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الفريق العلمي

PATHOLOGY

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Bone-Forming Tumors

NOTE : All the T cells in the following neoplasms produce bone that is usually woven & variably mineralized.

***Woven bone**: (also known as **fibrous bone**) which is characterized by a haphazard organization of collagen fibers and is mechanically weak.
***Lamellar bone**: which has a regular parallel alignment of collagen into sheets ("lamellae") and is mechanically strong.

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*OSTEOMA : << OMA means benign >>

1) **Definition** : it is benign bone T, most commonly encountered in the head & neck, including the paranasal sinuses, typically seen in middle age(40-50y) . usually solitary , slowly growing

2) **Appear as** hard and exophytic masses on the bone surface { exophytic masses : كتل خارجية }
NOTE :osteoma is usually solitary BUT if it appeared as **multiple osteomas,** this is a feature of hereditary Gardner syndrome.

3) **Histological appearance** : a bland mixture of woven & lamellar bone { bland : خفيف / رقيق }

4) **It may cause** : a) cosmetic deformities
b) local mechanical problems (eg, obstruction of a sinus cavity or ear channal)
However, they are not invasive & do not undergo malignant transformation
[benign وهاد الي بخلينا نعتبرهم] :)

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*OSTEOID OSTEOMA & OSTEOBLASTOMA : << OMA means benign >>

- Both are benign & arising during 10 to 20y & with a male predilection (2:1 in osteoid osteomas)
- They are distinguished primarily by their : (1) size
(2) site of origin
(3) radiographical appearance, and circumscribed lesions

- They usually **involve the cortex** & rarely the medullary cavity

- The central area of the T is called (**nidus**) and it is radiolucent but may become mineralized & surrounded by sclerotic bone.
ملاحظة : radiolucent يعني بتبين بالصورة لونها اسود وهاد دلالة على انها فاضية

- **Differences** :

1) Osteoid osteomas arise most often in the proximal femur & tibia BUT Osteoblastomas arise most often in the vertebral column
2) Osteoid osteomas is less than 2 cm BUT Osteoblastomas is more than 2 cm
3) In Osteoid osteomas the pt. has localized pain usually relieved by aspirin BUT Osteoblastomas cause pain that is more difficult to localize & is not responsive to aspirin.

- **TTT of choice is** : Local excision (الاستئصال)

BUT note that ● Incompletely resected lesions can recur

يعني اذا تم استئصاله لكن بشكل غير كامل رح يرد يرجع

● Malignant transformation is rare unless the lesion is treated with radiation

يعني اذا لم يتم استئصاله او اذا ما كان في علاج اشعاعي بالمرة رح يتحول نوعه ل malignant

- **Grossly , both lesions are** :

1) round or oval masses of **hemorrhagic gritty tan tissue** (مهم) { gritty : رملي }
2) with a rim of sclerotic bone present at the edge of both types of T << it is much more conspicuous in osteoid osteomas (بتكون بال osteoid osteomas واضحة اكتر)

- **Histological appearance :**

- both are composed of interlacing trabeculae of woven bone surrounded by osteoblasts
- The intervening stroma consist of loose vascular connective tissue containing variable numbers of giant cells.

ملاحظة : ال nidus شو بكون فيها ؟

* loose connective tissue that is highly vascularized

*وهاد ال tissue بتكون من : (1) interlacing network of trabeculae of newly formed woven bone

(2) giant cells

*وحوالين ال nidus غالبا رح نلاقي zone of sclerotic bone يلي بتعمله ال osteoblasts

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*OSTEOSARCOMA :

- **Definition** :

It is **the most common primary malignant tumor of bone**, accounting for 20% of primary bone cancers; with 2000 new cases diagnosed annually in the US

- **Distribution among age groups** : it occurs among all age groups BUT :

- 75% of patients are younger than age 20.
- the second peak occur in the elderly people that have other conditions, including :1) Paget disease
  2) Bone infarcts
  3) Prior irradiation

- **M/F ratio** = 1,6 / 1

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- **Tumor site** : any bone can be involved, but most tumors arise in the metaphyseal region of the long bones of the extremities with : * 60% >> at the knee
  * 15% >> around the hip
  * 10% >> at the shoulder
  * 8% >>in the jaw

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- **How can we recognize the subtype of osteosarcoma** :

1) site of involvement within the bone (medullary vs cortical)
2) degree of differentiation
3) solitary vs multicentric
4) presence of underlying disease
5) histologic variants

~~~~**The most common type of OS is :** primary, intramedullary, poorly differentiated, solitary

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- **Morphology** :

- It is hard, gritty, white turnip like tumor, often exhibiting hemorrhage & cystic degeneration.
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T frequently infiltrate & destroy the surrounding cortices & produce soft tissue masses

بكون شكل الtumor هاد نفس شكل نبات اللفت , ولأنه ورم خبيث فلازم اضل حاطة ببالي انه بده يضل يكسر ويكسر ويكسر شغلات كتير ، فبعمل cystic degradation & ما بكتفي انه يخبص بس بال medullary cavity . انما كمان بوصل ال cortex وبقعد يكسر فيها. **Necrosis & vascular invasion are very common**.

- NOTE خارجية :) In most sarcomas, soft tissue masses occur for no apparent reason
  *__Soft tissue sarcoma__ is a rare type of cancer that begins in the tissues that connect, support and surround other body structures.

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- **Histology** :

1) pleomorphic tumor cells (osteoblasts) that have large hyperchromatic nuclei
2) bizarre tumor giant cells & mitoses are common
3) Necrosis & vascular invasion are very common.

4) production of osteoid {mineralized or unmineralized} by the malignant osteoblasts >> this is very essential for diagnosis
5) The neoplastic bone is typically coarse & ragged BUT can also be deposited in broad sheets.

6) Cartilage & fibrous tissue can also be present in varying amounts. When malignant cartilage is abundant, the T is called a **chondroblastic osteosarcoma**

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- **Spread** : **EXTENSIVELY** >> OS spread in the medullary canal, infiltrating & replacing the marrow
  **INFREQUENTLY** >> OS penetrate the epiphyseal plate or enter the joint space

- **FOR making secondaries :**
  -OS typically spread hematogenously; at the time of diagnosis, up to 20% of patients have demonstrable pulmonary secondaries

- **Secondary OS** are highly aggressive T that do not respond well to therapy
  occur in older age group than do primary OS.
  They most commonly develop in the setting of Paget disease or past radiation exposure

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- **Pathogenesis :**

1) Development of OS is associated with several genetic mutations (eg, **RB gene mutations**)

- RB gene mutations occur in : - 70% of sporadic tumor
  - individuals with hereditary retinoblastomas
- note : hereditary retinoblastomas occurs (due to mutations in the RB gene) and these pts. have a X1000 greater risk of developing OS.

2) **Spontaneous OS** >> mutations in genes that regulate the cell cycle including :

- p53
- cyclins
- cyclin-dependent kinases
- kinase inhibitors

3) Many OS develop **at sites of greatest bone growth**
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- **Clinically :**

1) painful enlarging mass
2) pathologic fracture
3) X-Ray >> Sunburst appearance & Codman triangle
   *__Sunburst appearance result from__ the reactive periosteal bone formation
   *__Codman triangle is__ a triangular shadow that appears between the cortex & raised periosteum

X-Ray usually show a large, **destructive, mixed lytic & blastic mass with indistinct infiltrating margins**, frequently breaking through the cortex & lifting the periosteum, resulting in vertical zones of reactive periosteal bone formation

ال tumor وهو قاعد بعمل infiltrating بكون بعمل invading & necrosis ..ولانه ورم اكيد بده يكون يعمل انقسامات كتيرة.
هلأ اول ما يوصل ال tumor لل periosteum ويعمللله lefting .. كردة فعل : ال periosteum بصير reactive وبصير يعمل bone formation ... هلأ هاي الخطوات رح تعمل Sunburst appearance

- **TTT** : chemotherapy & limb-salvage therapy ~~ standard treatment currently yields long-term survivals of 60% to 70%.