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

Martin Ollenschleger, MD
Type 1 Spinal Dural AV Fistula
Edema within conus medullaris

Abnormal flow voids on surface of distal spinal cord.

Abnormal enhancing vessels on dorsal and ventral surface of spinal cord.
Intramedullary edema with dark peripheral signal

Thoracic Spine MRI: Axial and Sag T2

Edema extends superiorly to mid thoracic spinal cord
AV shunting at site of AV fistula (triangular shaped fistulous pouch)

Draining medullary vein

Spinal Angiogram Right
L2 segmental artery
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

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)  

Type 1 Spinal Dural AVF

Courtesy Maksim Shapiro, MD  
Neuroangio.org
References

- Citation: Ollenschleger M. Type 1 Spinal Dural AV Fistula. Radiology Online. 2021.