Sarcomas

- Epidemiology
  - Incidence: 15k/yr (thus rare constituting 1% of adult cancer but interestingly 10% of pediatric cancers) w/ 4k deaths/yr
- RFs
  - Genetic Syndromes (refer)
  - Exposure
    - **Radiation** (ionizing radiation specifically used in breast cancer, lymphoma, and cervical cancer can lead to sarcomas specifically osteosarcomas, angiosarcomas, and spindle cell sarcomas usually >10yrs from initial exposure)
    - **Chemical** (agent orange used in warfare, phenoxyacetic acids found in herbicides, and chlorophenols found preservatives)
    - **Lymphedema** (Stewart-Treves Syndrome specifically refers to lymphangiosarcoma that occurs as a complication to chronic lymphedema following mastectomy, aggressive LN dissection, and radiation)
    - **HIV** (Kaposi Sarcoma which, w/o HIV, is a rare indolent neoplasm of men of Jewish/Mediterranean origin)
    - NB there is definitive association b/t trauma and sarcoma w/ pts often reporting causal relationship, it is more likely that the traumatic event brought attention to a pre-existing abnormality
- S/S
  - Location: 40% lower extremity (esp around knee), 20% upper extremity, 30% trunk/ab/retroperitoneum, 10% head/neck
  - asymptomatic mass but sometimes pain depending on where the lesion is located esp around vital structures or nerves
  - rarely paraneoplastic syndromes (hypoglycemia from ILGF)
  - pathologic fractures if bone (must r/o mets and metabolic processes that affect the bone like hyperPTH, infection, etc)
  - NB 80% of bone tumors in children are benign while 70% of bone tumors in adults are malignant usually mets
  - Bone
    - Benign: rarely pain or pathologic fractures, X-ray: small <1cm, well-circumscribed/sharp, lytic w/ thick sclerotic rim 2/2 to reaction of bone to the tumor, no extension into soft tissue
    - Malignant: pain, tumefaction (swelling), pathologic fractures, often mimics cellulitis and osteomyelitis, X-ray: large >1cm, not well circumscribed/poorly defined, aggressive bone destruction, no sclerotic rim, extension into soft tissue
    - Bone Metastasis (more common than primary tumors)
      - Differentiate from primary using a bone scan (multiple lesions = met / solitary lesion = primary)
      - Metastasis to Bone (most common site is **vertebra**)
        - **Lytic (Lung, Colon, MM, many others) the other two common tumors**
        - **Blastic (Breast, Prostate) the sex tumors**
        - **Both (Stomach)**
- Dx
  - Bone sarcoma: bone scan picks up lesion first, X-ray picks it up later on (if you can see it on X-ray it is advanced), CT, MRI, Technetium-99m Scan
  - excisional biopsy if superficial, <5cm in size, and 1-2cm margins can be obtained otherwise just do incisional biopsy (oriented along the limb longitudinally) don't do core or FNA b/c of sampling error b/c sarcoma can have significant degree of histologic variation
  - MRI w/ Gadolinium
  - if suspect metastasis then do CT Chest/Ab b/c primarily hematogenous metastasis to lung/liver
- Prognosis
  - Range from very indolent to very aggressive
  - Factors: grade, size (**5cm**), location (superficial vs deep, extremity vs retroperitoneal)
- Staging
  - **NB grade is very important**
  - **NB node status is not very important b/c sarcomas spread hematogenously**

Stage	T	N	M	Grade	5yr Survival
Stage I	T1a/b (<5cm) T2a/b (>5cm) a = above superficial fascia b = deep to superficial fascia	0	0	Low Grade Well Differentiated	90%
Stage II	T1a/b T2a	0	0	Intermediate Grade Mod Differentiated	70%
Stage III	T2b	0	0	High Grade Poorly Differentiated	50%
Stage IV	#	0-1	1 (**hematogenously 80% to lung or liver**)	Any Grade Any Differentiation	15%

- Tx
  - **Surgical Excision** (remains the definitive form of treatment, appear to have capsule but actually it is a psuedocapsule therefore never just "shell-out" rather you want >2cm margins)

- **Chemo** (in general has **poor results** in sarcomas, the MAID regimen is most commonly used which includes anthracyclines + mustard alkylators)
  - Neoadjuvant: very controversial except in rhabdomyosarcomas where neoadjuvant chemo is particularly effective
  - Adjuvant: used if metastatic or unresectable or in Ewing's, rhabdomyosarcoma, osteosarcoma in all others it is controversial
- **Radiation**
  - Neoadjuvant: **very controversial** (good: may shrink the tumor vs bad: delays surgical resection, increases r/o wound complications, and inability to interpret effects of pre-op chemo from XRT changes)
  - Adjuvant: used if high grade, low grade and >5cm, positive margins, or reexcisions

- Types

	Benign	Malignant
Bone	• **Osteoid Osteoma** (15yo, Femur/Tibia) • **Osteoblastoma** (15yo, Post Spine) • **Osteochondroma** (1st most common, 10-50yo, Femur/Tibia, palpable, asymp, tendon irritation, neurovascular compression, bony growth covered by a cap of cartilage) • **Endochondroma** (10-50yo, Hand/Feet, pathologic fractures or asymp incidental findings, "popcorn" calcifications surrounded by reactive sclerosis, lytic lesions) • **Unicameral / Aneurysmal Bone Cyst** (10-20yo, proximal humerus, fluid (unicameral, asymp or pathologic fracture) or hemorrhagic (aneurismal, pain and swelling) filled cyst, Tx steroid injections (unicameral) vs curettage and grafting (aneurismal) • **Chondroblastoma** (15yo, Femur/Tibia, can undergo malignant transformation) • **Chondromyxoid Fibroma** (15yo, femur/tibia, rare, pathologic fracture) • **Giant Cell Tumor** (2nd most common, 25yo, femur/tibia, seen specifically in women, often recur, ballooning or "soap bubble" of the cortex due to cystic degeneration) • **Fibrosarcoma** (20-70yo, femur/tibia, very lytic, sheets of spindle cells in a herringbone pattern)	• **Osteosarcoma** (2nd most common, tumor Cell: Osteoblasts, 15yo, 90% Femur/Tibia, 20% Pelvis/Scapula, Pain, Swelling (Tumefaction), Lytic/Blastic resulting in a "sunburst" pattern (extension thru periosteum) on X-ray, bone formation within tumor is the sine qua non, lifting of the periosteum creating "Codman's triangle", palpable, ill defined with soft tissue extension, three types: osteogenic, chondrogenic, fibrogenic, produces "malignant osteoid" therefore radiodense, resulting in a 3x fold increase in AlkPhos, RFs: Paget's, Fibrous Dysplasia, Chondroma, Osteochondroma (if "Multiple Familial Osteochondromatosis"), Radiation, Bone Infarction, Familial Retinoblastoma), Tx: Neoadjuvant Chemo Surgical Excision w/ 2cm margins or Amputation, Adjuvant Chemo, Met to lungs are common therefore always check a CT Chest • **Chondrosarcoma** (30-60yo, Femur/Tibia/Shoulder/Hip/Spine, Pain, Swelling (Tumefaction), glassy blue on gross appearance, non palpable, cortical thickening, endosteal scalloping, stippled calcifications, sometimes develops from pre-existing chondroblastoma, radioopaque, Surgical Excision w/ 2cm margins • **Ewing's Sarcoma** (15yo, Long Bone/Ribs/Pelvis/Scapula, tumefaction, adults present w/ extra-osseous sarcoma "onion skinning" (concentric calcification) surrounding central liquefactive necrosis (mimicking osteomyelitis) on X-ray, t11:22, very malignant, small round blue cells that form psuedorosettes (5 Small Blue Cell Tumors: Lymphoma, Ewing, Rhabdomyosarcoma, Neuroblastoma, Small Cell Lung), Surgical Excision, Chemo, Radiation (but may form osteosarcoma at site of radiation)
Connective Tissue	• **Desmoid Tumor** ("internal malignant scar", usually in abdomen/pelvis, some hormonally stimulated, some occur w/ Gardner's Syndrome, usual sarcoma Tx but also agents like Tamoxifen if hormone stimulated and NSAIDs like Sulindac are found to be helpful) • **Giant Cell Tumor** (found on tendon sheaths of extremities, usual sarcoma Tx but also agents like IFN-alpha) • **Dermatofibrosarcoma Protuberans** (slow growing skin lesions, weird in that it is CD34+, responds to Gleevec)	• **Gastro-Intestinal Stromal Tumors (GIST)** (refer) • **Malignant Fibrous Histiocytoma** (most sarcomas were Dx as this in the 1980s until IHC had been able to differentiate them into other types such that this tumor does not really exist therefore if you can't categorize a sarcoma then call it this or call it spindle cell sarcoma not otherwise specified) • **Synovial Sarcoma** (not related to synovium, very aggressive) • **Fibrosarcoma**
Skeletal Muscle	• **Rhabdomyoma**	• **Rhabdomyosarcoma** (most common pediatric soft tissue sarcoma, 40% HEENT: orbital, nasopharyngeal, middle ear, neck, 20% GU: bladder, vaginal, uterine, 20% Ext,
Smooth Muscle	• **Leiomyoma**	• **Leiomyosarcoma**
Adipose	• **Lipoma**	• **Liposarcoma** (most common adult soft tissue sarcoma)
Vascular	• **Benign Glomus Tumor**	• **Malignant Glomus Tumor**
Neuro		• **Neuroectodermal Tumor**