

53 y/o woman presenting with 2 days history of low back pain, progressing to paraplegia and bilateral lower extremity sensory loss.

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HEALTH

RADIOLOGY

A large, stylized oak leaf graphic in a dark blue color, positioned on the left side of the slide. The leaf has a prominent central vein and several smaller veins branching off it. The leaf's edge is serrated.

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Type 1 Spinal Dural AV Fistula

Lumbar Spine MRI: Sag T2 and T1 post contrast

Edema within conus medullaris



Abnormal flow voids on surface of distal spinal cord.



Abnormal enhancing vessels on dorsal and ventral surface of spinal cord

Thoracic Spine MRI: Axial and Sag T2



Intramedullary edema with dark peripheral signal

Edema extends superiorly to mid thoracic spinal cord



Spinal Angiogram Right
L2 segmental artery



Draining medullary vein

AV shunting at site of AV
fistula (triangular shaped
fistulous pouch)

Type 1 Spinal Dural AV Fistula

- Spinal vascular malformations are divided into 4 types:
 - Type 1 – spinal dural AVF
 - Direct fistula to radiculomedullary vein at nerve root sheath
 - Most common
 - Type 2 – Spinal cord AVM
 - Compact, intramedullary Nidus
 - Type 3 – Juvenile AVM
 - Extensive AVM, often involving entire segment (vertebral body, paraspinal tissue)
 - Type 4 – Perimedullary AVF
 - Pial surface of spinal cord

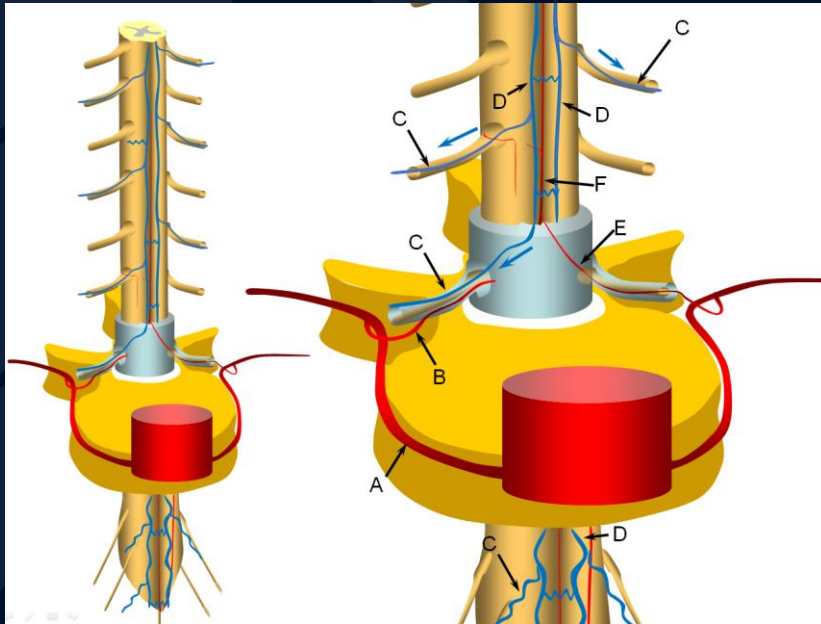
Type 1 Spinal Dural AV Fistula

- MR Imaging Features suggestive of Type 1 Fistulas
 - Dilated, tortuous intradural vessels
 - Flow voids on T2
 - Enhancing, serpentine signal on post-T1
 - Spinal cord enlargement
 - Spinal cord enhancement
 - Increased T2 signal centrally
 - Decreased T2 signal peripherally
 - Venous stasis in sub-pial veins
- Spinal MRA / CTA
 - Time resolved imaging can show early venous filling
 - Helpful for localization prior to catheter based angiography
 - Limits time of procedure, radiation and contrast exposure
 - Evaluation for recurrence after treatment

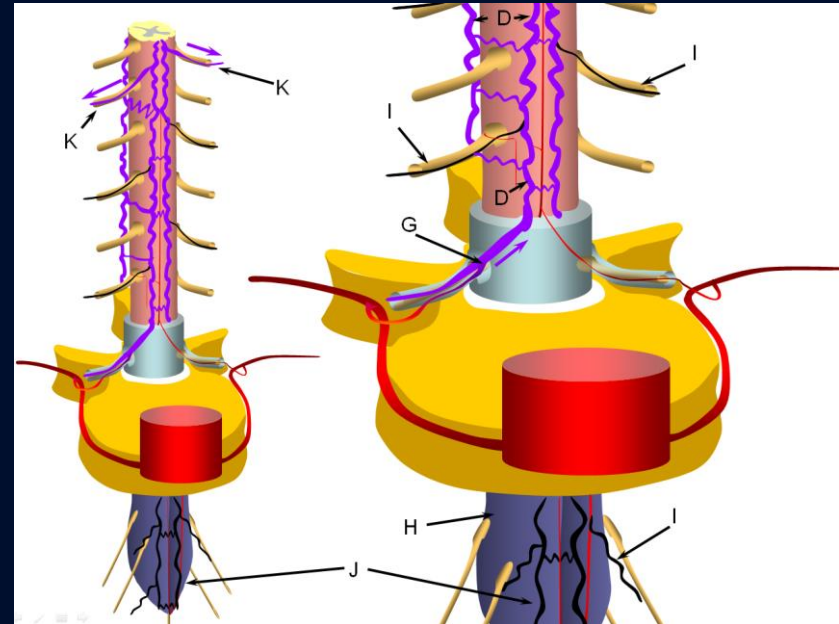
Type 1 Spinal Dural AV Fistula

- Catheter Spinal Angiography
 - Gold standard to localize fistula and evaluate for treatment
 - Identify anterior and posterior spinal artery anatomy
- Treatment Options Include
 - Endovascular occlusion with liquid embolic agents
 - N-BCA or Onyx liquid embolic system
 - Inject through microcatheter within the segmental artery close to the fistulous site
 - Embolic material needs to flow through the fistula into the vein for permanent occlusion
 - Surgical obliteration
 - Dilated radiculomedullary vein is identified and tracked back to fistulous point at the nerve root sheath
 - Fistula is obliterated with bipolar cautery

Type 1 Spinal Dural AV Fistula



Normal spinal vascular anatomy



Type 1 Spinal Dural AVF

- A: segmental artery
- B: radicular artery
- C: radiculomedullary veins
- D: longitudinal spinal cord veins
- E: radiculomedullary artery
- F: anterior spinal artery
- G: fistula formed between the radicular artery (B) and radiculomedullary vein (C)

Courtesy Maksim Shapiro, MD
Neuroangio.org

References

- Krings et al. *Spinal Dural Arteriovenous Fistulas*. Am J Neuroradiol. 2009 Apr;30(4):639-48
- NeuroAngio.org: <http://neuroangio.org/spinal-vascular-anatomy/spinal-dural-avf/>
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