Diagnostic algorithm of cervical tumors

Guillem Saló Bru, MD, Phd
Orthopaedic Department. Spine Unit.
Hospital del Mar. Barcelona.
Associated Professor UAB

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Disclosure information

I have no financial relationships with commercial entities that produce health-care related products.
Case problem.

39 years Male
Trap Case
Diagnostic algorithm of cervical tumors

- Medical history: Symptoms
  - Presentation
  - Onset of pain
  - Patient’s age
  - Location

- Physical examination
  - Clinical Aspect.
  - Root compression signs
  - Cord compression signs

- Blood test (proteinogram, tumor markers, infection markers…)

- Imaging techniques
  - X-Ray
  - Bone Scan
  - MRI
  - CT-Scan

- Biopsy

- Extension study in case of malignancy: PET/Scan/thoraco-abdominal CT Scan.
### Medical history: Age of presentation

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<th>20</th>
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#### Patient’s age:

- **Myeloma 5, 6 decades**
- **Primary spinal neoplasms**
  - < 21 years majority benign
  - > 21 years 70% malignant
- **Metastatic disease 4, 5, 6 decades**

#### Disease Types

- **OB/OO**
- **ABC**
- **EG**
- **GCT**
- **HAEM**
- **OC**
- **CB**
- **CS**
- **EW**
- **MX & Myeloma**
- **OS**
- **OS**
Location of bone spine tumours

- Haemangioma (HAEM)
- Osteoblastoma (OB/OO)
- Osteoid osteoma (OC)
- Ganglion cell tumour (GCT)
- Chordoma (Chor)
- Ewing's sarcoma (GE)

AOSpine logo
Location of bone spine tumors

Osteoblastoma
Osteoid Osteoma
Aneurismathic Bone Cyst.
Osteochondroma

Giant Cell Tumor
Haemangioma
Eosinophilic Granuloma
Ewing’s sarcoma.
Chordoma
Myeloma / Metastasis

Location:

• Anterior location  ➔ malignant
• Strictly posterior  ➔ benign
• “winking owl" in AP view.
• When the tumor is shown in X-ray, a 30-50% of trabecular bone has been destroyed.
MRI

Soft tissues
Bone scan

False positive: osteoarthritis
False negative: Eosinophilic Granuloma
Myeloma, Hemangioma, Metastasis of Liposarcoma
PET scan

Tissue metabolism
CT scan

Bone destruction
Biopsy

- The hazards of biopsy seen in musculoskeletal tumors of the extremities may be even more apparent in the axial skeleton.
- Essential procedure in the diagnostic work-up of any bone and soft tissues lesion.
- It is necessary in differential diagnosis and histological examination of lesions that need specific treatment: tumors and infection.
- It could be an open surgical biopsy or percutaneous needle biopsy (x-Ray guided or CT-guided).
# CT- Guided biopsy

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Anatomical Classification of Spinal Tumors

- **Extradural tumors:**
  - Benign and malignant vertebral tumors.
  - Tumors near the spinal cord (soft tissues).

- **Intradural tumors**
  - Extramedullary (90%): nerve sheath and meningeal
  - Intramedullary (10%): glial and other
Diagnostic algorithm of cervical tumors

- Cervical tumor
  - Extradural
    - Bone
      - Vertebral body
      - Posterior arch
    - Soft tissues
  - Intradural
    - Extramedullary
    - Intramedullary
Extradural tumors
Diagnostic algorithm of cervical tumors
Extradural → bone tumor → vertebral body → benign

Hemangioma

- Most common primary tumor in spine
- Asymptomatic
- Commonly incidental finding
- 10% of autopsy
- Single lesion in 2/3 of cases
- Mainly in vertebral body, thoracic spine
Diagnostic algorithm of cervical tumors
Extradural → bone tumor → vertebral body → benign

**Eosinophilic Granuloma**

Benign, self-limiting process of well-demarcated bone resorption, ? etiology
1st – 2nd decade, Male 2:1
Spine involved in 10-15% of EG
Common sites: skull, pelvis, ribs, shoulder
Associated with 2 systemic diseases:
- Hand-Schüller-Christian disease
- Letterer-Siwe disease
Diagnostic algorithm of cervical tumors
Extradural → bone tumor → vertebral body → benign

Fibrous dysplasia

• Asymptomathic
• Lytic, well defined lesion
• Fibrous tissue.
• Jaw, Skull.
• Sometimes pathologic fracture
Giant Cell Tumor (GCT)

- **Characteristics:**
  - 5-10% of GCT involves spine
  - Most common in sacrum
  - Rare in cervical
  - Vertebral body

- **Clinical Presentation:**
  - Age: 30s-40s, more in women
  - Variable: slowly growing to locally aggressive with metastases
  - Delayed diagnosis
  - Pain and radiculopathy
Diagnostic algorithm of cervical tumors

Extradural → bone tumor → vertebral body → malignant

Chordoma

- Most common primary malignant tumor of spine (excluding lymphoproliferative disorders)
- Age: 50s – 60s, Males: 3x more common
- Remnants of the primitive notochord → midline
- Sacrococcygeal > Base of skull > V. body (C)
- < 20% occur in mobile spine
- Recurrence very frequent
Multiple Myeloma

- Lytic lesion, not-well defined.
- B-cell lymphoproliferative diseases
- Rapidly progressive and highly lethal (20% survival at 5 yr)
- Age: 60s – 70s
Metastasis

- Metastatic lesions are the most common tumors of the spine (95%)
- The spine is the most common site for skeletal metastases. Cervical only 8%. Brihaye J. 1985
- Breast (21%), Lung (14%), Prostate (7.5%), Renal (5%), GI (5%), Thyroid (2.5%)
- Vertebral body affected first.
- Approximately 70% of patients who die of cancer have evidence of vertebral metastases on autopsy.

Diagnostic algorithm of cervical tumors

Extradural → bone tumor → vertebral body → malignant
Osteosarcoma

- 3-14% of malignant tumors of spine
- 2% of all osteosarcoma in the body
- Mainly in vertebral body, lumbosacral
- Bimodal age:
  - 10 – 25 yr: primary
  - Older than 50yr: secondary (radiation, Paget’s)

Diagnostic algorithm of cervical tumors
Extradural → bone tumor → vertebral body → malignant
Ewing’s sarcoma

- 6% of primary bone malignant tumors
- Only 3.5-8% arise of spine, (sacrum and lumbar spine). Exceptional in cervical spine.
- Involves the vertebral body.
- 2nd decade / Males.

Diagnostic algorithm of cervical tumors

Extradural → bone tumor → vertebral body → malignant

Ewing’s sarcoma
Osteochondroma

- <10% of all osteochondroma
- Calcified lesion.
- Cervical first location in spine.
- > 50% < 20 years
- If multiple \(\rightarrow\) hereditary multiple exostoses (8%)
- Slowly growing \(\rightarrow\) rare mechanical or compressive symptoms

Diagnostic algorithm of cervical tumors
Extradural \(\rightarrow\) bone tumor \(\rightarrow\) vertebral arch \(\rightarrow\) benign
Diagnostic algorithm of cervical tumors
Extradural → bone tumor → vertebral arch → benign

Osteoid Osteoma

- Age: 1st 3 decades, peak 15
- 10-25% of osteoid osteoma occur in spine
- 70% of painful juvenile torticollis are due to osteoid osteoma
- Pain, worse at night, responds to NSAIDs
Diagnostic algorithm of cervical tumors
Extradural→bone tumor→vertebral arch→benign

Aneurysmal Bone Cyst (ABC)

- Spine involved in 10-30% of ABC
- Posterior element of thoracolumbar spine
- Liquid levels inside.
- May involve multilevel adjacent segments
- 1\textsuperscript{st} – 2\textsuperscript{nd} decade
- Embolisation.
Diagnostic algorithm of cervical tumors
Extradural → bone tumor → vertebral arch → benign

Aneurysmal Bone Cyst (ABC)
Diagnostic algorithm of cervical tumors
Extradural→bone tumor→vertebral arch→benign

Osteoblastoma

• 40% of osteoblastoma involves spine. Sclerotic lesion.
• Histologically similar to osteoid osteoma, but larger in size, different presentation
• Clinical Presentation:
  • Pain, activity, not as responsive to NSAIDs
  • Larger size (>2cm) → cortical expansion → radiculopathy
  • Scoliosis: less common than osteoid osteoma
Chondrosarcoma

- 2nd most common spine primary malignant bone tumor (after chordoma)
- 7-12% of all spine tumors
- Age: 40s, more in men
- Malignant tumor differentiate into cartilage
- Age < 30-70>
- > 10% mobile spine
- Intralesional surgery = local recurrence
- Resistant QT&RT protocols
Lipoma.

Ossifying lipoma of c1-c2 in an adolescent.


Department of Orthopaedic Surgery, University of Minnesota Hospitals, Ann Arbor, MI, USA.

Abstract

The authors present the case of a 21-month-old girl with a posterior cervical subcutaneous spinal lipoma that contained herniated bone. The patient demonstrated no neurological deficits and the lesion was resected without complication. The lesion was determined to be an ossifying lipoma. The literature on ossifying lipomas and osteolipomas is reviewed and the differences between the two are enumerated.

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Lipoma

- Typically associated with spinal dysraphism
- Presents like any space occupying lesion with progressive myelopathy
- Onset of symptoms often associated with weight gain
Extramedullary tumors
Meningioma

- Slow growing benign masses producing indolent symptoms
- ~15% of all meningiomas are spinal
- 5:1 female to male ratio
- Typically intradural extramedullary but can be extradural
- Most commonly thoracic in location, Cervical second most common
Schwannoma

- Account for ~25% of intradural & ~50% of intradural, extramedullary tumors
- 70% intradural, 15% dumbbell, 5% extradural
- Typically present in 4th and 5th decade
- No male-female predilection
- Arise from Schwann cells of the sensory rootlets
- Tumor only contains Schwann cells and causes symptoms by compressing neural elements.

Diagram of cervical tumors:
Intradural → Extramedullary → Benign

Fewer Antoni B cells
Neurofibroma & Neurofibromatosis

- Commonly seen in NF-1
- Occur more frequently in the cervical spine in NF-1
- May be intradural, extradural or dumbell
- Often multiple
- Sometimes plexiform.
- Benign
- Fusiform expansion of the nerve (Schwann, perineural and neural cells)
Ganglioglioma

- 10% of gangliogliomas are spinal, rest cranial
- Most are paraspinal, may extend into canal
- Arise from sympathetic NS
- Rarely intramedullary
- IM tumors do not have a plane

Diagnostic algorithm of cervical tumors
Intradural → Extramedullary → Benign
Intramedullary tumors
Diagnostic algorithm of cervical tumors

Intradural → Intramedullary → Benign

Ependymoma

- Seen in adults, 15 to 40
- Male = Female
- Presenting signs depend on location
- Longer duration, more severe symptoms = less favorable functional outcome with surgery
- Arise from ependymal lining of the central canal & from filum terminale
- Sometimes associated with a syrinx
Diagnostic algorithm of cervical tumors
Intradural → Intramedullary → Malignant

Astrocytoma

- Occur at any age, average age of dx is 35 to 40
- Accompanying syrinx in 40%
- Occurs equally throughout cord
- Presenting sign depend upon location
Hemangioblastoma

- Highly vascular tumors comprising 2% of spinal cord tumors
- ¼ associated with von Hippel-Lindau, ¾ sporadic
- 10 times less common than intracranial
- Male predominance
- Presents mid life
Cavernous Angioma

- Vascular malformation
- M = F, Female more likely to hemorrhage
- More likely to present in 3rd & 4th decade
Differential diagnosis: Infection.

- Epidural abscess.
- Disk infection.
Differential diagnosis: Infection.

- Tuberculosis (Pott’s disease)
Differential diagnosis
Conclusions. Take at Home message.

- Is essential a good medical history and imaging techniques.
- Location of tumor.
- In extradural tumors, biopsy is mandatory.
- We prefer CT-guided biopsy, with a good sensitivity, specificity, and accuracy.
- We recommend always to culture the biopsy of tumors and get the histology of infections.
- As all of tumors, the diagnoses of a cervical invasive lesion should be carried out by a multidisciplinary team, composed by neuroradiologist, pathologist, oncologist, neurosurgeon and orthopaedic surgeon. Communication between the members of this committee is the key to success.
Excellence in Spine

gsalo@hospitaldelmar.cat