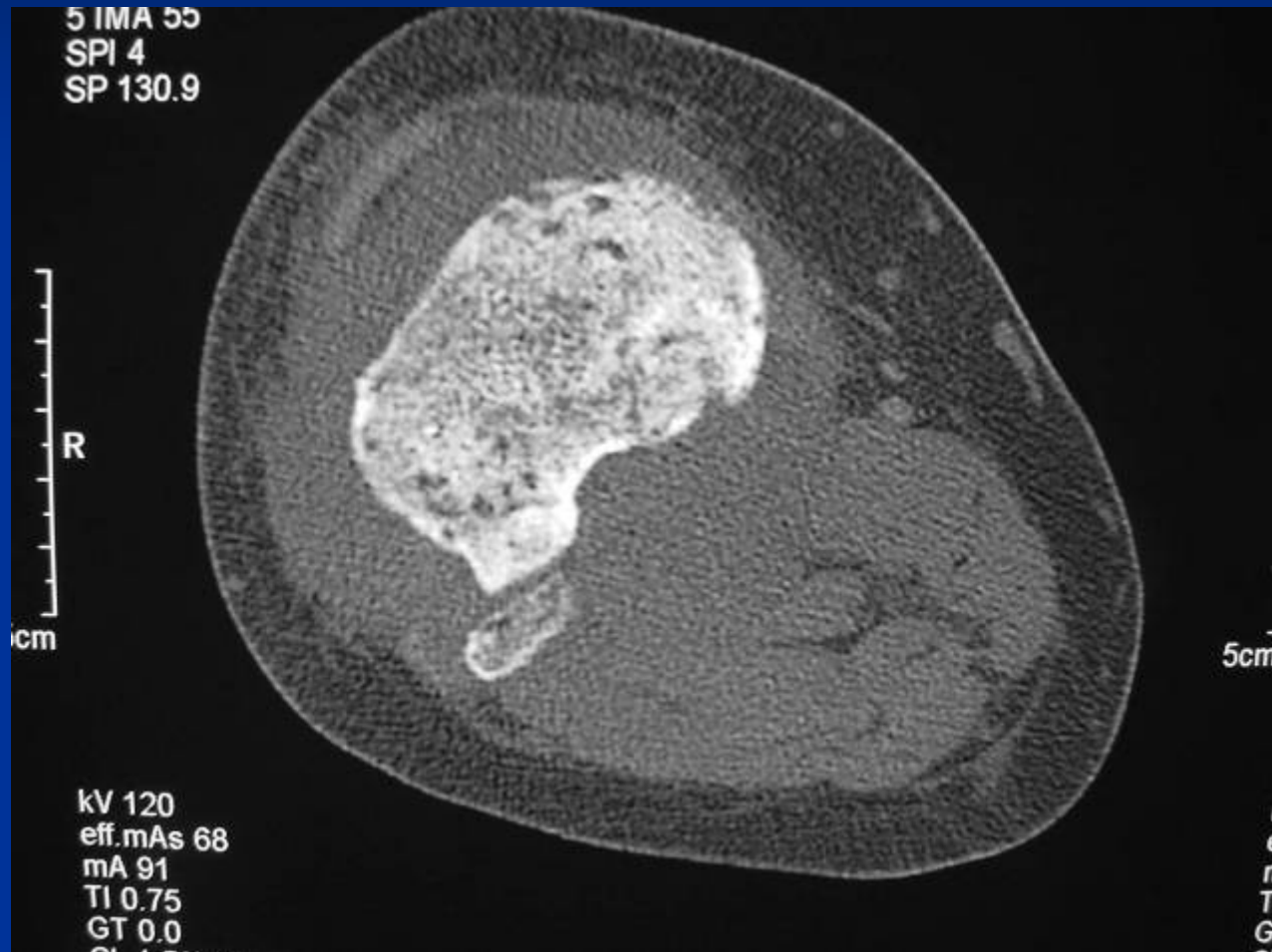


Permeative—MRI Demonstrates Tumor Extent Better



Permeative—CT Example

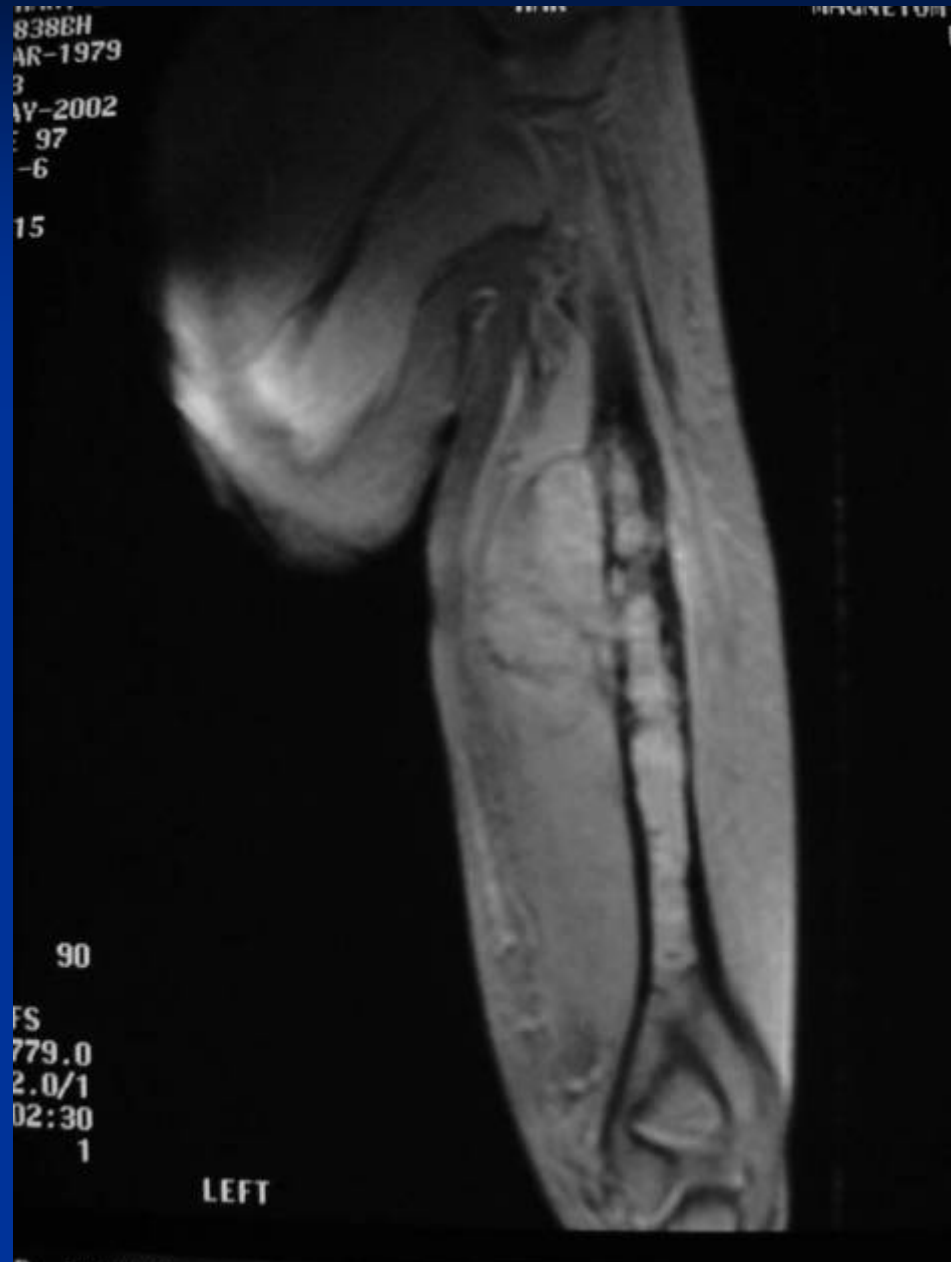
The Tumor is Not Clearly Demarcated



Permeative



Permeative

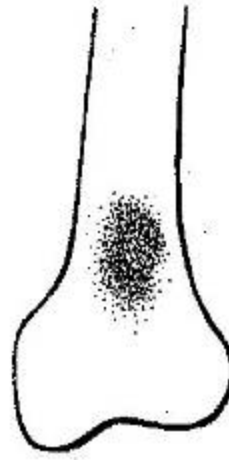


Visible Tumor Matrix

- Calcification
 - Stippled, Flocculent, Rings and Arcs
- Ossification
 - Solid, Cloud-Like, Ivory-Like
- Must Differentiate Mineralization from Calcification Due to Dead or Necrotic Tissue, Fracture Callus (Pathologic Fracture), Sclerotic Response of Non-Neoplastic Bone to Adjacent Tumor Deposit



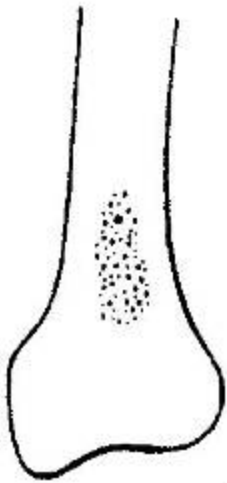
Solid



Cloud-Like



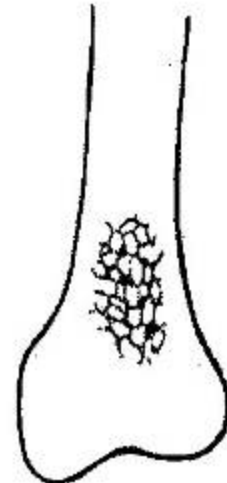
Ivory-Like



Stippled



Flocculent



Rings and Arcs

Visible Tumor Matrix

■ Calcification

- Rings, Arcs, Flocculent, Fleck-like

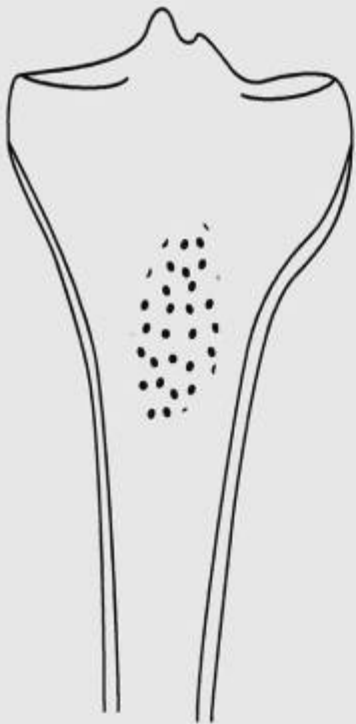
■ Cartilage Tumors

- Enchondroma
- Chondrosarcoma
- Chondroblastoma
- Chondromyxofibroma

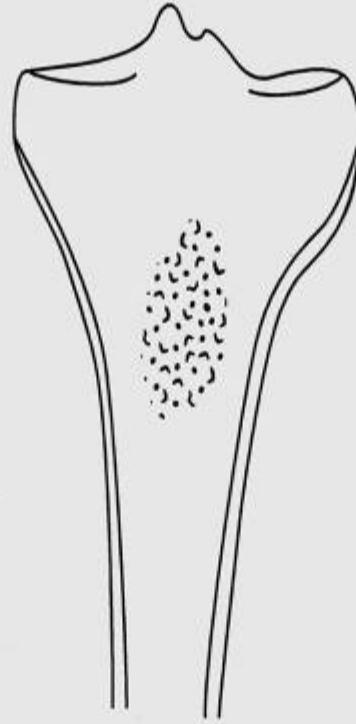
Visible Tumor Matrix

- Cartilage grows in a lobular manner or in a ball like manner
- Calcification occurs around the periphery of these lobules
- If the calcification occurs completely around the periphery (circumference) it forms a circle or a **Ring** of calcification that is detectable on the Xray
- If the calcification occurs only partially around the lobule, it forms only part of a circle or an **Arc** that is detectable on the Xray

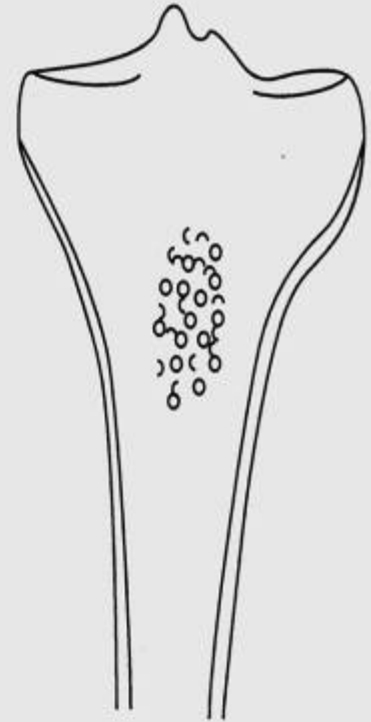
Cartilage Matrix



Stippled



Flocculent



Rings and Arcs
("o"s and "c"s")

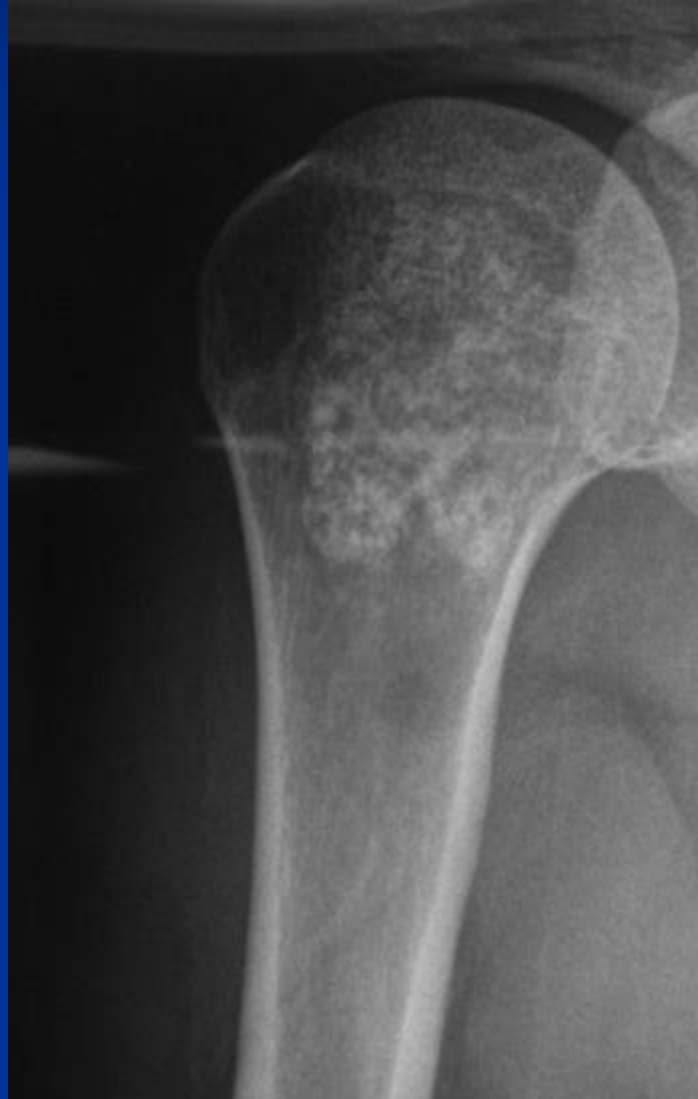
A



Enchondroma or Low Grade Chondrosarcoma



Enchondroma





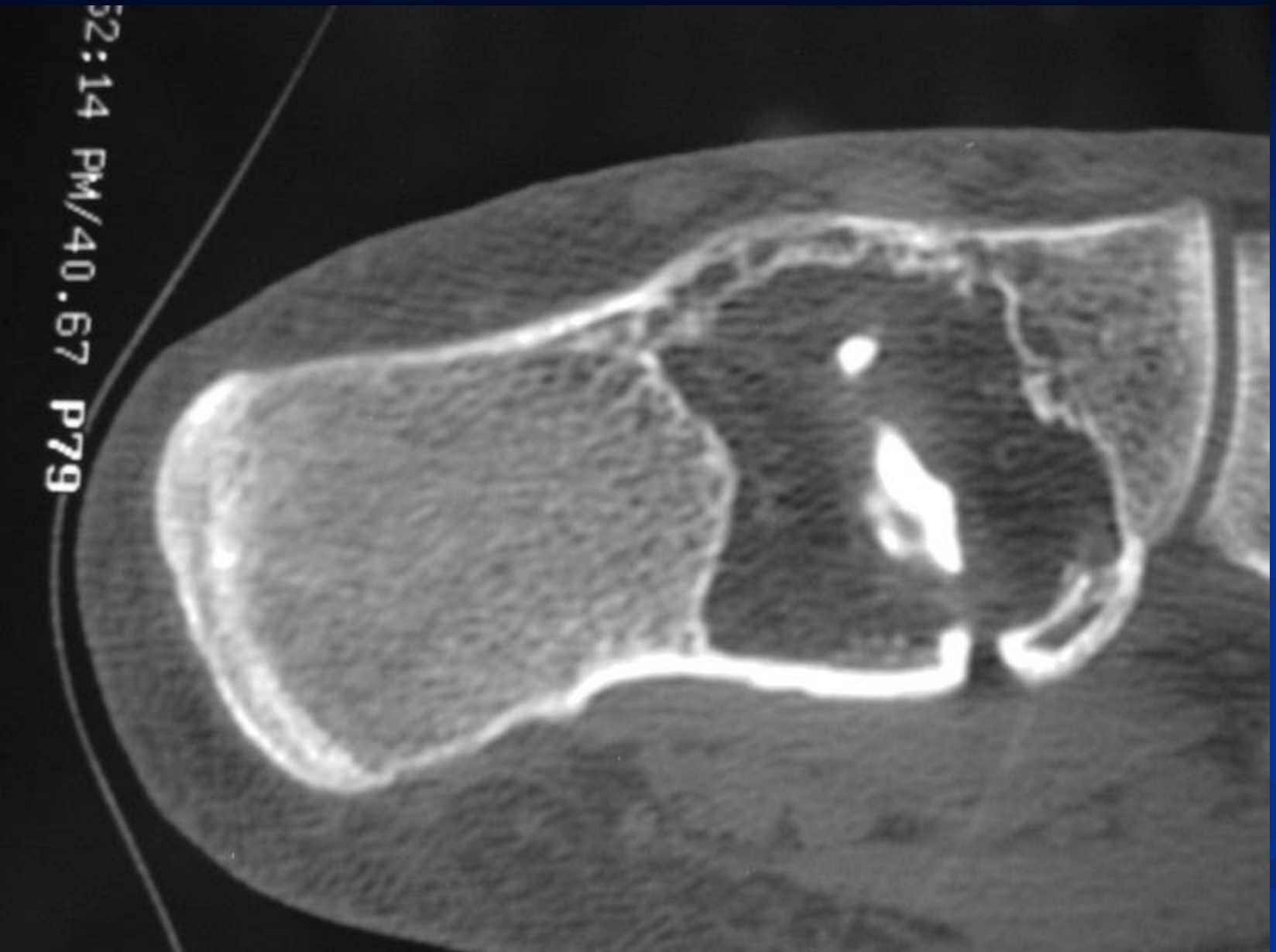
Chondrosarcoma





Intraosseous Lipoma

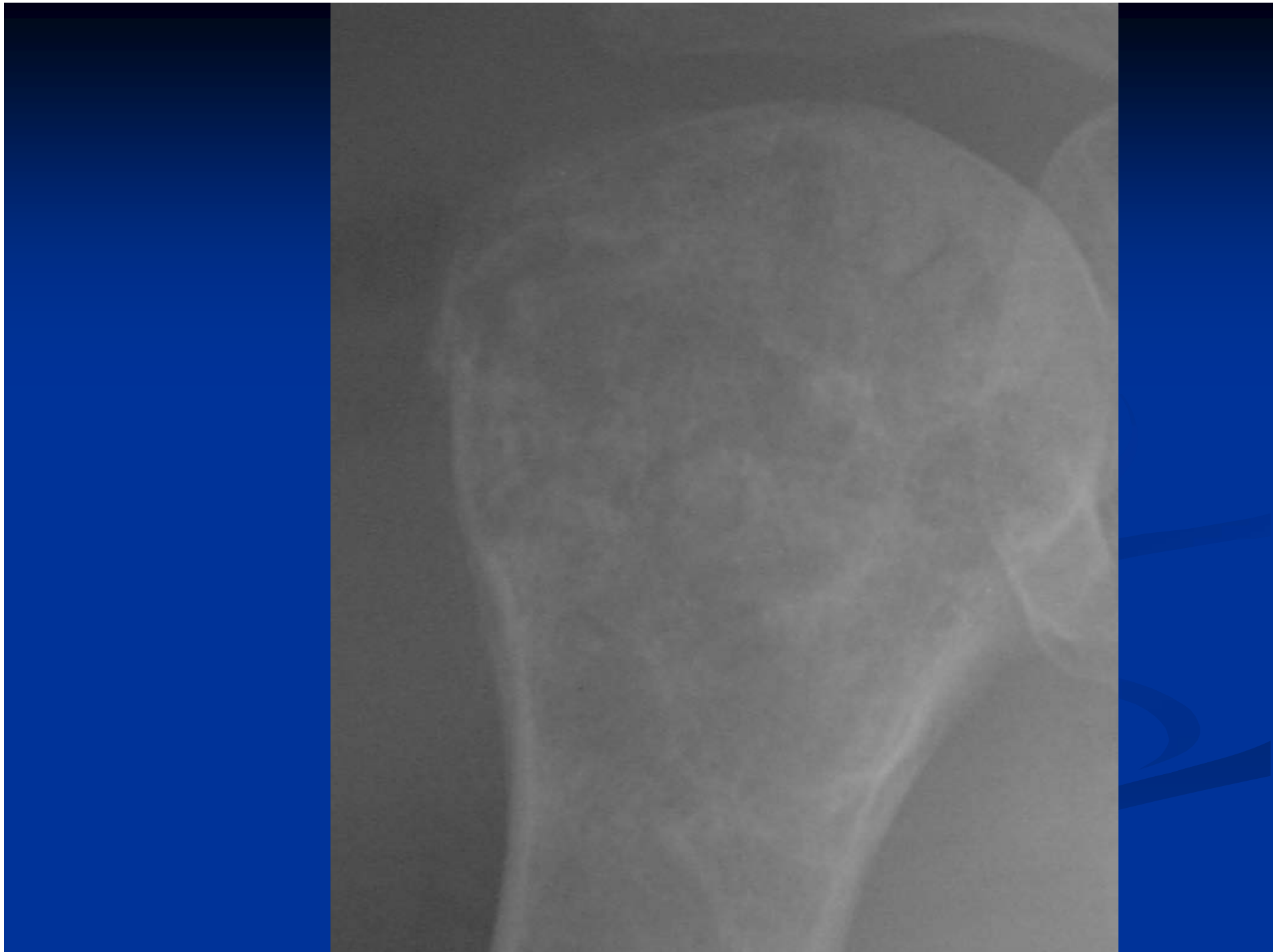




02:14 PM/40.67 P79

Chondrosarcoma







6
2

KV 120
mA 300~

Smart mA 287

Large%

5.0mm/1:1

Tilt 0.0

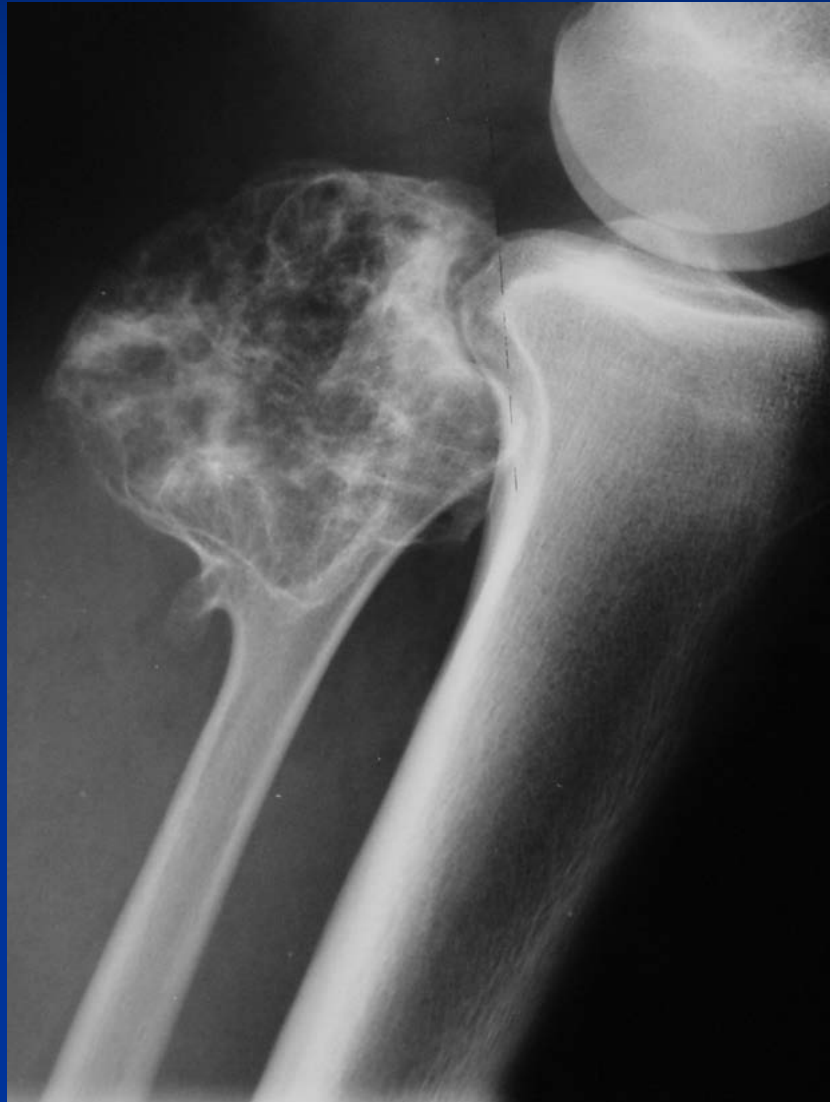
1.0 s/HE 02:35:33 PM/00.00

350

L = 35

L

Osteochondroma





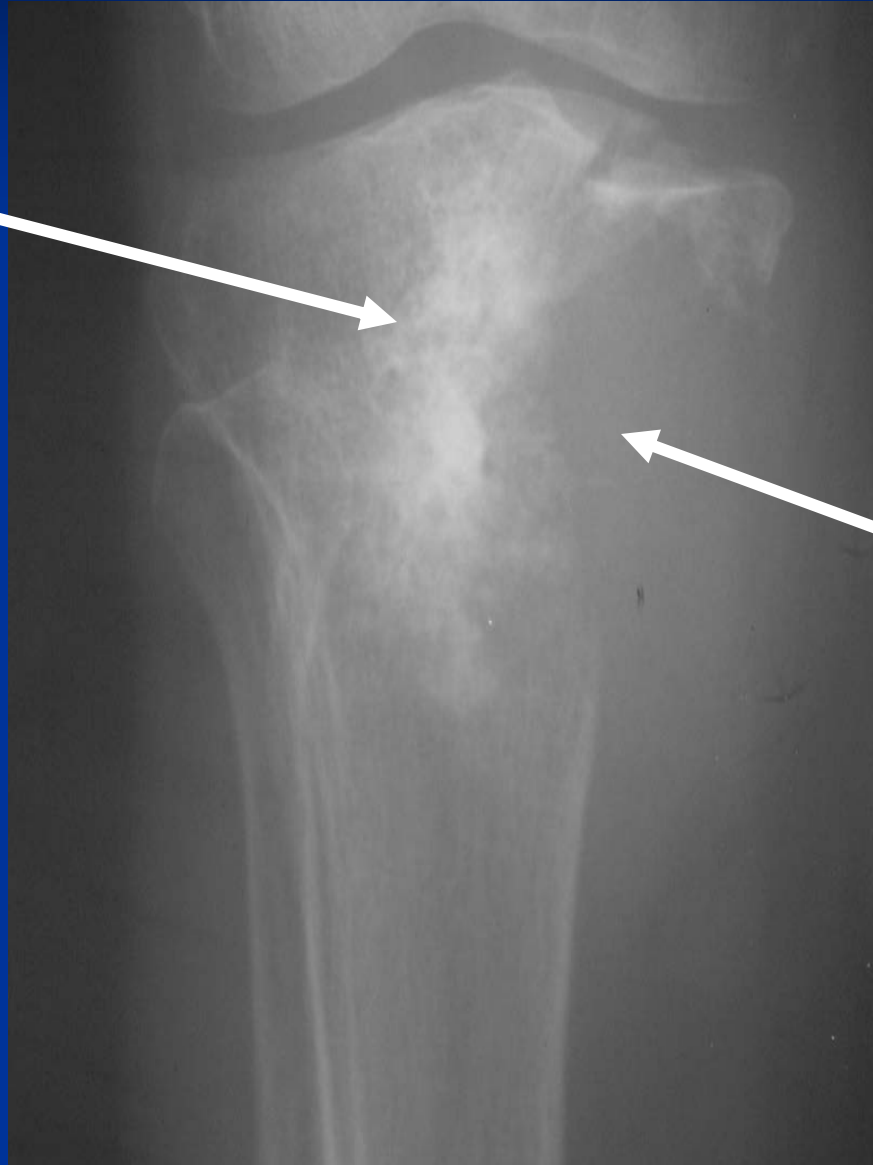






Dedifferentiated Chondrosarcoma

Rings and Arcs
Calcifications

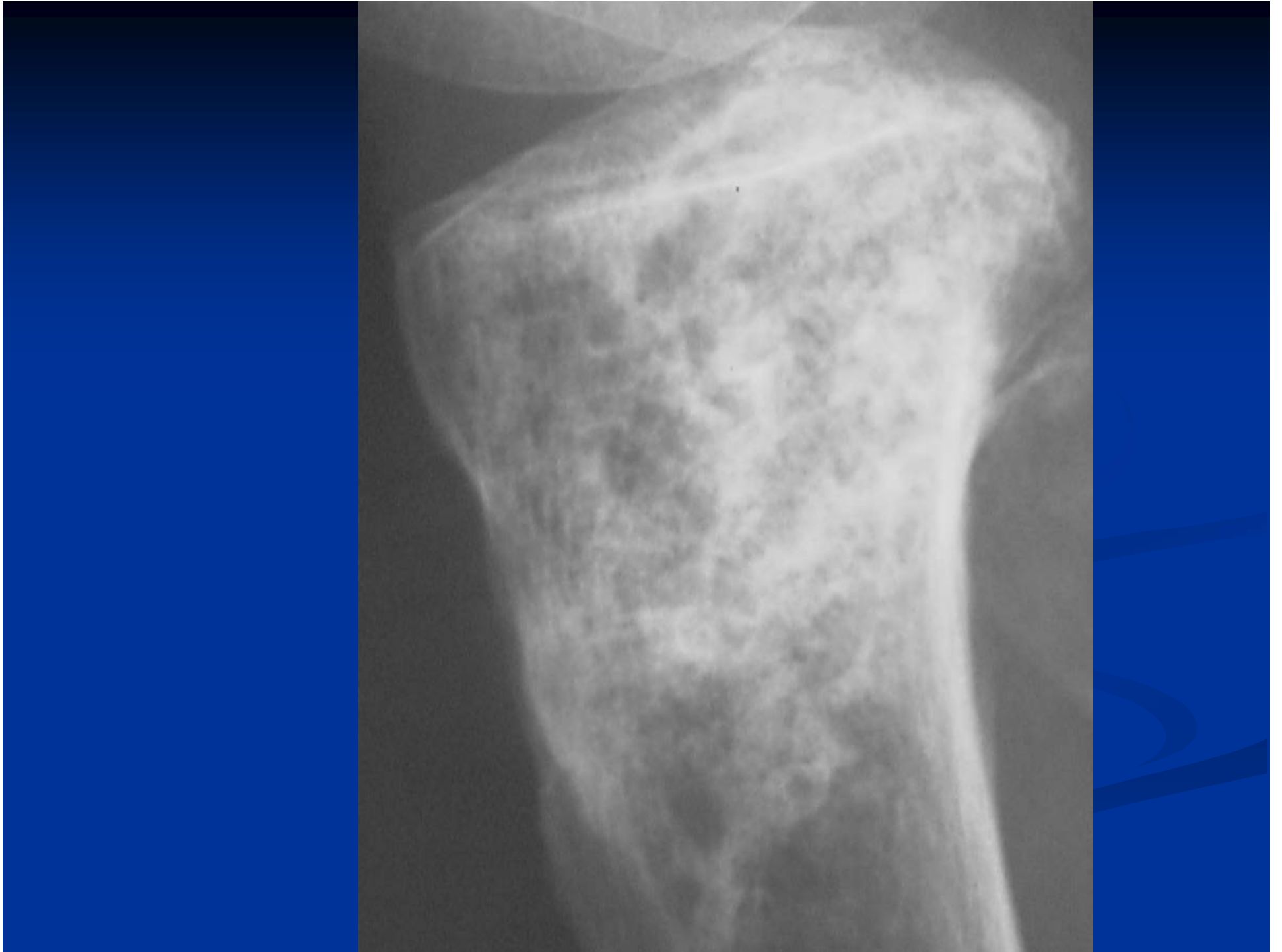


Lytic Destruction
by Dedifferentiated
Component

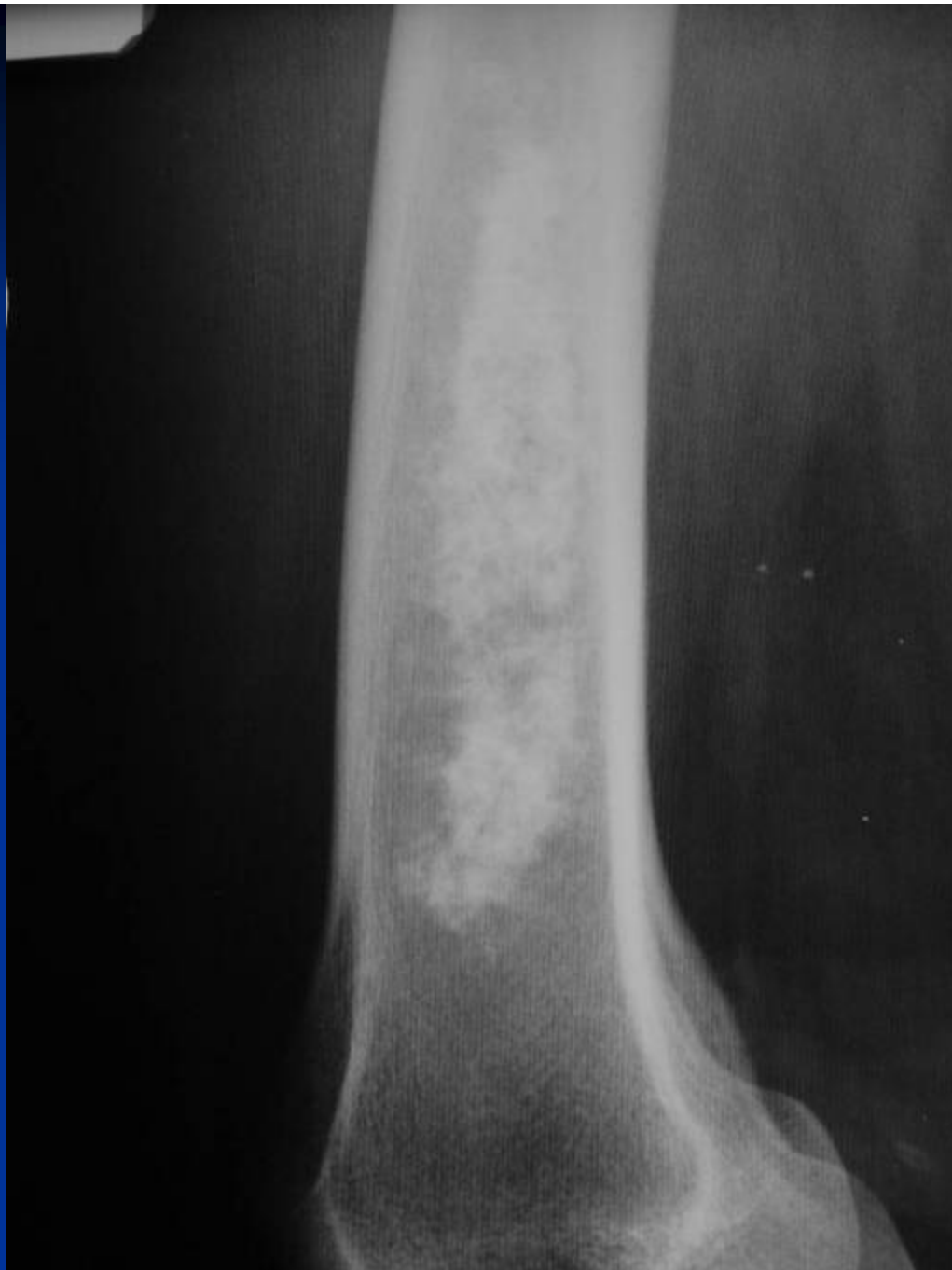


Rings and Arcs





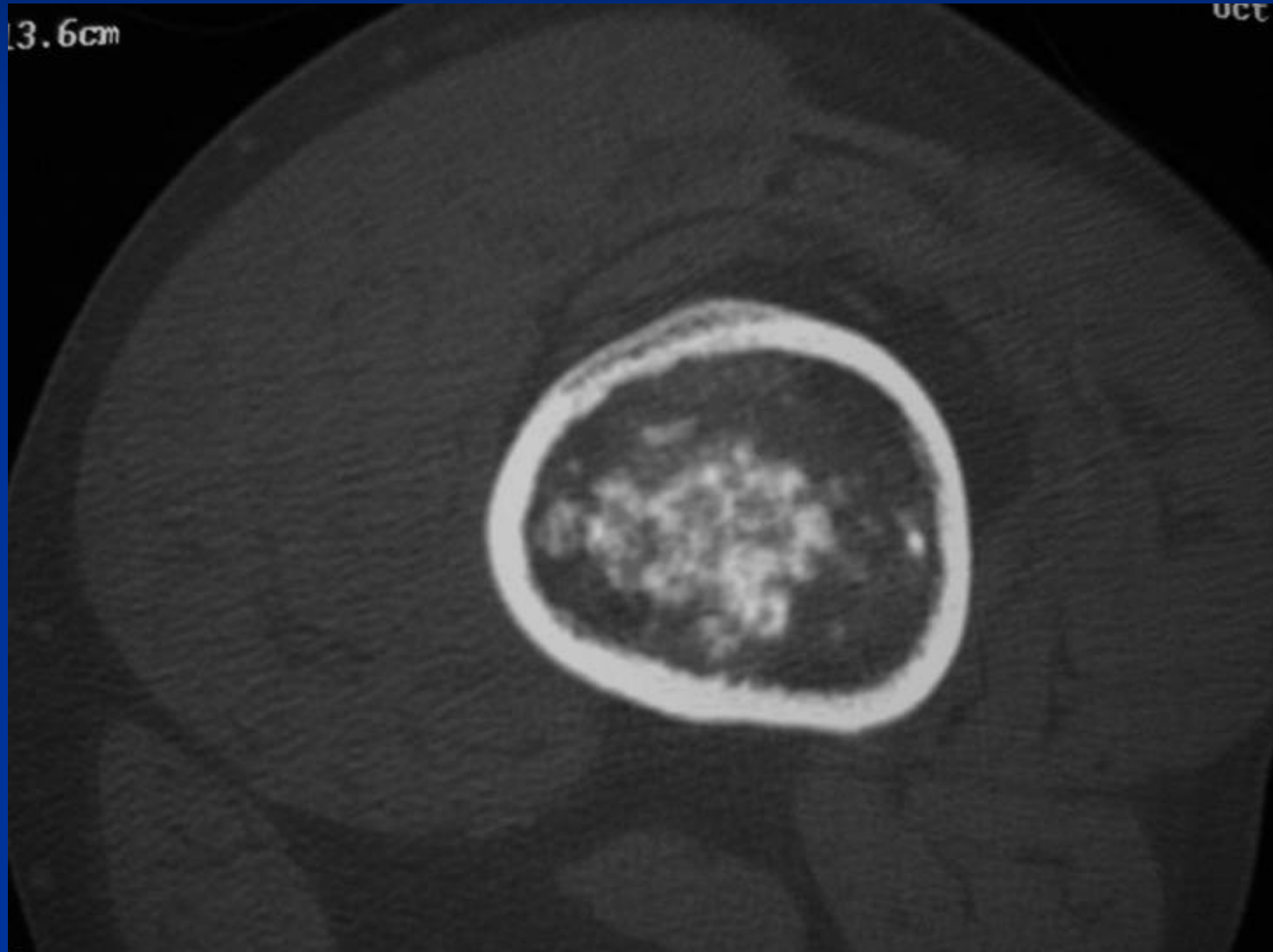






Rings and Arcs-Calcifications

Cartilage Tumor



Visible Tumor Matrix

■ Ossification

- Cloudlike, Fluffy, Marble-like

 - Osteosarcoma

 - Parosteal Osteosarcoma

 - Osteoblastoma

 - Osteoma





Osteosarcoma



DFOV 49.6cm
STND

512

FLT:1u

R

2
0
4

L

2
9
2

kV 140
mA 280

Large
2.50mm/7.50 HQ

Tilt: 0.0

0.8s /HE 06:35:19 PM/14.93

W:2001 L:350

P 210

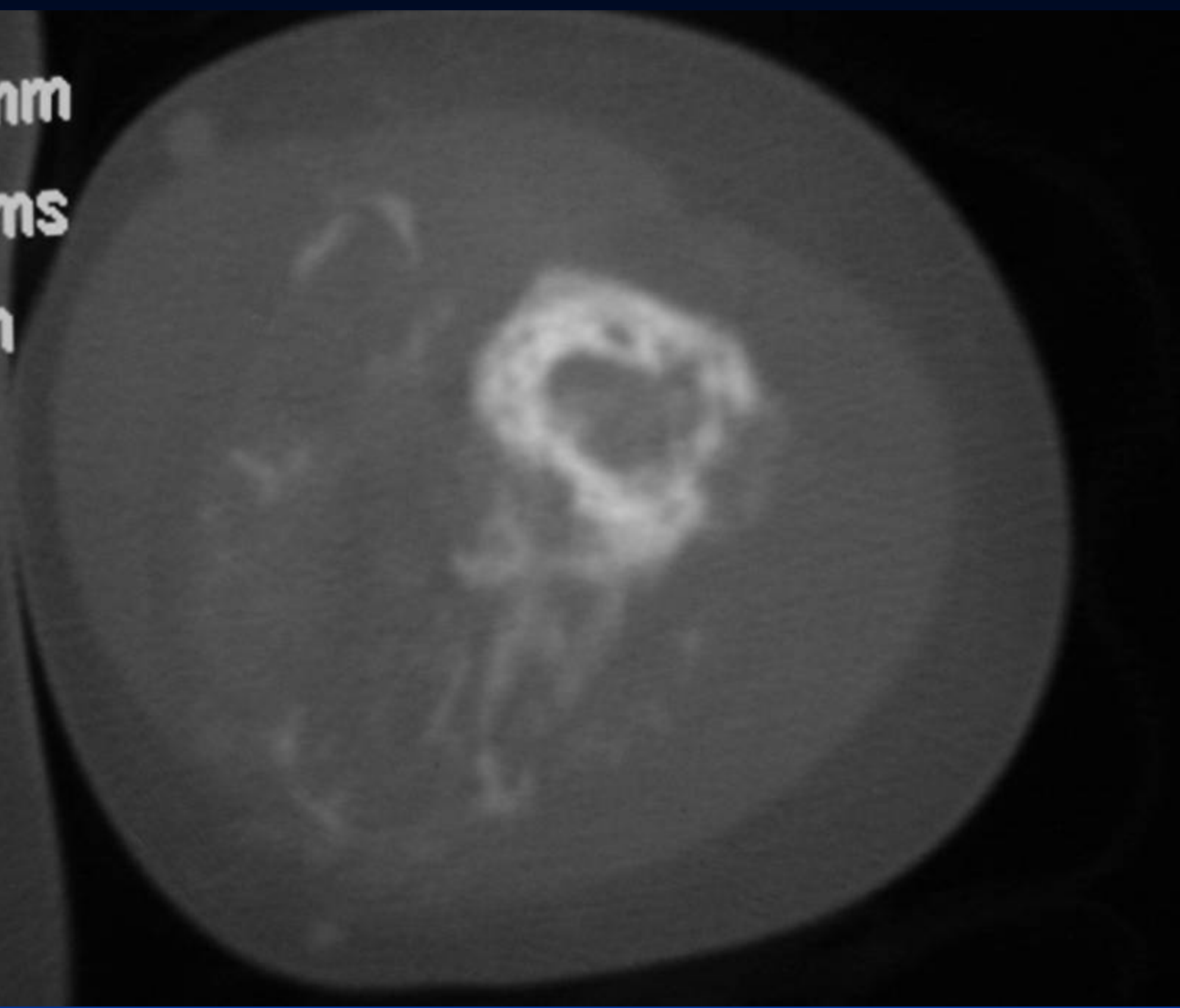


Osteosarcoma



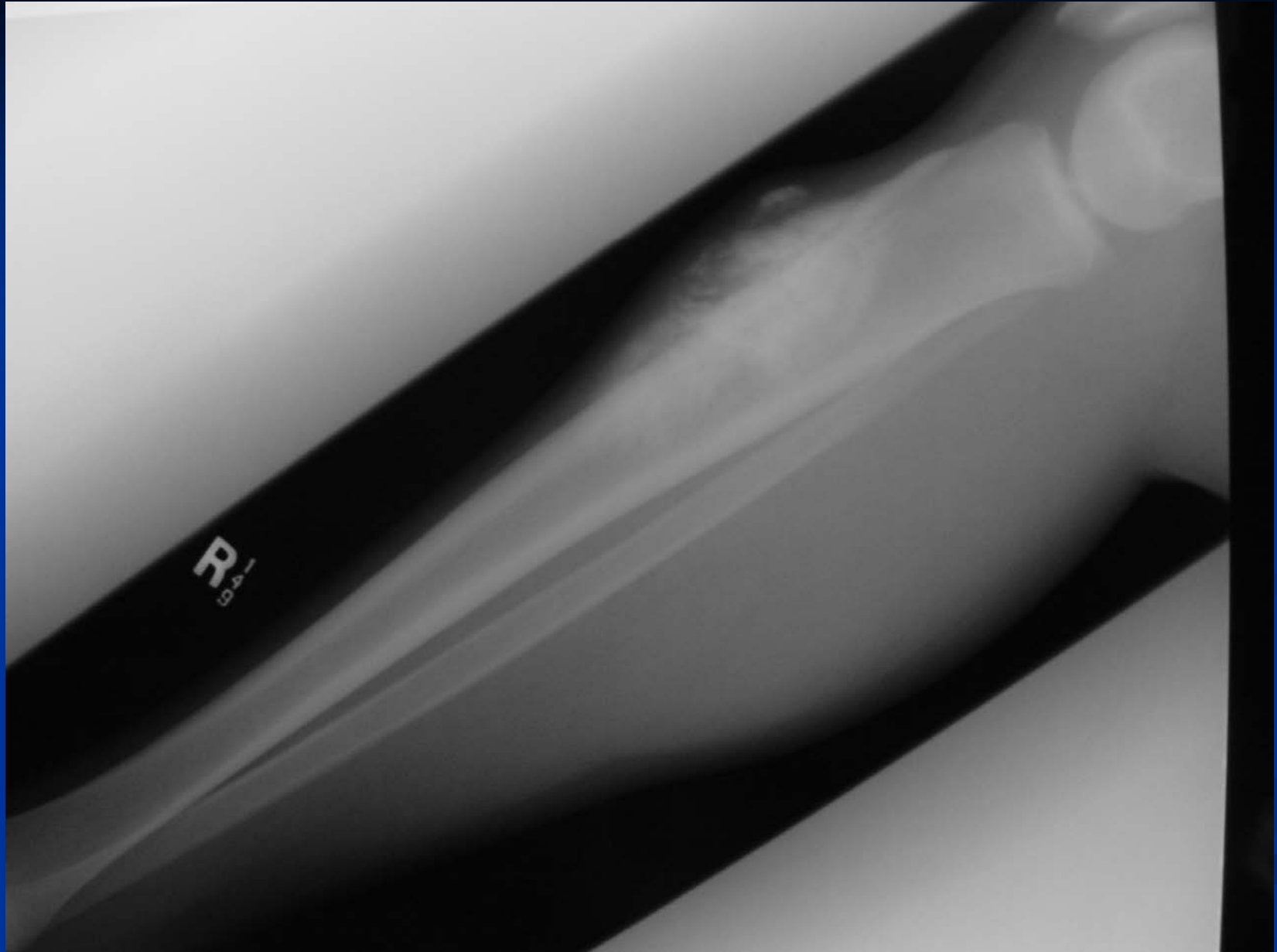


153 mm
000 ms
5 mm
-175
ONE
mA

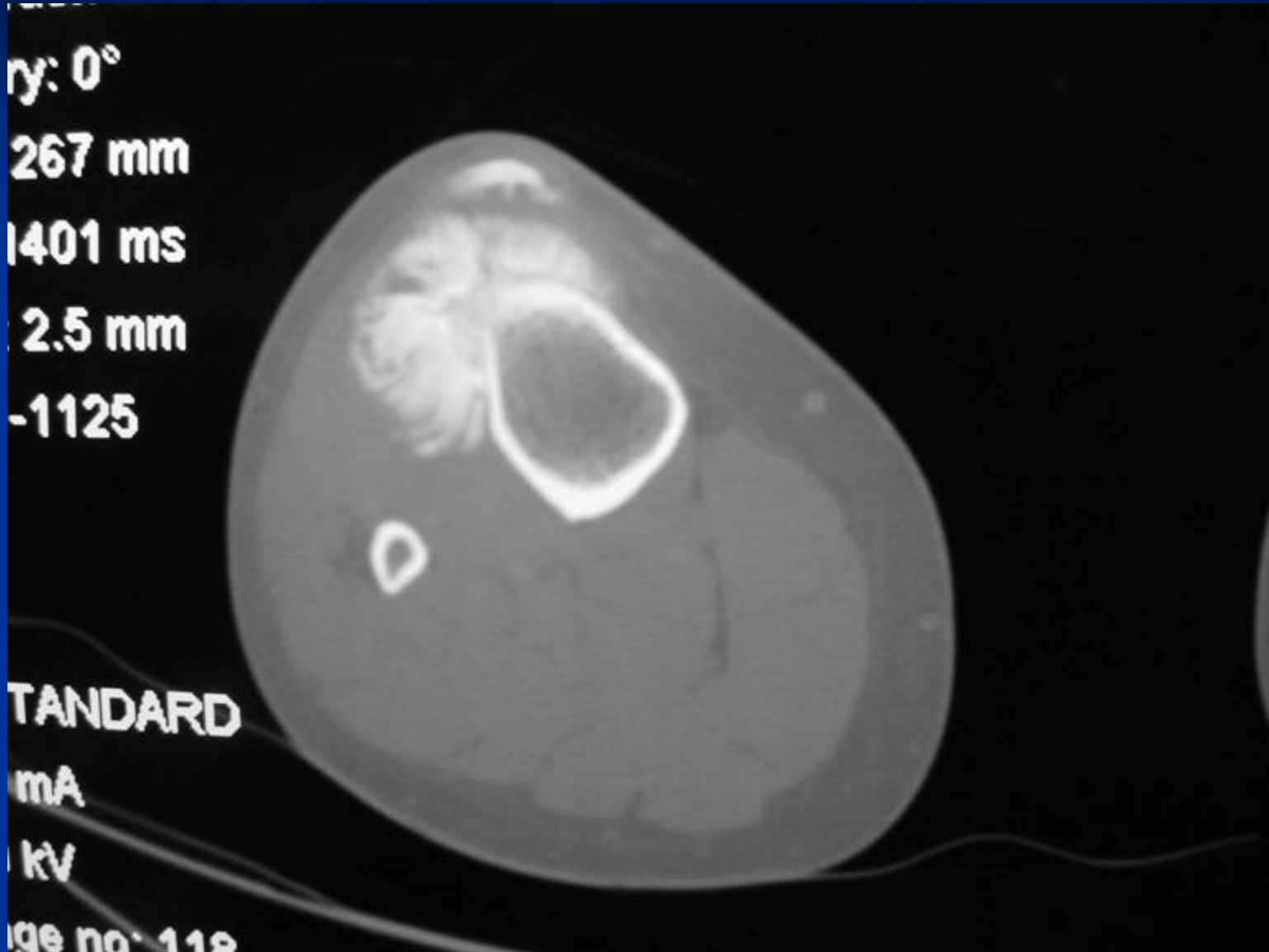


Periosteal Osteosarcoma





Periosteal Osteosarcoma CT Scan



Conventional Intramedullary Osteosarcoma

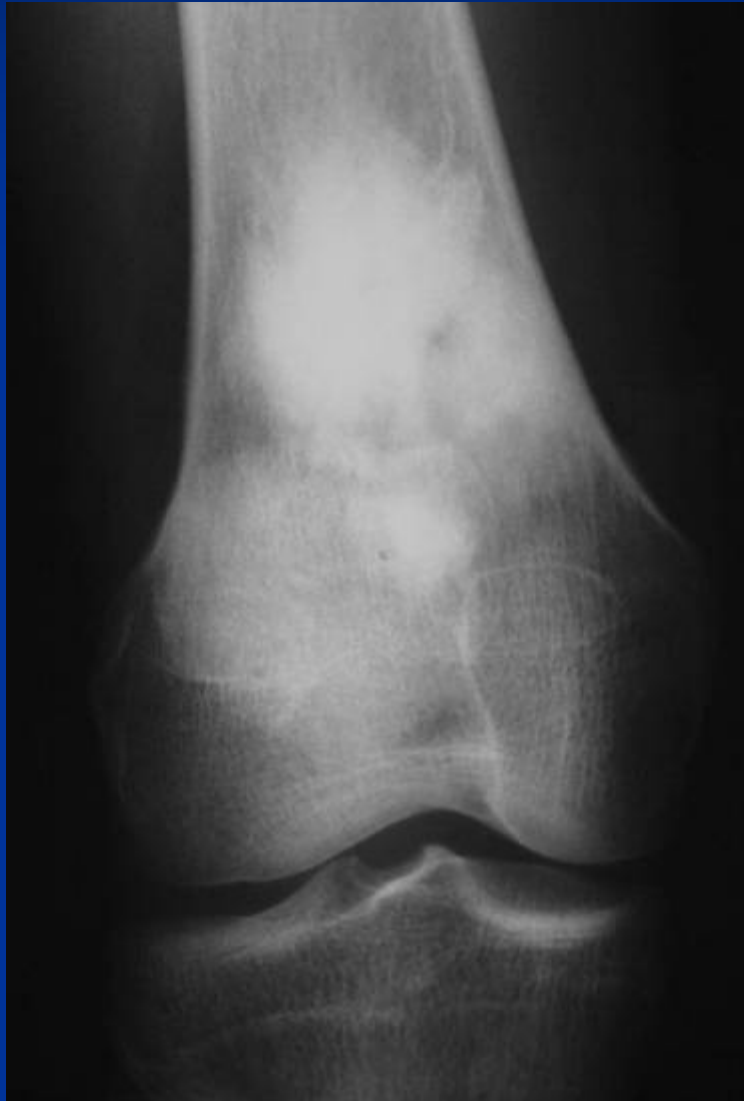




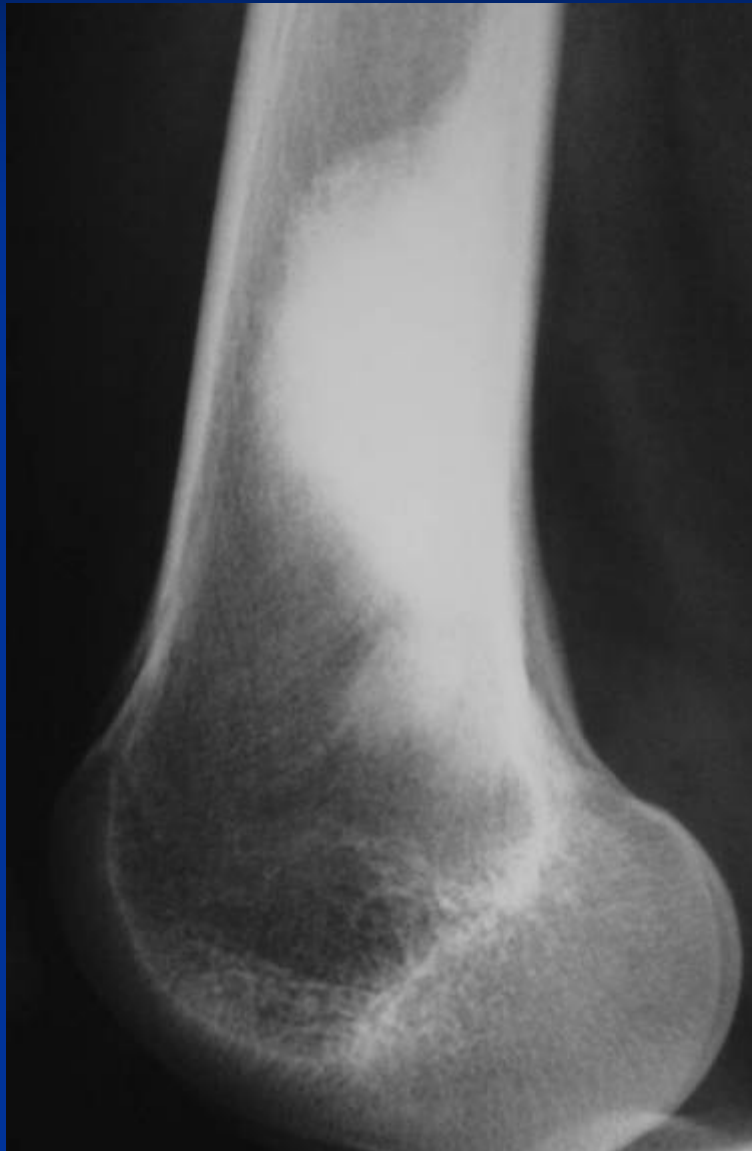


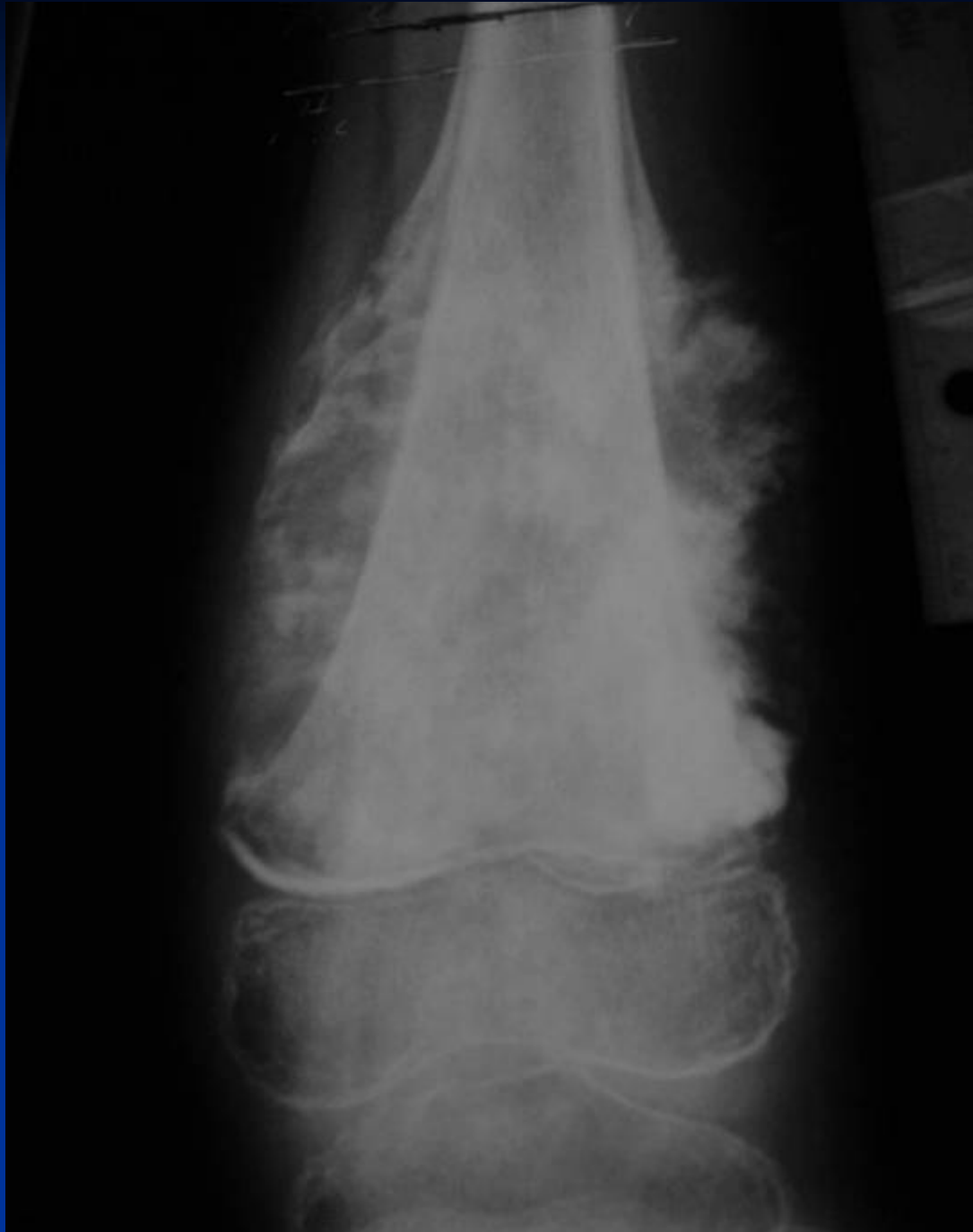


Conventional Intramedullary Osteosarcoma



Marble-Like Ossification Osteosarcoma

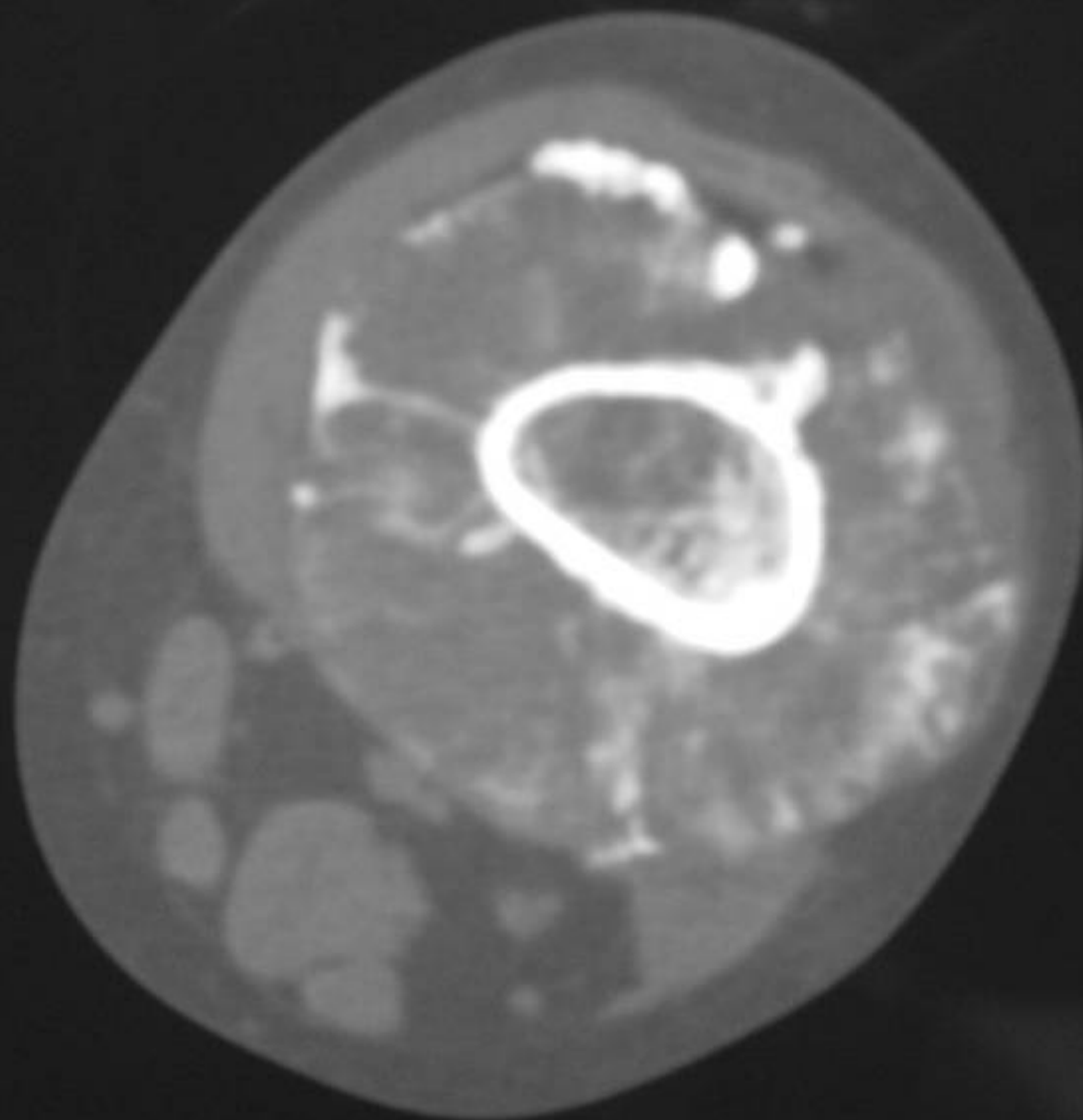




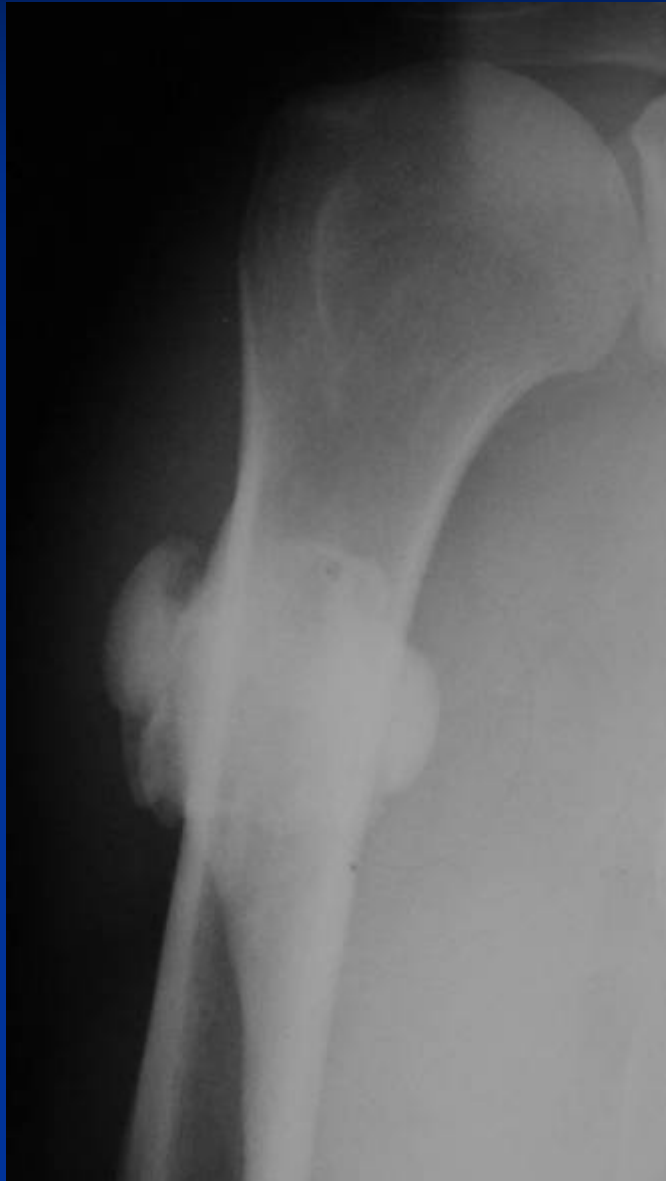


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92 1994.07.03
CLOEX-/L
TP:93
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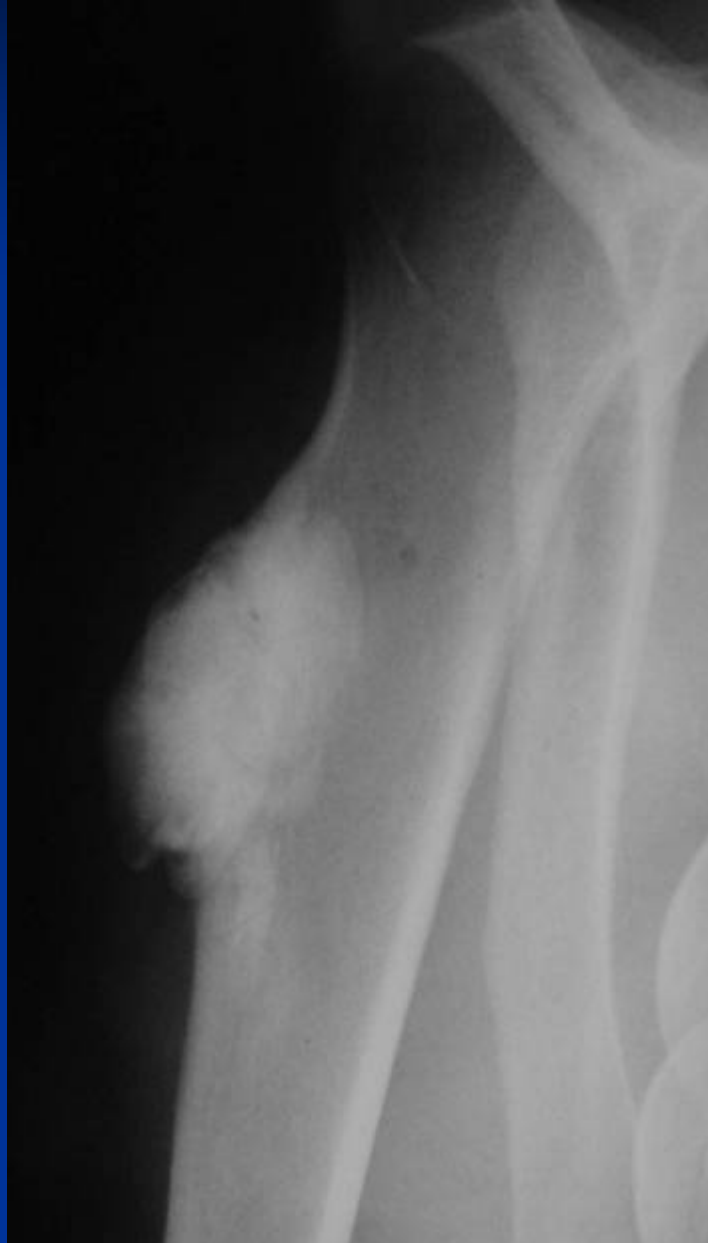
10-10
10-10



Parosteal Osteosarcoma



Parosteal Osteosarcoma



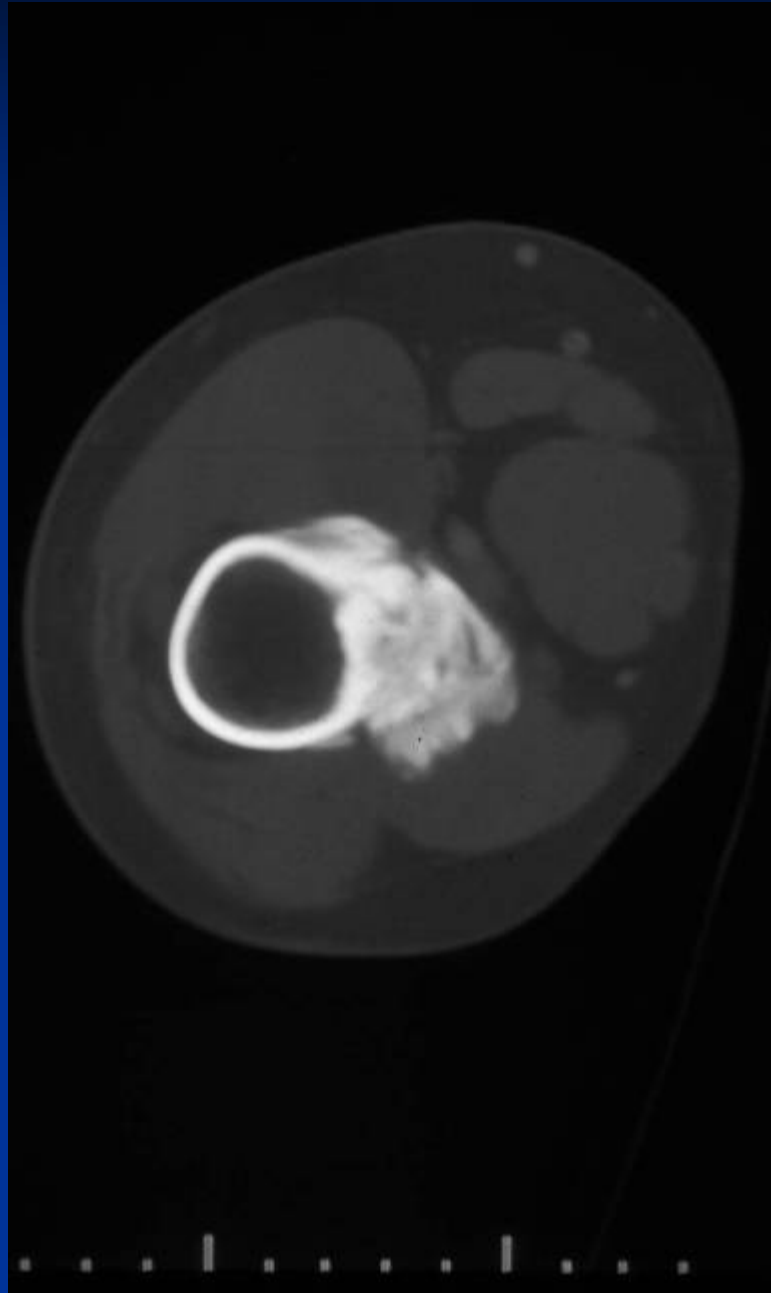
Parosteal Osteosarcoma CT Scan



Parosteal Osteosarcoma

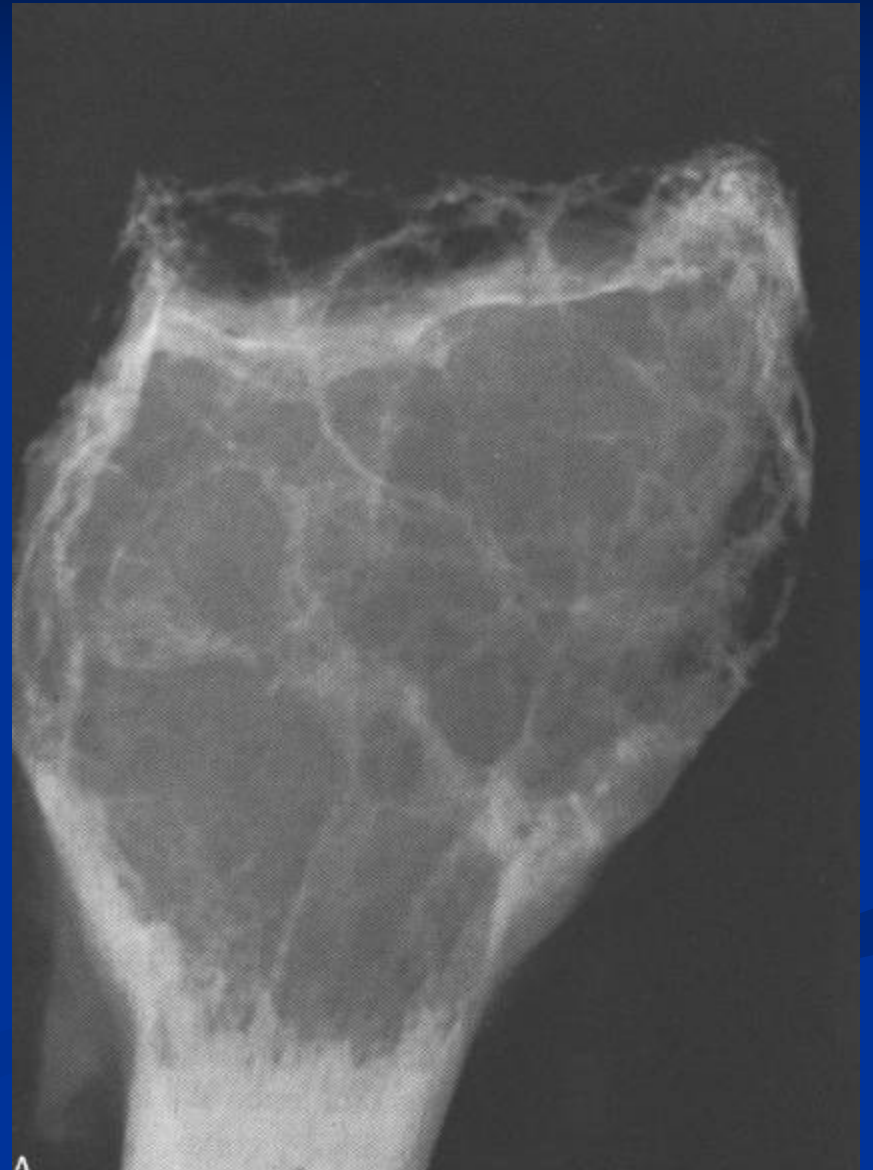


Parosteal Osteosarcoma CT Scan



Internal Trabeculations

- Residual Trabeculae or New Bone Formation Due to Adjacent Tumor
- **Differential Diagnosis:**
- Giant Cell Tumor
- Chondromyxofibroma
- Desmoplastic Fibroma
- Nonossifying Fibroma
- Aneurysmal Bone Cyst
- Hemangioma



Giant Cell Tumor



Desmoplastic Fibroma



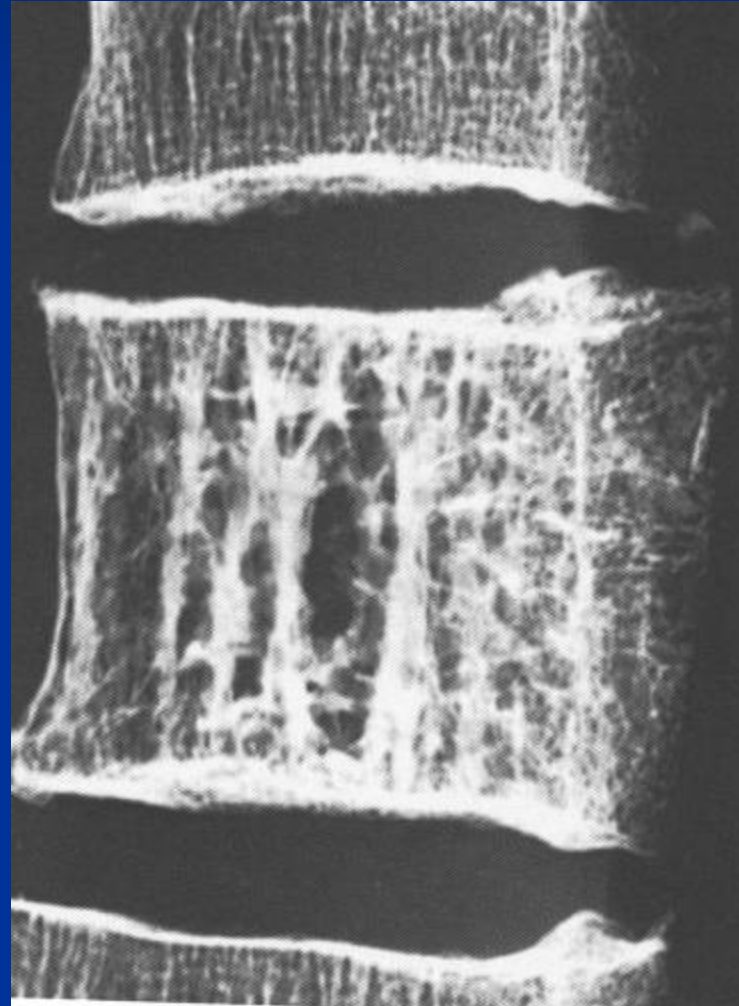
Chondromyxofibroma



Nonossifying Fibroma



Hemangioma



ABC

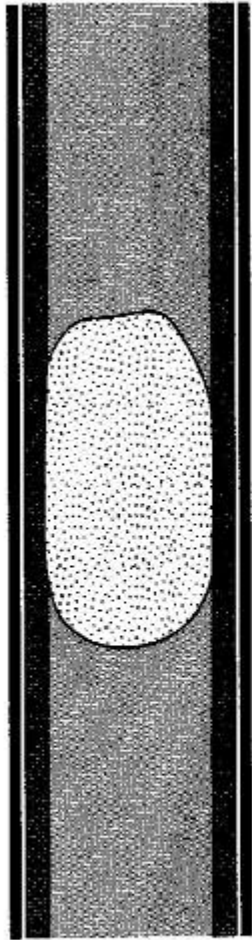


Cortical Erosion, Expansion, Penetration

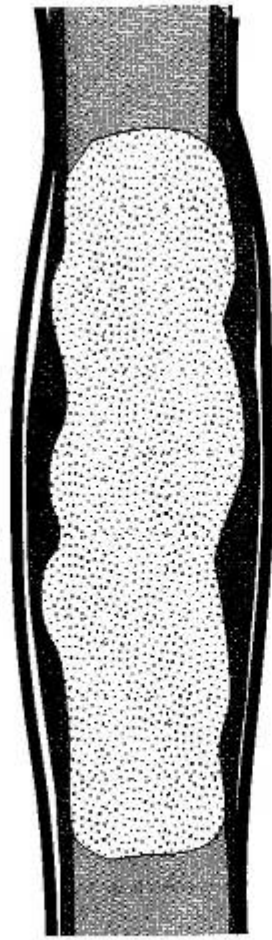
- Bone Cortex Can Be an Effective Barrier To Tumor Growth of Certain Tumors
- Certain Tumors Penetrate the Cortex Partially or Completely (Benign and Malignant)
- Progressive Endosteal Erosion that is Accompanied by a Periosteal Reaction Leads to an Expanded Bony Contour (Like an ABC)
- Aggressive lesion that Penetrates the entire Cortex or Penetrates Haversian Canals will Elevate the Periosteum and Lead to a Periosteal Reaction

Cortical Erosion, Expansion, Penetration

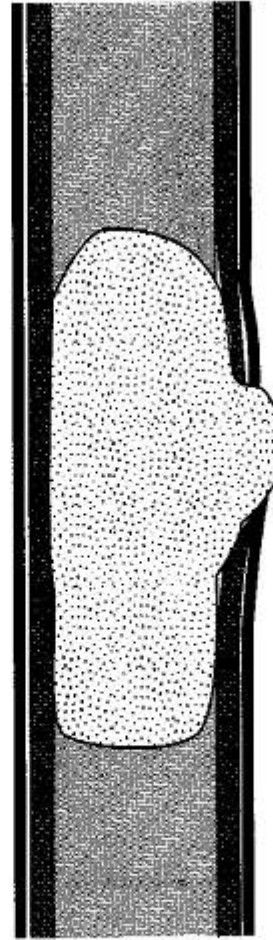
- It is important to understand that both benign and malignant tumors can penetrate the cortical bone and form a soft tissue mass. The fact that there is a soft tissue mass does not automatically confer that the tumor is malignant. Certain benign tumors can also form a soft tissue mass. The periosteum usually remains intact around a benign soft tissue mass. This may only be detectable on a CT scan demonstrating an “Egg-Shell” rim of calcification around the periphery of the mass. The periosteum is usually destroyed by malignant tumors and does not remain intact around the soft tissue component of a malignant tumor.



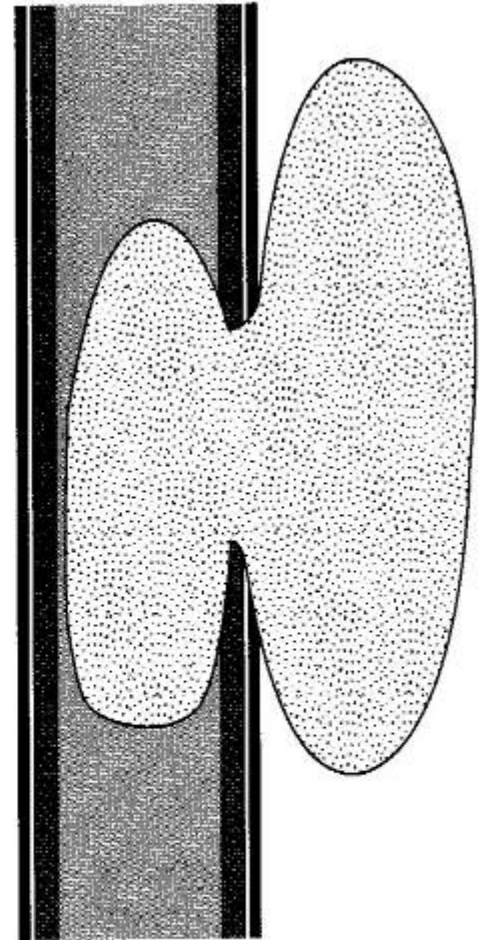
Intact cortex



Scalloped cortex

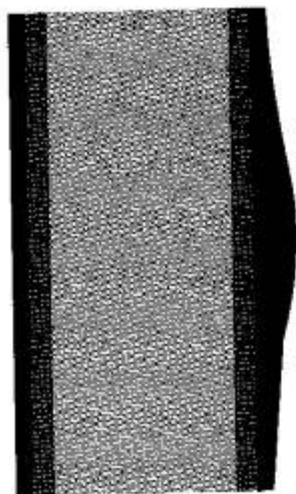


Complete cortical
disruption

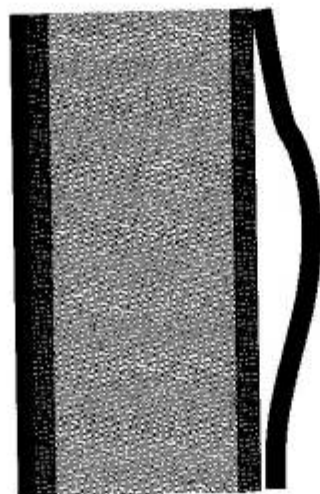


Dumbbell
Configuration

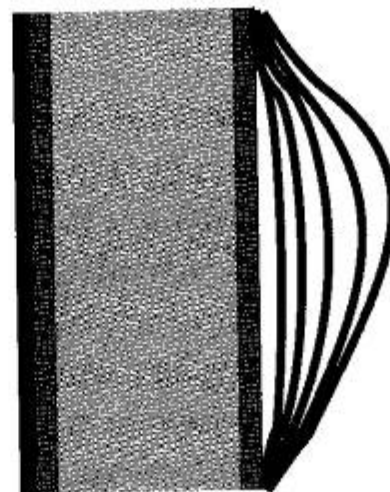
Continuous



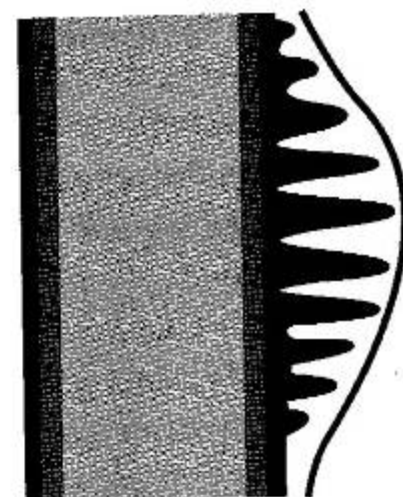
Solid



Single lamellar

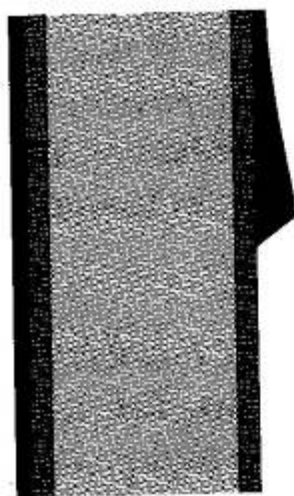


Onion-skin

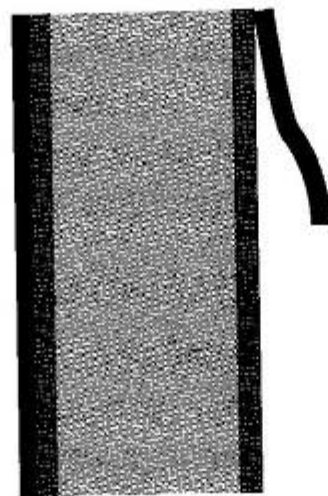


Spiculated

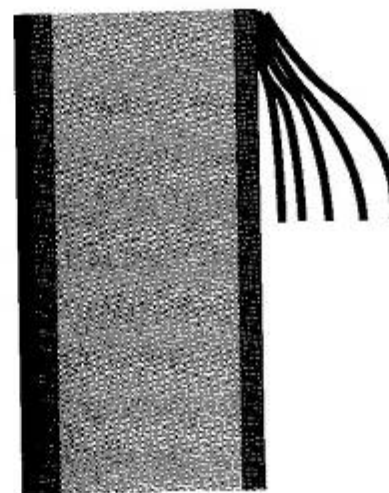
Interrupted



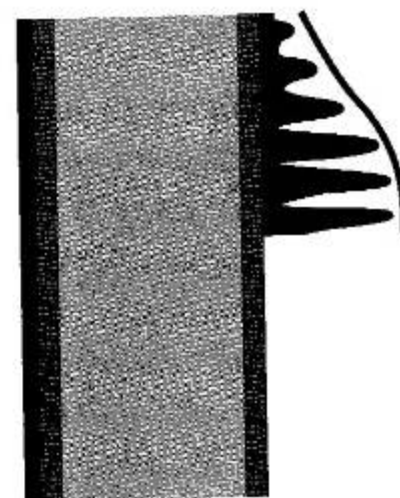
Buttress



Codman's triangle



Lamellar



Spiculated

Uninterrupted

Interrupted

**solid
buttress**

**perpendicular
(sunburst)**

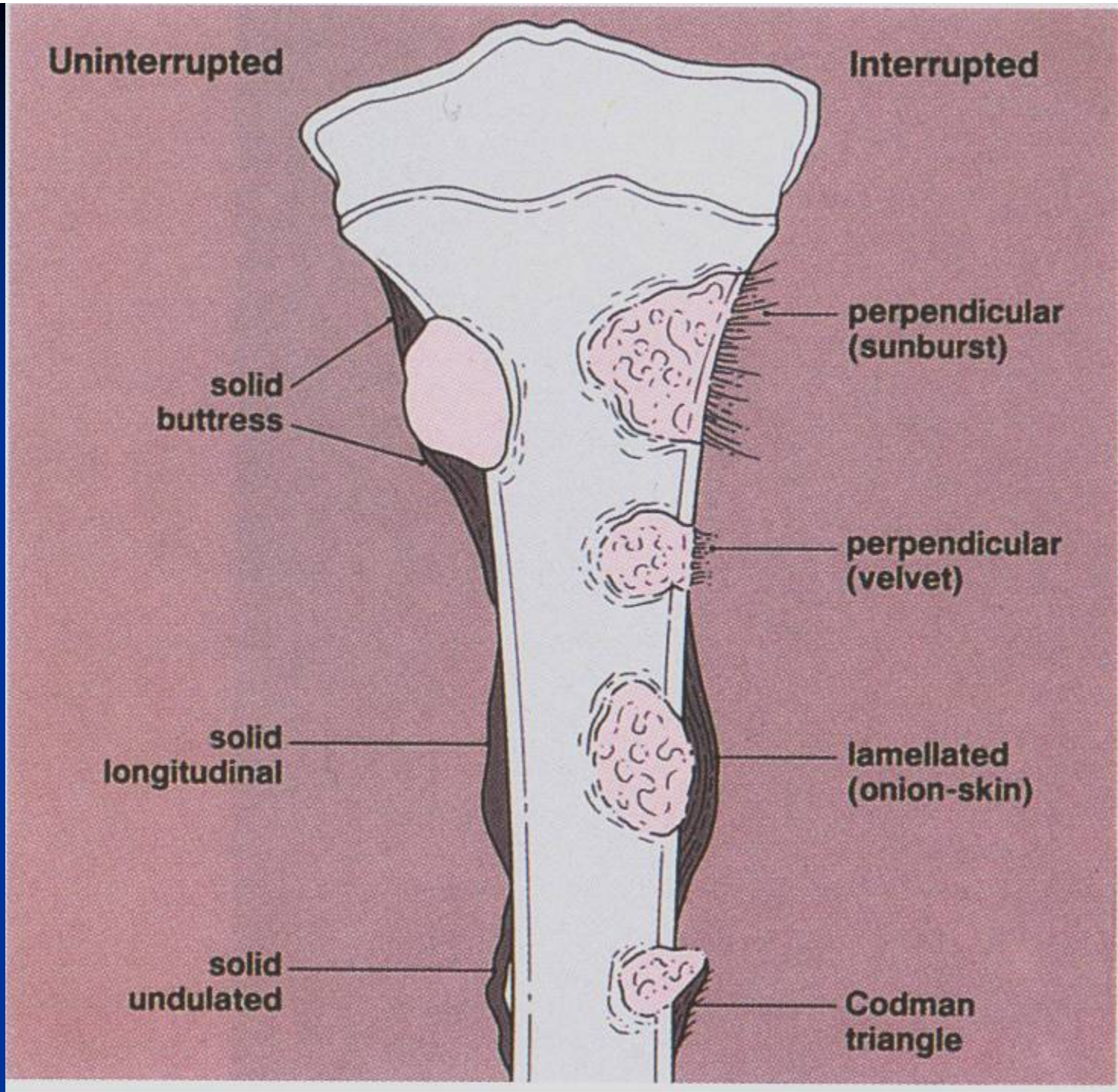
**perpendicular
(velvet)**

**solid
longitudinal**

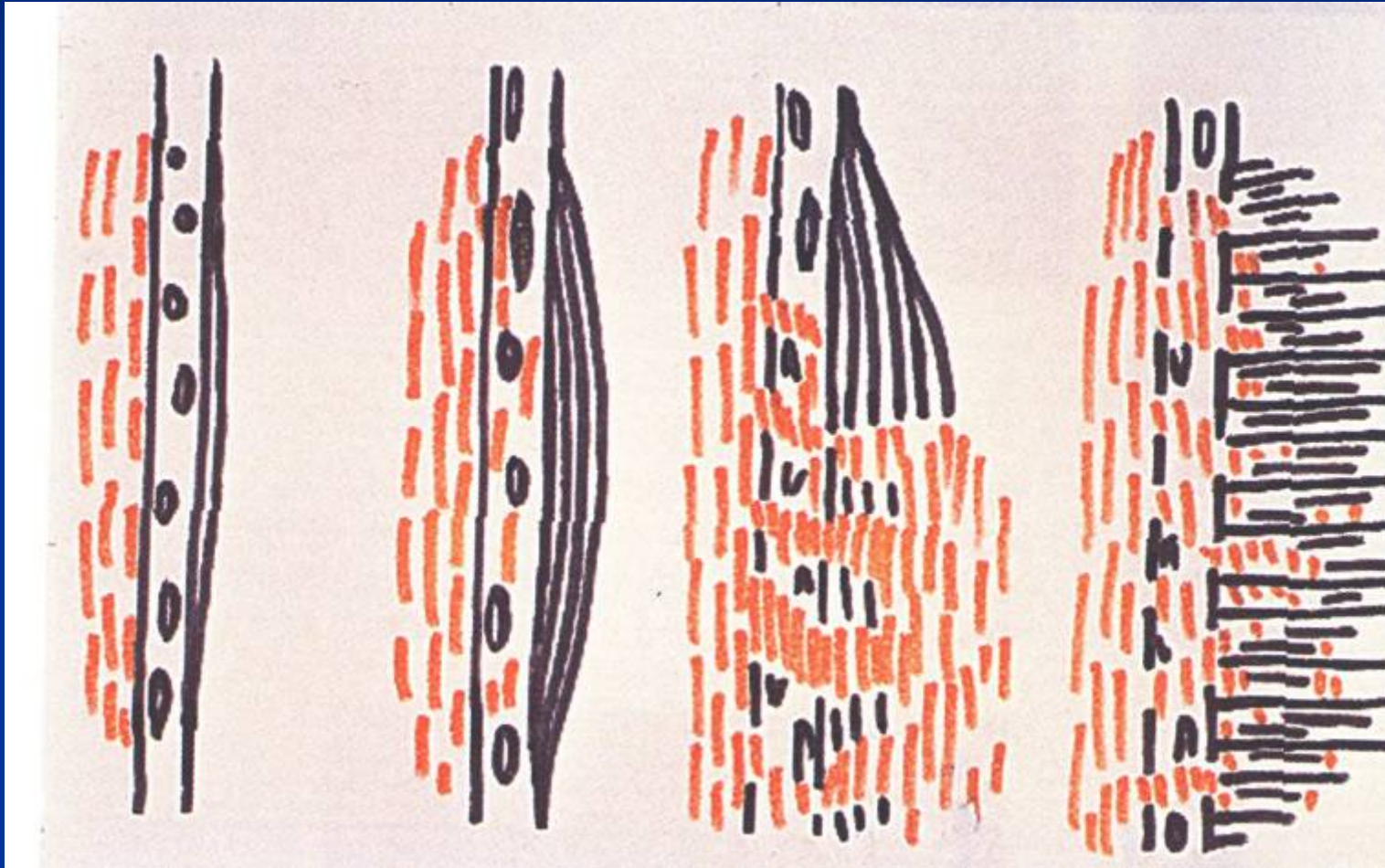
**lamellated
(onion-skin)**

**solid
undulated**

**Codman
triangle**



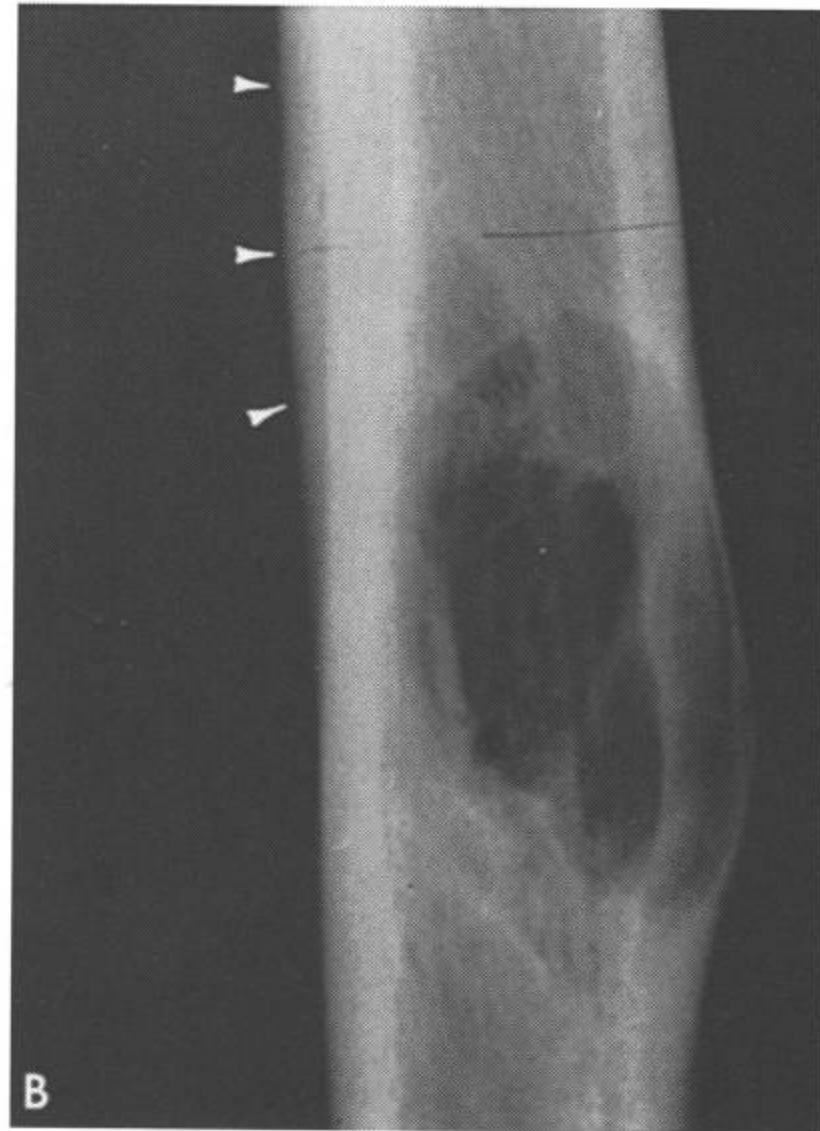
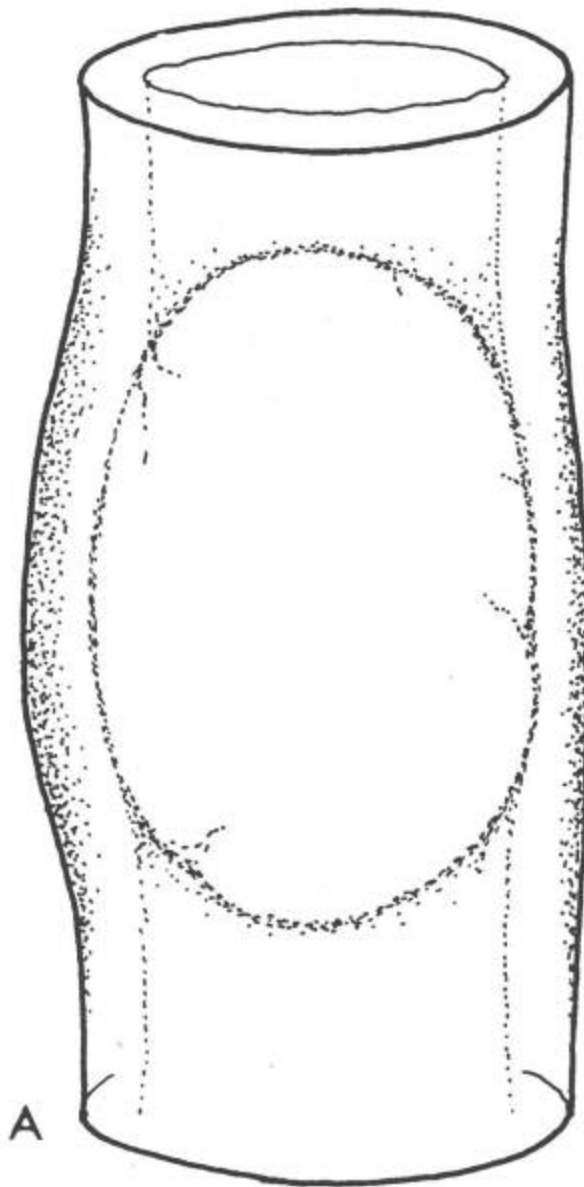
Periosteal Reactions as Related to Tumor Growth



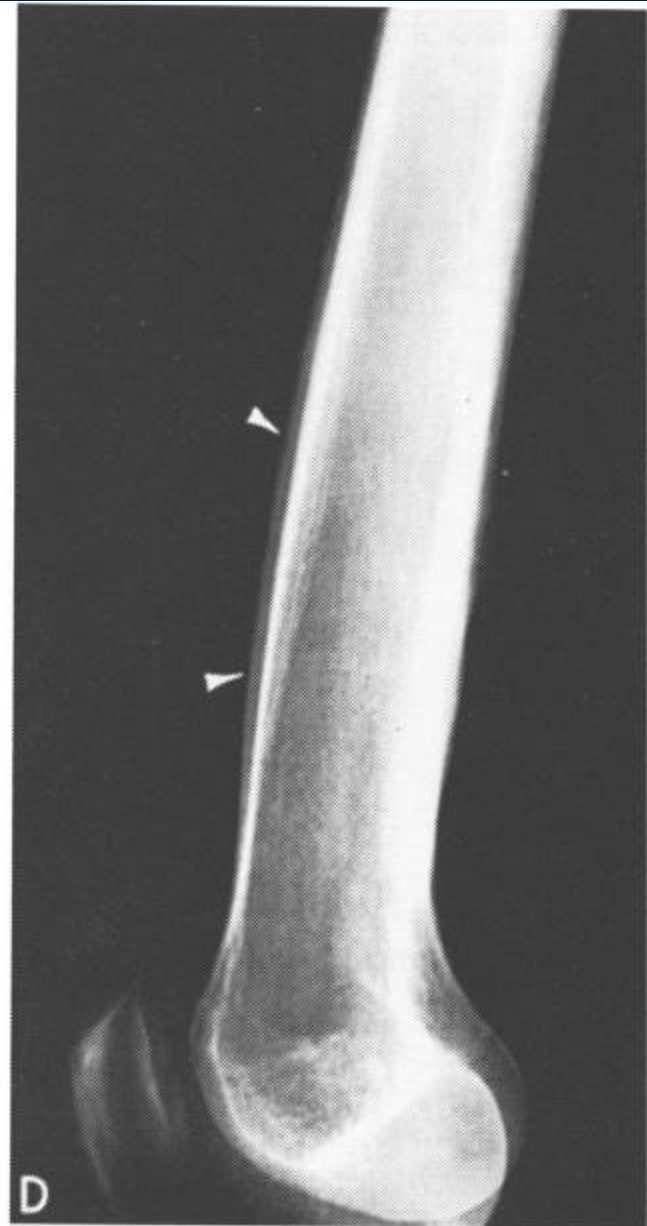
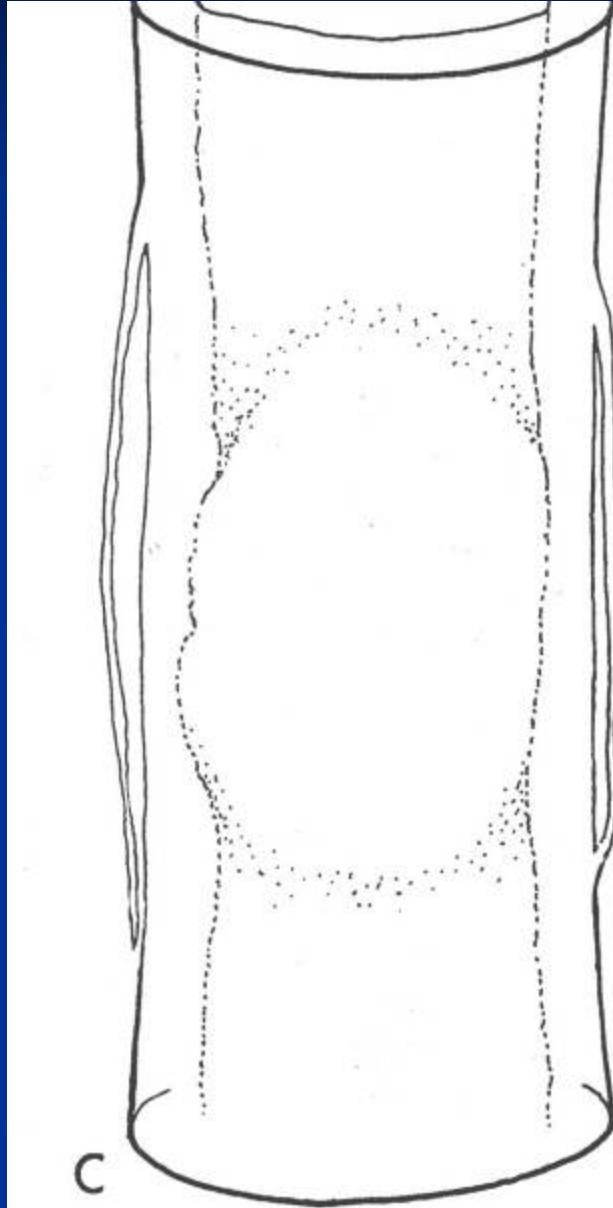
Periosteal Response

- **Benign:** Buttressing Pattern; Single Lamellar; Cortical Thickening; Bony Expansion
 - Endosteal Erosion Leads to Periosteal Proliferation
 - Can Be Same or Diminished Thickness Compared to Normal Cortex
 - Buttressing: Interface Between Normal and Expanded Cortex is Filled In with Bone

Buttressing



Buttressing



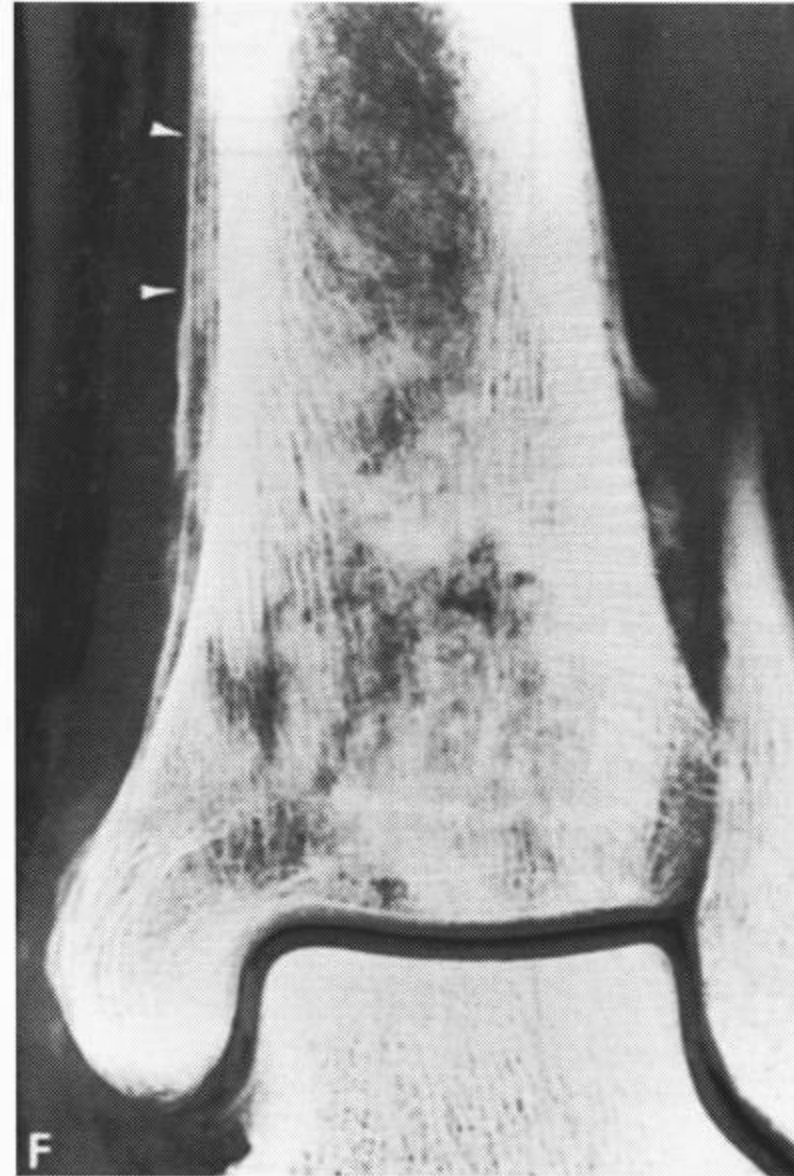
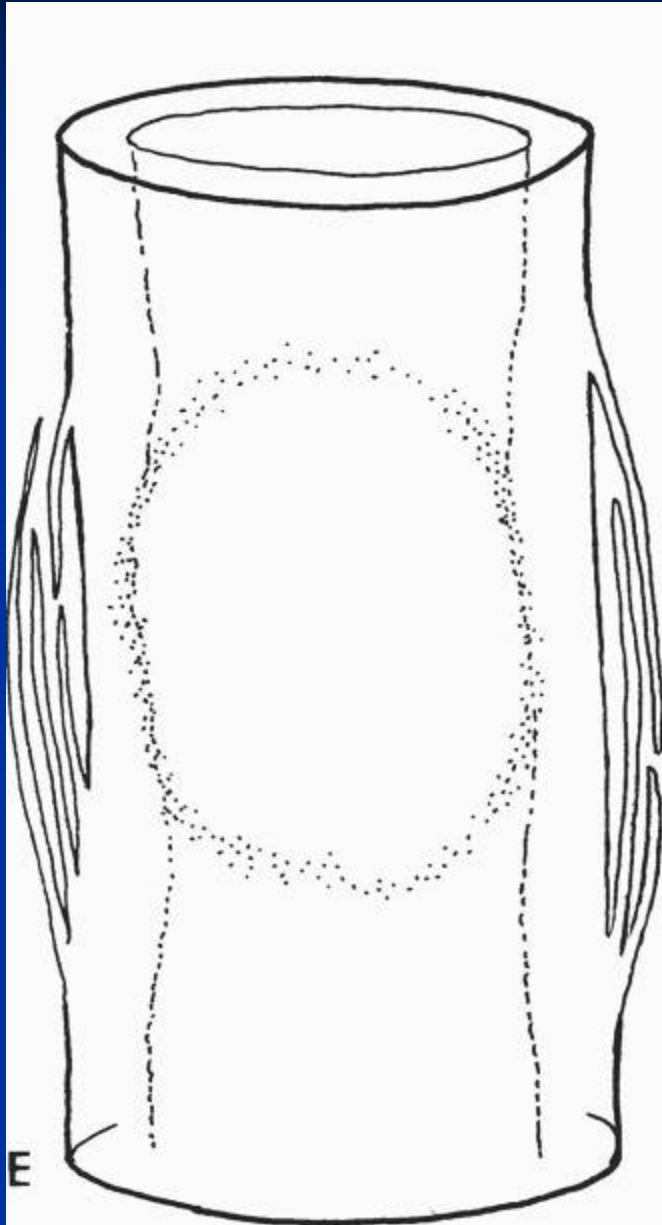
Buttressing



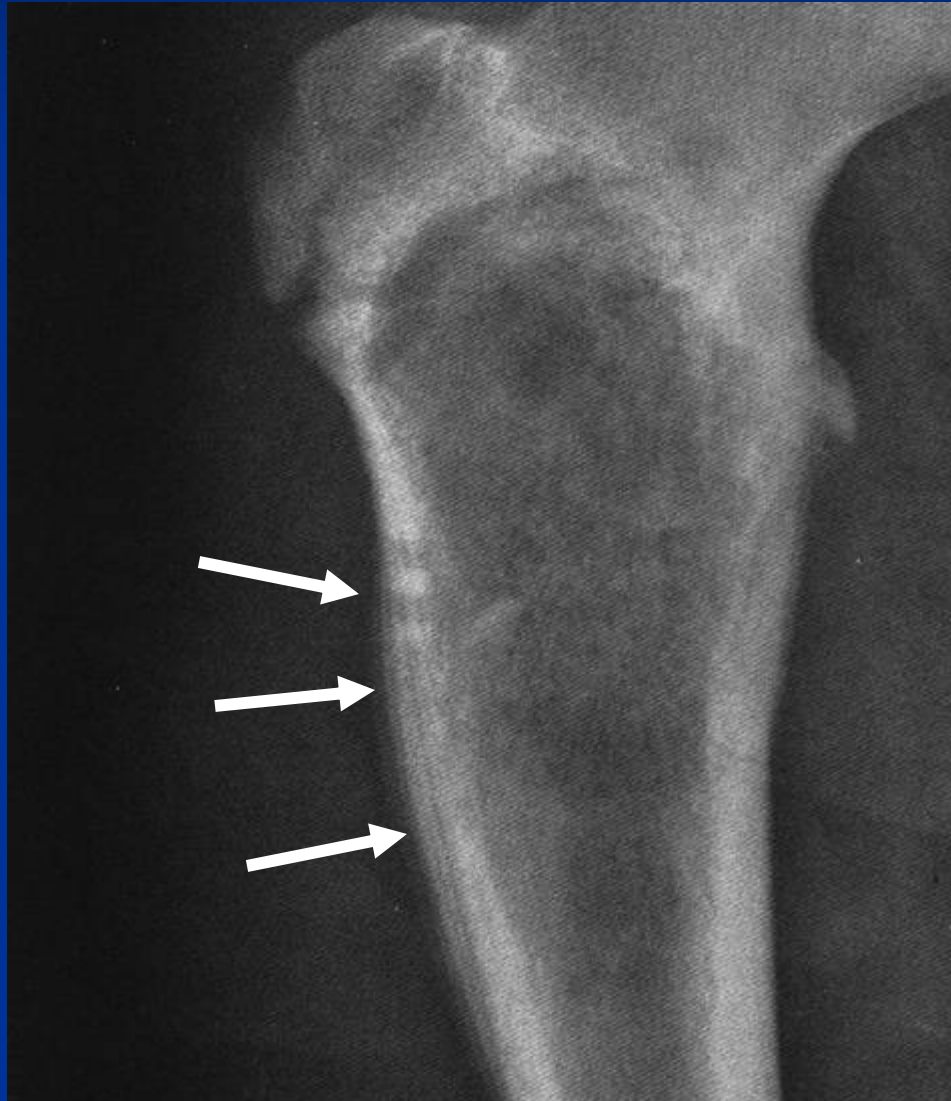
Periosteal Response

- **Malignant Tumors:** Rapid Tumor Growth May Lead to Single or Multiple Concentric Layers
- **Types of Malignant Periosteal Reactions:**
 - **Onion Skin:** Multiple Concentric layers
 - **Codman's Triangle:** Occurs at the Periphery of a Lesion or Infective Focus
 - **Sun Burst:** Delicate Rays that Extend Away from the Bone (Angled with Bone)
 - **Hair On End:** Rays are Perpendicular to Bone

Onion Skin Appearance



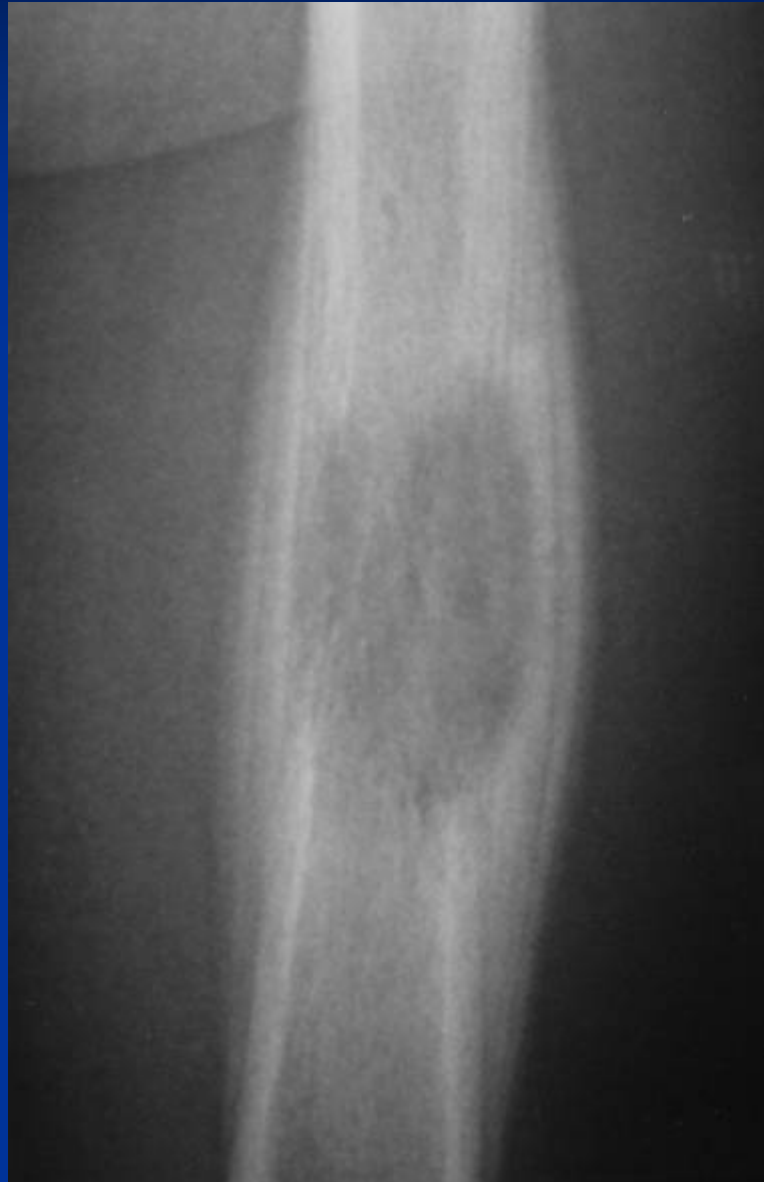
Onion Skin



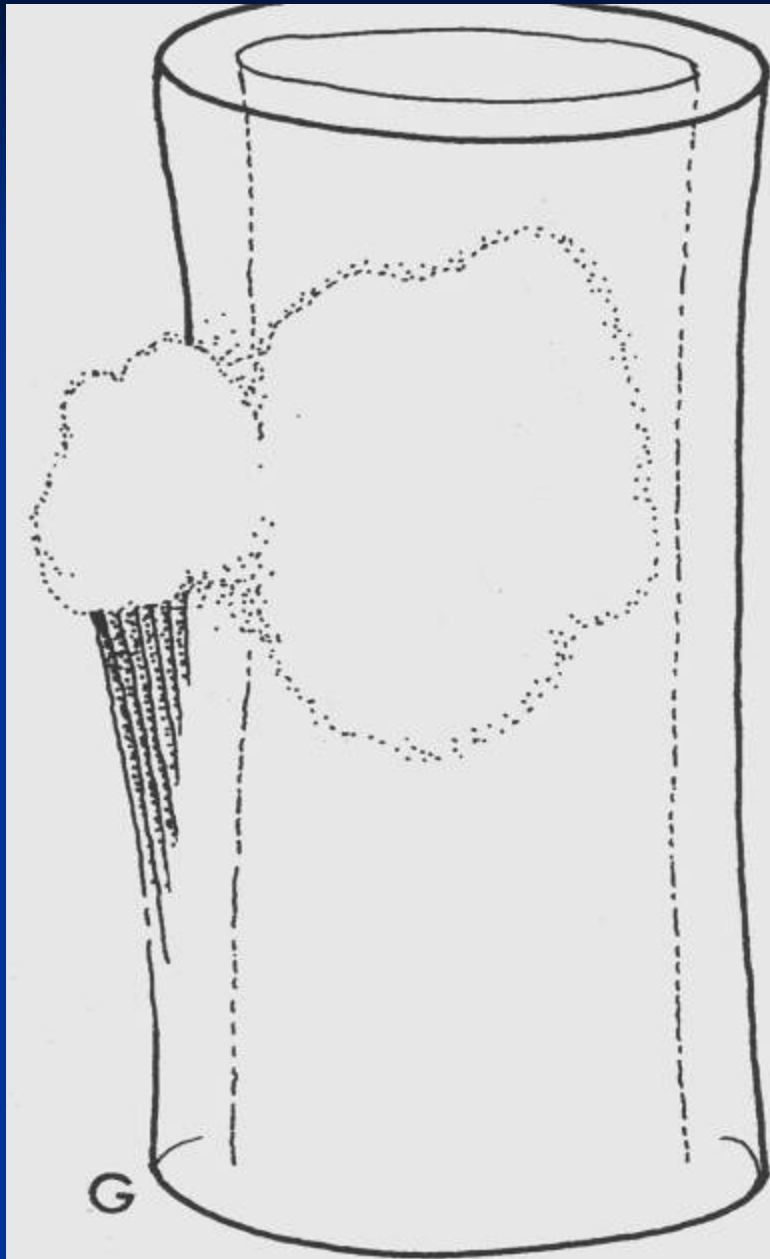
Onion Skin



Onion Skin



Codman's Triangle



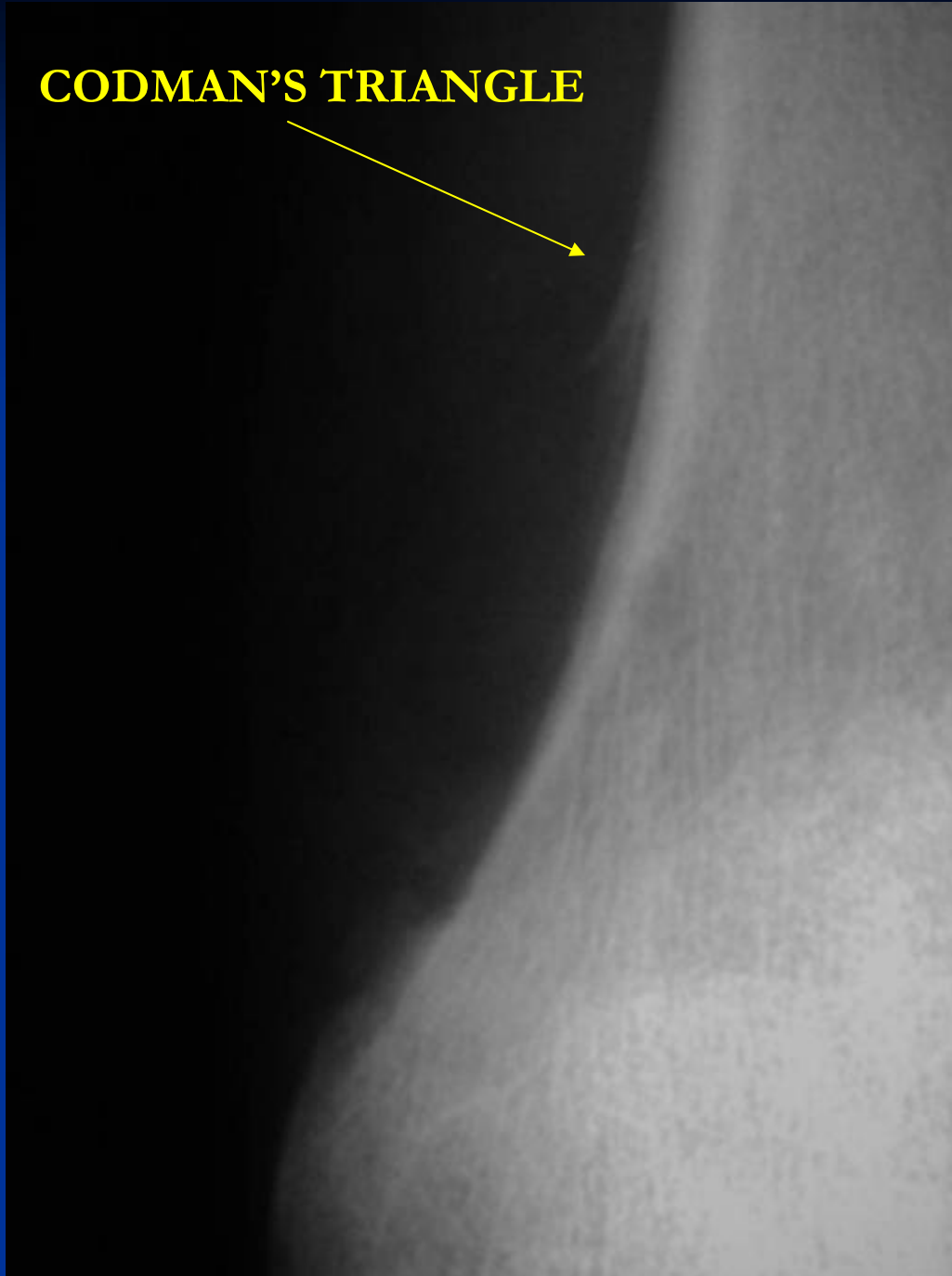
Codman's Triangle



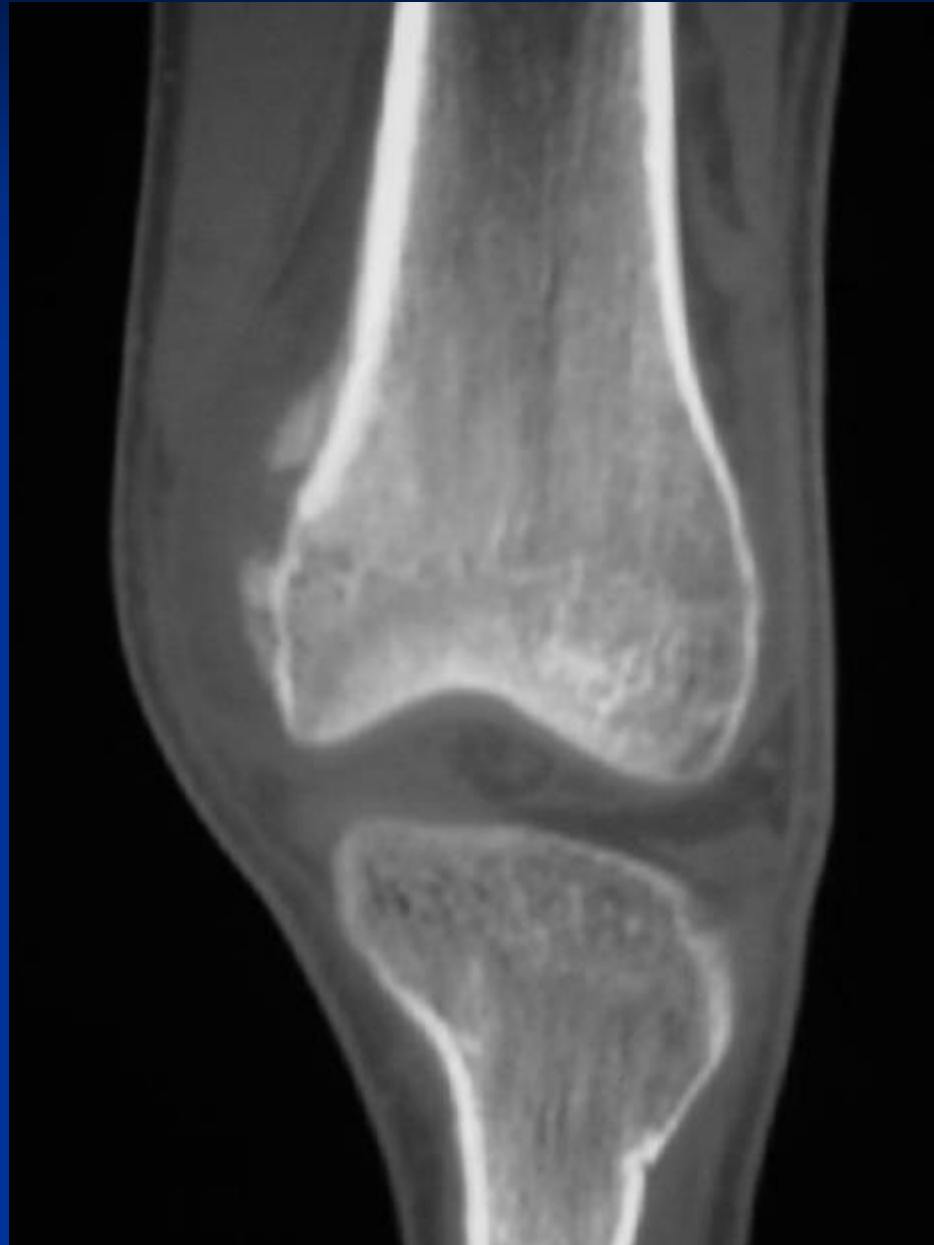
Codman's Triangle



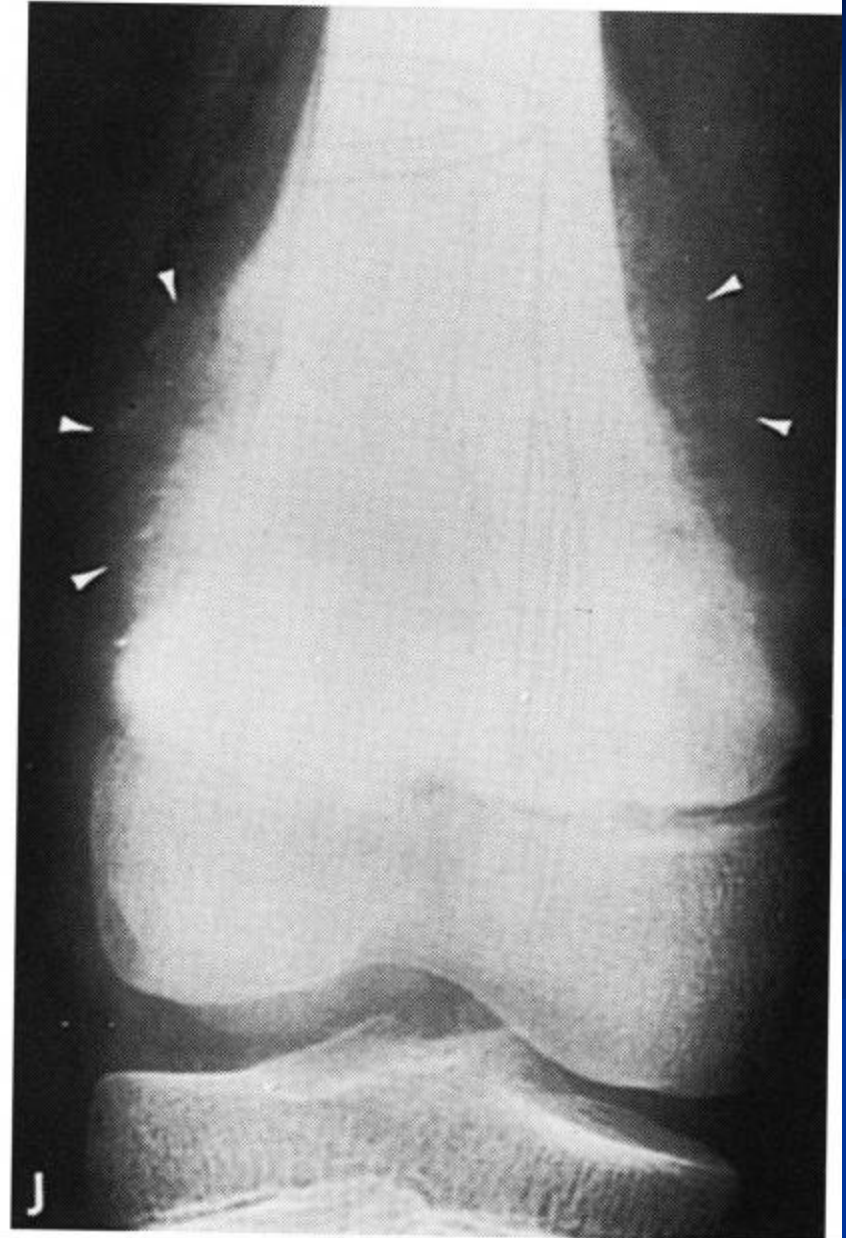
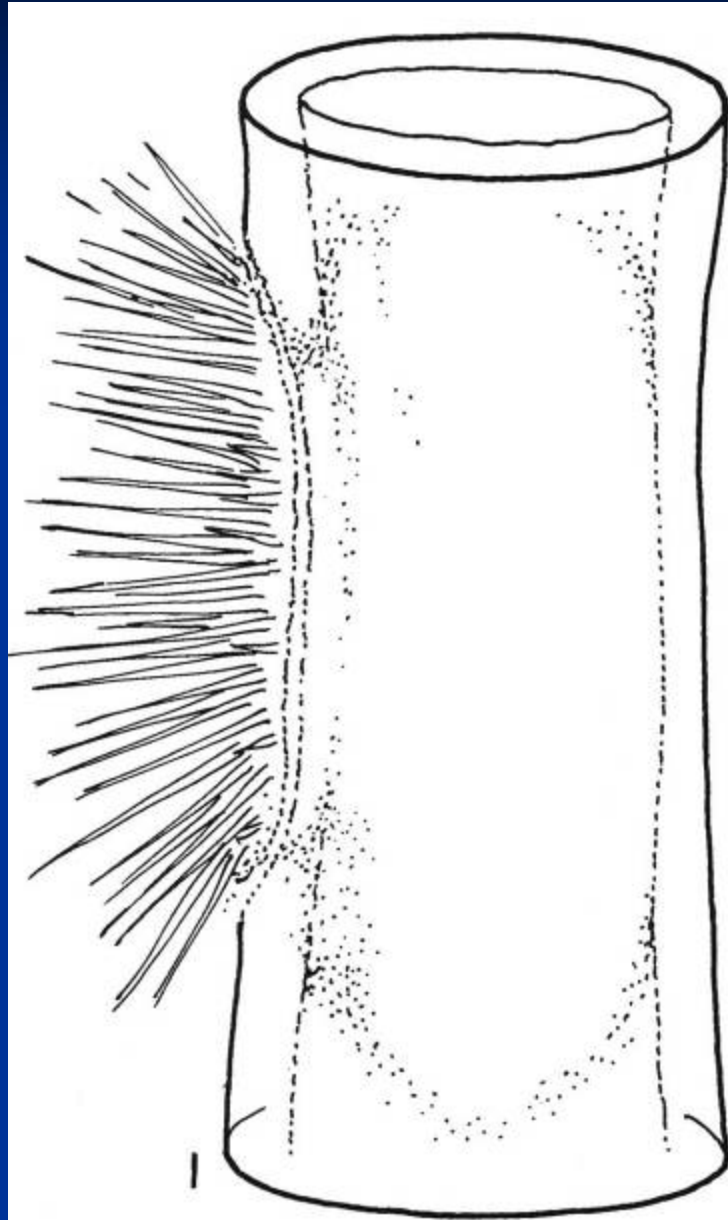
CODMAN'S TRIANGLE



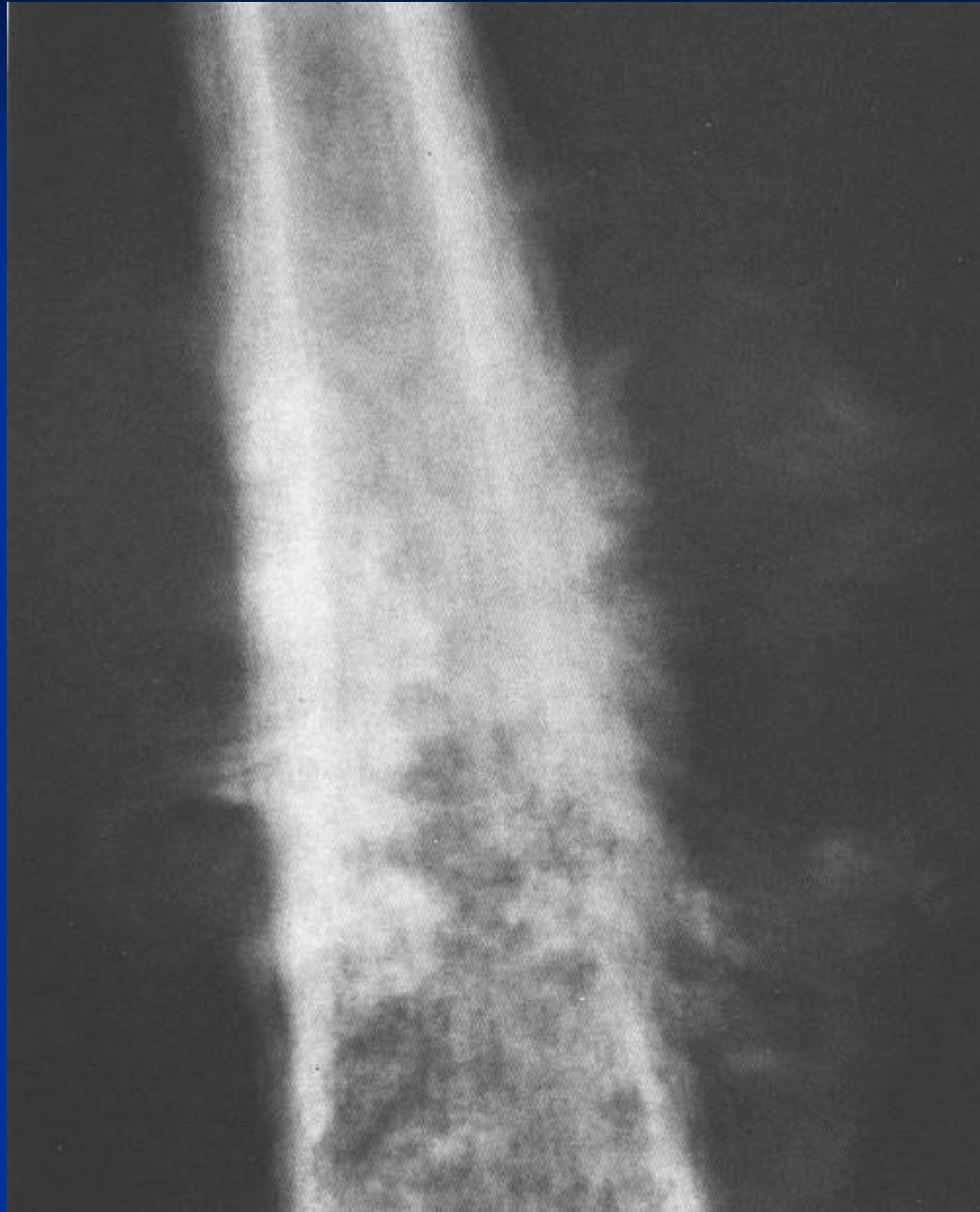
CT Scan of Codman's triangle



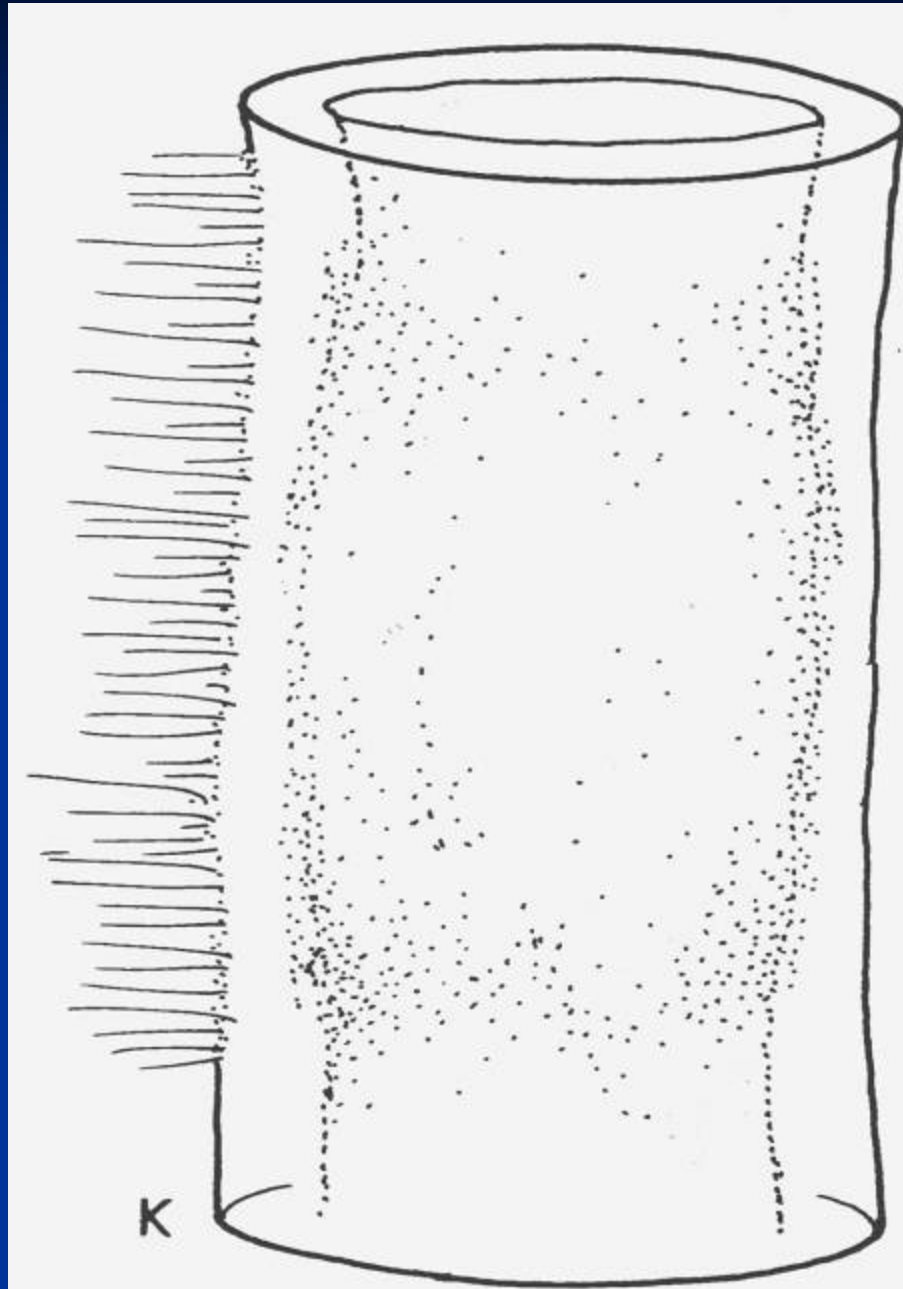
Sunburst Pattern



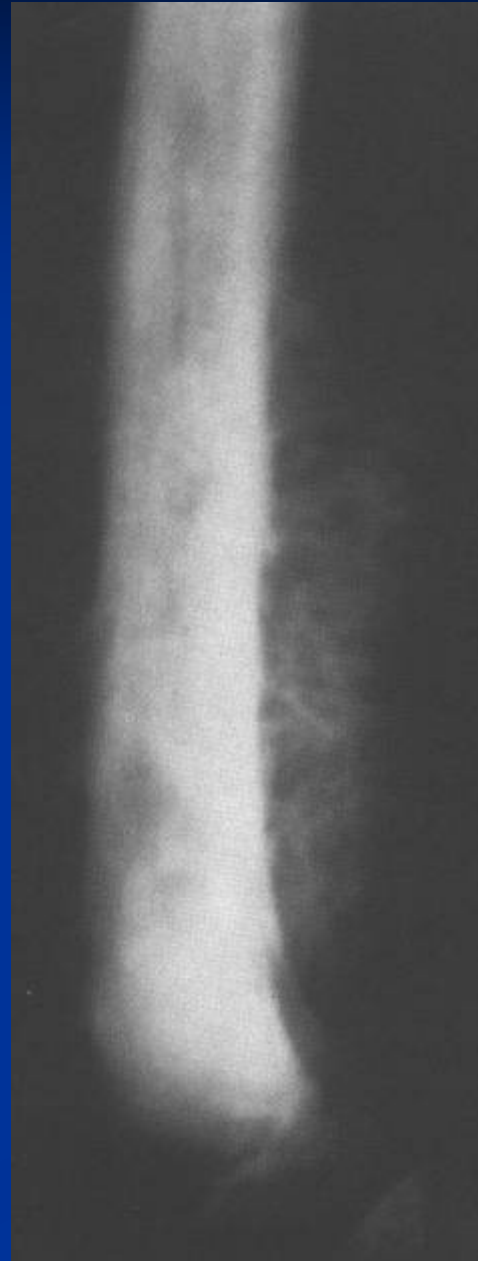
Sunburst Pattern



Hair On End

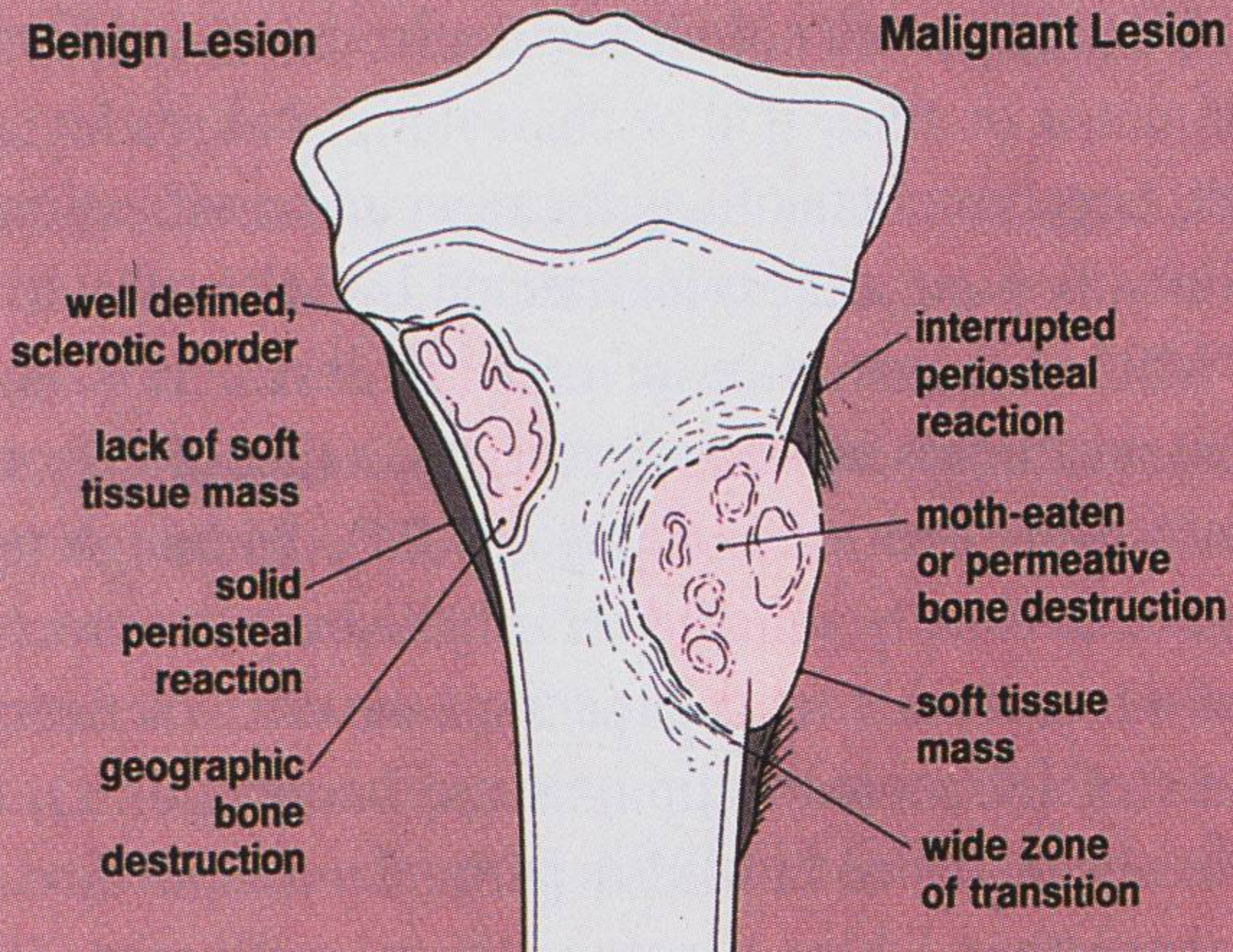


Hair on End Periosteal Reaction



Benign Lesion

Malignant Lesion

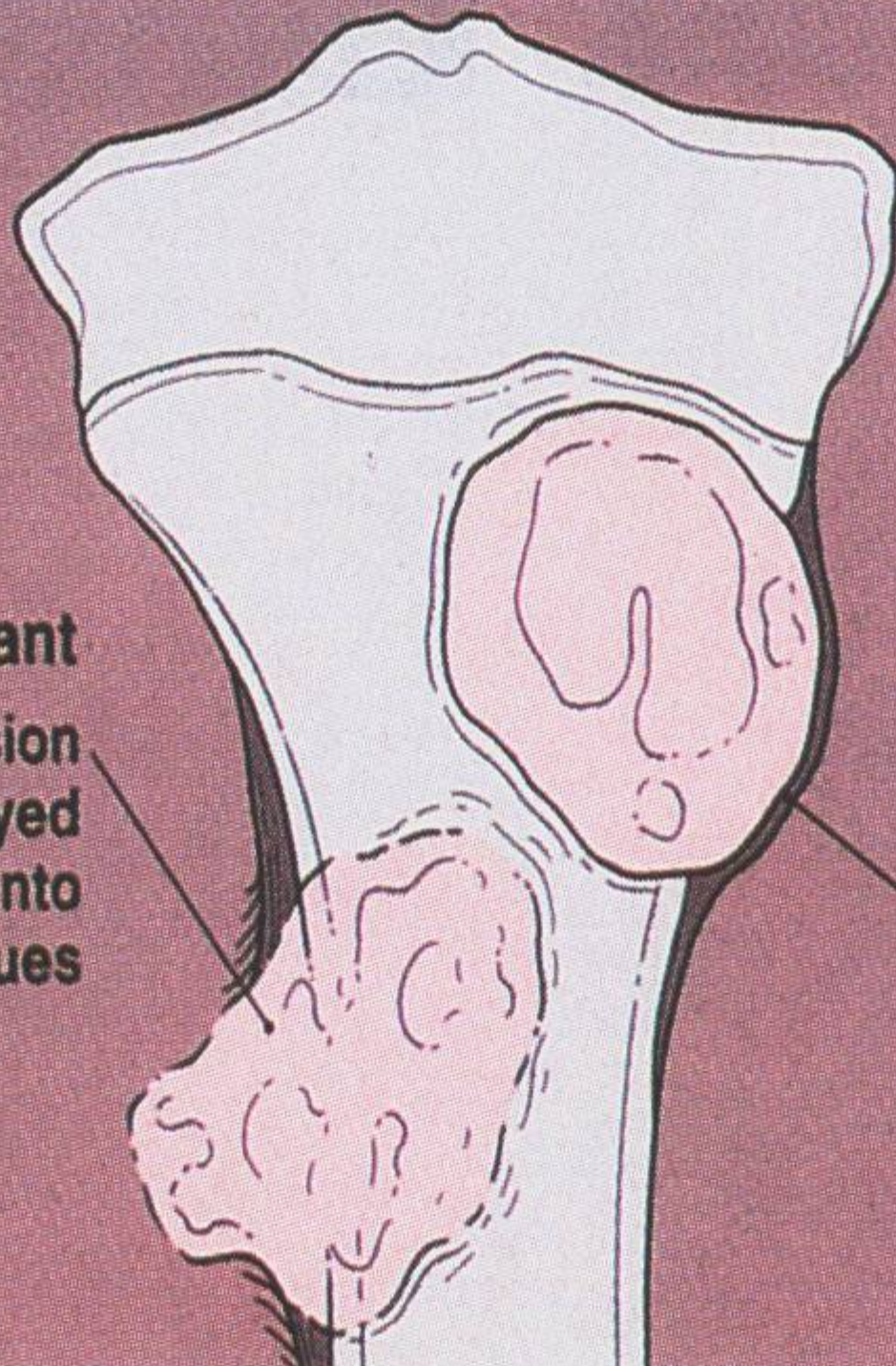


Soft Tissue Mass

- Primary Malignant Bone Tumors
- Benign Aggressive Bone Tumors
- Mets
- Osteomyelitis

Malignant
frank extension
through destroyed
periosteum into
soft tissues

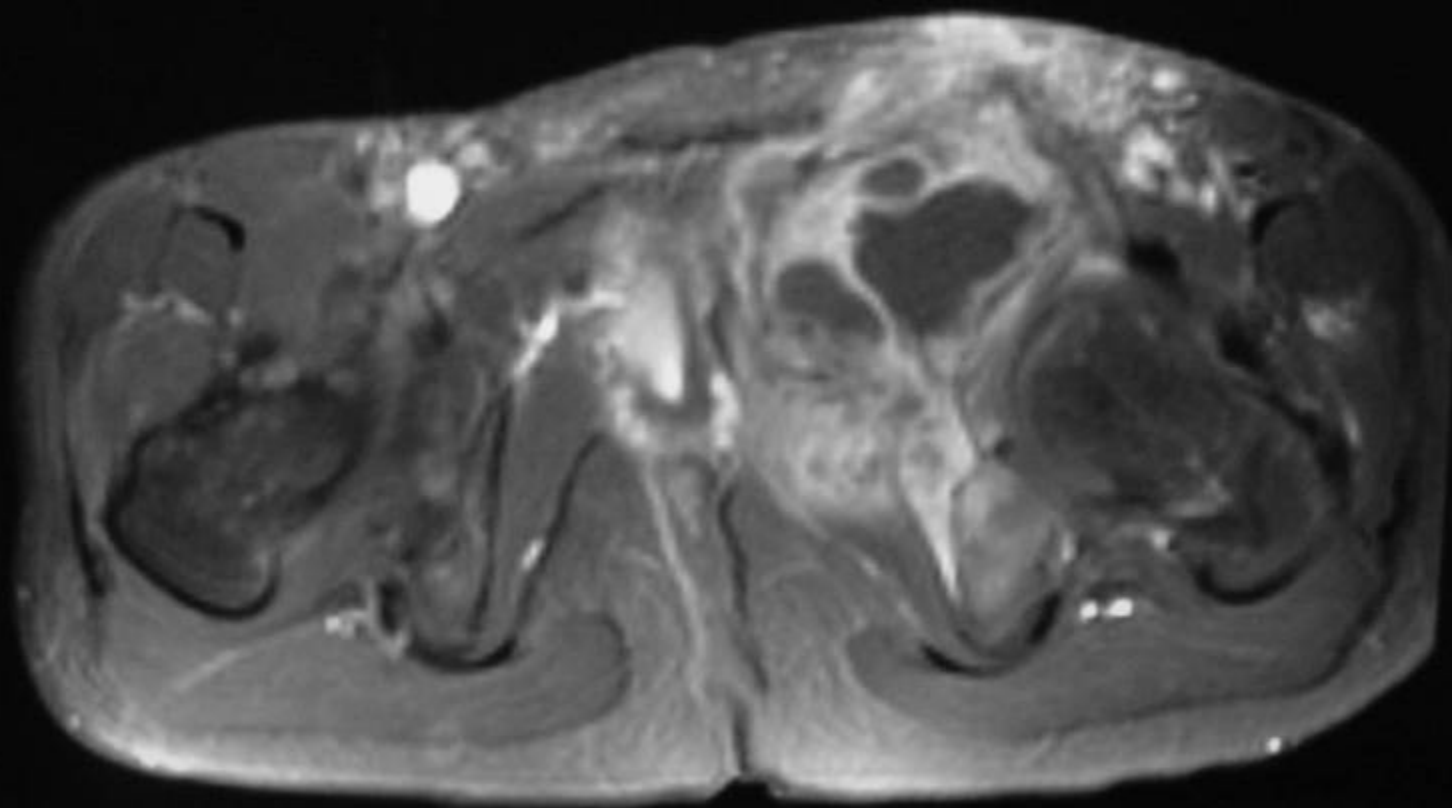
Benign
containment of
lesion by
shell of
periosteal
new bone



Benign Aggressive Tumor



AUG-2002
JE 399
1-12

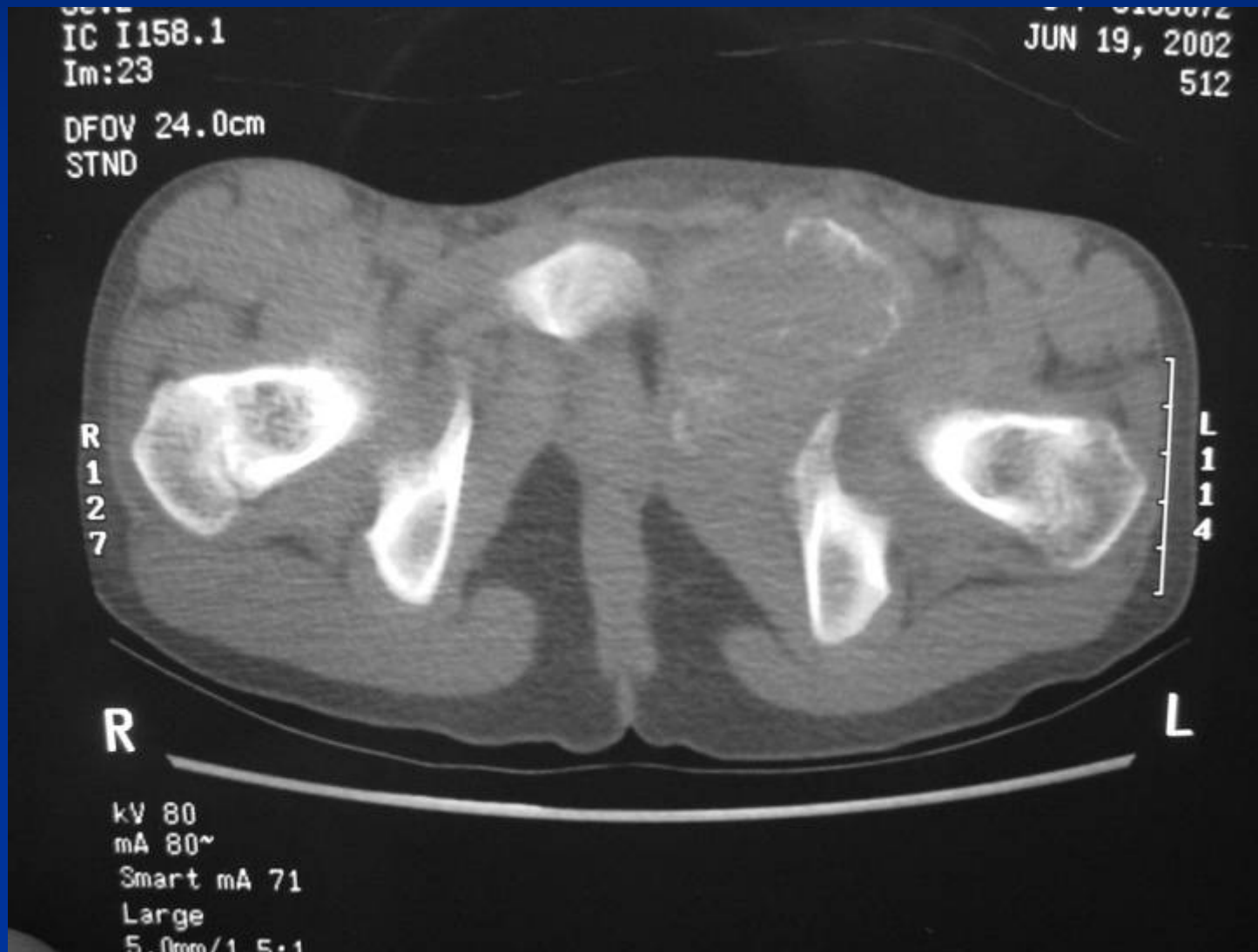


ost CM

el 90
R

SP -15.8
SL 6.0
FoV 150*300

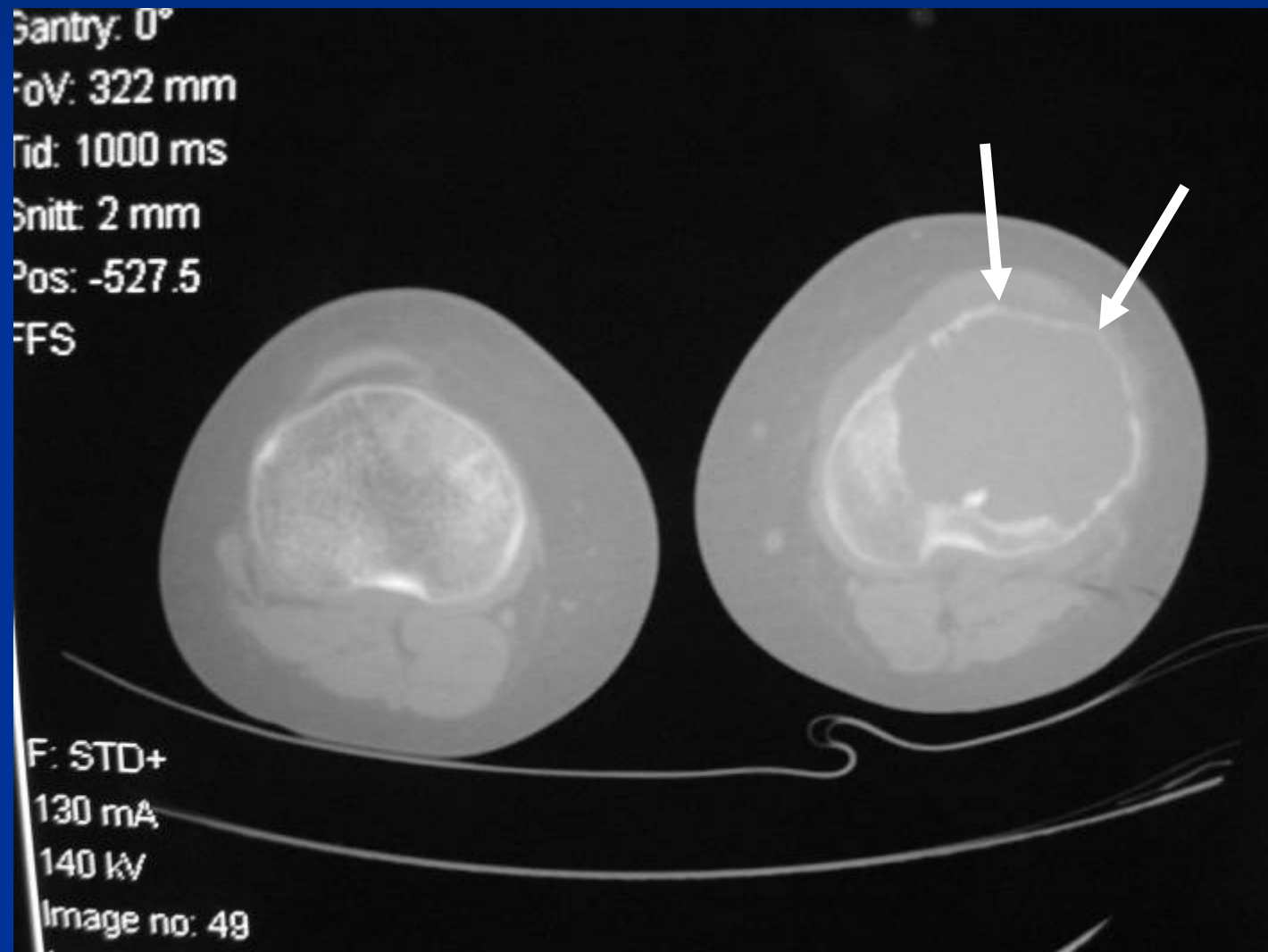
Periosteum Intact Around Periphery of Soft Tissue Mass



Benign Aggressive Giant Cell Tumor



Periosteum Intact Around Periphery



VISION plus
F-SP-CR VB33D
+ : F A L

MF 1.25

R

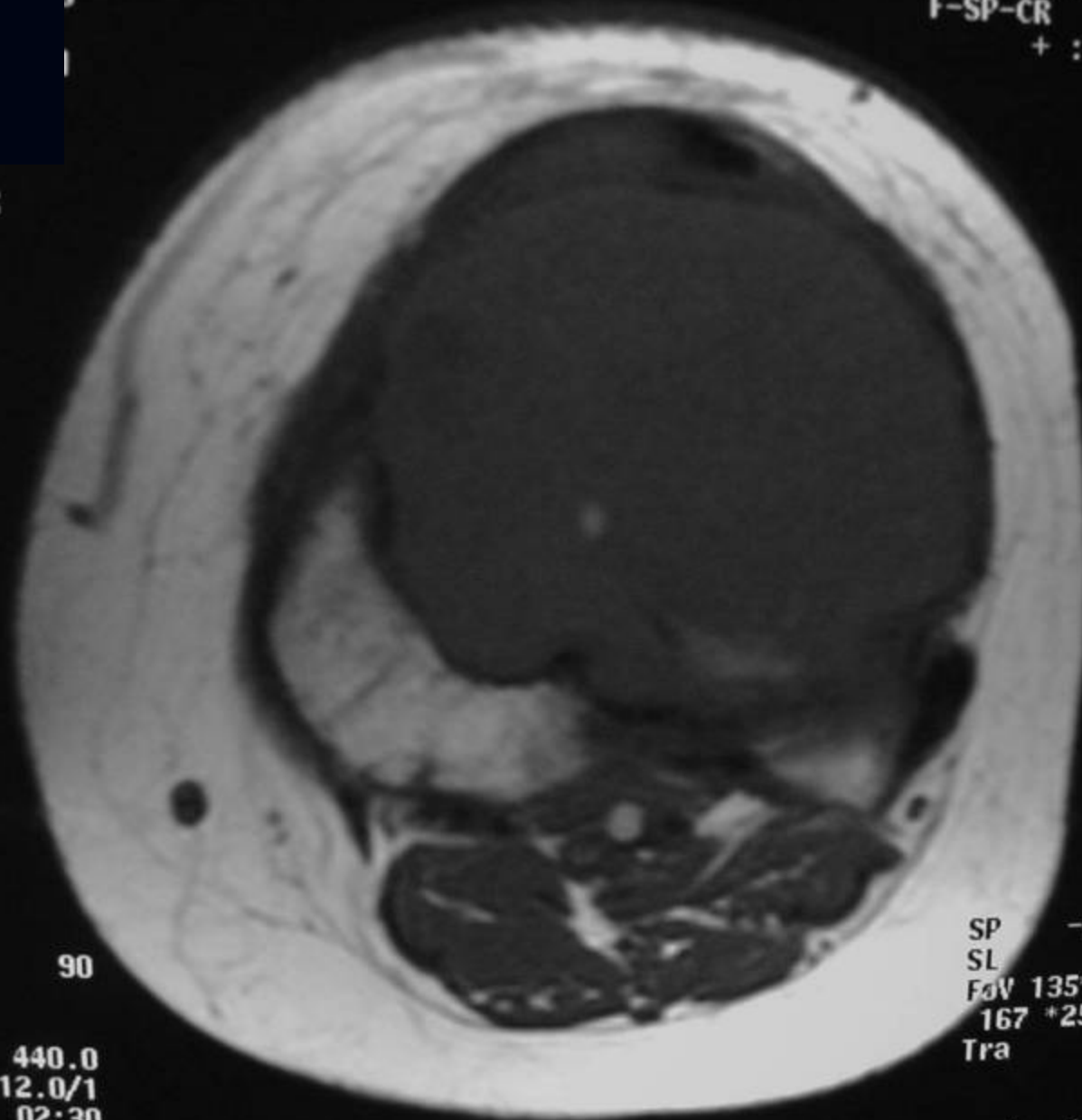
se1 90
*R

TR 440.0
TE 12.0/1
TA 02:30
AC 2

LEFT

SP -22.8
SL 6.0
FoV 135*180
167 *2560s
Tra

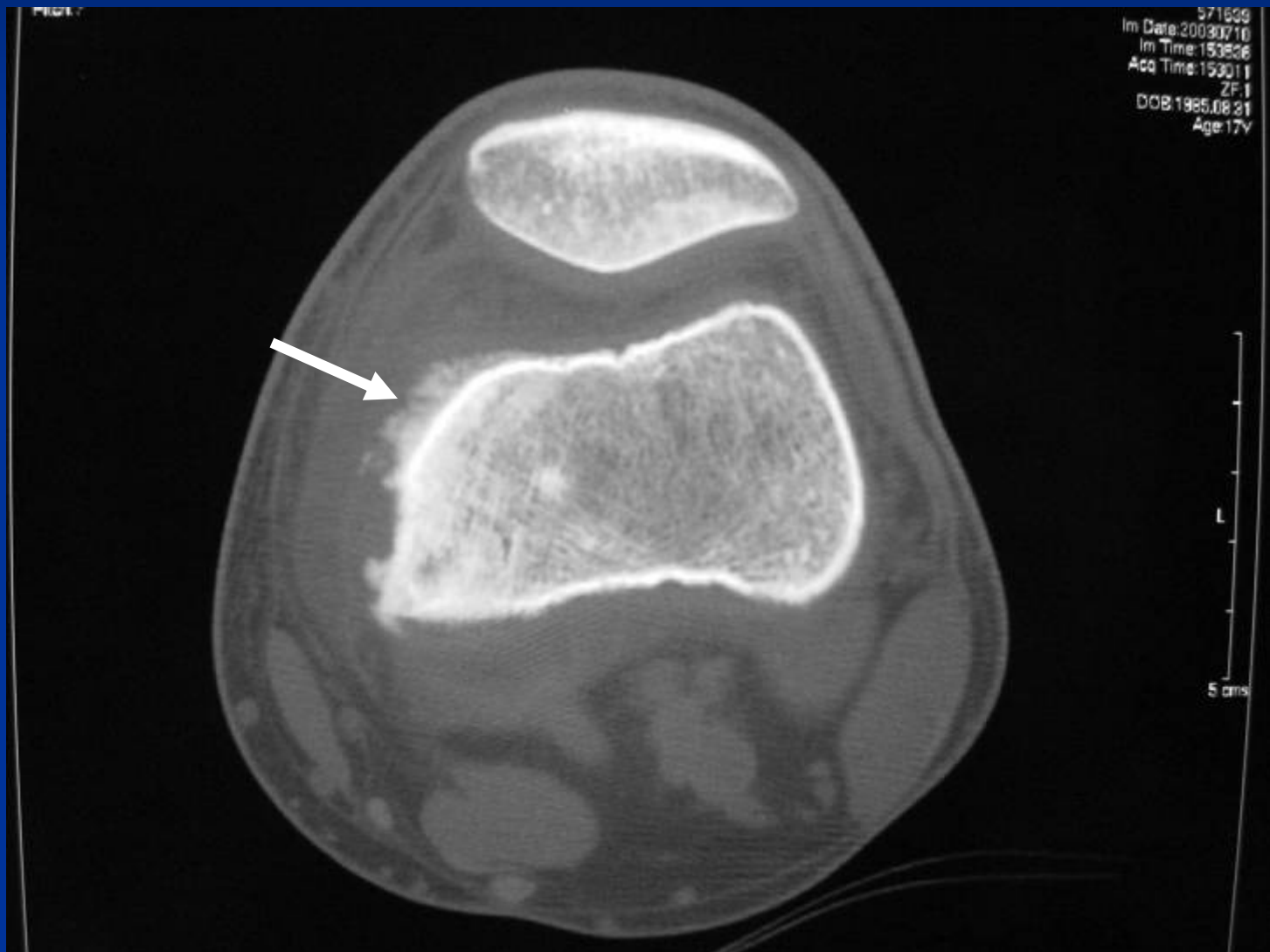
W 1252
540



Malignant-- Osteosarcoma

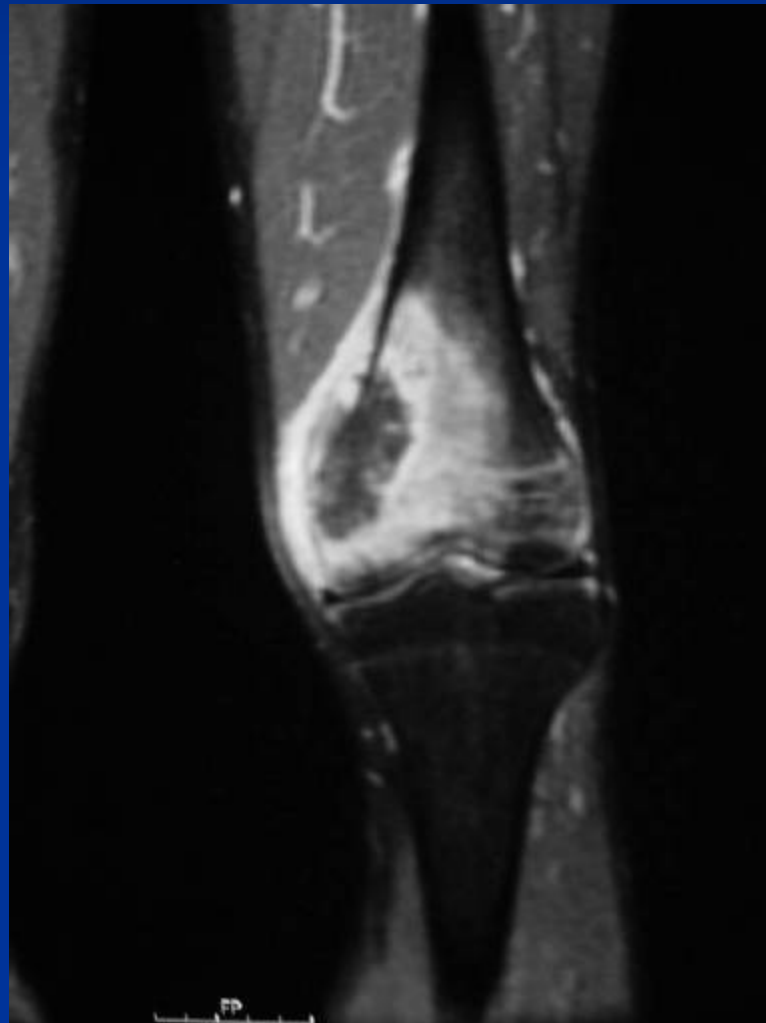


Periosteum Not Intact Around Soft Tissue Mass



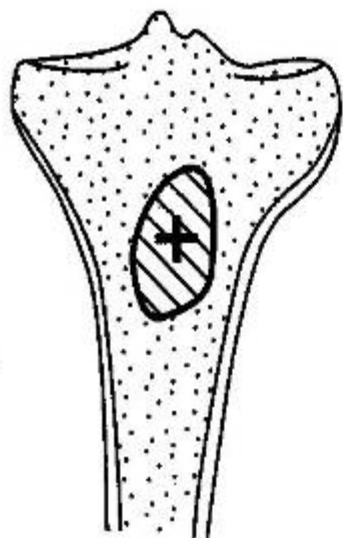
MRI of Osteosarcoma

Periosteum Not Intact Around Soft Tissue Mass

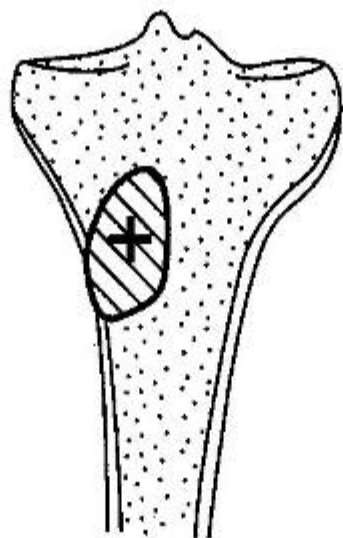


Distribution in Bone

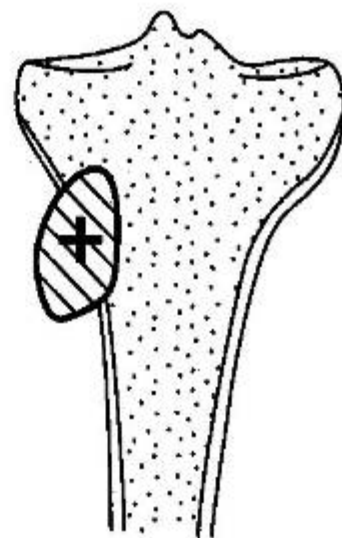
- **Position in Transverse Plain**
 - Central
 - Eccentric
 - Cortical
 - Juxtacortical (Periosteal/Parosteal)
 - Soft Tissue Location



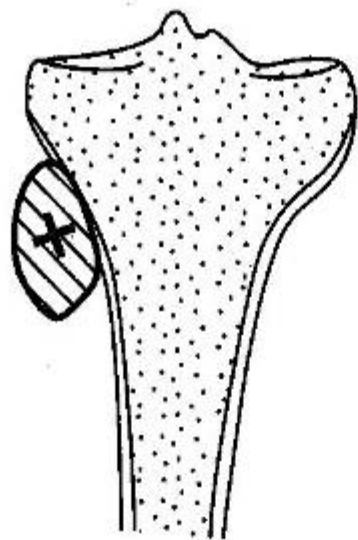
Central



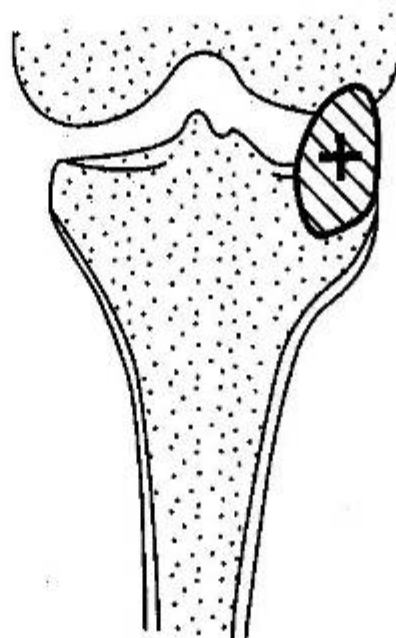
Eccentric



Cortical



Parosteal (periosteal)



Intra-articular

A

Central Axis

- Enchondromas
- Fibrous Dysplasia
- Simple Bone Cysts

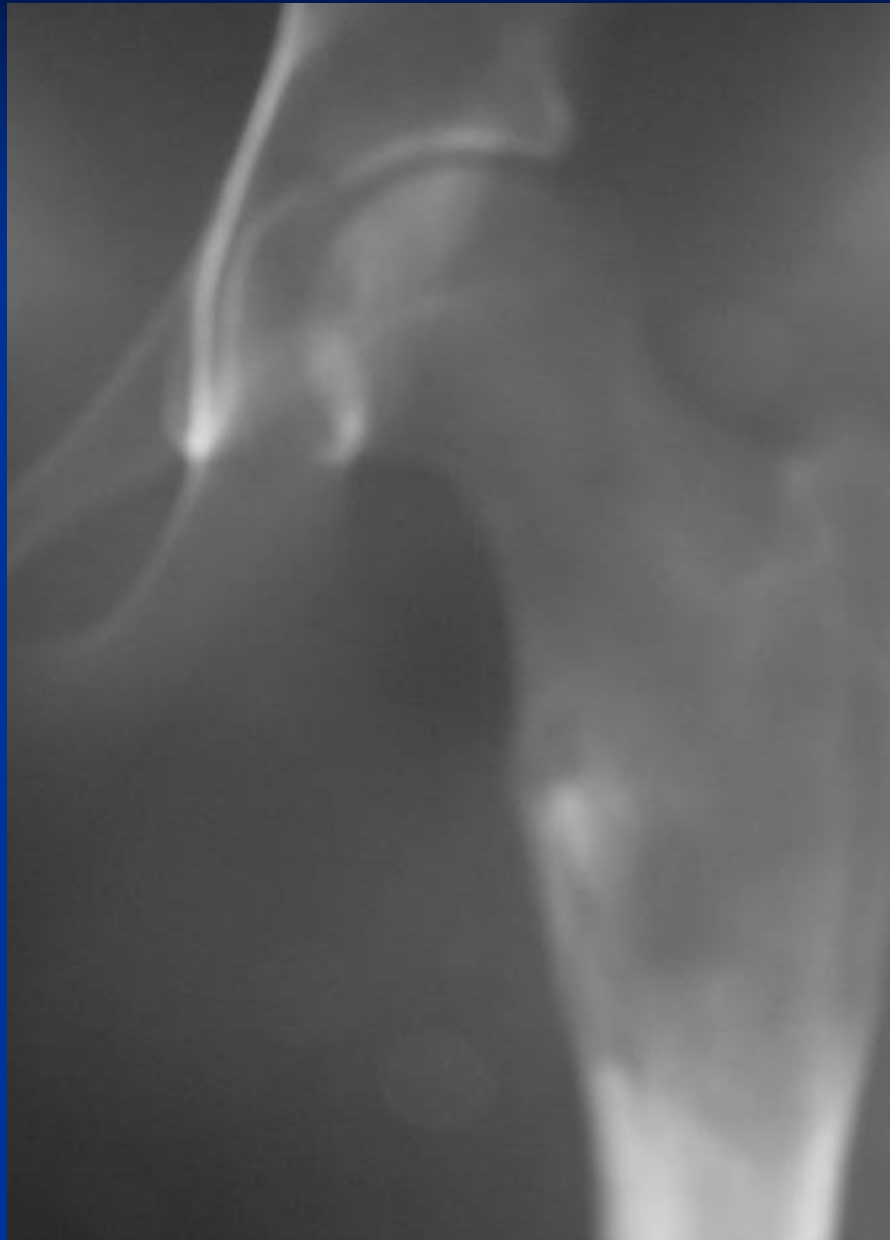
UBC



UBC



Fibrous Dysplasia



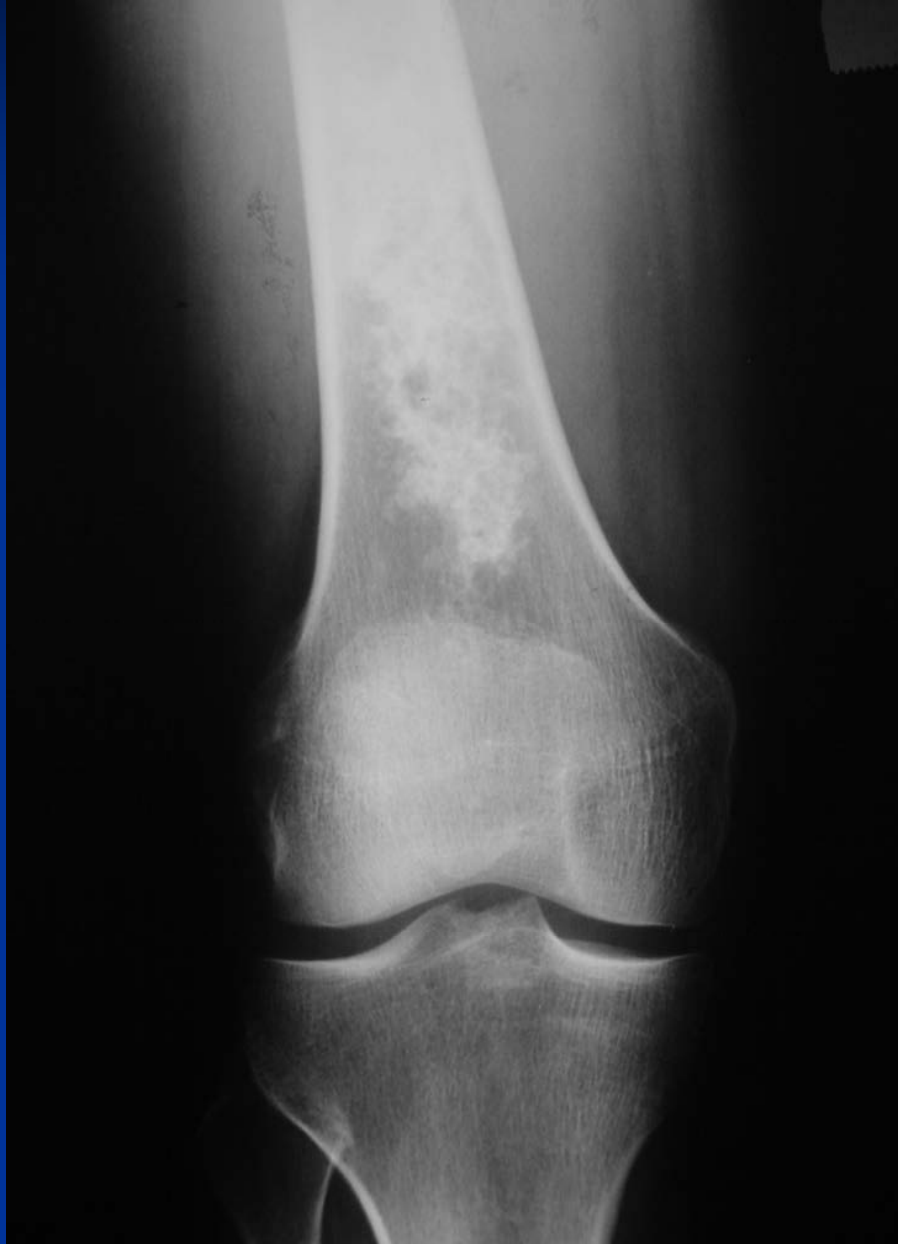
Fibrous Dysplasia



Fibrous Dysplasia



Enchondroma



Eccentric Lesions

- Giant Cell Tumor
- Osteosarcoma
- Chondrosarcoma
- Chondromyxofibroma

GCT



Osteosarcoma



Osteosarcoma



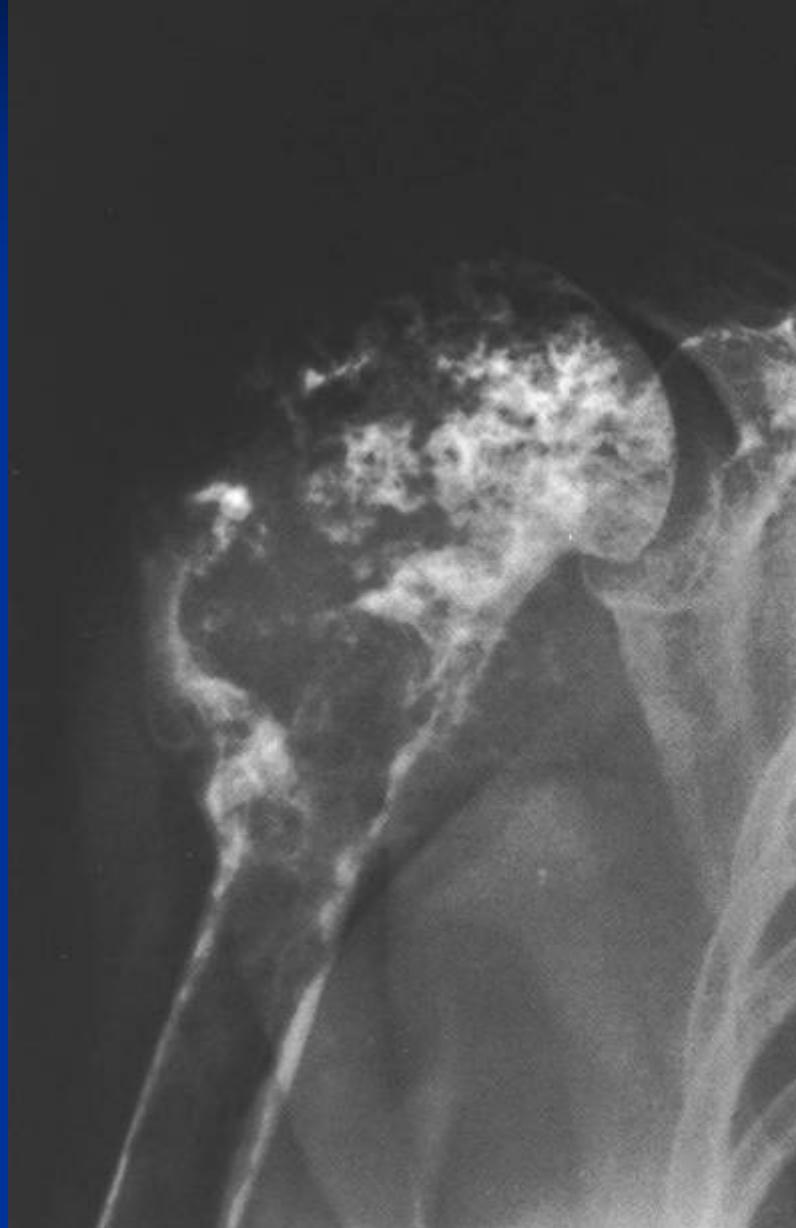
Osteosarcoma



Osteosarcoma



Chondrosarcoma



Chondromyxofibroma



Cortical Lesions

- Nonossifying Fibromas
- Osteoid Osteomas

Nonossifying Fibroma



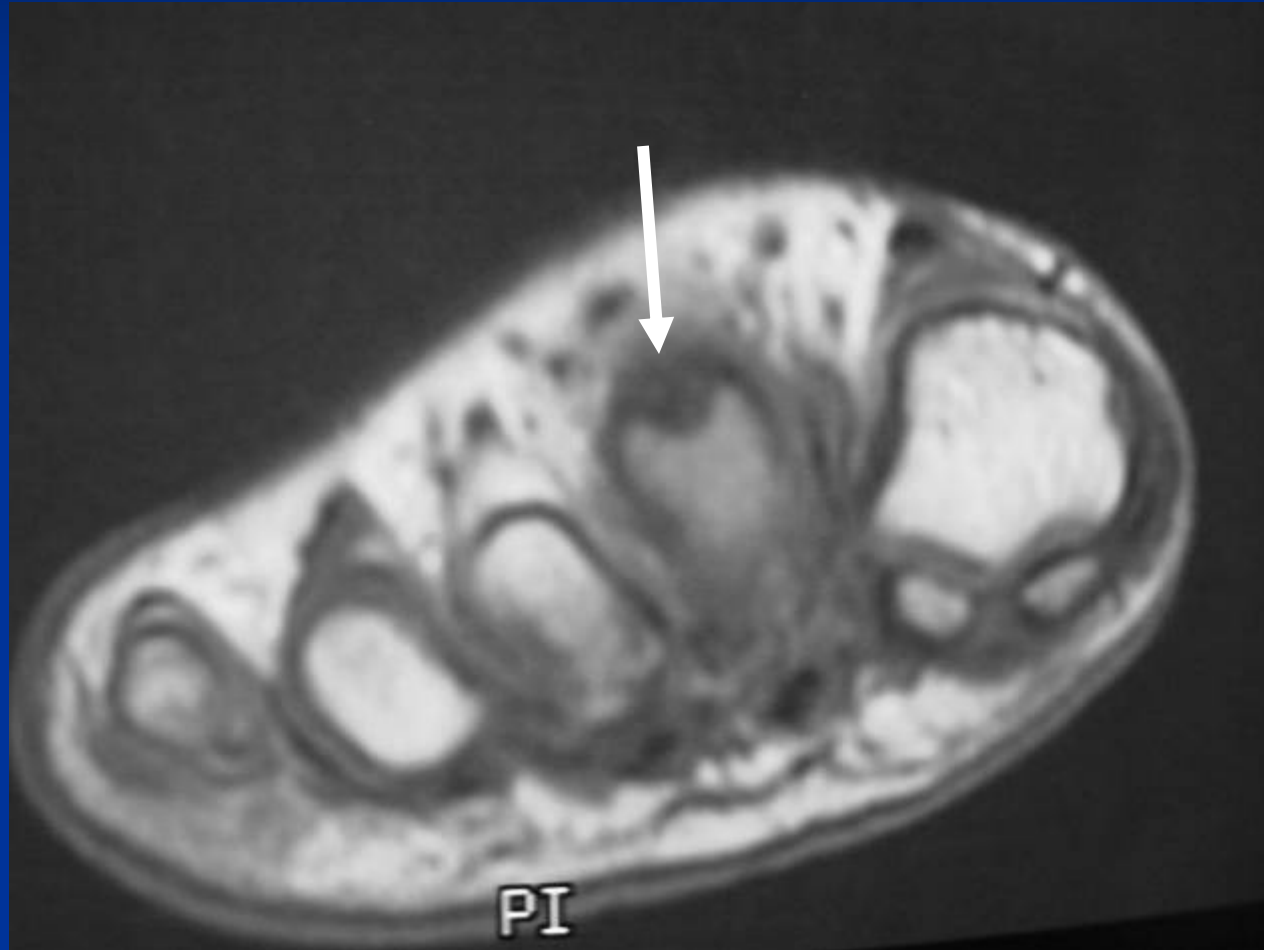
Osteoid Osteoma



Osteoid Osteoma



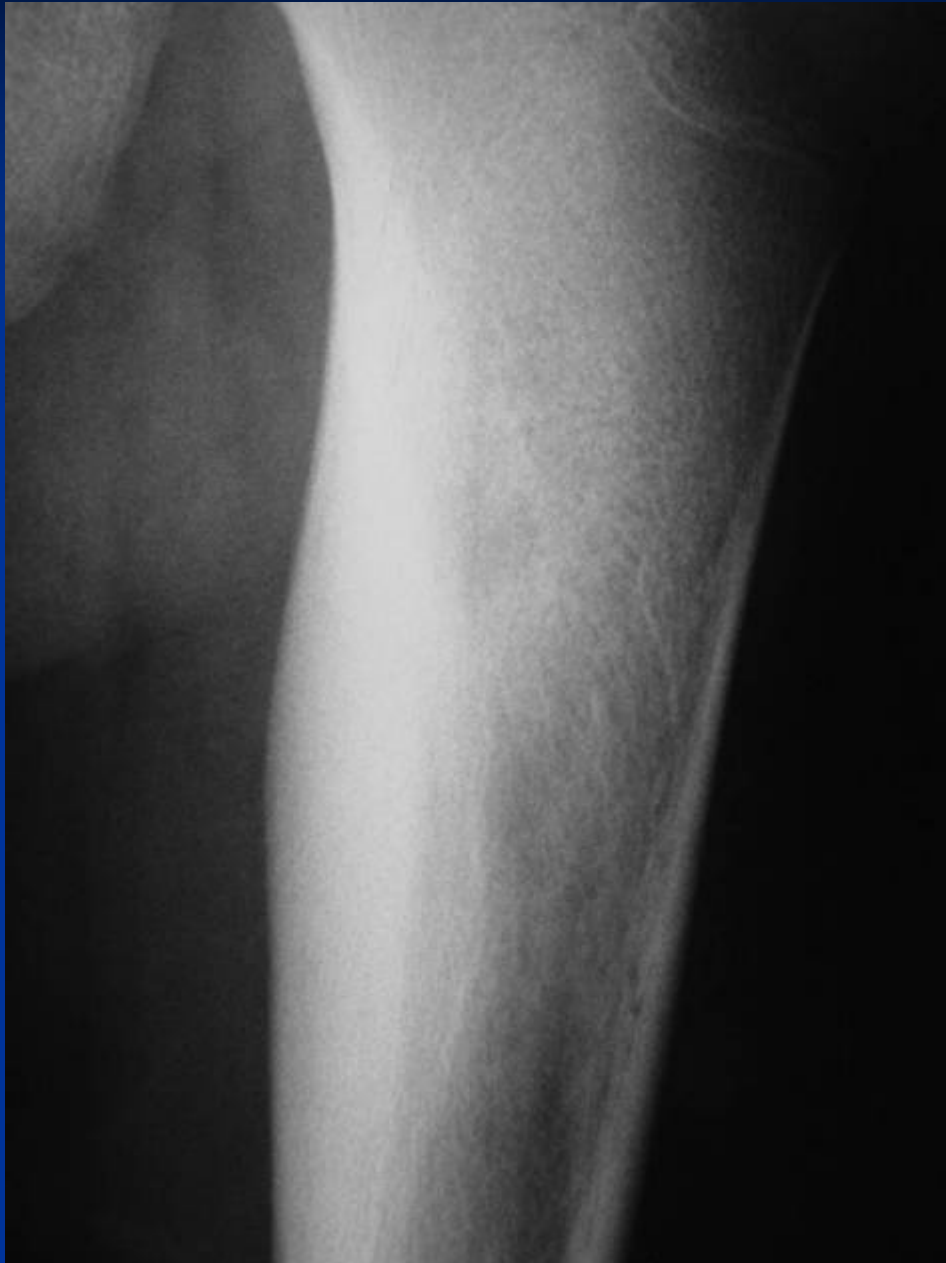
Osteoid Osteoma



Osteoid Osteoma



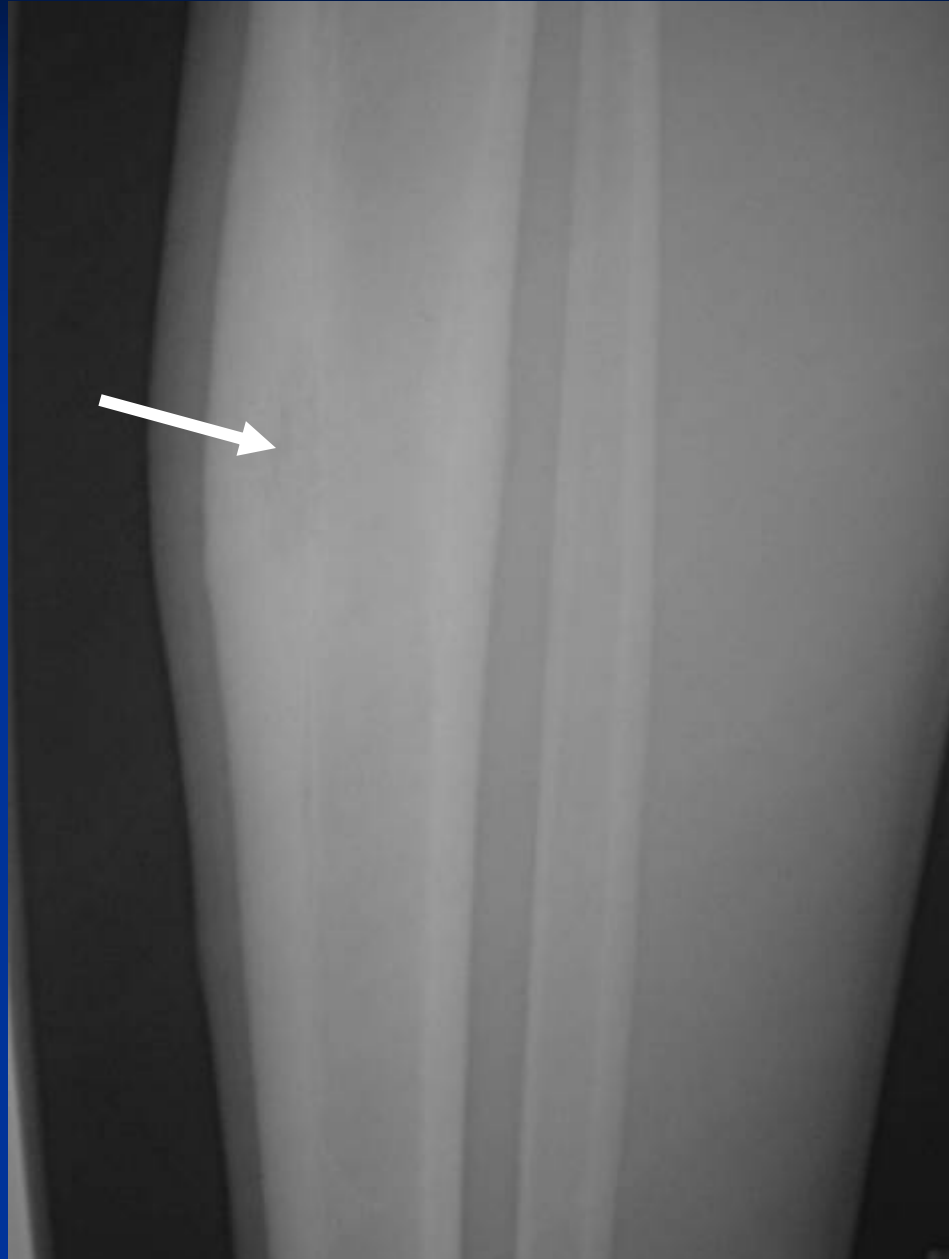
Osteoid Osteoma



Osteoid Osteoma



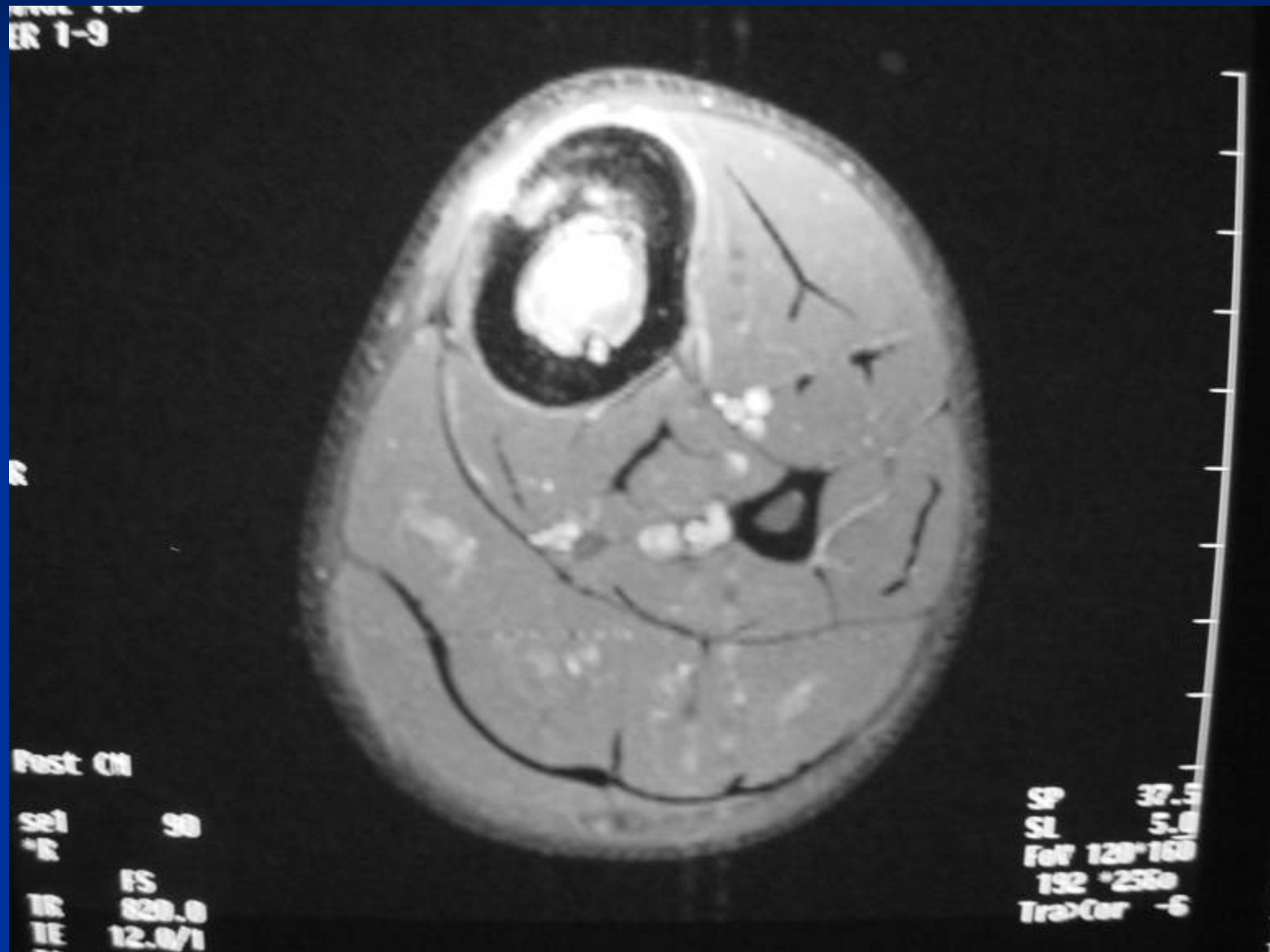
Brodie's Abscess



Brodie's Abscess



Brodie's Abscess



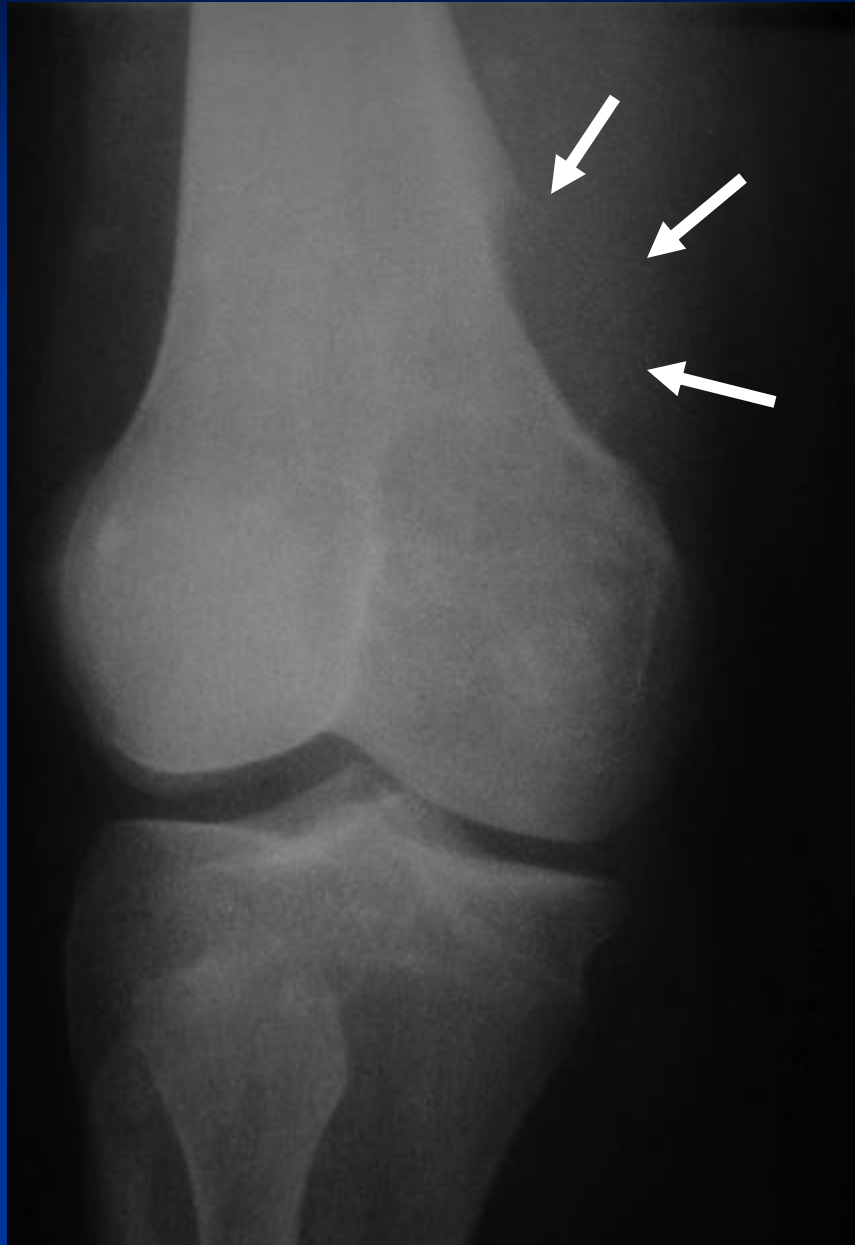
Juxtacortical Lesions

- Juxtacortical Chondroma
- Periosteal Osteosarcoma/Chondrosarcoma
- Parosteal Osteosarcoma

Periosteal Chondroma



Periosteal Chondrosarcoma



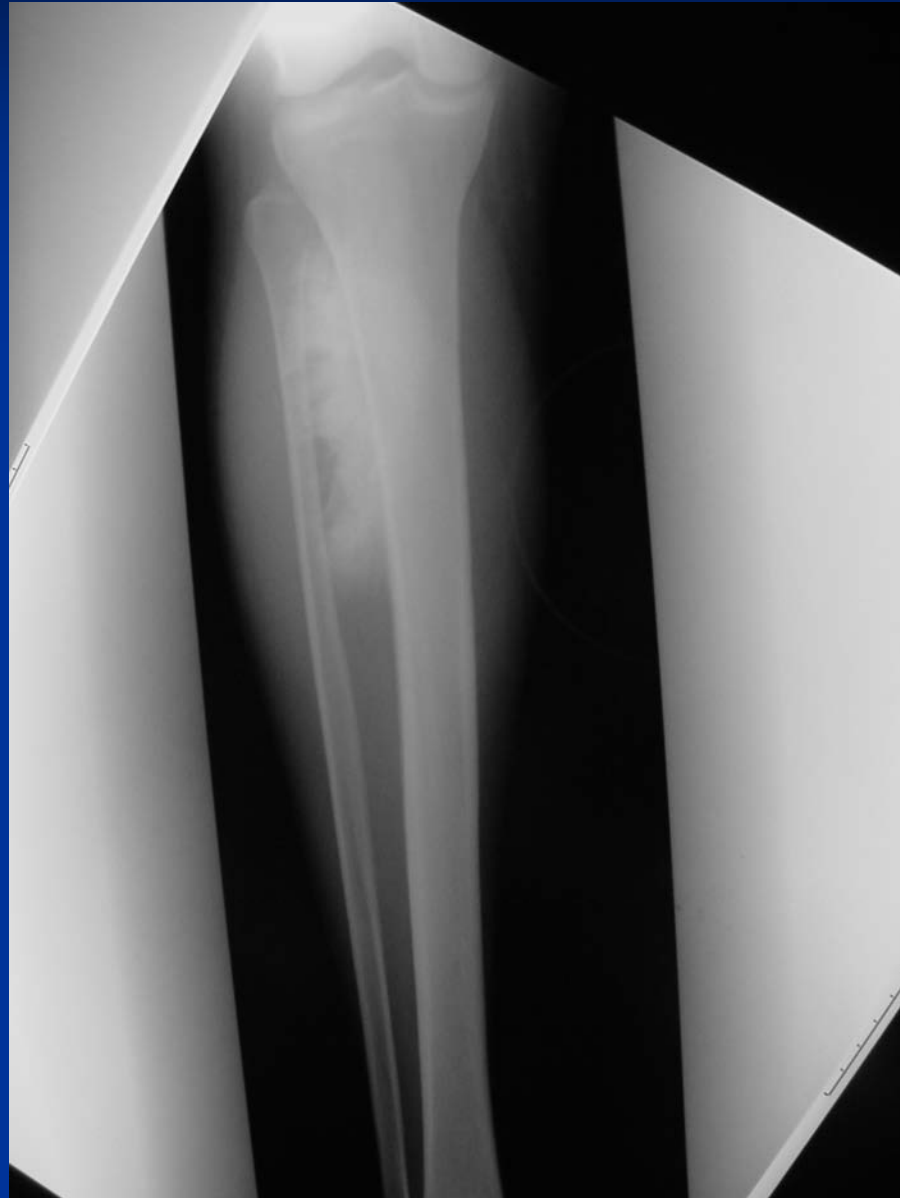
Periosteal Osteosarcoma



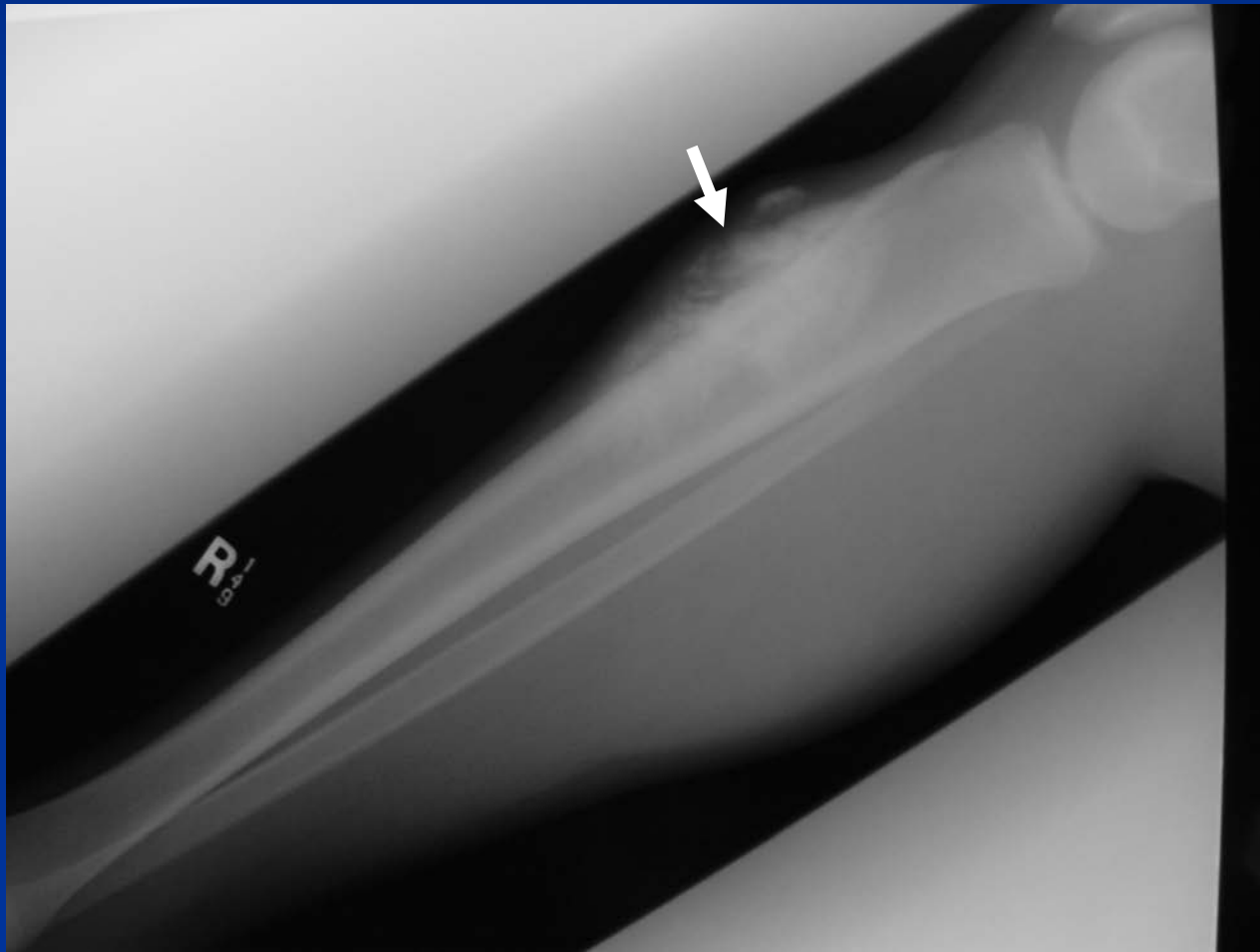
Periosteal Osteosarcoma



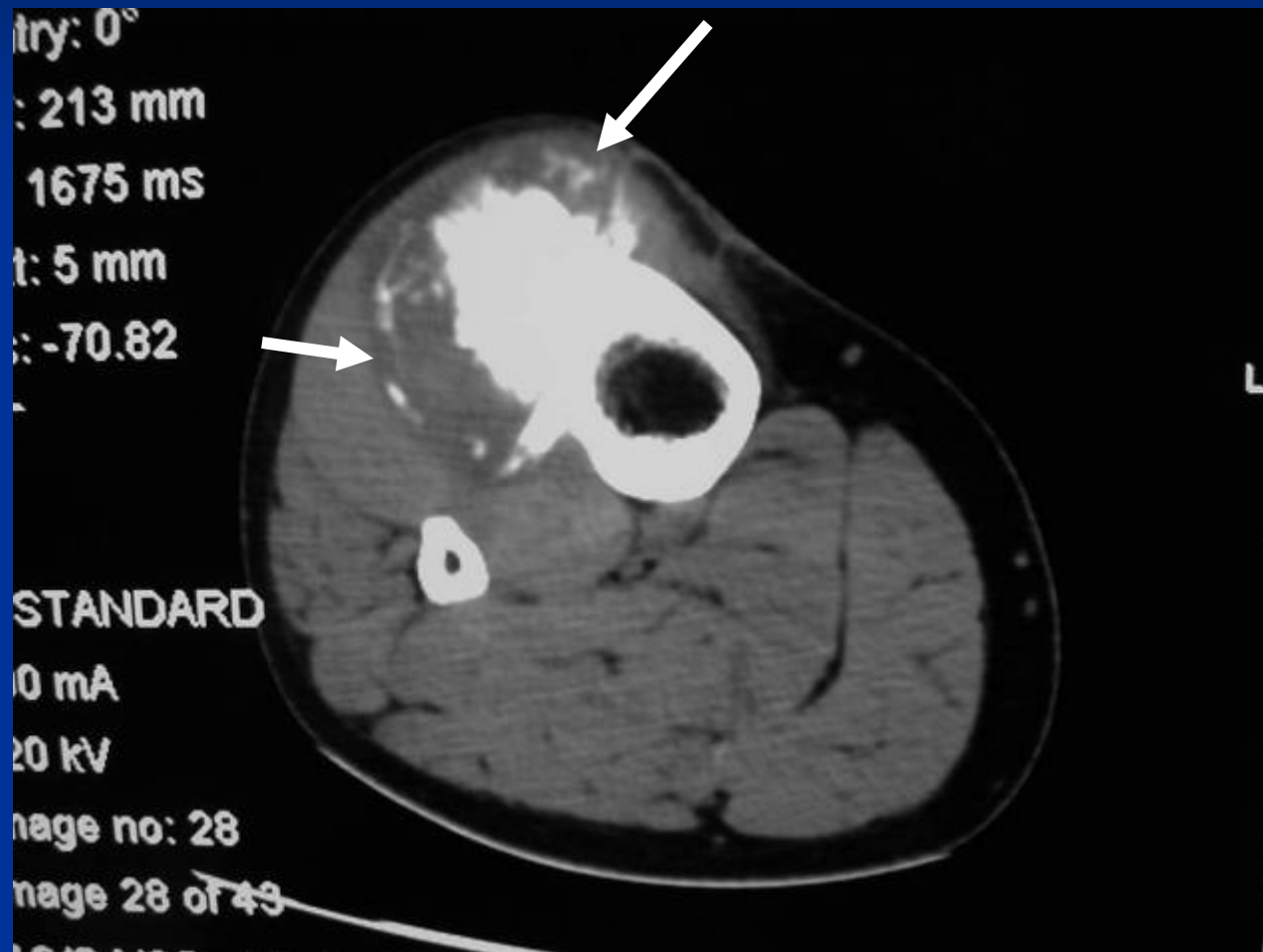
Periosteal/High Grade Surface Osteosarcoma



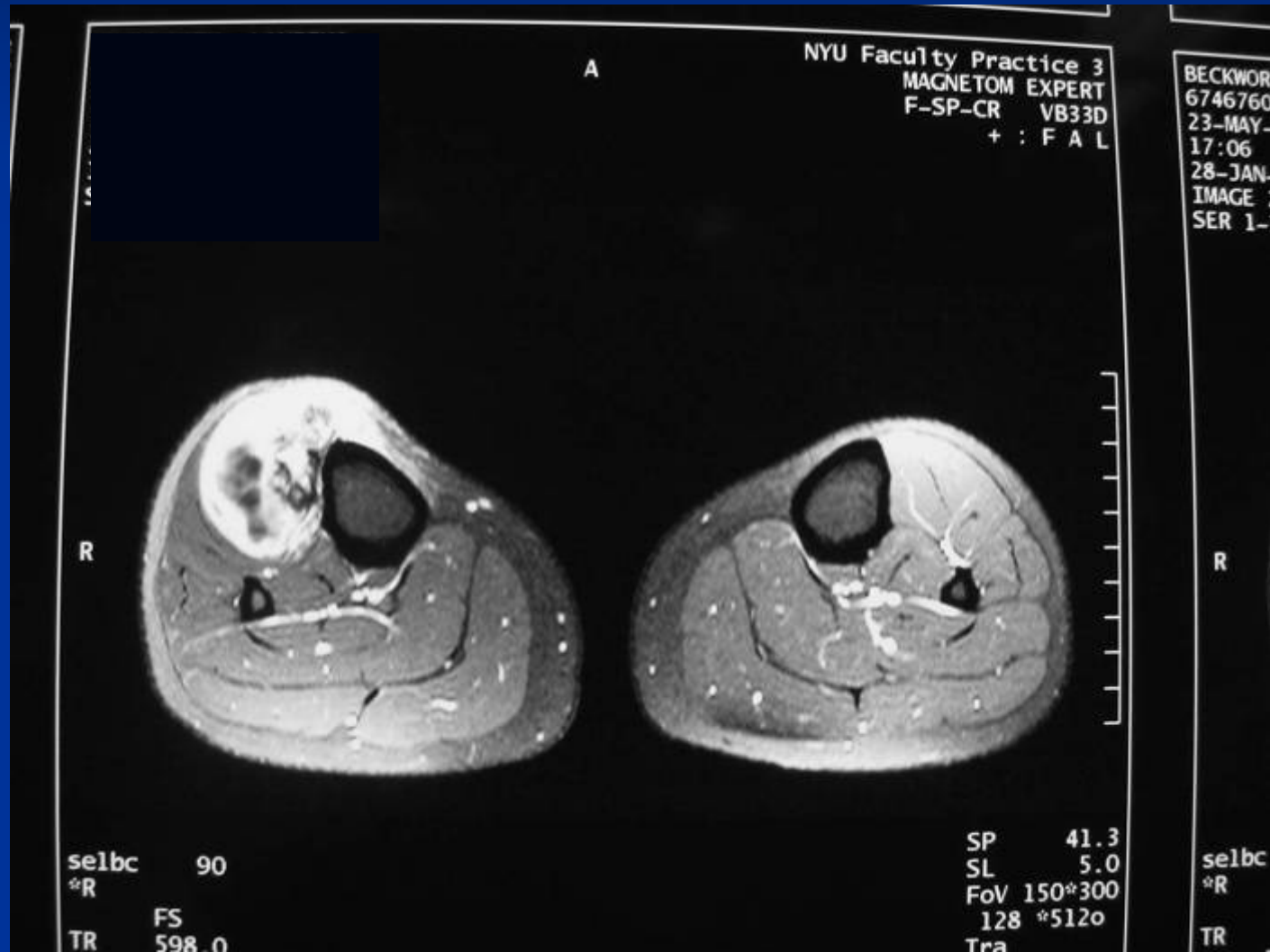
Periosteal/HGS Osteosarc



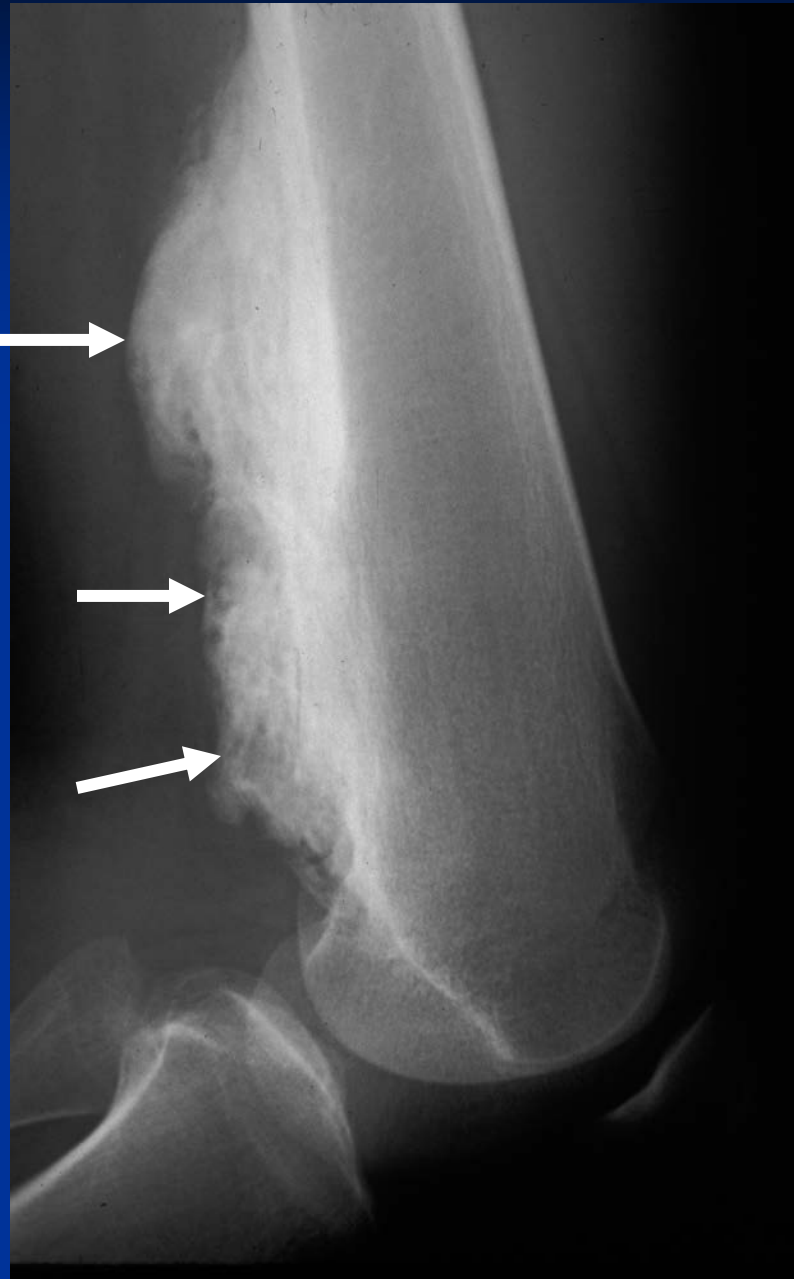
Periosteal/HGS Osteosarc



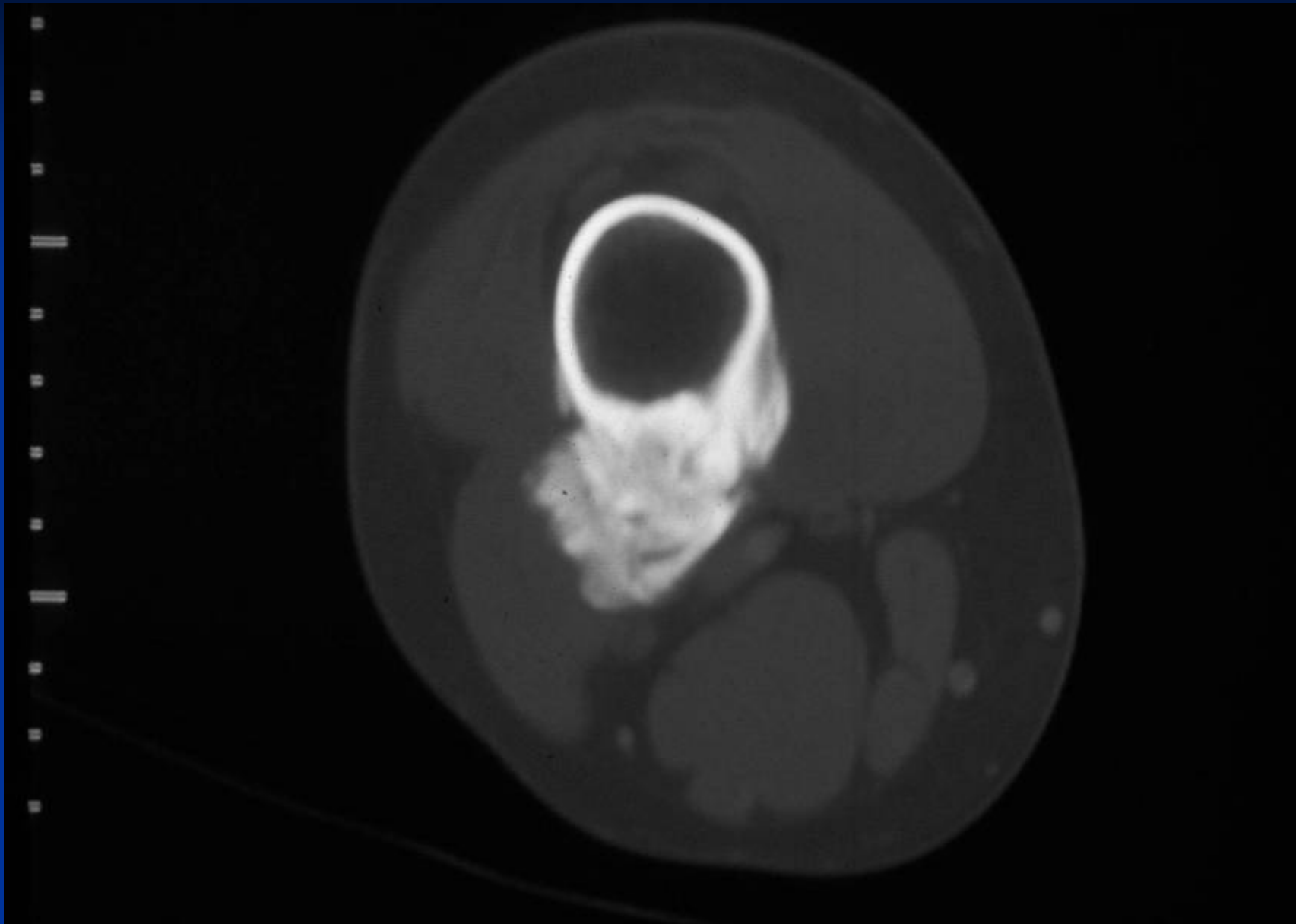
Periosteal/HGS Osteosarcoma



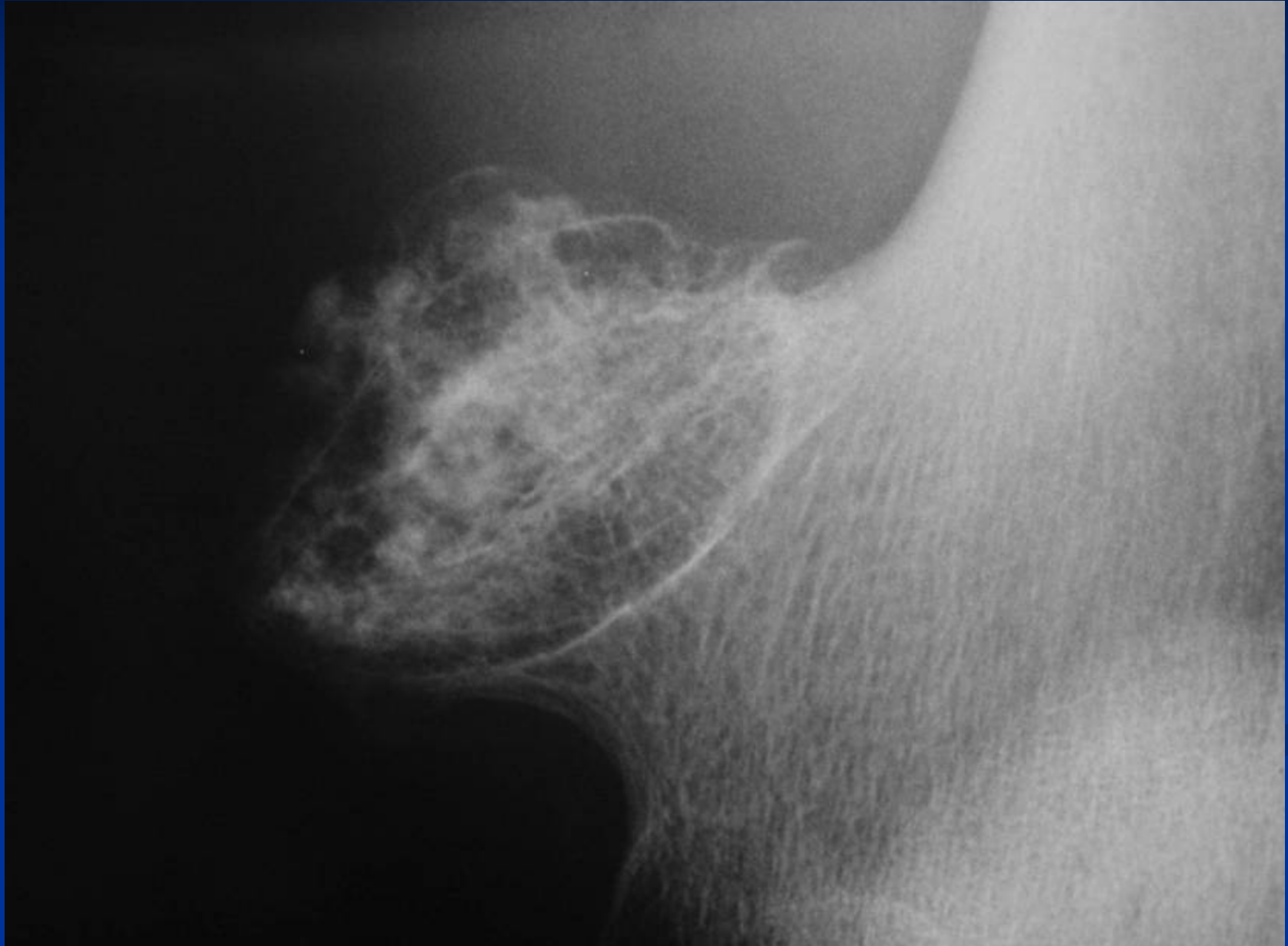
Parosteal Osteosarcoma



Parosteal Osteosarcoma



Osteochondroma



Osteochondroma

Cortico-Medullary Continuity



Surface Osteoma

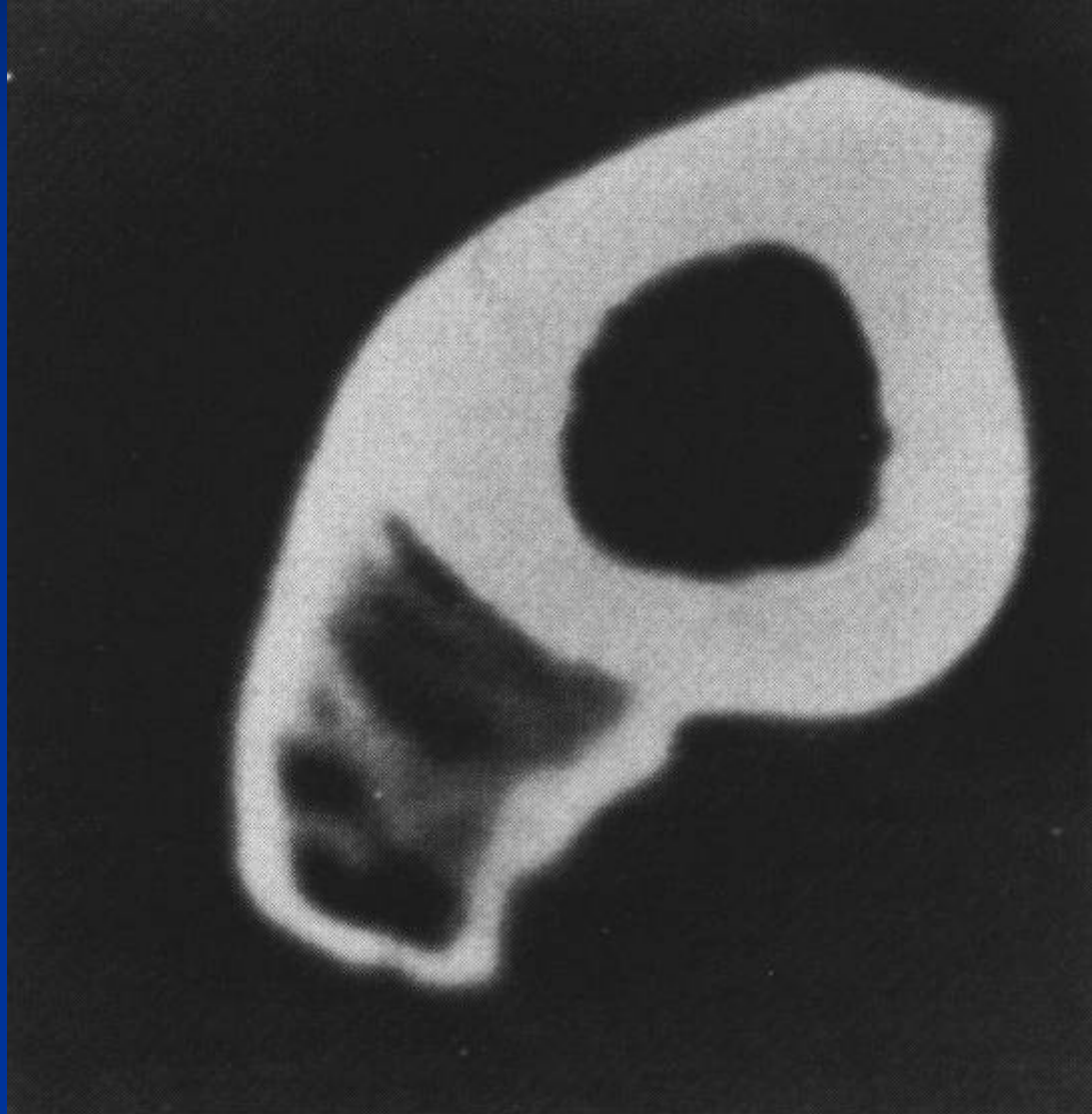


Myositis Ossificans



Myositis Ossificans

Zonal Phenomenon—Central Lucency



Melorrheostosis

“Candle Wax Drippings”



Position of Lesion in Longitudinal Plane

- Epiphysis
- Metaphysis
- Diaphysis

Epiphyseal Lesions

■ Adults:

- Clear Cell Chondrosarcoma
- Metastasis, Myeloma, Lymphoma
- Lipoma
- Intraosseous Ganglion

Epiphyseal Lesions

■ Children:

- Chondroblastoma
- Osteomyelitis
- Osteoid Osteoma
- Enchondroma
- Eosinophilic Granuloma

Metaphyseal Lesions

- GCT (extends to epiphysis)
- Nonossifying Fibroma
- Chondromyxoid Fibroma
- Simple Bone Cyst (Unicameral Bone Cyst)
- Osteochondroma
- Brodie's Abscess
- Osteosarcoma
- Chondrosarcoma
- MFH/Fibrosarcoma

Diaphyseal Lesions

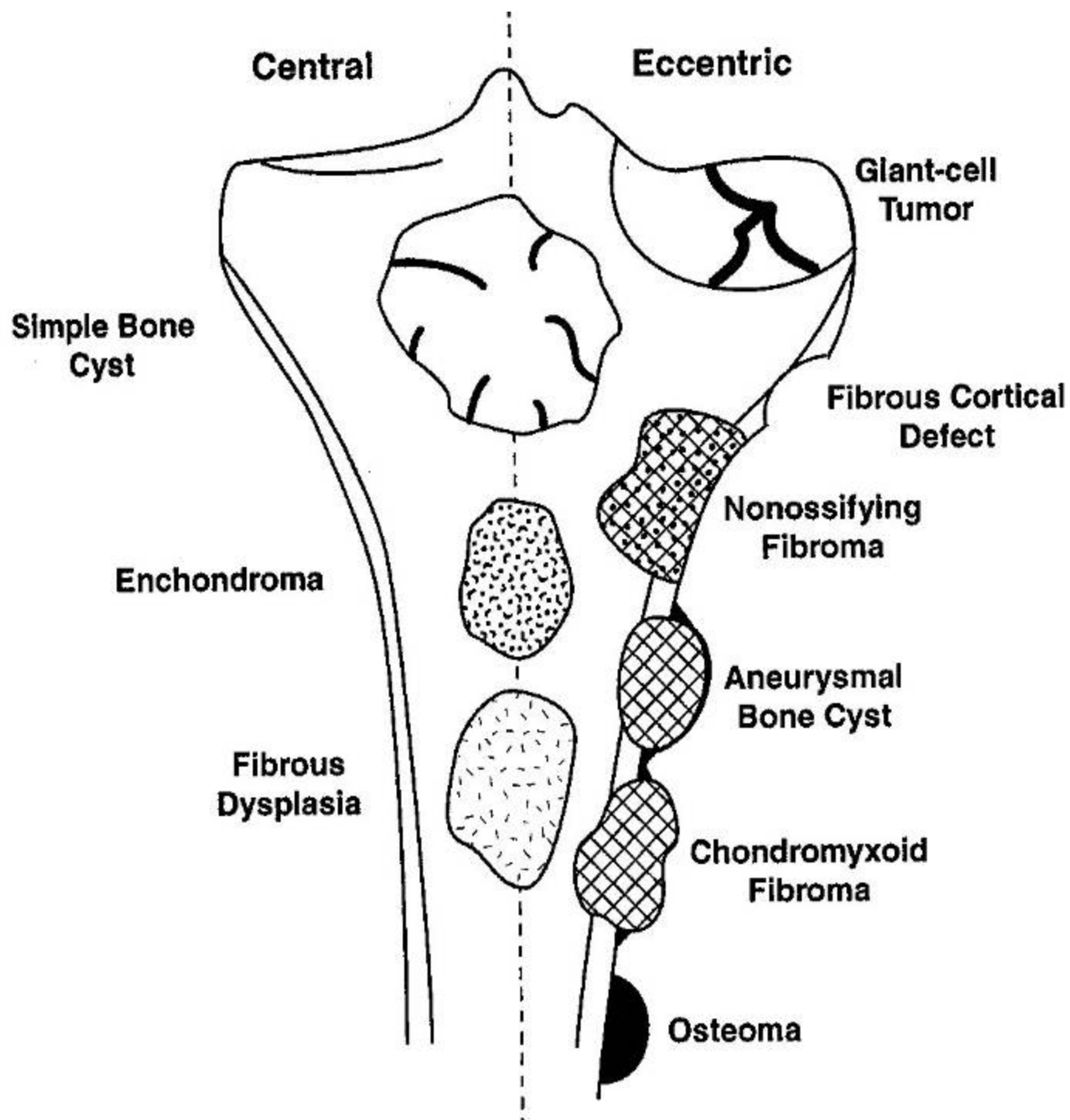
- Ewing's Sarcoma
- Nonossifying fibroma
- Simple Bone Cysts
- Aneurysmal Bone Cysts
- Enchondromas
- Osteoblastomas
- Fibrous Dysplasia
- Adamantinoma
- Osteofibrous Dysplasia

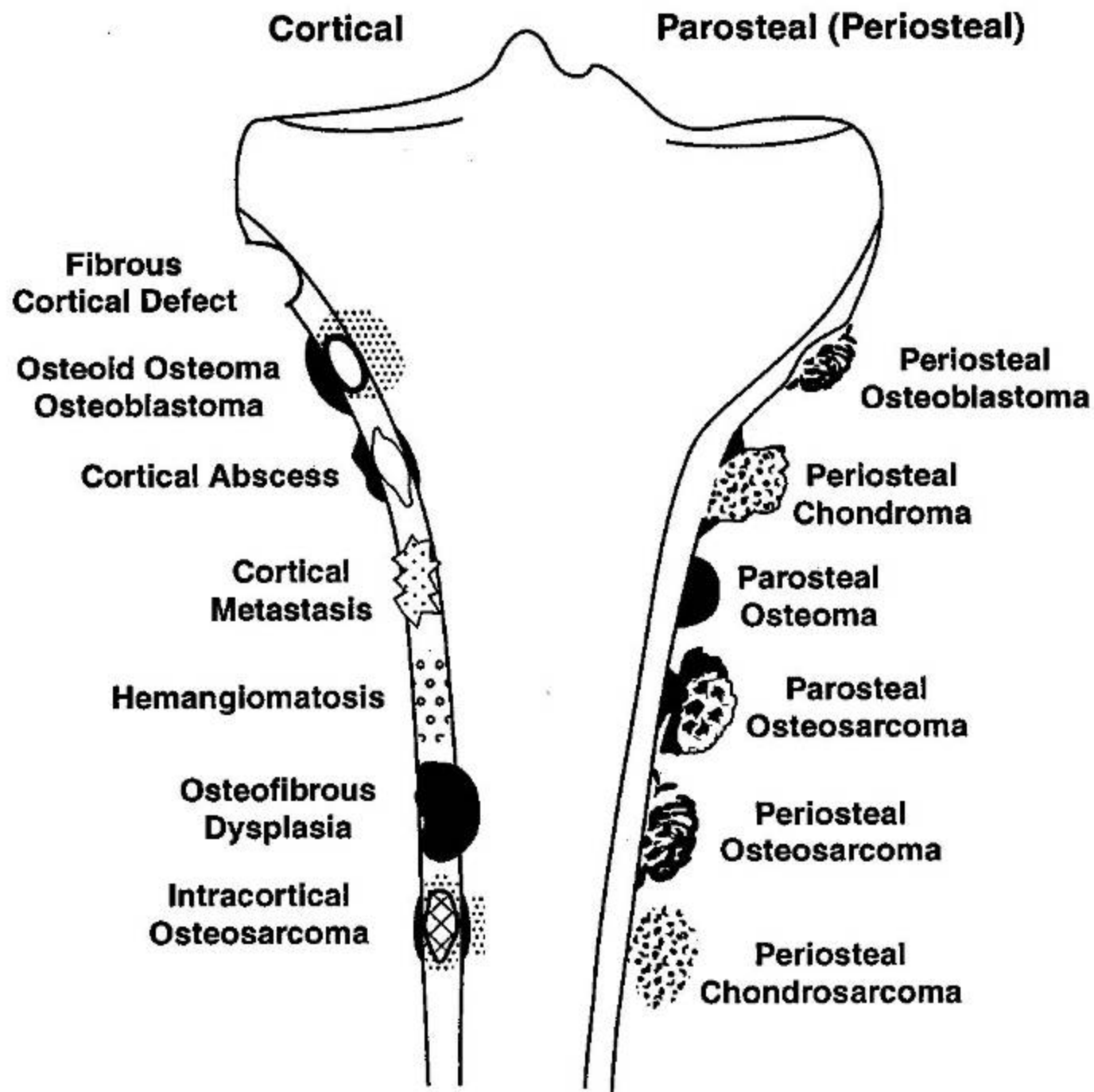
Epiphyseal Equivalent Areas

- Subchondral Regions of Acetabulum and Scapula
- Tarsal Bones
- Calcaneus, Talus

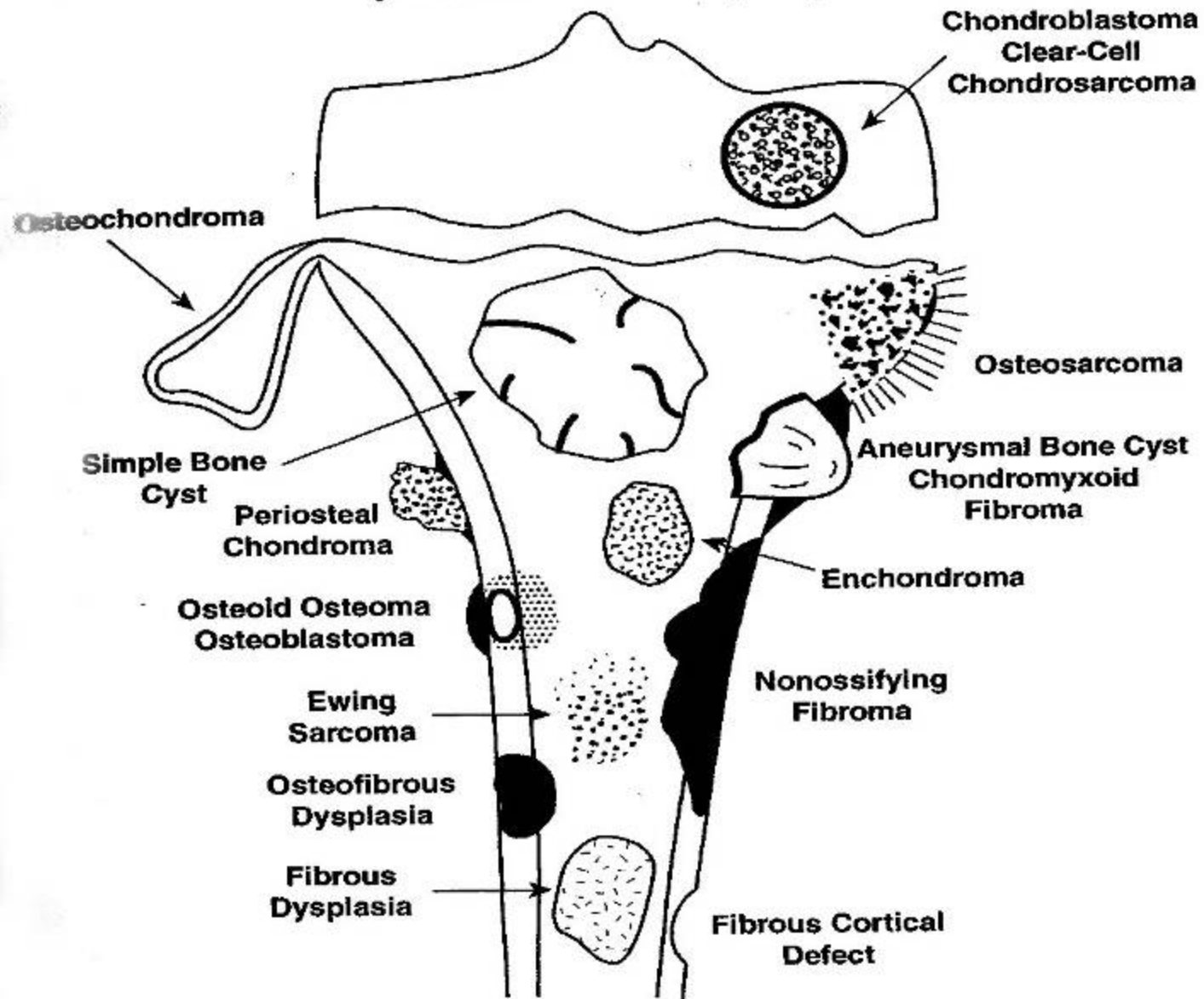
Growth Plate

- Tumors Usually Do Not Cross Growth Plate
- Think Infection

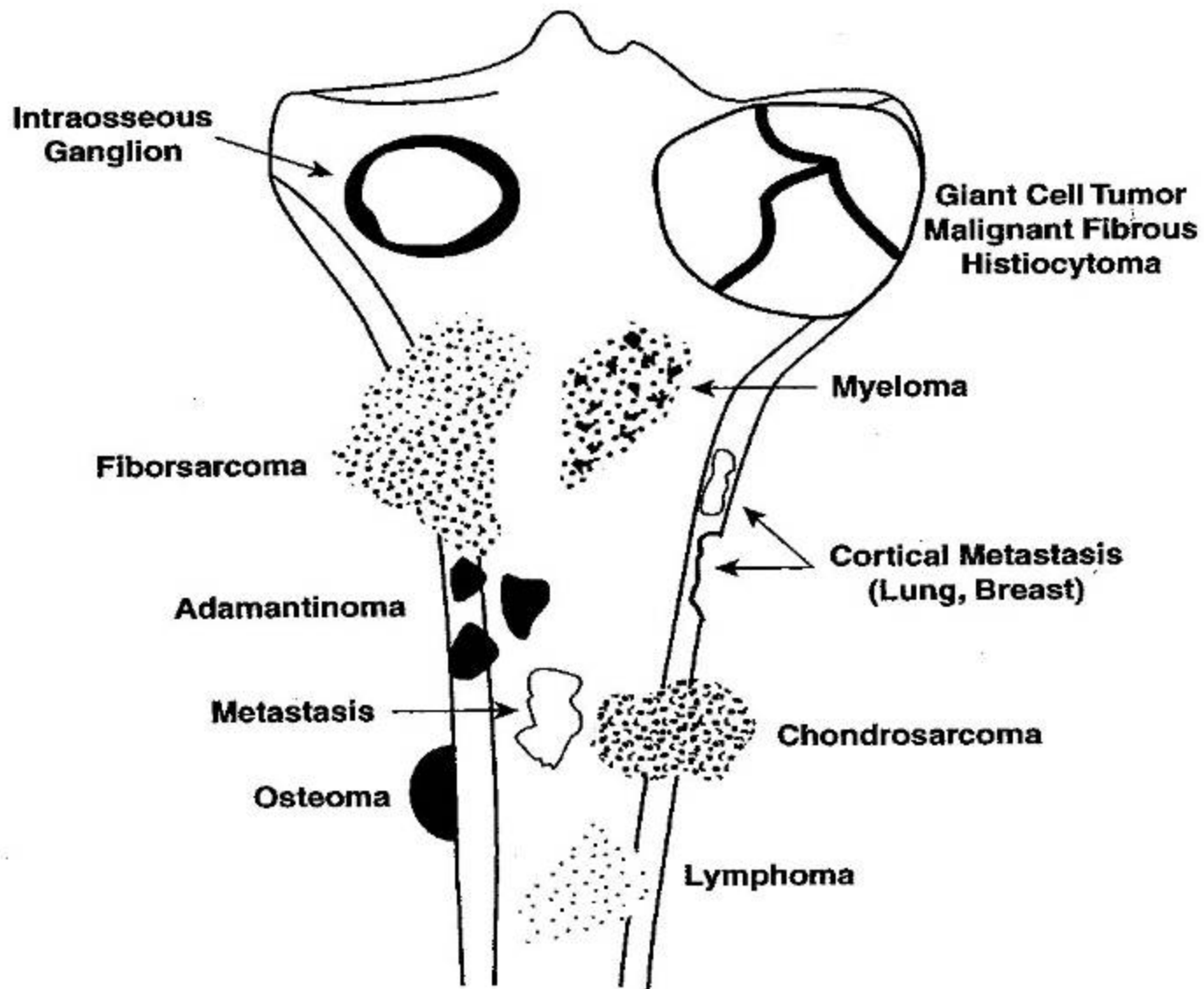




Immature Skeleton (Growth Plate Open)



Mature Skeleton (Growth Plate Closed)



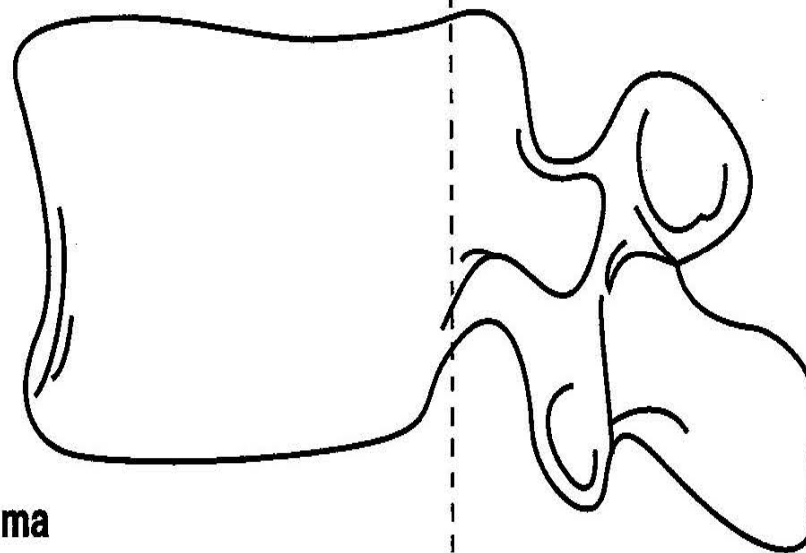
Lymphoma
Hodgkin
Myeloma
Ewing
Osteosarcoma
Chondrosarcoma
Metastasis

Exceptions:

Hemangioma
Langerhans-cell Granuloma
Fibrous Dysplasia

MALIGNANT

BENIGN



Osteblastoma
Osteoid Osteoma
Aneurysmal Bone Cyst
Osteochondroma
Chondromyxoid Fibroma

Anterior

Posterior

Specific Bones

- Hematopoietic Marrow—predilection for sites with red marrow; rich sinusoidal vasculature
- Axial and Appendicular Skeleton in Children
- **Axial Skeleton in Adults**
 - Metastatic Disease
 - Myeloma
 - Ewing's Sarcoma
 - Histiocytic Lymphoma

Specific Bones

- **Areas of Rapid Growth**
- Primary Bone Tumors
 - Distal Femur
 - Proximal Tibia
 - Proximal Humerus

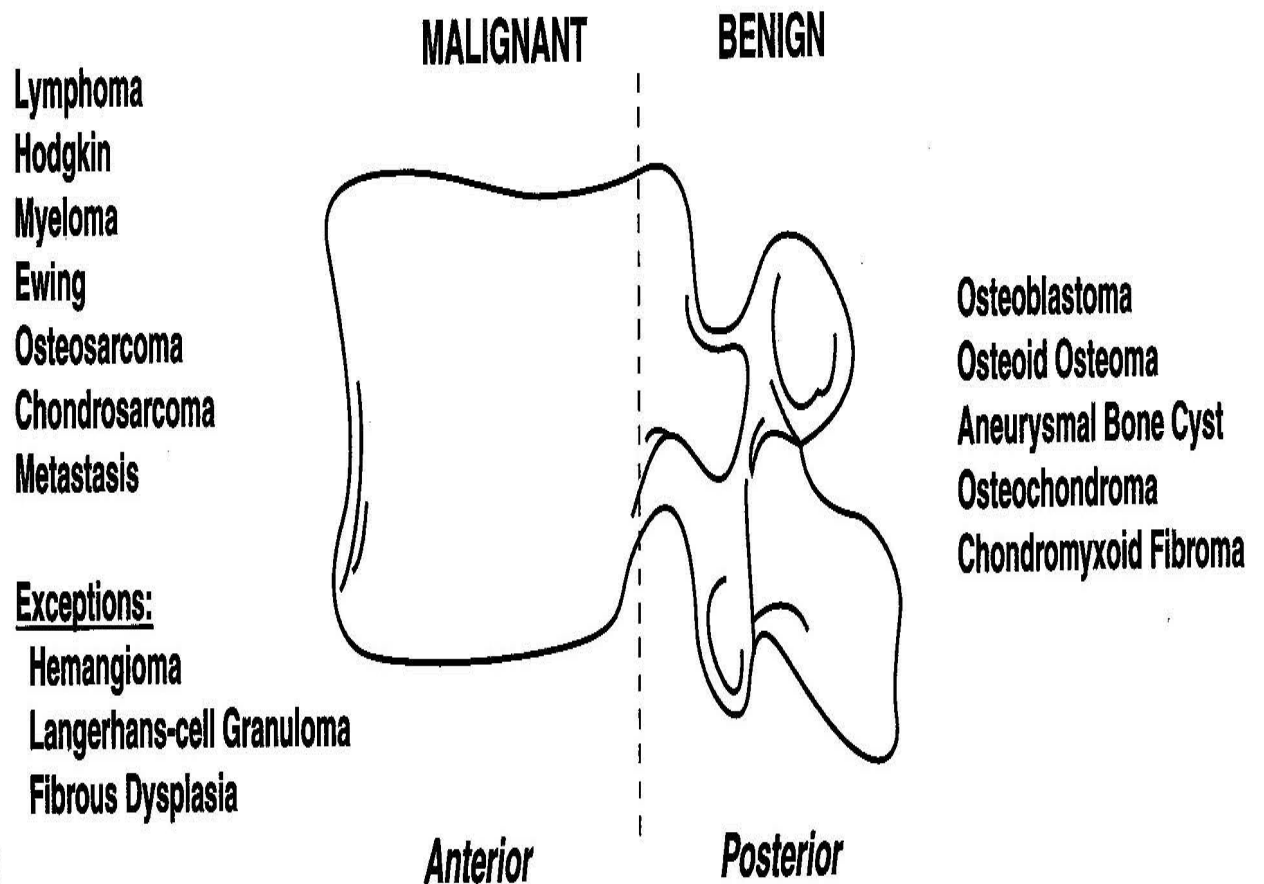
Specific Bones

■ Vertebrae (Adults)

- Skeletal Mets
- Myeloma
- Hemangioma
- Lymphoma
- Osteomyelitis

■ Vertebrae (Children)

- Eosinophilic Granuloma
- ABC
- Osteblastoma
- Osteoid Osteoma
- Lymphoma
- Leukemia
- Osteomyelitis



Specific Bones

■ Sacrum

- Chordoma
- Myeloma/Plasmacytoma
- Giant Cell Tumor
- Mets
- Simple Cysts
- Neurogenic Tumors /Schwannoma

Specific Bones

■ Ribs

- Mets
- Fibrous Dysplasia
- Enchondroma

Specific Bones

■ Metacarpals and Phalanges

- Giant Cell Tumor
- Giant Cell Reparative Granuloma
- Sarcoidosis
- ABC
- Fibrous Dysplasia
- Enchondroma

Specific Bones

■ Terminal Phalanges

- Inclusion Cyst
- Glomus Tumor
- Mets (Lung)

Figure 15.28 Examples of Tumors and Tumor-Like Lesions With a Predilection for Specific Bones, Sites in Bones, and Location*

LESION	BONE	ANATOMIC SITE	LOCATION
Simple bone cyst	Humerus Femur	Metaphysis Proximal diaphysis (see Figs. 17.26, 17.27)	Central
Osteoid osteoma	Femur Tibia	Neck of femur (see Figs. 16.4, 16.16)	
Chondroblastoma		Epiphysis (see Figs. 15.6, 16.52, 16.53)	Eccentric
Parosteal osteosarcoma	Femur	Posterior aspect, distal end (see Figs. 15.18, 18.14)	
Chordoma	Clivus C-2 Sacrum		Central
Osteofibrous dysplasia	Tibia	Anterior aspect (see Fig. 17.20)	
Adamantinoma			
Giant cell tumor	Femur Tibia Radius	Articular end (see Figs. 17.36, 17.39, 17.41, 17.42, 17.43)	Eccentric
Aneurysmal bone cyst	Tibia Humerus	Metaphysis (see Fig. 17.32)	Eccentric
Chondromyxoid fibroma	Tibia	Metaphysis (see Figs. 16.55, 16.56)	Eccentric
Multiple myeloma	Pelvis Spine Skull	Vertebral body Calvaria (see Figs. 18.43, 18.45)	

Fig. 15.28 Examples of Tumors and Tumor-Like Lesions With a Predilection for Specific Bones, Sites in Bones, and Location 16.2 16.22 16.22 16.22 16.22 16.42 16.51 16.54 17.1 17.12 17.24 17.24

Unknown Examples

Unknown #1



Unknow #1

- Epiphyseal Lesion with Geographic Pattern of Bone Destruction (Probably Benign)
- Eccentric
- Internal Mineralization/Calcifications (indicates most likely cartilaginous nature)
- Sclerotic IA/IB Margin

Chondroblastoma



Unknown #2



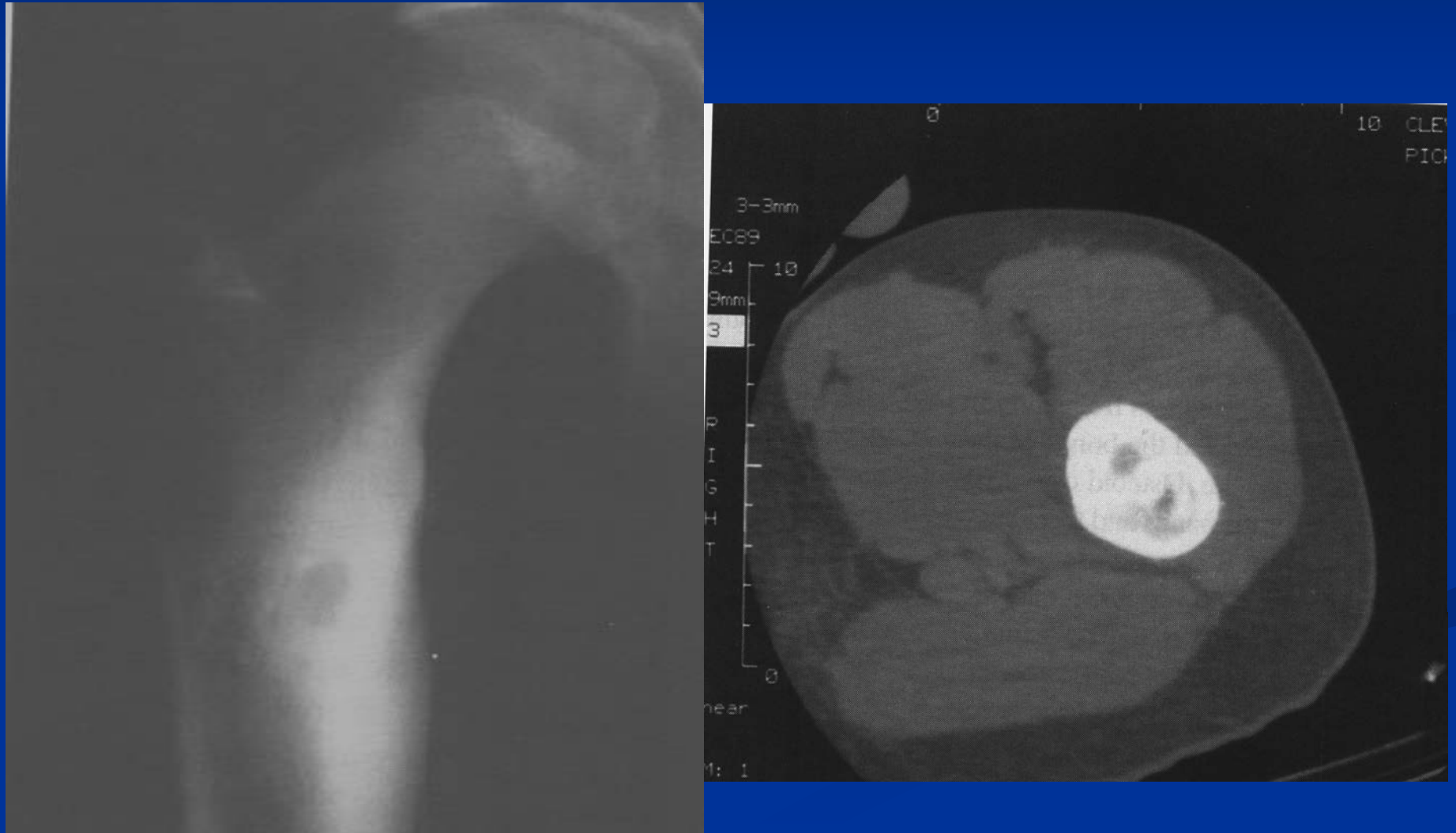
Unknown #2

- Spine Lesion
- Posterior Elements
- Geographic Pattern of Bone Destruction
(Probably benign)
- Internal Mineralization indicative of bone producing or cartilage producing tumor

Osteoblastoma



Unknown #3



Unknown #3

- Small Cortical Lesion
- Geographic pattern of Bone Destruction
- Extensive Surrounding Sclerosis
- Buttressing Periosteal Reaction (Benign Periosteal Reaction)
- Internal Mineralization

Osteoid Osteoma



Unknown #4



Unknown #4

- Central, Diaphyseal Lesion
- No Periosteal Reaction
- No Cortical destruction
- Calcifications in a Ring and Arc Like Manner

Enchondroma



Unknown #5



Unknown #5

- Metaphyseal Eccentric Lesion
- Permeative Lesion (Malignant)
- Cortical Destruction
- Calcifications in a Ring and Arc Manner
indicative of a cartilage tumor

Dedifferentiated Chondrosarcoma



Unknown #6



Unknown #6

- Permeative Pattern of Bone Destruction
- Diaphyseal
- Cortical penetration
- Hair on End Periosteal Reaction
- No Internal Mineralization (probably not bone or cartilage producing)
- Malignant Appearing

Ewing's Sarcoma



Unknown #7



Unknown #7

- Metaphyseal, Central lesion
- Permeative Pattern of Bone Destruction (malignant)
- No Internal Mineralization (probably not cartilage or bone producing—no visible matrix)
- No Periosteal Reaction
- Malignant Appearing

Fibrosarcoma of Bone



Unknown #8



Unknown #8

- Central Lesion
- Geographic Pattern of Bone Destruction (Benign Appearing)
- Metadiaphyseal
- Bone is Expanded (Benign Periosteal reaction)
- No Internal Mineralization (Probably not Cartilaginous or Bone Producing)
- Ground Glass Appearance

Fibrous Dysplasia



Unknown #9



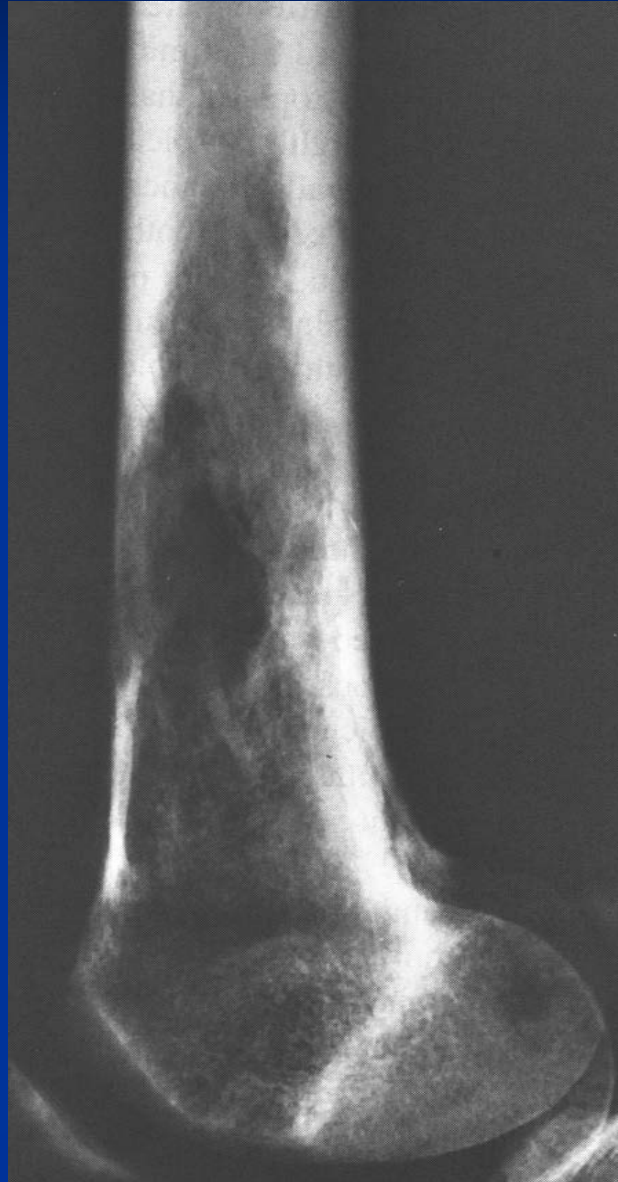
Unknown #9

- Eccentric Lesion
- Metaphyseal with Epiphyseal Extension
- No Internal Mineralization
- Cortex is Thinned and Slightly Expanded
- Thin, Incomplete Sclerotic Margin (Type IB)
- Benign Appearing

Giant Cell Tumor



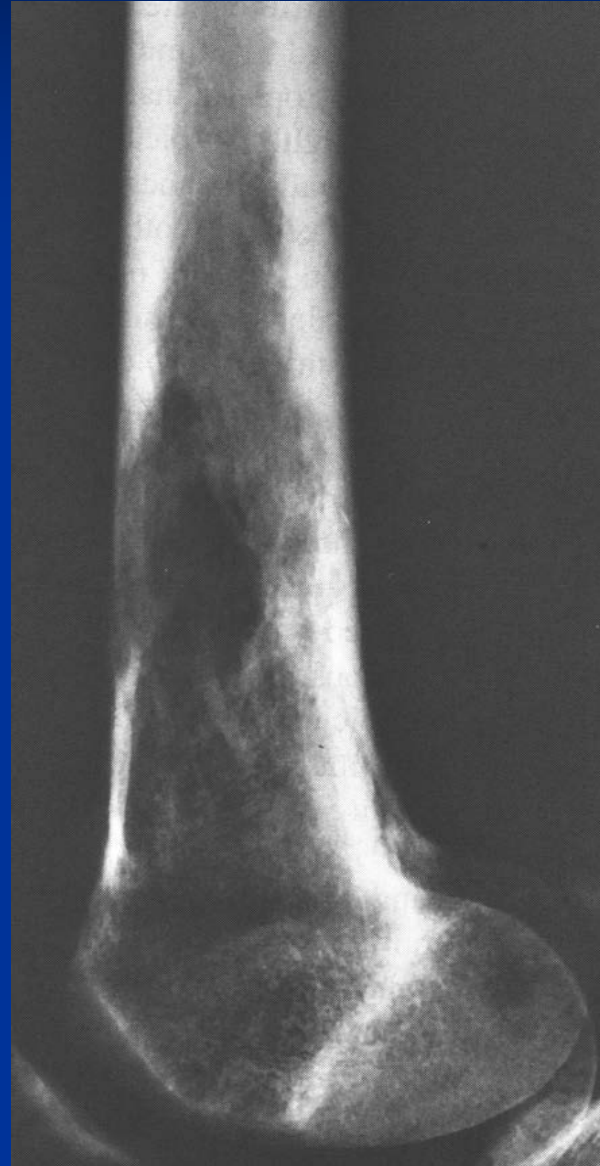
Unknown #10



Unknown #10

- Metadiaphyseal Lesion
- Motheaten and Permeative (Malignant Appearing)
- No Internal Mineralization
- Cortical Destruction
- No Periosteal Reaction

Malignant Fibrous Histiocytoma of Bone



Unknown #11



Unknown #11

- Central Location
- Metaphyseal
- Multiloculated
- Geographic
- Bone is Expanded
- Skeletally Immature
- No Mineralization
- Benign Appearing

Unicameral Bone Cyst



Unknown #12



Unknown #12

- Eccentric/Cortical Lesion
- Metaphyseal
- Geographic pattern of Bone Destruction
- Well Circumscribed (Type IA Margin: Indolent)
- No Internal Mineralization
- Bone has Expanded Contour
- Benign Appearing

Nonossifying Fibroma



Unknown #13



Unknown #13

- Geographic, Central Lesion in a Phalange
- Lobular Growth Contour with Endosteal Erosion
- Punctate calcifications (arrows)--Cartilaginous
- Appears Benign

Enchondroma



Unknown #14



Unknown #14

- Cortical based, Geographic Lesion in Tibia
- Extensive Sclerotic Margin
- Tibial bowing

Osteofibrous Dysplasia



Unknown #15



Unknown #15

- Permeative/Moth Eaten Lesion (Malignant)
- Eccentric, Metaphyseal
- Ossification Present within Neoplasm
- Codman's Triangle
- Skeletally Immature; Spares Growth Plate
- Cortical Destruction
- Appears Malignant and is Producing Osteoid

Osteosarcoma



Unknown #16



Osteofibrous Dysplasia

