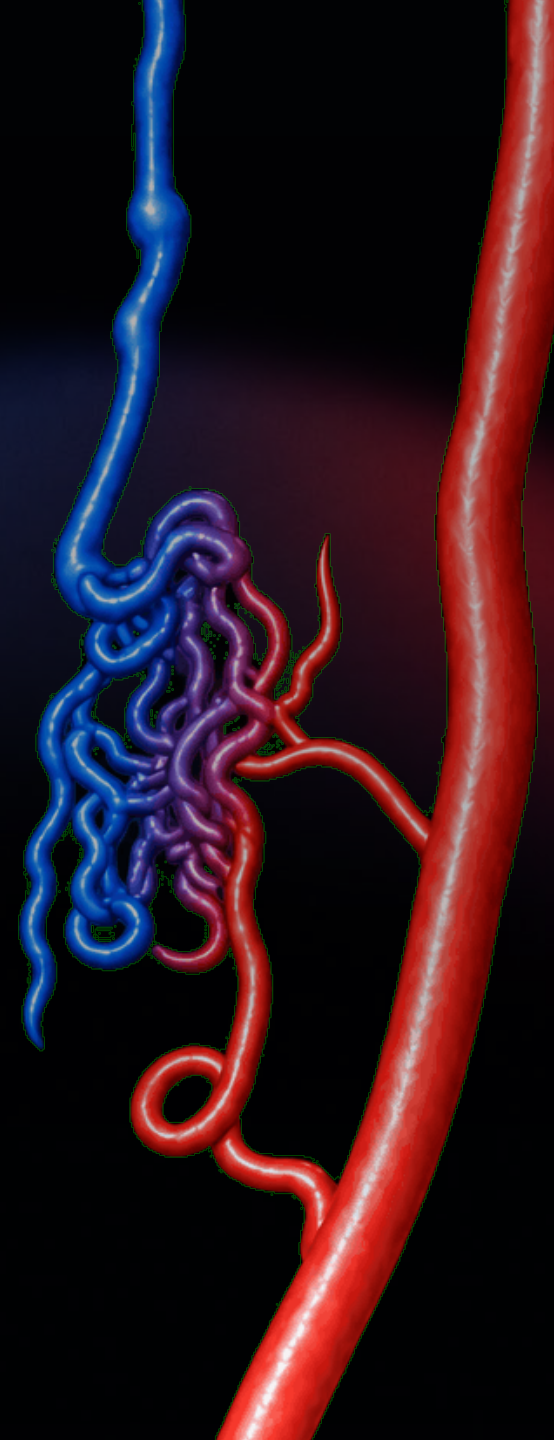
HIGH FLOW, HIGH STAKES

A Ruptured Cervical Intramedullary Arteriovenous Malformation Presenting as Acute Quadriplegia

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Clinical Presentation: Acute, nontraumatic quadriplegia

30-year-old male with no PMH

SYMPTOMS

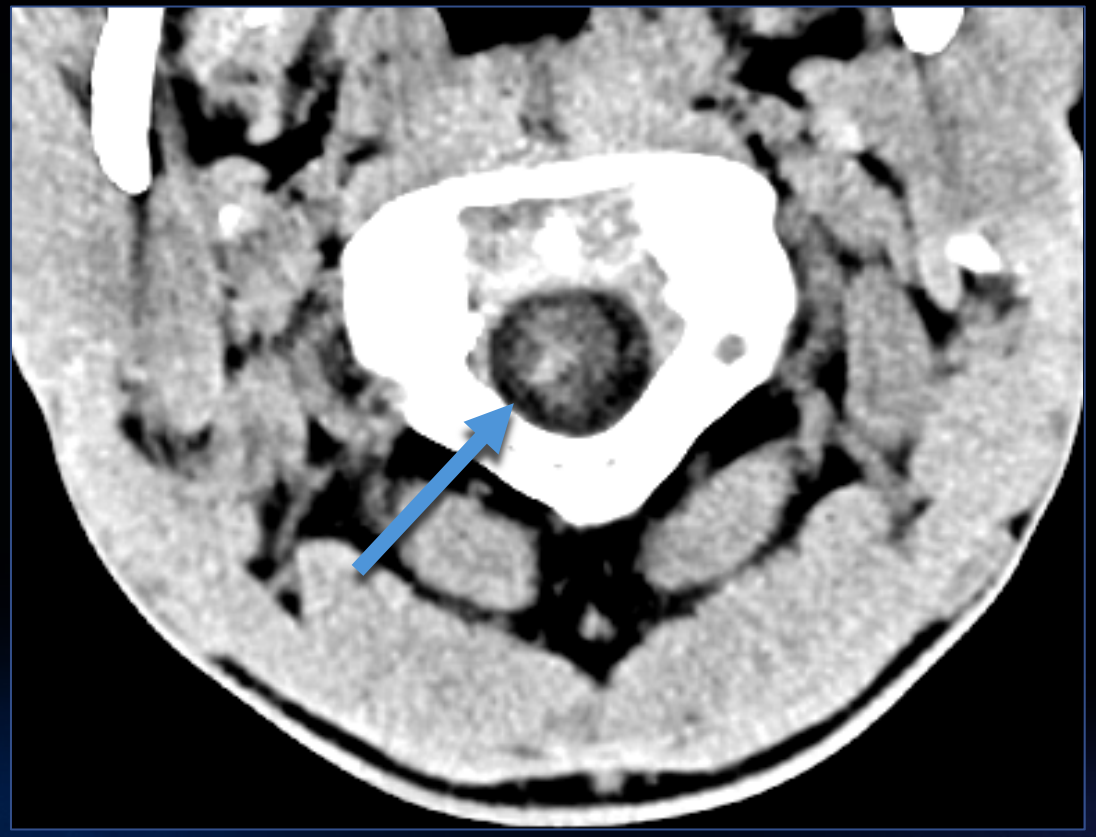
Early Left arm numbness

Later Progressed to numbness and inability to move all four extremities

PHYSICAL EXAMINATION

- 0/5 strength in all four extremities
- Loss of sensation below the C5 level
- Hypo- to areflexia
- Alert; speech and cranial nerve function preserved
- Bradycardia and hypothermia

Imaging Discussion: Non-contrast CT Head, CTA head & neck



NON-CONTRAST CT HEAD

Hyperdensity in the upper cervical spinal cord suspicious for hemorrhage



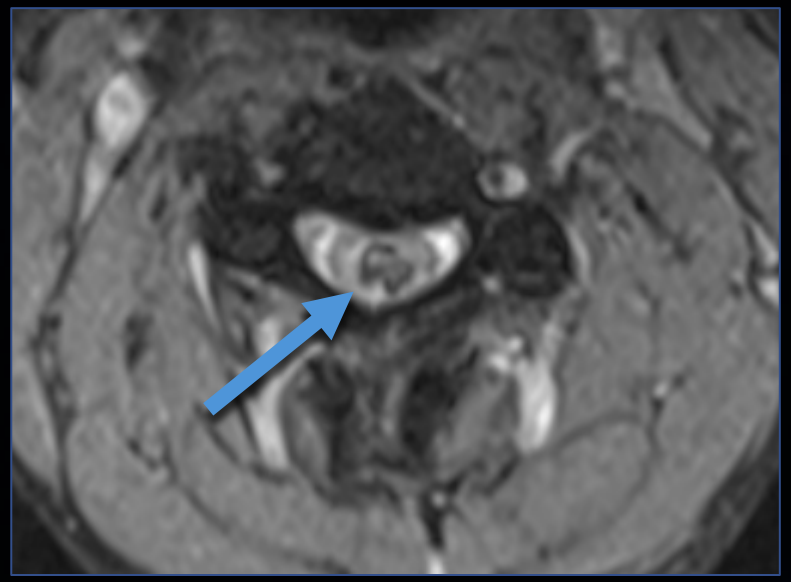
CTA HEAD & NECK

1.8 cm vascular lesion within the cervical spinal cord with a prominent draining vessel superiorly suspicious for a spinal AVM/AVF

Imaging Discussion: MR Cervical spine with and without contrast

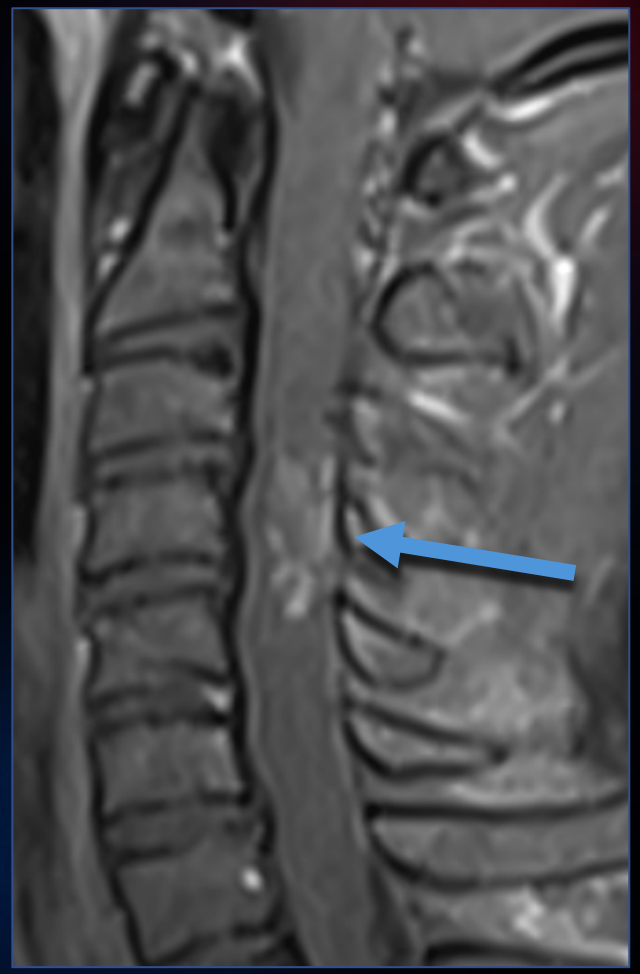


SAGITTAL T2



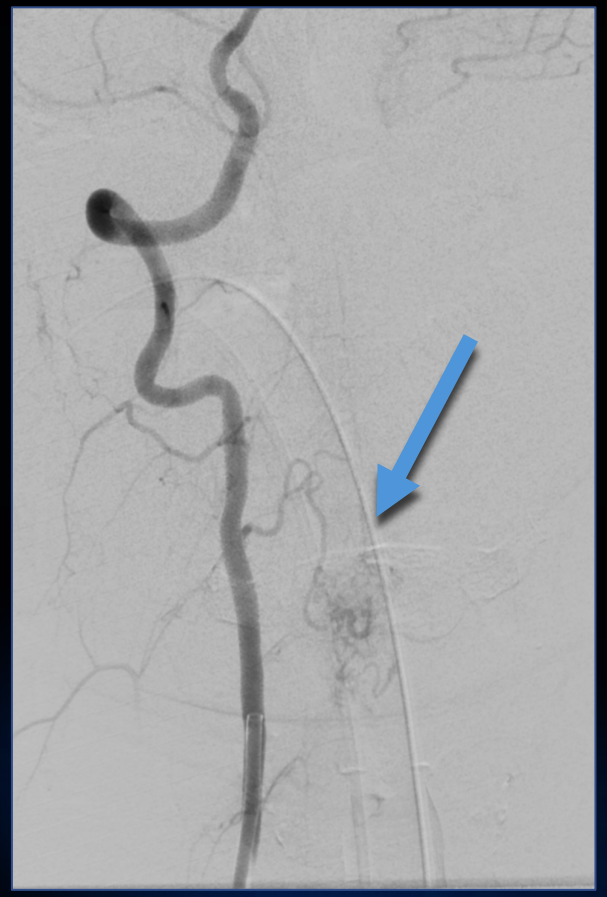
AXIAL GRE

1.8 cm enhancing vascular lesion (right) in the cervical cord at the C4 level as well as long segment cord hemorrhage (middle) and edema (left) from C1-T1 most consistent with a ruptured spinal AVM



SAGITTAL POST CON FS

Imaging Discussion: Spinal Catheter Angiogram



DSA of R vertebral artery



DSA of L vertebral artery

FINDINGS:

- Vascular nidus (blue) with arterial supply from the L and R vertebral arteries
- Enlarged ascending dorsal draining vein (orange)

Differential Diagnosis:

Lesion	Key discriminator
Spinal AVM	**High flow, direct connection of artery and vein with intervening nidus, causes cord edema from venous congestion and hemorrhage**
Spinal dural AVF	High flow, direct connection of artery and vein along nerve root sleeve, no intervening nidus, causes cord edema from venous congestion, insidious onset, hemorrhage rare
Cavernous malformation	Slow flow venous malformation, can hemorrhage, angiographically occult
Hypervascular tumor	Enhancing mass, can hemorrhage, can demonstrate enlarged feeding vessels

Management: Treatment options

MICROSURGERY

Surgical resection of the nidus

- A compact nidus is an important factor for surgical candidacy
- Most effective in total obliteration of the nidus
- Risks associated with surgery, especially if the lesion is deep

EMBOLIZATION

Liquid embolic agents such as Onyx delivered directly to the nidus via the supplying arteries

- Used with less compact lesions with easily accessible feeding arteries
- Can be used in adjunct with surgery
- Very effective in total obliteration of the nidus
- Risk to normal spinal cord if the lesion is supplied by the anterior spinal artery

RADIOSURGERY

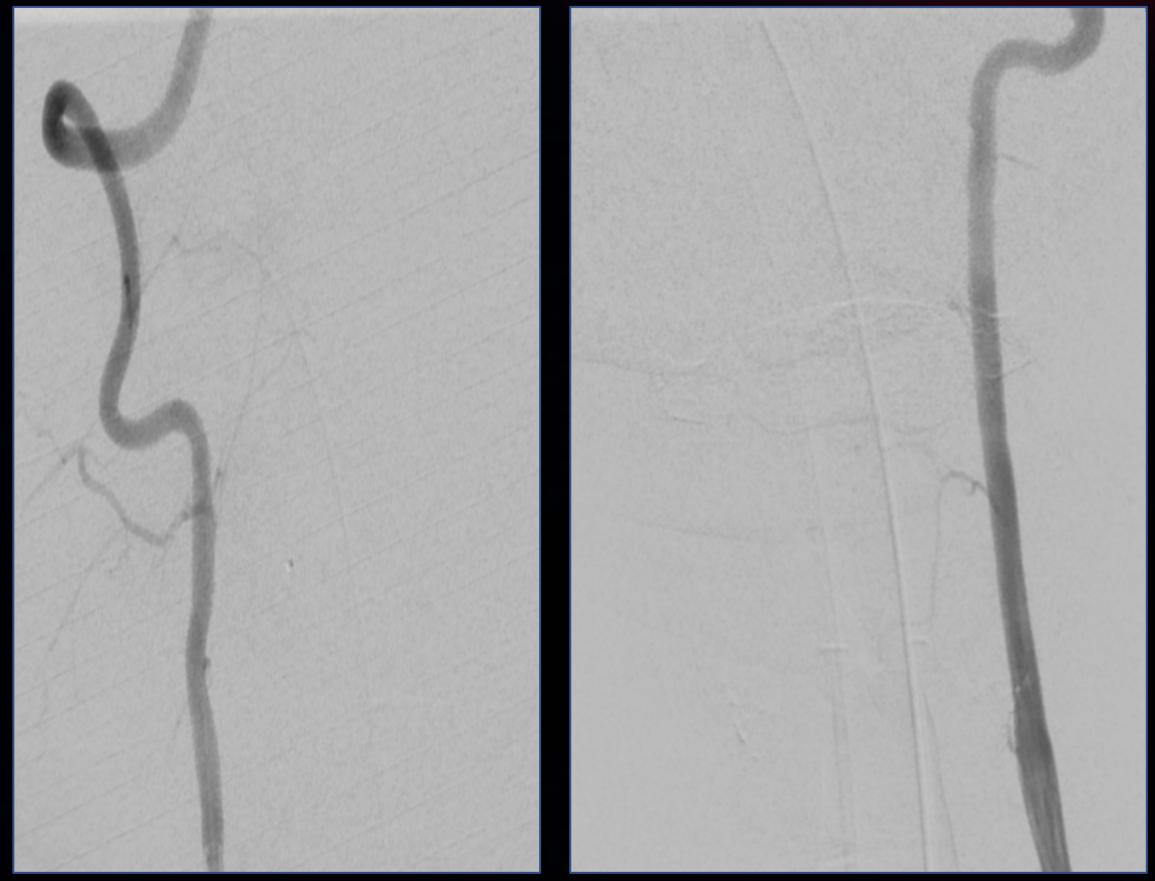
Targeted radiation to the nidus

- Used mainly for lesions in which embolization or surgery is unsafe
- Less likely to lead to complete obliteration of the nidus
- Risk of radiation-induced myelitis

Management: Onyx Embolization



PRE EMBOLIZATION



POST EMBOLIZATION

RESULT: Complete obliteration of the vascular nidus

Outcome: Persistent deficits at discharge

ON ADMISSION:	ON DISCHARGE:
Awake, alert	Awake, alert
Normal cranial nerve function	Normal cranial nerve function
0/5 strength in UE & LE, hyporeflexia in UE, areflexia in LE	0/5 strength in UE & LE, areflexia in UE & LE
Loss of sensation below C5	Loss of sensation below C5
Normal respiratory effort	Mechanical ventilation, poor respiratory effort

Take-Home Points:

01 Knee-jerk reaction interpreted symptoms as concerning for acute stroke, but physical exam findings pointed toward high cervical cord injury with acute quadriplegia, a high sensory level, preserved cranial nerve function and autonomic dysfunction

02 Each imaging modality plays its role in gathering information. For this case, CTA diagnosed the vascular abnormality, MRI determined extent, and DSA characterized and treated

03 Treatment determined by lesion-specific angioarchitecture. Microsurgery remains the most effective at complete obliteration of the nidus, but comes with risks

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