Bone Tumors

(1) Bone Forming Tumors :

The tumor cells in the following neoplasms all produce bone that is usually woven and variably mineralized by the neoplastic cells.

- Benign Tumors :

	A- Osteoma	B- Osteoid osteoma	c- Osteoblastoma
Definition	They are benign lesions that represent developmental aberrations or reactive growths rather than true neoplasms.	They are benign neoplasms that have very similar histological features but differ in: 1- size 2- site of origin 3- radiographic features.	
Site	At any site but most commonly in the head and neck, including the paransan sinuses.	The proximal femur and tibia	Vertebral column
Morphology G.P	Osteomas are usually solitary and present as: localized, slowly growing, hard, exophytic masses on bone surface	round-to-oval masses of hemorrhagic gritty tan tissue : They are less than 2 cm in the greatest dimenstion.	round-to-oval masses of hemorrhagic gritty tan tissue : Larger than 2 cm.
Morphology M.P	osteomas are a bland mixture of woven and lamellar bone.	**They are the same in microscopic picture showing :** 1- both neoplasms are composed of interlacing trabeculae of woven bone surrounded by osteoblasts . 2- The intervening stroma is loose, vascular connective tissue containing variable numbers of giant cells.	
Clinical features	- They are not invasive and do not undergo malignant transformation. - **BUT** may cause local: 1- mechanical problems(e.g obstruction of a sinus cavity) 2- cosmetic deformities	Local pain which can usually be relieved by aspirin.	Unlocalized pain which is not responsive to aspirin

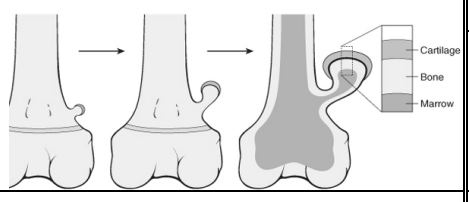
- Malignant Tumors : → (osteosarcoma)

It's a malignant mesenchymal neoplasms in which the neoplastic cells produce osteoid.

	- Primary Osteosarcoma	- secondry Osteosarcoma
Definition	It is the most common type of osteosarcoma which is idiopathic primary, solitary, intramedullary, and poorly differentiated, producing a predominantly bony matrix.	It arises as a complications of : Paget disease – Bone infarcts - prior irradiation
Site	Any bone can be involved but most tumors arise in the metaphyseal region of the long bones of the extremities, with most : 60% in knee - 15% around the hip - 10% at the shoulder - 8% in jaw	
Morphology G.P	- Osteosarcomas are gritty, gray-white tumors, often exhibiting hemorrhage and cystic degeneration. - spread extensively in the medullary canal, infiltrating and replacing the marrow	**-**Tumors frequently destroy the surrounding cortices and produce soft tissue masses **-** infrequently penetrating the epiphyseal plate or entering the joint space
Morphology M.P	Tumor cells vary in size and shape, and frequently have large hyperchromatic nuclei; bizarre tumor giant cells and mitoses are common **- The production of mineralized or unmineralized bone (osteoid) by malignant cells is essential for diagnosis of osteosarcoma.** - The neoplastic bone is typically coarse and ragged but can also be deposited in broad sheets. - When malignant cartilage is abundant, the tumor is called a **chondroblastic osteosarcoma.**	- Cartilage and fibrous tissue can also be present in varying amounts. - Vascular invasion is common, as is spontaneous tumor necrosis.
Clinical features	- They present as painful enlarging masses and pathologic fracture can be the first symptom. - Osteosarcomas typically spread hematogenously; at the time of diagnosis, approximately 10% to 20% of patients have demonstrable pulmonary metastases.	

(2) Cartilaginous Tumors :

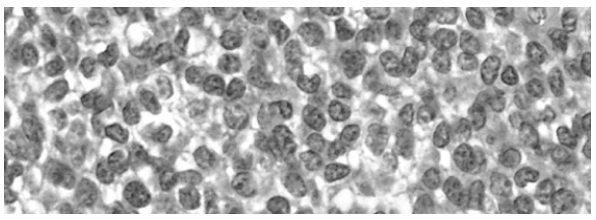
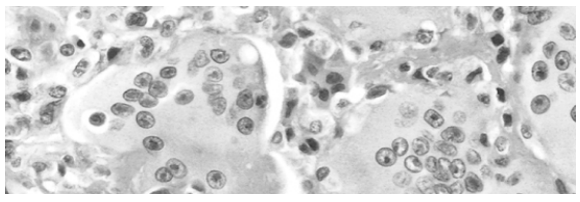
- Benign Tumors :

	A- Osteochondroma	B- Chondroma
Definition	- They are benign proliferations composed of mature bone and a cartilaginous cap attached attached by a bony stalk to the underlying skeleton.	**- They are benign tumors of hyaline cartilage :** When they arise within the medulla → they are called ***enchondromas*** When on the bone surface → they are called ***juxtacortical chondromas***
Site	- Osteochondromas develop only in bones of endochondral origin arising at the metaphysis near the growth plate of long tubular bones, especially about the knee; - They develop from bones of: the pelvis, scapula, and ribs, and in these sites are frequently sessile 	- Small bones of hands and feet (mostly the proximal phalanges). Two syndromes characterized by multiple chondromas, both disorders have 25% risk of malignant transformation to chondrosarcoma : A- **Ollier's disease** → Multiple enchodromas associated with soft tissue. B- **Maffucci's syndrome** → Multiple enchodromas associated with soft tissue hemagiomas.
Morphology G.P		Enchondromas are gray-blue, translucent nodules usually smaller than 3 cm.
Morphology M.P	- Osteochondromas vary from 1-20cm in size. - The cap is benign hyaline cartilage, resembling disorganized growth plate undergoing endochondral ossification. - Newly formed bone forms the inner portion of the head and stalk, with the stalk cortex merging with the cortex of the host bone	- There is well-circumscribed hyaline matrix and cytologically benign chondrocytes. - At periphery, there is endochondral ossification, **while** the center calcifies & dies. - In hereditary multiple chondromatoses, the islands of cartilage exhibit greater cellularity and atypia, making them difficult to distinguish from chondrosarcoma.
Clinical features	- Osteochondromas are slow-growing masses that are painful when they compress on a nerve or if the stalk is fractured. - deformity of the underlying bone suggests an associated disturbance in epiphyseal growth. - Osteochondromas rarely progress to chondrosarcoma or other sarcoma,	- they are painful or cause pathologic fractures - The growth potential of chondromas is limited, - Solitary chondromas rarely undergo malignant transformation, but those associated with enchondromatoses are at increased risk.

- Malignant tumors : → (Chondrosarcoma)

Definition	They are malignant neoplasms populated by mesenchymal cells that produce a cartilaginous matrix. *(unlike cartilage-forming osteosarcoma, the neoplastic cells don't form osteoid)*
Site	Central portions of the skeleton, common sites of origin include the shoulder area, pelvis, proximal femur, and ribs.
Morphology	- arise within the medullary cavity of the bone to form an expansile glistening mass that often erodes the cortex - They exhibit malignant hyaline and myxoid cartilage. - In **myxoid chondrosarcomas,** the tumors are: 1-viscous and gelatinous, 2- Spotty calcifications are present, 3- and central necrosis can create cystic spaces. - The adjacent cortex is thickened or eroded, - **Low-grade tumors** → resemble normal cartilage. **Higher grade lesions →** contain pleomorphic chondrocytes, Multinucleate cells are present with lacunae containing two or more chondrocytes
Clinical features	- They present as painful, progressively enlarging masses involving the central portion of the skeleton. - A slowly growing **low-grade tumor** →causes reactive thickening of the cortex, while more aggressive **high-grade tumor →** destroys the cortex and forms a soft tissue mass - Chondrosarcomas metastasize hematogenously, most often to the lungs and skeleton.

(3) Miscellaneous Tumors :

	A- Ewing's sarcoma primitive neuroectodermal tumors (PNETs)	B- Giant cell tumor (osteoclastoma)
Definition	- Ewing sarcoma and primitive neuroectodermal tumors (PNETs) are primary malignant small round-cell tumors of bone and soft tissue. - Because they share an identical chromosome translocation, they should be viewed as the same tumor, differing only in degree of differentiation.	- It's it is benign tumor but locally aggressive. - It's named osteoclastoma because it contains a profusion of multinucleated osteoclast-type giant cells.
Site	Diaphysis of long bones, pelvis.	It arises in the epiphysis of long bones around the knee (distal femur and proximal tibia)
Morphology G.P	- They arise in the medullary cavity and invade the cortex and periosteum to produce a soft tissue mass - The tumor is tan-white, frequently with hemorrhage and necrosis.	- Tumors are large and red-brown with frequent cystic degeneration.
Morphology M.P	It is composed of sheets of uniform small, round cells that are slightly larger than lymphocytes with few mitoses and little intervening stroma (Fig. 21-14).  - The cells have scant glycogen-rich cytoplasm. - The presence of **Homer-Wright rosettes** (tumor cells circled about a central fibrillary space) indicates neural differentiation.	They are composed of sheets of uniform oval mononuclear cells with frequent mitoses, with scattered osteoclast-type giant cells containing 100 or more nuclei (Fig. 21-15).  - Necrosis, hemorrhage, and reactive bone formation are also commonly present.
Clinical features	- They present as painful enlarging masses . - the affected site is : → tender , warm , swollen. - systemic signs& symptoms→ fever, elevated erythrocyte sedimentation rate, anemia, leukocytosis	- They cause arthritis-like symptoms. - Although GCTs are histologically benign, roughly half recur after simple curettage, and as many as 4% metastasize to the lungs.