MUSCULOSKELETAL SOFT TISSUE TUMORS

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GANGLION CYST

- Misnomer, not related to ganglion cells of nervous system
- Appears near joint capsule or tendon sheath
- The soft tissue undergoes cystic degeneration
- No cellular lining, does not communicate with joint space
- Most common site: wrist joint, foot
- Appears firm, pea-sized translucent nodule

SYNOVIAL CYST

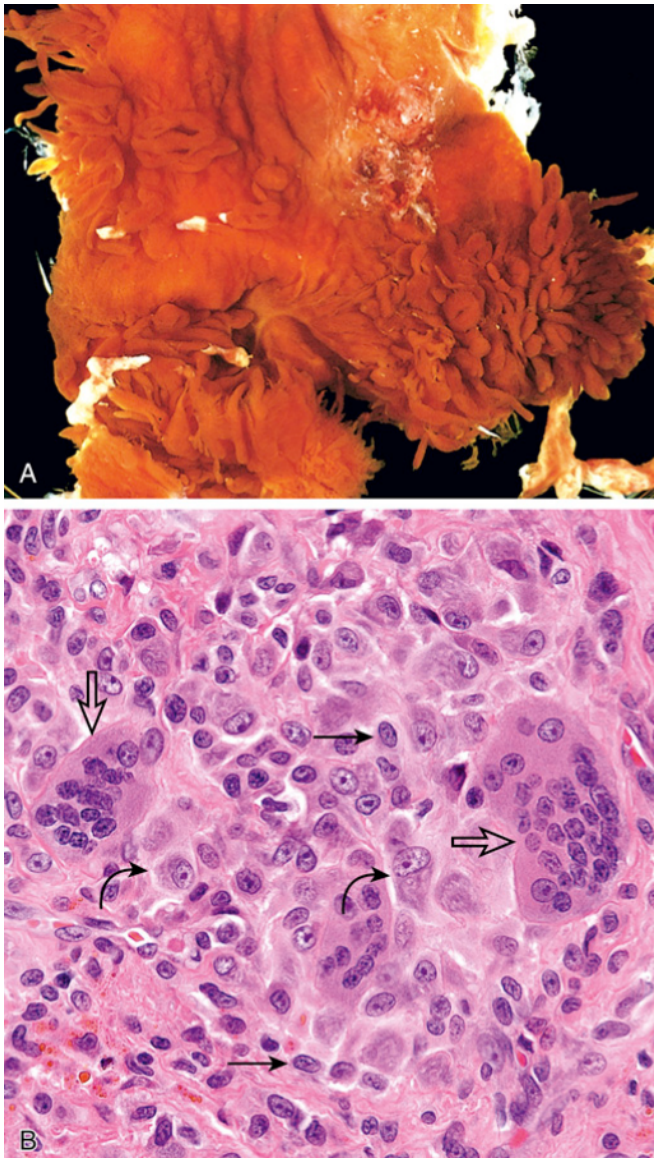
- Herniation of synovium through joint capsule into soft tissue
- Appears in the setting of rheumatoid arthritis or osteoarthritis
- Histologically: synovial lining, inflammation, fibrin
- Most common site: popliteal space (called Baker cyst)

TENOSYNOVIAL GIANT CELL TUMOR

- Benign tumor that arises in synovium of joints and tendon sheath
- Can be localized (small tumor, commonly in the hand, painless, well-circumscribed), or diffuse (large tumor, knee joint, called “pigmented villonodular synovitis”, causing pain, swelling, limitation of movement, sometimes a palpable mass)
- Appears in middle age adults
- t(1;2)(p13;q37), gene of type IV-collagen fuses with monocyte colony-stimulating factor gene, result in production of large amount of macrophages

MORPHOLOGY

- Grossly: red or brown (pigmented)
- Tumors show nodules and finger-like projections
- Diffuse tumors fill the knee join space
- Neoplastic cells form a minority of tumor cells, appear polygonal and medium size (similar to synoviocytes). The majority of tumor cells are macrophages (containing hemosiderin) and multinucleated giant cells



- enosynovial giant cell tumor. (A) Diffuse type: excised synovium with fronds and nodules. (B) Histologically, there is a mixed cell population, including epithelioid cells (curved arrow), mononuclear stromal cells (thin arrow), and osteoclast-like giant cells (thick arrow)

SOFT TISSUE TUMORS

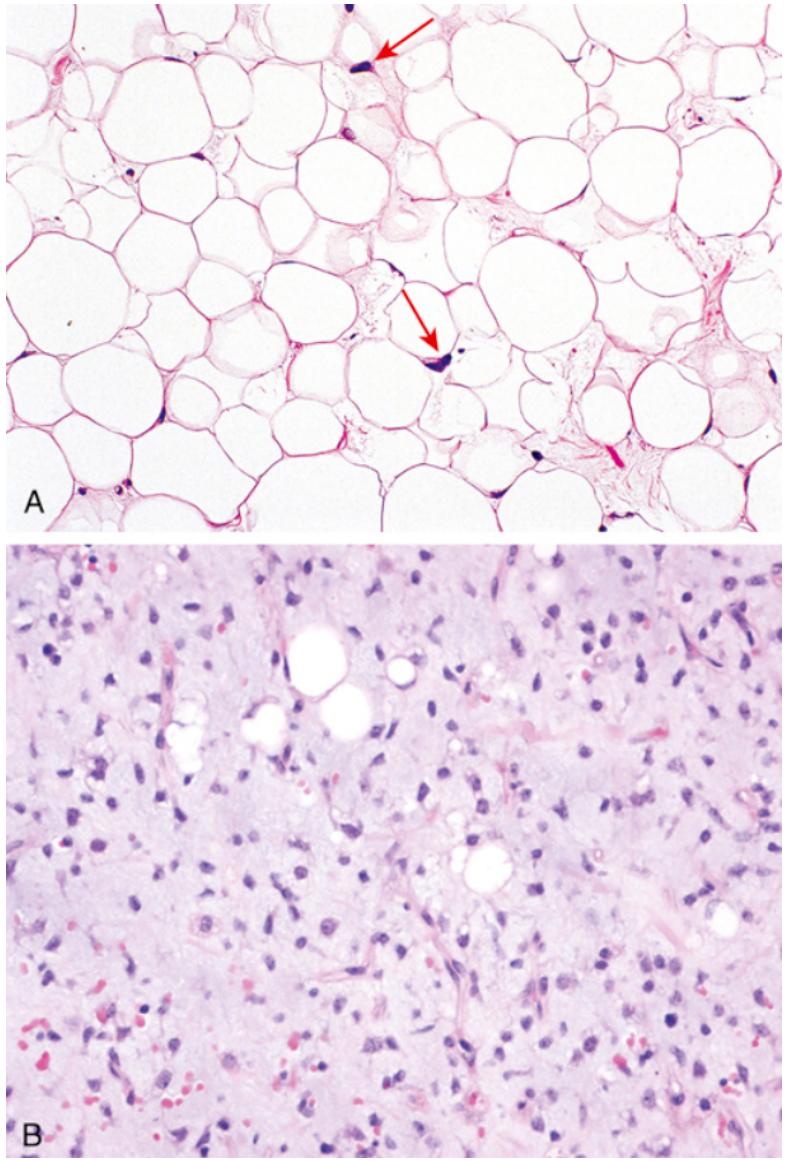
- Benign tumors are more common than malignant (except for skeletal muscle tumors)
- Sarcomas are generally rare tumors, aggressive, lack effective treatment
- Most common site: extremities (especially thigh)
- 15% of cases arise in children, carry germline mutations
- Most cases are sporadic, rarely associated with syndromes (Li-Fraumeni, neurofibromatosis)
- In contrast to carcinoma and lymphoma, most tumors arise from pluripotent mesenchymal stem cells that acquire genetic mutations
- 80% of sarcomas show complex karyotype (multiple chromosomal gains or losses), while 15% show simple karyotype

LIPOMA

- Benign tumor with adipose tissue differentiation
- The most common soft tissue tumor in adults
- Well-circumscribed tumor, appears in subcutis of extremities or trunk, middle age adults
- Histologically appears like normal adipose tissue

LIPOSARCOMA

- Malignant tumor with adipose tissue differentiation
- Most common sarcoma in adults
- Patients are in 50s-60s
- Appears deep in the thigh or retroperitoneum
- Three types:
- 1) well-differentiated: MDM2 and P53 mutations, good prognosis
- 2) myxoid: t(12;16), intermediate prognosis
- 3) pleomorphic: complex karyotype, poor prognosis



- Liposarcoma. (A) The well-differentiated subtype consists of mature adipocytes and rare, atypical stromal (red arrows) cells with hyperchromatic nuclei. (B) Myxoid liposarcoma with abundant basophilic background substance and a rich capillary network in which are scattered immature adipocytes.

NODULAR FASCIITIS

- Benign tumor of fibroblasts
- Arises in upper extremities of young adults
- t(17;22)(MYH9-USP9) gene fusion
- Self-limited proliferation, spontaneous regression

FIBROMATOSIS

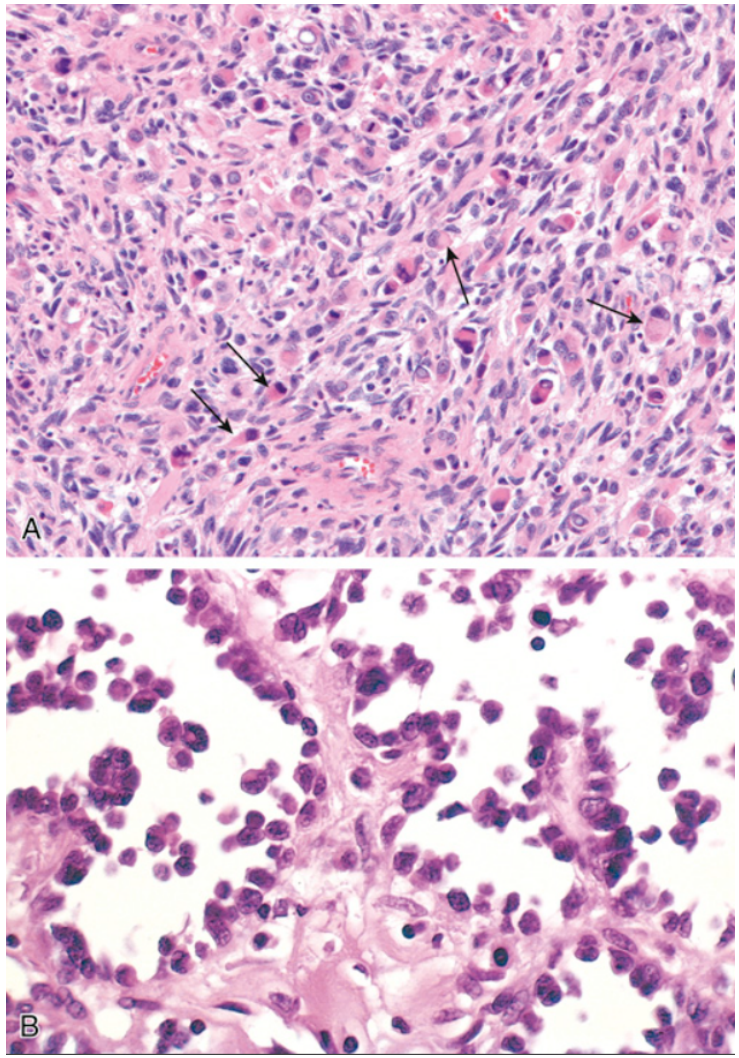
- Benign tumor of fibroblasts
- Can be superficial or deep (called desmoid), abdomen
- Large mass with infiltrative margins, frequently recur but do not metastasize
- Carry mutation in CTNB1 (β-catenin) and APC (adenomatous polyposis coli) genes
- Most cases are sporadic, but may appear in Gardner syndrome (familial adenomatous polyposis coli)

RHABDOMYOSARCOMA

- Malignant mesenchymal tumor with skeletal muscle differentiation
- Four types:
- Alveolar and embryonal: most common sarcomas in children and adolescents
- Pleomorphic: appears in adults
- Spindle cell: appears in any age groups
- Pediatric rhabdomyosarcoma arises in head and neck, or genitourinary areas
- Alveolar rhabdomyosarcoma carry a mutation in PAX3 gene (FOXO3-PAX3) that interferes with normal skeletal muscle differentiation

MORPHOLOGY

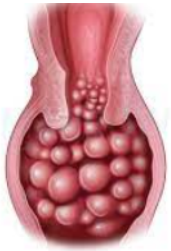
- **Embryonal rhabdomyosarcoma:** very cellular tumor, malignant cells appear as different stages of skeletal muscle maturation (from primitive to rhabdomyoblasts with cytoplasmic striation).
- **Alveolar rhabdomyosarcoma:** tumor shows empty spaces like lung alveoli, malignant cells are loosely cohesive



- Rhabdomyosarcoma. (A) Embryonal subtype composed of malignant cells ranging from primitive and round to densely eosinophilic with skeletal muscle differentiation (arrows). (B) Alveolar rhabdomyosarcoma with numerous spaces lined by dyscohesive, uniform round tumor cells

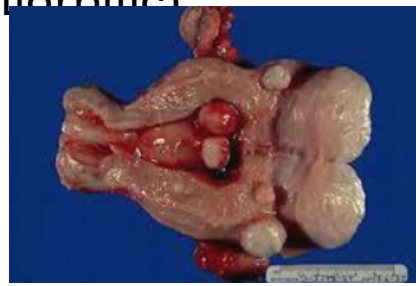
SARCOMA BOTRYOIDES

- A variant of embryonal rhabdomyosarcoma
- Affects children
- Arises in the walls of hollow organs (urinary bladder and vagina)
- Appears like a bunch of grapes
- Good prognosis



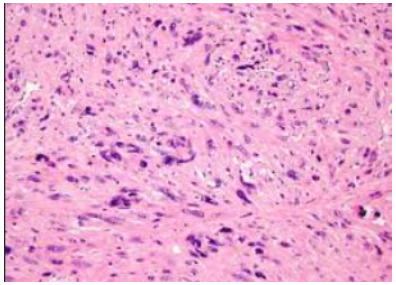
LEIOMYOMA

- Benign tumor of smooth muscle differentiation
- Commonly arises in uterus (myometrium, called fibroids), but also in skin (erector pili muscle) and soft tissue
- Germ-line mutation in fumarate hydratase (FH) gene results in loss of function, patients develop multiple leiomyomas and renal cell carcinoma
- Leiomyomas are small, well circumscribed, similar morphology to normal smooth muscles (spindle cells, eosinophilic cytoplasm, monomorphic)



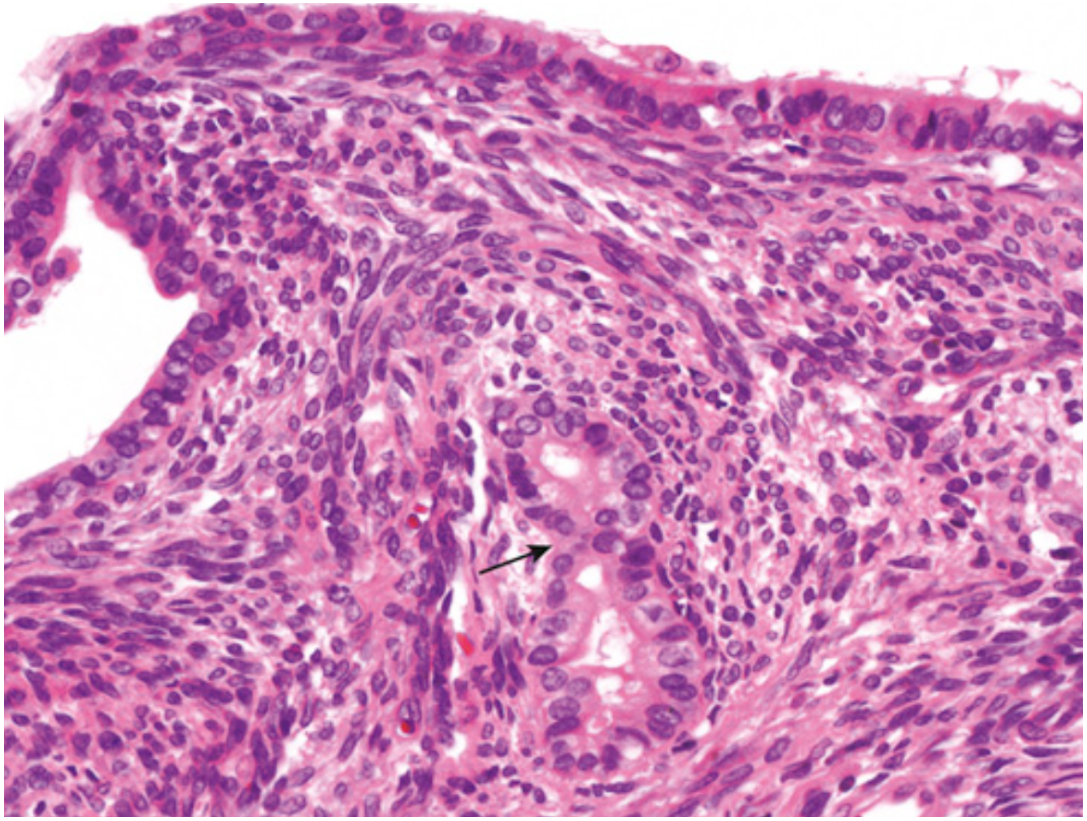
LIOMYOSARCOMA

- Malignant tumor that shows smooth muscle differentiation
- 10%-20% of sarcomas
- Old age
- Arises in deep soft tissue of extremities, uterus, retroperitoneum, great blood vessels (inferior vena cava)
- Complex karyotype
- Morphology: spindle cells, pleomorphic, numerous mitosis



SYNOVIAL SARCOMA

- Tumor that arises near joint
- Adolescents and middle age adults
- Carries translocation (X;18)(SS18;SSX), produces chimeric proteins that interfere with normal chromatin remodeling
- Morphology: monophasic: spindle cell sarcoma, or biphasic: spindle cell and gland-like structures



- Synovial sarcoma showing the classic biphasic spindle cell and glandlike (arrow) histologic appearance