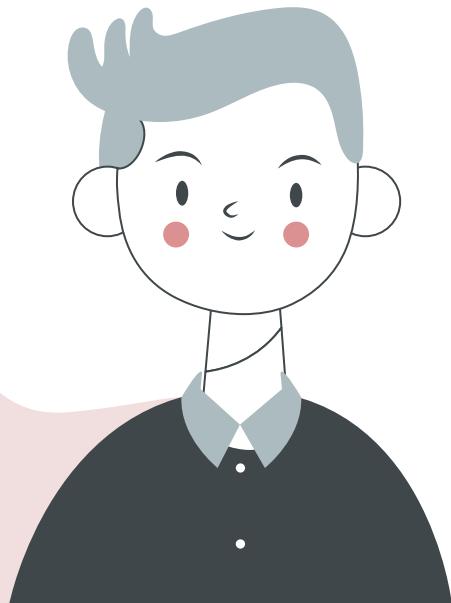


# Interesting case

R1 Thitapa/R2 Jitsupa/A. Anundorn

# Case A Thai boy 14 years old



Chief complaint:

อ่อนแรงขาทั้ง2ข้าง

3 ชั่วโมง PTA

# Present illness

1 week PTA มีอาการปวดต้นขาด้านขวา ไม่มีปวดหลัง ไม่มีปวดร้าวไปที่อื่น เป็นอยู่ประมาณ 5-10นาที หลังจากนั้นอาการดีขึ้นเอง ไม่อ่อนแรง

17 hour PTA ปวดขาทั้ง2ข้าง ปวดที่หลังส่วนล่าง pain score 8/10 ปวดขาด้านขามากกว่าด้านซ้าย ยกขาขวาไม่ได้เลย ยกขาข้างซ้ายได้บ้างเล็กน้อย ปวดจนสะดุงตื้น มีอาการชาตั้งแต่บริเวณสะโพกลงไปถึงปลายเท้า

## Other Information ?

# Present illness

ไม่มีไข้ ไม่มีประวัติกระแทกอุบัติเหตุ ไม่มีอุจจาระรด ไม่มี  
ซักเกร็งกระตุก ไม่มีจุดจ้ำเลือดตามตัว ไม่มีประวัติติดเชื้อน้ำมาก่อน ไม่มีผื่น  
ตามตัว

ก่อนหน้าที่จะมีอาการเดินได้ตามปกติ ไม่มีอ่อนแรง ไม่มีอาการชา  
สามารถถ่ายอุจจาระปัสสาวะได้ตามปกติ

# Past history

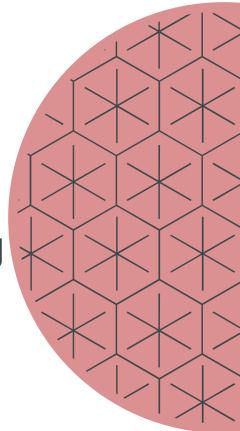
Known case spinal AVM S/P angiogram with embolization

25/10/2564

Present with paraplegia 10/10/64 มีชาทั้ง2ข้าง ปัสสาวะไม่ออก  
ขณะนี้สามารถคลุจจาระปัสสาวะได้ตามปกติ ไม่มีอ่อนแรงแขนขา ตรวจร่างกาย  
ล่าสุด motor gr V all extremities

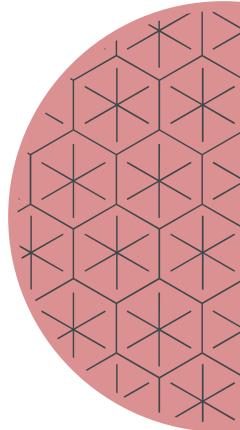
# Personal history

- Perinatal history: Term male newborn, normal labor, no complication
- Nutrition: กินอาหารครบ 5 หมู่ 3 มื้อ ไม่ชอบกินผัก แต่ถ้ามีก็กินได้ ดีมั่นวันละ 1-2 กล่อง/วัน เป็นนมจืด
- Growth and development เรียนอยู่ชั้น ม.3 เกรดเฉลี่ย 3.8-3.9 เข้ากับกลุ่มเพื่อนได้ดี
- Vaccination: complete vaccination ตาม EPI
- No drug and food allergy



# Family history

- ยาย 85 ปี มีโรคประจำตัว hypertension, dyslipidemia
- แม่ 44 ปี ไม่มีโรคประจำตัว
- พ่อ 44 ปี ไม่มีโรคประจำตัว
- น้องสาว 10 ปี ไม่มีโรคประจำตัว



# **Physical Examination**

Vital sign: Body temperature 36.2 °C    Respiratory rate 23/min

Pulse rate 87 bpm                      Blood pressure 111/80 mmHg

**What will you looking for ?**

# Physical examination

**Vital sign:** Body temperature 36.2 °C    Respiratory rate 23/min

Pulse rate 87 bpm                      Blood pressure 111/80 mmHg

**General appearance:** good consciousness, well cooperation

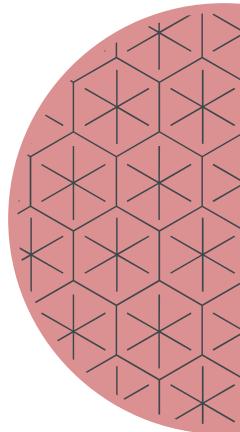
**HEENT:** not pale conjunctivae, anicteric sclerae, no lymphadenopathy

**Lungs:** clear equal breath sound, no retraction

**CVS:** normal s1 s2 ,no murmur, pulse full, capillary refill 2sec

**Abdomen:** soft, not tender, no hepatosplenomegaly

**Extremities:** no petechiae, no rash



# Physical examination

**Back:** no scoliosis, no mass, normal alignment

**Neurological examination:**

Mental status: good consciousness, orientation to time-place-person

Cranial nerve:

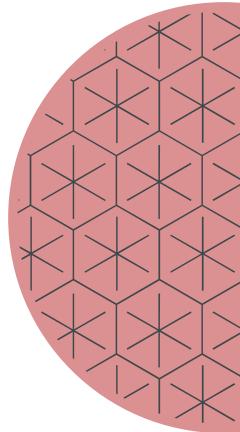
CN II ,III: pupil 3 mm RTLBE

CN III,IV,VI: full extraocular movement both eyes

CN V: normal facial sensation

CN VII: no facial palsy

CN IX, XI,XII: normal gag reflex, normal function of SCM, no tongue deviated



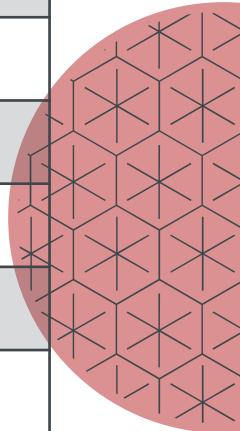
# Physical examination

## Neurological examination

Motor function

Normal muscle tone

Level	Motor grade	
	Right	Left
Shoulder abduction	V	V
Elbow flexion	V	V
Elbow extension	V	V
Wrist flexion	V	V
Finger abduction	V	V
Hip flexion	II	III
Knee extension	II	III
Ankle dorsiflexion	II	III
Great toe extension	II	III
Ankle plantarflexion	II	III



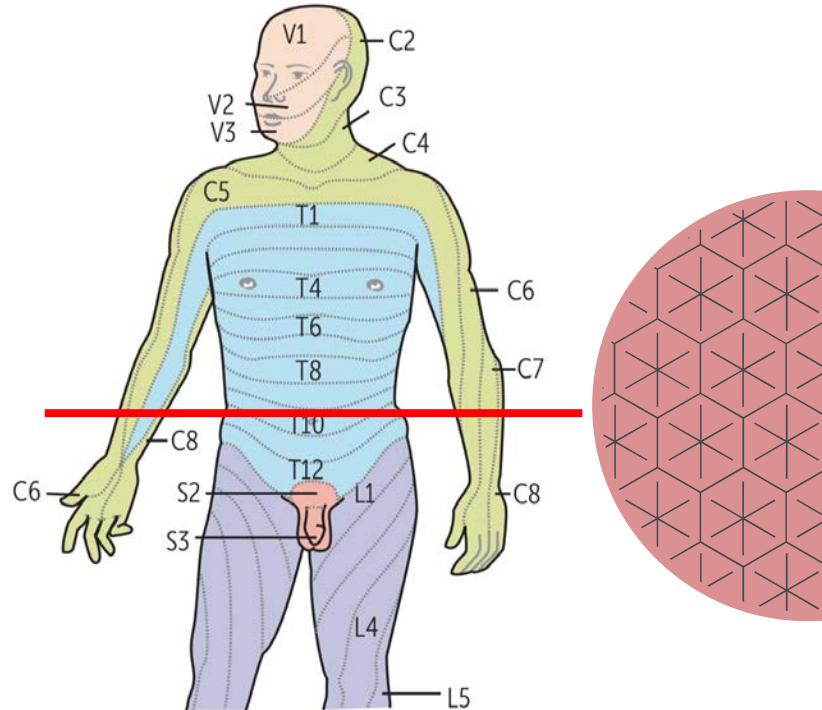
# Physical examination

## Neurological examination

### Sensory function

**Decrease sensation** (pain, temperature, light touch) below umbilical area  
(Decrease Left side > Right side)

**Decrease proprioception** at lower extremities both sides



# Physical examination

## Reflex

Deep tendon reflex Right side grade 3+, Left side grade 3+

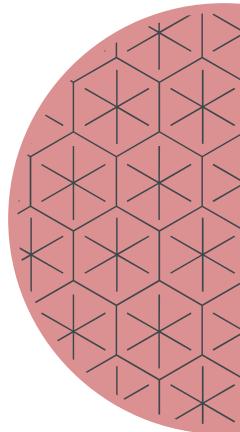
Babinski sign positive right side

Clonus sign negative

Loose sphincter tone

Deep and superficial abdominal reflex absent

Stiff neck negative

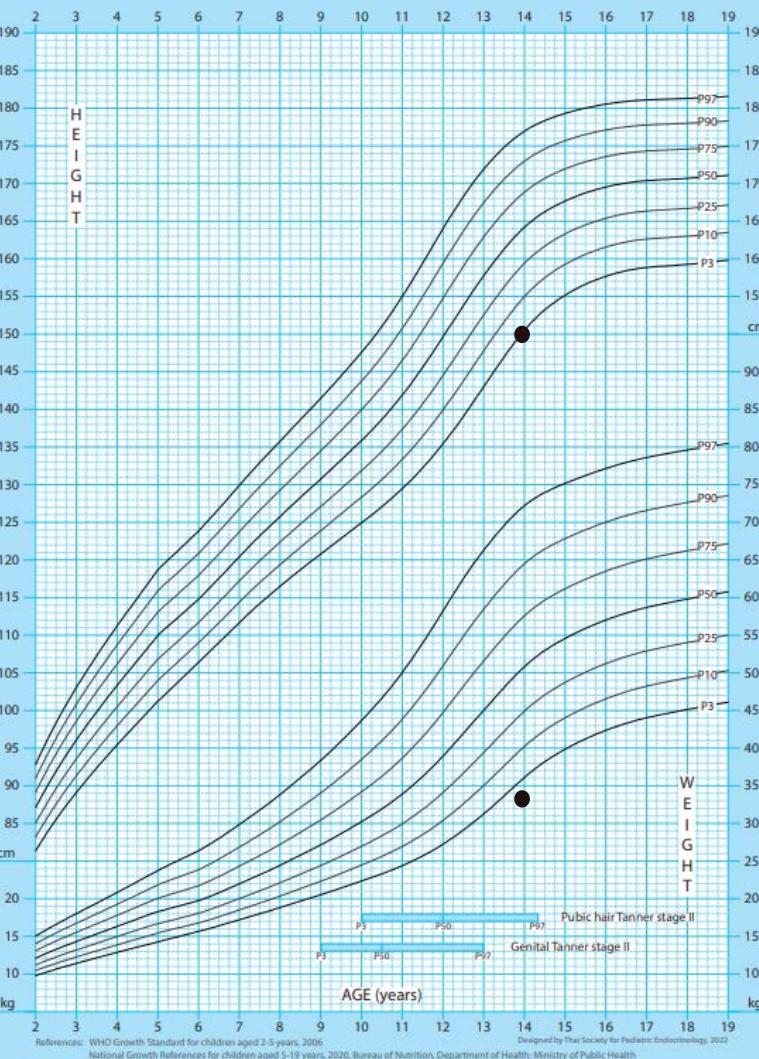


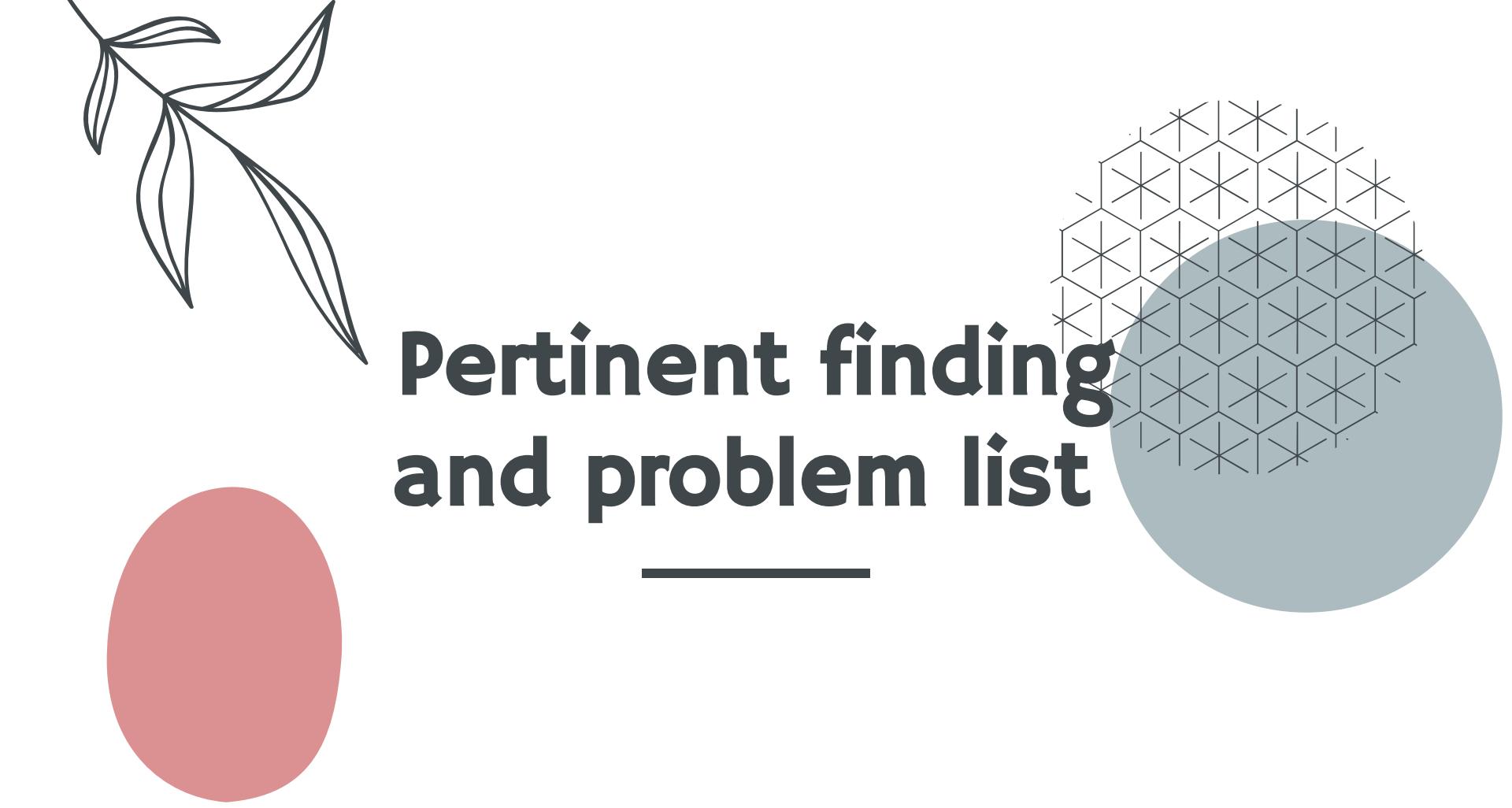
# Physical examination

Measurement:

Height 149 cm (Percentile 3)

Weight 33 kg (<Percentile 3)



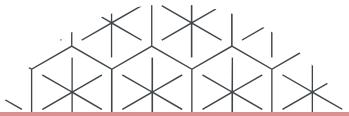


# Pertinent finding and problem list

---

# Pertinent finding

Positive finding	Negative finding
<ul style="list-style-type: none"><li>• Acute onset back and leg pain</li><li>• Acute paraparesis (Right &gt; Left)</li><li>• Decrease sensation (pain, temp, light touch) below umbilical area (Left&gt;Right)</li><li>• Loss of proprioception</li><li>• Hyperreflexia with Babinski sign positive Rt side</li><li>• Loose sphincter tone</li><li>• History of spinal AVM</li></ul>	<ul style="list-style-type: none"><li>• No history of trauma</li><li>• No fever</li><li>• No bleeding tendency</li><li>• No seizure</li><li>• Normal muscle tone</li><li>• Normal cranial nerve function</li><li>• Normal consciousness</li></ul>

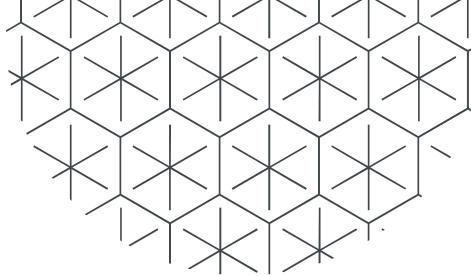


# Problem list

#A thai boy 14 years old presented with acute paraparesis with impair sensation below umbilical for 3 hours

#History of spinal AVM





# Approach

# Where is the lesion?



**UMN**

**LMN**

	Weakness Symmetric /Distribution		Sensory	Reflex	Tone	BBK	Specific finding
Brain	No	Hemi/ Quadripareisis	+/-	hyperreflexia	↑	↑	Seizure, Coma, CN dysfunction
Spinal cord	Yes	Paraparesis (below lesion)	Loss (below lesion)	Hypo/areflexia (early) Hyperreflexia	↑ ↓	↑	Bowel & bladder dysfunction, Back pain
Anterior Horn cell	No (Polio)	Proximal	Normal	Hypo/areflexia	↓	↓	Fasciculation, meningism
Nerve	Yes (GBS) No (Trauma)	Dist>Prox	Dist >Prox	Hypo/areflexia	↓	↓	Autonomic or CN dysfunction (GBS)
NMJ	Yes	Prox. (Fatigability)	Normal	Normal	+/-	↓	Ptosis, diplopia (MG), dilate pupils, Bulbar dysfunction (botulism)
Muscle	Yes	Proximal	Normal	+/-	+/-	↓	Muscle tenderness (myositis)

# Where is the lesion?

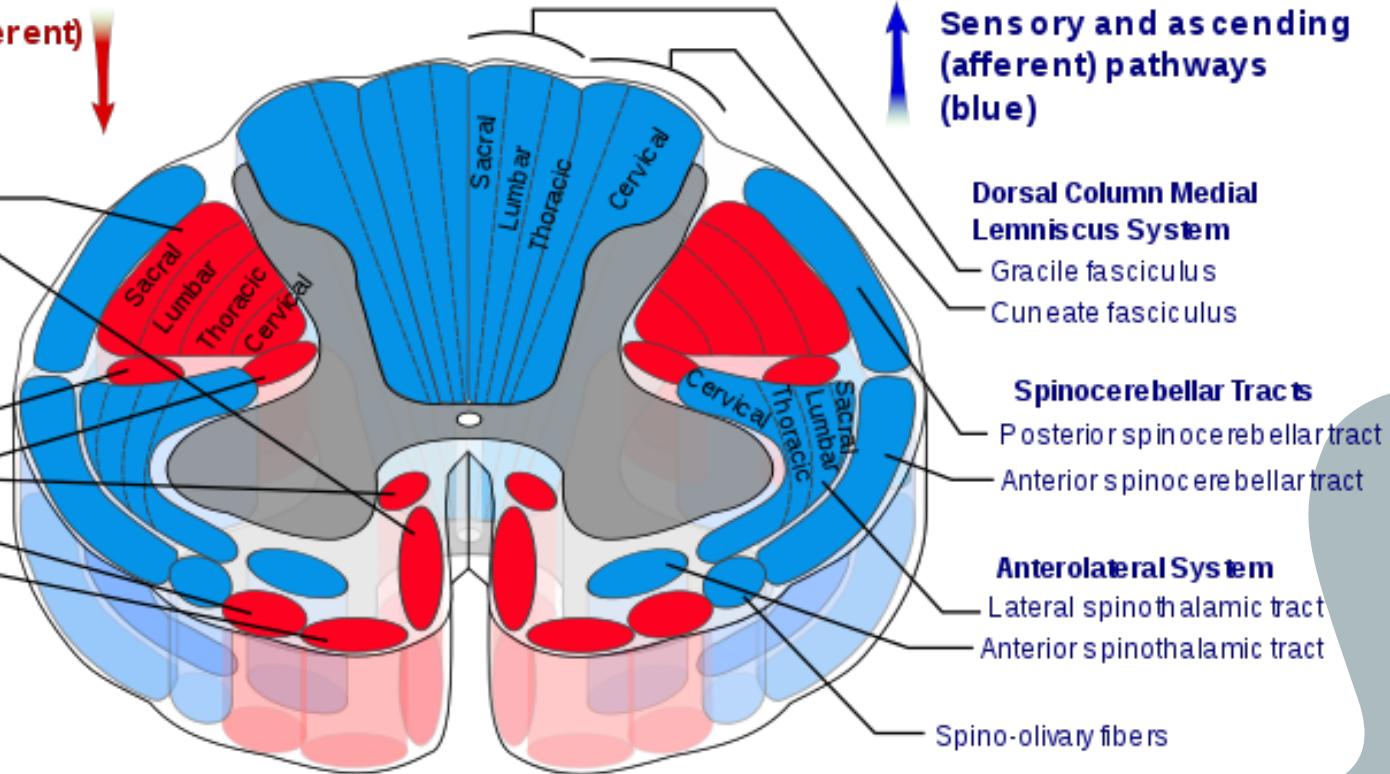
**Motor and descending (efferent) pathways (red)**

## Pyramidal tracts

- Lateral corticospinal tract
- Anterior corticospinal tract

## Extrapyramidal Tracts

- Rubrospinal tract
- Reticulospinal tracts
- Olivospinal tract
- Vestibulospinal tract



**Sensory and ascending (afferent) pathways (blue)**

## Dorsal Column Medial Lemniscus System

- Gracile fasciculus
- Cuneate fasciculus

## Spinocerebellar Tracts

- Posterior spinocerebellar tract
- Anterior spinocerebellar tract

## Anterolateral System

- Lateral spinothalamic tract
- Anterior spinothalamic tract

Spino-olivary fibers

# Spinal cord lesion



## Extrinsic cord lesion

- Early spastic weakness in legs  
(Ascending weakness)
- Late ANS involvement
- Early sacral sensory loss  
(Ascending loss)
- Radicular pain, Root pain
- Pain and Gibbus

## Intrinsic cord lesion

- ~~○~~ Late corticospinal tract sign  
(Descending weakness)
- ~~○~~ Early bowel/bladder involvement
- ~~○~~ Sacral sparing (Descending loss)
- ~~○~~ Funicular pain, Suspended pain
- ~~○~~ No pain and Gibbus

Weakness

Autonomic

Sensory

Pain

Vertebral

# Localize the lesion

## Motor

Below myotome L2

### Upper limb

C5 – Shoulder abduction

C6 – Elbow flexion

C7 – Elbow extension

C8 – Wrist flexion

T1 – Finger abduction

### Lower limb

L2 – Hip flexion

L3 – Knee extension

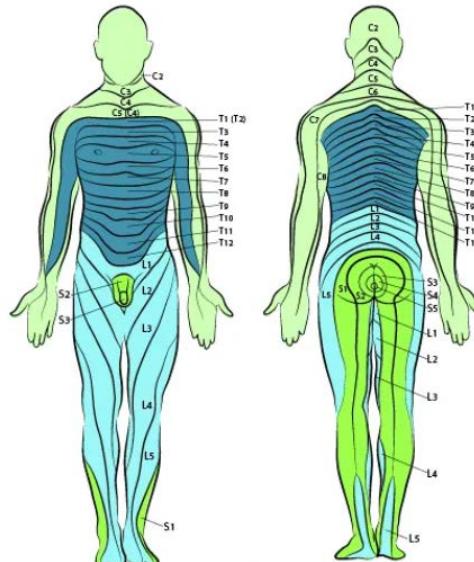
L4 – Ankle dorsiflexion

L5 – Great toe extension

S1 – Ankle plantarflexion

## Sensory

Below dermatome T10



## Reflex

No abdominal reflex

>>defect at T8-T12 level



# What is the lesion?

## Vitamins

V = Vascular 

I = Infection 

T = Trauma

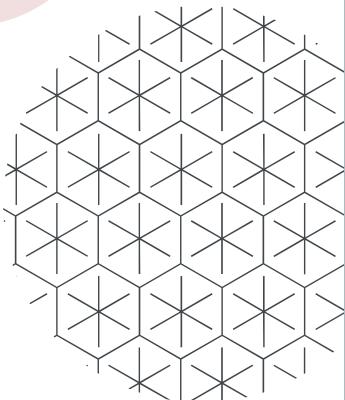
A = Autoimmune

M = Metabolic

I = Idiopathic

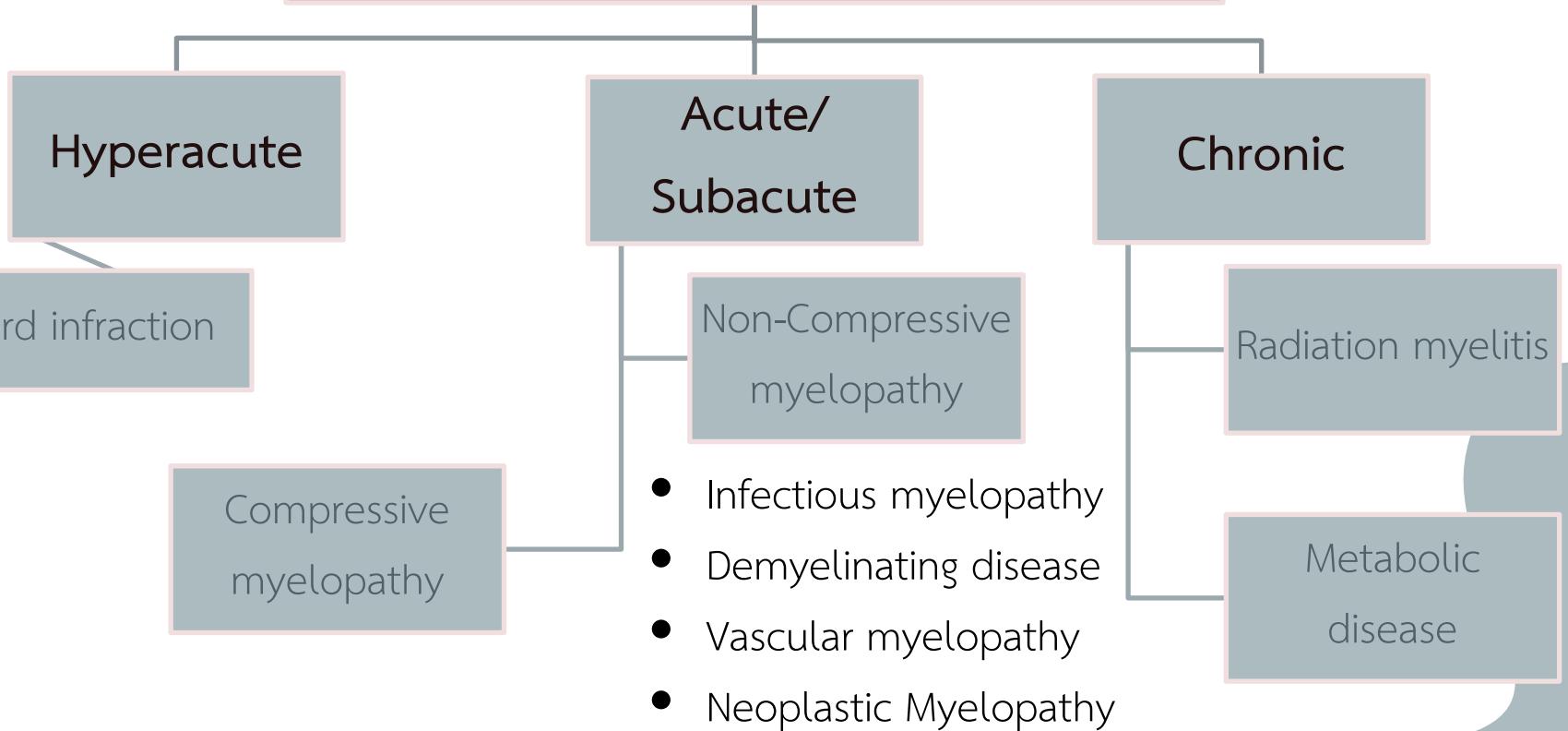
N = Neoplasm

S = Seizure / Structural



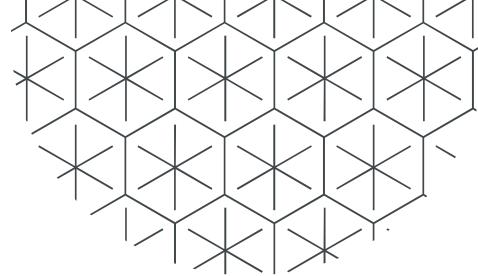
# Intrinsic cord lesion

## Onset

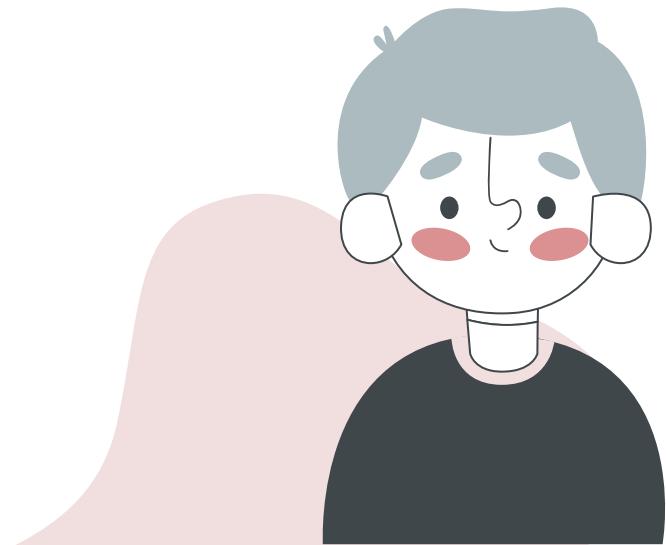


# Differential diagnosis

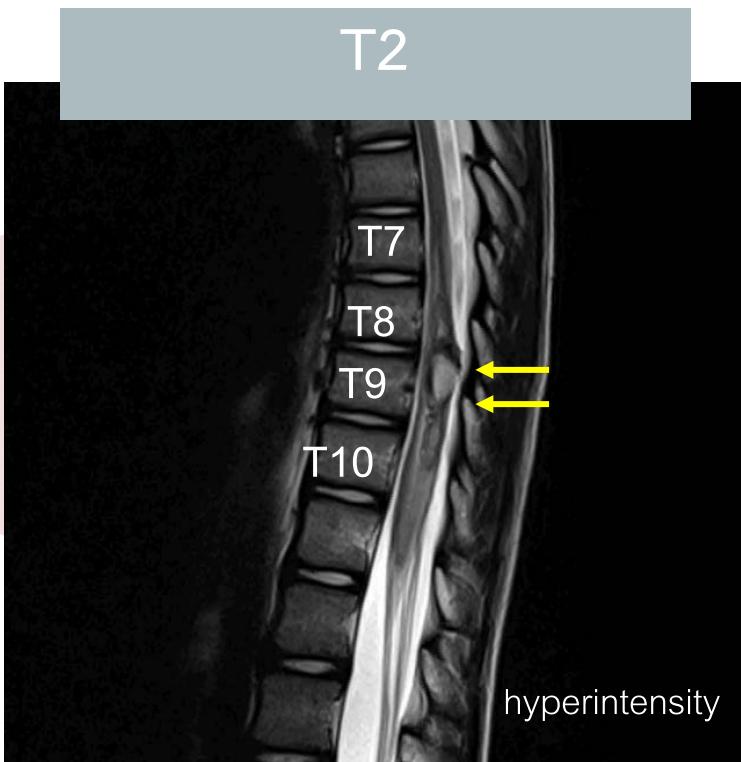
Disease	Pros	Cons
Ruptured Spinal AVM/ spinal infarction	<ul style="list-style-type: none"><li>-U/D spinal AVM S/P embolization</li><li>-Awakening back pain</li><li>-Acute paraparesis with impaired sensation with autonomic involvement</li></ul>	-
Acute transverse myelitis	<ul style="list-style-type: none"><li>- Weakness, loss of sensation, bowel and bladder dysfunction in hours to day</li></ul>	<ul style="list-style-type: none"><li>-No history of infection</li><li>-Pain</li></ul>
Epidural abscess	<ul style="list-style-type: none"><li>-Acute back pain</li><li>-Acute flaccid paralysis</li></ul>	<ul style="list-style-type: none"><li>-Intrinsic cord lesion</li><li>-No fever/sign of infection</li><li>-No history of trauma</li></ul>



# Investigation

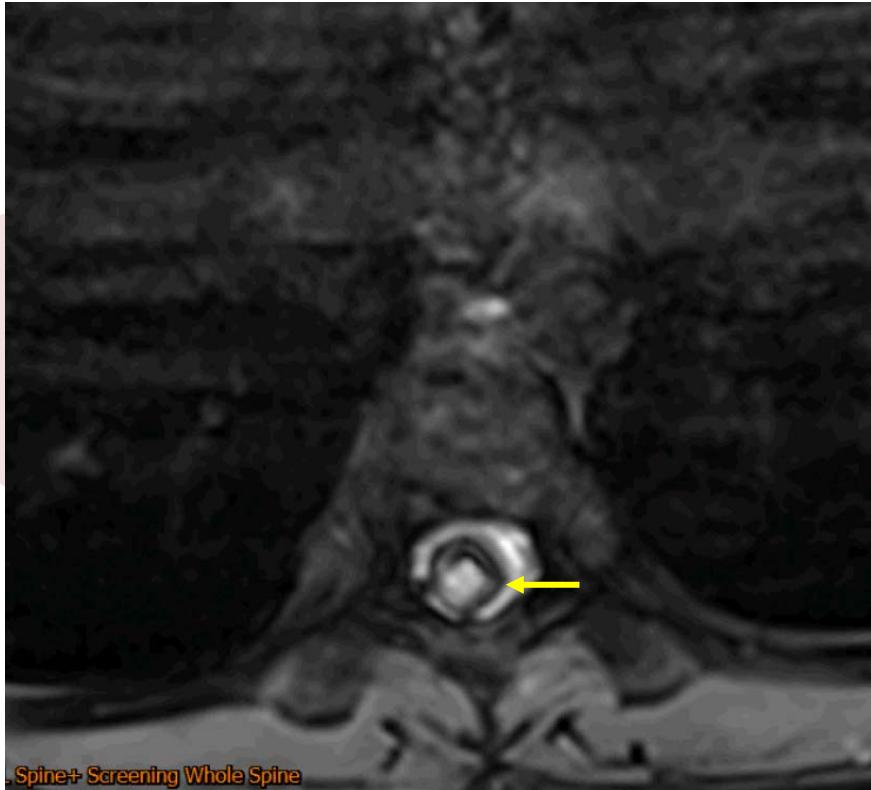


# MRI I4/6/66

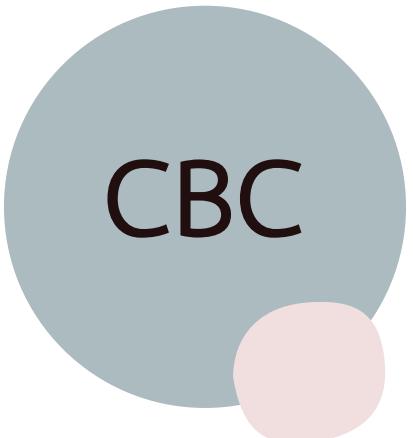
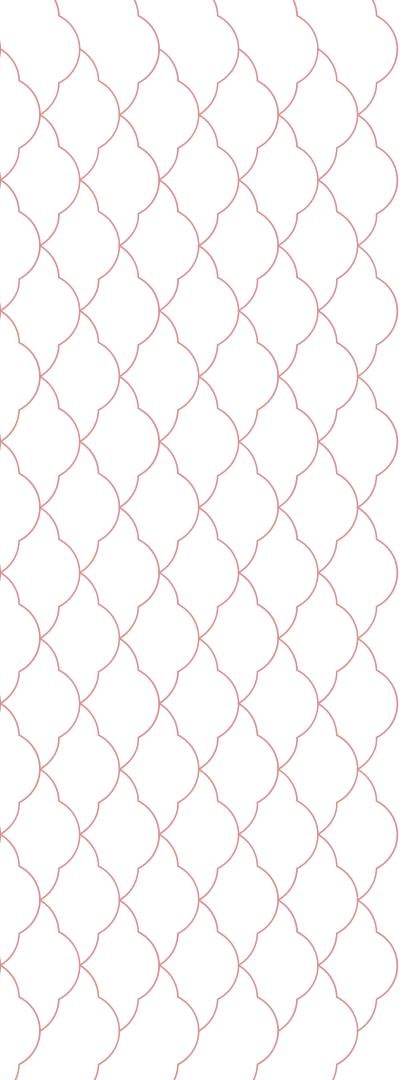


Focal edema along T7-11 level with a  $0.7*0.8*0.5$  cm mild enhancing lesion

# MRI 14/6/66 Axial view



Acute to chronic  
stage hemorrhage



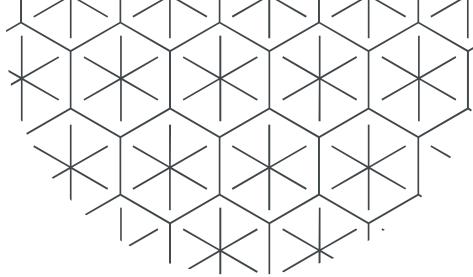
# CBC

Hb (g/dl)	13.1
Hct (%)	38.9
WBC (cell/mm3)	13400
PMN(%)	17
L(%)	65
M(%)	1
B(%)	0
E(%)	17
MCV	72.8
MCH	24.5
MCHC	33.7
RDW	20.6
Platelet (cell/mm3)	394000

# Investigation

APTT	25.1/0.96
PT/INR	12/1
TT	15.3/0.94

Na (mEq/L)	140.7
K(mEq/L)	3.66
Cl(mEq/L)	105
HCO3(mEq/L)	20.4
BUN (mg/dL)	11.2
Cr (mg/dL)	0.44

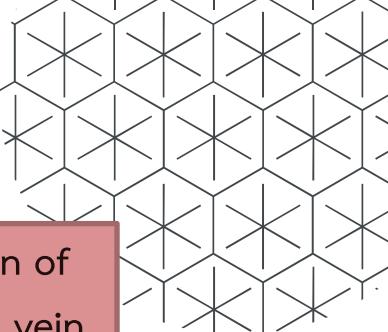


# Management

# Treatment

- Stabilized patient
  - A : Protect airway, consider ETT if respiratory compromised
  - B : Maintain normal oxygenation
  - C : Normotension , vasopressor and atropine in patient with shock
  - D : Complete neurological examination
    - Dexamethasone for cord edema is controversy
    - Consider foley catheter if there is autonomic involvement
    - Avoid hypoglycemia/hyperglycemia

# Definite Treatment



Goal : interrupt or disconnect the fistula by occluding the distal portion of the feeding vessel and the proximal portion of the efferent arterialized vein

## Surgical treatment

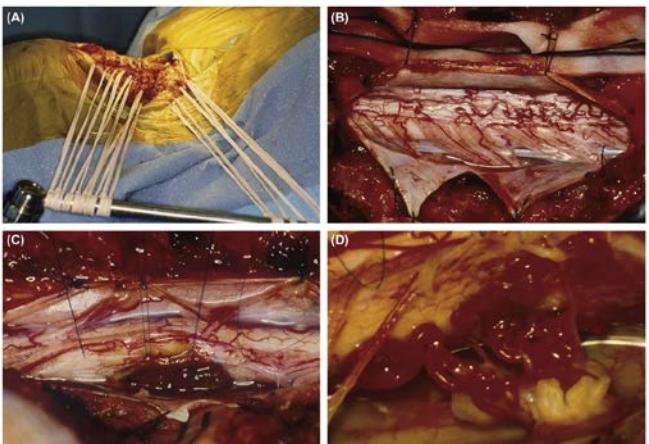
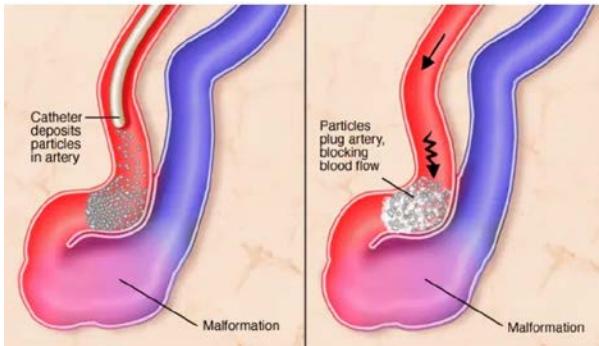


FIGURE 100.10 Posterior surgical approach to a type II AVM of the cervical spinal cord. (A) Fish hooks secured to a Leyla bar are used to hold the edges of the incision in the depressed position to aid in visualization of the surgical corridor. The crano-caudad axis is oriented left to right. (B) The dura is opened sharply and retracted with suture. The exiting nerve routes are visualized. (C) After the dentate ligaments are cut, pial stitches are used to gently rotate the spinal cord to visualize the anterior surface and the AVM. (D) High-powered magnification of the AVM using the operating microscope.

## Endovascular embolization

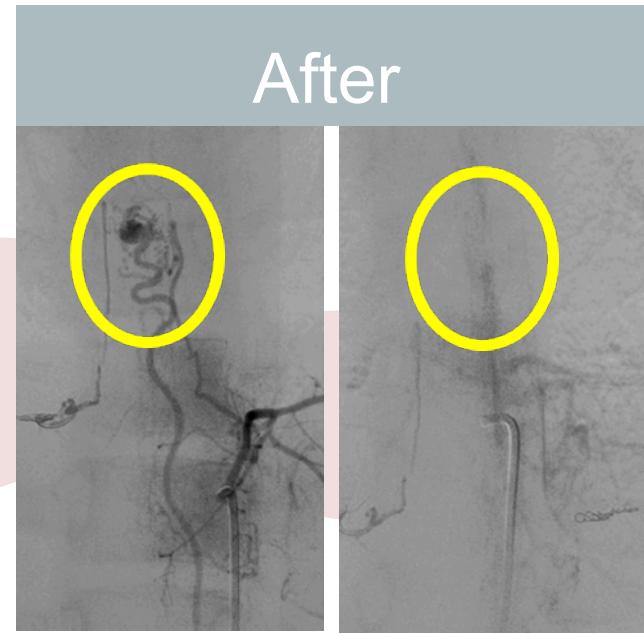
- Material : polyvinyl alcohol (PVA) particles, cyanoacrylate polymers and onyx
- Less invasive



# Management in this patient

- On foley catheter
- Dexamethasone 5 mg IV \*1 dose
- Embolization
- Pain control : Fentanyl
- Monitor vital signs and neuro signs

# Embolization 15/6/66



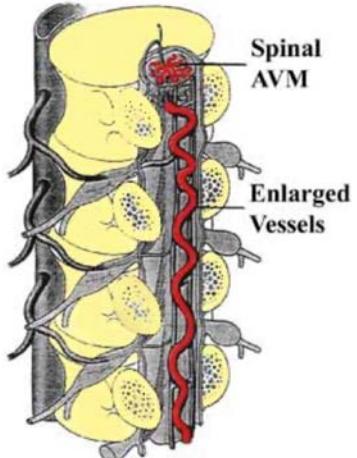
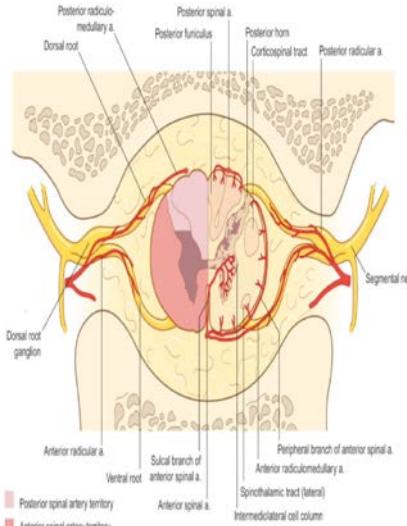
# **Spinal Arteriovenous Malformations**





# Spinal AVM

- Arteriovenous malformations of the spinal cord are rare lesions in children
- In the United States ,only about 60 patients younger than age 18 year are treated in each year.
- Lesions are complex and multiple subtypes

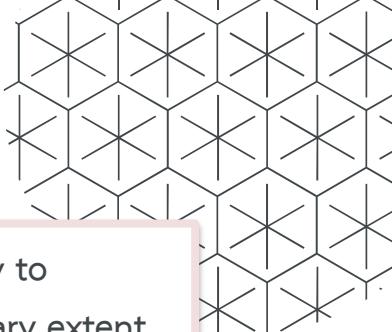




# Clinical presentation

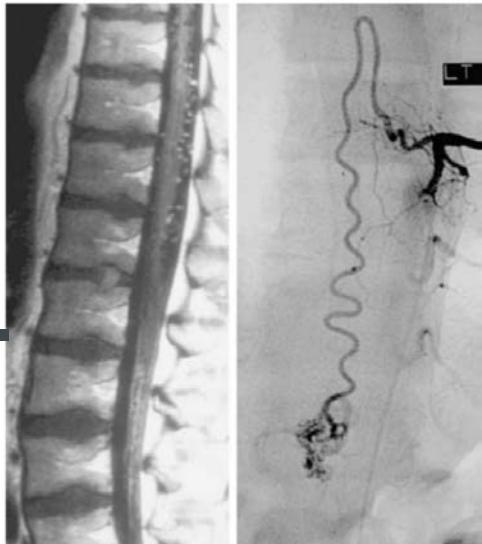
- Back or neck pain, depending on the segments of the spinal cord involved.
- Insidious onset of motor and sensory disturbances with loss of bladder control.
- Sudden onset of paraplegia secondary to hemorrhage
- May present with subarachnoid hemorrhage without overt neurologic deficits, similar to cerebral aneurysms





# Investigation

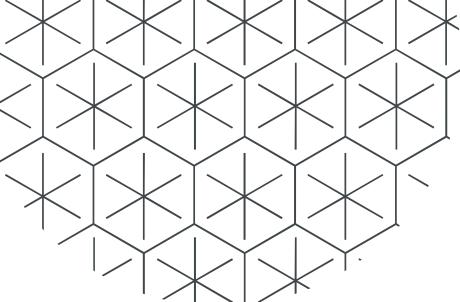
- MRI : **first step** in diagnosis
- Distinguishes intramedullary from dural and extramedullary locations of the malformation and may allow recognition of thrombus formation
- Arteriography is still necessary to demonstrate the intramedullary extent of the malformation and all of the **feeding vessels**



# Type of spinal AVM and Treatment

**TABLE 100.1** Summary of Characteristics and Treatment of Spinal Arteriovenous Malformations

Type	Anatomy	Presentation	Epidemiology	Location	Treatment
I	dAVF at the nerve root sleeve	Progressive myelopathy from venous hypertension	Thought to be acquired; male predominance; age >40	Lower thoracic, upper lumbar	Surgery or embolization
II	Intramedullary, compact nidus, no intervening parenchyma	Acute, hemorrhage	Congenital, presents in children and young adults	No predilection	Combined embolization followed by surgical extirpation
III	Intramedullary nidus, extramedullary and extraspinal extension	Acute, hemorrhage	Adolescents and young adults	Cervical and thoracic	Combined embolization followed by surgical extirpation; worse outcomes than type II
IV	Intradural, extramedullary arteriovenous fistula Type A: Single feeding artery with small venous enlargement Type B: Multiple feeding arteries with venous enlargement Type C: Giant, multipediculated feedings arteries and large, engorged veins	Progressive myelopathy from venous hypertension	No age or sex predilection	Type A: Thoracolumbar Type C: Cervicothoracic	Type A: Surgery Type B: Embolization or surgery Type C: Embolization with subsequent surgery



# Long term outcome



**Medical  
treatment**



**Surgical  
treatment**



**Multidisciplinary  
team**

# Progress note

S: ตื้นดี กินได้ ไม่มีแพลซึม ปวดแพลเล็กน้อย pain score 1/10 ไม่ถ่ายอุจจาระมา 3 วัน ปกติอุจจาระทุกวัน รู้สึกอาการชาดีขึ้น

O: V/S: stable, afebrile

GA: alert, active

Lungs: clear, equal breath sound, no retraction

Ext: full pulse dorsalis pedis

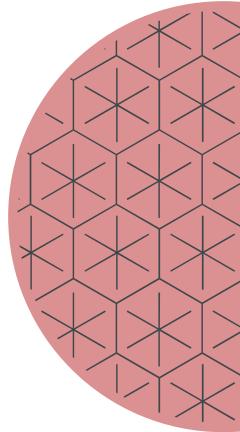
A+P: ruptured spinal AVM, neurogenic bladder

- Observe pulse dorsalis pedis
- On foley catheter
- Laxative drug: unison enema

Level	Motor grade	
	Right	Left
C5-T1	V	V
L1-L2		V
L3		V
L4		V
L5		V
S1		V

# Take home message

- Approach weakness and localized lesion >>paraparesis
- Spinal cord lesion ; Extrinsic VS Intrinsic cord lesion, compressive VS Non-compressive, onset (Hyperacute, acute to subacute, chronic)
- Hyperacute spinal cord lesion >> vascular cause(hemorrhage/ infarction)
- Acute management in patient suspected spinal cord injury ; stabilization , steroid controversy
- Definite treatment depends on type of AVM , surgical treatment and Endovascular embolization



# Thank You

Do you have any questions ?

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