Spine Tumors

tumor in the spinal cord or the spinal column.

*most common spinal tumor → metastatic

* CNS tumors:

15% spine

~85% brain

Facts

- 15% of primary CNS tumors are intraspinal.
- Most primary tumors of the spine are benign, unlike most intracranial tumors which are malignant.
- As it grows, the tumor affects the spinal cord cells, nerve roots, meninges, blood vessels, or the bones of the spine. It causes symptoms commonly due to compression of the spinal cord or nerve roots (similar to spinal cord trauma), invasion of normal cells by the tumor, or ischemia (lack of oxygen) that results from blockage of blood vessels.
- Their incidence is about 1.1 case per 100,000 population.

Definition

- A spinal tumor is an abnormal mass of tissue *within* or *surrounding* the spinal cord and spinal column, in which cells grow and multiply uncontrollably, seemingly unchecked by the mechanisms that control normal cells

* شرح جيد .

Classification

mc : metastisis . (From lung).

- 1. Extradural → extra-axial [bone, muscle, ligament, soft tissue]
- 2. Intradural: [thecal sac]
  - A. Extramedullary → extraaxial
  - B. Intramedullary (in the spinal cord). → intra-axial.

* extradural > extramedullary > intramedullary.
55 %. 45 %. 5 %.

Extradural Tumors

most common 55% / secondary > primary

- Arise outside the cord, in the vertebral bodies or epidural space.
- They represent about 55% of all spine tumors.
- Either:
  - A- Primary (very rare).
  - B- Secondary (The spinal column is the most common site for bone metastasis).
  - C- Tumors that are usually intradural but can be partially or completely extradural.

✓ *more in cancellus bone
*most common site of brain metastasis → thoracic spine

Extradural

* most common site of the vertebra? pedicle

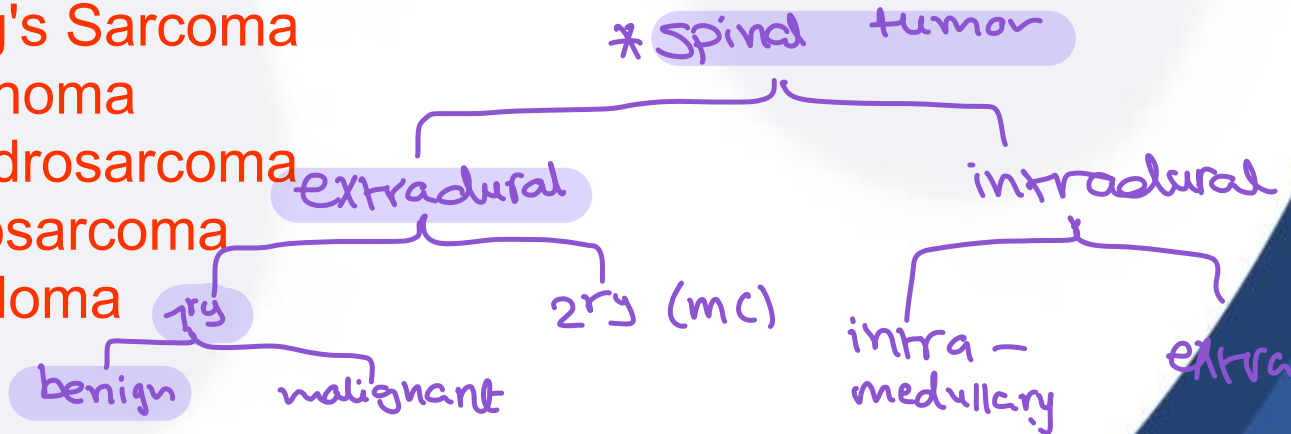
- A - Primary tumors: [rare]

Benign …

- ✓ – Hemangioma → غير شائع → not significant.
- ✓ – Osteochondroma
- ✓ – Osteoid osteoma
- ✓ – Osteoblastoma
- ✓ – Aneurysmal Bone Cysts (ABCs)
- ✓ – Giant Cell Tumor
- ✓ – Eosinophilic Granuloma

Malignant …

- – Plasmacytoma
- – Myeloma
- – Ewing's Sarcoma
- – Lymphoma
- – Chondrosarcoma
- – Osteosarcoma
- – Chordoma



- Primary tumors:

Benign

A- Osteochondroma

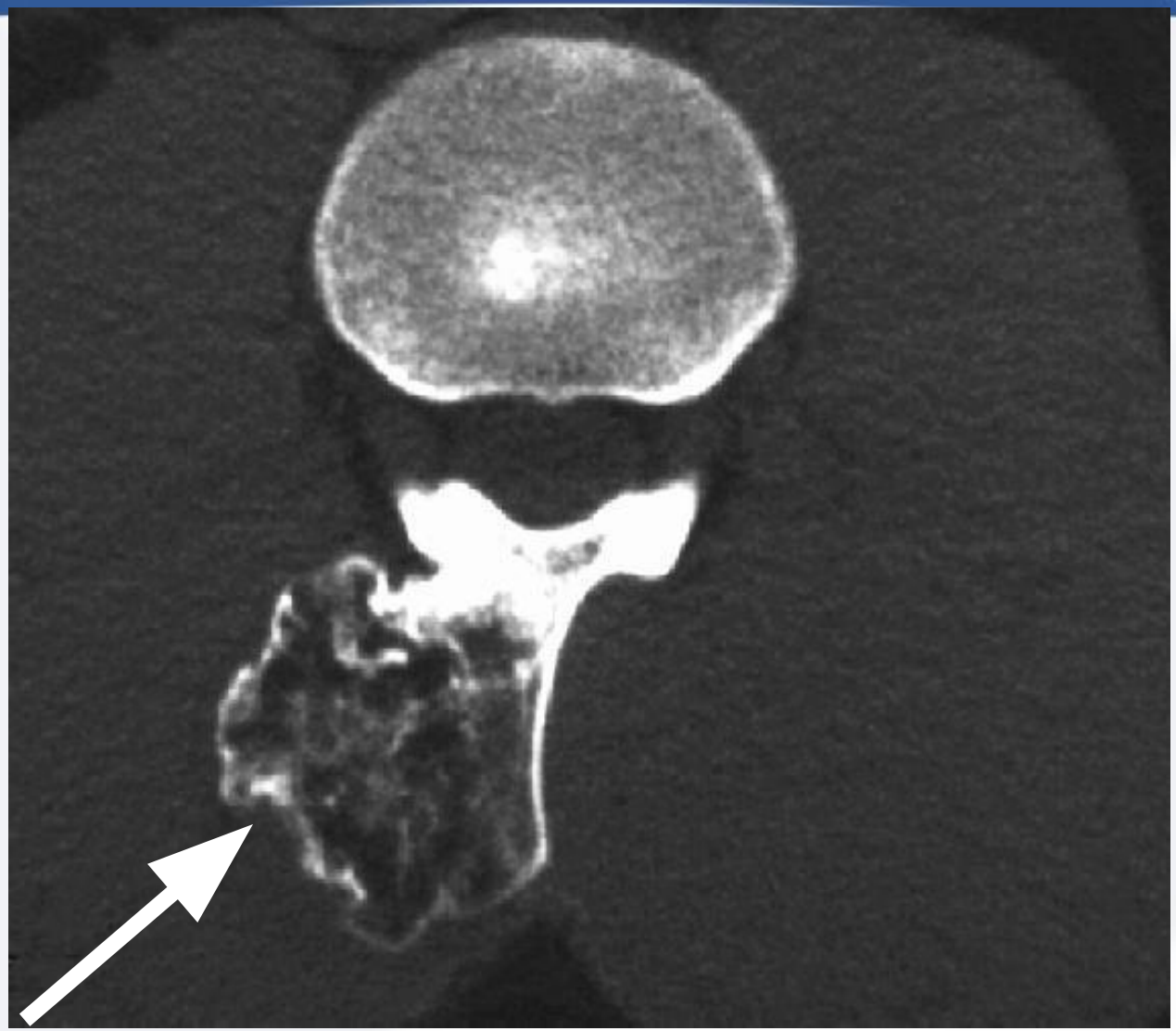
cartilage

benign

- A slow growing tumor of the cartilage usually affecting adolescents.
- It is uncommon and is usually found in the posterior (rear) spine

body ← كل اشي تقريباً ماعدا

Osteochondroma



B- Hemagioma...

- A hemangioma is a benign tumor that can involve the body of the vertebra.
- This tumor is often found in the lower thoracic or upper lumbar spine, usually involving only a single vertebra.
- Interestingly, not all hemangiomas produce symptoms such as pain. [silent] (99% of cases → incidental finding]
- Hemangiomas typically occur during mid-life, affecting females more often than males. F > M.
- The most common symptom associated with a hemangioma is pain.
- They have a very characteristic appearance on regular x-rays, referred to as " honeycombing."

Hemagioma

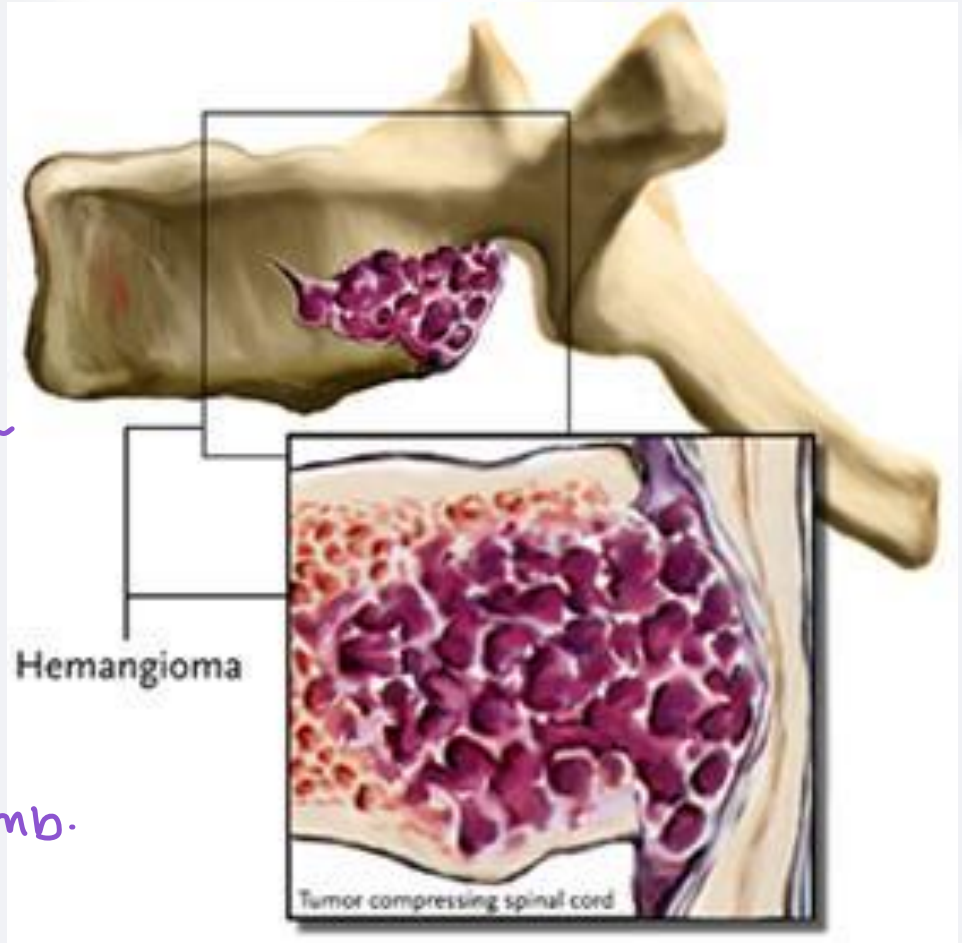
* at the body of the vertebra.

* at lower thoracic or upper lumbar.

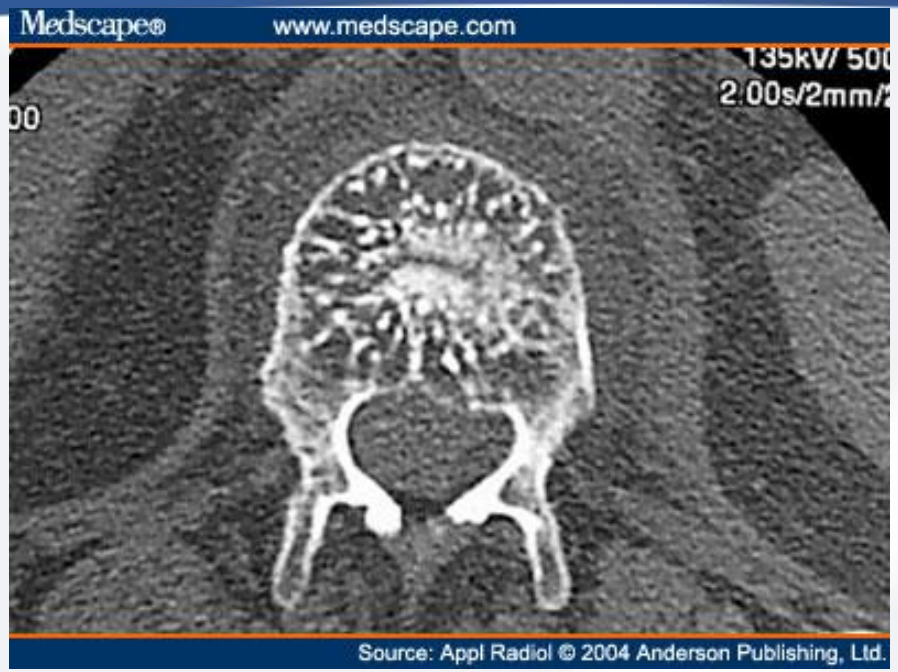
* F > M

* silent.

* xray: honeycomb.



Hemagioma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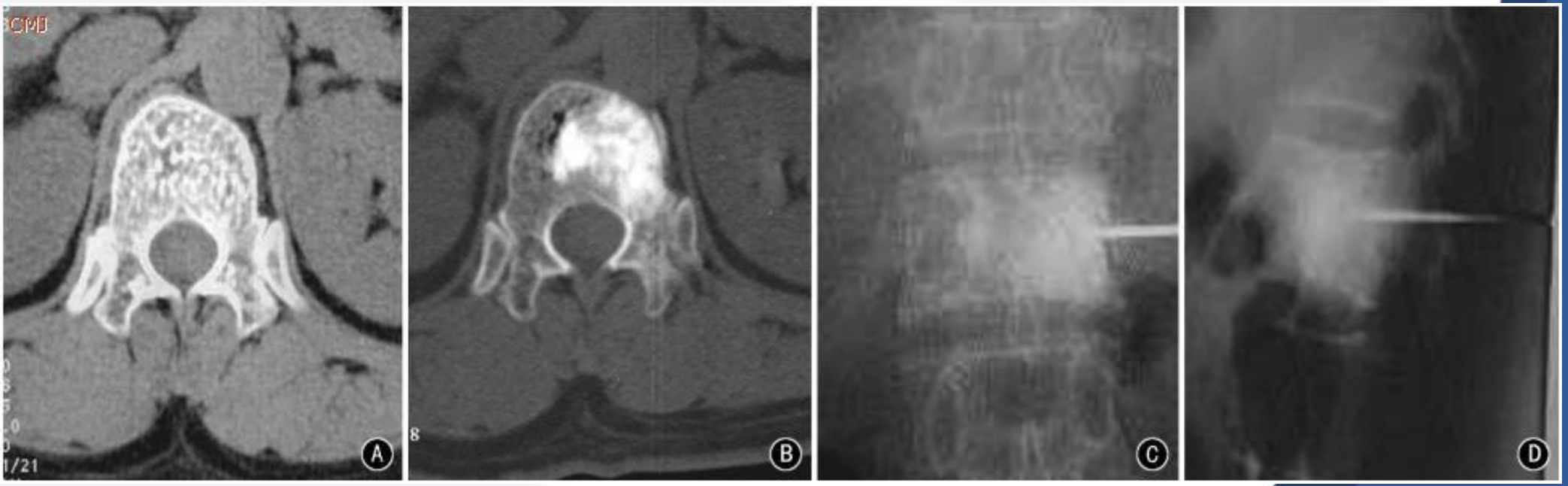

A
B
C
D

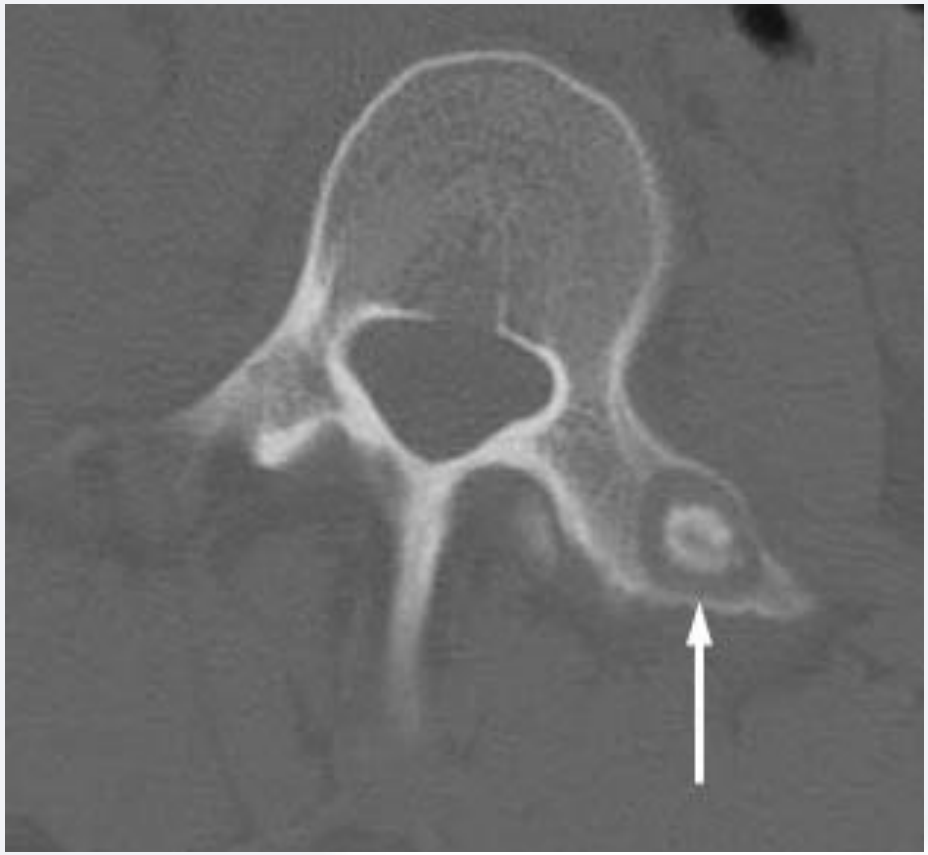
C- Osteoid Osteoma

حبيبه الـ osteoblastoma ، بتفرقوا في الحجم

- is a small bone tumor (less than 2 cm).
- It usually affects adolescents causing night pain and may result in spinal deformity.
- It typically presents as unrelenting pain, clearly worse at night, which is exceedingly sensitive to aspirin or Non-Steroidal Anti-Inflammatory Drugs (NSAID's) like Ibuprofen.

* >2cm → osteoblastoma
* <2cm → osteoid osteoma.

Osteoid Osteoma



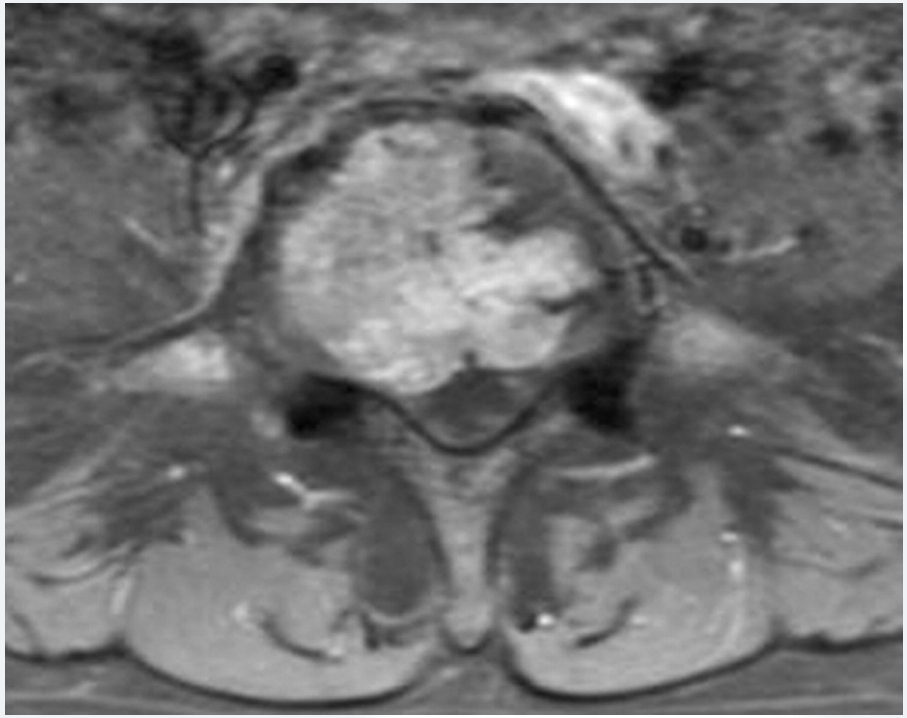
D- Osteoblastoma

- Osteoblastomas are bigger versions of osteoid osteomas, and by definition, are greater than 2 cm in diameter. They also have the tendency to affect the posterior part of the spine and present with pain. They tend to be more aggressive
- Affects children and adolescents.
- Sometimes causing spinal deformity and paralysis.

Osteoblastoma

* اذا كان اكثر من واحدة

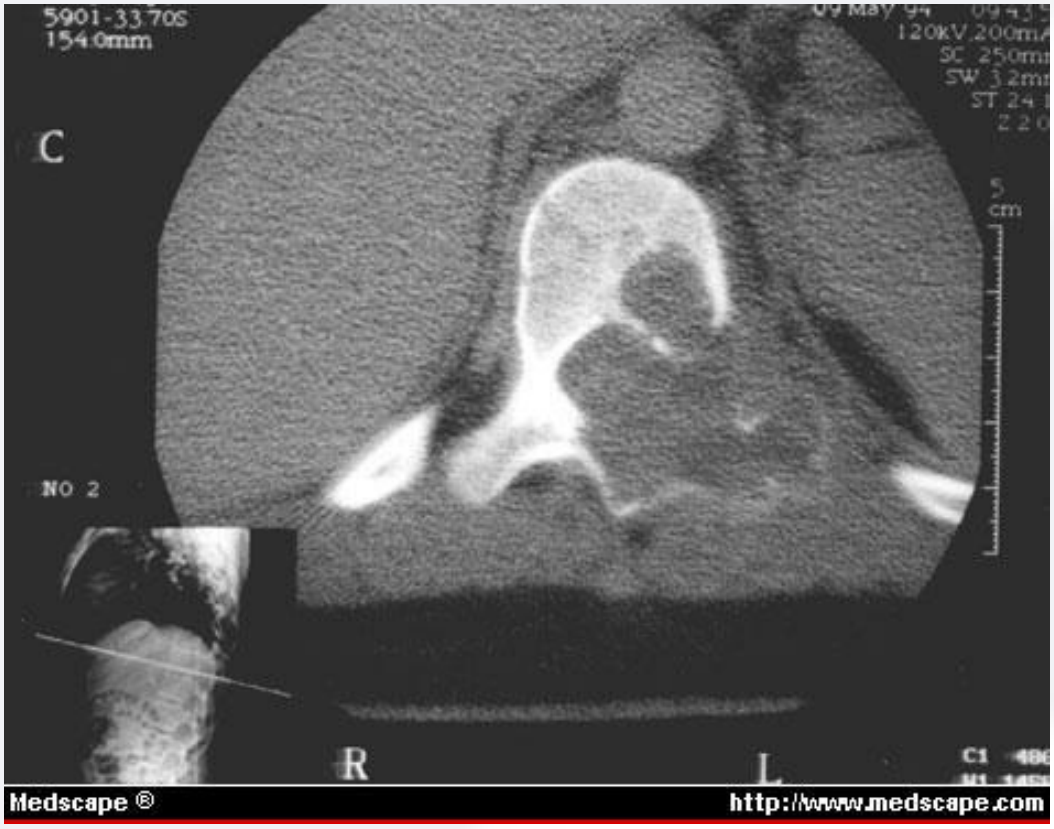
. bad



E- Aneurysmal Bone Cysts (ABCs)

- ABC's are uncommon benign tumors that may affect the posterior elements of the spine or the vertebral body itself.
- These tumors tend to affect older adolescents, presenting with pain and in some cases, neurological symptoms.
- The cause is poorly understood.
- These tumors can be large and quite vascular.

Aneurysmal Bone Cysts

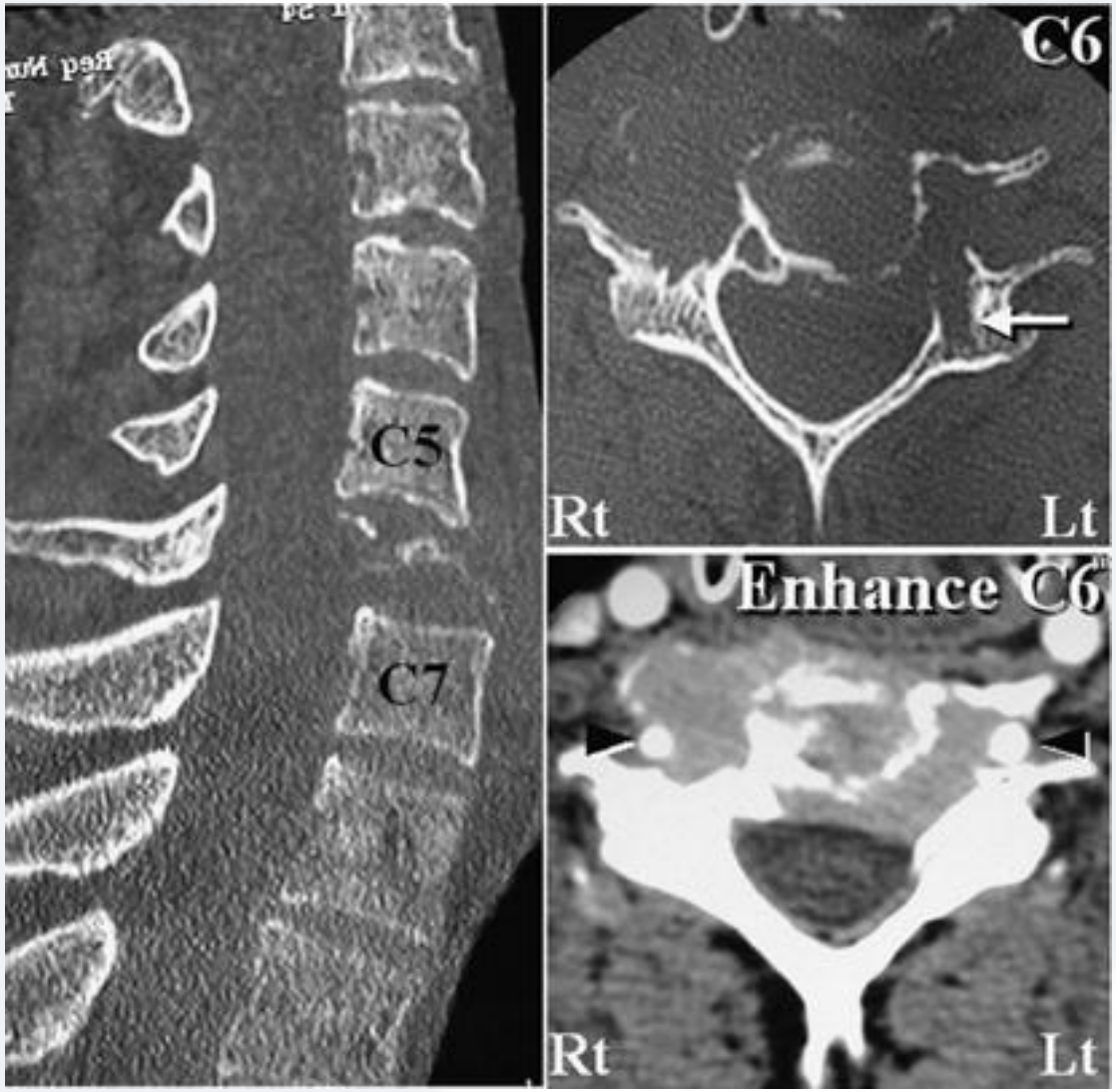


F- Giant Cell Tumor

benign but act like malignant.

- Is known to affect children, adolescents and young adults.
- These tumors can be found at the cervical, thoracic, or lumbar segments of the spine, but are more common in the sacrum.
- Despite being technically "benign," they can be very aggressive and sometimes spread elsewhere.

Giant Cell Tumor

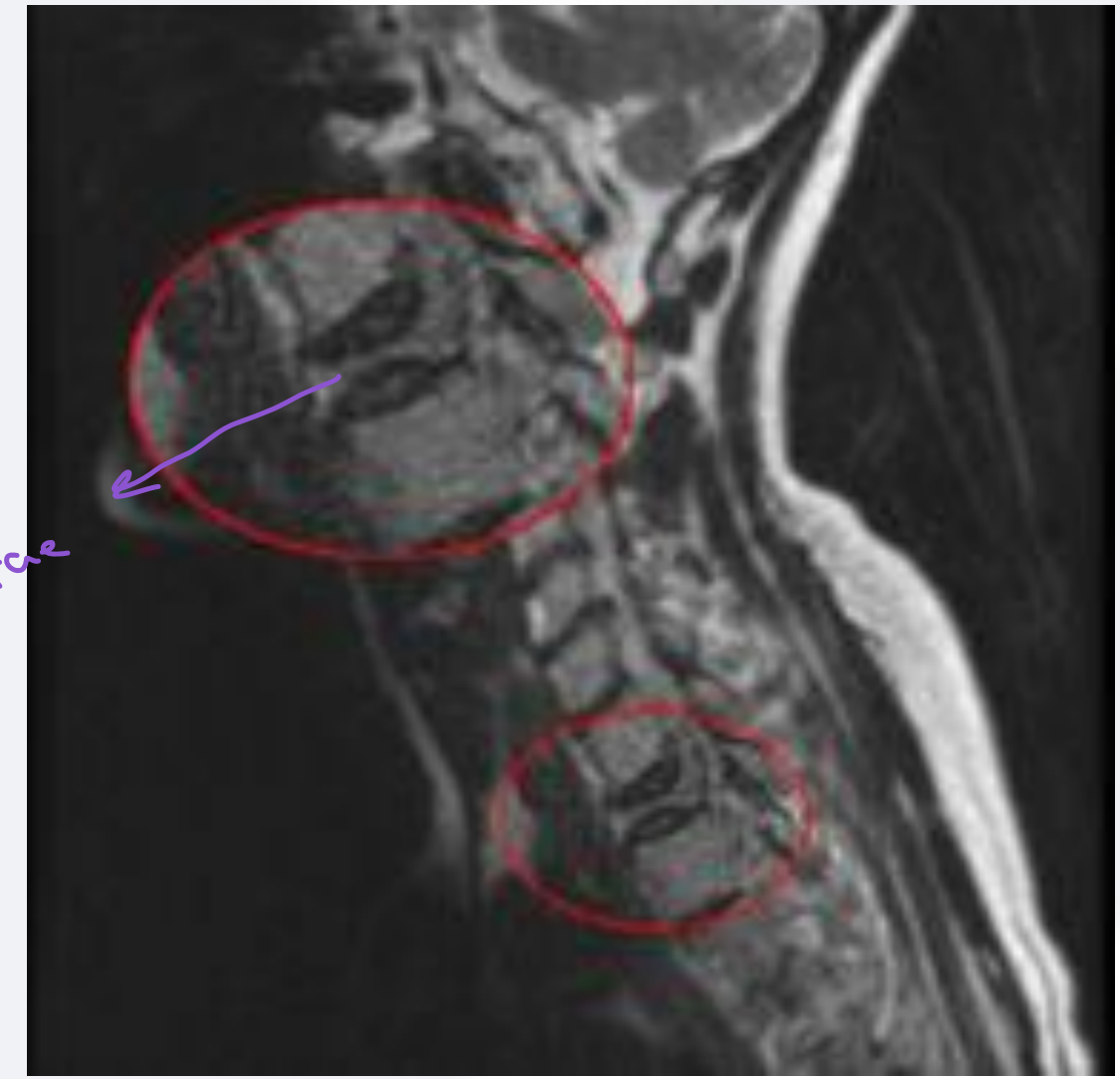


G- Eosinophilic Granuloma

- EG is a benign lesion of bone that will present with pain and the characteristic radiographic finding of "vertebra plana," a collapse or flattening of the vertebral body.
- These tumors may occur by themselves, or as part of a syndrome involving multiple bones and other organs.
- When this tumor is systemic it is termed Histiocytosis X
- On occasion, they may heal spontaneously.

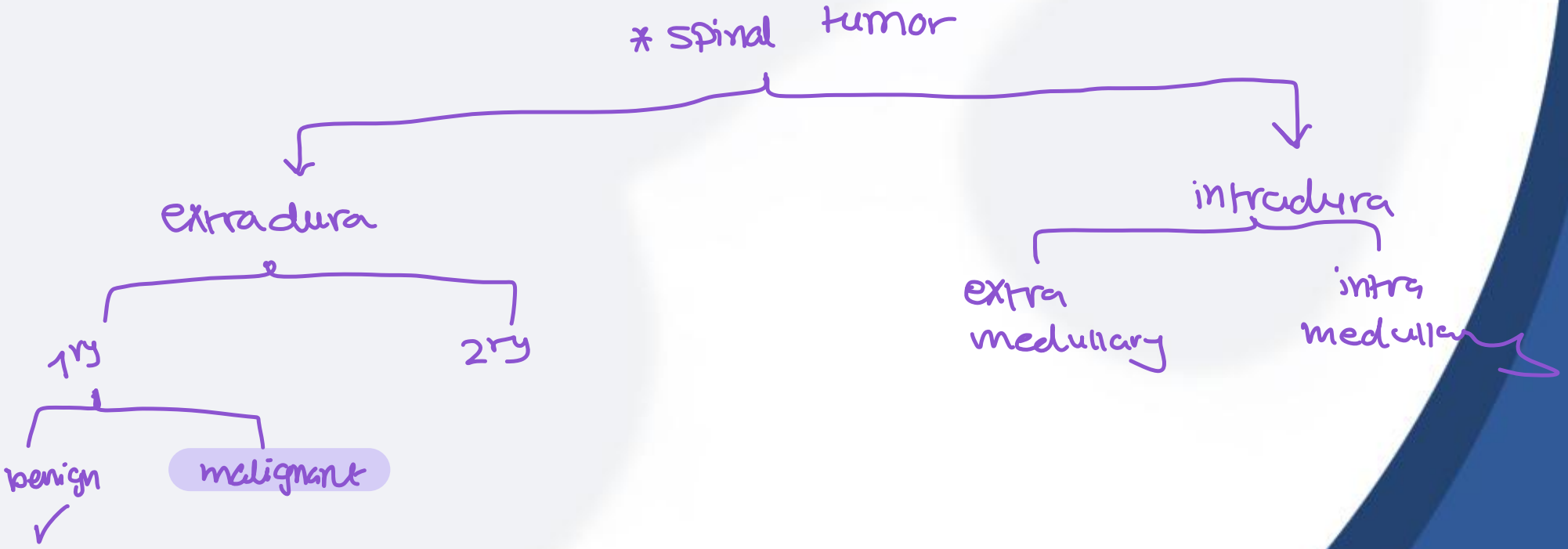
ممكن يجي مع اي osteolytic tumor. مع الـ mets.

Eosinophilic Granuloma



- Primary tumors:

Malignant

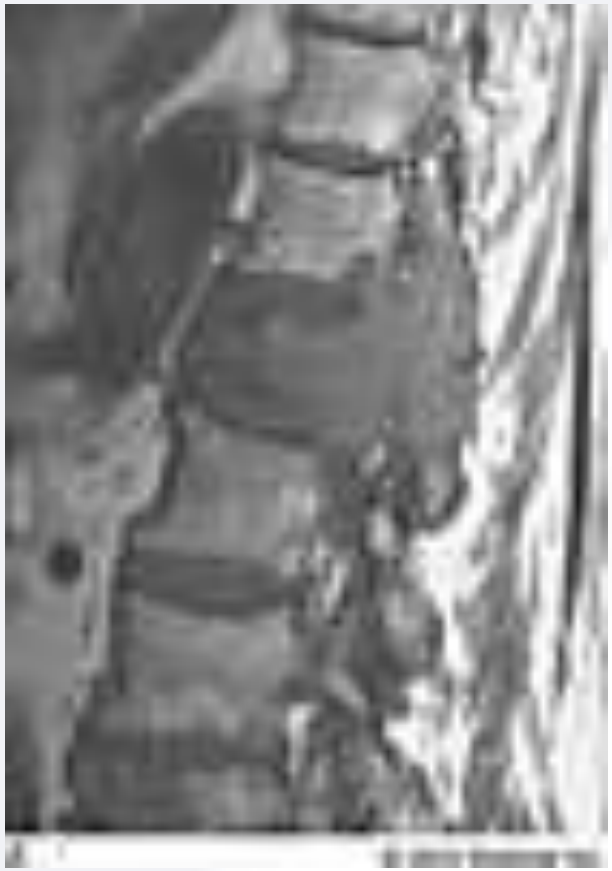


A- Plasmacytoma [single, focal]

- presents in middle aged and older adults.
- These tumors are common in the pedicle and vertebral body and may cause paraparesis. شلل نصفي

* if systemic → (called) multiple myeloma [multiple]

Plasmacytoma

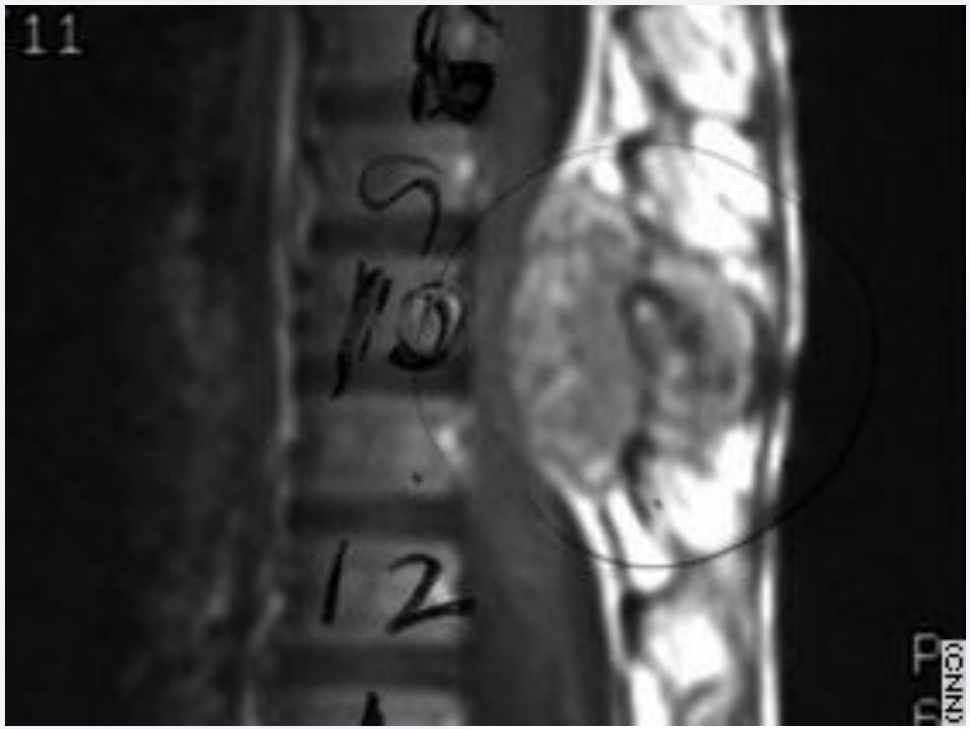


B- Ewing's Sarcoma

- An aggressive tumor affecting adolescents and young adults.
- In some cases, it may metastasize.

* ممكن يكون primary و ممكن mets .

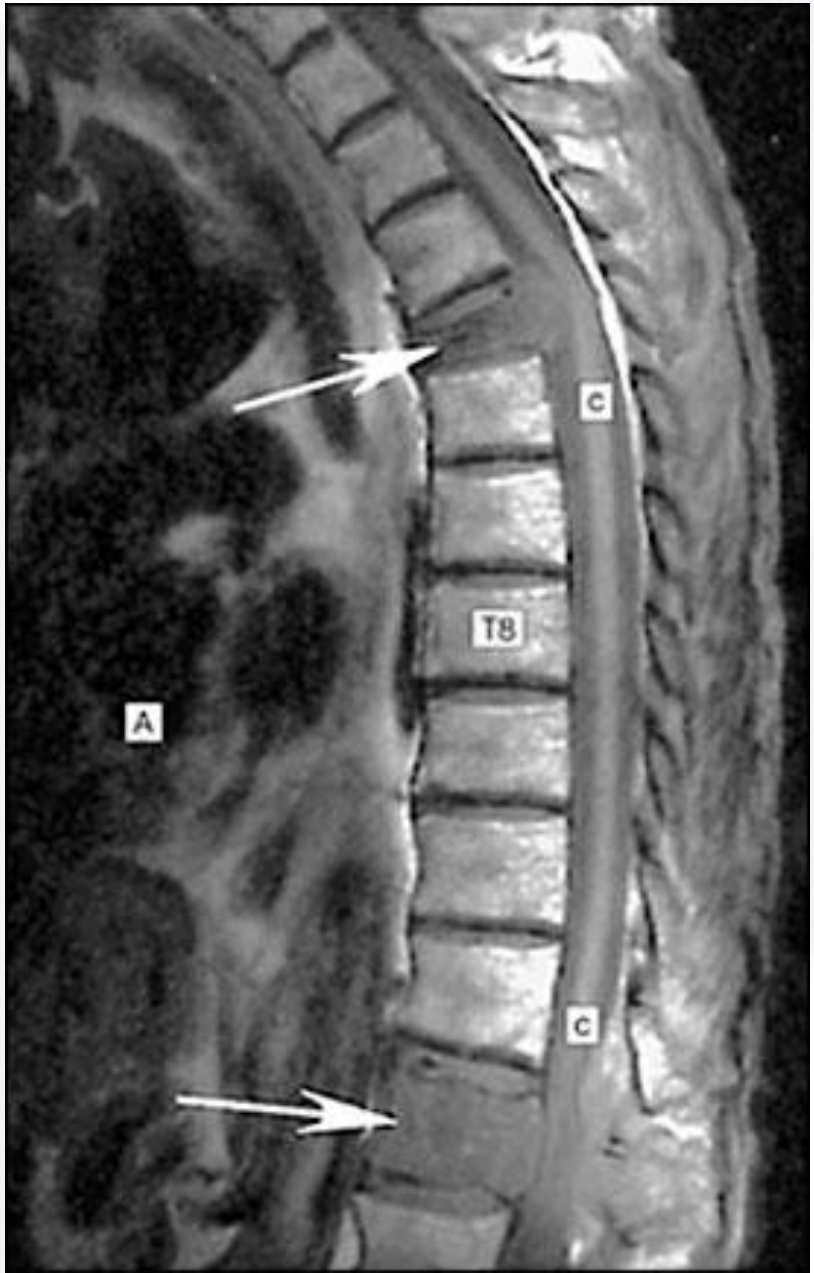
Ewing's Sarcoma



C- Lymphoma

- May present in one or more vertebral bodies in middle aged or older adults.
- Sometimes the lymphatic system is involved. ↳ lymphatic spread.

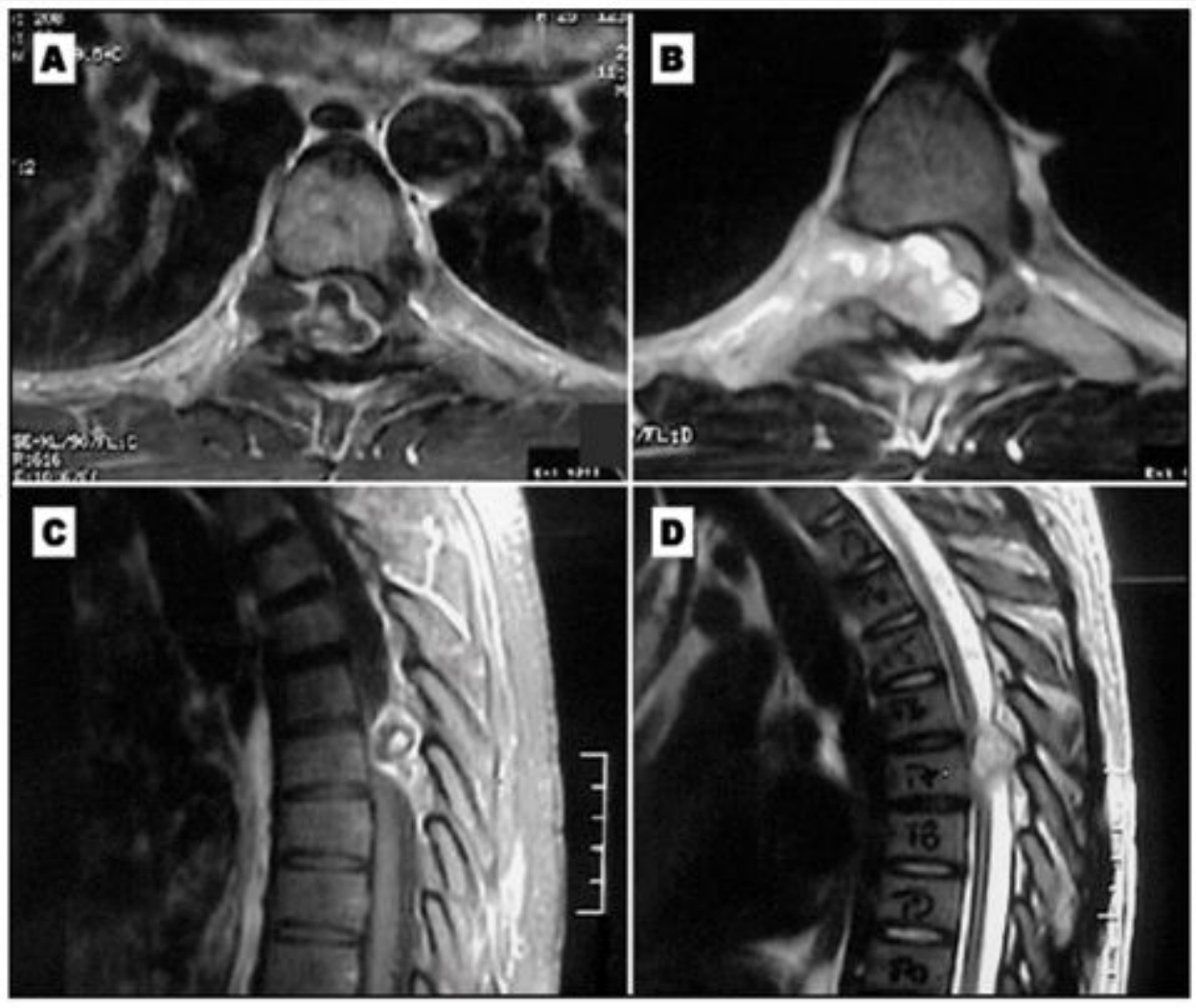
Lymphoma



D- Chondrosarcoma (malignant)

- Is a tumor affecting spinal cartilage in middle-aged adults.
- It grows slowly but can be dangerous.
- Usually aggressive medical intervention is required.

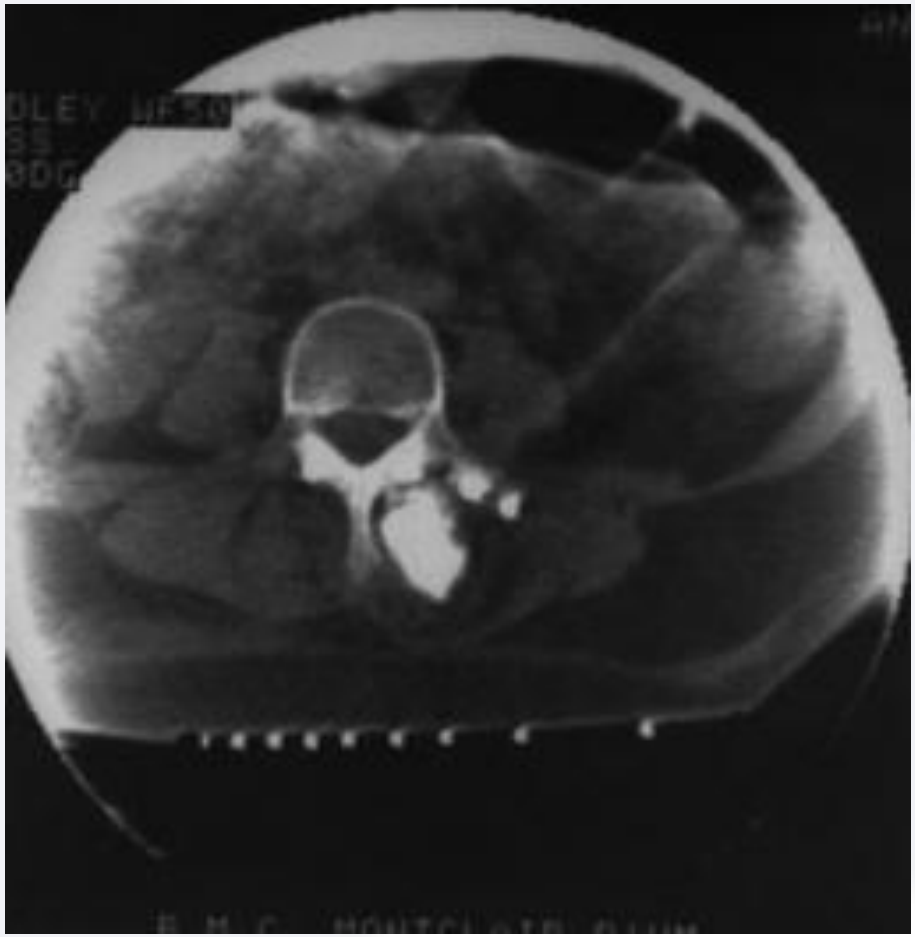
Chondrosarcoma



E- Osteosarcoma

- Osteosarcoma is the second most common primary malignant tumor of bone
- Found in adolescents and middle-aged adults.
- These tumors may metastasize requiring aggressive medical therapy.

Osteosarcoma



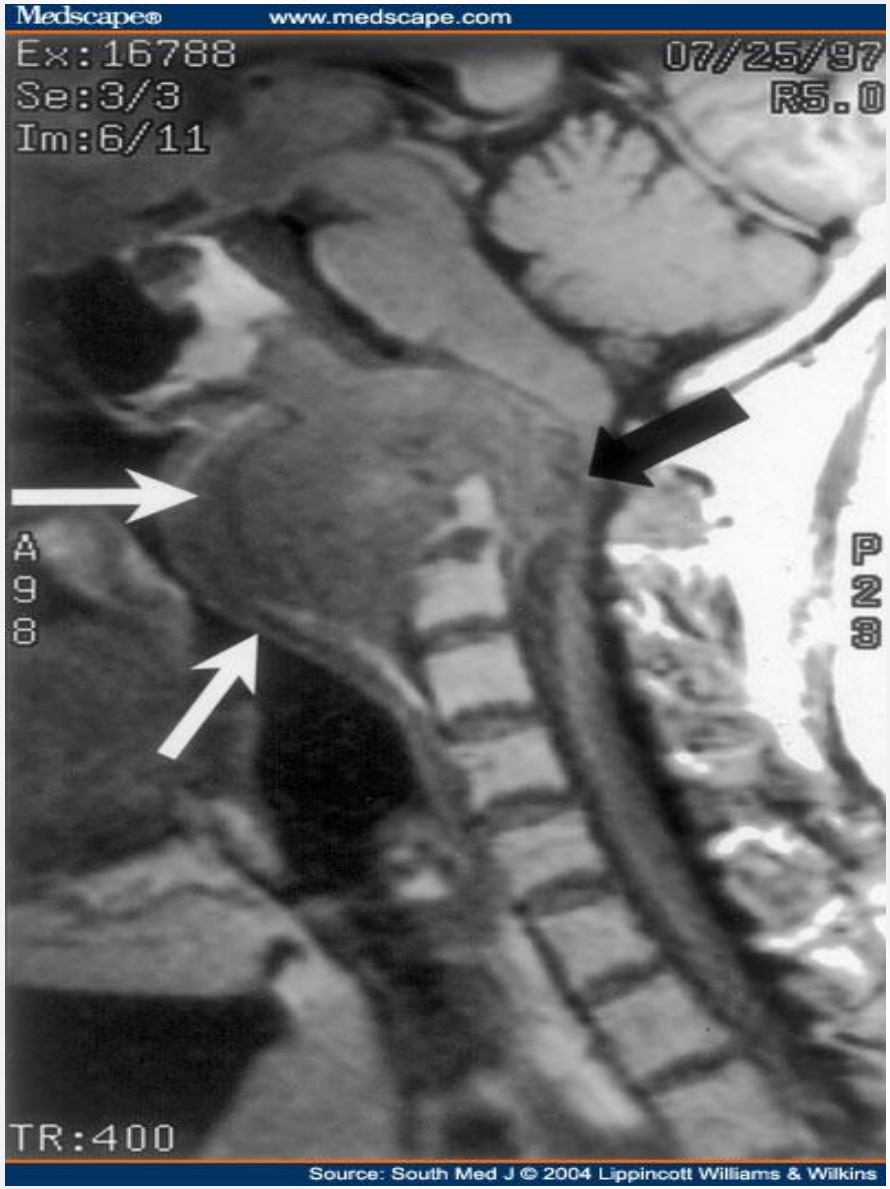
preminant of notochord

nucleus pulposis → normal in adult.

F- Chordoma

- is usually seen in adults frequently (50%) involving the sacrum, although it can affect other parts of the spine.
- These tumors often require aggressive medical therapy.

Chordoma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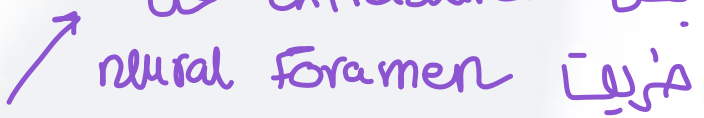
Extradural Cont…

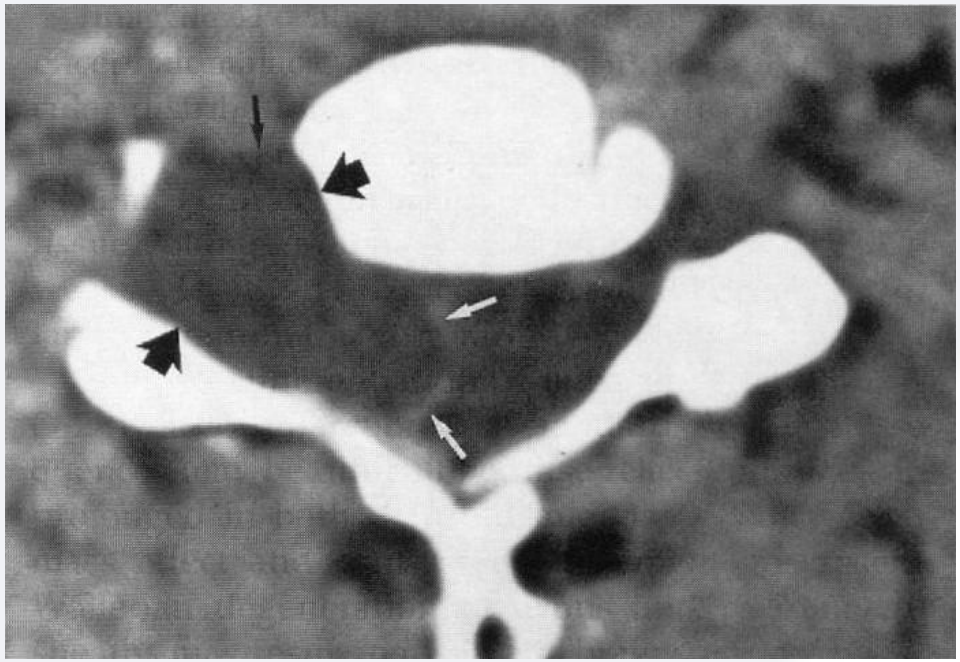
- B- Secondary :
  - The most common
  - Causes bone resorption rather than destruction.
  - The six most common source of Mets are :
    1. Lung (most common).
    2. Breast
    3. Prostate
    4. Thyroid
    5. Kidney
    6. GIT

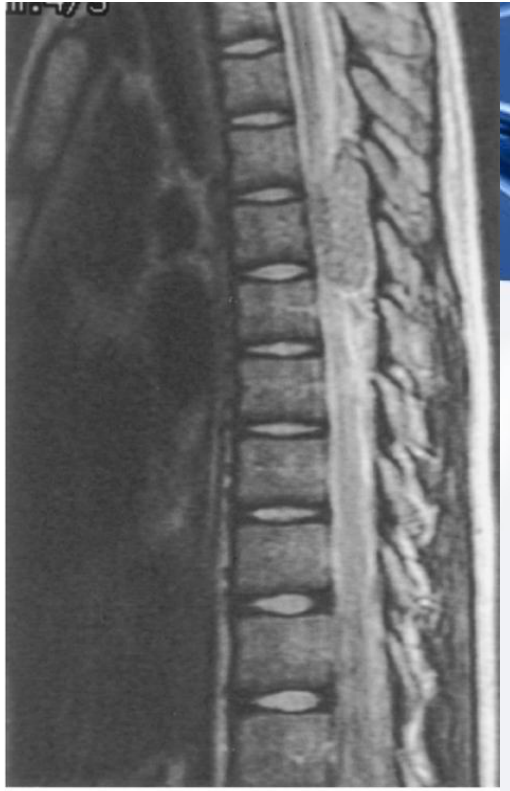
Extradural Cont…

- C- Tumors that are usually intradural but can be partially or completely extradural.
  - Examples
    - Meningioma
    - Neurofibroma
  - This gives the appearance of "dumbbell" which is a mass consisting of two spherical portions connected by a narrow isthmus.



Dum bell schwannoma ...





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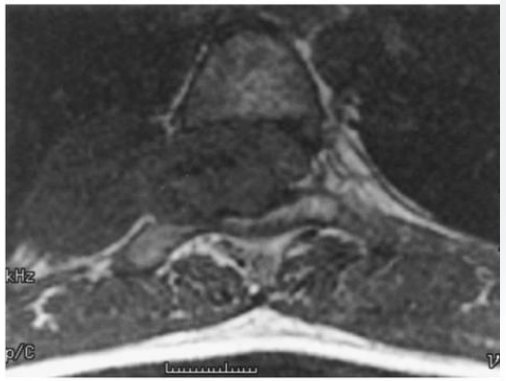

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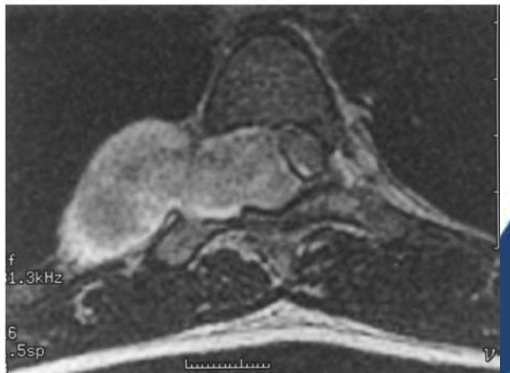


Intradural

Intradural Tumors 45%

Intramedullary 5%

Spinal cord (in)

intra-axial

Extramedullary 40%

extra-axial

⊛ extradural > extramedullary > intramedullary

A- Extramedullary

- These tumors develop in the spinal cord's arachnoid membrane (meningiomas), in the nerve roots that extend out from the spinal cord (schwannomas and neurofibromas) or at the spinal cord base (filum terminale ependymomas)

Extramedullary Cont…

1. Meningioma:
   - Meningiomas are the second most common tumor in the intradural extramedullary location, second only to tumors of the nerve sheath.
   - Meningiomas account for approximately 25% of all spinal tumors.
   - They are believed to arise from the arachnoid cluster cells "cap cells" located at the entry zone of the nerve roots or at the junction of dentate ligaments and dura mater, where the spinal arteries penetrate.
   - For this reason, lateral tumors are more common than dorsal and ventral lesions.

Extramedullary Cont…

- Meningioma Cont..:
  - Spinal meningiomas differ from intracranial meningiomas by their slightly greater proclivity for Psammomatous change.
  - Spinal meningiomas are typically globoid, and they vary in consistency depending on the extent of calcification.
  - Multiple meningiomas are rare (2%) and most often associated with neurofibromatosis type II.

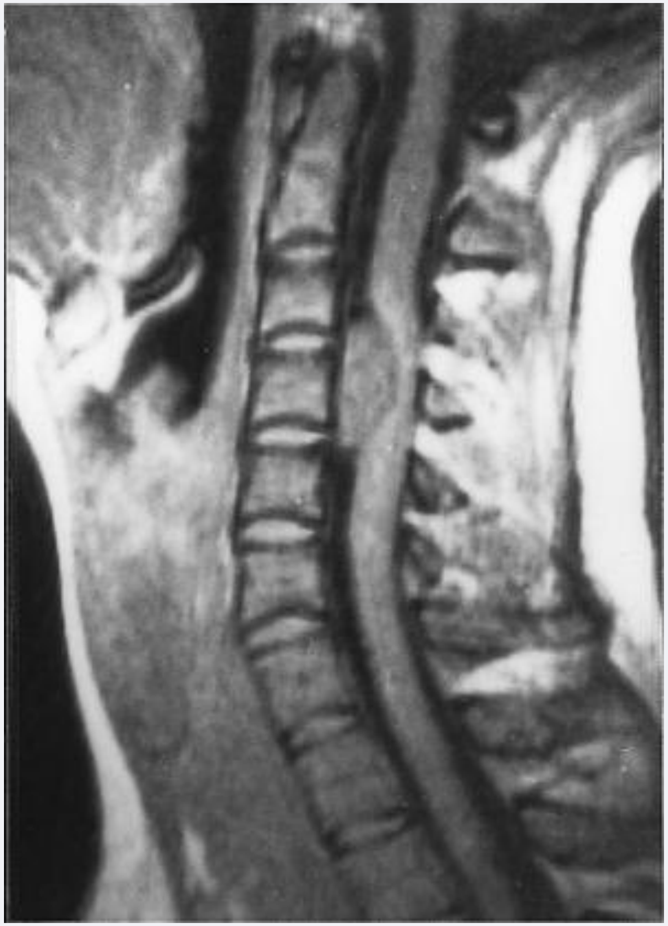
Extramedullary Cont…

- Meningioma Cont..:
  - Patients most frequently complain of regional back pain, especially at night, followed by sensorimotor changes and, eventually, bowel and bladder dysfunction
  - A high incidence of Brown-Séquard's syndrome is seen, *with ipsilateral paralysis, decreased tactile and deep sensation, and a contralateral deficit in pain and temperature sensation*. This finding is most likely secondary to the high incidence of laterally positioned meningiomas

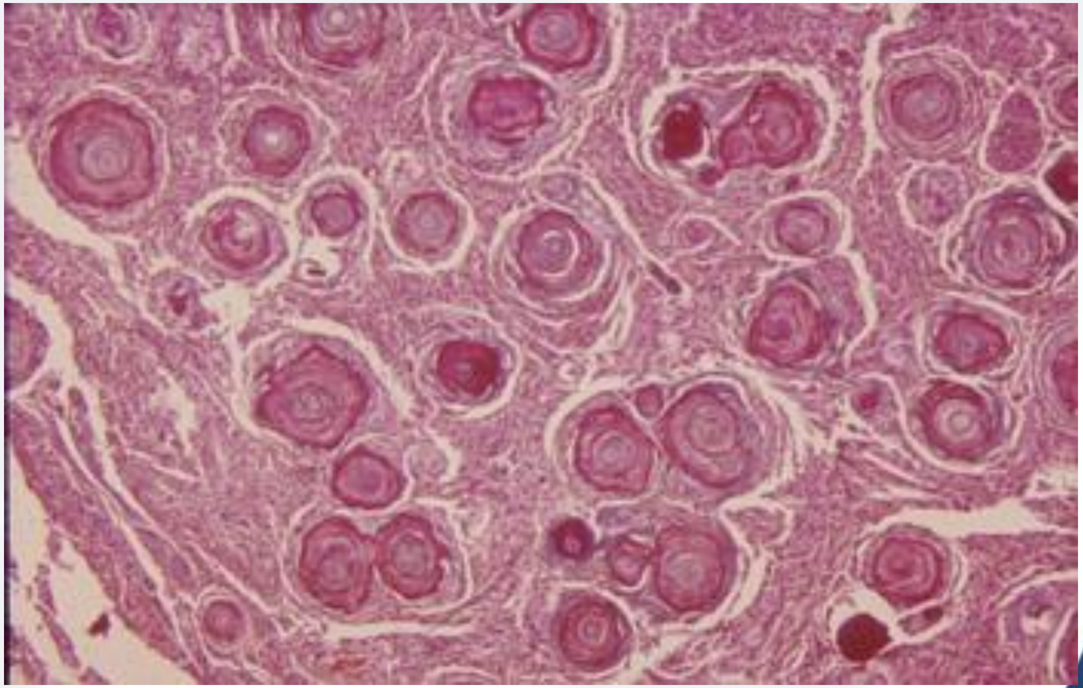
Extramedullary Cont…

- Meningioma Cont..:

intradural, extramedullary



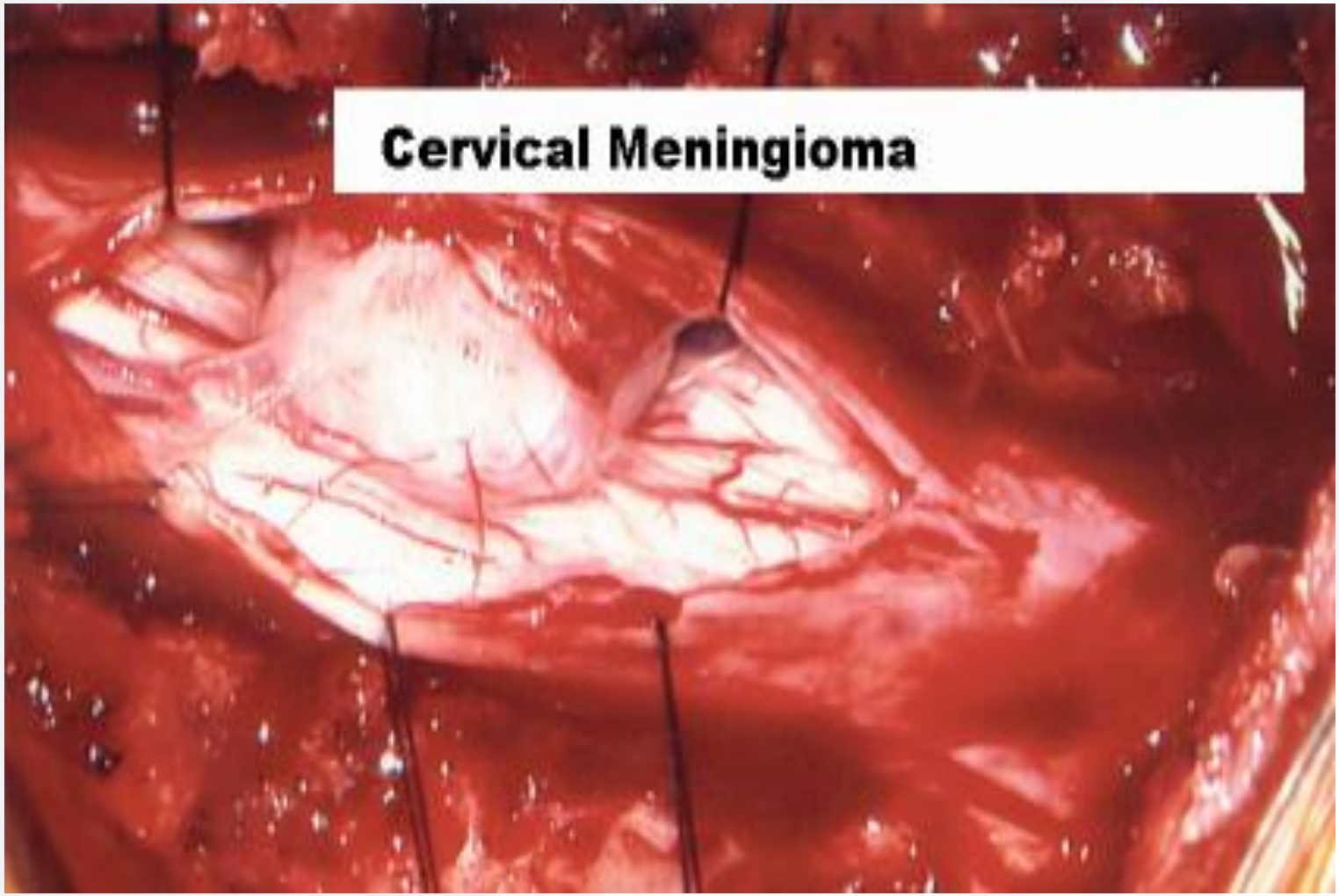
ضاغطة على ال spinal canal



Psammoma bodies

Extramedullary Cont…

- Meningioma Cont..:



Extramedullary Cont…

- Meningioma Cont..:
  - **Treatment**

    The treatment of spinal meningioma is resection of the tumour and the involved dura.

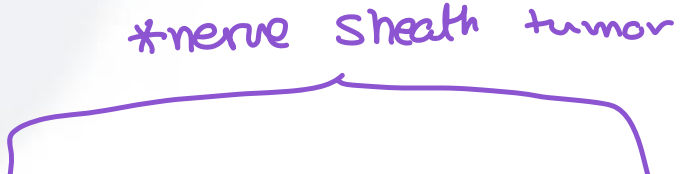
Extramedullary Cont…

2. Nerve sheath tumors:

- Either schwannoma or neurofibroma
- Common in lower thoracic and upper lumbar spine

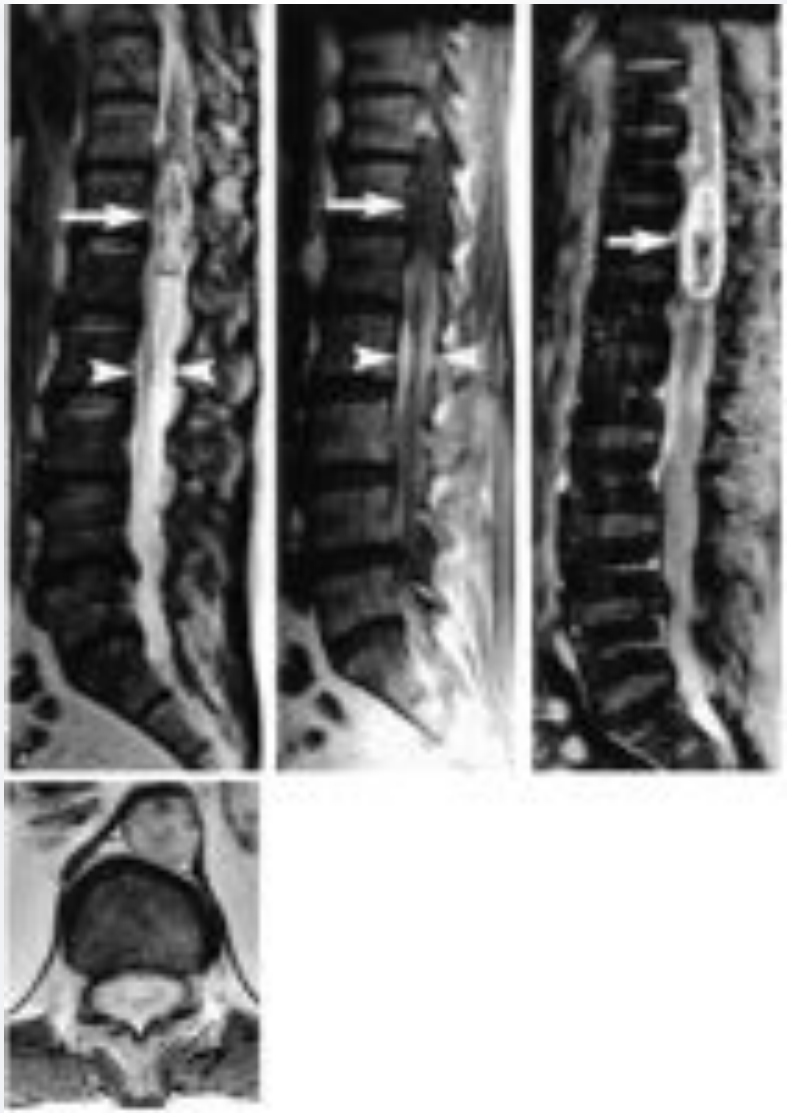
- Treatment :

✔ Through surgical excision of the tumor, access to the tumor is obtained by laminectomy.



Schwannoma	Neurofibroma
Composed of schwan cells	Schwan cells and fibrous cells
Usually solitary	Multiple
Associated with NF type II	Associated with NF type I
Compresses the nerve trunk	Fusiform and involves the nerve trunk
Encapsulated	Not
Easily resectable without nerve damage	Not resectable without sacrificing the nerve

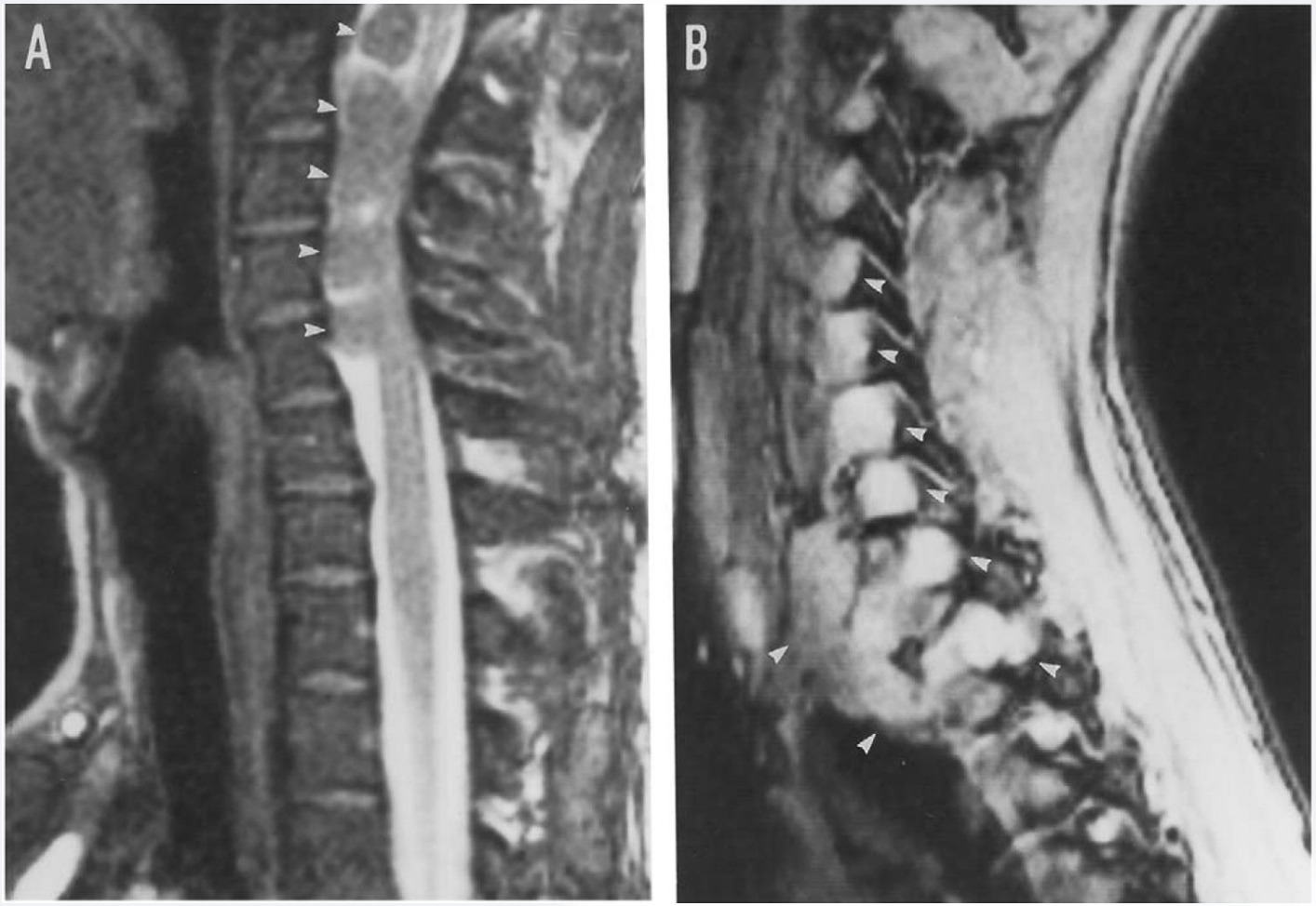
schwannoma



Neurofibroma

- Neurofibromas have been subdivided into two broad categories:
  - Dermal
  - Plexiform

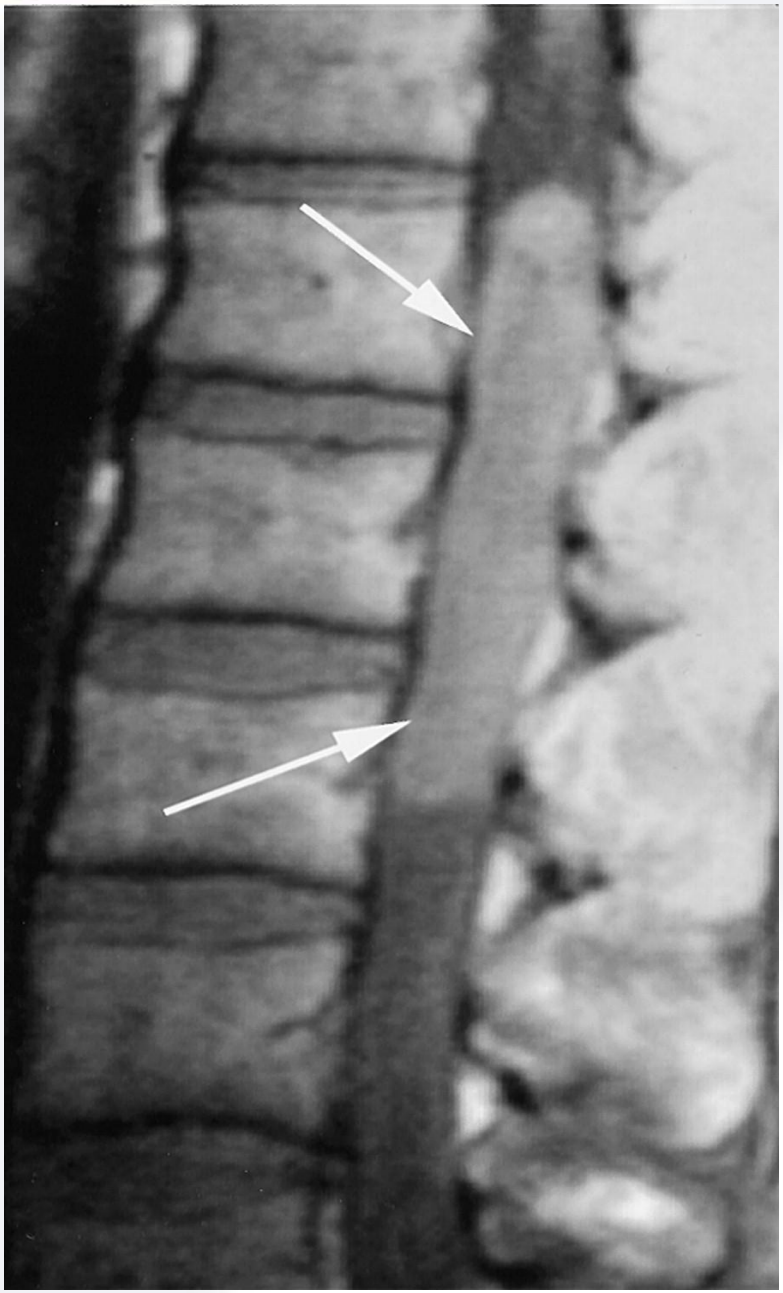
Neurofibroma



Extramedullary Cont…

3. Filum terminale ependymoma:
   - More common in the males
   - 4th-5th decade
   - Mostly in the proximal intradural portion of the filum

Filum terminale ependymoma



Extramedullary Cont…

4. Others :

- Lipoma
- Epidermoid
- Dermoid
- Mets (uncommon)

spinal cord داخل ال

B- Intramedullary

- These tumors grow inside the spinal cord or individual nerves, most frequently occurring in the cervical (neck) region.
- They are typically derived from glial or ependymal cells that are found throughout the interstitium of the cord.
- They are often benign, but can be difficult to remove.
- Intramedullary lipomas are rare congenital tumors most commonly located in the thoracic spinal cord.

Intramedullary Cont…

- Patients are often diagnosed only after the development of neurologic signs and symptoms that may occur later in the course of the disease.
- Early diagnosis is important, however, because surgical removal for most tumors is curative, and surgical results are optimized when tumors are smaller.
- Also, neurological deficits resulting from intramedullary spinal cord tumors are seldom reversible.
- As such, functional outcomes after surgery are closely tied to the patient's preoperative neurologic condition.

Intramedullary Cont…

- **Symptoms** :
  - The clinical features of intramedullary spinal cord tumors are variable. Symptoms are not specific to spinal cord tumors and may be present in any myelopathic process.
  - Because of the slow-growing nature of many of these tumors, symptoms precede diagnosis (an average of 2 years).
  - Patients with malignant or metastatic spinal cord tumors present in the range of several weeks to a few months after symptoms develop.

Symptoms Cont…

- Progressively worsening pain and weakness are the most common presenting symptoms of intramedullary spinal cord tumors.
- Pain is often the earliest symptom, classically occurring at night when the patient is supine.
- The pain is typically local over the level of the tumor but may radiate.

neurological

Pain.

* extradural → night pain.

Symptoms Cont…

- Progressive weakness may occur in the arms (cervical tumors) or legs (cervical, thoracic, conus tumors).
- Impaired bowel, bladder, or sexual function often occurs early. Patients may have poor balance.
- Rarely, symptoms of subarachnoid hemorrhage may be present.
- Intratumoral hemorrhage can cause an abrupt deterioration, a presentation most often associated with ependymomas.

Intramedullary Cont…

- Examination :
  - Examination may reveal a combination of upper and lower motor neuron signs.
  - Lower motor signs may be at the level of the lesion and may aid in localization.
  - Other signs evident upon physical examination may include spine tenderness, stiffening of gait, trophic changes of extremity, sensory loss, hyperreflexia, clonus, and scoliosis or torticollis (generally in children).

Intramedullary Cont…

- They include:
  - Astrocytoma
  - Ependymoma
  - Haemangioblastoma
  - Miscellaneous (dermoid ,lipoma, teratoma)

diffuse ما في حدود واضح لها

في حدود واضح بينها وبين باقي spine ال

The most common

I. Astrocytoma

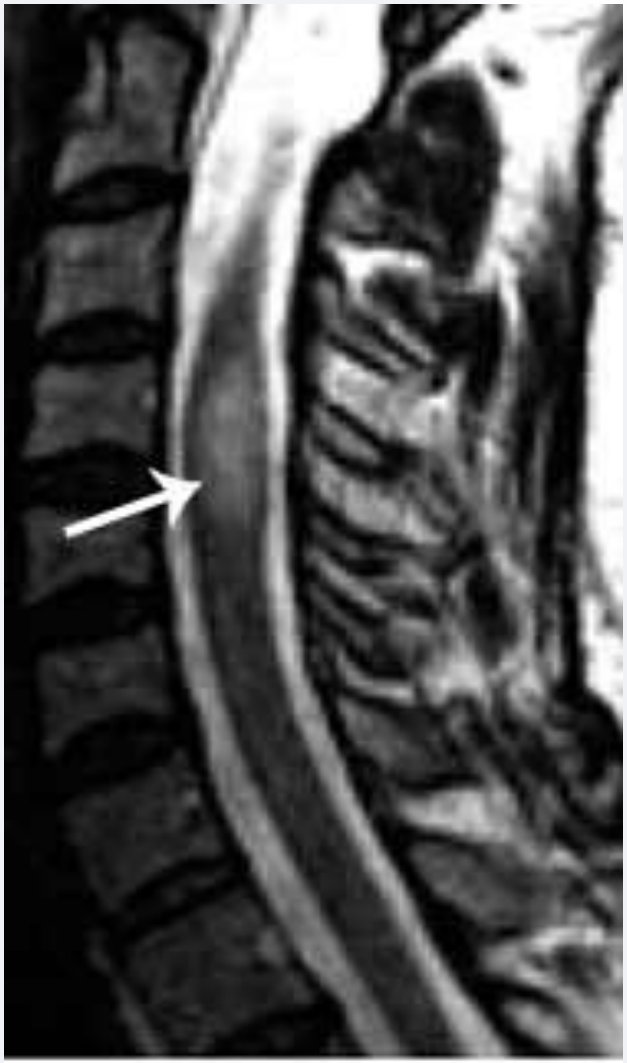
(35-45% in adults, 60% in children)

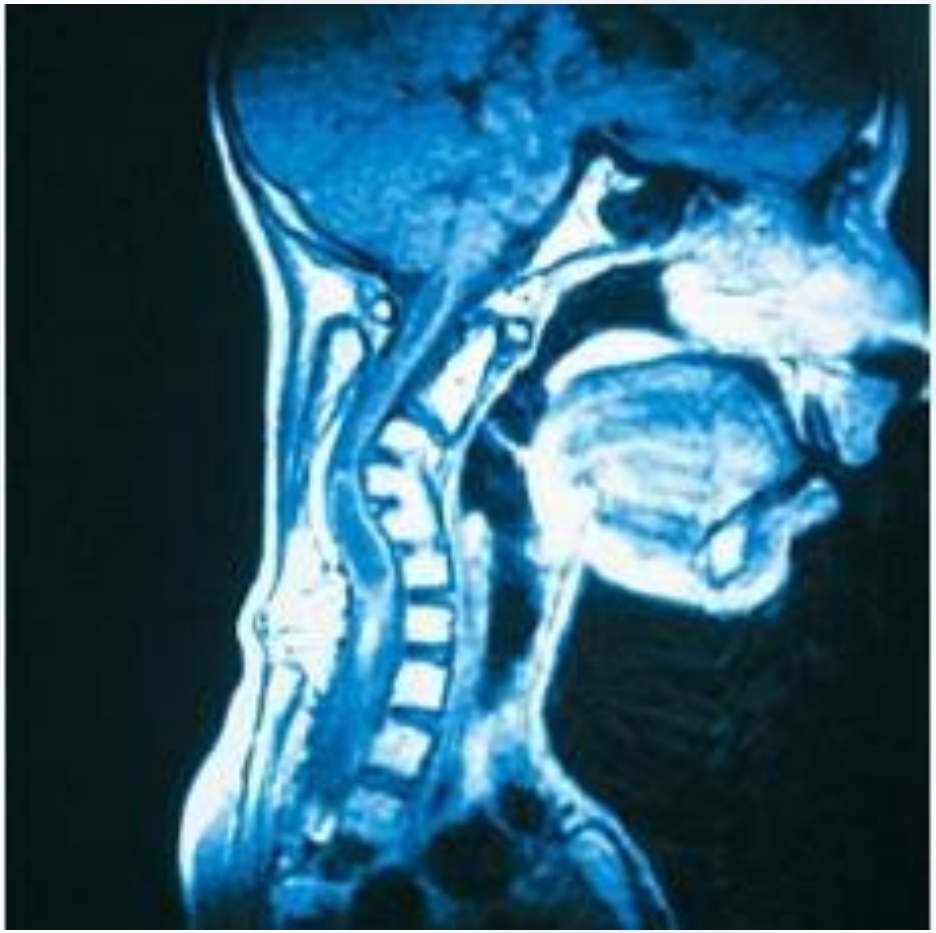
- Arise from astrocytes in the spinal cord
- The pilocytic varieties are well differentiated and tend to be indolent, with a definable surgical plane.
- The remainder of low-grade astrocytomas are infiltrative and impossible to resect completely. Residual tumor often has an indolent course, and controversy exists in the management of such tumors.
- Patients with the *NF1* gene are predisposed to spinal astrocytomas

- Fortunately, anaplastic astrocytoma or glioblastoma are rare.

- These malignant tumors exhibit rapid growth, are locally invasive, and may seed the CSF.
-
- Aggressive surgical resection has a controversial role with such tumors.

- Most spinal astrocytomas are low grade (WHO grade II) and less aggressive than astrocytomas in the brain.





II. Ependymoma

→ intradural, extramedullary in filum terminal.

(40-60% in adults, 30% in children)

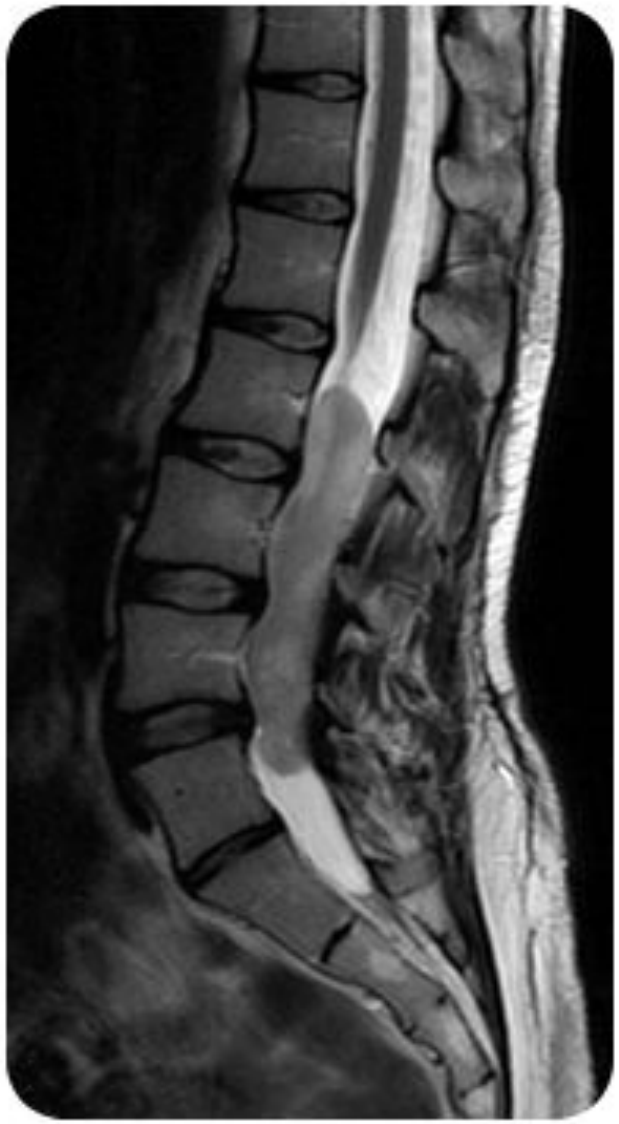
- The most common intrinsic spinal cord tumor.
- Usually indolent, encapsulated tumors that are histologically benign.
- Has a male predilection and a mean age of presentation of 35-40 years.
- They occur anywhere in the cord and are commonly in the conus medullaris, where an exophytic component may be present.
- Even histologically benign–appearing spinal ependymomas can metastasize.

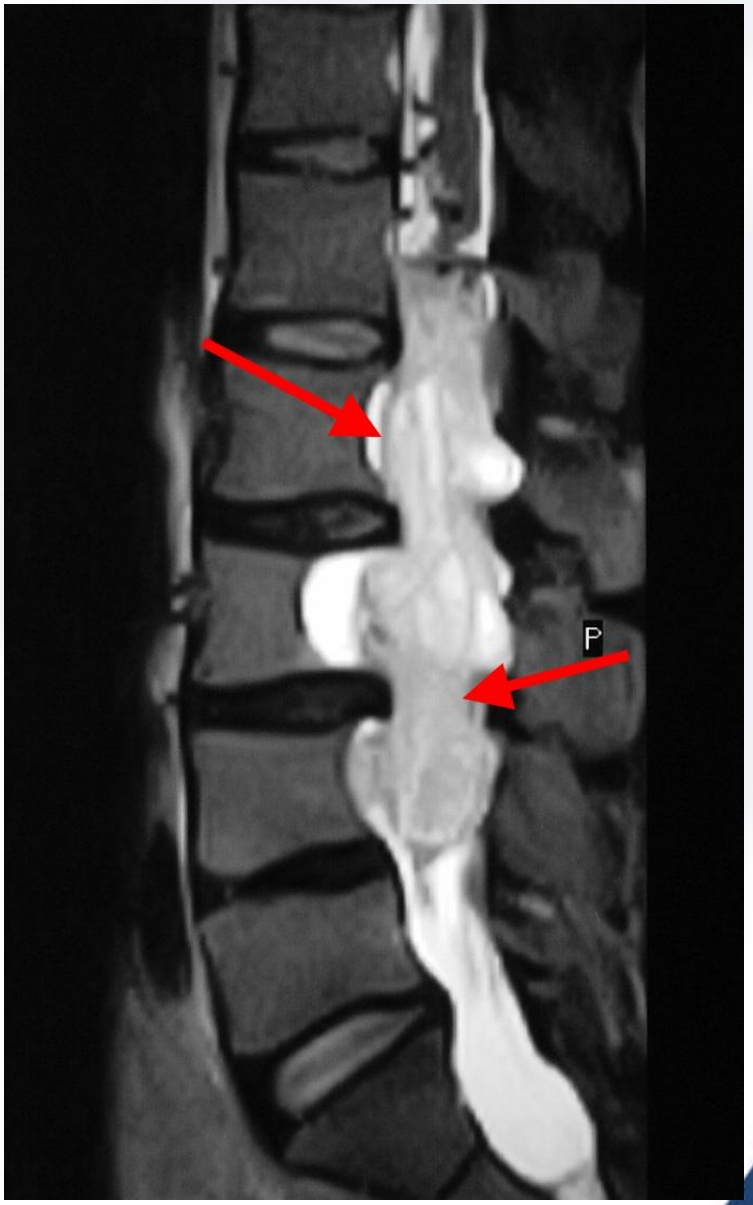
seeding.

- Lesions are characteristically hypovascular, well circumscribed, and non-infiltrative of the surrounding cord.
- Sometimes they are associated with a cystic "capping" of the tumor poles.
- Symptoms are due a chronic dilation of neural tissue rather than infiltration.
- Complete resection often results in a cure.

- Various histological subtypes exist; however, the only feature that influences prognosis is anaplasia.

- Patients with the *NF2* gene are predisposed to spinal ependymomas.




P

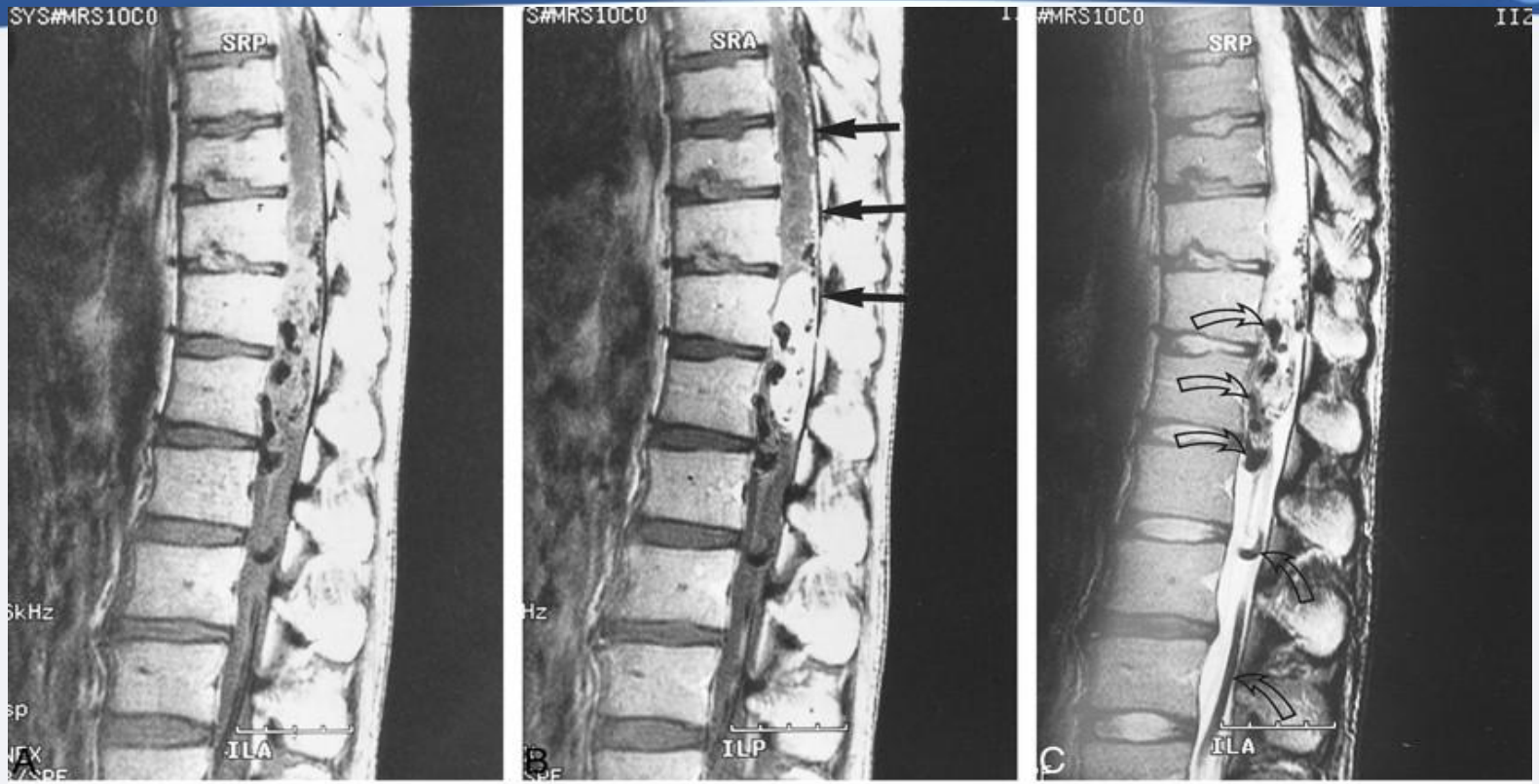
III. Haemangioblastoma

- Haemangioblastomas are thought to arise from red blood cell precursors and are not intrinsic spinal cord tumors, but they are often anatomically intramedullary because of their association with the blood vessels that penetrate and nourish the spinal cord.

- It is associated with von Hippel-Lindau disease in 30% of cases.
- They often have an associated syrinx (*pathological cavity in the spine*) and occur in multiple locations.
- These should not be removed in a piecemeal fashion because significant bleeding may ensue, increasing the risk of the procedure.
- Removal of the lesion is considered curative

- Lesions usually become symptomatic because this capillary hyperpermeability leads to fluid collections or syringes, which are often larger than the tumor itself, causing mass effect in addition to stretching of neural pathways. These fluid spaces are not lined with tumor cells, however, and only the tumor nidus needs to be removed at surgery.

Hemangioblastoma ال خفيف فكرة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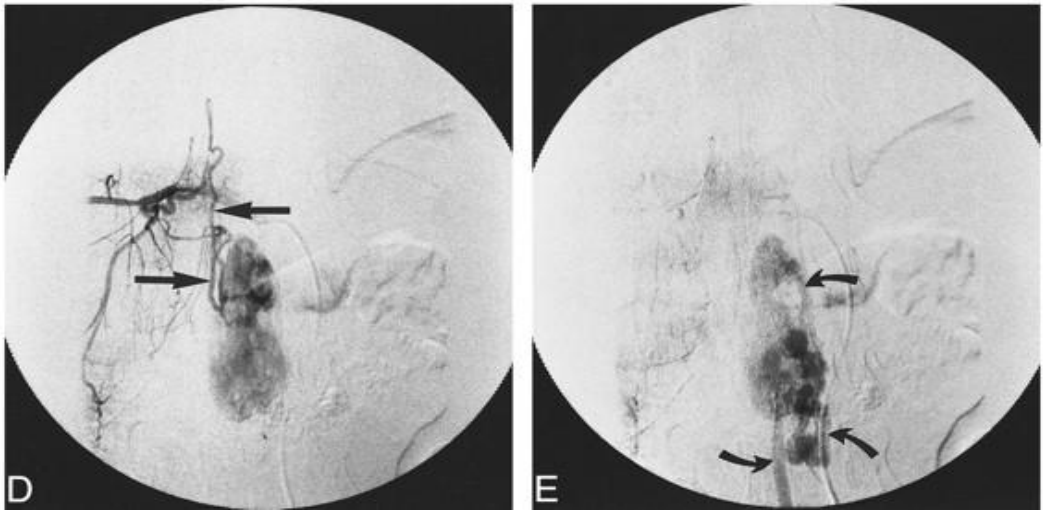
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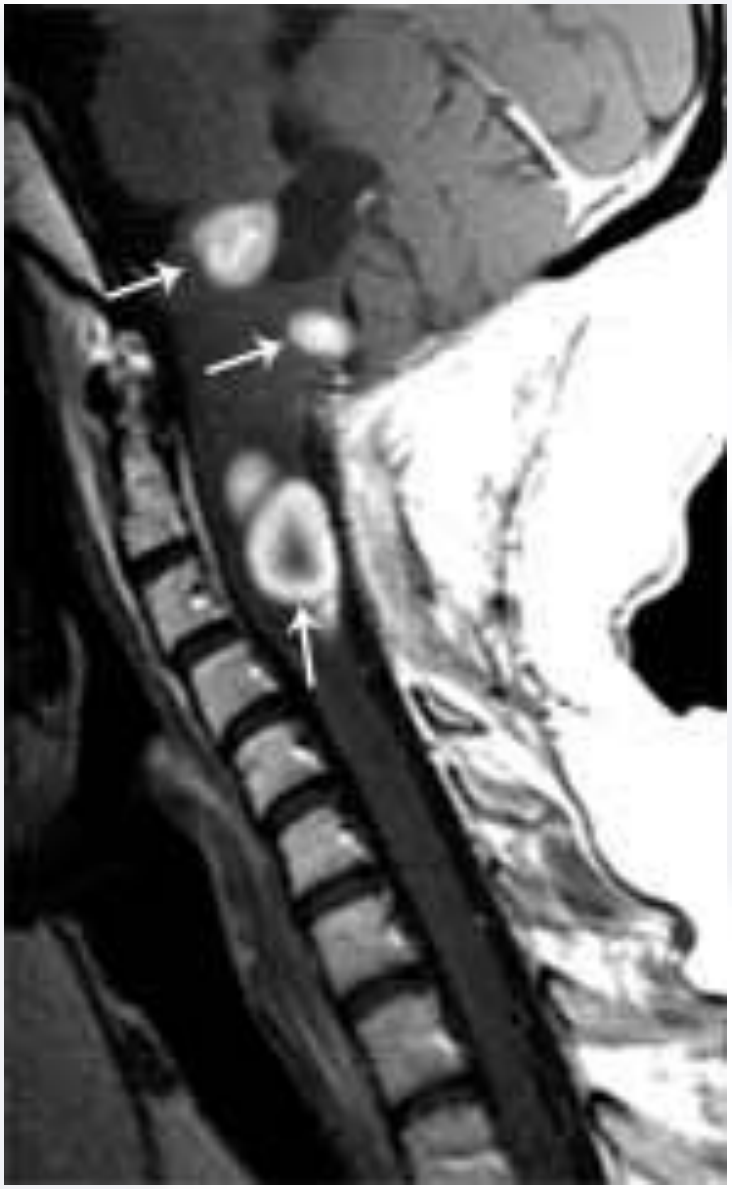
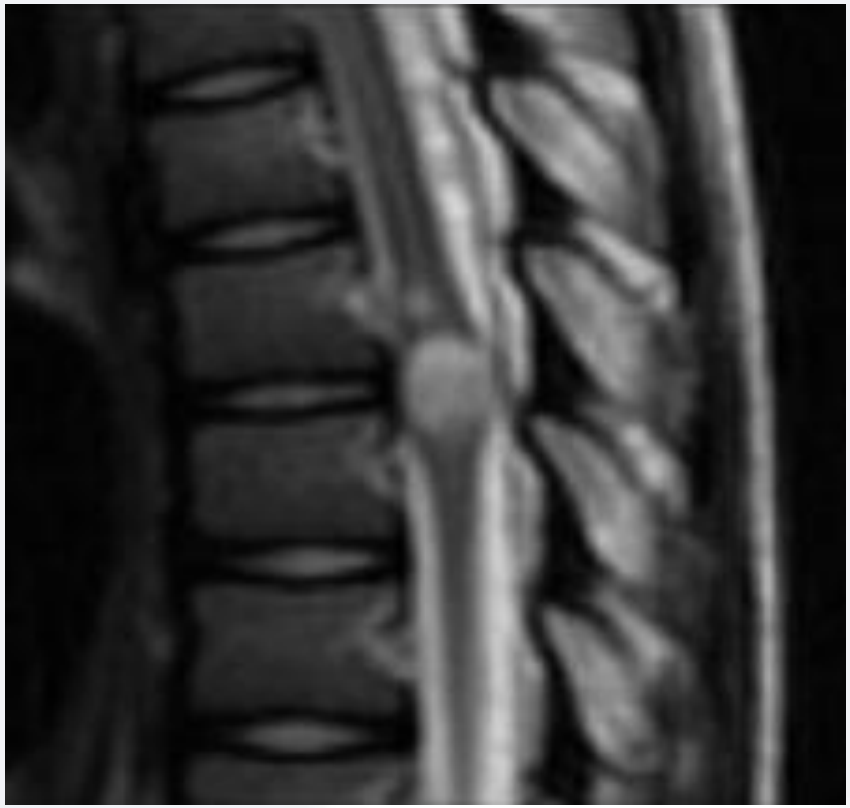


IV. Developmental tumors

(2%)

- Dermoid, epidermoid, and teratoma are slow-growing neoplasms with a thoracolumbar predominance.
- Some dermoids of the conus medullaris have been attributed to lumbar punctures that carry in cutaneous tissue.
- These may have a dense capsule, precluding complete removal; although, this may be compatible with prolonged symptom-free survival.
- When complete removal is unobtainable, debris produced by the tumor may cause an early recurrence of symptoms.

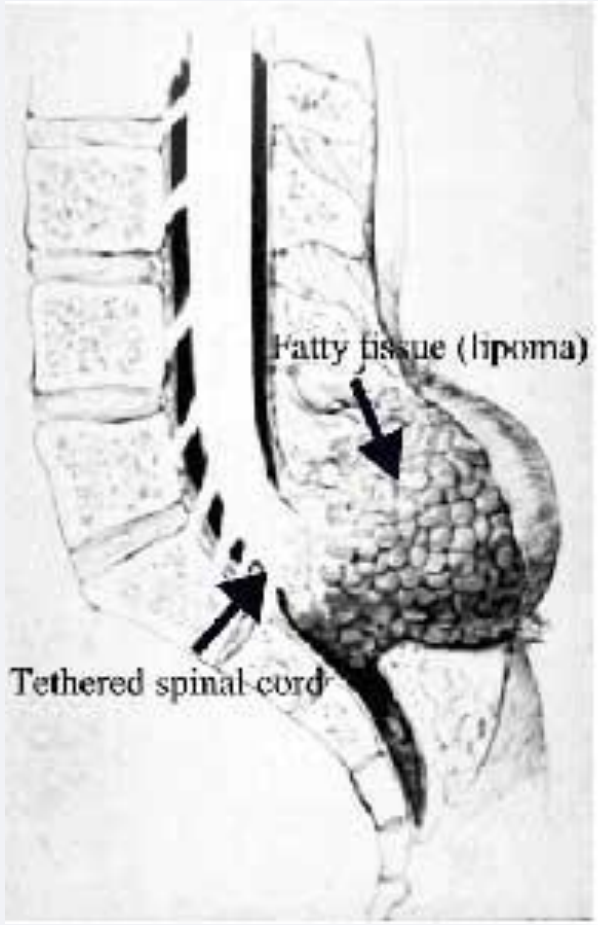
- Spinal dermoid

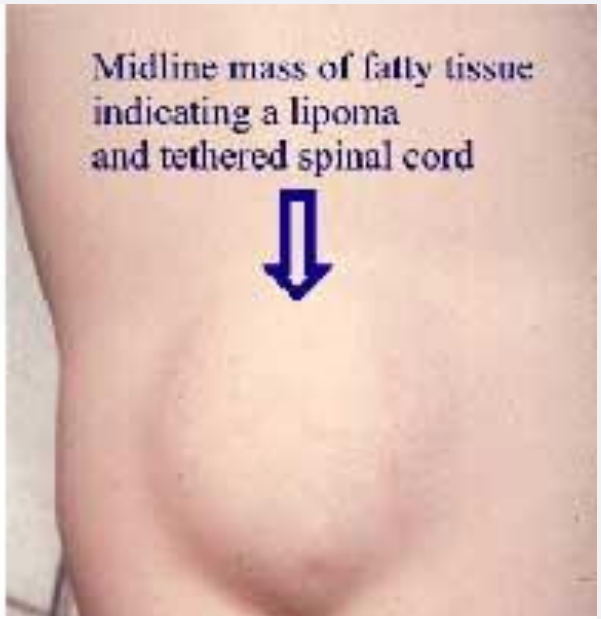


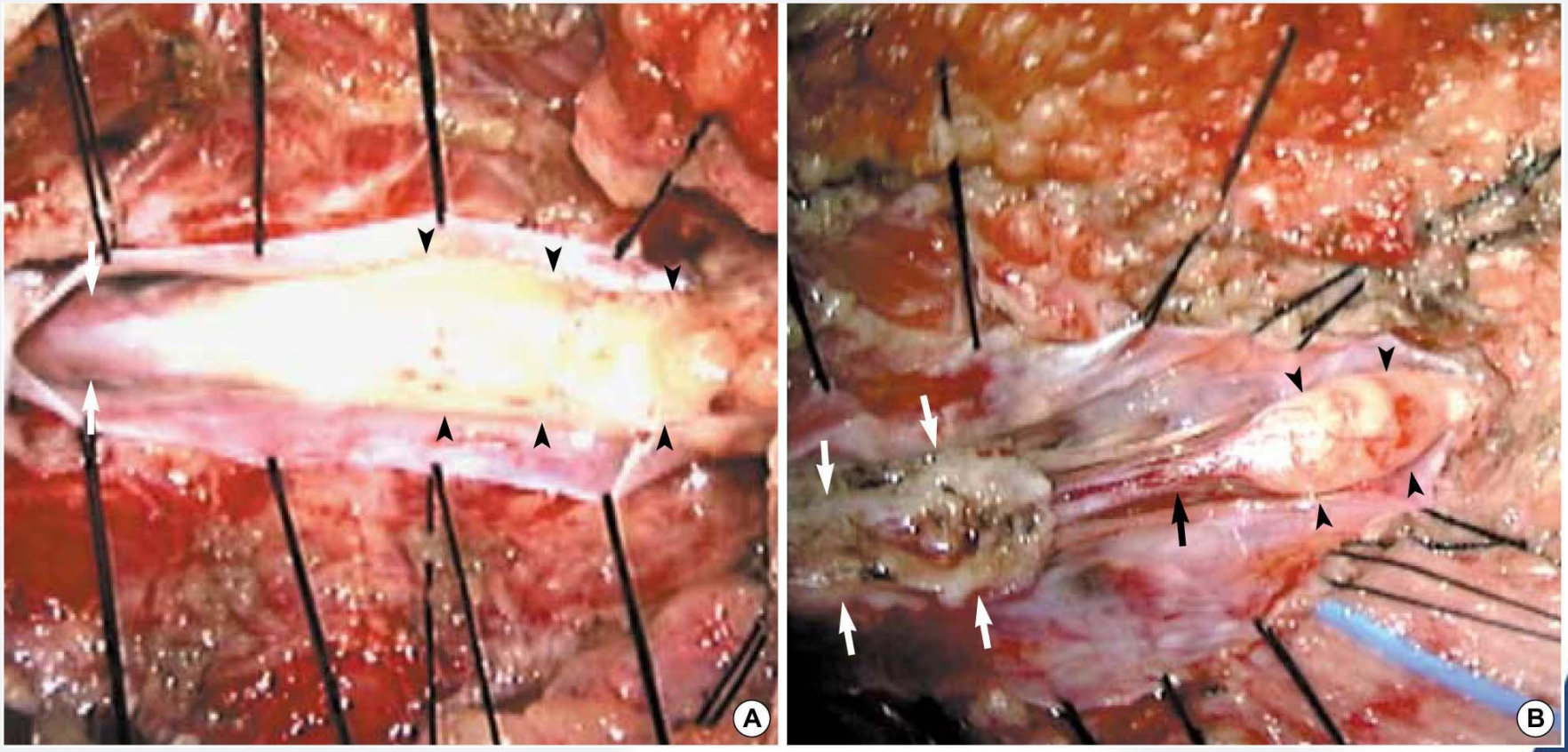
V. Lipoma

(2%)

- Not true neoplasms, Lipomas present in the first 3 decades of life when fat is being deposited. They may be associated with cutaneous abnormalities.
- Loss of total body fat may be necessary to reduce the mass of the tumor.
- Fibrous adhesions to the cord make total removal difficult.
- Removal is not the goal of surgery.
- The carbon dioxide laser is particularly useful during surgery for this lesion.


Fatty tissue (lipoma)
Tethered spinal cord


Midline mass of fatty tissue
indicating a lipoma
and tethered spinal cord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VI. Others

- Unusual lesions include subependymoma, ganglioglioma and intramedullary schwannoma, and neurofibroma.
- Management of low-grade lesions parallels other indolent lesions.
- Metastatic lesions to the spinal cord are unusual.

*symptoms of spinal tumors → pain → by tumor cell
② neurological [compression over the spinal cord]

*hyperreflexia
* hypertonia
*spastic gait
* paralysis.
*bowel + bladder dysfunction
<=> UMN

*
- intramedullary
- extramedullary

⊛ Pain → night pain
+any neurological symptoms

⊛ most common spinal tumor → metastisis
⊛ most common extradural spinal tumor → metastasis
⊛ " " intradural " " → primary [meningeoma]
⊛ " " intramedullary " " → ① ependymoma ② astrocytoma.

✓ ⊛ in bone → extradural
✓ ⊛ in the spinal cord → intramedullary
✓ ⊛ at the CSF +compress the spinal cord → extramedullary


Thank You!