

Bone Tumors



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Objectives

- Identify radiographic characteristics of bone tumors
- Recognize common Benign bone tumors
- Review aggressive benign bone tumors and their treatment
- Recognize signs/symptoms of malignant bone tumors
- Review the most common malignant bone tumors
- Review presentation and work up of a new metastatic

Common Presentations of a New Bone Tumor

- Deformity
- Mass
- Pain
- Fracture
- Incidental finding



Initial Evaluation – Plain Radiographs

Enneking's Four questions

- Where is the Tumor?
- What is it doing to the bone?
- What is the bone doing to it?
- What is inside it?

Where is the tumor?





NOF



Osteosarcoma

What is it doing to the bone?

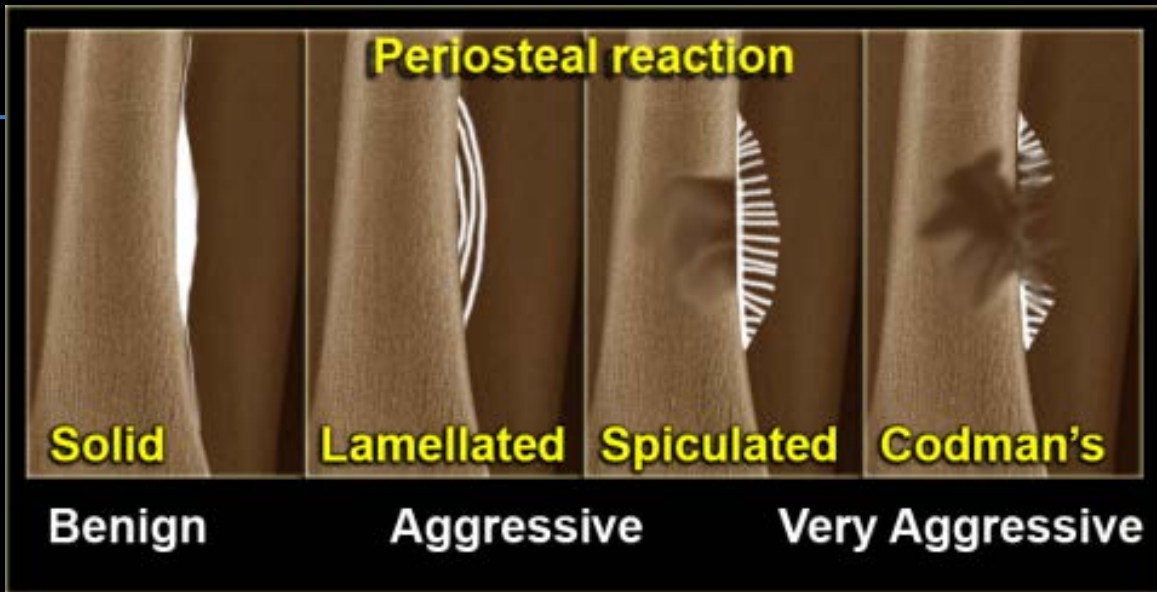
- Expansion
- Cortical erosion
- Fracture
- Transition Zone**

What is the bone doing to it ?

- Neo Cortex
- Periosteal Reaction

What is in it?

- Matrix
- Calcifications
- Soft tissue component



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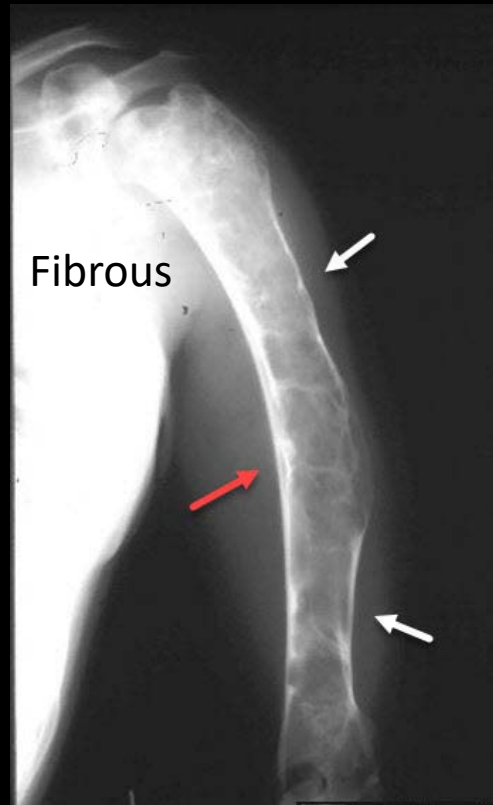
What is in it?

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Chondroid



Fibrous



RT

Lytic

What is it doing to the bone?

- Expansion
- Cortical erosion
- Fracture
- Transition Zone

What is the bone doing to it ?

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What is in it?

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Benign Latent Bone Tumors

Osteochondroma

Most common benign bone tumor

Most are asymptomatic

Males 2:1, dx age 6-20

Long bones



Treatment/things to watch for:

Asymptomatic lesions –
no treatment needed

Painful lesions – surgical
excision

<1% malignant
transformation

Benign Latent Bone Tumors

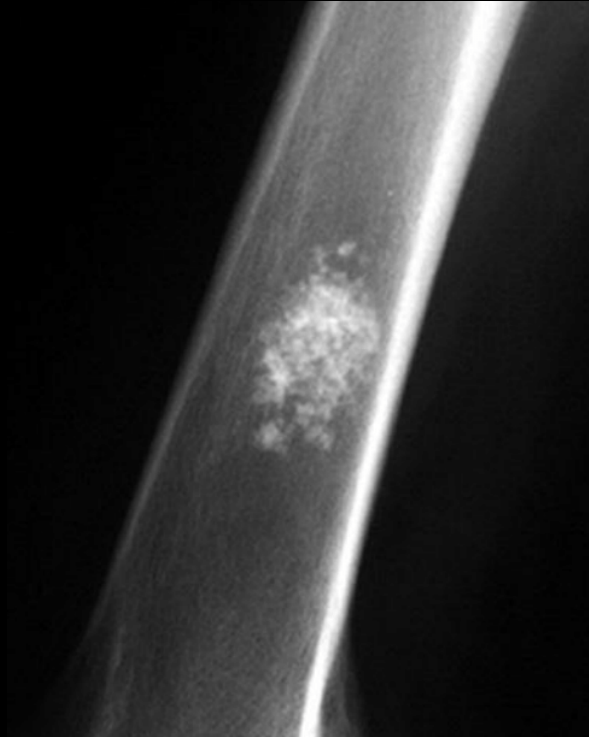
Enchondroma

2nd mc benign cartilage lesion

Most often asymptomatic

Age 20-50

Hands/feet > humerus, tibia, femur



Popcorn Appearance

Treatment/things to watch for:

A growing lesion or painful lesion should raise suspicion of malignant transformation into chondrosarcoma.

Watch for cortical destruction or large size.

Benign Latent Bone Tumors

Enchondroma

Enchondromatosis (Ollier's disease)

Nonhereditary developmental anomaly

Unilateral lesions

25-30% chance of malignant transformation



Maffucci's Syndrome

Congenital, nonhereditary condition

Multiple chondromas associated with hemangiomas

Up to 40% risk of transformation



Benign Latent Bone Tumors

Fibrous Dysplasia

Most are asymptomatic

Lower extremity > upper

Ground glass appearance



Treatment/things to watch for:

Asymptomatic lesions –
no treatment needed

Indications for surgery:

- Deformity, pain,
fracture

C&C with Allograft

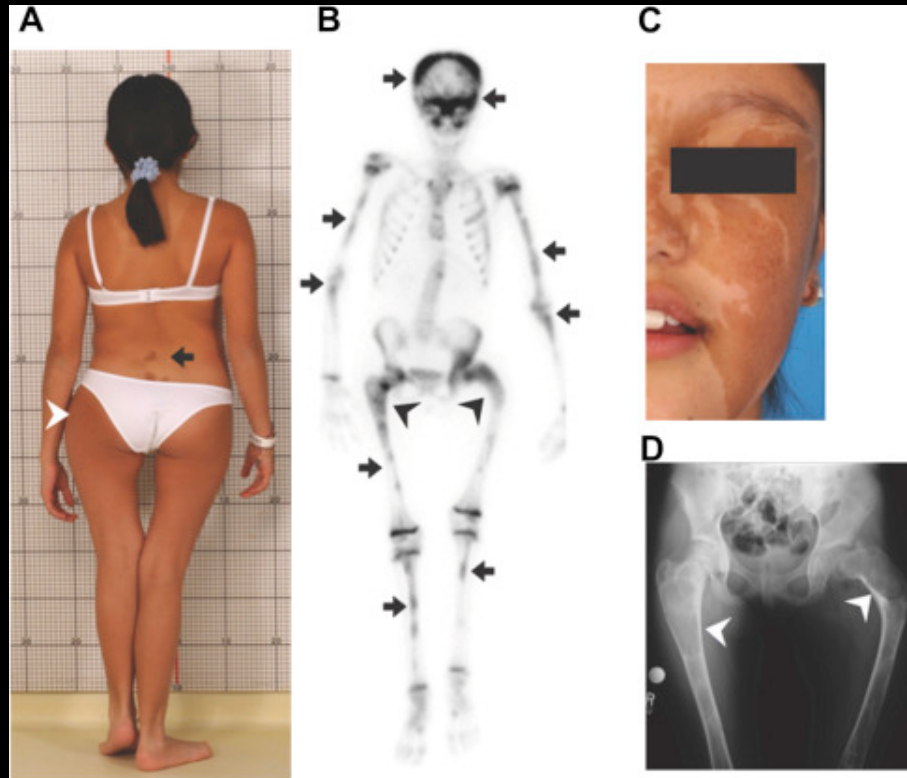
Benign Latent Bone Tumors

Polyostotic Fibrous Dysplasia

20-30% of FD are polyostotic

Deformities

Leg length discrepancy



McCune Albright Syndrome:

GNAS Gene mutation

Precocious puberty

Endocrine abnormalities

Café-au-lait spots

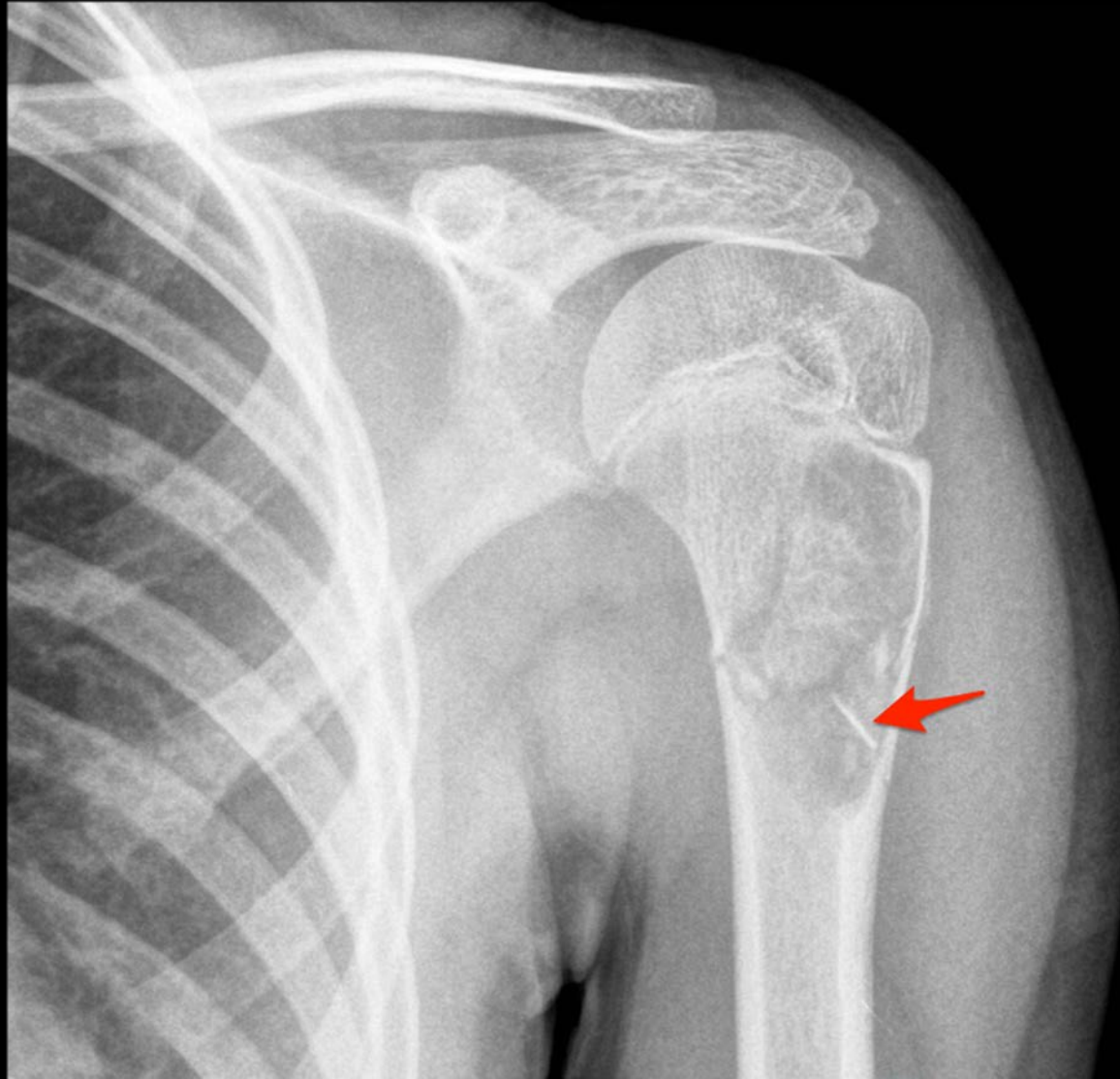
Benign Latent Bone Tumors

Unicameral Bone Cyst (UBC)

Painless unless fractured

Some will resolve spontaneously or with fracture

“Fallen Leaf sign”



Treatment/things to watch for:

Small / asymptomatic lesions – observation

Larger/ symptomatic lesions”

- Curettage +/- bone grafting or ORIF
- Possible intralesional treatments – (steroid, demineralized bone matrix)

Benign Active Tumors

Osteoid Osteoma

Presentation:

Well localized constant pain,
worse at night

Pain is relieved by NSAIDs

Adolescents/ young adults. M>F

Treatment :

CT guided radio frequency
or ablation

Surgery in refractory cases



Benign Active Tumors

Aneurysmal Bone Cyst

Can be seen on their own or associated with other tumors

Presentation:

< 20 yo with pain and swelling x weeks
Pregnancy

Treatment :

Intralesional curettage + bone grafting

“Curopsy” = biopsy with attempt to cure

20% Recurrence rate



Benign Aggressive Tumors

Giant Cell Tumor

Presentation:

20% of benign bone tumors

20-40 year old, F>M

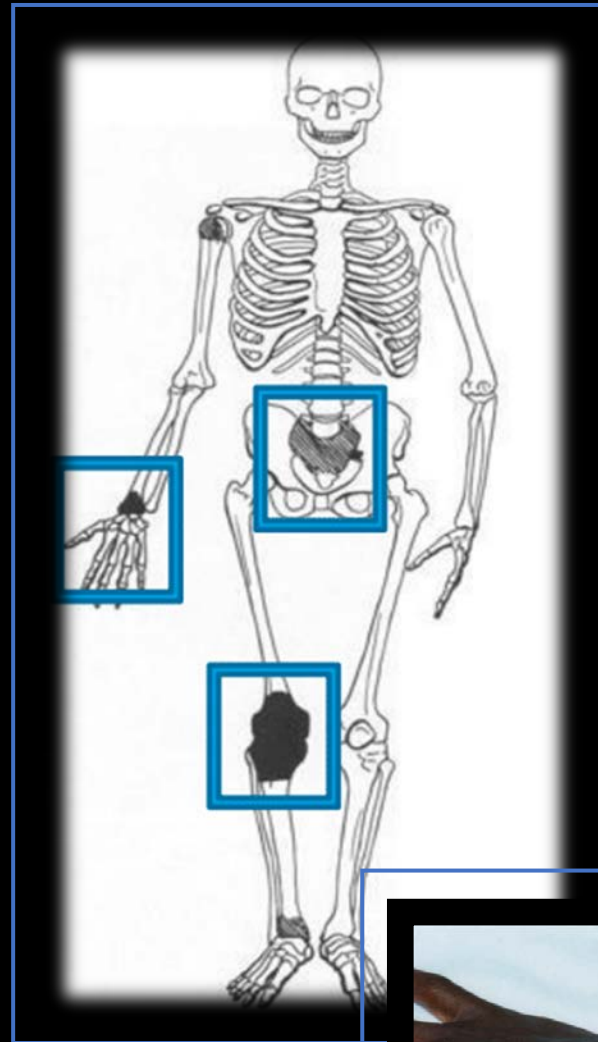
Insidious pain & swelling

or acute pathological fractures

Location:

50% around the knee

Distal radius, sacral ala



Benign Aggressive Tumors

Giant Cell Tumor

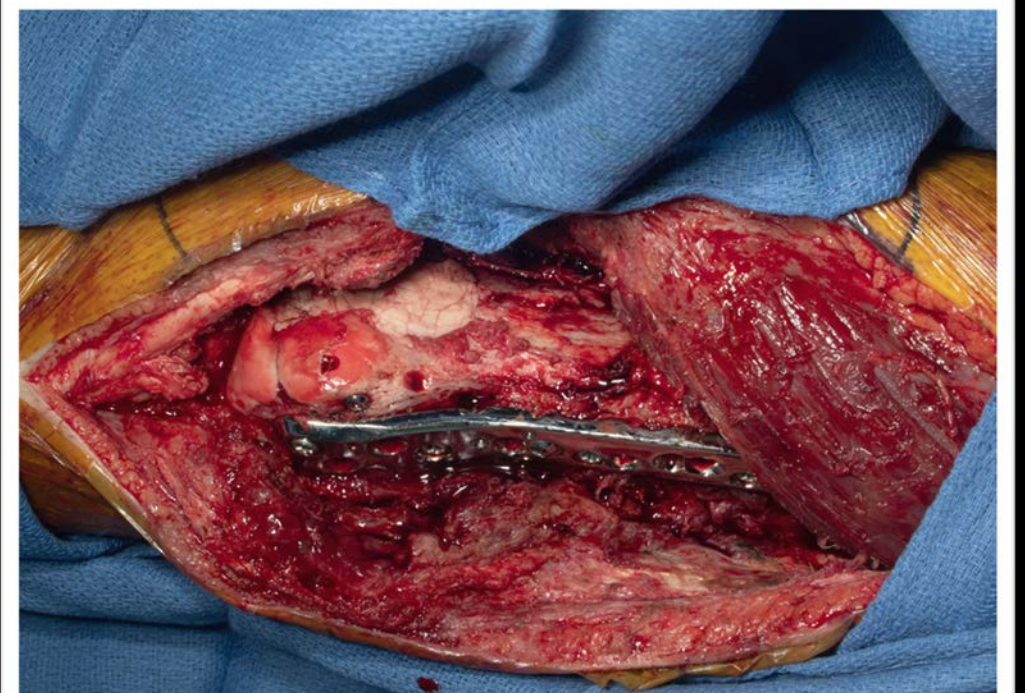
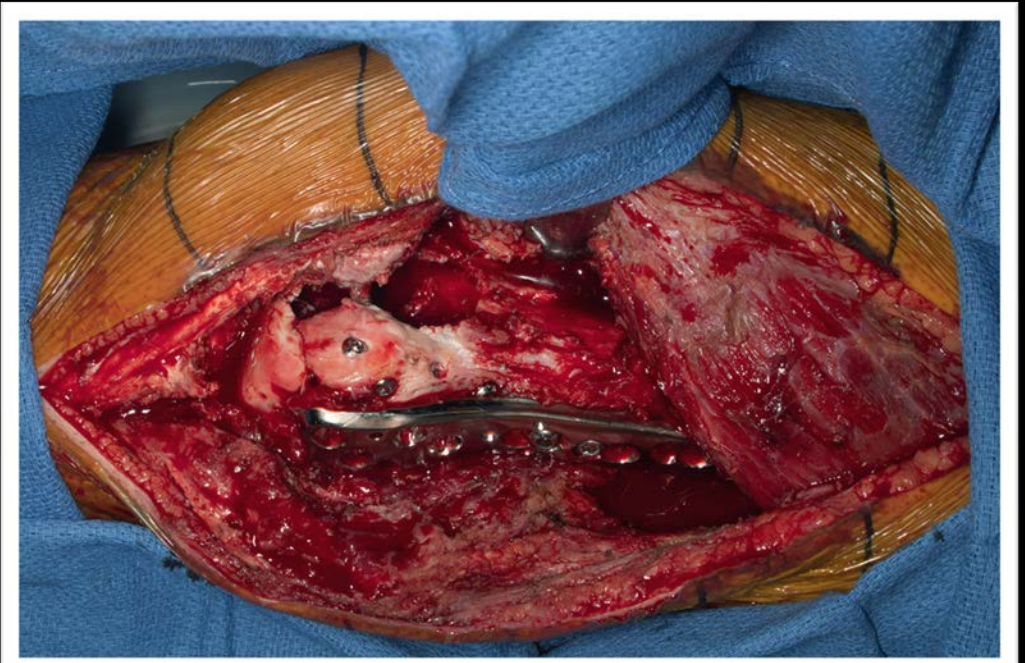


Benign Aggressive Tumors

Giant Cell Tumor

Treatment

- Intra lesional Curettage + Adjuvant treatment
 - Liquid nitrogen, Phenol, Argon Beam, and PMMA
 - Recurrence 20-40% without adjuvant therapy vs 3-10% with
- Possible systemic therapy – Denosumab
- Radiation Therapy
 - Only for inoperable/ recurrent disease
 - 15% risk of malignant transformation



Benign Aggressive Tumors

Giant Cell Tumor



Prognosis:

Recurrence rate up to 20%

- Surveillance with X-ray Q 3 months
- Must re- biopsy to r/o malignancy

Malignant Transformation

- 1% spontaneous
- 5-15% radiation induced

1-3% Metastatic disease

Benign Aggressive Tumor

Chondroblastoma

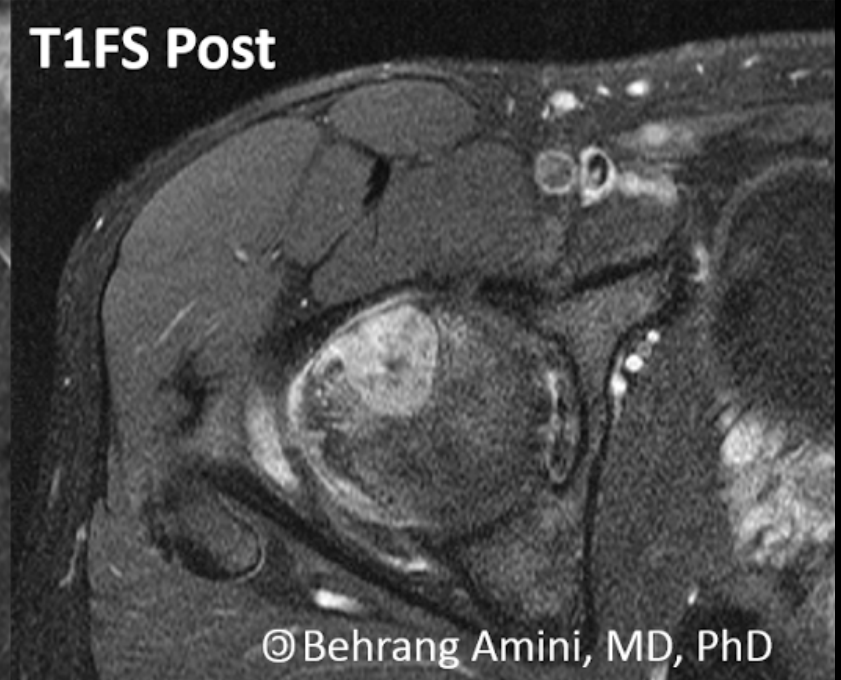
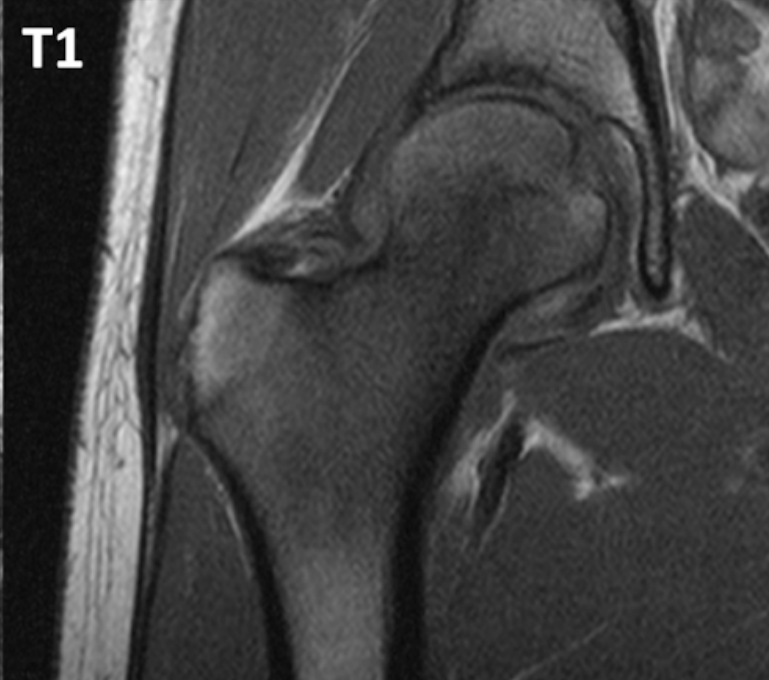
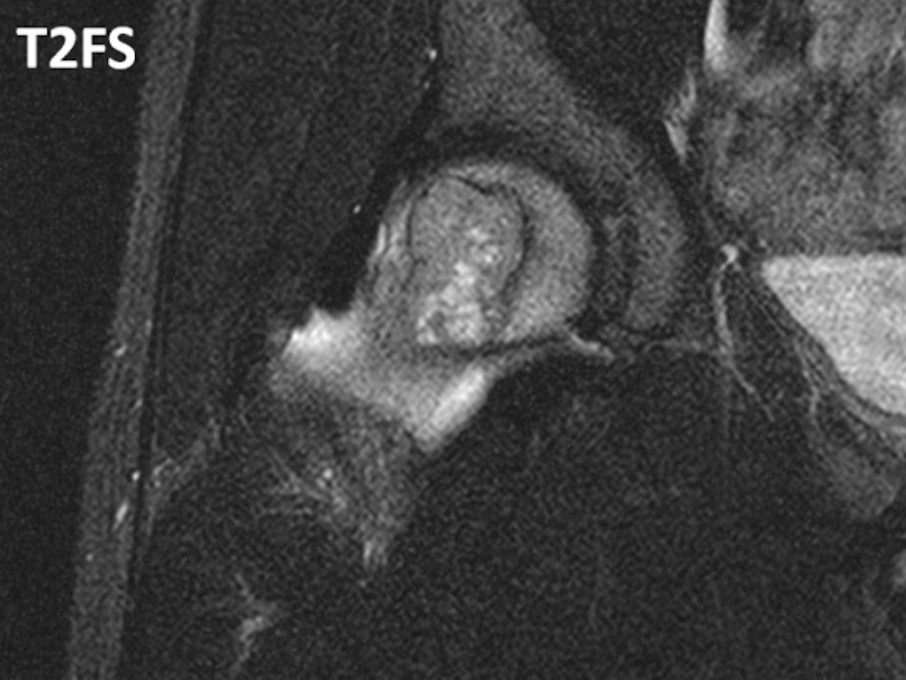
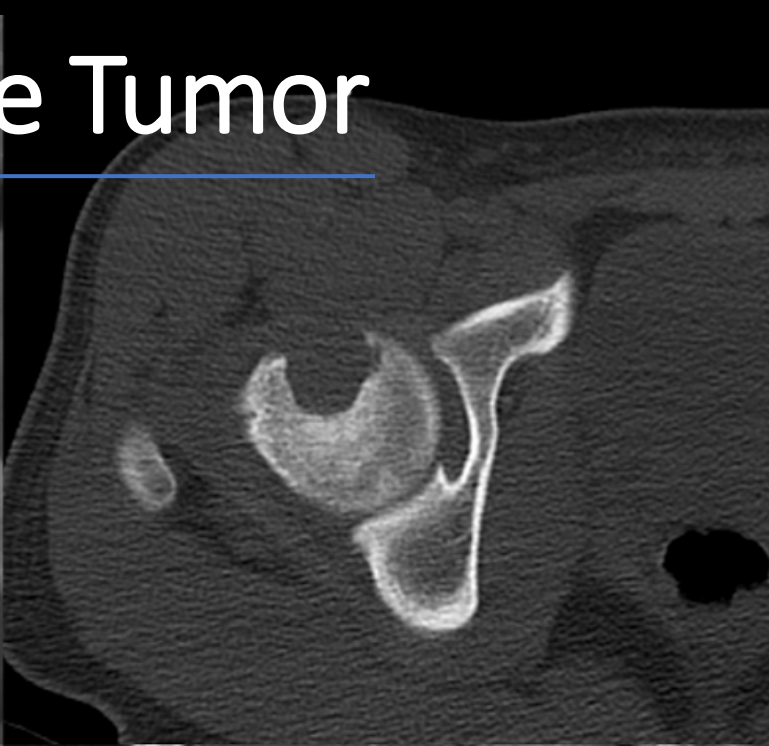
Presentation:

- Rare, <1% of bone neoplasms
- 10-20 yo with progressive pain and swelling
- Knee



Benign Aggressive Tumor

Chondroblastoma



Benign Aggressive Tumor

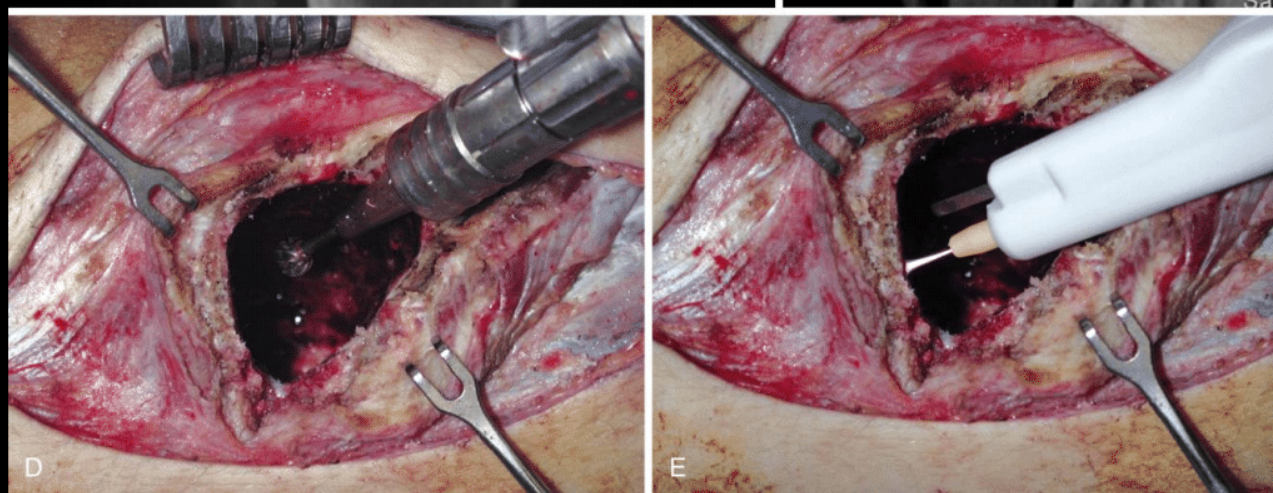
Chondroblastoma

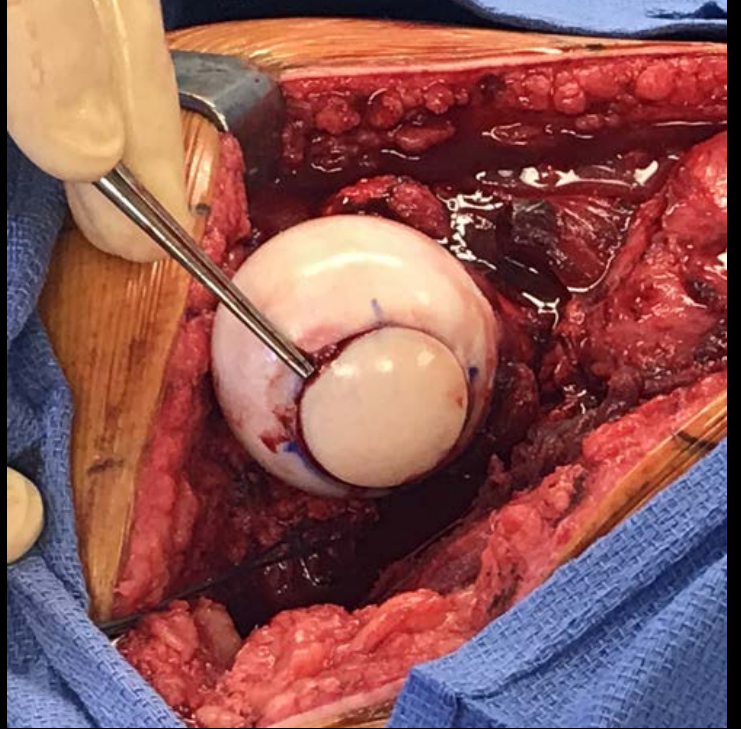
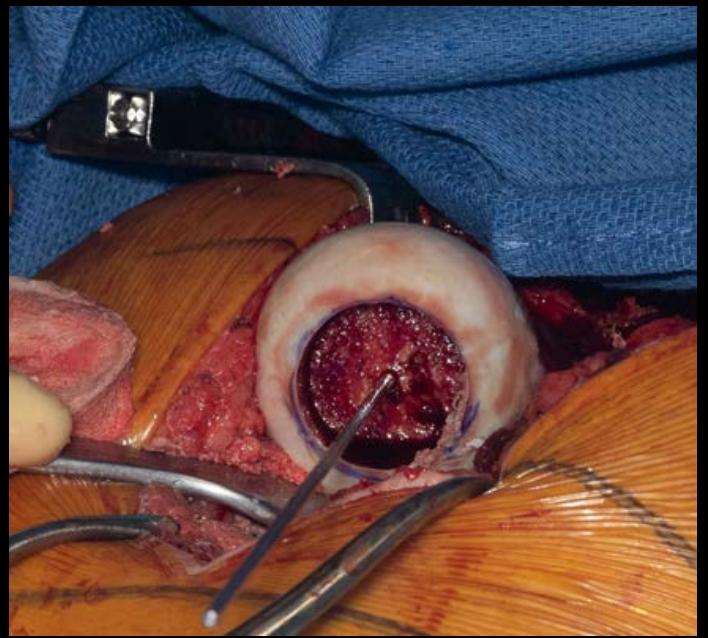
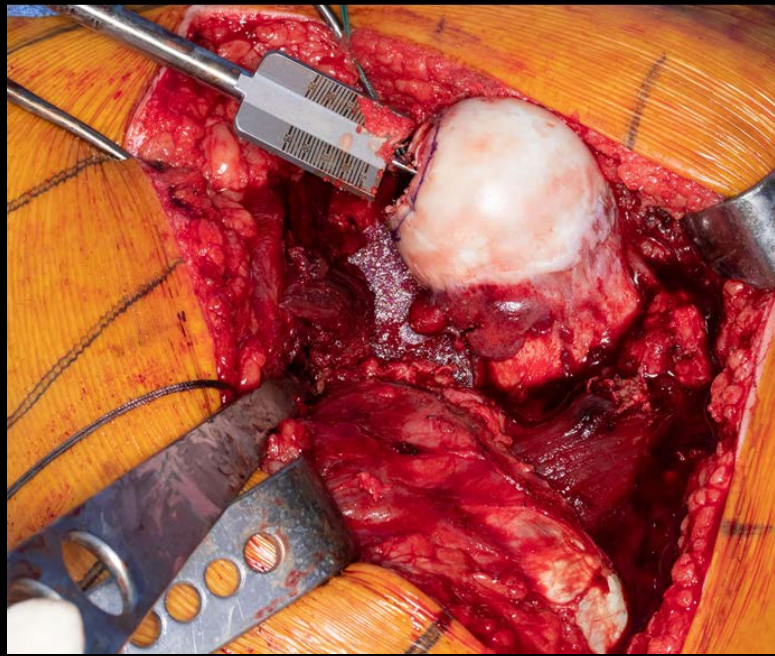
Treatment:

- Intralesional Curettage + bone graft
 - +/- adjuvant treatments

Prognosis:

- 10-15% recurrence rate
- Lung Mets in 1% - excision curative





Benign Aggressive Tumor

Osteoblastoma

Presentation:

- Pain, age 10-30, primarily in the spine

Treatment:

- Surgical management
- Radiation in inoperable lesions



Malignant Bone Tumors



Malignant Bone Tumors

Red Flags

Symptoms:

- Pain
- Night pain
- Inconsistent exam findings

Imaging:

- Destructive lesions
- Wide zone of transition
- Periosteal Reaction



Workup of a Suspected Malignant Bone Tumor

- X-ray of the extremity
- MRI with and without contrast
- CT Chest
- PET CT

- Biopsy - Tract planned by orthopedic oncologist and performed at a sarcoma center!



Osteosarcoma

Presentation:

- Bimodal age peak 20s and 60s
- Male > female
- Pain and soft tissue mass
- Night pain
- Distal femur, proximal tibia, proximal humerus
- Most common primary malignancy of bone
- Accounts for 20% of primary sarcomas
- Multiple subtypes

Time 2/Volume 1

S
S 18

cm



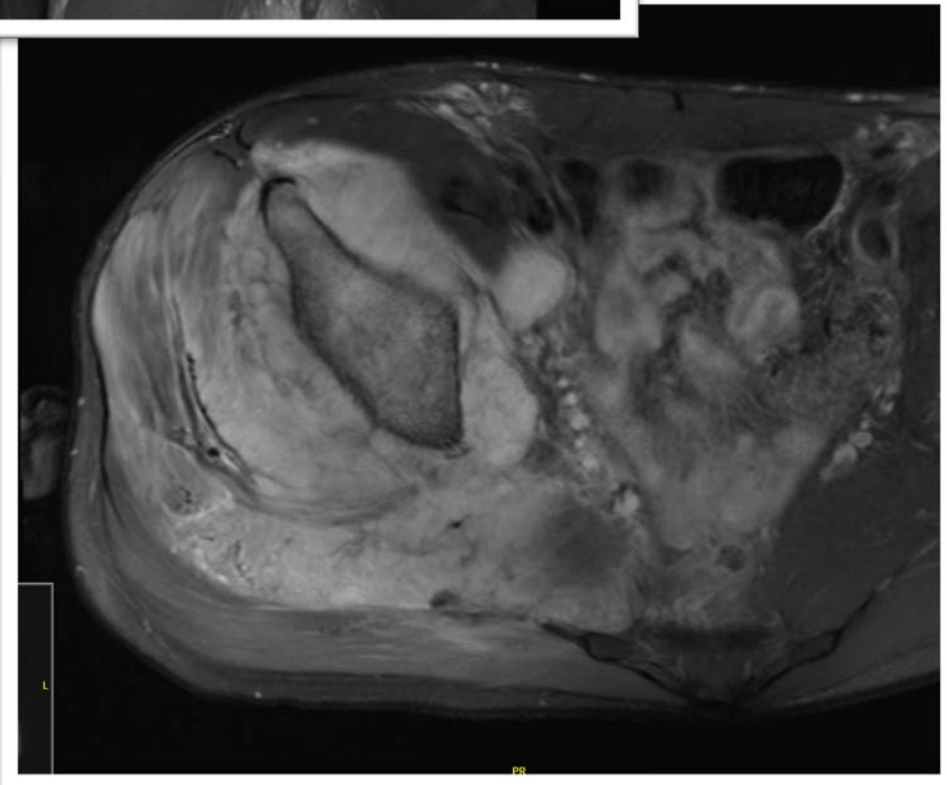
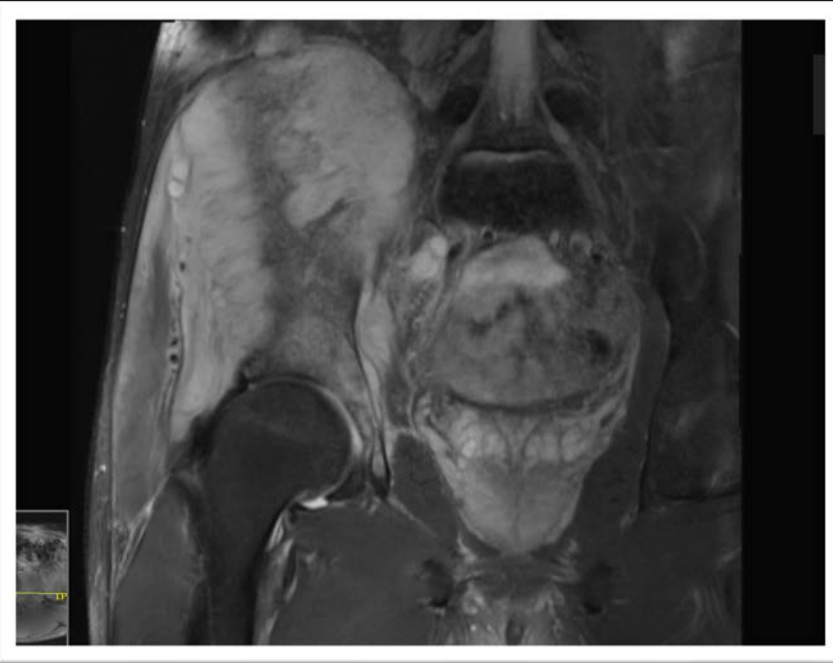
SP

1.6 g/ml

1 1819

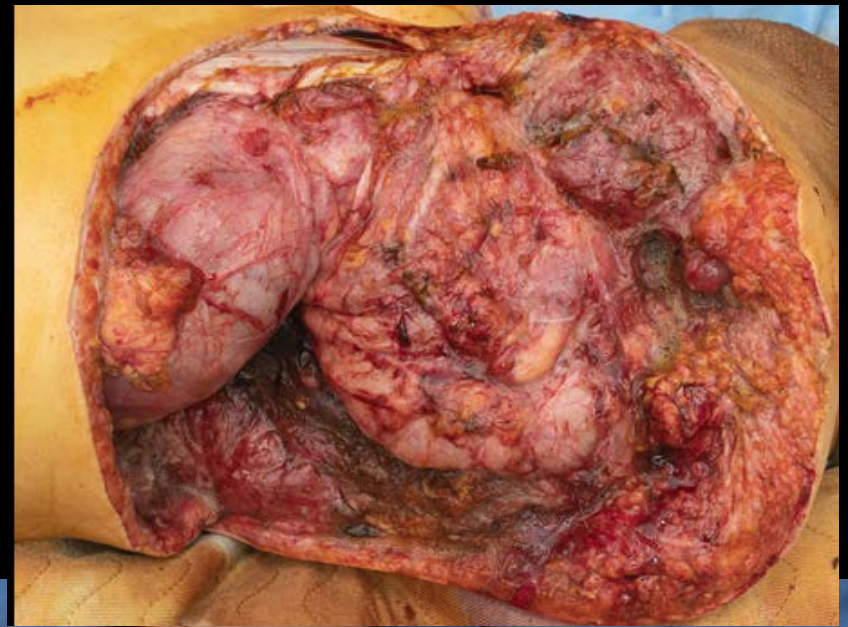


Osteosarcoma Imaging



Osteosarcoma Treatment:

- Will consist of neoadjuvant chemotherapy and surgery
- No radiation





Prognosis and Surveillance

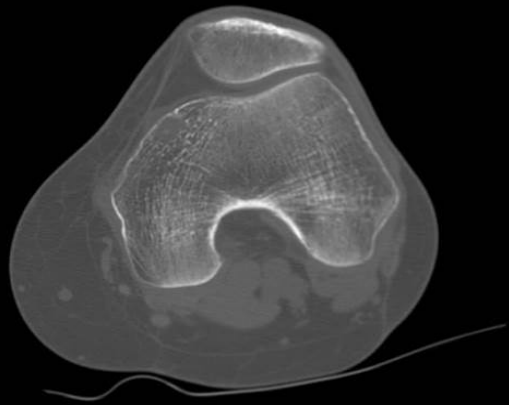
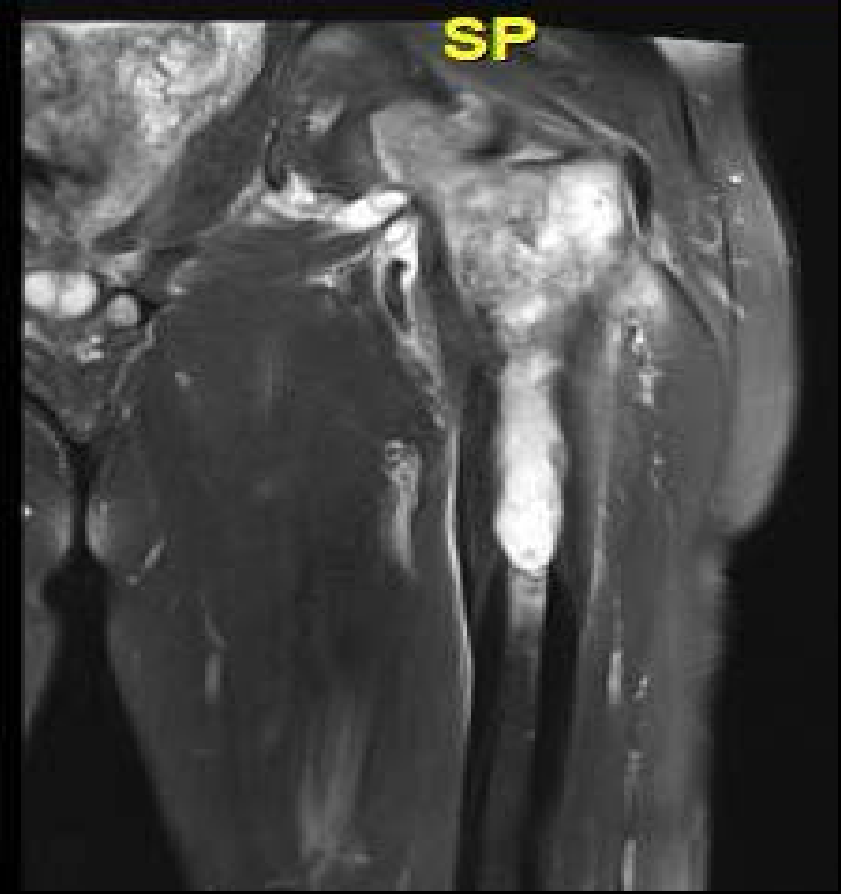
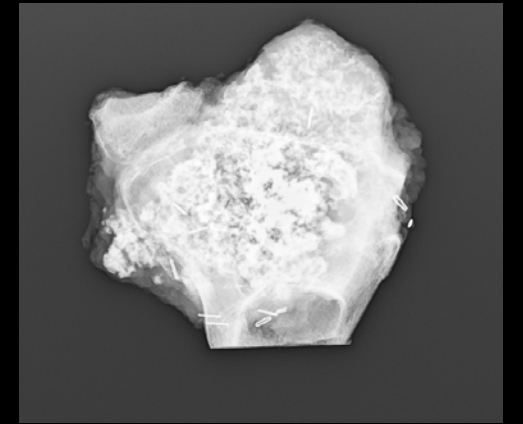
- 10 year survival
 - Without CTX – 15%
 - With CTX – 70% in non metastatic disease
- Surveillance
 - 10 years of radiographic Surveillance
 - CT chest and MRI of the involved extremity
 - Recurrence or metastasis most likely in the first 2-3 years after surgery

Chondrosarcoma

Presentation:

- 40-60 yo, M>F
- +/- Pain
- +/- soft tissue mass
- Proximal femur, pelvis, proximal humerus
- Classified based on origin, location, histology, and clinical behavior
- Can be primary or secondary

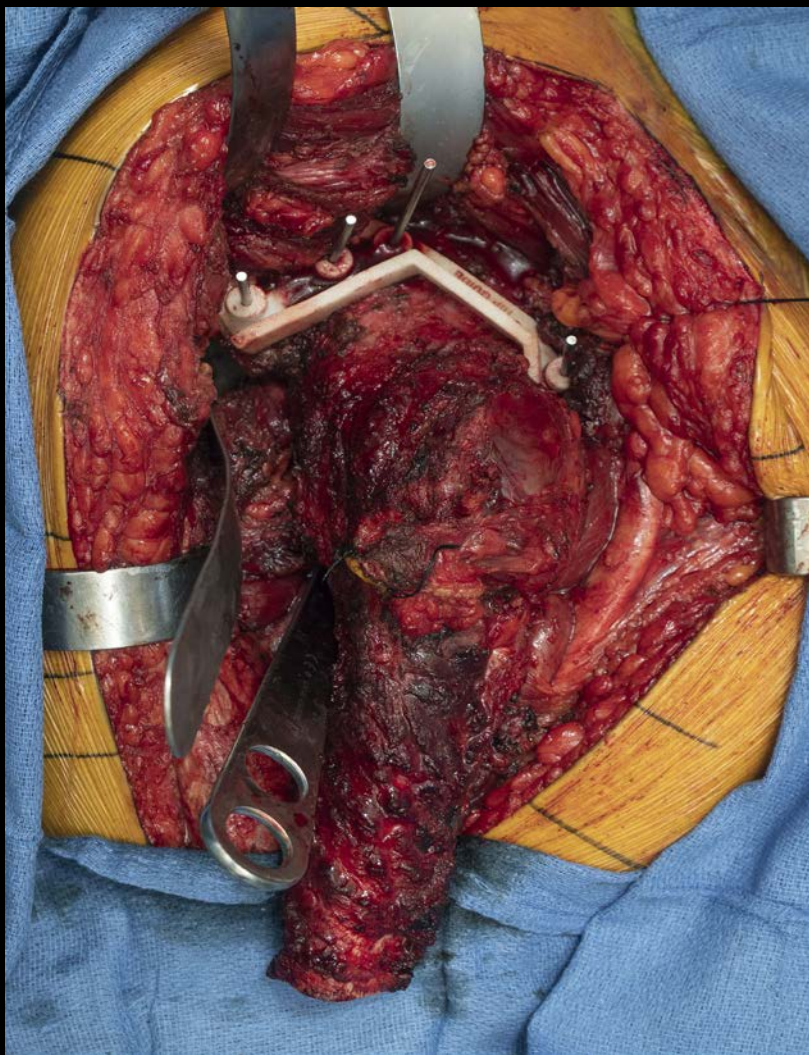
Chondrosarcoma Imaging



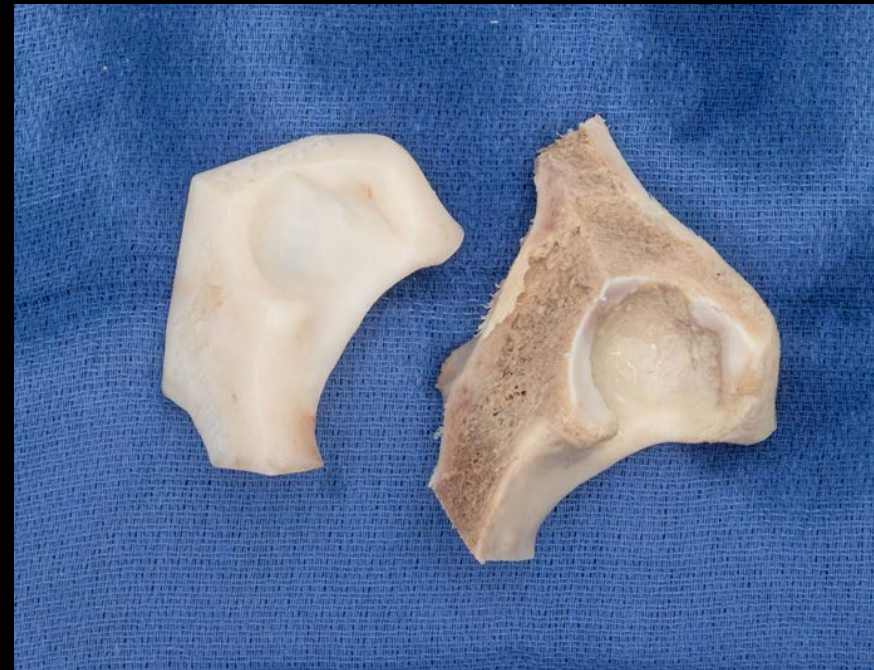
Chondrosarcoma Treatment

- Wide resection with negative margins is curative
- Lung metastatic disease – excision
- 5 year survival of Grade 1 – 90-98%
- Grade II lesions – 25% of pulmonary mets
- 50-80% of patients with grade III will die of disease

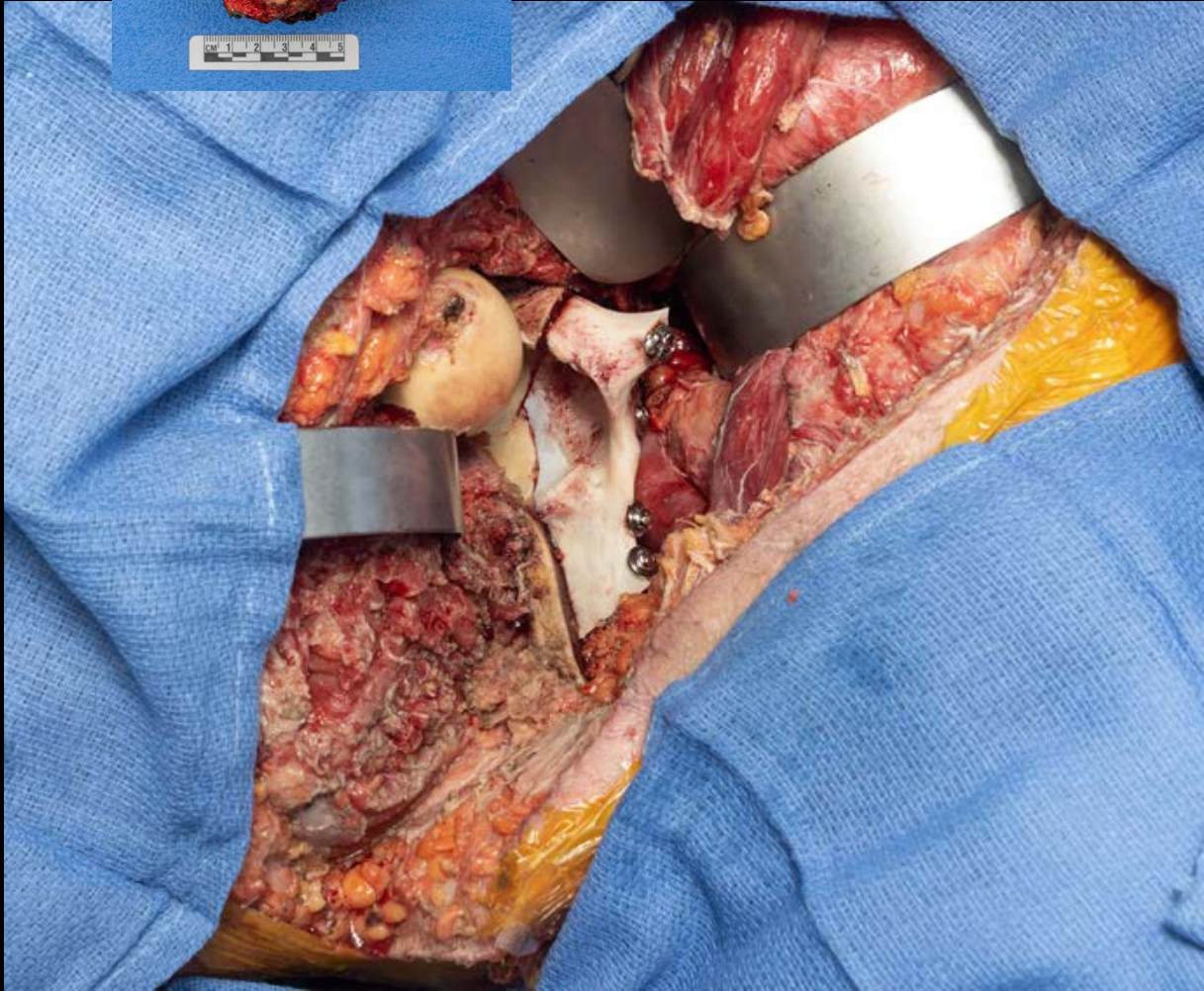
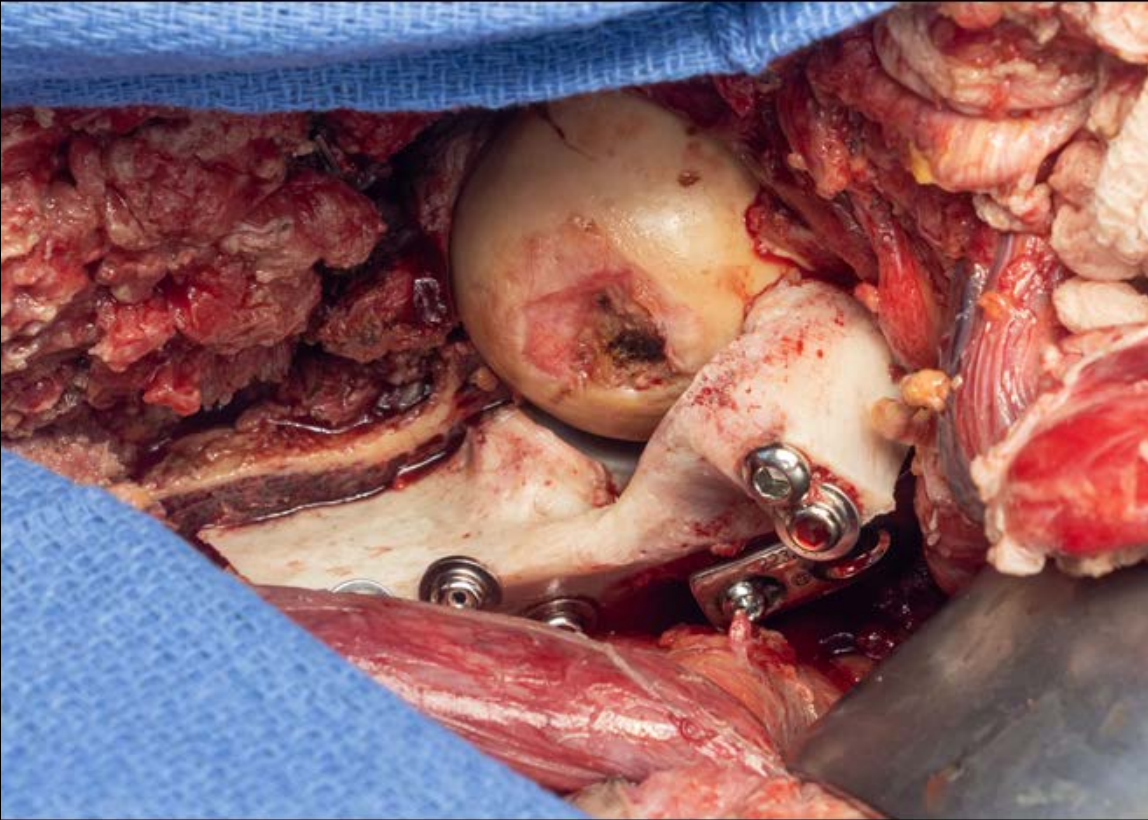




Allograft Reconstruction



Interoperative Photos

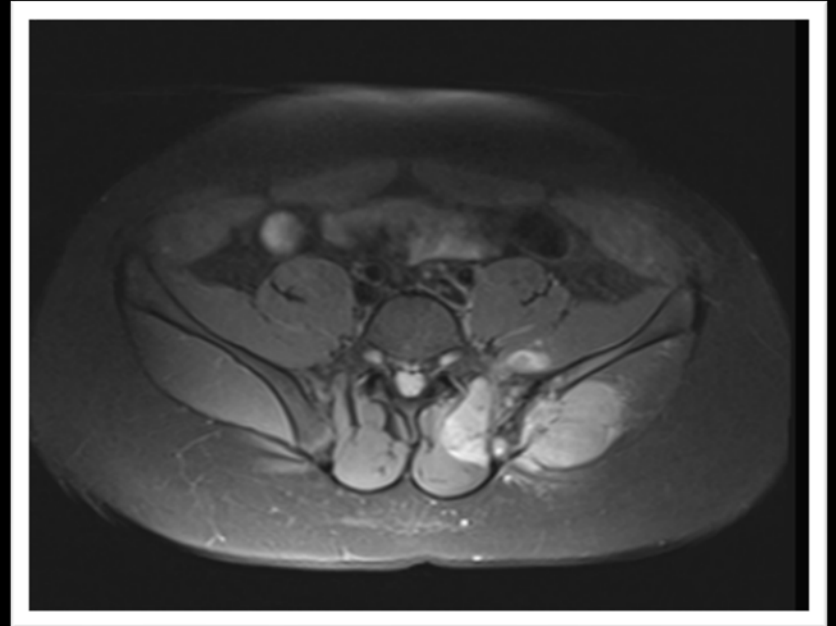
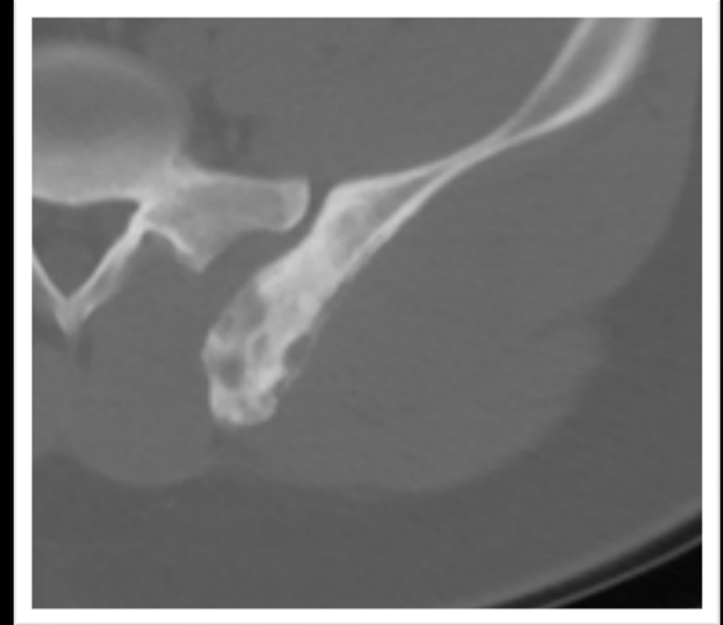


Ewings Sarcoma

Presentation:

- Age 5-25
- M>F 1.5:1
- Pain is earliest symptom
- Swelling or palpable mass
- +/- fever, ESR, LDH elevation
- 2nd most common bone malignancy
- Small, round, blue cell malignancy
- 1% of childhood tumors

Ewings Sarcoma



Ewings Sarcoma

Treatment :

- Chemotherapy always
- Surgery
- Radiation – inoperable or (+) margin

Prognosis:

- Small, extremity – 80% survival
- Large, axial tumor that cannot be excised - <60%
- Metastatic disease – < 20%

Metastatic Disease of Bone

Solitary Lytic Bone Lesion in the older population

- Multiple Myeloma
- Lymphoma
- Metastatic Disease



Cancers that commonly Met to Bone:

- Prostate
- Thyroid
- Breast
- Lungs
- Kidneys

Workup of Solitary Lytic Lesion

Labwork:

- CBC /CMP
- Alk Phos
- ESR/ CRP
- Myeloma Markers
- CEA
- PSA

X-ray of long bones

CT Chest/Abdomen/Pelvis

PET-CT

Biopsy



Treatment of Bone Metastasis

Goal: Quality of Life

Refer to appropriate teams



Mirel's Criteria:

Parameter	Score		
	1	2	3
Site	Upper limb	Lower limb	Peritrochanter
Pain	Mild	Moderate	Severe
Lesion	Blastic	Mixed	Lytic
Size	<1/3	1/3-2/3	>2/3

>8 = Fixate

Summary

- Be aware of red flags
- Biopsy Solitary Lytic Lesions
- Refer Suspicious lesions
- Refer for biopsies of primary bone tumors

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Thank you!

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Benign Aggressive Tumor

Chondromyxoid Fibroma

Presentation:

- Rare- 0.5% bone tumors
- 20-30 yo M>F
- Mild- mod pain
- 75% in pelvic and LE (proximal tibia)



Benign Aggressive Tumor

Chondromyxoid Fibroma

Imaging:

- Metaphyseal
- “Bubbly”

