Primary malignant bone tumors of the Spine ñ a pictorial review

e-Poster: 1335

Congress: ESSR 2008

Type: Educational

Topic: Musculoskeletal / Bone

Authors: M.F..S. Seco, J. Brito, B. Graça, B.J. Gonçalves, F. Caseiro-Alves; Coimbra/PT

MeSH:

Spine [A02.835.232.834]

Bone Neoplasms [C05.116.231]

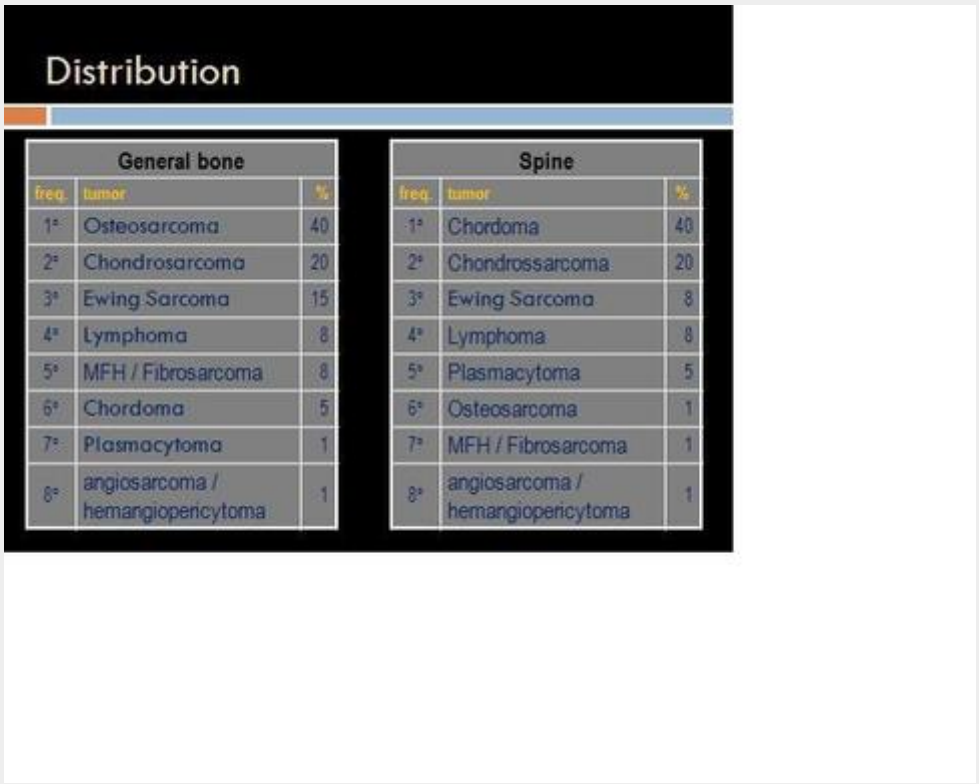
Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ESSR's endorsement, sponsorship or recommendation of the third party, information, product, or service. ESSR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.
As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited.
You agree to defend, indemnify, and hold ESSR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.
Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.
www.essr.org

1. Introduction

Primary malignant bone tumors of the spine are relatively rare when compared with metastatic disease and multiple myeloma. The last two usually manifest with multifocal lesions and thus pose little diagnostic dilemma.

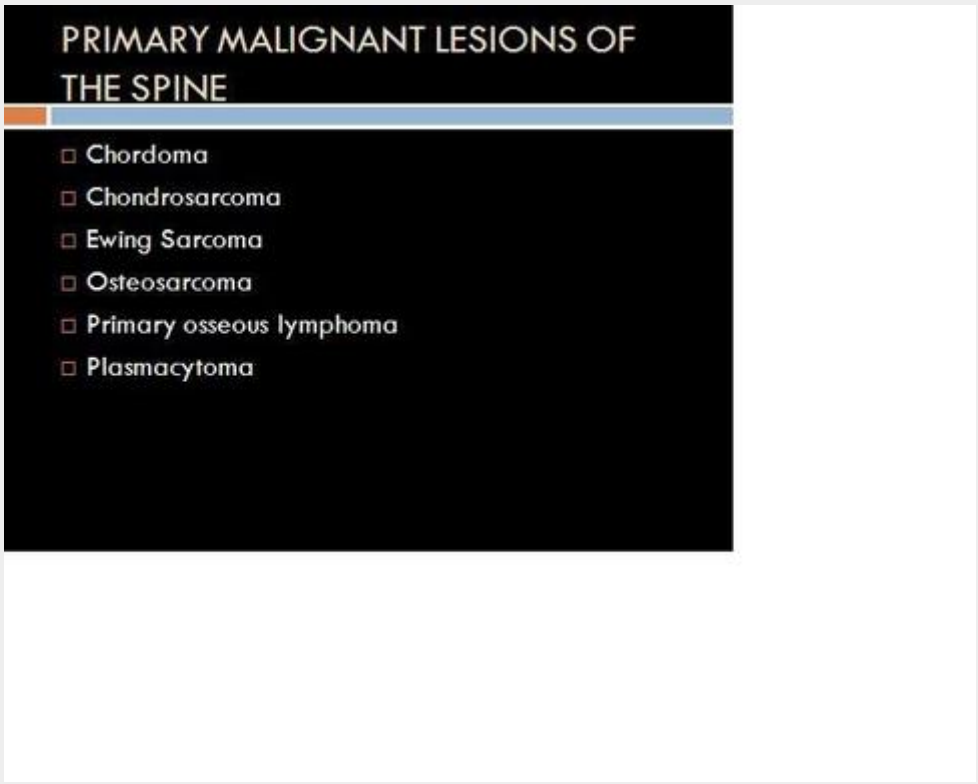
The aim of this presentation is to review the imaging findings of primary malignant bone tumors of the spine using a multimodality approach (X-Ray, CT, MR).

2.jpg



MFH – Malignant Fibrous Histiocytoma. Repair in the different distribution of malignant neoplasm in general bone and spine. For example osteosarcoma is the most frequent neoplasm in general bone, but it is rare in spine. On the other hand, chordoma is the most frequent in spine, and is relatively rare in general bone.

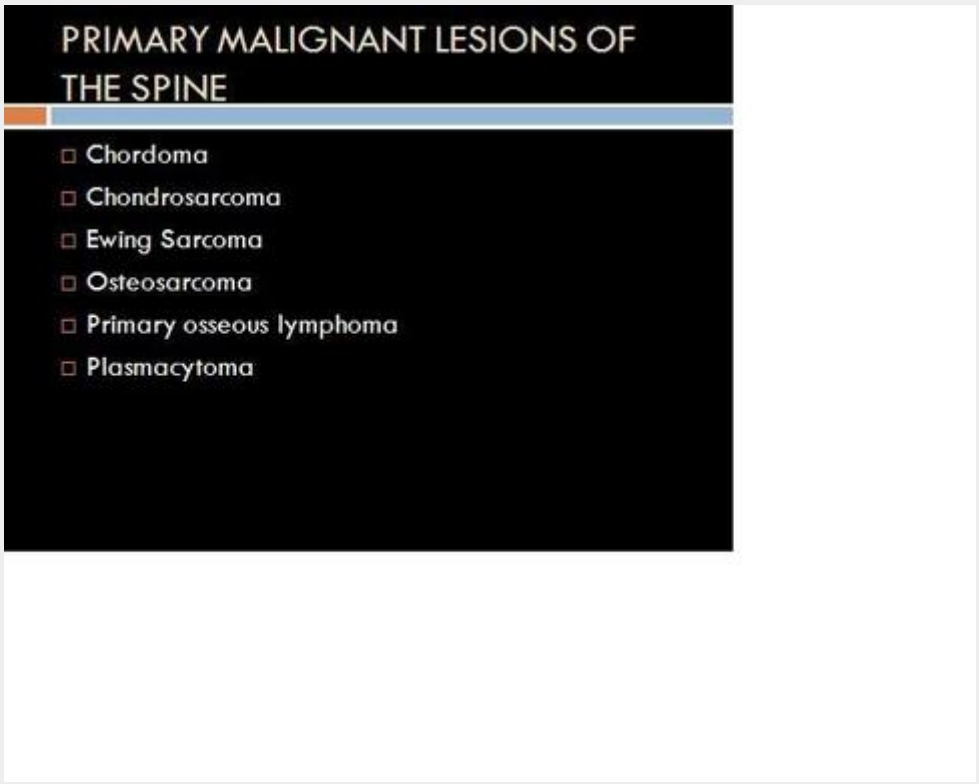
3.jpg



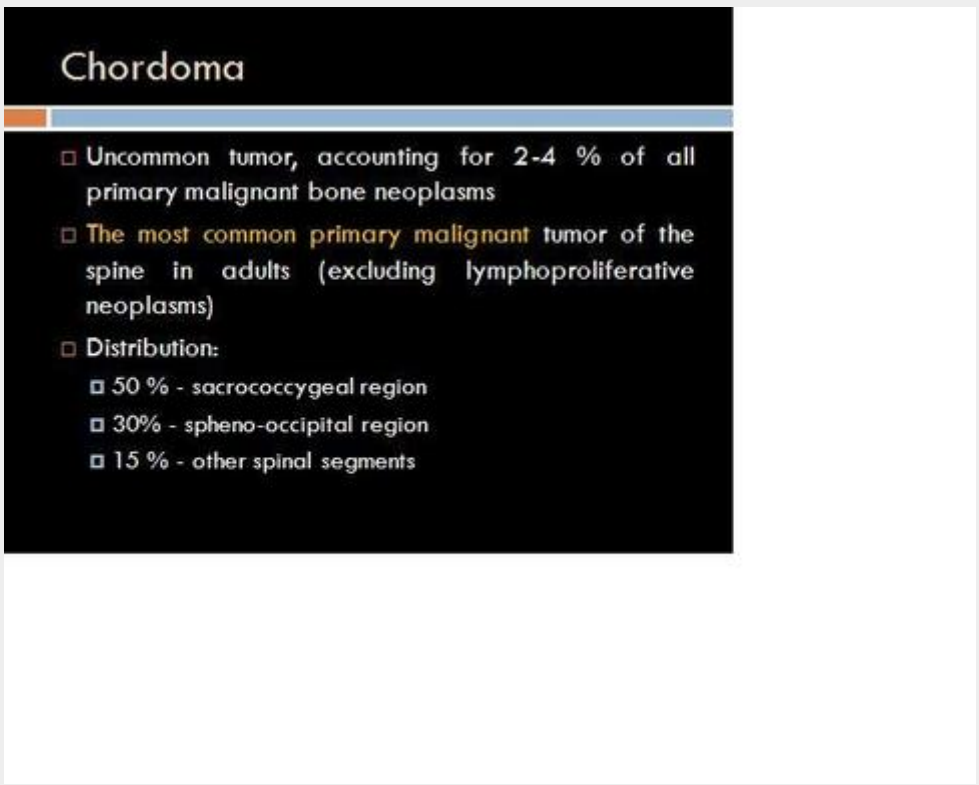
2. Discussion

Discussion.

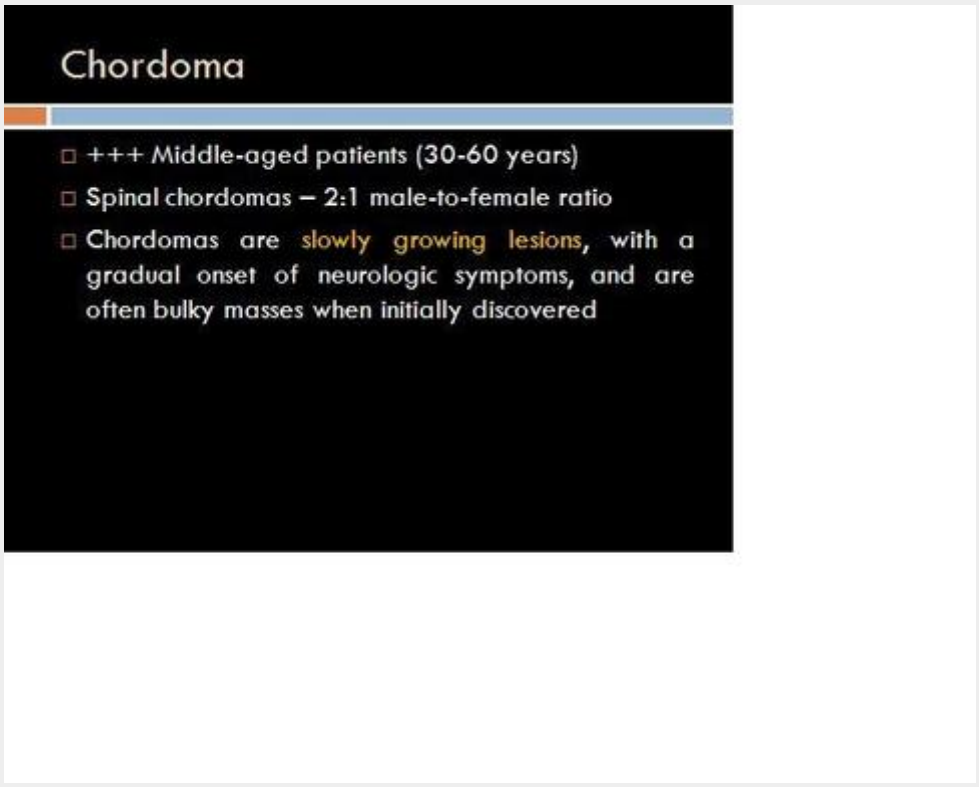
3.jpg


PRIMARY MALIGNANT LESIONS OF THE SPINE
Chordoma
Chondrosarcoma
Ewing Sarcoma
Osteosarcoma
Primary osseous lymphoma
Plasmacytoma

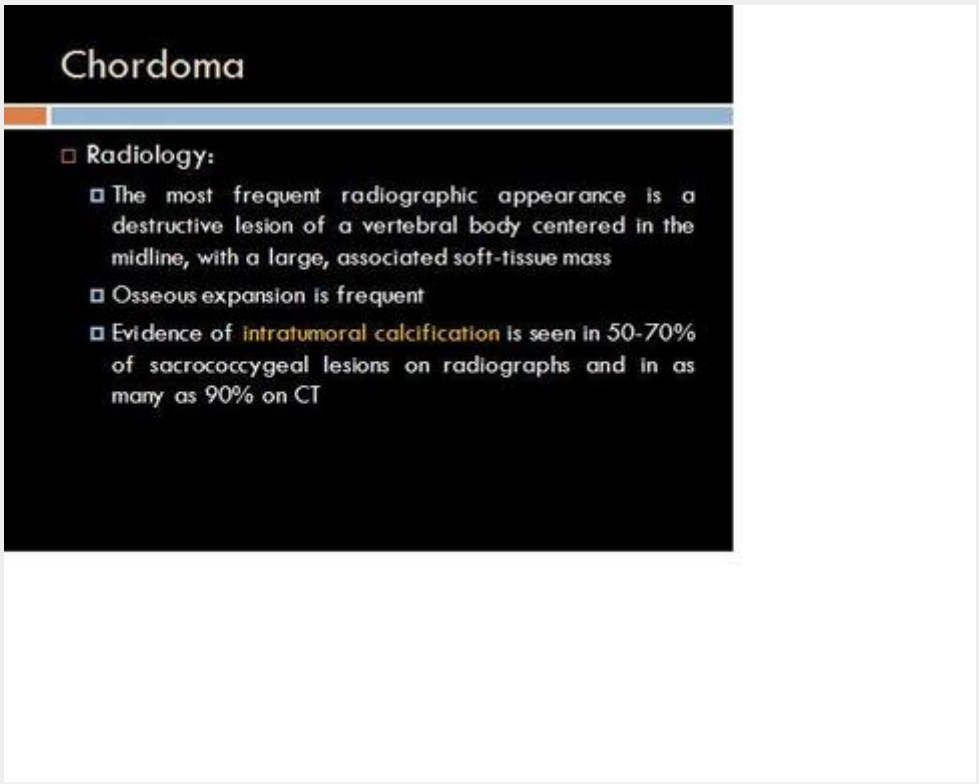
4.jpg


Chordoma
Uncommon tumor, accounting for 2-4 % of all primary malignant bone neoplasms
The most common primary malignant tumor of the spine in adults (excluding lymphoproliferative neoplasms)
Distribution:
50 % - sacrococcygeal region
30% - spheno-occipital region
15 % - other spinal segments

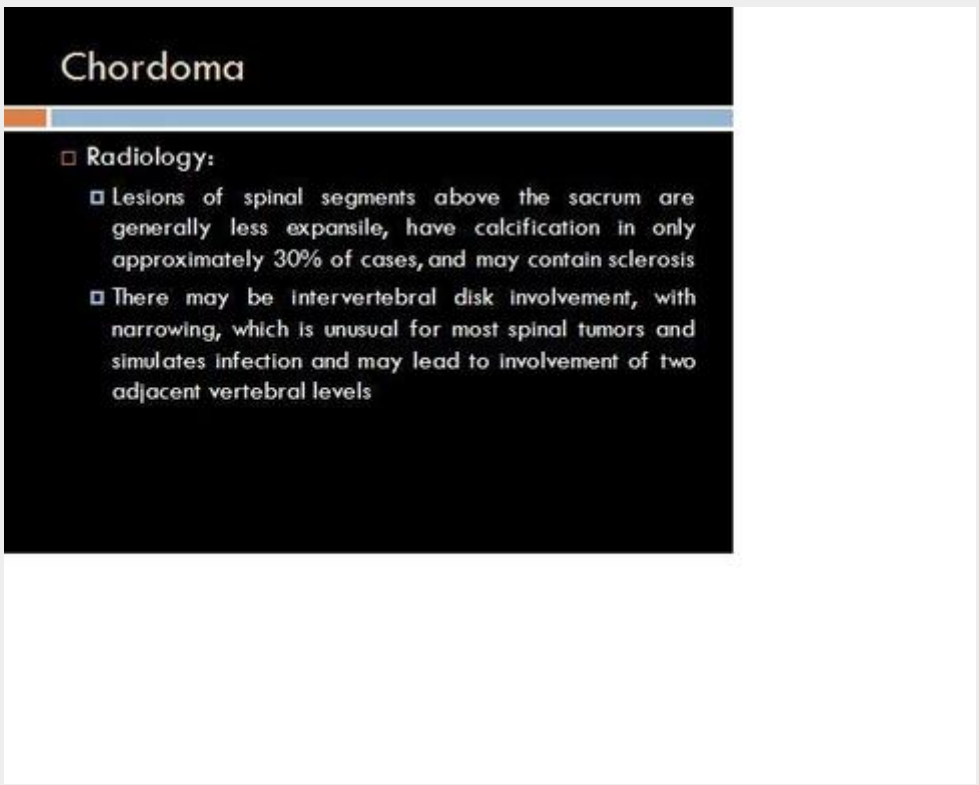
5.jpg


Chordoma
+++ Middle-aged patients (30-60 years)
Spinal chordomas – 2:1 male-to-female ratio
Chordomas are slowly growing lesions, with a gradual onset of neurologic symptoms, and are often bulky masses when initially discovered

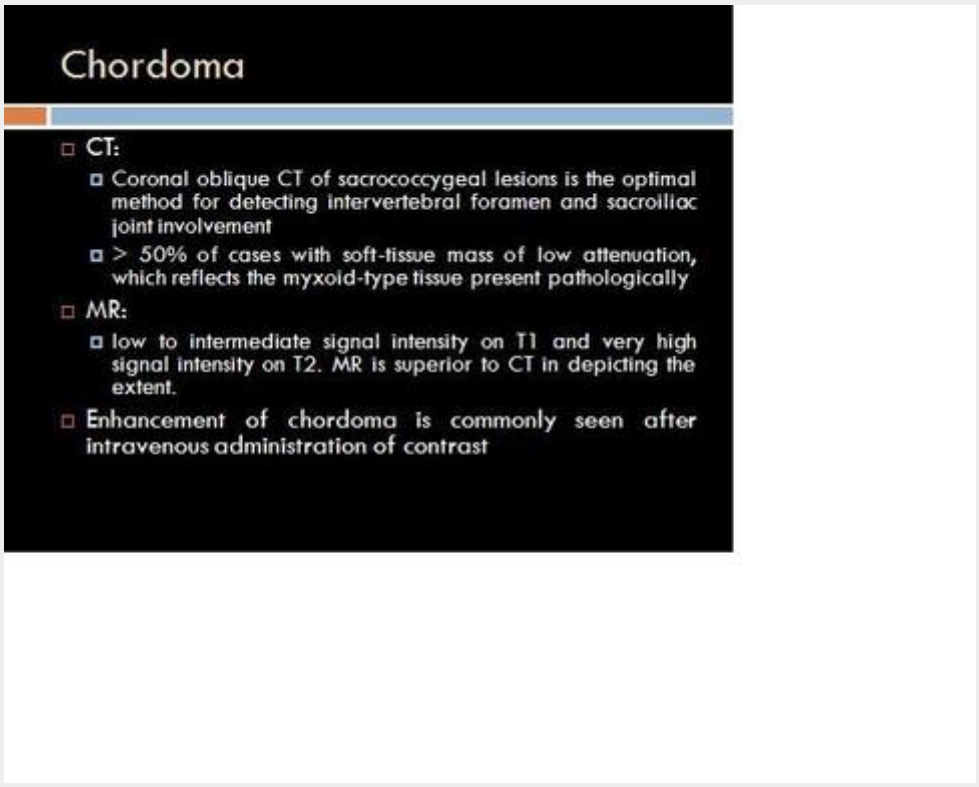
6.jpg


Chordoma
Radiology:
The most frequent radiographic appearance is a destructive lesion of a vertebral body centered in the midline, with a large, associated soft-tissue mass
Osseous expansion is frequent
Evidence of intratumoral calcification is seen in 50-70% of sacrococcygeal lesions on radiographs and in as many as 90% on CT

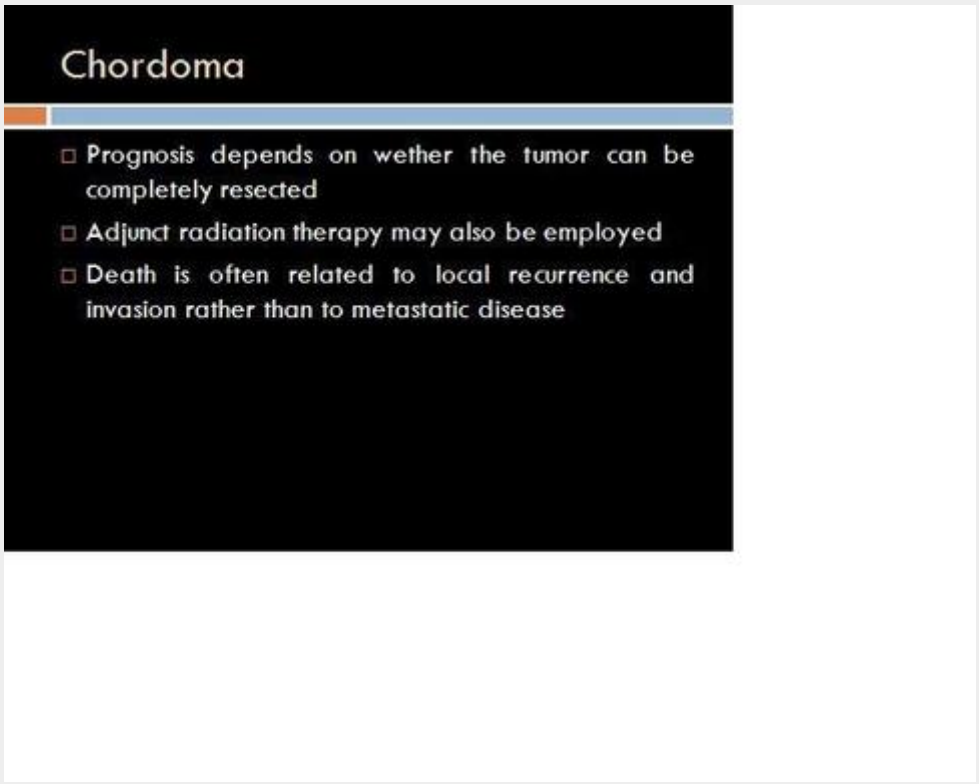
7.jpg


Chordoma
Radiology:
Lesions of spinal segments above the sacrum are generally less expansile, have calcification in only approximately 30% of cases, and may contain sclerosis
There may be intervertebral disk involvement, with narrowing, which is unusual for most spinal tumors and simulates infection and may lead to involvement of two adjacent vertebral levels

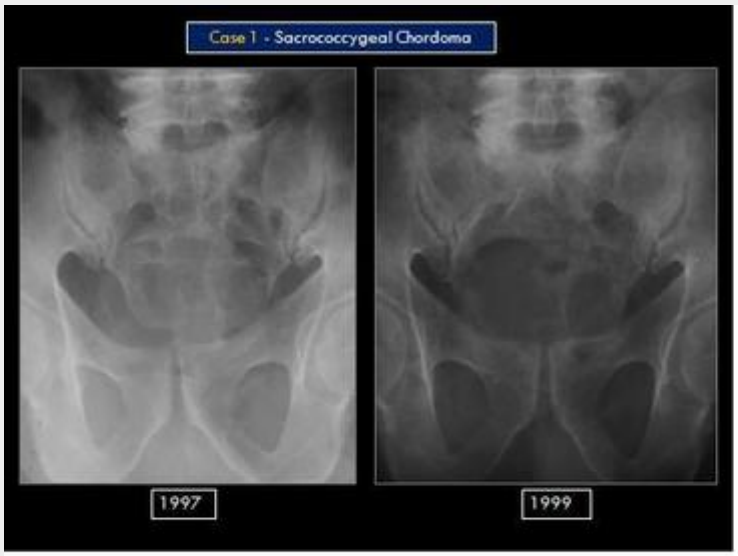
8.jpg


Chordoma
CT:
Coronal oblique CT of sacrococcygeal lesions is the optimal method for detecting intervertebral foramen and sacroiliac joint involvement
> 50% of cases with soft-tissue mass of low attenuation, which reflects the myxoid-type tissue present pathologically
MR:
low to intermediate signal intensity on T1 and very high signal intensity on T2. MR is superior to CT in depicting the extent.
Enhancement of chordoma is commonly seen after intravenous administration of contrast

9.jpg


Chordoma
Prognosis depends on wether the tumor can be completely resected
Adjunct radiation therapy may also be employed
Death is often related to local recurrence and invasion rather than to metastatic disease

10.jpg

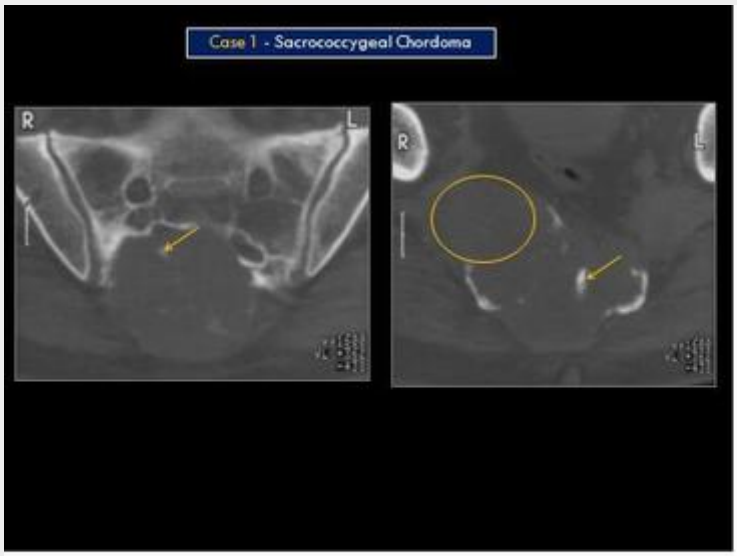


X-Ray and CT – Pelvis X-Ray obtained with two years interval (patient refused treatment in 1997) reveals a slow growing tumor. This case appears in the midline of sacrococcygeal region (the most frequent location for Chordoma) as a expansil lytic lesion, that spares the upper portion of sacrum. The soft-tissue mass has low density (circle), due to the myxoid-type tissue present pathologically. There are intra-tumoral calcifications (arrows) that usually represent destructed bone sequestrum (and not matrix calcification).

11.jpg

X-Ray and CT – Pelvis X-Ray obtained with two years interval (patient refused treatment in 1997) reveals a slow growing tumor. This case appears in the midline of sacrococcygeal region (the most frequent location for Chordoma) as a expansil lytic lesion, that spares the upper portion of sacrum. The soft-tissue mass has low density (circle), due to the myxoid-type tissue present pathologically. There are intra-tumoral calcifications (arrows) that usually represent destructed bone sequestrum (and not matrix calcification).

12.jpg

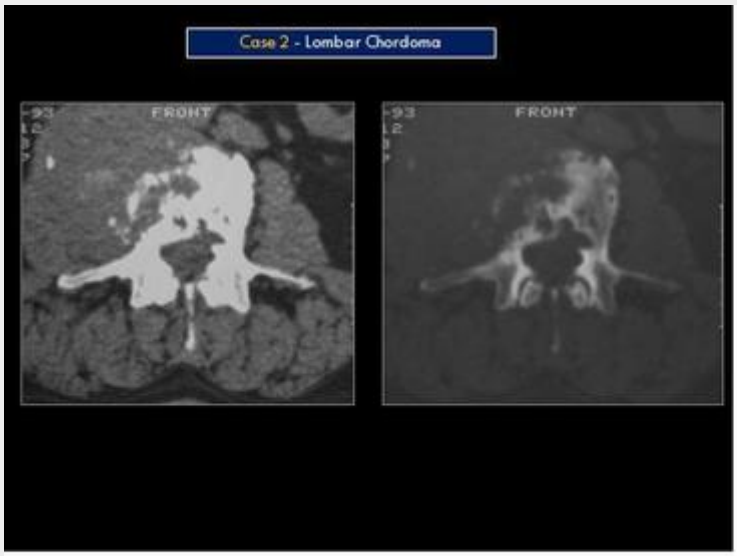


X-Ray and CT – Pelvis X-Ray obtained with two years interval (patient refused treatment in 1997) reveals a slow growing tumor. This case appears in the midline of sacrococcygeal region (the most frequent location for Chordoma) as a expansil lytic lesion, that spares the upper portion of sacrum. The soft-tissue mass has low density (circle), due to the myxoid-type tissue present pathologically. There are intra-tumoral calcifications (arrows) that usually represent destructed bone sequestrum (and not matrix calcification).

13.jpg

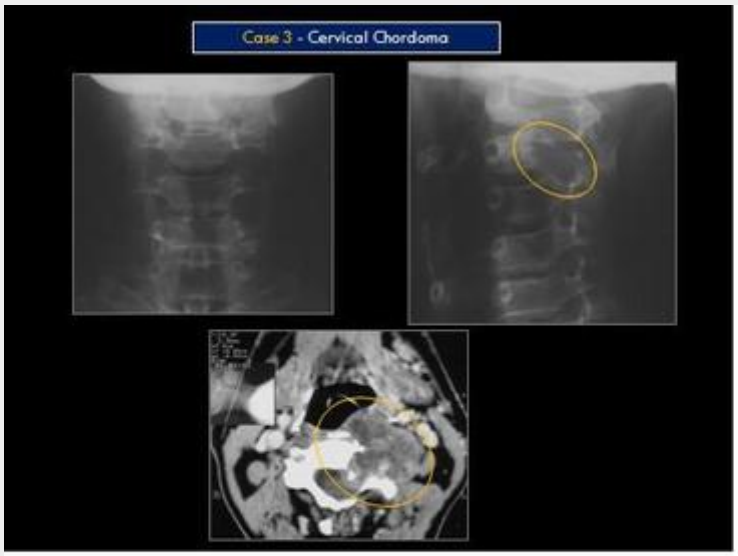
X-Ray and CT – In lombar spine the lesion usually arises from the transition between the anterior 2/3 with the posterior 1/3 of the vertebral body (place of remnants of notochord). Usually, lombar chordoma, as seen in this case, has a mixed pattern of lysis and sclerosis. There is a soft tissue mass with calcifications, intervertebral disk involvement with narrowing (can simulate infection!) and partial vertebral body collapse.

14.jpg



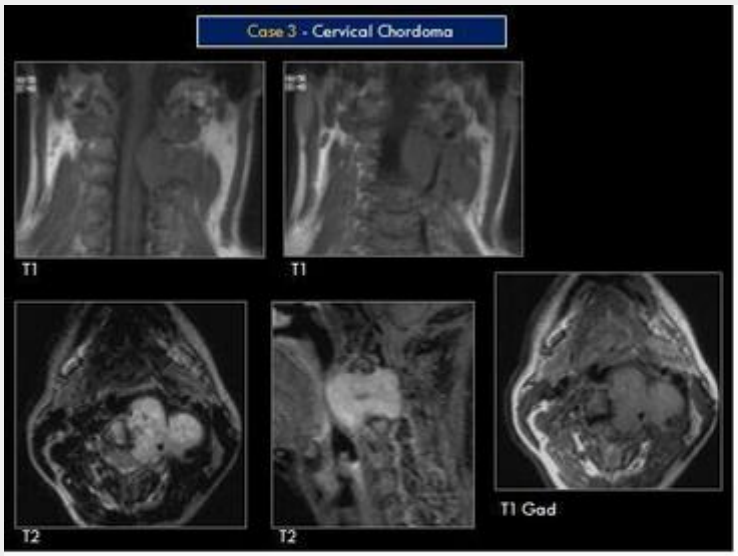
X-Ray and CT – In lombar spine the lesion usually arises from the transition between the anterior 2/3 with the posterior 1/3 of the vertebral body (place of remnants of notochord). Usually, lombar chordoma, as seen in this case, has a mixed pattern of lysis and sclerosis. There is a soft tissue mass with calcifications, intervertebral disk involvement with narrowing (can simulate infection!) and partial vertebral body collapse.

15.jpg



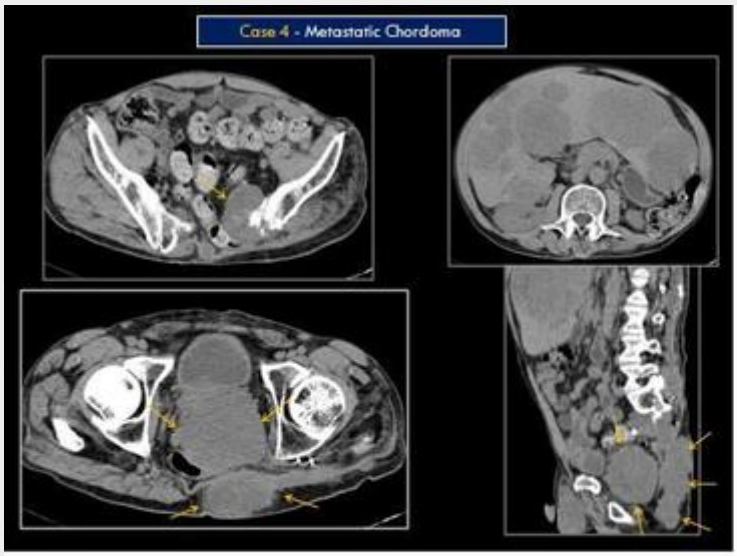
X-Ray, CT and MR – Osteolytic lesion, with a big and lobulated soft-tissue mass, that goes through an enlarged neural foramina extending to epidural and paravertebral space. There is low signal on T1, very high signal on T2 (myxoid content) with a weak but heterogeneous enhancement after gadolinium.

16.jpg



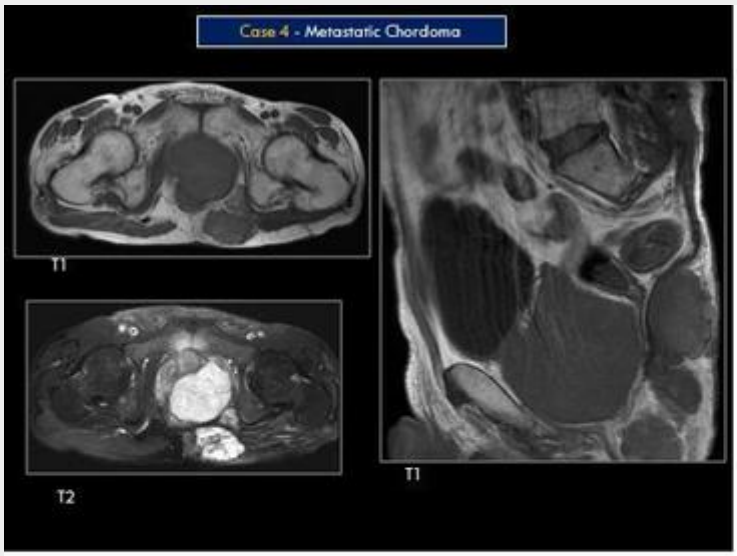
X-Ray, CT and MR – Osteolytic lesion, with a big and lobulated soft-tissue mass, that goes through an enlarged neural foramina extending to epidural and paravertebral space. There is low signal on T1, very high signal on T2 (myxoid content) with a weak but heterogeneous enhancement after gadolinium.

17.jpg



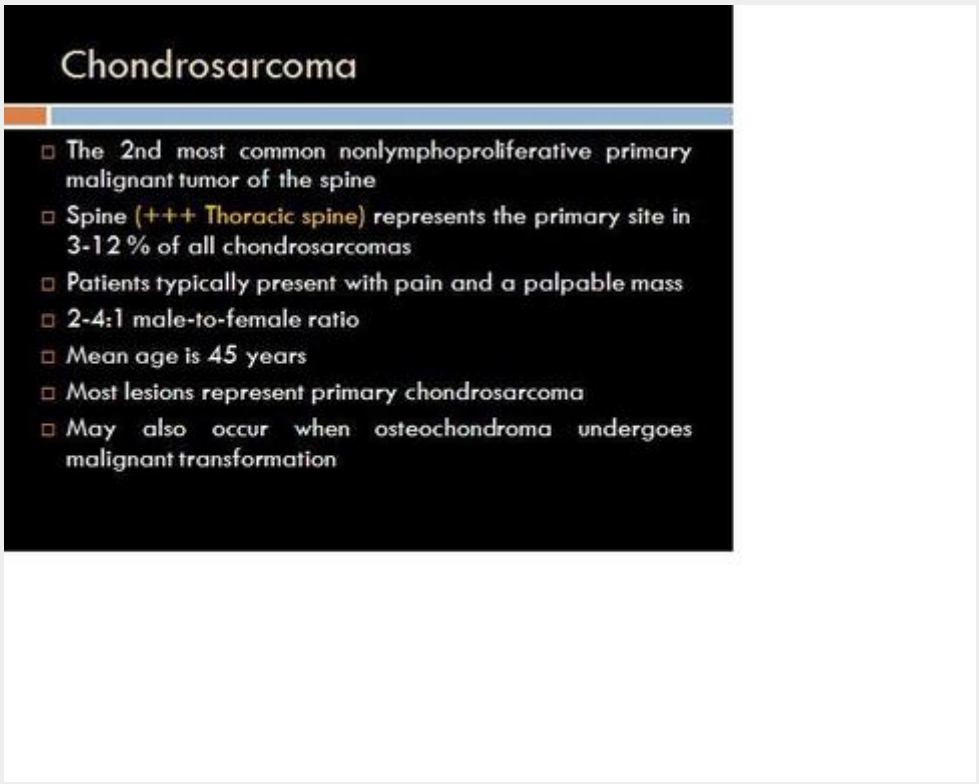
CT and MR – We can see several volumous soft-tissue masses in the pelvis (arrows). The lesions have intermediate signal on T1 and high signal on T2. There are also multiple liver metastasis.

18.jpg

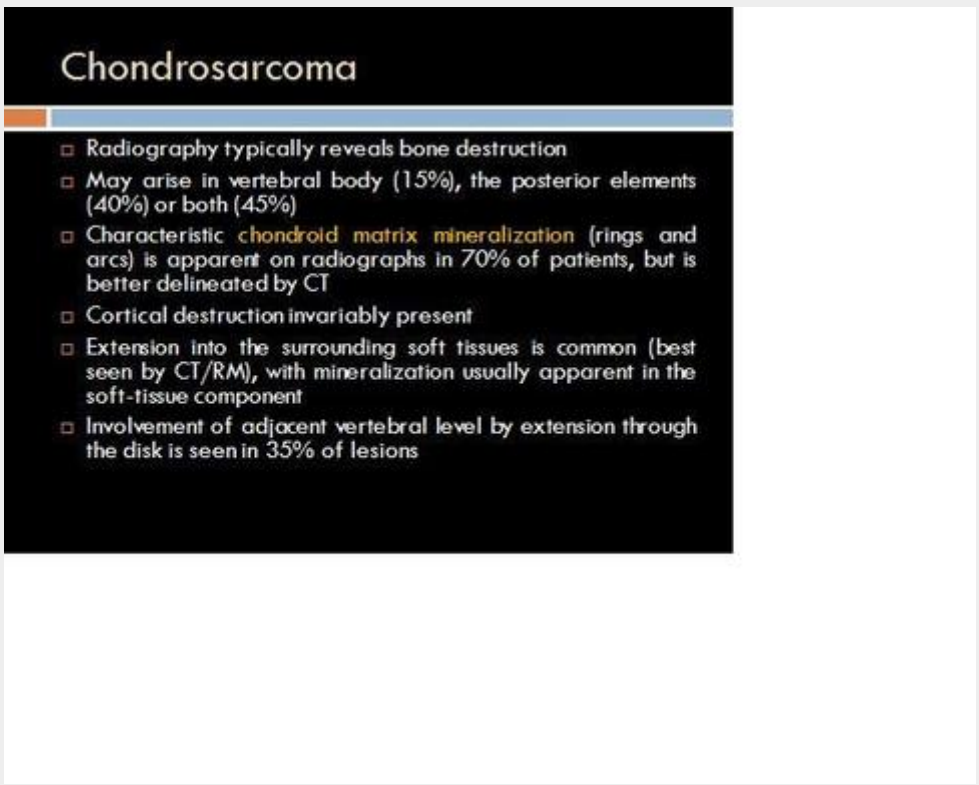


CT and MR – We can see several volumous soft-tissue masses in the pelvis (arrows). The lesions have intermediate signal on T1 and high signal on T2. There are also multiple liver metastasis.

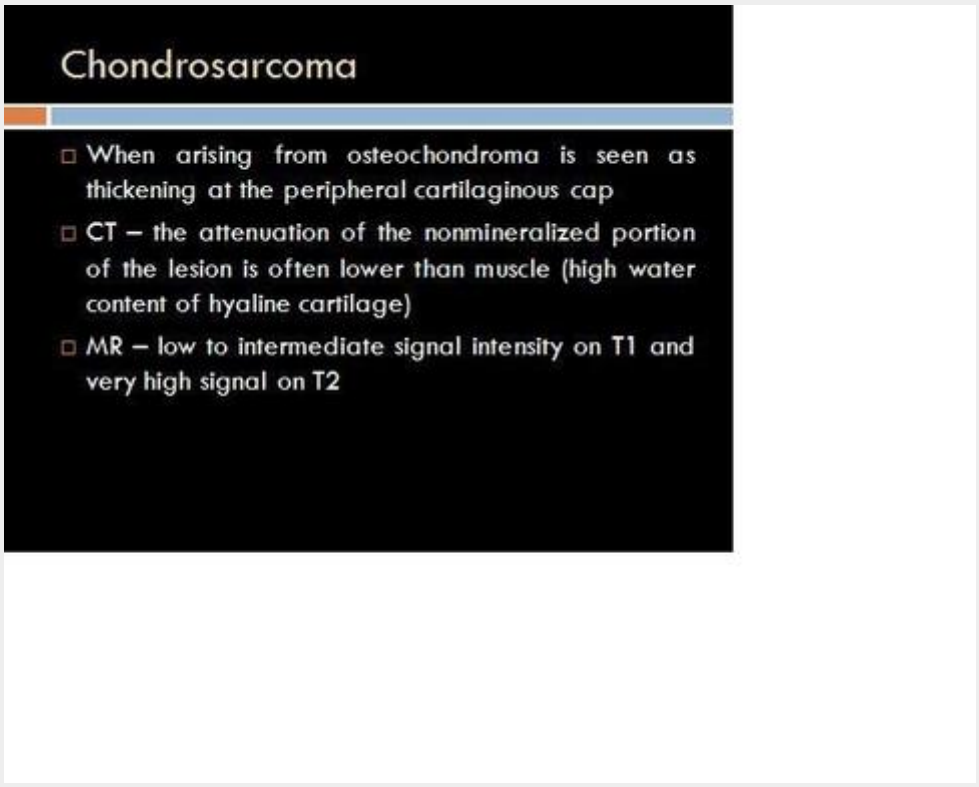
19.jpg


Chondrosarcoma
The 2nd most common nonlymphoproliferative primary malignant tumor of the spine
Spine (+++ Thoracic spine) represents the primary site in 3-12 % of all chondrosarcomas
Patients typically present with pain and a palpable mass
2-4:1 male-to-female ratio
Mean age is 45 years
Most lesions represent primary chondrosarcoma
May also occur when osteochondroma undergoes malignant transformation

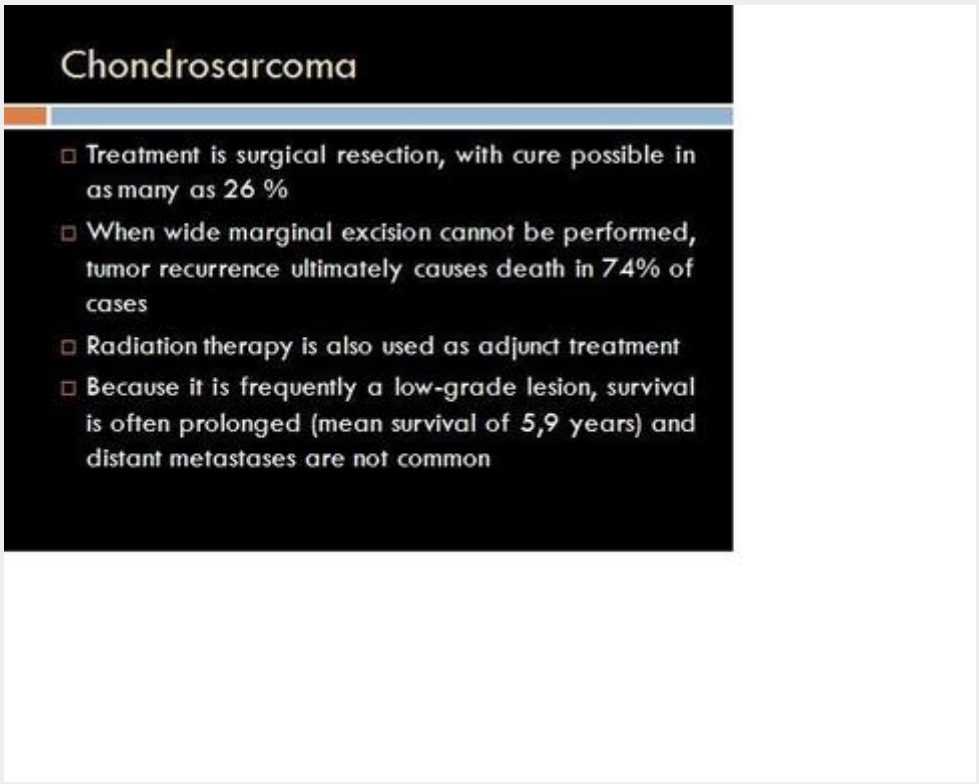
20.jpg


Chondrosarcoma
Radiography typically reveals bone destruction
May arise in vertebral body (15%), the posterior elements (40%) or both (45%)
Characteristic chondroid matrix mineralization (rings and arcs) is apparent on radiographs in 70% of patients, but is better delineated by CT
Cortical destruction invariably present
Extension into the surrounding soft tissues is common (best seen by CT/RM), with mineralization usually apparent in the soft-tissue component
Involvement of adjacent vertebral level by extension through the disk is seen in 35% of lesions

21.jpg


Chondrosarcoma
When arising from osteochondroma is seen as thickening at the peripheral cartilaginous cap
CT – the attenuation of the nonmineralized portion of the lesion is often lower than muscle (high water content of hyaline cartilage)
MR – low to intermediate signal intensity on T1 and very high signal on T2

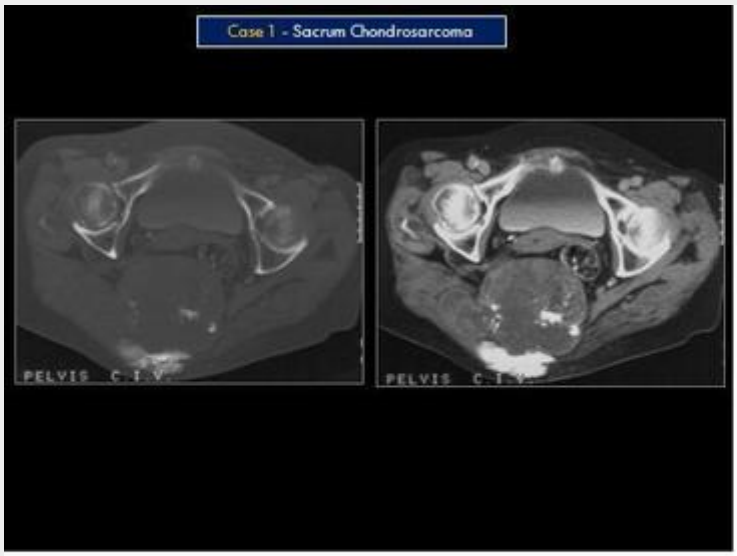
22.jpg


Chondrosarcoma
Treatment is surgical resection, with cure possible in as many as 26 %
When wide marginal excision cannot be performed, tumor recurrence ultimately causes death in 74% of cases
Radiation therapy is also used as adjunct treatment
Because it is frequently a low-grade lesion, survival is often prolonged (mean survival of 5,9 years) and distant metastases are not common

23.jpg

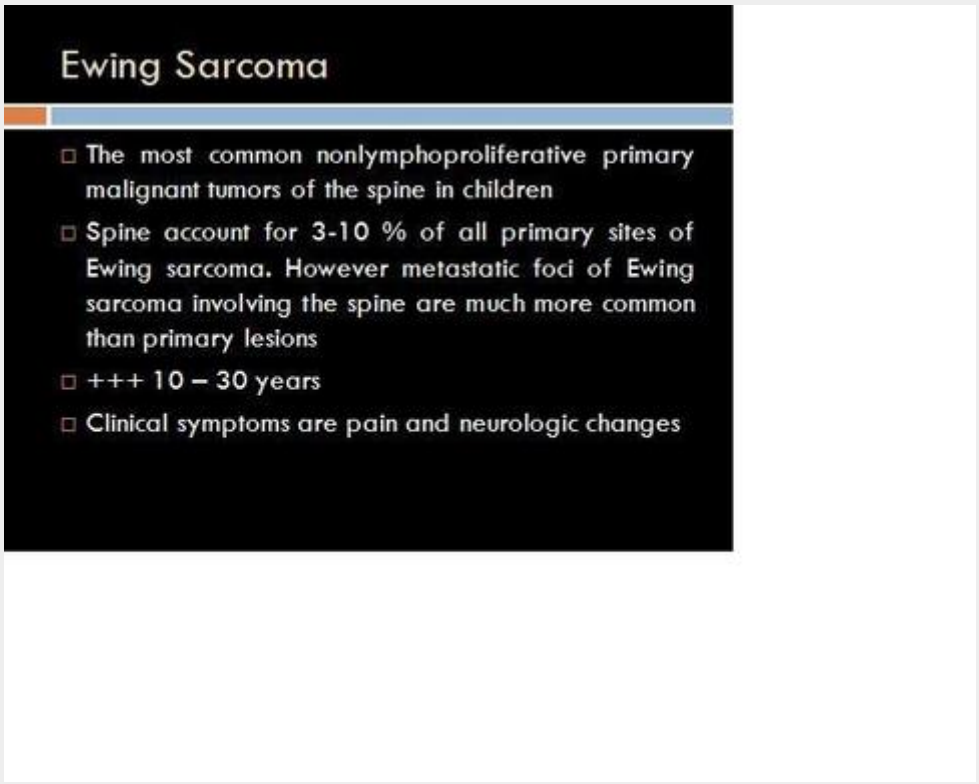
X-Ray and CT – There is a osteolytic lesion associated with a volumous soft-tissue mass, which has several mineralized areas (resulting not only from chondroid matrix mineralization but also due to bone sequestra that result from destruction of the previous osteochondroma). The low attenuation seen at CT in the nonmineralizard portion of the mass is typical, and reflects the high water content of hyaline cartilage.

24.jpg

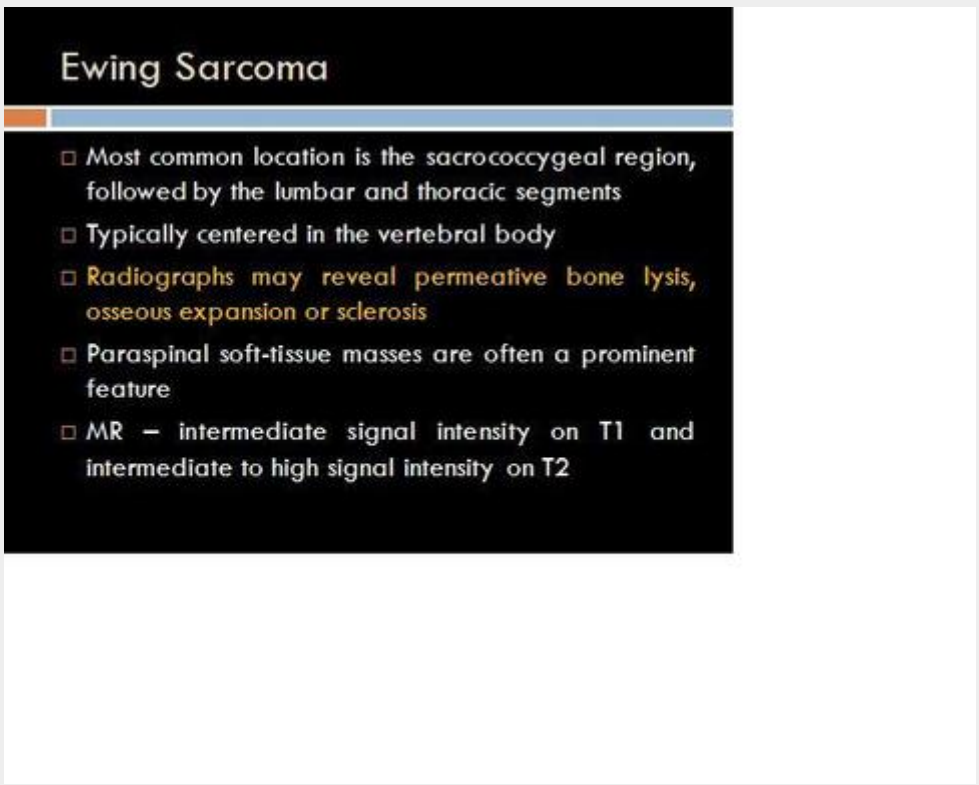


X-Ray and CT – There is a osteolytic lesion associated with a volumous soft-tissue mass, which has several mineralized areas (resulting not only from chondroid matrix mineralization but also due to bone sequestra that result from destruction of the previous osteochondroma). The low attenuation seen at CT in the nonmineralizard portion of the mass is typical, and reflects the high water content of hyaline cartilage.

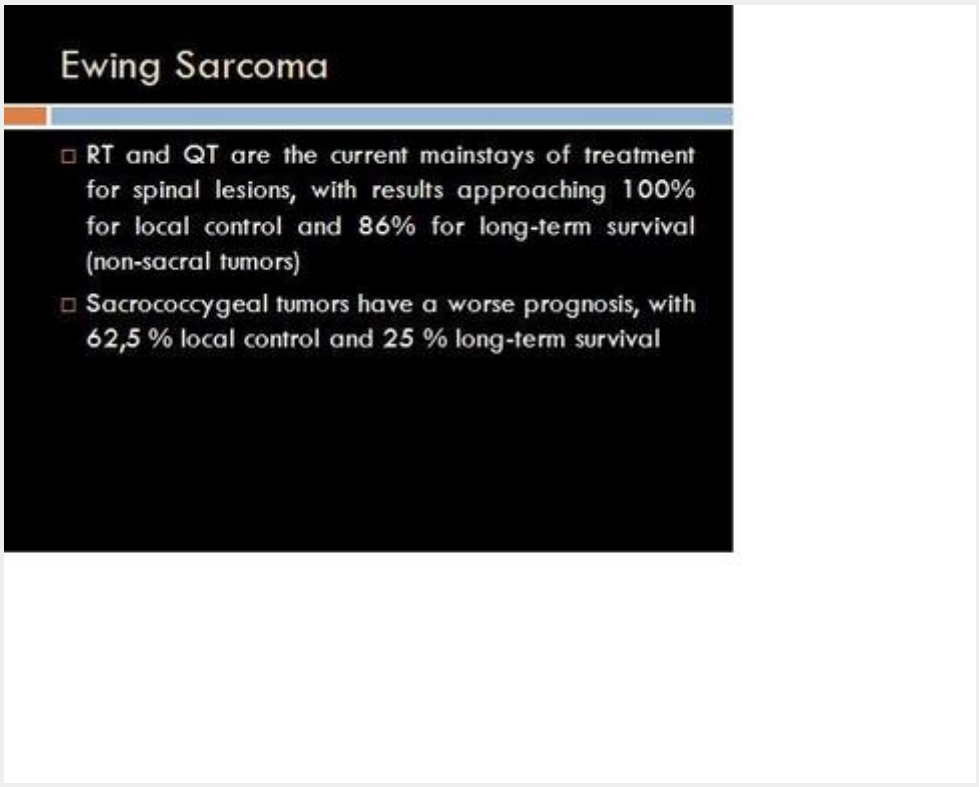
25.jpg


Ewing Sarcoma
The most common nonlymphoproliferative primary malignant tumors of the spine in children
Spine account for 3-10 % of all primary sites of Ewing sarcoma. However metastatic foci of Ewing sarcoma involving the spine are much more common than primary lesions
+++ 10 – 30 years
Clinical symptoms are pain and neurologic changes

26.jpg


Ewing Sarcoma
Most common location is the sacrococcygeal region, followed by the lumbar and thoracic segments
Typically centered in the vertebral body
Radiographs may reveal permeative bone lysis, osseous expansion or sclerosis
Paraspinal soft-tissue masses are often a prominent feature
MR – intermediate signal intensity on T1 and intermediate to high signal intensity on T2

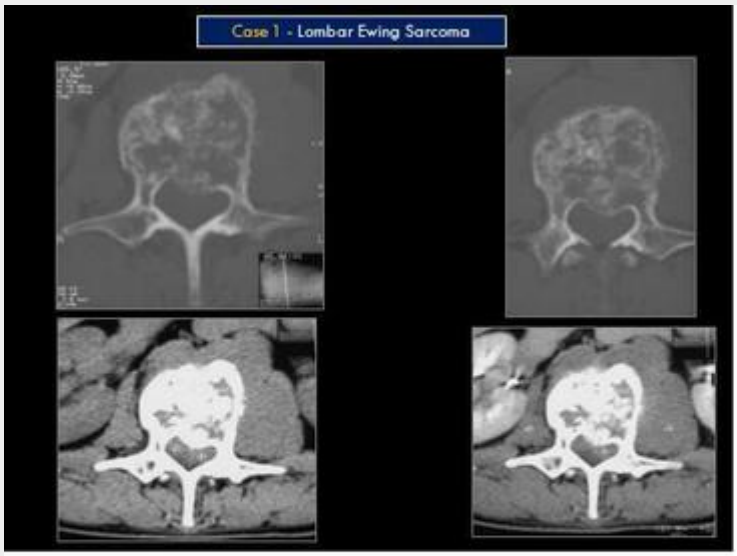
27.jpg


Ewing Sarcoma
RT and QT are the current mainstays of treatment for spinal lesions, with results approaching 100% for local control and 86% for long-term survival (non-sacral tumors)
Sacrococcygeal tumors have a worse prognosis, with 62,5 % local control and 25 % long-term survival

28.jpg

X-Ray, CT and MR – This case has a mixed pattern (lytic and sclerotic), more often seen after treatment. The lesion is centered in the vertebral body – a typical location for Ewing Sarcoma. There is a prevertebral soft-tissue mass, also a prominent feature of these lesions. The MR appearance is nonspecificic – intermediate signal intensity on T1 and intermediate to high signal intensity on T2.

29.jpg

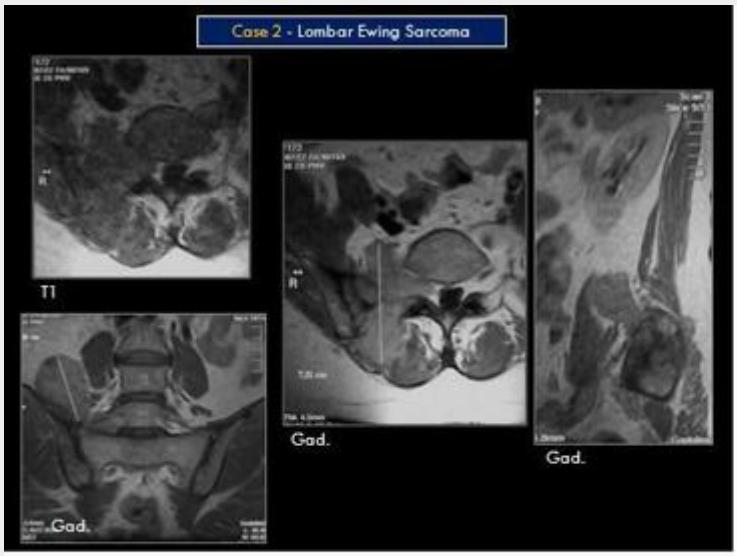


X-Ray, CT and MR – This case has a mixed pattern (lytic and sclerotic), more often seen after treatment. The lesion is centered in the vertebral body – a typical location for Ewing Sarcoma. There is a prevertebral soft-tissue mass, also a prominent feature of these lesions. The MR appearance is nonspecificic – intermediate signal intensity on T1 and intermediate to high signal intensity on T2.

30.jpg

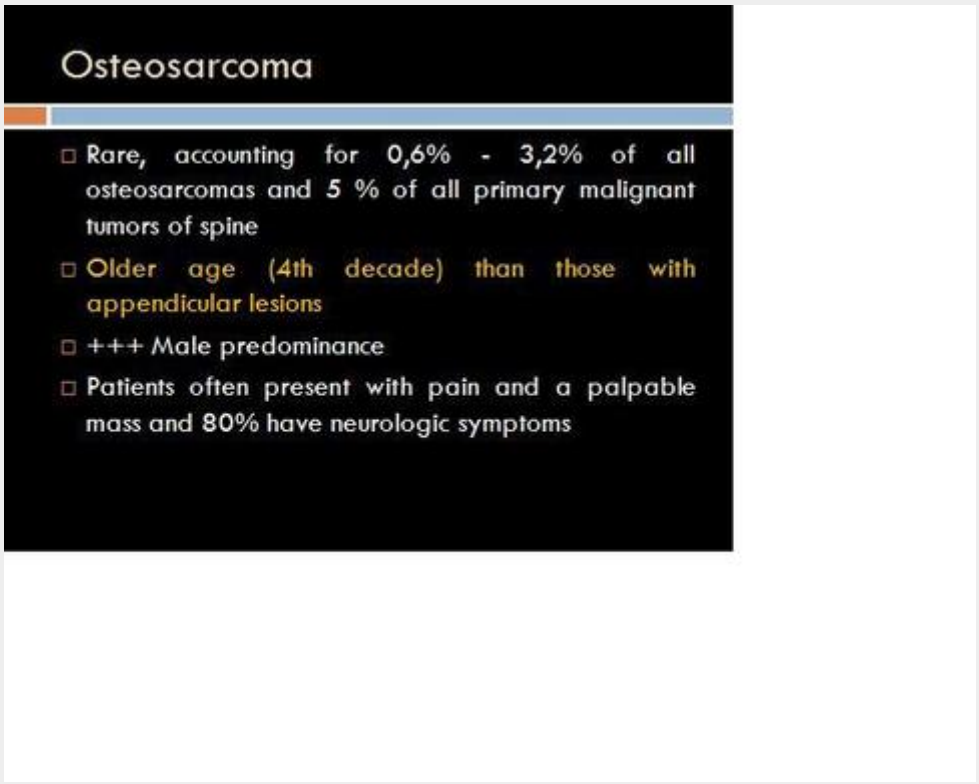
X-Ray, CT and MR – This case has a mixed pattern (lytic and sclerotic), more often seen after treatment. The lesion is centered in the vertebral body – a typical location for Ewing Sarcoma. There is a prevertebral soft-tissue mass, also a prominent feature of these lesions. The MR appearance is nonspecificic – intermediate signal intensity on T1 and intermediate to high signal intensity on T2.

31.jpg

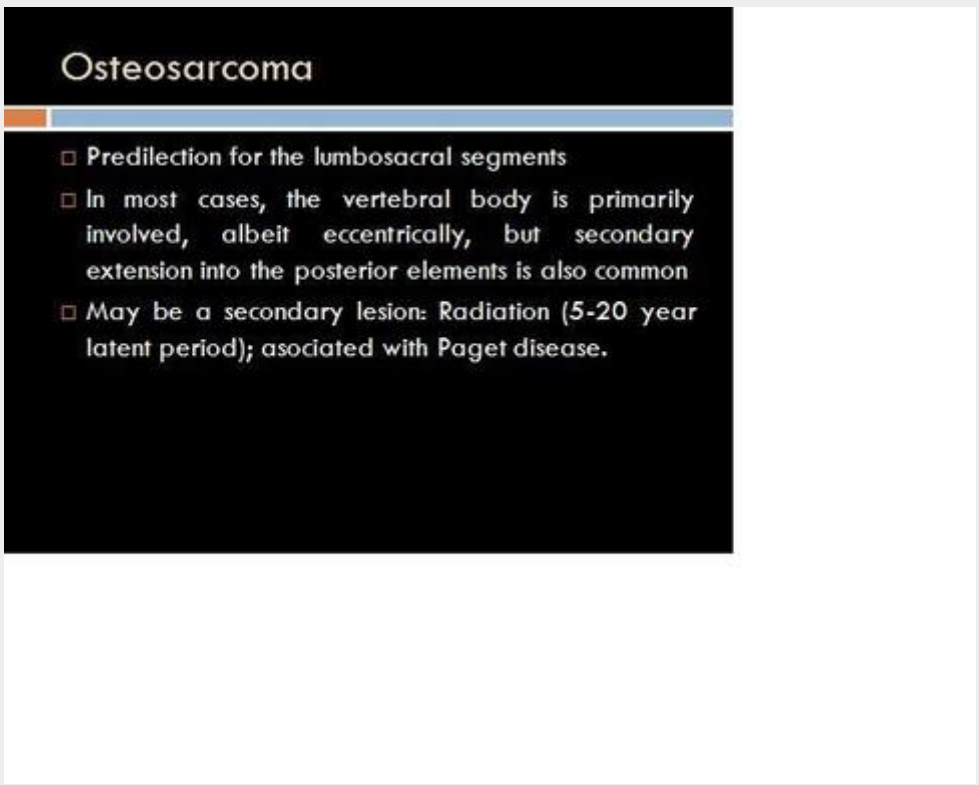


MR – The associated soft-tissue mass is the prominent feature of this tumor. The MR findings are nonspecific, with low/intermediate signal on T1, and a weak homogeneous enhancement after gadolinium.

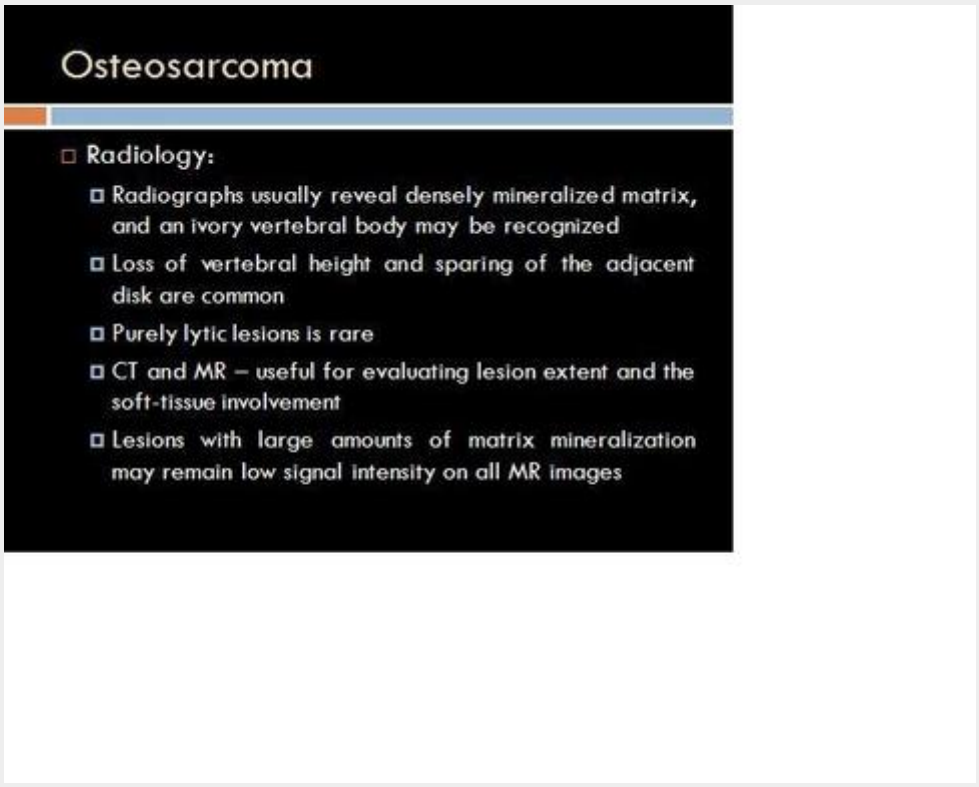
32.jpg


Osteosarcoma
Rare, accounting for 0,6% - 3,2% of all osteosarcomas and 5 % of all primary malignant tumors of spine
Older age (4th decade) than those with appendicular lesions
+++ Male predominance
Patients often present with pain and a palpable mass and 80% have neurologic symptoms

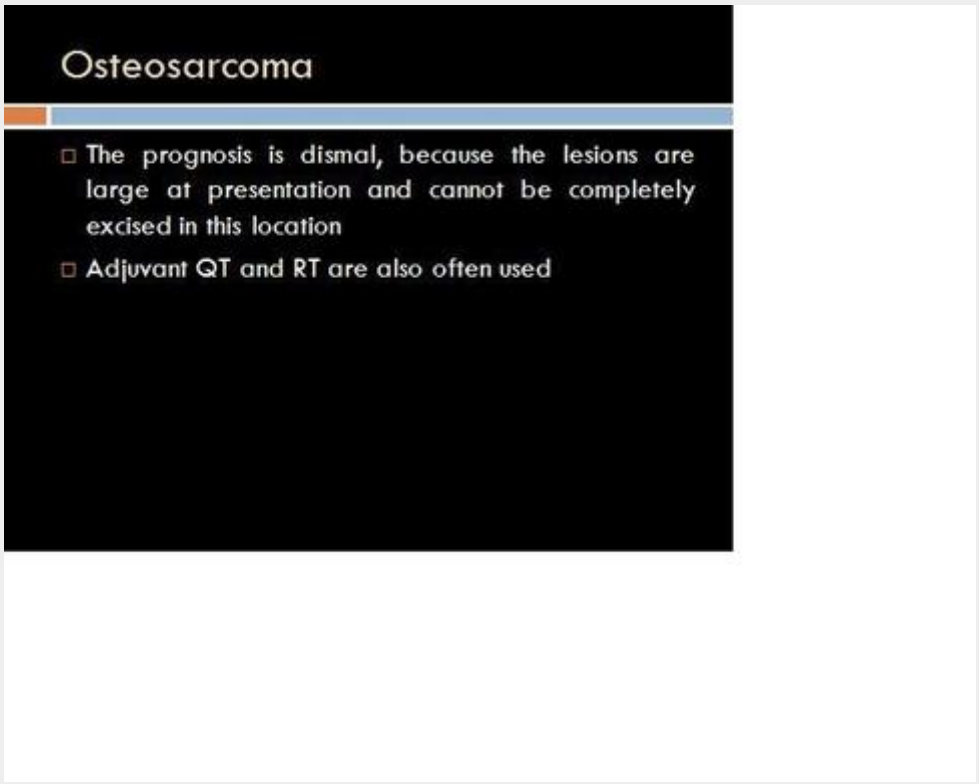
33.jpg


Osteosarcoma
Predilection for the lumbosacral segments
In most cases, the vertebral body is primarily involved, albeit eccentrically, but secondary extension into the posterior elements is also common
May be a secondary lesion: Radiation (5-20 year latent period); asociated with Paget disease.

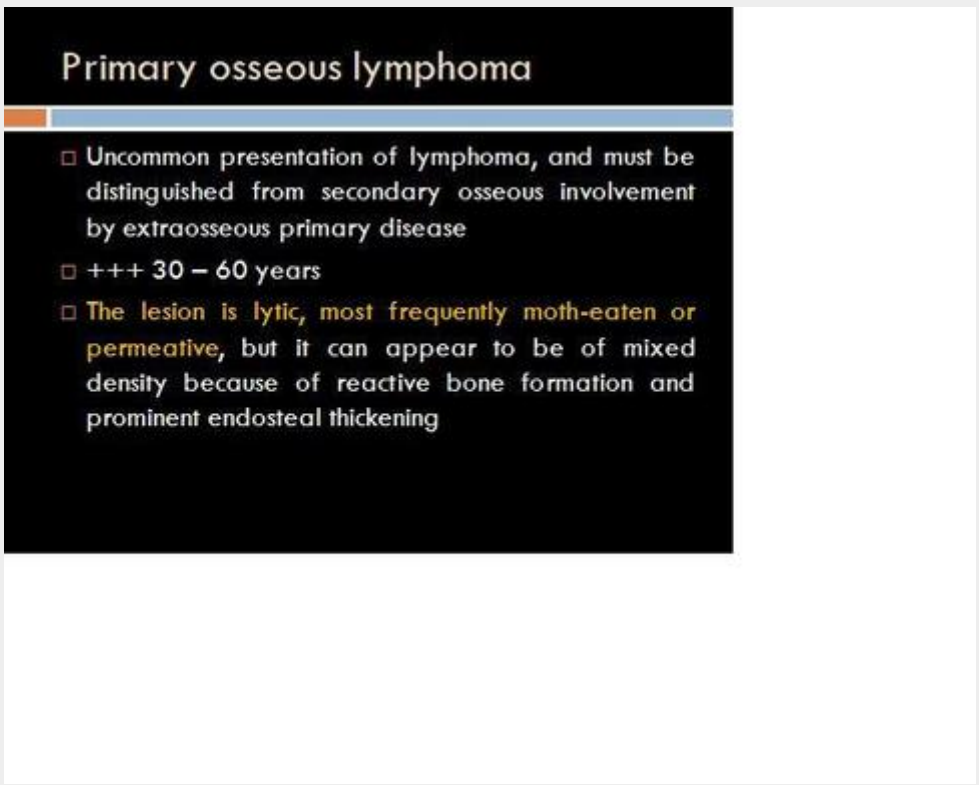
34.jpg


Osteosarcoma
Radiology:
Radiographs usually reveal densely mineralized matrix, and an ivory vertebral body may be recognized
Loss of vertebral height and sparing of the adjacent disk are common
Purely lytic lesions is rare
CT and MR – useful for evaluating lesion extent and the soft-tissue involvement
Lesions with large amounts of matrix mineralization may remain low signal intensity on all MR images

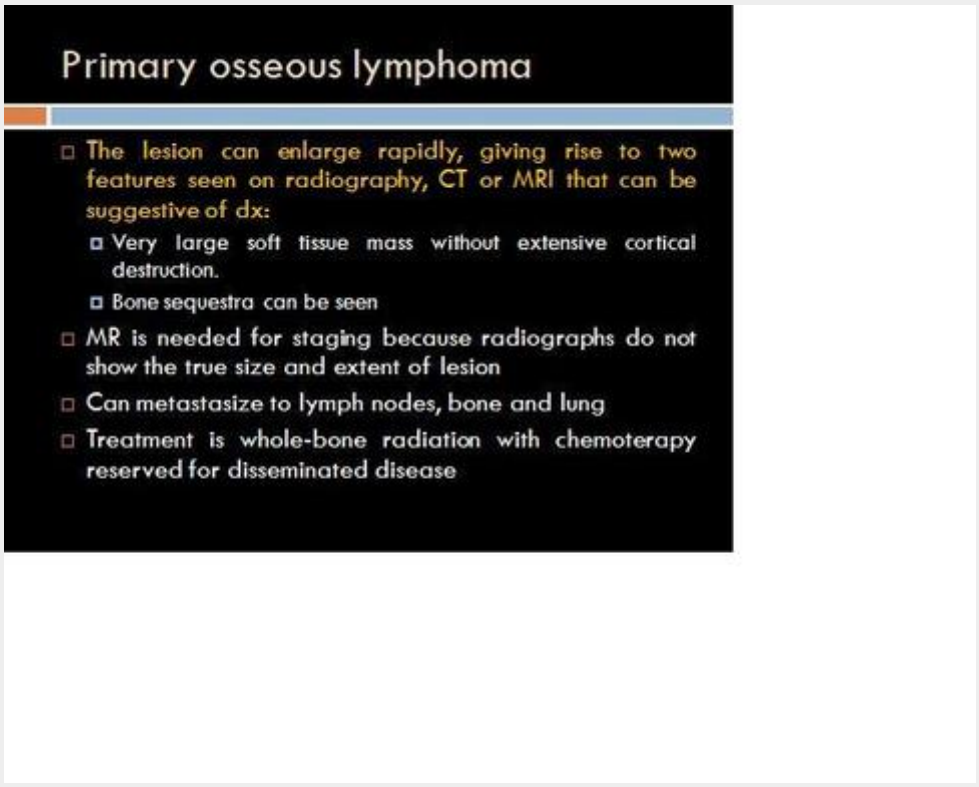
35.jpg


Osteosarcoma
The prognosis is dismal, because the lesions are large at presentation and cannot be completely excised in this location
Adjuvant QT and RT are also often used

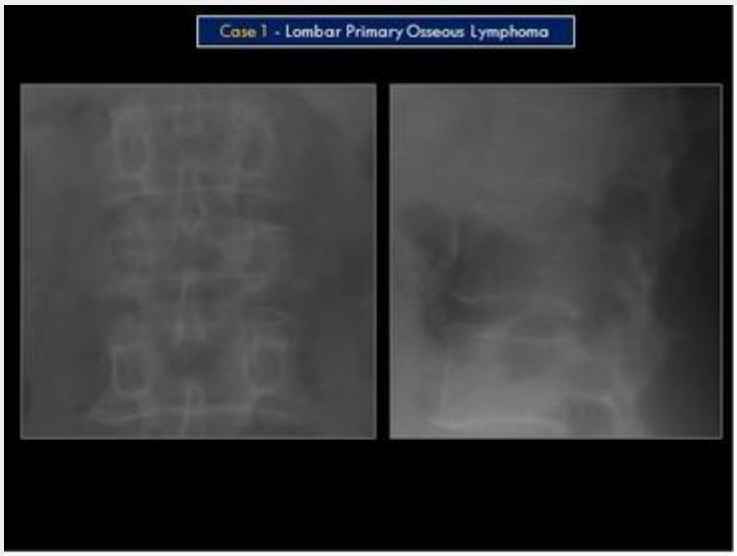
36.jpg


Primary osseous lymphoma
Uncommon presentation of lymphoma, and must be distinguished from secondary osseous involvement by extraosseous primary disease
+++ 30 – 60 years
The lesion is lytic, most frequently moth-eaten or permeative, but it can appear to be of mixed density because of reactive bone formation and prominent endosteal thickening

37.jpg


Primary osseous lymphoma
The lesion can enlarge rapidly, giving rise to two features seen on radiography, CT or MRI that can be suggestive of dx:
Very large soft tissue mass without extensive cortical destruction.
Bone sequestra can be seen
MR is needed for staging because radiographs do not show the true size and extent of lesion
Can metastasize to lymph nodes, bone and lung
Treatment is whole-bone radiation with chemoterapy reserved for disseminated disease

38.jpg



X-Ray and CT – This lesion is difficult to characterize on X-Ray. However CT demonstrates well the typical permeative pattern seen in primary bone lymphoma.

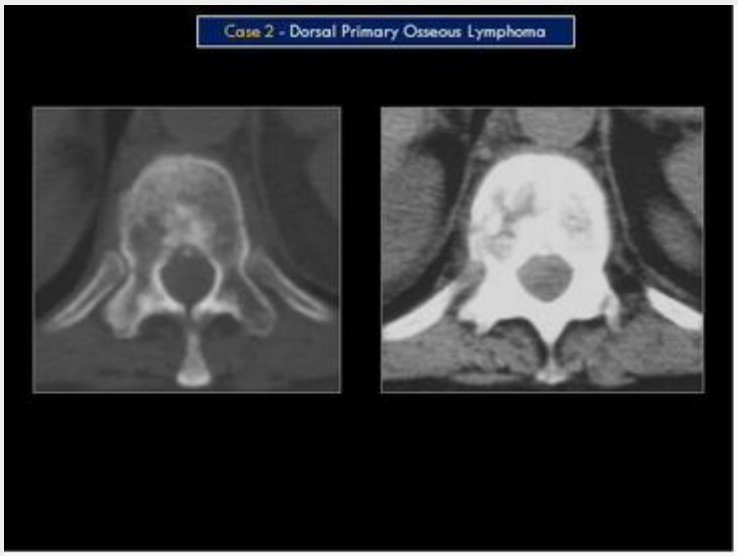
39.jpg

X-Ray and CT – This lesion is difficult to characterize on X-Ray. However CT demonstrates well the typical permeative pattern seen in primary bone lymphoma.

40.jpg

X-Ray, CT and MR – The pattern of this lesion is mainly osteolytic, with partial vertebral body colapse. At MR there is low signal on T1 and high signal on T2. After gadolinium there is little but heterogeneous enhancement. In this case there isn't an associated soft-tissue mass (frequently seen with this kind of tumors).

41.jpg

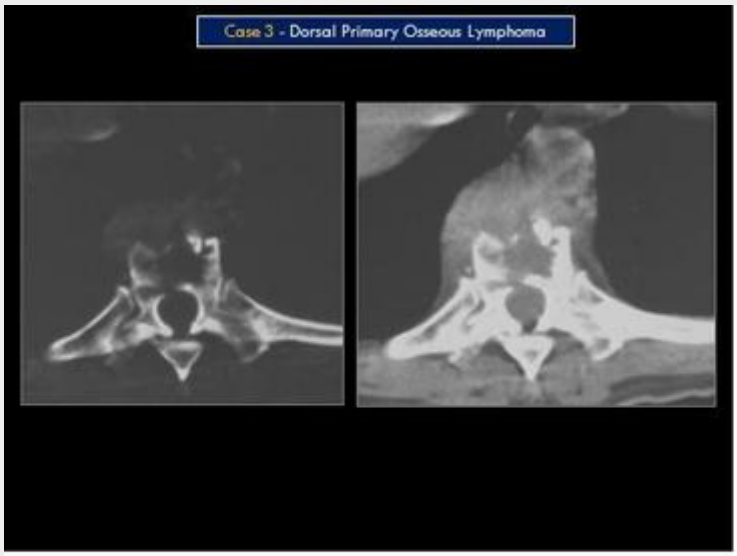


X-Ray, CT and MR – The pattern of this lesion is mainly osteolytic, with partial vertebral body colapse. At MR there is low signal on T1 and high signal on T2. After gadolinium there is little but heterogeneous enhancement. In this case there isn't an associated soft-tissue mass (frequently seen with this kind of tumors).

42.jpg

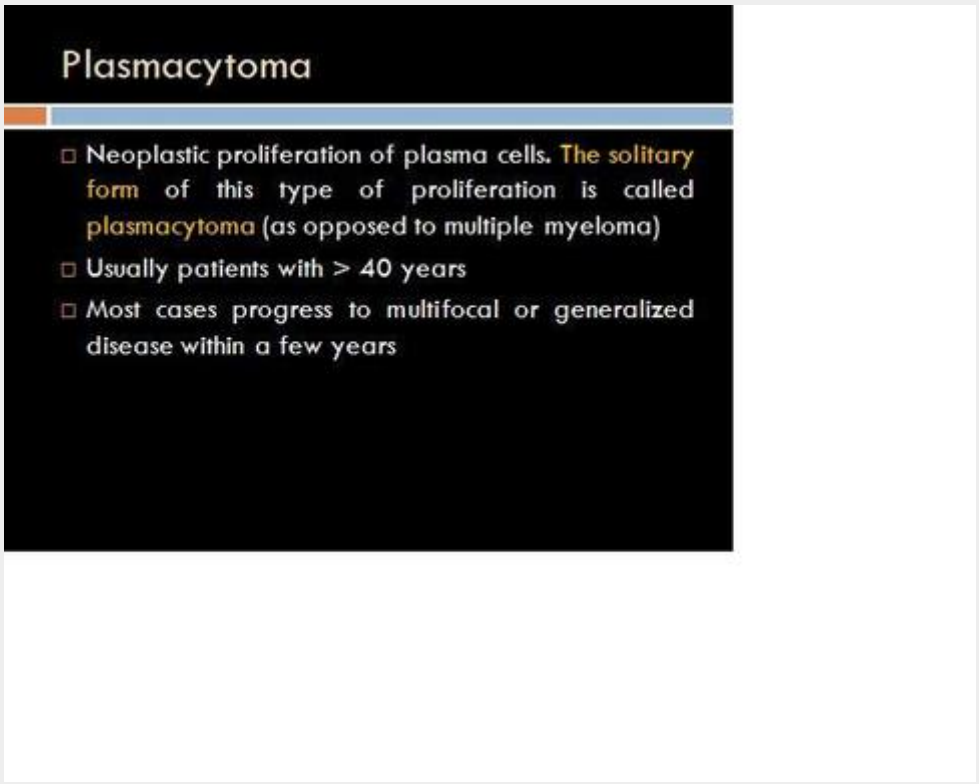
X-Ray, CT and MR – The pattern of this lesion is mainly osteolytic, with partial vertebral body colapse. At MR there is low signal on T1 and high signal on T2. After gadolinium there is little but heterogeneous enhancement. In this case there isn't an associated soft-tissue mass (frequently seen with this kind of tumors).

43.jpg

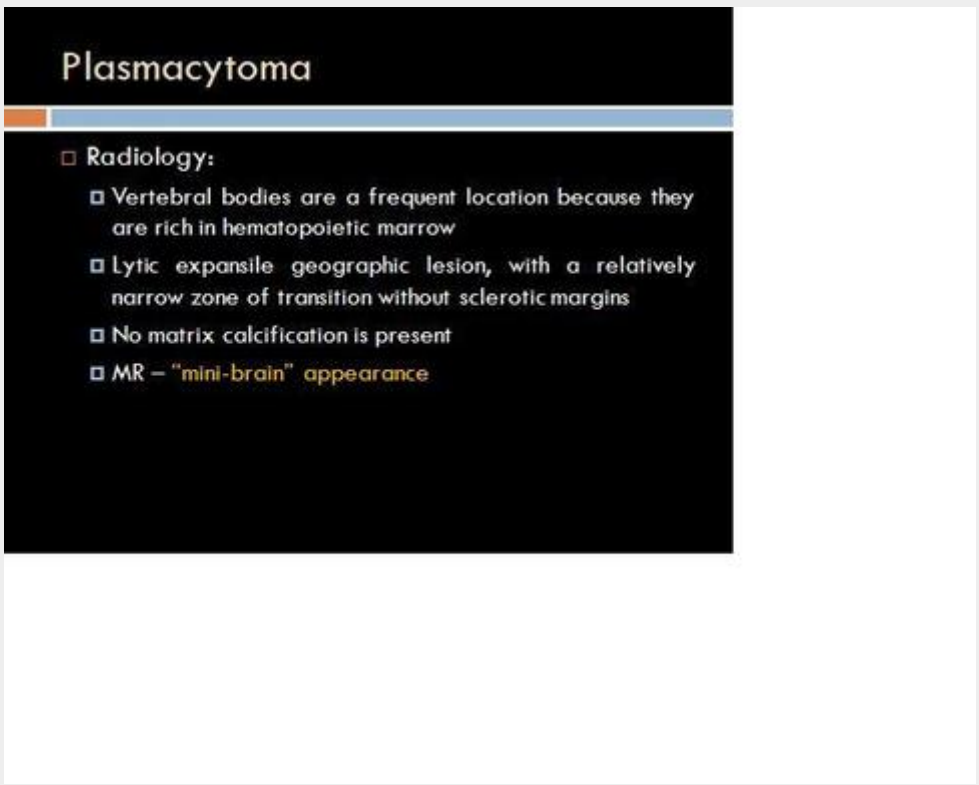


CT – Osteolytic lesion located in the vertebral body associated with a soft tissue mass.

44.jpg


Plasmacytoma
Neoplastic proliferation of plasma cells. The solitary form of this type of proliferation is called plasmacytoma (as opposed to multiple myeloma)
Usually patients with > 40 years
Most cases progress to multifocal or generalized disease within a few years

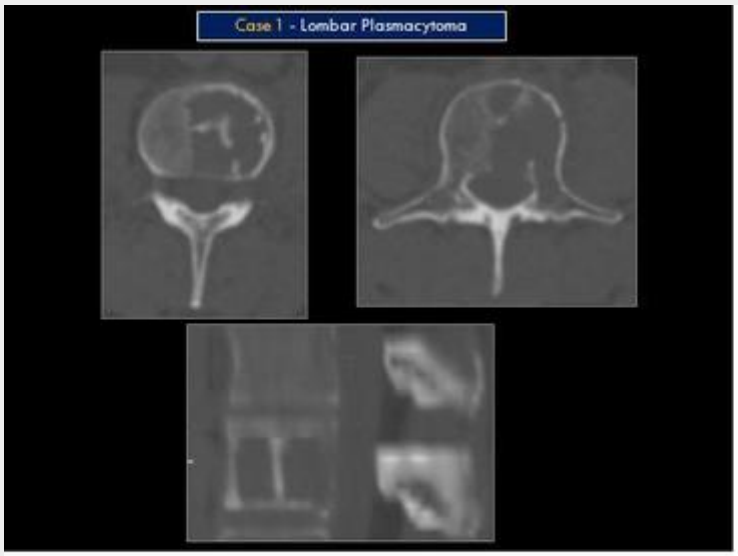
45.jpg


Plasmacytoma
Radiology:
Vertebral bodies are a frequent location because they are rich in hematopoietic marrow
Lytic expansile geographic lesion, with a relatively narrow zone of transition without sclerotic margins
No matrix calcification is present
MR – "mini-brain" appearance

46.jpg

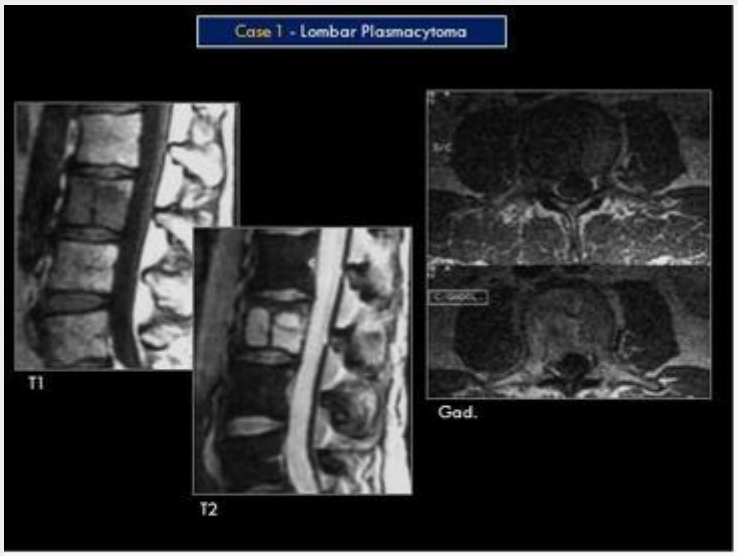
X-Ray, CT and MR – Osteolytic lesion affecting a lombar vertebral body, with relative preservation of cortical bone – "empty vertebra appearance". We can see several lytic areas, separated by vertical bone bridges, with preservation of vertebral body height. The lesion has low signal on T1 and high signal on T2, with enhancement after gadolinium.

47.jpg



X-Ray, CT and MR – Osteolytic lesion affecting a lombar vertebral body, with relative preservation of cortical bone – “empty vertebra appearance”. We can see several lytic areas, separated by vertical bone bridges, with preservation of vertebral body height. The lesion has low signal on T1 and high signal on T2, with enhancement after gadolinium.

48.jpg



X-Ray, CT and MR – Osteolytic lesion affecting a lombar vertebral body, with relative preservation of cortical bone – “empty vertebra appearance”. We can see several lytic areas, separated by vertical bone bridges, with preservation of vertebral body height. The lesion has low signal on T1 and high signal on T2, with enhancement after gadolinium.

49.jpg

X-Ray and CT – Purely lytic lesion with associated soft-tissue mass.

50.jpg

X-Ray and MR – There is fracture with vertebral body collapse, being apparent a medular osteolytic pattern with relative preservation of cortical vertebral plates. The lesion is low signal on T1 and high signal on T2, with good enhancement after gadolinium.

51.jpg

X-Ray and MR – There is fracture with vertebral body collapse, being apparent a medular osteolytic pattern with relative preservation of cortical vertebral plates. The lesion is low signal on T1 and high signal on T2, with good enhancement after gadolinium.

52.jpg

Interventional Radiology – CT guided biopsy is instrumental for obtaining tissue for histologic analysis. Biopsy can be made in the bone lesion or in the often associated soft-tissue mass, at any level of the spine.

Conclusions:

1) The identification of a solitary spinal bony lesion challenges the differential diagnosis, and imaging is instrumental for clinical decision making.

2) Radiological and clinical findings quite often are sufficiently specific to address the correct diagnosis.

3) When necessary CT guided biopsy is the best way for obtaining tissue for histologic analysis.

3. References

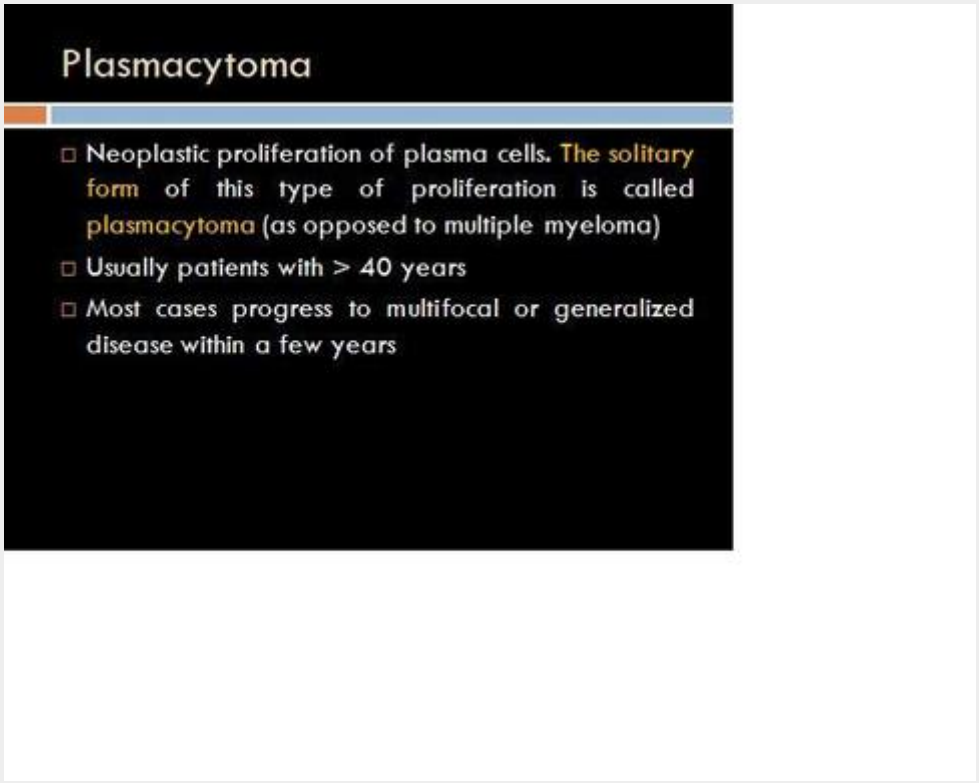
References:

53.jpg

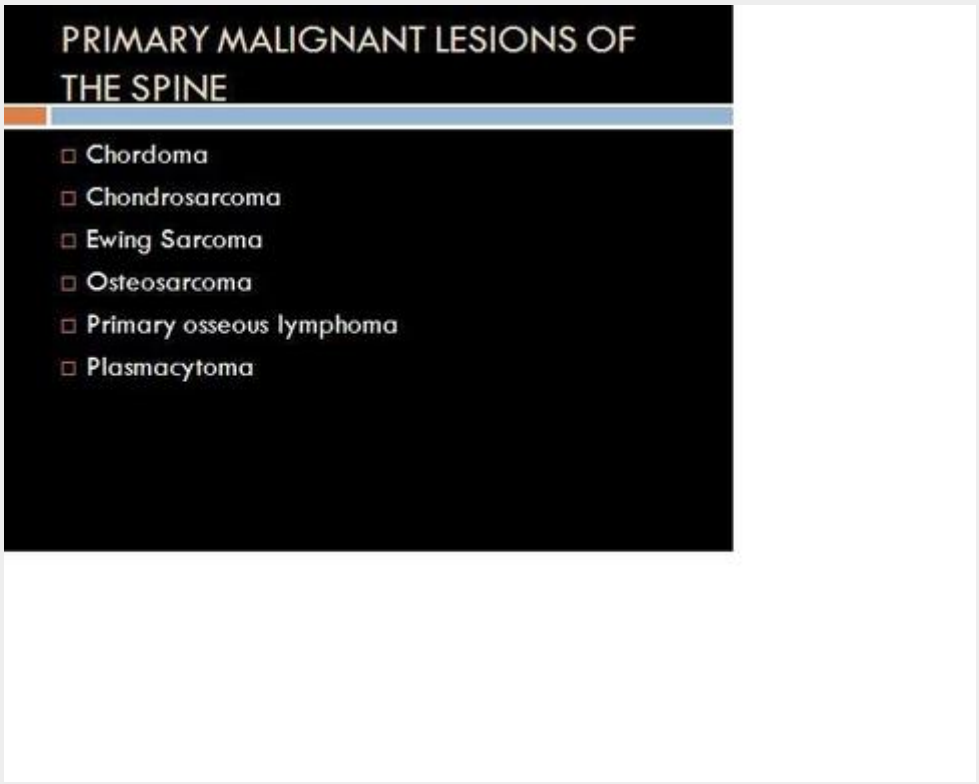

References
Masaryk T.J Neoplastic disease of the spine. Radiol Clin North Am 1991 29:829-845.
Meyer JE, et al. Chordomas: their CT appearance in the cervical, thoracic, and lumbar spine. Radiology 1984, 153:693-696.
De Bruine FT, Kroon HM. Spinal chordoma: radiologic features in 14 cases. AJR 1988; 150: 861-863.
Shives TC, Mcleod RA, et al. Chondrosarcoma of the spine. J Bone Joint Surg 1989; 71:1158 – 1165.
Pilepich MV, et al. Ewing's sarcoma of the vertebral columns. Int J Radiat Oncol Biol Phys 1981, 7:27-31.
Grubb MR, et al. Primary Ewing's sarcoma of the spine. Spine 1994; 19:309-313.
Patel DV, et al. Primary osteogenic sarcoma of the spine. Skeletal Radiol 1984; 12:276-279.
Manaster B.J, et al.: Marrow Tumors and Metastatic Disease of Bone. In B.J Manaster, et al: Musculoskeletal Imaging – THE REQUISITES, 3rd ed. Mosby Elsevier, 2007, pp 489 – 499.
Rumboldt Z, et al.: The Spine. In Lee JKT, et al: Computed Body Tomography with MRI Correlation, 4th edition. Lippincott Williams and Wilkins, 2006, pp 1661 – 1726.

4. Mediafiles

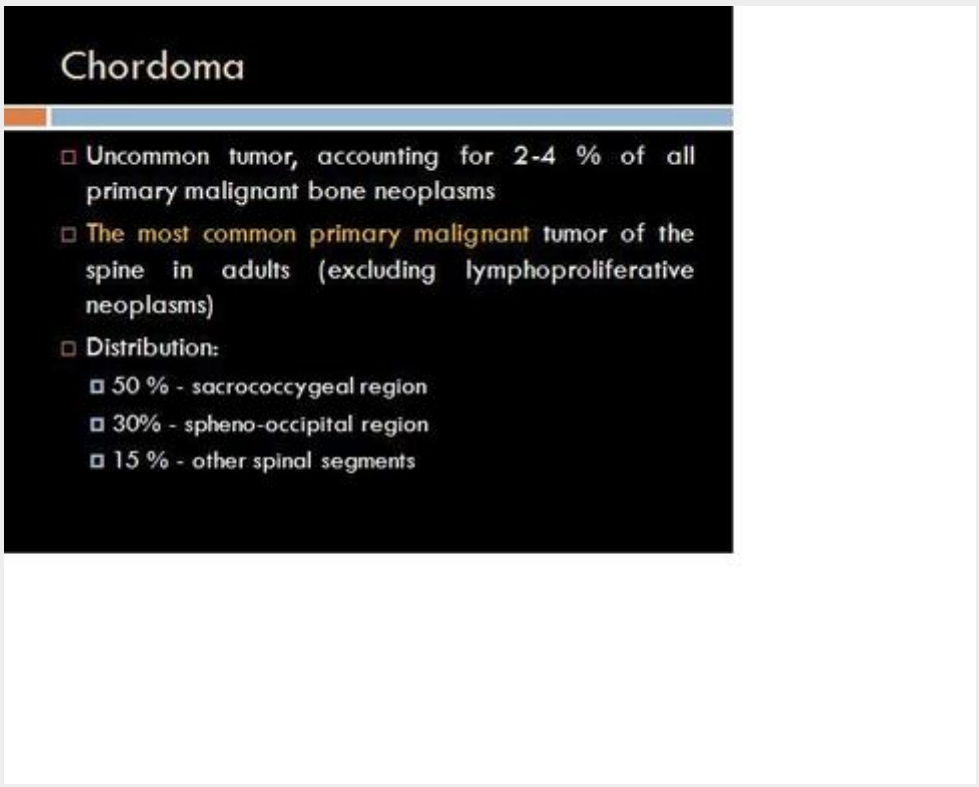
44.jpg



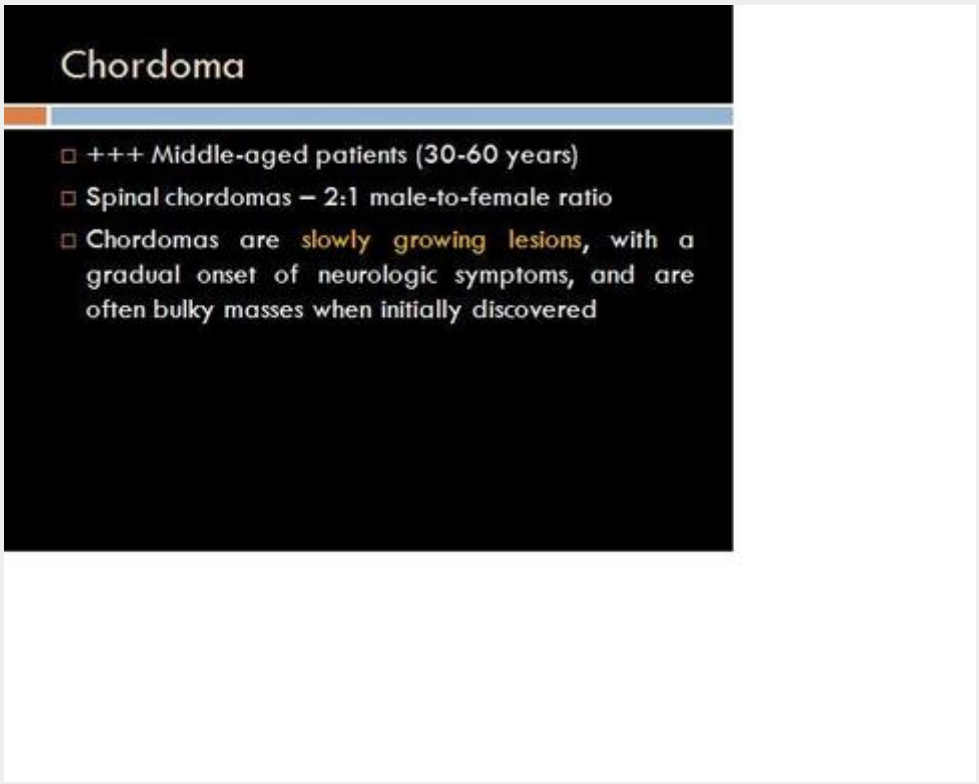
3.jpg


PRIMARY MALIGNANT LESIONS OF THE SPINE
Chordoma
Chondrosarcoma
Ewing Sarcoma
Osteosarcoma
Primary osseous lymphoma
Plasmacytoma

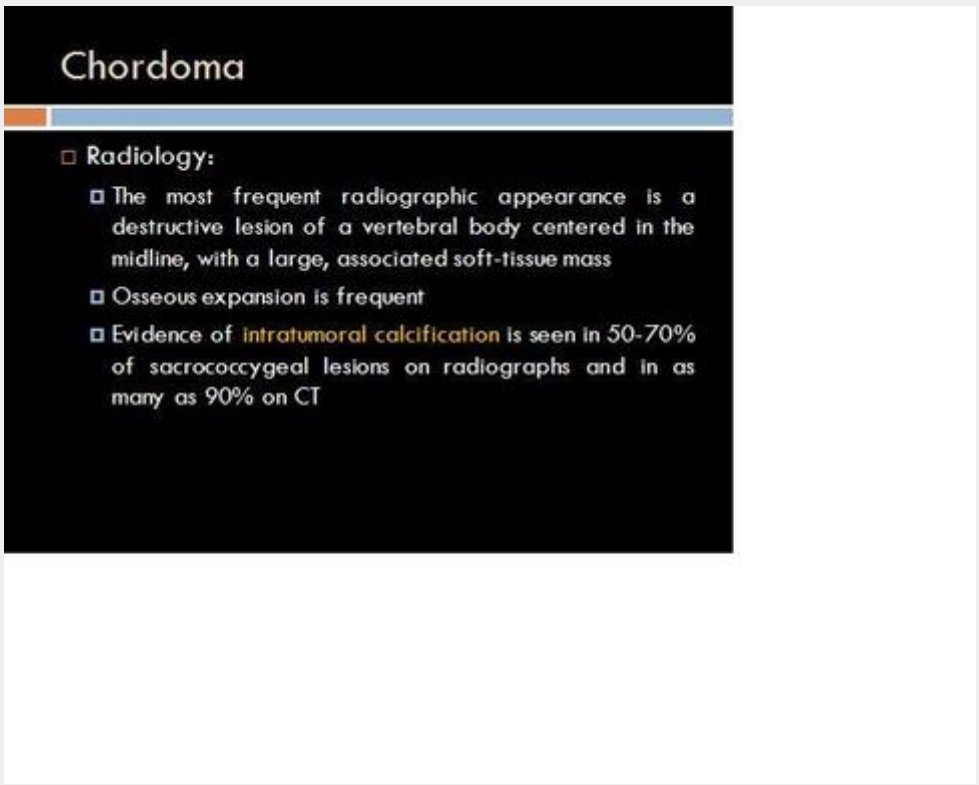
4.jpg


Chordoma
Uncommon tumor, accounting for 2-4 % of all primary malignant bone neoplasms
The most common primary malignant tumor of the spine in adults (excluding lymphoproliferative neoplasms)
Distribution:
50 % - sacrococcygeal region
30% - spheno-occipital region
15 % - other spinal segments

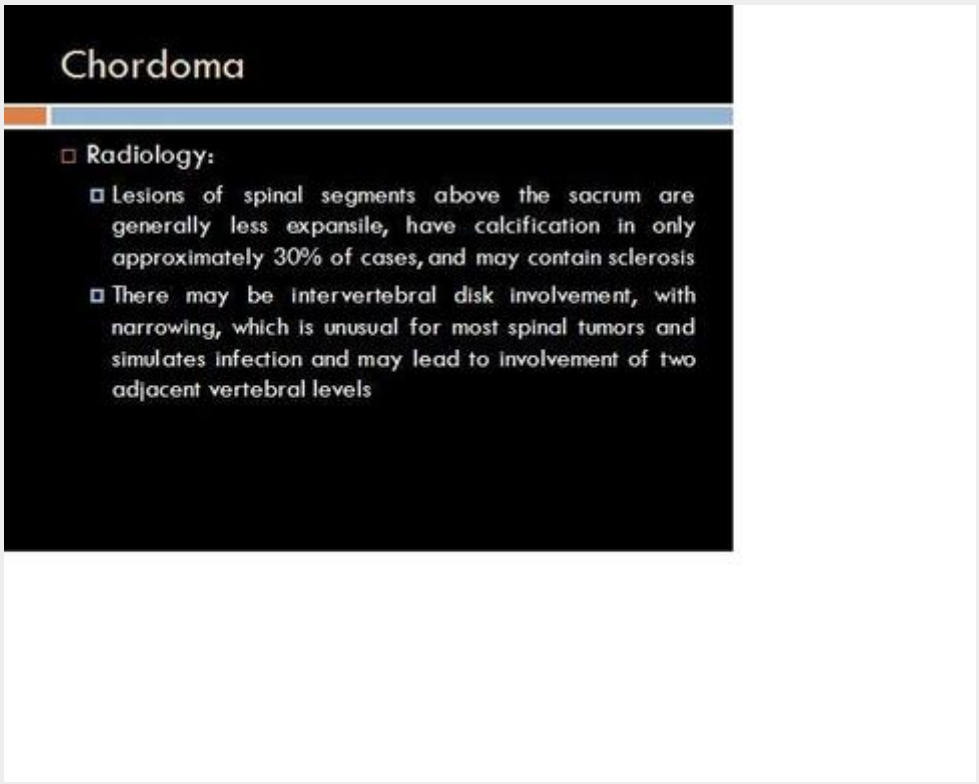
5.jpg


Chordoma
+++ Middle-aged patients (30-60 years)
Spinal chordomas – 2:1 male-to-female ratio
Chordomas are slowly growing lesions, with a gradual onset of neurologic symptoms, and are often bulky masses when initially discovered

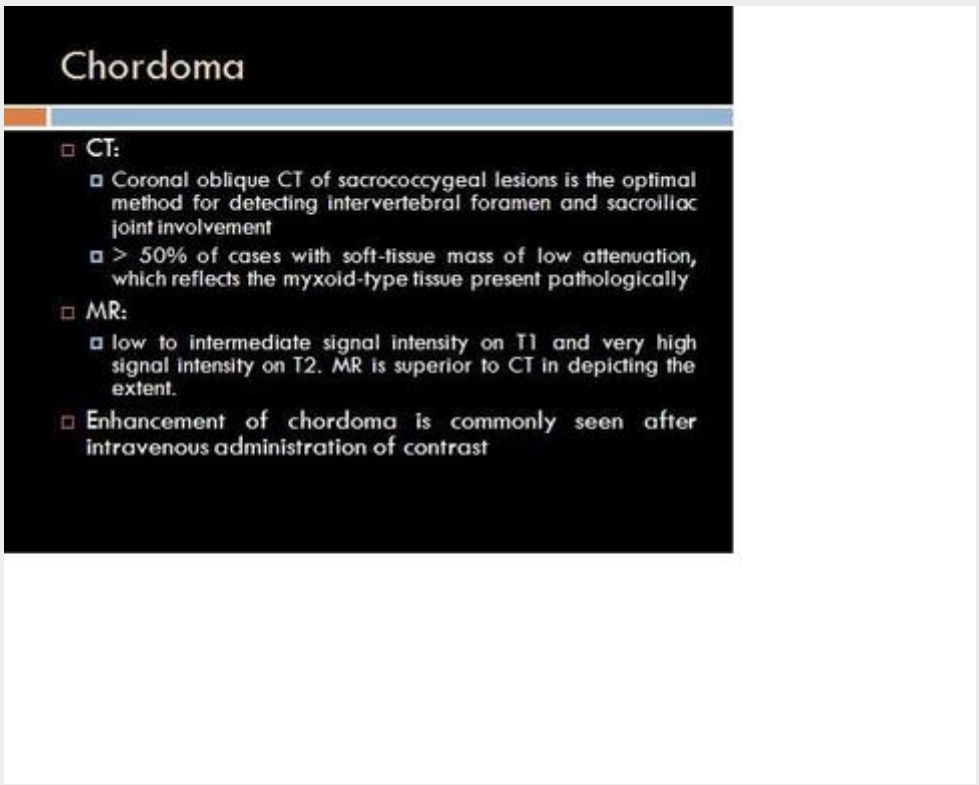
6.jpg


Chordoma
Radiology:
The most frequent radiographic appearance is a destructive lesion of a vertebral body centered in the midline, with a large, associated soft-tissue mass
Osseous expansion is frequent
Evidence of intratumoral calcification is seen in 50-70% of sacrococcygeal lesions on radiographs and in as many as 90% on CT

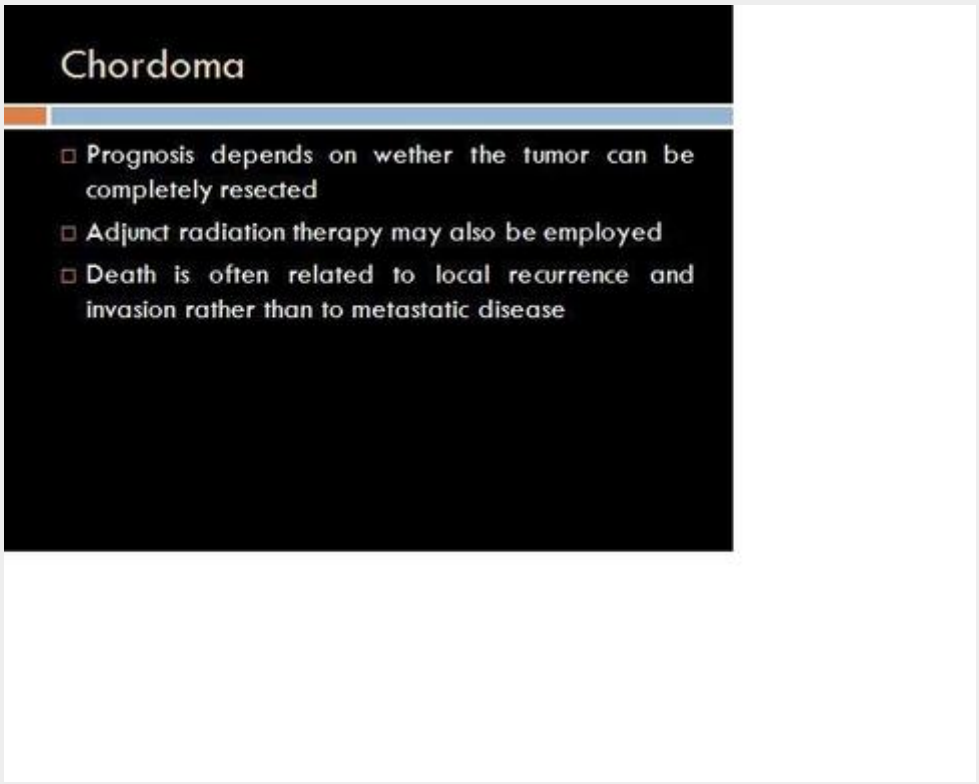
7.jpg


Chordoma
Radiology:
Lesions of spinal segments above the sacrum are generally less expansile, have calcification in only approximately 30% of cases, and may contain sclerosis
There may be intervertebral disk involvement, with narrowing, which is unusual for most spinal tumors and simulates infection and may lead to involvement of two adjacent vertebral levels

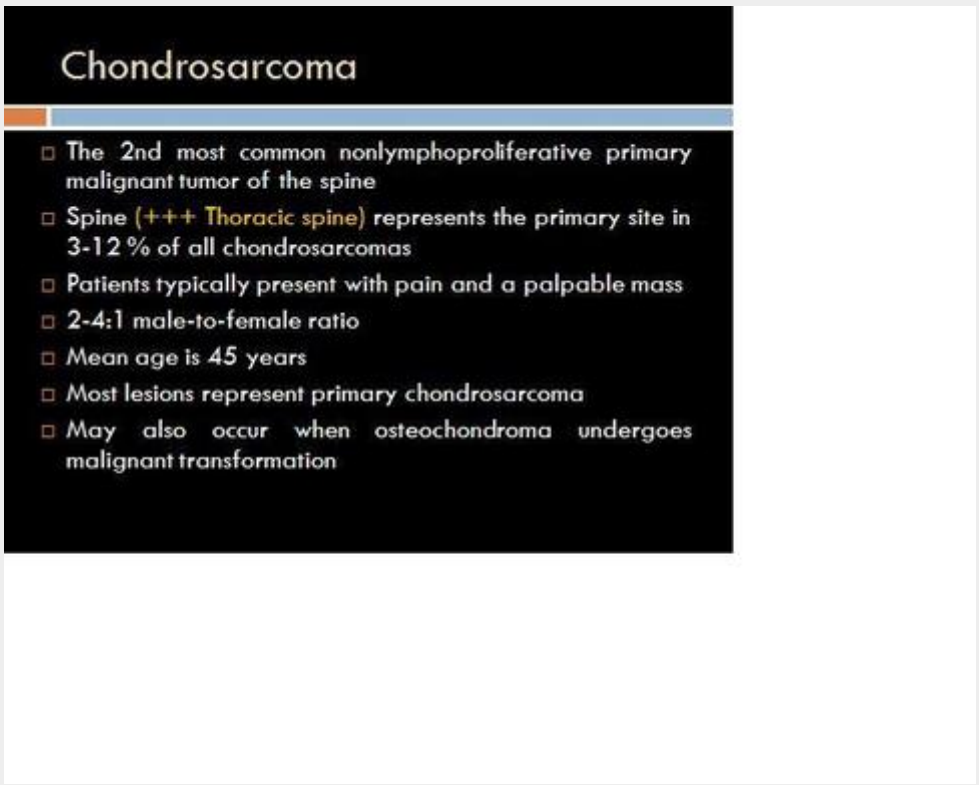
8.jpg


Chordoma
CT:
Coronal oblique CT of sacrococcygeal lesions is the optimal method for detecting intervertebral foramen and sacroiliac joint involvement
> 50% of cases with soft-tissue mass of low attenuation, which reflects the myxoid-type tissue present pathologically
MR:
low to intermediate signal intensity on T1 and very high signal intensity on T2. MR is superior to CT in depicting the extent.
Enhancement of chordoma is commonly seen after intravenous administration of contrast

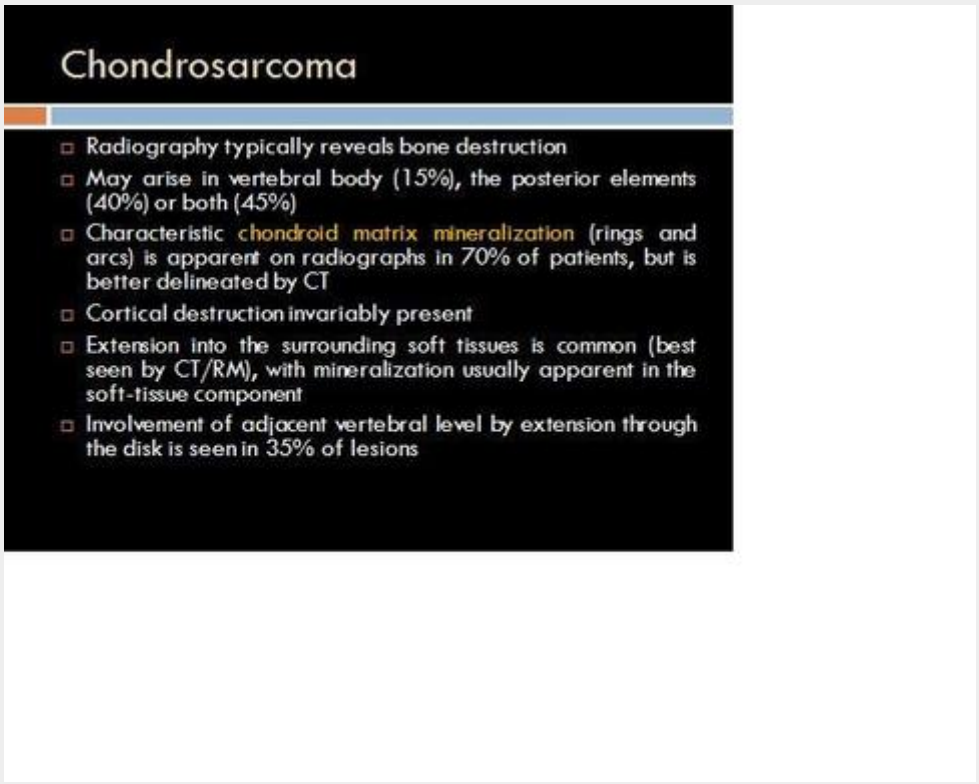
9.jpg


Chordoma
Prognosis depends on wether the tumor can be completely resected
Adjunct radiation therapy may also be employed
Death is often related to local recurrence and invasion rather than to metastatic disease

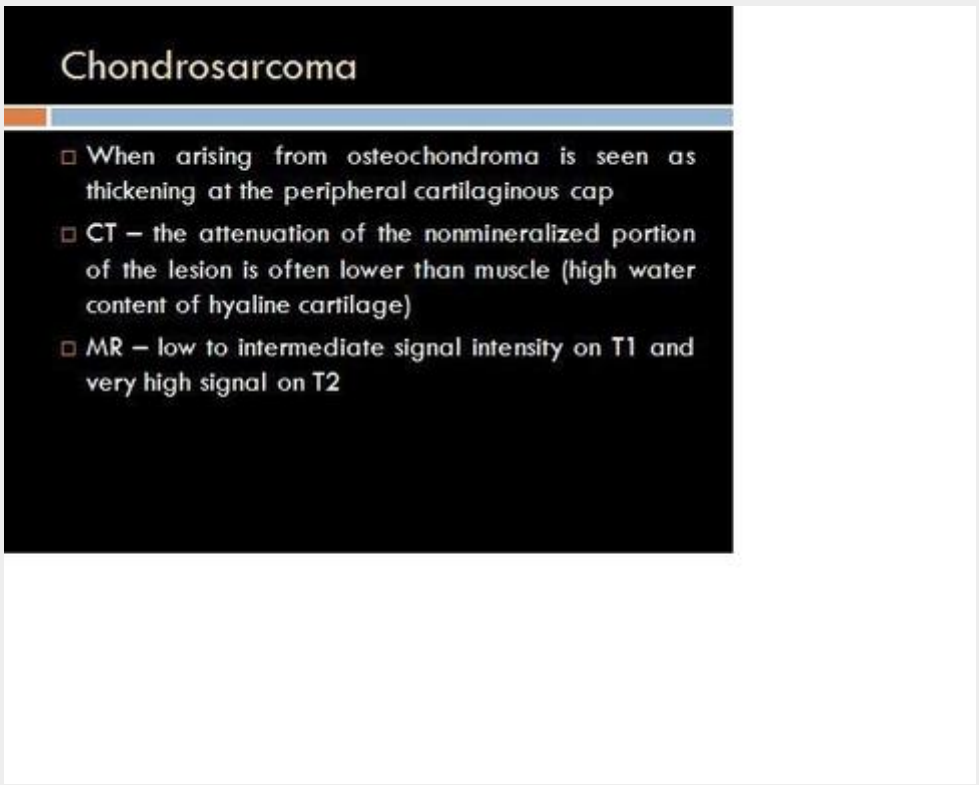
19.jpg


Chondrosarcoma
The 2nd most common nonlymphoproliferative primary malignant tumor of the spine
Spine (+++ Thoracic spine) represents the primary site in 3-12 % of all chondrosarcomas
Patients typically present with pain and a palpable mass
2-4:1 male-to-female ratio
Mean age is 45 years
Most lesions represent primary chondrosarcoma
May also occur when osteochondroma undergoes malignant transformation

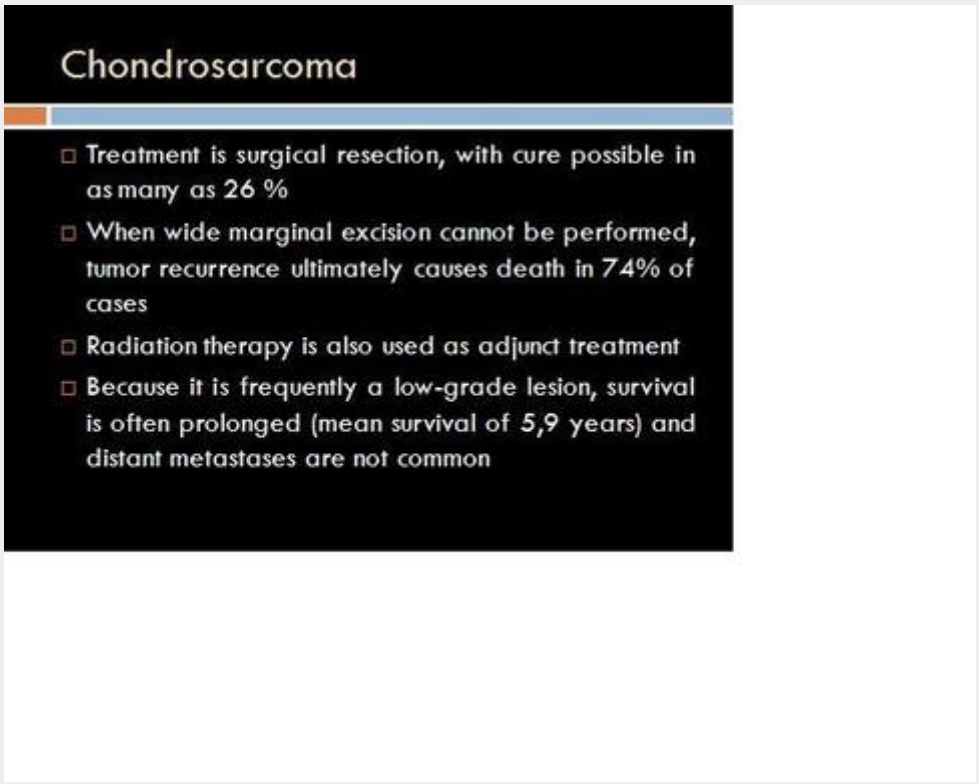
20.jpg


Chondrosarcoma
Radiography typically reveals bone destruction
May arise in vertebral body (15%), the posterior elements (40%) or both (45%)
Characteristic chondroid matrix mineralization (rings and arcs) is apparent on radiographs in 70% of patients, but is better delineated by CT
Cortical destruction invariably present
Extension into the surrounding soft tissues is common (best seen by CT/RM), with mineralization usually apparent in the soft-tissue component
Involvement of adjacent vertebral level by extension through the disk is seen in 35% of lesions

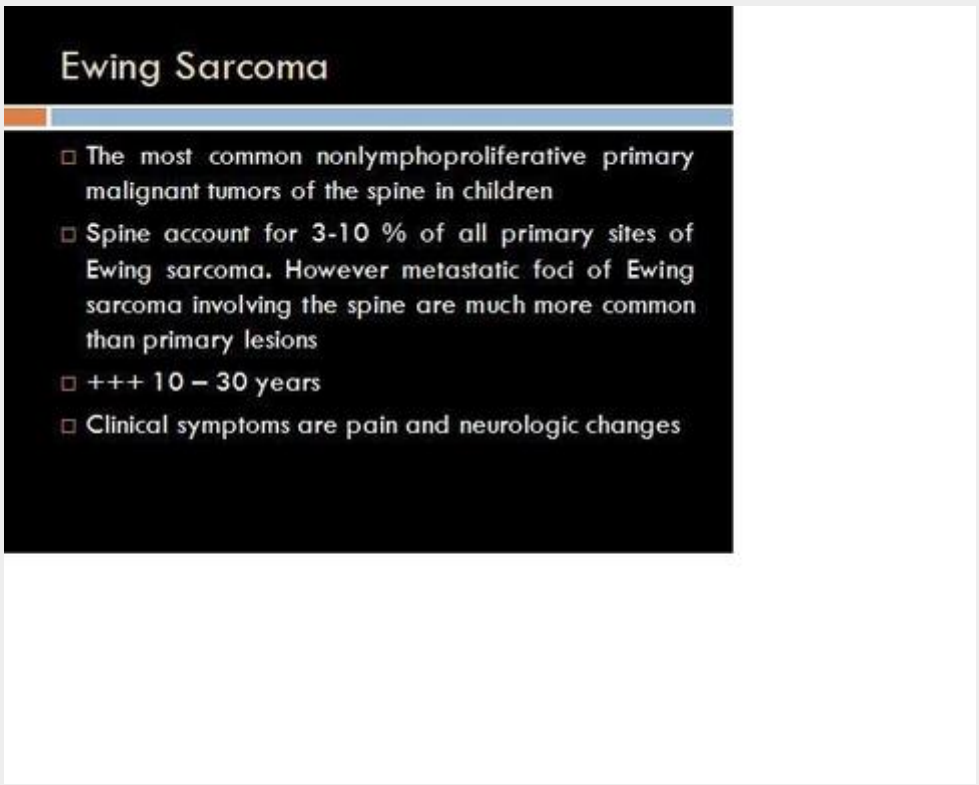
21.jpg


Chondrosarcoma
When arising from osteochondroma is seen as thickening at the peripheral cartilaginous cap
CT – the attenuation of the nonmineralized portion of the lesion is often lower than muscle (high water content of hyaline cartilage)
MR – low to intermediate signal intensity on T1 and very high signal on T2

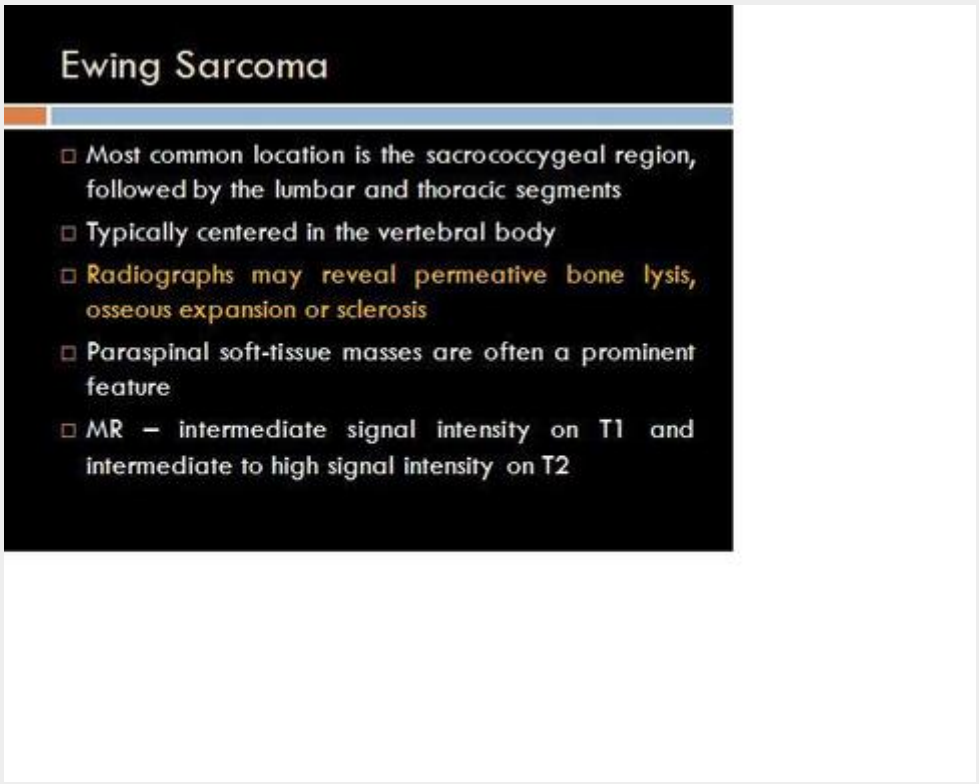
22.jpg


Chondrosarcoma
Treatment is surgical resection, with cure possible in as many as 26 %
When wide marginal excision cannot be performed, tumor recurrence ultimately causes death in 74% of cases
Radiation therapy is also used as adjunct treatment
Because it is frequently a low-grade lesion, survival is often prolonged (mean survival of 5,9 years) and distant metastases are not common

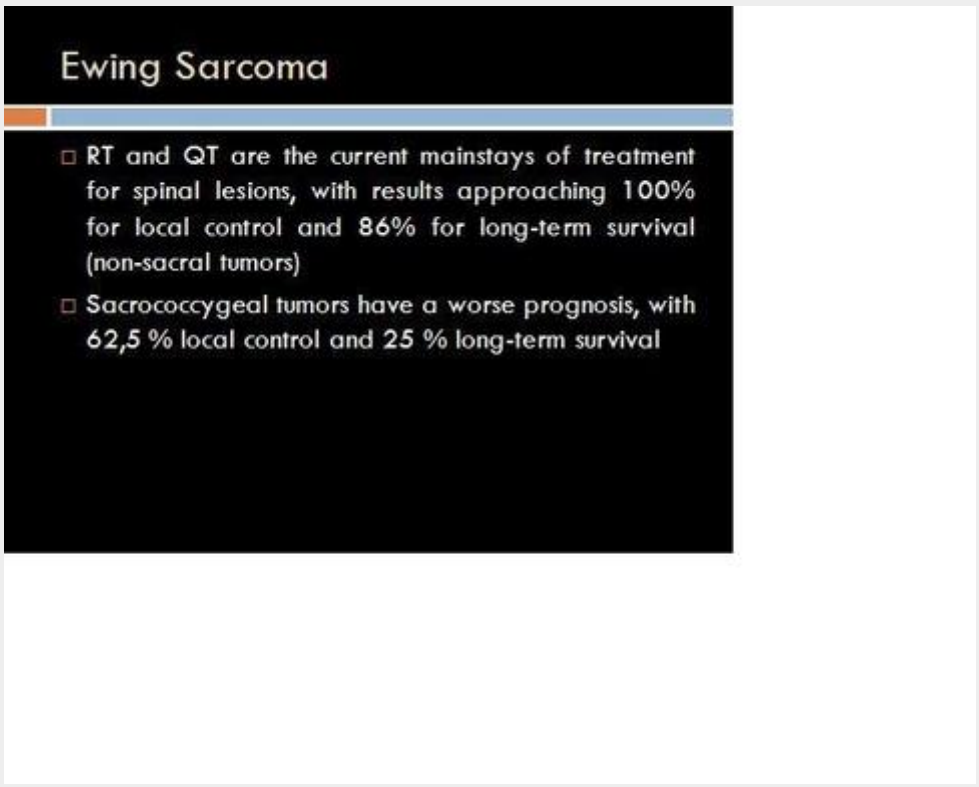
25.jpg


Ewing Sarcoma
The most common nonlymphoproliferative primary malignant tumors of the spine in children
Spine account for 3-10 % of all primary sites of Ewing sarcoma. However metastatic foci of Ewing sarcoma involving the spine are much more common than primary lesions
+++ 10 – 30 years
Clinical symptoms are pain and neurologic changes

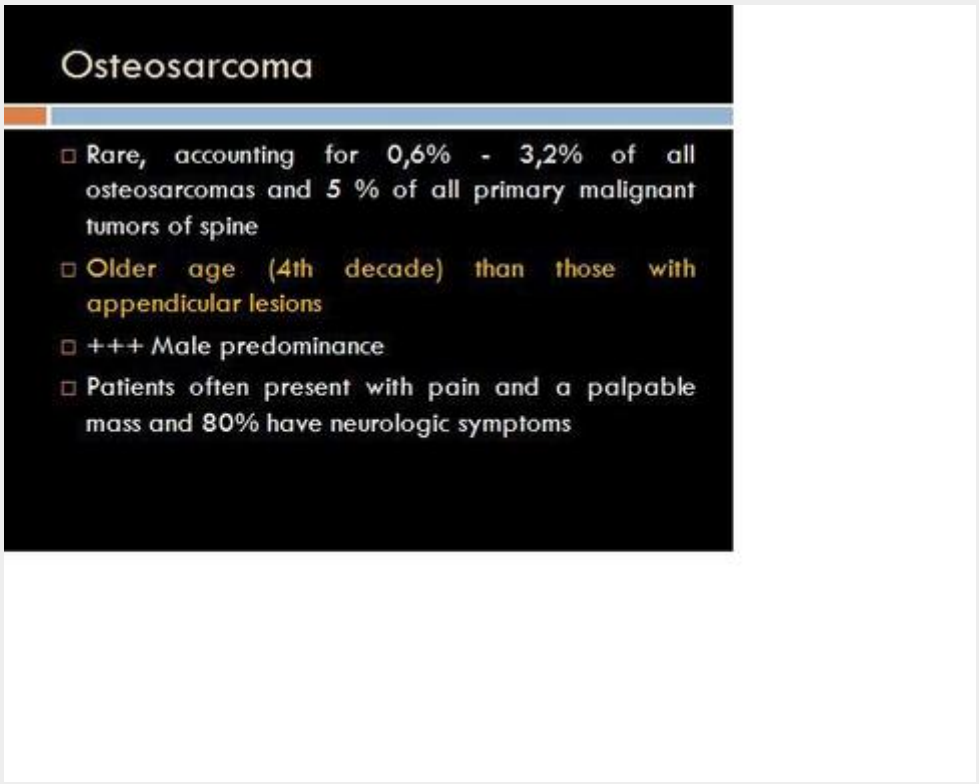
26.jpg


Ewing Sarcoma
Most common location is the sacrococcygeal region, followed by the lumbar and thoracic segments
Typically centered in the vertebral body
Radiographs may reveal permeative bone lysis, osseous expansion or sclerosis
Paraspinal soft-tissue masses are often a prominent feature
MR – intermediate signal intensity on T1 and intermediate to high signal intensity on T2

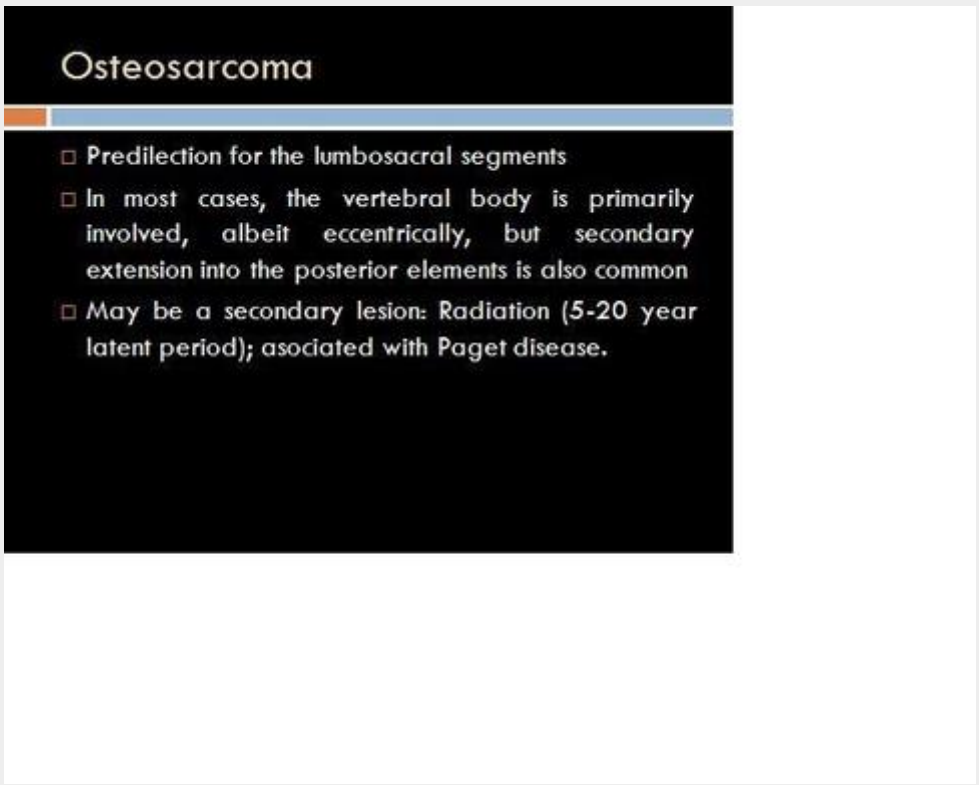
27.jpg


Ewing Sarcoma
RT and QT are the current mainstays of treatment for spinal lesions, with results approaching 100% for local control and 86% for long-term survival (non-sacral tumors)
Sacrococcygeal tumors have a worse prognosis, with 62,5 % local control and 25 % long-term survival

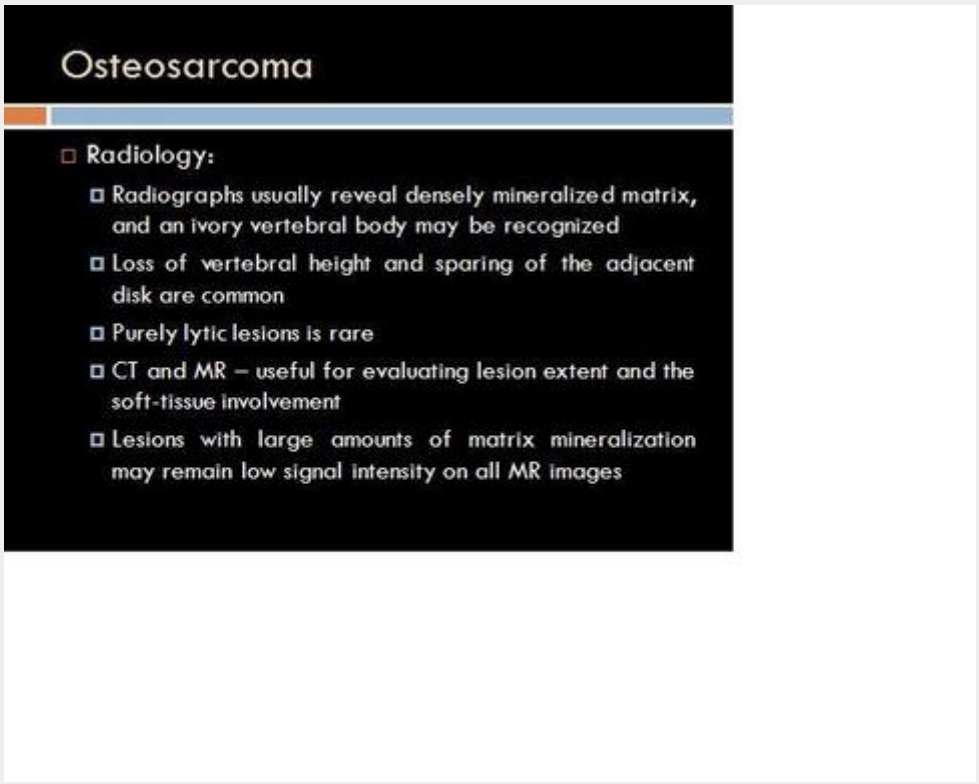
32.jpg


Osteosarcoma
Rare, accounting for 0,6% - 3,2% of all osteosarcomas and 5 % of all primary malignant tumors of spine
Older age (4th decade) than those with appendicular lesions
+++ Male predominance
Patients often present with pain and a palpable mass and 80% have neurologic symptoms

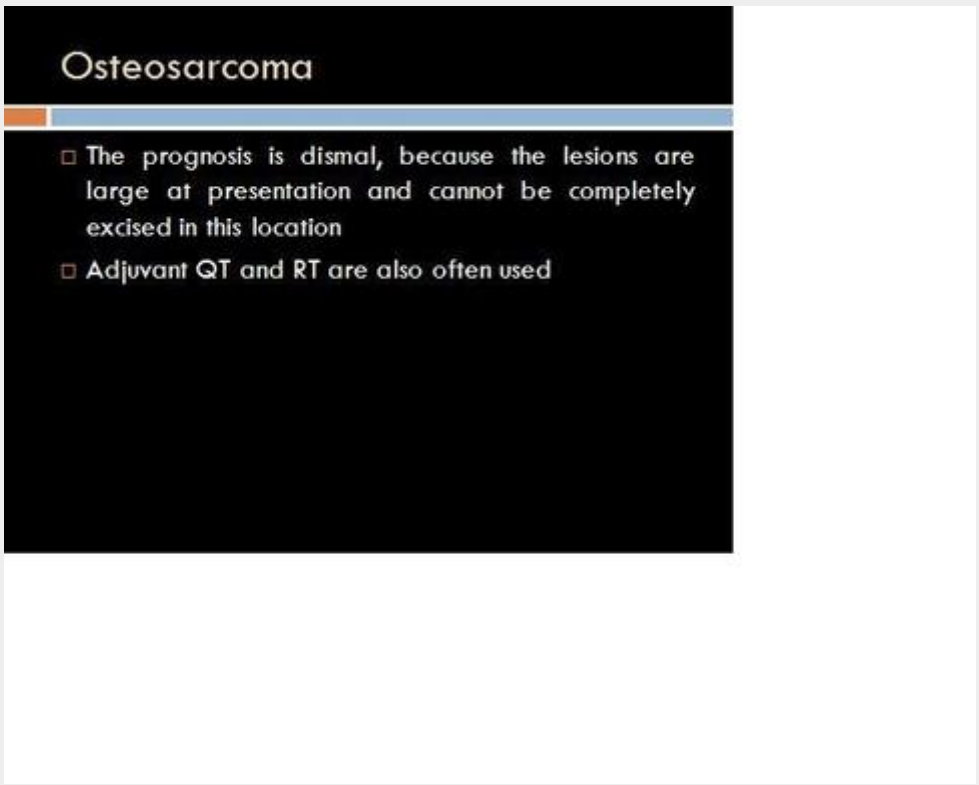
33.jpg


Osteosarcoma
Predilection for the lumbosacral segments
In most cases, the vertebral body is primarily involved, albeit eccentrically, but secondary extension into the posterior elements is also common
May be a secondary lesion: Radiation (5-20 year latent period); asociated with Paget disease.

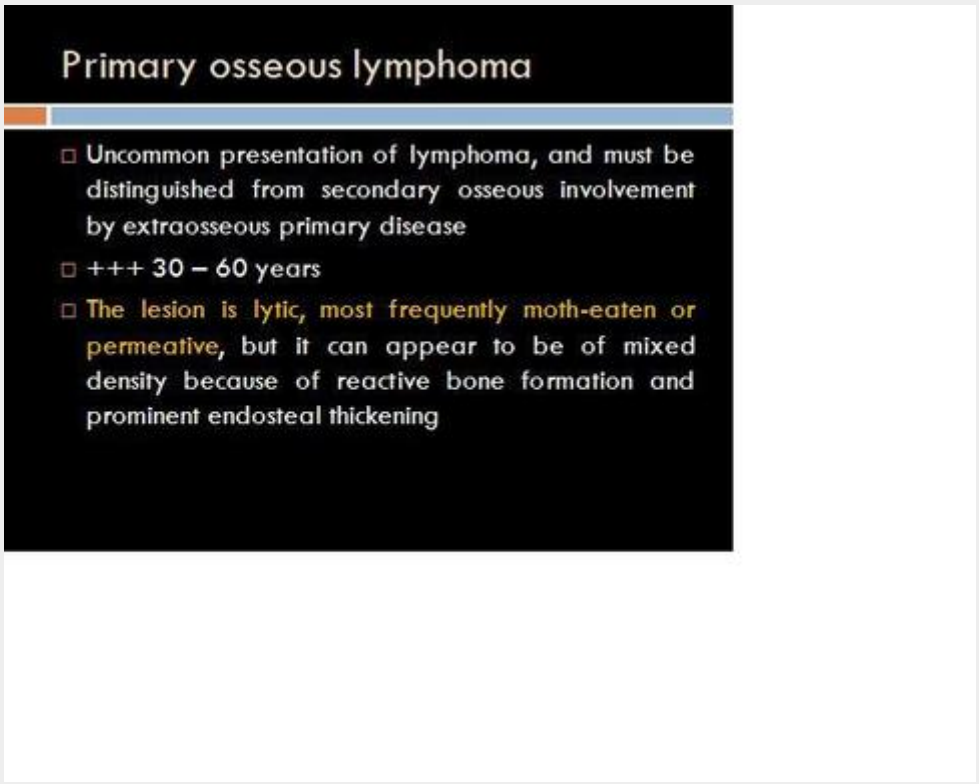
34.jpg


Osteosarcoma
Radiology:
Radiographs usually reveal densely mineralized matrix, and an ivory vertebral body may be recognized
Loss of vertebral height and sparing of the adjacent disk are common
Purely lytic lesions is rare
CT and MR – useful for evaluating lesion extent and the soft-tissue involvement
Lesions with large amounts of matrix mineralization may remain low signal intensity on all MR images

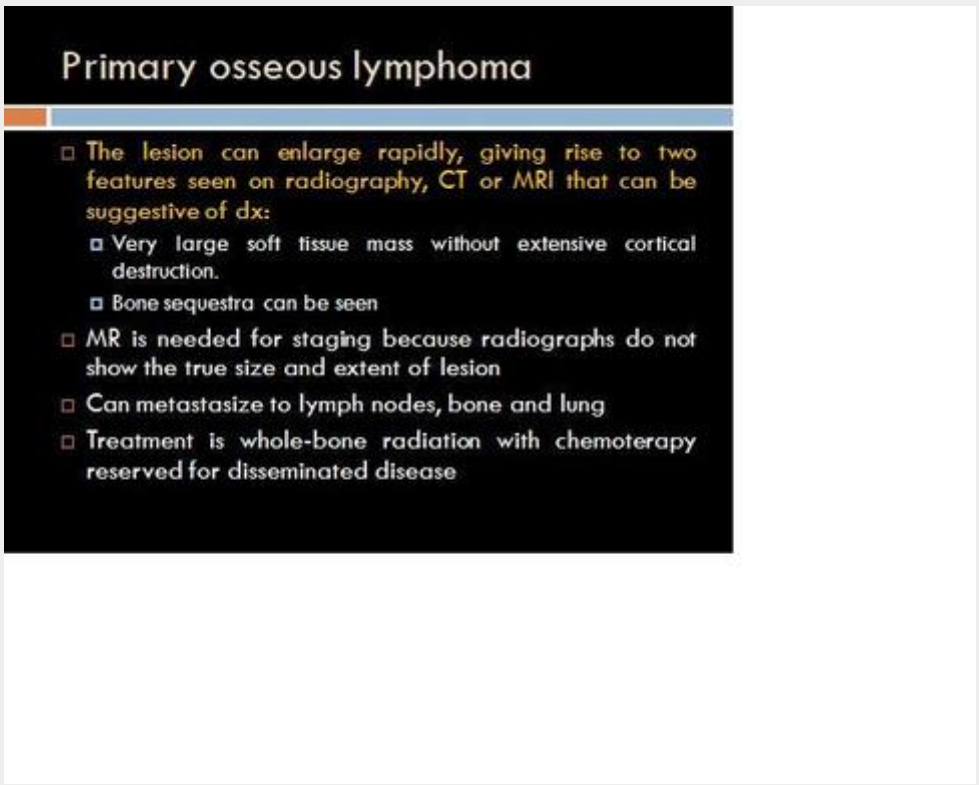
35.jpg


Osteosarcoma
The prognosis is dismal, because the lesions are large at presentation and cannot be completely excised in this location
Adjuvant QT and RT are also often used

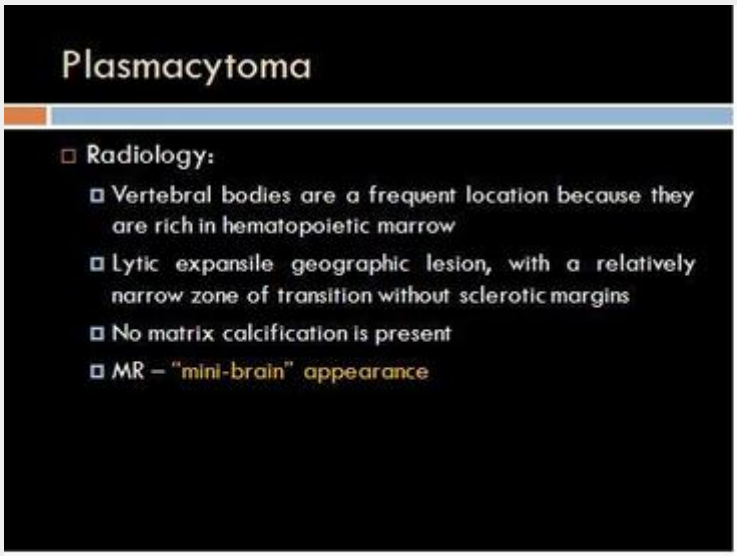
36.jpg


Primary osseous lymphoma
Uncommon presentation of lymphoma, and must be distinguished from secondary osseous involvement by extraosseous primary disease
+++ 30 – 60 years
The lesion is lytic, most frequently moth-eaten or permeative, but it can appear to be of mixed density because of reactive bone formation and prominent endosteal thickening

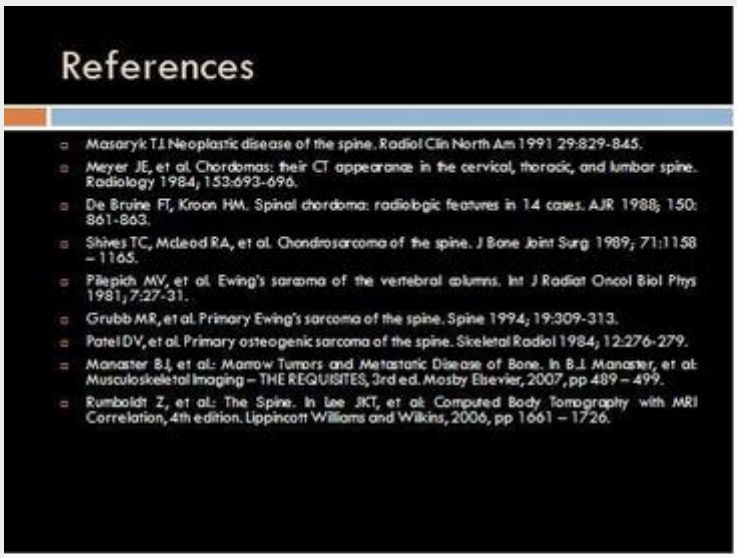
37.jpg


Primary osseous lymphoma
The lesion can enlarge rapidly, giving rise to two features seen on radiography, CT or MRI that can be suggestive of dx:
Very large soft tissue mass without extensive cortical destruction.
Bone sequestra can be seen
MR is needed for staging because radiographs do not show the true size and extent of lesion
Can metastasize to lymph nodes, bone and lung
Treatment is whole-bone radiation with chemoterapy reserved for disseminated disease

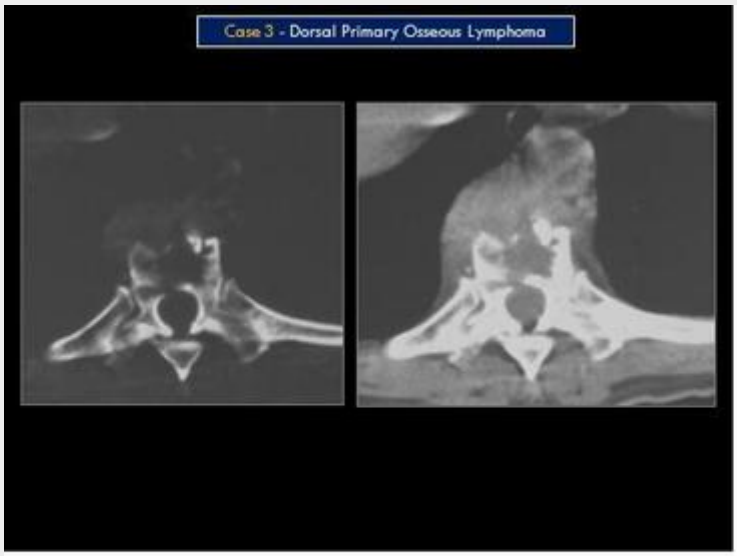
45.jpg


Plasmacytoma
Radiology:
Vertebral bodies are a frequent location because they are rich in hematopoietic marrow
Lytic expansile geographic lesion, with a relatively narrow zone of transition without sclerotic margins
No matrix calcification is present
MR – "mini-brain" appearance

53.jpg

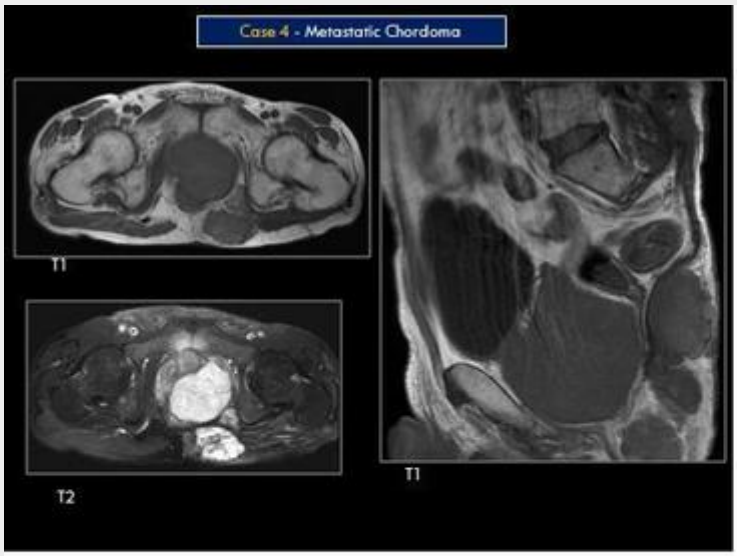

References
Masaryk T.J. Neoplastic disease of the spine. Radiol Clin North Am 1991 29:829-845.
Meyer JE, et al. Chordomas: their CT appearance in the cervical, thoracic, and lumbar spine. Radiology 1984, 153:693-696.
De Bruine FT, Kroon HM. Spinal chordoma: radiologic features in 14 cases. AJR 1988; 150: 861-863.
Shives TC, Mcleod RA, et al. Chondrosarcoma of the spine. J Bone Joint Surg 1989; 71:1158 – 1165.
Pilepich MV, et al. Ewing's sarcoma of the vertebral columns. Int J Radiat Oncol Biol Phys 1981, 7:27-31.
Grubb MR, et al. Primary Ewing's sarcoma of the spine. Spine 1994; 19:309-313.
Patel DV, et al. Primary osteogenic sarcoma of the spine. Skeletal Radiol 1984; 12:276-279.
Manaster B.J, et al.: Marrow Tumors and Metastatic Disease of Bone. In B.J. Manaster, et al: Musculoskeletal Imaging – THE REQUISITES, 3rd ed. Mosby Elsevier, 2007, pp 489 – 499.
Rumboldt Z, et al.: The Spine. In Lee JKT, et al: Computed Body Tomography with MRI Correlation, 4th edition. Lippincott Williams and Wilkins, 2006, pp 1661 – 1726.

43.jpg



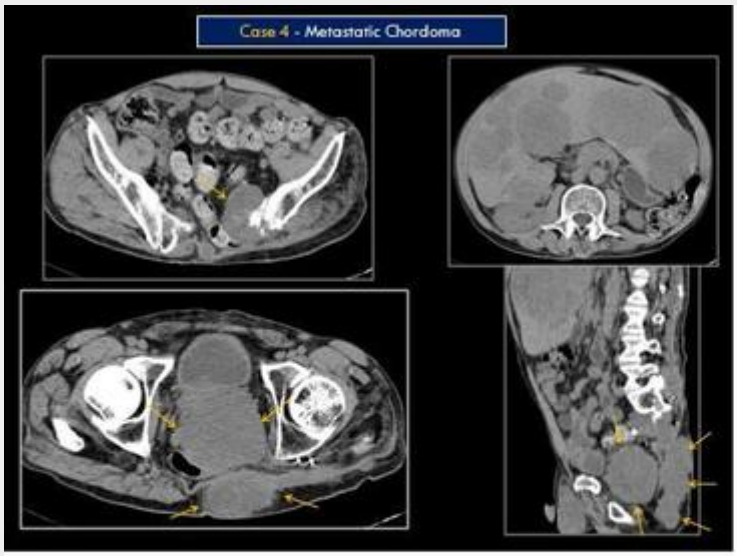
CT – Osteolytic lesion located in the vertebral body associated with a soft tissue mass.

18.jpg



CT and MR – We can see several volumous soft-tissue masses in the pelvis (arrows). The lesions have intermediate signal on T1 and high signal on T2. There are also multiple liver metastasis.

17.jpg

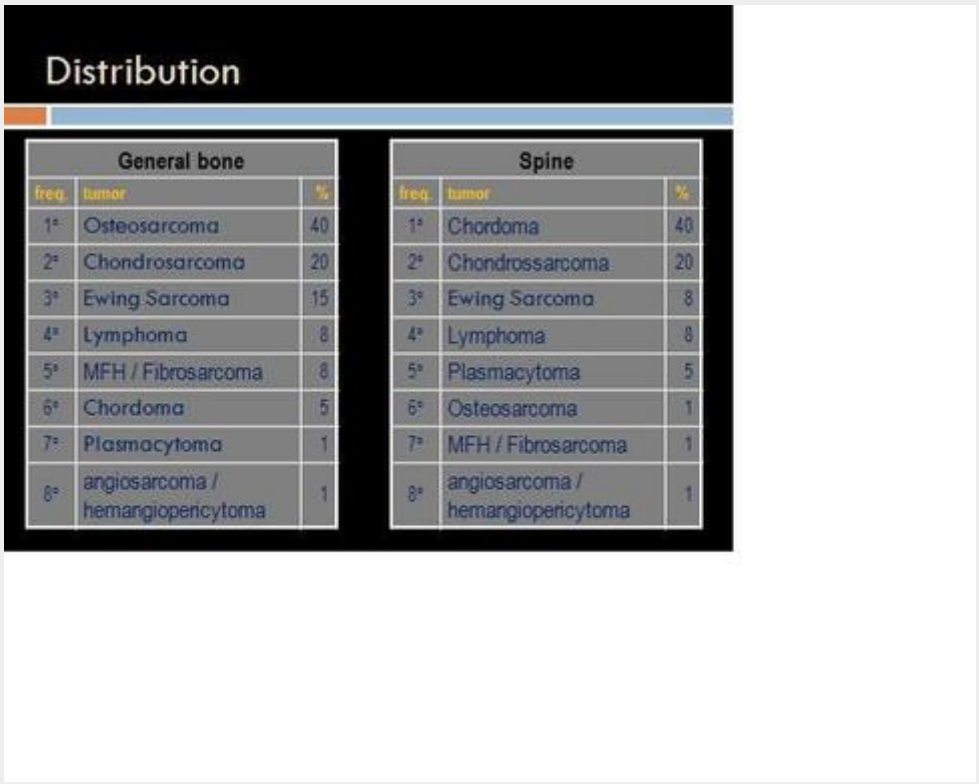


CT and MR – We can see several volumous soft-tissue masses in the pelvis (arrows). The lesions have intermediate signal on T1 and high signal on T2. There are also multiple liver metastasis.

52.jpg

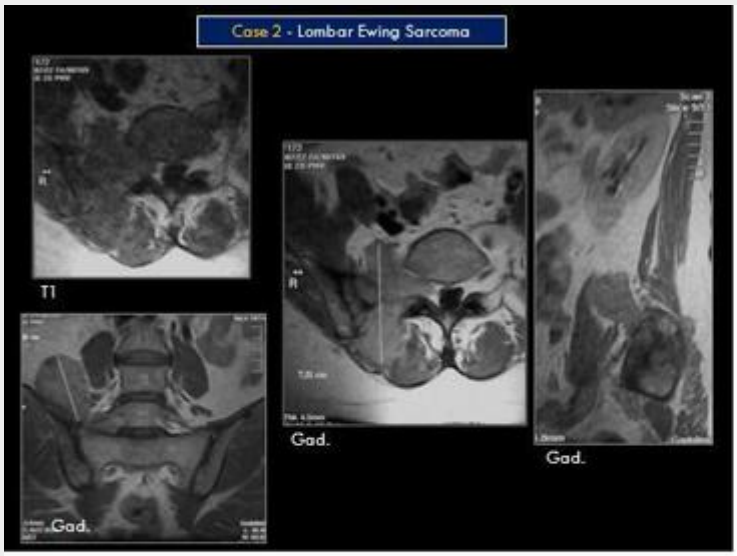
Interventional Radiology – CT guided biopsy is instrumental for obtaining tissue for histologic analysis. Biopsy can be made in the bone lesion or in the often associated soft-tissue mass, at any level of the spine.

2.jpg



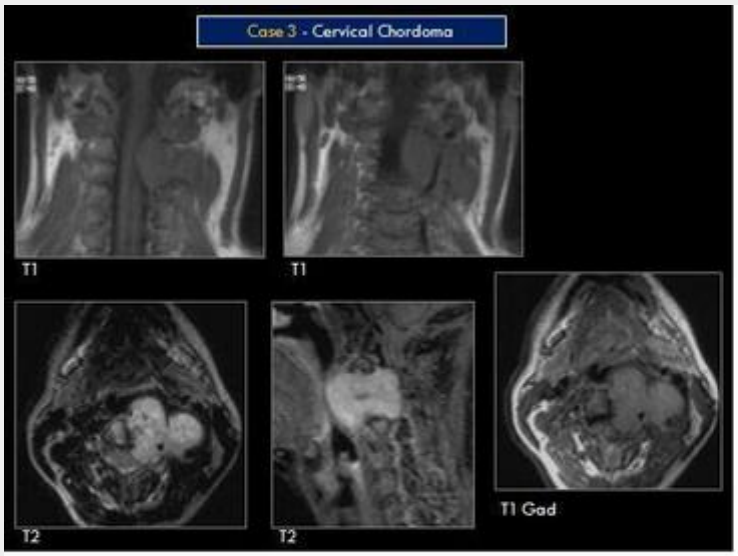
MFH – Malignant Fibrous Histiocytoma. Repair in the different distribution of malignant neoplasm in general bone and spine. For example osteosarcoma is the most frequent neoplasm in general bone, but it is rare in spine. On the other hand, chordoma is the most frequent in spine, and is relatively rare in general bone.

31.jpg



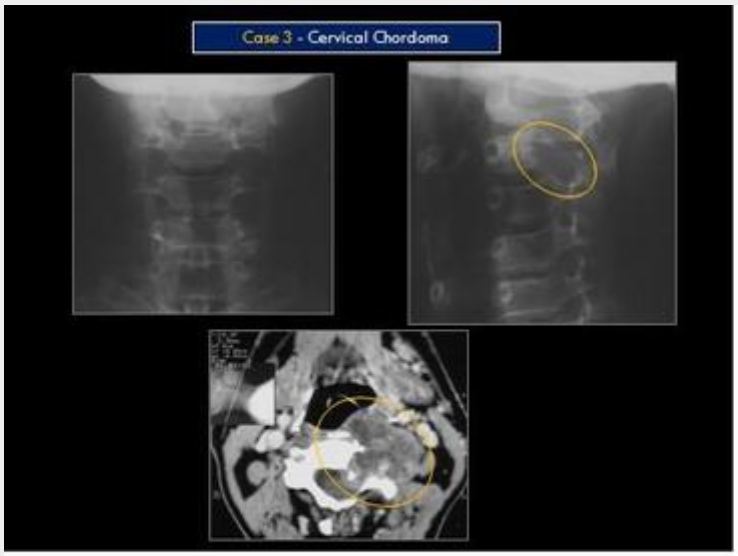
MR – The associated soft-tissue mass is the prominent feature of this tumor. The MR findings are nonspecific, with low/intermediate signal on T1, and a weak homogeneous enhancement after gadolinium.

16.jpg



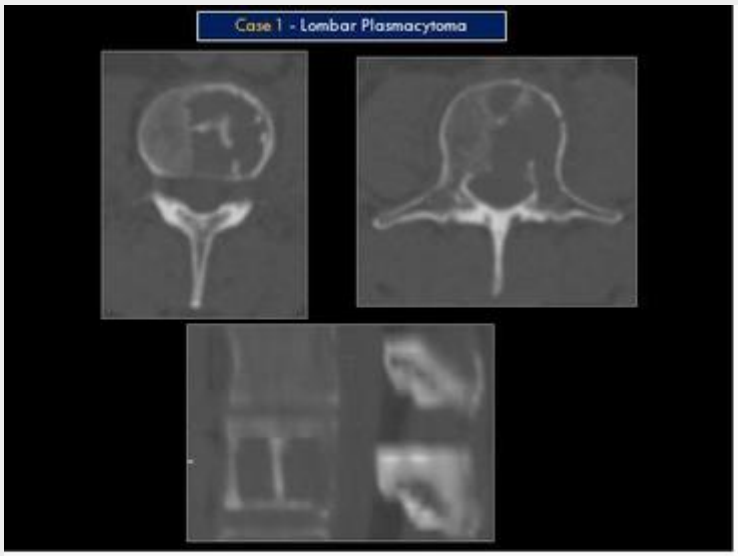
X-Ray, CT and MR – Osteolytic lesion, with a big and lobulated soft-tissue mass, that goes through an enlarged neural foramina extending to epidural and paravertebral space. There is low signal on T1, very high signal on T2 (myxoid content) with a weak but heterogeneous enhancement after gadolinium.

15.jpg



X-Ray, CT and MR – Osteolytic lesion, with a big and lobulated soft-tissue mass, that goes through an enlarged neural foramina extending to epidural and paravertebral space. There is low signal on T1, very high signal on T2 (myxoid content) with a weak but heterogeneous enhancement after gadolinium.

47.jpg

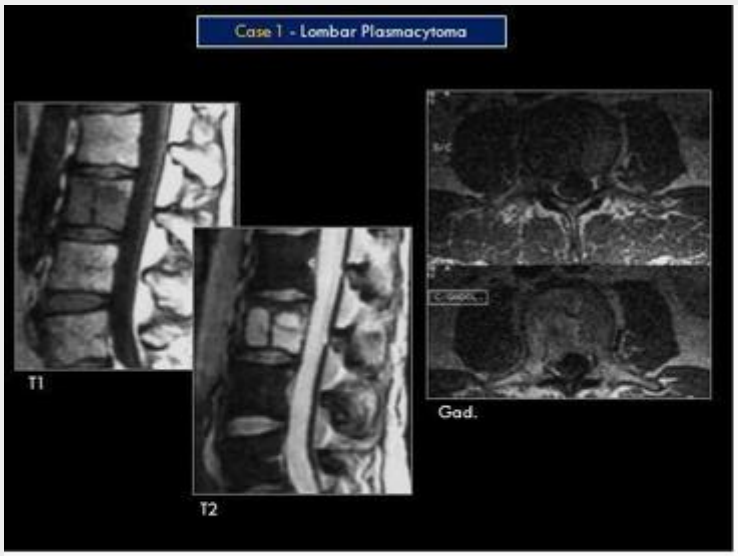


X-Ray, CT and MR – Osteolytic lesion affecting a lombar vertebral body, with relative preservation of cortical bone – “empty vertebra appearance”. We can see several lytic areas, separated by vertical bone bridges, with preservation of vertebral body height. The lesion has low signal on T1 and high signal on T2, with enhancement after gadolinium.

46.jpg

X-Ray, CT and MR – Osteolytic lesion affecting a lombar vertebral body, with relative preservation of cortical bone – “empty vertebra appearance”. We can see several lytic areas, separated by vertical bone bridges, with preservation of vertebral body height. The lesion has low signal on T1 and high signal on T2, with enhancement after gadolinium.

48.jpg

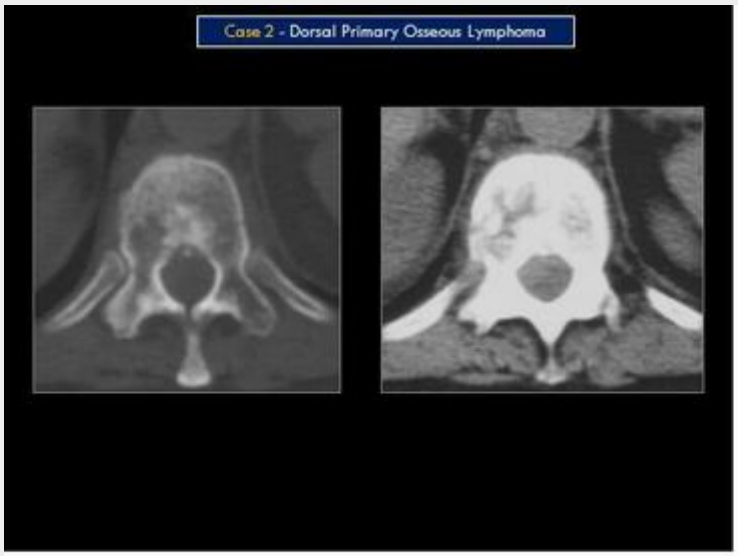


X-Ray, CT and MR – Osteolytic lesion affecting a lombar vertebral body, with relative preservation of cortical bone – “empty vertebra appearance”. We can see several lytic areas, separated by vertical bone bridges, with preservation of vertebral body height. The lesion has low signal on T1 and high signal on T2, with enhancement after gadolinium.

42.jpg

X-Ray, CT and MR – The pattern of this lesion is mainly osteolytic, with partial vertebral body colapse. At MR there is low signal on T1 and high signal on T2. After gadolinium there is little but heterogeneous enhancement. In this case there isn't an associated soft-tissue mass (frequently seen with this kind of tumors).

41.jpg



X-Ray, CT and MR – The pattern of this lesion is mainly osteolytic, with partial vertebral body colapse. At MR there is low signal on T1 and high signal on T2. After gadolinium there is little but heterogeneous enhancement. In this case there isn't an associated soft-tissue mass (frequently seen with this kind of tumors).

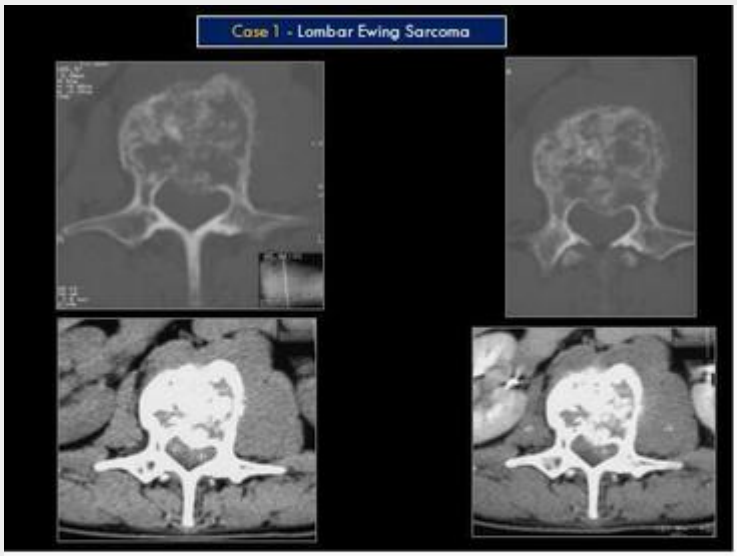
40.jpg

X-Ray, CT and MR – The pattern of this lesion is mainly osteolytic, with partial vertebral body colapse. At MR there is low signal on T1 and high signal on T2. After gadolinium there is little but heterogeneous enhancement. In this case there isn't an associated soft-tissue mass (frequently seen with this kind of tumors).

30.jpg

X-Ray, CT and MR – This case has a mixed pattern (lytic and sclerotic), more often seen after treatment. The lesion is centered in the vertebral body – a typical location for Ewing Sarcoma. There is a prevertebral soft-tissue mass, also a prominent feature of these lesions. The MR appearance is nonspecificic – intermediate signal intensity on T1 and intermediate to high signal intensity on T2.

29.jpg



X-Ray, CT and MR – This case has a mixed pattern (lytic and sclerotic), more often seen after treatment. The lesion is centered in the vertebral body – a typical location for Ewing Sarcoma. There is a prevertebral soft-tissue mass, also a prominent feature of these lesions. The MR appearance is nonspecificic – intermediate signal intensity on T1 and intermediate to high signal intensity on T2.

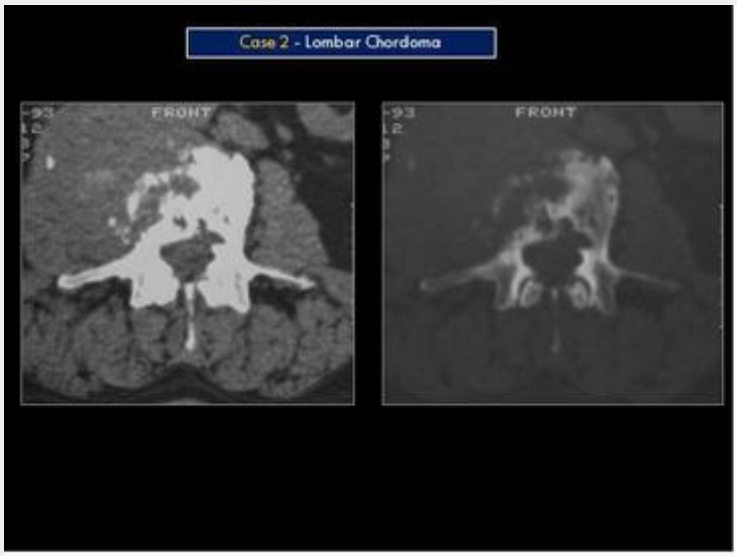
28.jpg

X-Ray, CT and MR – This case has a mixed pattern (lytic and sclerotic), more often seen after treatment. The lesion is centered in the vertebral body – a typical location for Ewing Sarcoma. There is a prevertebral soft-tissue mass, also a prominent feature of these lesions. The MR appearance is nonspecificic – intermediate signal intensity on T1 and intermediate to high signal intensity on T2.

13.jpg

X-Ray and CT – In lombar spine the lesion usually arises from the transition between the anterior 2/3 with the posterior 1/3 of the vertebral body (place of remnants of notochord). Usually, lombar chordoma, as seen in this case, has a mixed pattern of lysis and sclerosis. There is a soft tissue mass with calcifications, intervertebral disk involvement with narrowing (can simulate infection!) and partial vertebral body collapse.

14.jpg

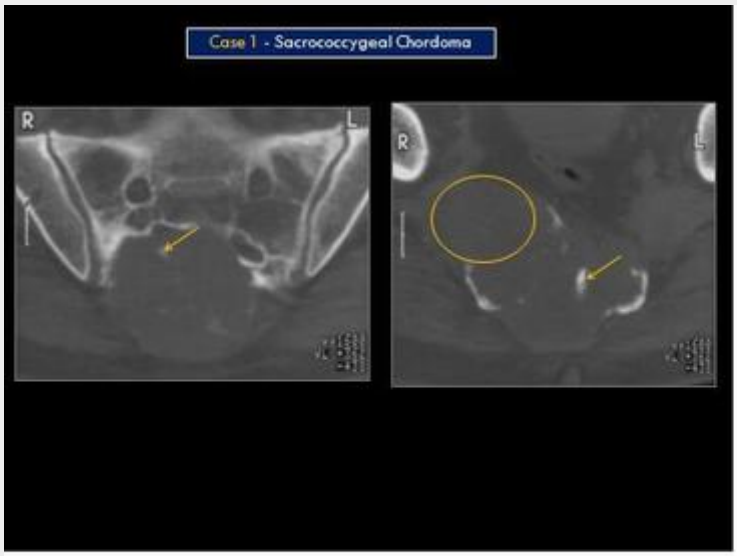


X-Ray and CT – In lombar spine the lesion usually arises from the transition between the anterior 2/3 with the posterior 1/3 of the vertebral body (place of remnants of notochord). Usually, lombar chordoma, as seen in this case, has a mixed pattern of lysis and sclerosis. There is a soft tissue mass with calcifications, intervertebral disk involvement with narrowing (can simulate infection!) and partial vertebral body collapse.

11.jpg

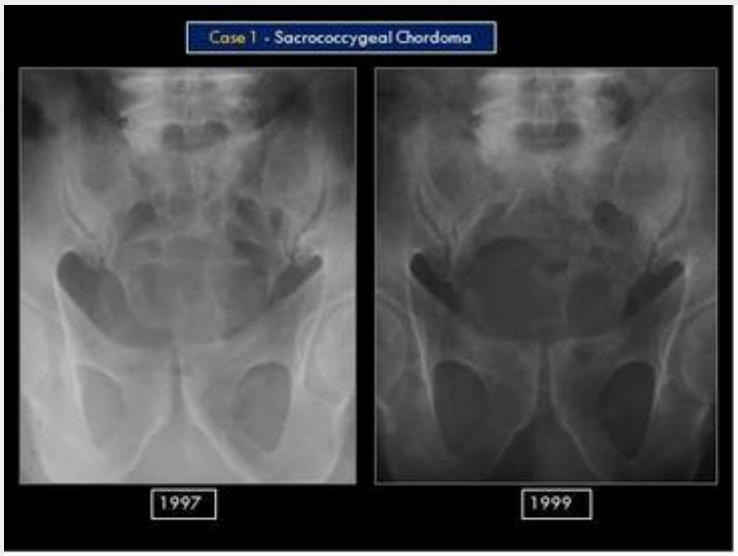
X-Ray and CT – Pelvis X-Ray obtained with two years interval (patient refused treatment in 1997) reveals a slow growing tumor. This case appears in the midline of sacrococcygeal region (the most frequent location for Chordoma) as a expansil lytic lesion, that spares the upper portion of sacrum. The soft-tissue mass has low density (circle), due to the myxoid-type tissue present pathologically. There are intra-tumoral calcifications (arrows) that usually represent destructed bone sequestrum (and not matrix calcification).

12.jpg



X-Ray and CT – Pelvis X-Ray obtained with two years interval (patient refused treatment in 1997) reveals a slow growing tumor. This case appears in the midline of sacrococcygeal region (the most frequent location for Chordoma) as a expansil lytic lesion, that spares the upper portion of sacrum. The soft-tissue mass has low density (circle), due to the myxoid-type tissue present pathologically. There are intra-tumoral calcifications (arrows) that usually represent destructed bone sequestrum (and not matrix calcification).

10.jpg

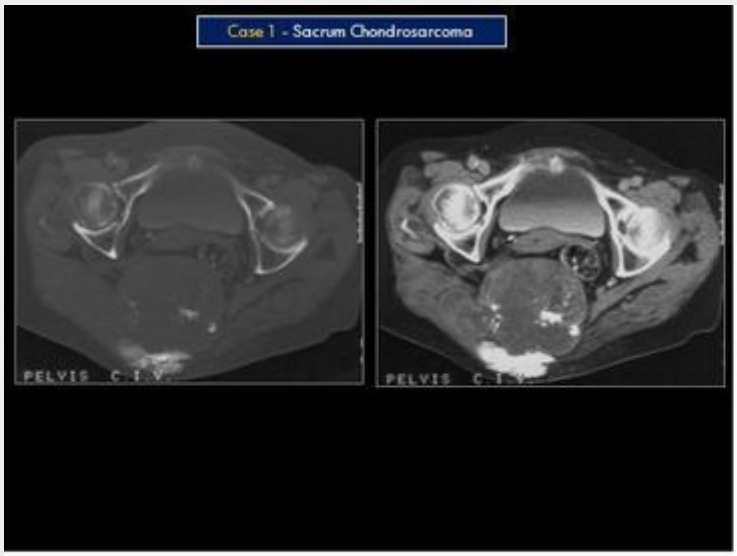


X-Ray and CT – Pelvis X-Ray obtained with two years interval (patient refused treatment in 1997) reveals a slow growing tumor. This case appears in the midline of sacrococcygeal region (the most frequent location for Chordoma) as a expansil lytic lesion, that spares the upper portion of sacrum. The soft-tissue mass has low density (circle), due to the myxoid-type tissue present pathologically. There are intra-tumoral calcifications (arrows) that usually represent destructed bone sequestrum (and not matrix calcification).

49.jpg

X-Ray and CT – Purely lytic lesion with associated soft-tissue mass.

24.jpg



X-Ray and CT – There is a osteolytic lesion associated with a volumous soft-tissue mass, which has several mineralized areas (resulting not only from chondroid matrix mineralization but also due to bone sequestra that result from destruction of the previous osteochondroma). The low attenuation seen at CT in the nonmineralizard portion of the mass is typical, and reflects the high water content of hyaline cartilage.

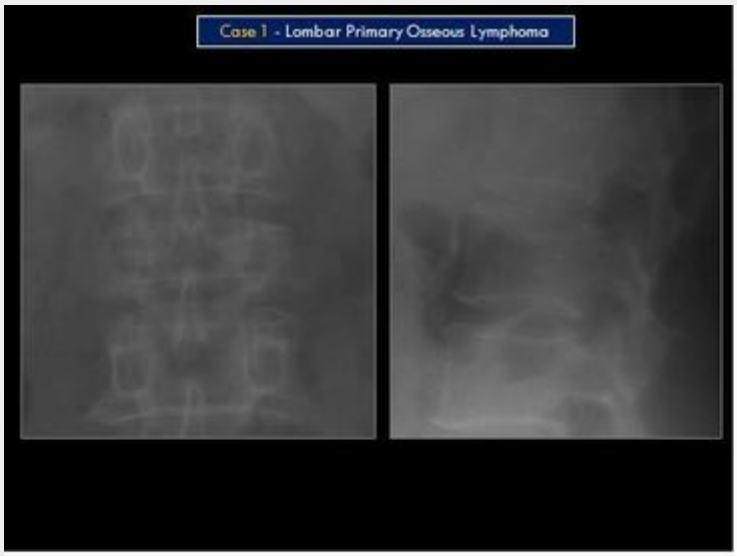
23.jpg

X-Ray and CT – There is a osteolytic lesion associated with a volumous soft-tissue mass, which has several mineralized areas (resulting not only from chondroid matrix mineralization but also due to bone sequestra that result from destruction of the previous osteochondroma). The low attenuation seen at CT in the nonmineralizard portion of the mass is typical, and reflects the high water content of hyaline cartilage.

39.jpg

X-Ray and CT – This lesion is difficult to characterize on X-Ray. However CT demonstrates well the typical permeative pattern seen in primary bone lymphoma.

38.jpg



X-Ray and CT – This lesion is difficult to characterize on X-Ray. However CT demonstrates well the typical permeative pattern seen in primary bone lymphoma.

51.jpg

X-Ray and MR – There is fracture with vertebral body collapse, being apparent a medular osteolytic pattern with relative preservation of cortical vertebral plates. The lesion is low signal on T1 and high signal on T2, with good enhancement after gadolinium.

50.jpg

X-Ray and MR – There is fracture with vertebral body collapse, being apparent a medular osteolytic pattern with relative preservation of cortical vertebral plates. The lesion is low signal on T1 and high signal on T2, with good enhancement after gadolinium.