La Moelle

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SLICE 0.5 mm
Gap 0.5 mm
T 8-12 hours

RESOLUTION:
50x50x500 microns
Myelopathy

- Tumors
- Demyelinating
- Degenerative
- Infections
- Vascular
- Inflammatory
Roadmap for Myelopathy

How long is the lesion?
Where is the lesion located?
How many lesions?
Enhancement?
Cysts or syrinx?
Brain lesions?
Clinical history?
Child or adult?
Something is wrong with the spinal cord!

Case 1

How long?
Where?
How many?
Enhancing?
Cysts/syrinx?
Brain?
How old?

24 y female

Multiple Sclerosis
Clues for Multiple Sclerosis (MS)

- Focal lesions
- Dorsal and lateral (may be ventral)
- May enhance nodular or ring-like
- < 2/3 of the cord cross section area
- Spinal cord atrophy in PPMS
- Brain lesions
Neuromyelitis optica (NMO)

6 y female
NMO was thought to be a variant of multiple sclerosis (MS), but in 2004, a serum antibody specific to patients with NMO was detected.

**NEW DEFINITION**

NMO is considered to be an autoimmune antibody-mediated disease, induced by a specific serum autoantibody, the NMO-IgG, directed against Aquaporin-4

**HIGH sensitivity and specificity (90-100%)**

Optic involvement in NMO

- Optic neuritis precedes or is simultaneous with myelitis
- Usually severe, painful
- Uni- or bilateral
- Selective involvement of chiasm is possible

MORE POSTERIOR involvement !!!

![MRI images highlighting optic nerve involvement]
Spinal cord involvement in NMO

Longitudinally extensive TM  **LETM**

- At least 3 vertebral segments
- Usually 4.5-8.7 segments
- Edematous in acute stage
- Centrally located
- 33% - 71% enhance
- Lesion may fragment with new attack
- Later: focal atrophy

*c/o Andrea Rossi*
Bright spotty lesions (BSL)

- 24 consecutive patients with NMO and 34 patients with MS who developed myelitis

- 54% NMO had BSL
- 3% MS had BSL

BSL seen on axial T2 is a discriminative factor for NMO

Clues for Neuromyelitis optica (NMO)

• Child or adult (asian origin)
• Optic nerve & spinal cord & brain
• LETM with BSL & patchy enhancement
• ON uni- or bilateral (posterior)
• Relapsing course
• NMO-IgG positive in serum or CSF
  (anti-NMO neg & anti-MOG pos)
Acute disseminated encephalomyelitis ADEM

11 y female

Three weeks after respiratory infection sudden onset of neurological symptoms
Acute Disseminated Encephalomyelitis (ADEM)

Parainfectious encephalomyelitis

- An immune-mediated demyelinating disorder of the CNS
- Children (5-8y)
- Within 3 weeks of infection, vaccination or drugs
- T-cell hypersensitivity reaction

- 25-30% spinal cord involvement
Anti–myelin oligodendrocyte glycoprotein (MOG) autoantibodies

• High serum titers in 50% of ADEM patients
• Not present in healthy children and children with viral encephalitis
• Not highly specific but supports the diagnosis of ADEM

Full length human MOG is made up of 218 amino acids and is expressed exclusively in the CNS

Lalive PH et al. *Mult Scler* 2011
Clues for ADEM

- Teenager 3 weeks after an infection
- Spine involvement focal or diffuse
- Multiple focal ("large") brain lesions
- Non-enhancing / all enhancing
- Pons, Basal ganglia
- Anti-MOG pos (ADEM with LETM)
Autoantigens in demyelinating diseases

- Anti-AQP4 is found in NMO
- Anti-MOG is seen in patients with anti-AQP4 negative NMO, childhood MS, ADEM, and ON
- Anti-MOG will be hardly seen in adult MS

Identification of autoantigens in demyelinating diseases is essential for the understanding of the pathogenesis

Lalive PH et al. *Mult Scler* 2011
How long?
Where?
How many?
Enhancing?
Cysts/syrinx?
Brain?

Ependymoma
Spinal Cord Tumors

- Ependymoma
- Astrocytoma
- Hemangioblastoma
  - Common
- Ganglioglioma
- Metastasis
- Lymphoma
- Hemangiopericytoma
- Melanocytoma
- Epidermoid
- Cavernoma
  - Rare
**Ependymoma**

- **ADULTS**: 4\textsuperscript{th} and 5\textsuperscript{th} decade
- **CHILDREN**: NF type 2
- Grade I: myxopapillary, subependymoma
  Grade II: classic (cellular)
  Grade III: anaplastic
- Centromedullary location
- Well-defined borders
- Cord enlargement & abnormal signal
- Focal enhancement – solid part
- Neoplastic cysts & satellite cysts
- “Cap sign” due to hemorrhage above/below the tumor
“Cap sign”
Myxopapillary Ependymoma

- Conus and filum terminale
- Strong inhomogeneous enhancement
Myxopapillary Ependymoma

- Vertebral body scalloping, scoliosis
- Enlargement of the neural foramina
Astrocytoma

- The most common spinal cord tumor in children
- ADULTS: 3rd and 4th decade
- Any region of the spine, >50% thoracic region
- 75% low grade tumors (I-II)

- Fusiform expansion of the spinal cord
- Inhomogeneous, ill-defined tumor
- Heterogeneous enhancement (although low grade!)
75% pilocytic astrocytoma (1-5 y)
7% fibrillary astrocytoma (>10y)
Astrocytoma

c/o T. Stosic-Opincal, SR
Ependymoma  
Astrocytoma
Diffusely infiltration
Fibers infiltrated

More central location
Fibers displaced laterally

Astrocytoma

Ependymoma

Thurnher/Van Hecke
Hemangioblastoma

- BENIGN, richly vascularized tumors
- Solitary (80%)
- multiple (Von Hippel-Lindau disease)
- Two typical presentations:
  
  a) small nodular lesion & extensive intramedullary edema
  
  b) small nodule & extensive intramedullary cyst
Hemangioblastoma
Hemangioblastoma
31 y male

Spinal cord metastasis
Spinal cord metastasis

- Enlargement of the cord
- Focal lesion with enhancement
- Leptomeningeal Enhancement !!!
- Bone involvement !!!
Epidermoid

- *Ectodermal inclusion cyst, Epidermoid, Cholesteatoma*
- Rare tumor of the spinal cord (0.6-1.1%)
- Slow-growing
- Common in lumbosacral and thoracic region
- In children associated with dermal sinus
Thurnher MM. Diffusion-weighted MR Imaging in two intradural spinal epidermoid cysts. *Neuroradiology* 2012
Melanocytoma

- Well-differentiated neoplasm arising from leptomeningeal melanocytes
- Most commonly located in the intradural extramedullary compartment
- Sometimes intramedullary (unclear!)
T1- high signal
Clues for Spinal Cord Tumors

- Cord enlargement & abnormal signal
- Enhancement (focal)
- Cystic degeneration or necrosis
- Syrinx formation
- Signal voids
- Slowly progressive clinical course
Candida abscess

How long?
Where?
How many?
Enhancing?
Cysts/syrinx?
Brain?
How old?

10-year-old boy, immunosuppressed due to CML & BMT
Herpes Zoster Virus (HZV)
Tuberculosis

 Courtesy of Tali T, Ankara, TR
Spinal cord bacterial abscess

Courtesy of Macedo L, Sao Paolo, Brazil
Tuberculosis  
Toxoplasmosis  
Candida  
Cysticercosis
Clues for Spinal Cord Infections

- Cord enlargement & abnormal signal
- Enhancement (focal or ring-like)
- Brain lesions !!!
- Immunocompromised individuals (fungal)
- Endemic regions
- Travel
67 y male

- Stenting of aortic aneurysm
- Lower extremity weakness
- Voiding dysfunction
Spinal cord ischemia
42 y male

- Headache, fever, hyperalgesia,
- Numbness of the left side of the body
- Pain in the limbs (during night)
- IV nerve palsy
- CSF analysis: 52/3 cells
Idiopathic Vasculitis
Subacute combined degeneration (SCD)
Myelopathy

- Tumors
- Demyelinating Infections
- Degenerative
- Vascular
- Inflammatory

Spinal Cord
MS

Polio

Vitamin B12 deficiency
Brain lesions?

YES

- MS
- ADEM
- NMO
- Infection
- Metastatic

NO

- TM
- Tumor
- Ischemia
- Degenerative
Cysts / Syrinx?

- YES
  - TUMOR

- NO
  - MS
  - ADEM
  - Myelitis
  - Ischemia
  - Infections
Clinical history?

- Sudden onset:
  - Ischemia
  - MS
  - TM
  - Infection

- Slowly progressive:
  - Tumor

- Relapsing:
  - MS
  - NMO
  - ADEM
  - Sarcoidosis
How long?
Where?
How many?
Enhancing?
Cysts/syrinx?
Brain?

Chagas disease
American trypanosomiasis
How long?
Where?
How many?
Enhancing?
Cysts/syrinx?
Brain?
• 38-year-old male
• While visiting the zoo he got a spread of tiger urine in his face / eyes
• 2 days later fever
• 4 days later urinary retention
• 5 days later progressive paraplegia
• Was admitted in a wheelchair
Tiger urine?

• Animal repellents are products designed to keep certain animals away from objects, areas, people, plants, or other animals.
• Tiger urine is very effective at keeping away animals / humans!

ADEM due to tiger urine poisoning
Thank you