Intramedullary Spinal Cord Abscess: Key Facts to Achieve a Rapid and Accurate Diagnosis

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• Very **uncommon** condition, but...

• Medullary abscess usually shows **nonspecific symptoms**, *(fever < 50%)* difficult to differentiate from other intramedullary lesions.

• **Delay** in diagnosis is very frequent

• High **mortality and disability** rate
ETIOLOGY:

- Idiopathic: Most of cases.
- Hematogenous spread (detected around only 10%)
  - Cardiopulmonary source
- Direct extension from adjacent infection:
  - Recent surgery or trauma
  - Congenital malformation: look for spinal dysraphism/dermal sinus tract in children

Multiple organisms involved:
- *Staphylococcus aureus*, *Staphylococcus epidermidis*,
- *Bacteroides*
- *Haemophilus* species,
- *Listeria* monocytogenes...

77 y-o man with cervical vertebral osteolyelitis showed a round enhancing lesion in spinal cord
A prompt imaging diagnosis is crucial in order to reduce the final disability and mortality rate.

A very rapid evolution of the lesions is frequently observed.

MRI is the technique of choice in the diagnosis and characterization of the lesion.
• A history of inflammation/infection is frequently **not** observed.

• **Never forget to include medullary abscess in the differential** of round / oblong irregular ring-enhancing cervical spinal cord lesion with associated extense edema

• There is a progressive extension through the central canal of the spinal cord.

• Add a brain MRI in the evaluation of these patients

• Include **diffusion** in the evaluation of these spinal cord lesions.
A 44 years old previously healthy man presented with a **10-day history of subacute neck pain radiating to left shoulder**. A cervical MRI (see below) was performed at an outpatient MR facility.

**T1** ill-defined low signal with expanded cord

**T2** center = hypo + extense hyperintense edema up to medulla oblongata (along central canal of the spinal cord)
A 44 years old previously healthy man presented with a 10-day history of subacute neck pain radiating to left shoulder. A cervical MRI (see below) was performed at an outpatient MR facility.

**STIR** better definition of cord edema with swollen cord.

**T1+ Gd** target ring-enhancing lesion with expanding lesion. May delineate enhancing central canal.
The patient was referred to the Neurosurgery service of our tertiary hospital to evaluate a ring-enhancing lesion, hypointense on T2 with edema (metastases? Primary glioma? myelitis?...).

Two days after admission, the patient has a sudden deterioration with quadriplegia and fever.

MR showed increased area of edema and central abscess core (hypo T2) and very good delineation of central canal all along the cervical spinal cord. An abscess is now clearly seen in medulla oblongata (*).
A 44 years old man with quadriplegia and fever. MR showed a cervical spinal cord abscess.

**DTI** marked diffusion restriction (hyper DWI and hypo ADC) is observed in the abscess core. FA is only mild reduced and tractography around abscess can be reconstructed.
A 44 years old man with quadriplegia and fever. MR showed a cervical spinal cord abscess.

**Brain MRI**

Look for more brain abscess or subarachnoid enhancement / ventriculitis

**Dorsal & lumbar MR**

Look for edema, more lesions and pus in the thecal sac (arrow)
TREATMENT

- IV antibiotic coverage 4-6 weeks, with 2-3 additional months oral antibiotics in mild cases

- Early surgical drainage followed by antibiotic therapy in severe deterioration
  - Laminectomy with myelotomy and drainage

- Surgically treated mortality approximately 14%

An emergency surgery for acute onset of quadriplegia was performed C4-C5 laminectomy and myelotomy, with output of pus and drainage of the abscess, obtaining samples for culture samples were positive to Streptococcus Milleri.

The patient had a persistent quadriplegia and was discharged 63 days after surgery.
A 77 years old was admitted with neck pain and fever. MRI showed a vertebral spondylodiskitis C4-C5 and a round hypointense lesion on T2 at C3 level with ring-enhancement after Gd injection, extensive edema and swollen cord. Brain MR also showed several cerebral abscess. The patient completed antibiotic treatment with satisfactory evolution.
33 y-o woman with rapidly progressive right hemiparesis, fever and allodynia (a pain due to a stimulus which does not normally provoke pain). MRI showed an extensive hyperintense lesion (from medulla oblongata to 7th cervical). T1+Gd demonstrated a central ring enhancing lesion. A brain MRI also depicted a left basal ganglia ring enhancing lesion. The patient suffered a rapid deterioration and died 5 days later.
A 42-year-old man who presented with fever and headache. Two days later, left-side numbness, lack of sphincter control, and a new aortic murmur were noticed. MR showed a ring enhancing lesion with cord edema (hyper T2). Transesophageal echocardiography revealed an aortic valve perforation as a result of infective endocarditis. Conservative management was decided for the intramedullary abscess with satisfactory evolution.

GALLERY OF CASES

Case from Elena Arnáiz García, MD. Salamanca, Spain
DIFFERENTIAL DIAGNOSIS:

- Transverse myelitis
- Multiple sclerosis
- Neoplasms
  - Metastases
  - Astrocytoma
  - Ependymoma
  - Hemangioblastoma
- Vascular lesions
  - Cavernoma
  - Cord infarction
  - AV fistula
- Neurosarcoidosis
- Epidermoid cyst
DIFFERENTIAL DIAGNOSIS:

TRANSVERSE MYELITIS

- Acute inflammatory insult of spinal cord due to direct viral infection or post-viral immunologic attack.

- Rapid onset of paraplegia, sensory symptoms and bladder dysfunction.

- Nonspecific central T2 hyperintensity in cord, with variable enhancement (but no ring enhancement).
DIFFERENTIAL DIAGNOSIS:

- Multiple lesions disseminated over time and space.
- Look for concomitant intracranial lesions.
- Isolated spinal cord disease less frequent (cervical segment is most commonly affected).
- Affects the dorsolateral aspect of cord.
- Size: < 2 vertebral segments in length.
- Homogeneous, nodular, or ring enhancement during acute or subacute phase (enhancement lasts 1-2 months).
DIFFERENTIAL DIAGNOSIS:

METASTASES

- Focal enhancing lesion with very extensive edema
- Usually small and well-circumscribed
- Look for more lesions: do full craniospinal imaging when focal cord lesion found.
- May have hemorrhagic components (hypo T2* hypointensity, e.g., thyroid and renal cell carcinoma)

Abscess vs
DIFFERENTIAL DIAGNOSIS:

CORD NEOPLASMS

EPENDYMO Moma

- Mass centrally located
- Well circumscribed, symmetric cord expansion, may have exophytic component.
- Solid and cystic components cause fusiform cord expansion.
- Associated peripheral hemorrhage.
DIFFERENTIAL DIAGNOSIS:

CORD NEOPLASMS

ASTROCYTOMA

- Usually not hypervascular
- Most common intramedullary tumor in children and young adults.
- Cervical segment is the most frequent.
- **Slow onset** of myelopathy.
- Fusiform expansion of cord, with variable enhancing component of variable morphology
DIFFERENTIAL DIAGNOSIS:

- **CORD INFARCTION**
  - Abrupt onset
  - Focal hyperintensity on T2WI in slightly expanded cord
  - Affects central cord (‘butterfly’ = grey matter)
  - May show patchy, ill-defined enhancement in subacute phase

- **Abscess**

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T2WI image showing the affected area in the spinal cord.
DIFFERENTIAL DIAGNOSIS:

A-V DURAL FISTULA

- May show only cord expansion and edema on T2WI, without prominent vessels
- No cord ring enhancement (may show mild patchy enh)
DIFFERENTIAL DIAGNOSIS:

CAVERNOUS MALFORMATION

- Well-defined round/oval lesion
- Center hyper T2
- Strong hypo T2 hemosiderin rim
- T2* blooming
- No enhancement
DIFFERENTIAL DIAGNOSIS:

- SARCOIDOSIS

- Peripheral-superficial mass like
- Fusiform cord enlargement
- Edema
- Look for several lesions
- Intense focal enhancement
DIFFERENTIAL DIAGNOSIS:

- **EPIDERMOID CYST**

- Slowly progressive myelopathy
- Peripheral lesion
- CSF isointense
- Restricted diffusion
- Absent or faint peripheral enhancement
Conclusion

- Intramedullary abscess is a rare and treatable entity. A prompt diagnosis is crucial in order to achieve a satisfactory evolution.

- Preoperative diagnosis is difficult because clinical manifestations are often unspecific.

- Add a brain MRI in these patients (full craniospinal imaging).

- **MRI:**
  - Abscess core is hypo T2 and shows ring enhancement.
  - DTI: show restricted diffusion.


