

Giant Cell Tumor of the Proximal Fibula

James C. Wittig, MD

Associate Professor of Orthopedic Surgery

Chief, Orthopedic Oncology

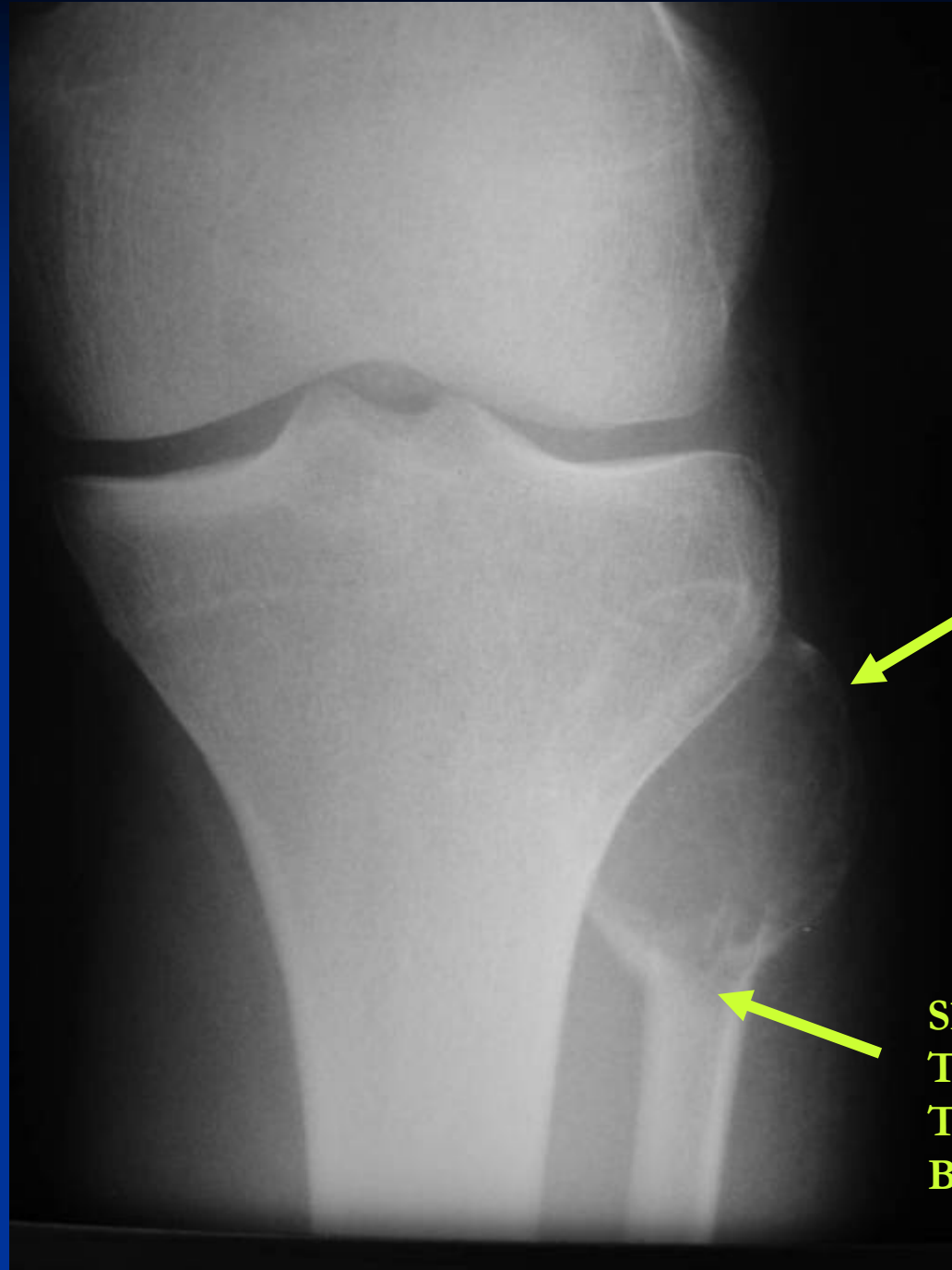
Mount Sinai Medical Center

Clinical History

- 19 year old female with a mildly painful enlargement on the outside of her left knee for several months.
- The patient gave a history of a twisting injury to the knee several months prior to the onset of pain.
- The patient was otherwise healthy.
- She was born in the U.S. and gave no history of travel.
- There were no fevers, night sweats or weight loss.
- Blood tests were normal

X-rays

- X-rays demonstrated a geographic, expansile lesion of the head of the fibula. There was a surrounding “egg shell” rim of calcification indicating the periosteum was intact.
- There were internal trabeculations within the lesion/tumor
- The lesion was expansile and displaced the peroneal nerve and popliteal blood vessels.
- The entire head of the fibula was destroyed by the neoplasm



Tumor

**Geographic and
Expansile**

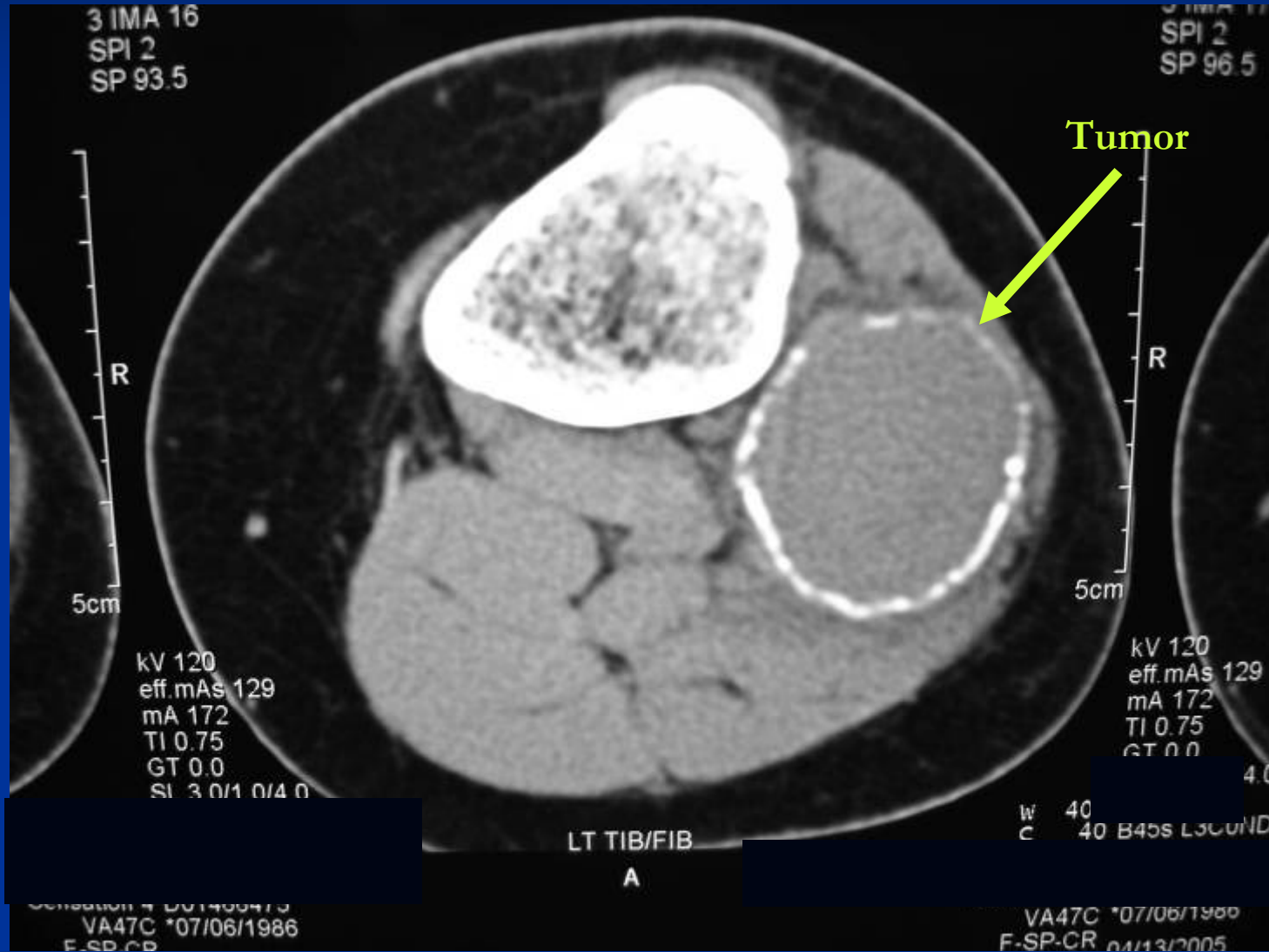
**Sharp Zone of
Transition between
Tumor and Normal
Bone/Fibula**

CT Scan

- CT scan shows a thin cortical shell around the tumor indicating the periosteum is intact and the tumor is likely benign
- There was no ossification or calcification within the tumor indicating that the tumor was probably not a bone or cartilage producing tumor



CT Scan Axial Section



MRI

- The MRI findings were not specific for a particular type of neoplasm or infection
- The lesion was low to intermediate signal on T1 and intermediate to high signal on T2 weighted images. The tumor diffusely enhanced with contrast. There were no “fluid-fluid” levels that would indicate cystic changes.
- The MRI nicely demonstrated the tumor’s local extent and proximity to the vascular structures.

MRI



H

MAGNETOM VISION
F-SP VB33G
+ : F A L

D
0
1
1
I
S



SP -28.1
SL 5.0
FoV 360*360
210 *2560
Cor

ti
*R
2
TR
TE

R-2005

E 74

I-5

.25

e1-7 180

SAT FS

SP -77.9

SL 5.0

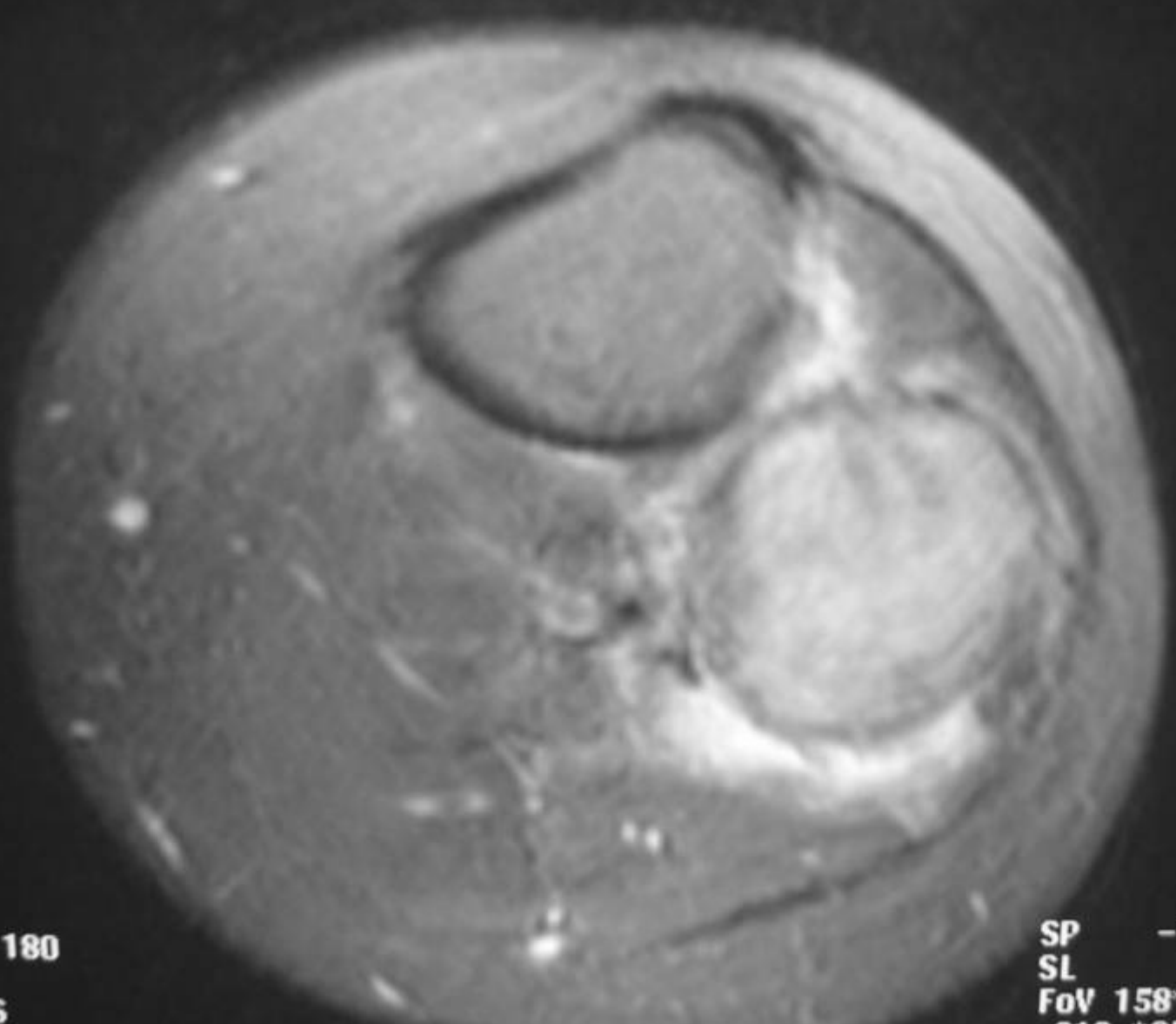
FoV 158*180

210 *256

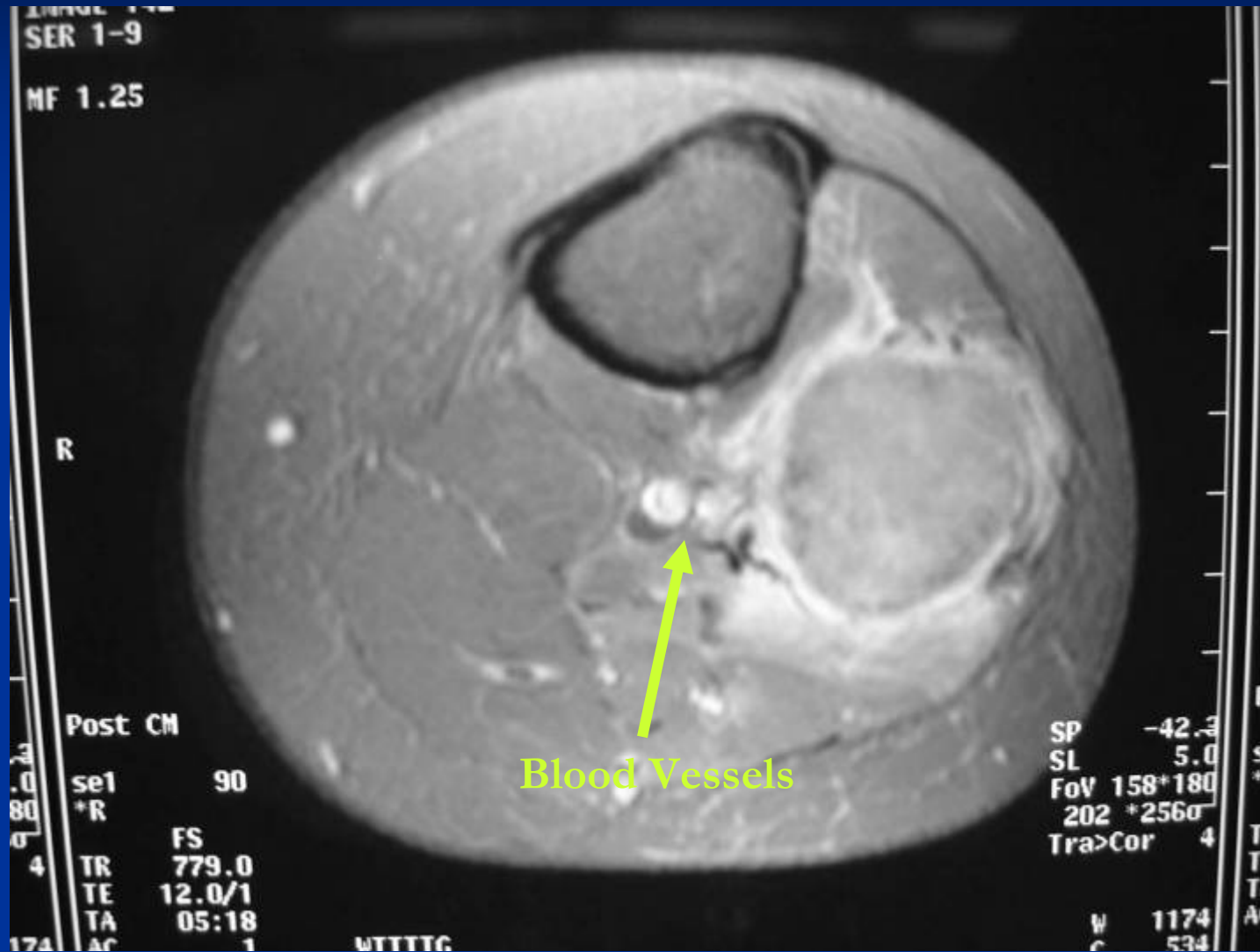
ts

*R

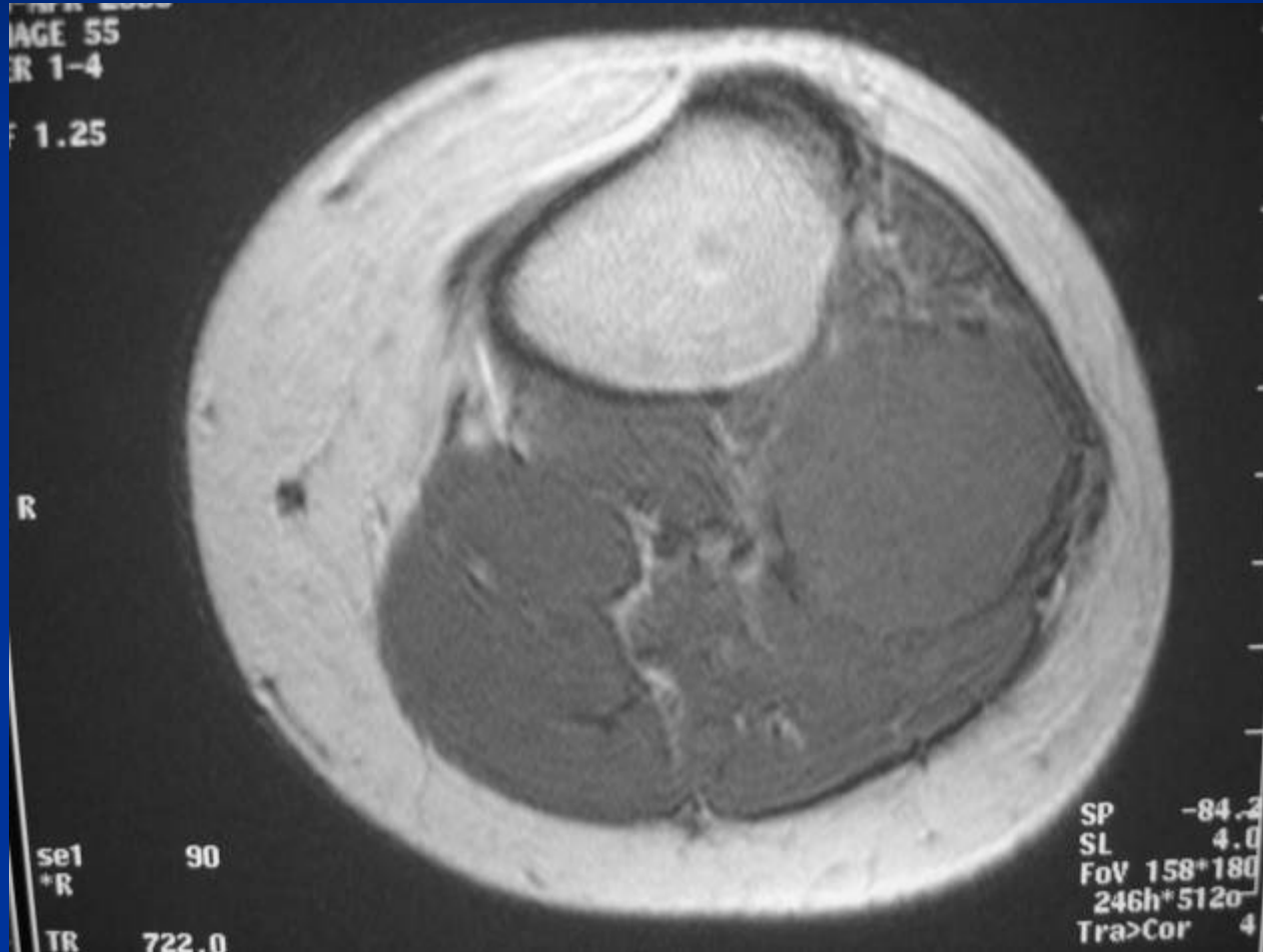
2



MRI with Gadolinium Contrast



T1 Weighted Axial MRI



Bone Scan Demonstrates Increased Activity in Neoplasm



Differential Diagnosis

- The radiographic differential diagnosis included
 - Giant Cell Tumor
 - Aneurysmal Bone Cyst
 - Chondroblastoma
 - Enchondroma
 - Osteoblastoma
 - Atypical Infection
 - Desmoplastic Fibroma
 - Non-ossifying Fibroma

Differential Diagnosis

- The radiographic studies support the diagnosis of a benign aggressive neoplasm. The lesion expands the bone and the periosteum appears to be intact and to contain the lesion. There is a sharp zone of transition between the tumor and normal bone (geographic pattern of bone destruction). Given the age, benign aggressive appearance, origin in the metaphysis and involvement of the epiphysis and lack of mineralization, the most likely diagnosis is a Giant Cell Tumor of Bone.

Differential Diagnosis

- The lack of mineralization argues against a chondroblastoma, enchondroma and osteoblastoma although these lesions do not always demonstrate mineralization. The epiphyseal involvement suggests a chondroblastoma however this would be a very rare site for a chondroblastoma and chondroblastomas usually do not show internal trabeculations.

Differential Diagnosis

- The differential diagnosis of internal trabeculations includes desmoplastic fibroma, chondromyxofibroma, hemangioma, aneurysmal bone cyst, nonossifying fibroma and giant cell tumor. Desmoplastic fibroma is extremely rare and this would be an unusual age and location for a desmoplastic fibroma. This would also be an extremely rare site for a chondromyxofibroma. Chondromyxofibromas also usually arise eccentrically from the bone and have a border that is very expansile and another border with an indolent appearance. Nonossifying fibromas are usually sharply circumscribed, arise eccentrically from the bone and do not expand and destroy the bone. This is also an unusual site for a nonossifying fibroma.

Differential Diagnosis

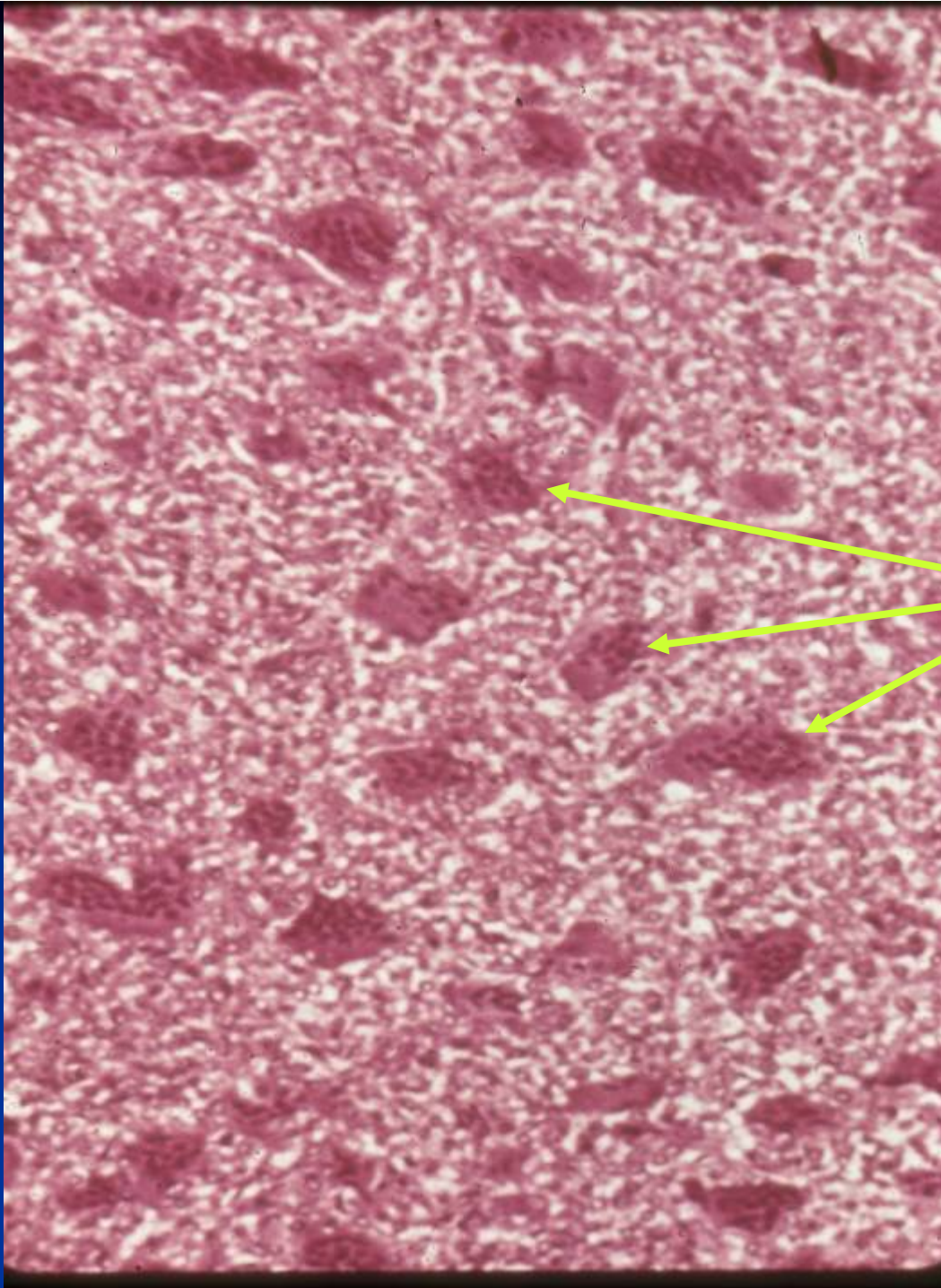
- Aneurysmal Bone Cyst: ABCs arise in this age group. This would be an unusual site and there were no “fluid-fluid” levels detected on the MRI which would be consistent with a primary or secondary ABC.

Differential Diagnosis

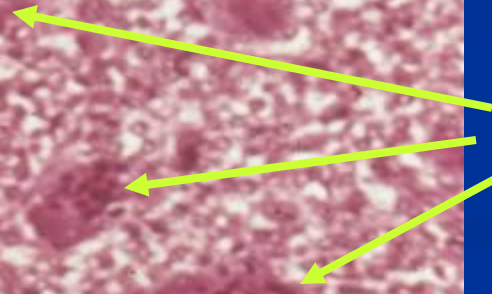
- Infections can be considered within the differential. TB and Fungal infections can present in an unusual manner such as this. However, the patient gave no history of travel, exposure to tuberculosis and was born in the U.S. She had no fevers, night sweats and all blood tests were normal.
- The key to an accurate diagnosis lies in the biopsy of the tumor/lesion.

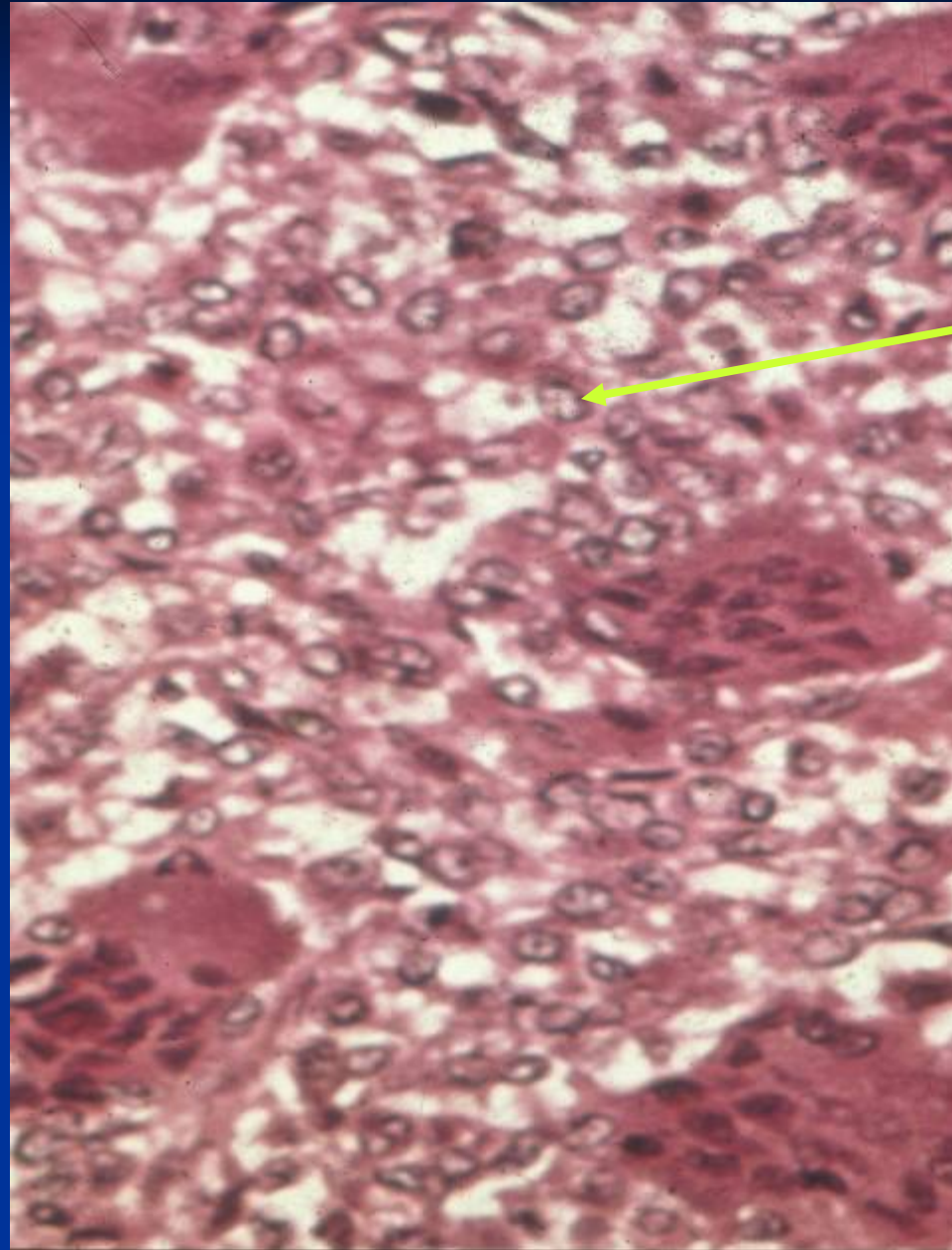
Biopsy

- A CT guided core needle biopsy was performed
- The pathology demonstrated many giant cells dispersed amongst a sea of uniform mononuclear cells
- The nuclei of the mononuclear cells resembled the nuclei in the giant cells
- There was no evidence of ossification or calcification
- There was no matrix production
- There were no granulomas
- Cultures were negative

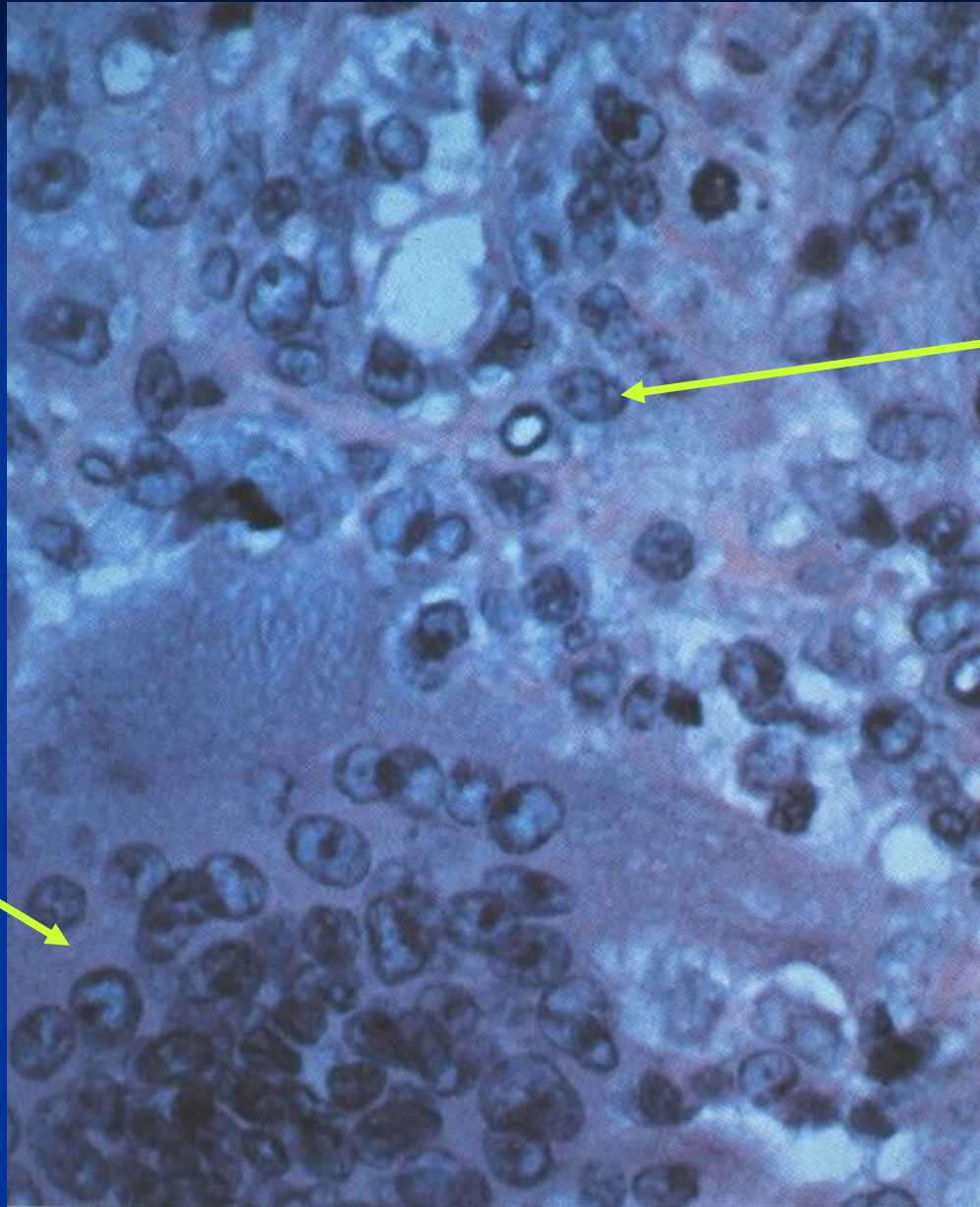


Giant Cells





Nuclei of the Mononuclear Cells appear similar to the Nuclei of the Giant Cells



Giant Cell



Mononuclear Cells



Diagnosis

- The diagnosis is Giant Cell Tumor
- Giant Cells can be seen in many different tumors. The key is that the cells surrounding the giant cells are all mononuclear cells and their nuclei are very similar to the nuclei within the giant cells. These mononuclear cells coalesce to form the giant cells. Notice that the nuclei are all clumped within the center of the giant cell. Giant cells are also present in TB and Fungal infections, these types of giant cells are called Langerhan's Giant Cells. The nuclei of these giant cells are arranged around the periphery of the giant cell.

Surgery

- The surgery consists of a wide/radical resection of the tumor/proximal fibula.

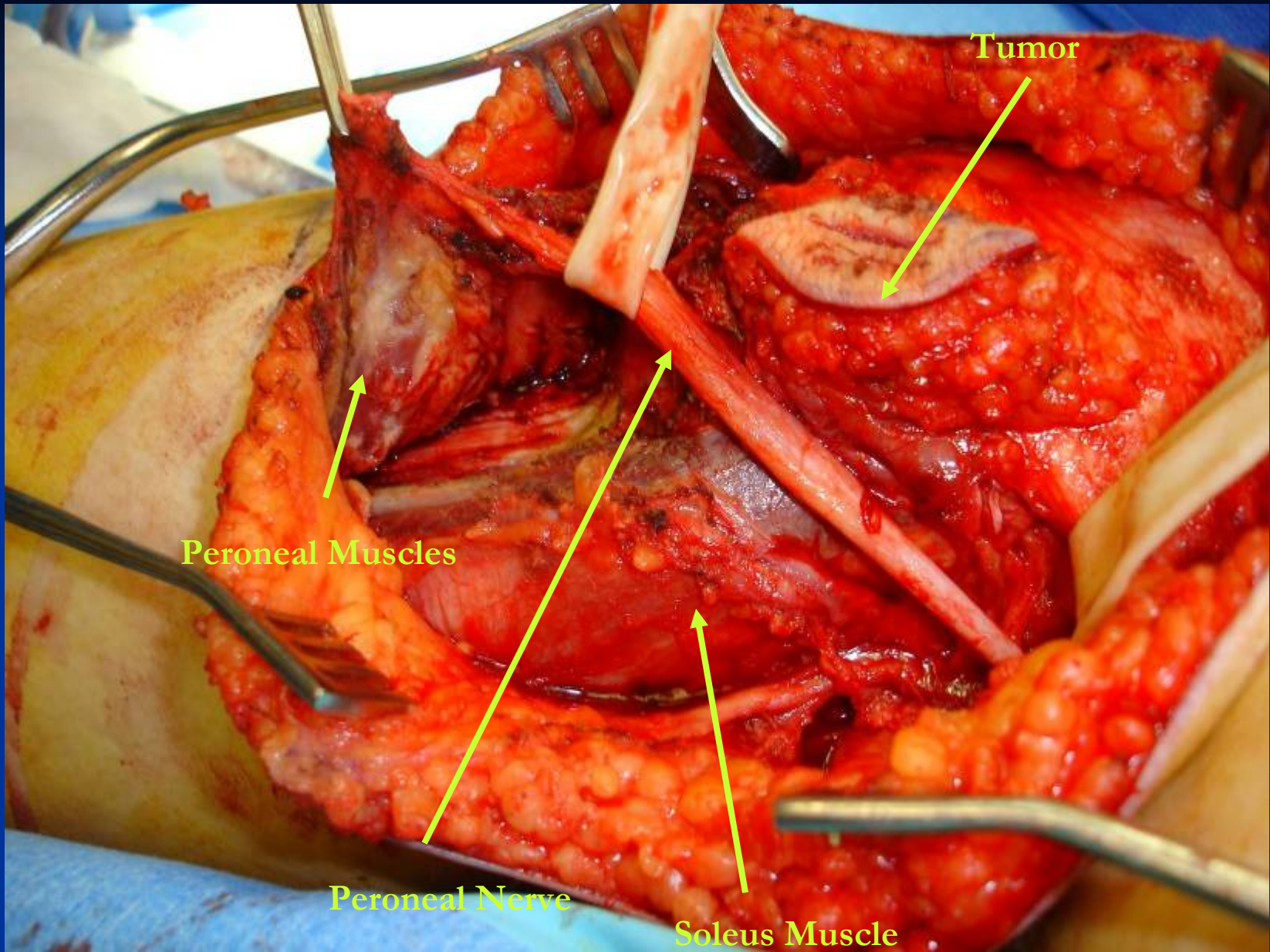
Surgery

- The peroneal nerve and all its branches to the peroneal muscles, anterior tibialis muscle, extensor digitorum longus and extensor hallucis longus (all the muscles that lift the foot off the ground/dorsiflex the ankle and toes) is dissected and separated from the neoplasm. The nerve and all its branches are protected while the fibula is cut at a distance from the tumor in order to remove the tumor with an adequate margin.

Surgery

- The biceps femoris muscle and lateral collateral ligament are released from the insertion on the tumor/head of fibula. They are later repaired with suture anchors to the tibia.
- The remaining muscles are subsequently rotated and closed to each other to cover the defect.
- After physical therapy, most patients have a normal functioning, stable knee. The gait is normal and the leg is virtually normal for almost all patients.
- Possible complications include foot drop, tumor recurrence, infection, knee pain and instability and neurovascular injury.
- The fibula is considered an expendable bone and can be sacrificed with very little compromise in function

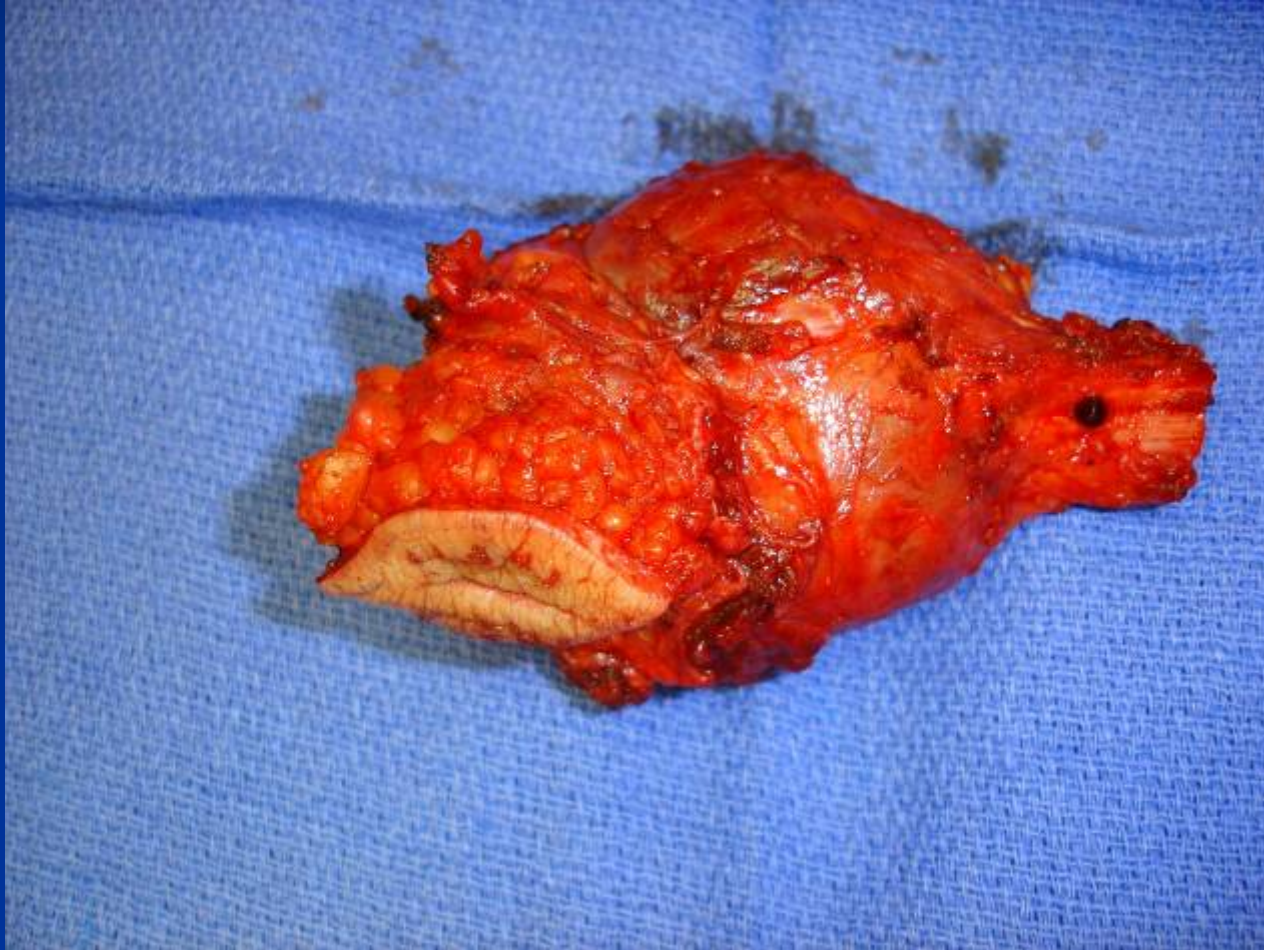






**Biceps Femoris Muscle and
Lateral Collateral Ligament
Detached from Head of Fibula
Preserved for Later Repair**

Specimen



Specimen



Defect

