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Preoperative endovascular embolization prior to complete excision of meningioma: a case-based insight

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Abstract

A meningioma is a usually slow-growing tumor that develops in the meninges, the protective layers around the brain and spinal cord. Most meningiomas are non-cancerous, but they can still cause symptoms such as headaches, vision problems, seizures, or weakness by pressing on nearby brain tissue. They are more common in older adults and women, and risk factors include prior radiation exposure and conditions such as neurofibromatosis type 2.

Diagnosis is typically made with imaging scans such as MRI, and treatment may involve observation, surgery, or radiation depending on the tumor's size and symptoms. This report describes a case in which preoperative endovascular embolization was used to reduce intraoperative blood loss prior to complete surgical excision of a hypervascular meningioma.

Case Report

A 43-year-old female presented with headache for over 2 years, associated with difficulty walking and gradually progressive weakness involving all four limbs, along with seizures and vertigo for a couple of months.

On neurologic examination, the patient had features of spastic quadriparesis with progressive paresthesia in all four limbs. Sensory examination was limited due to poor cooperation. Cranial nerve examination was unremarkable. Bladder and bowel function were preserved.

Computed tomography of the brain revealed an extra-axial mass lesion with perilesional edema and mass effect, with intense enhancement in the right frontoparietal lobe (Figure 1).

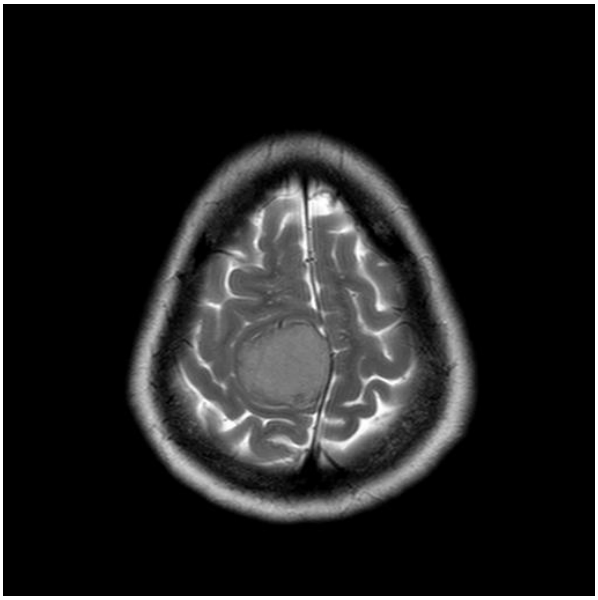


Figure 1. Computed tomography of the brain showing an extra-axial mass lesion with perilesional edema and mass effect, with intense enhancement in the right frontoparietal lobe.

Magnetic resonance imaging (MRI) of the brain with contrast revealed a large, extra-axial, markedly enhancing, well-defined, altered signal intensity lesion along the calvarium in the right high frontal region, with perilesional edema, mass effect, and midline shift toward the left side (Figure 2).

Figure 2. MRI of the brain with contrast showing a large, extra-axial, markedly enhancing lesion along the calvarium in the right high frontal region, with perilesional edema, mass effect, and midline shift toward the left side.

Digital subtraction angiography (DSA) showed hypervascularity of the tumor (Figure 3).

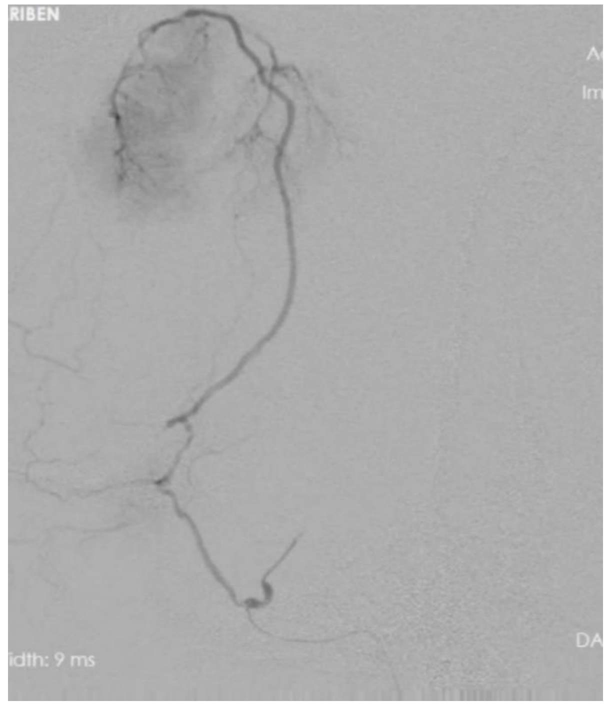
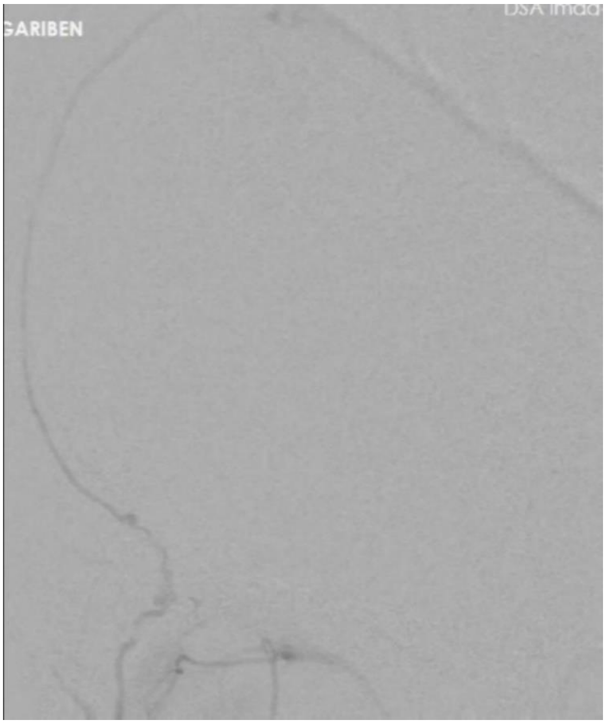


Figure 3. Digital subtraction angiography showing hypervascularity of the tumor.

Preoperative embolization of the hypervascular meningioma was performed under general anesthesia via femoral arterial access, followed by diagnostic digital subtraction angiography to delineate the tumor blush and feeding vessels, typically arising from external carotid branches such as the middle meningeal artery. A microcatheter was advanced for superselective catheterization of these feeders, and careful angiography was performed to exclude dangerous anastomoses with the internal carotid or ophthalmic circulation. Embolic agents such as PVA particles, microspheres, NBCA, or Onyx were then slowly injected under continuous fluoroscopic guidance to achieve devascularization while avoiding reflux and non-target embolization. This process was repeated for all significant feeders, and a final angiographic run confirmed reduction or elimination of the tumor blush before catheter removal and hemostasis, with surgical excision typically planned within 24-72 hours (Figure 4).



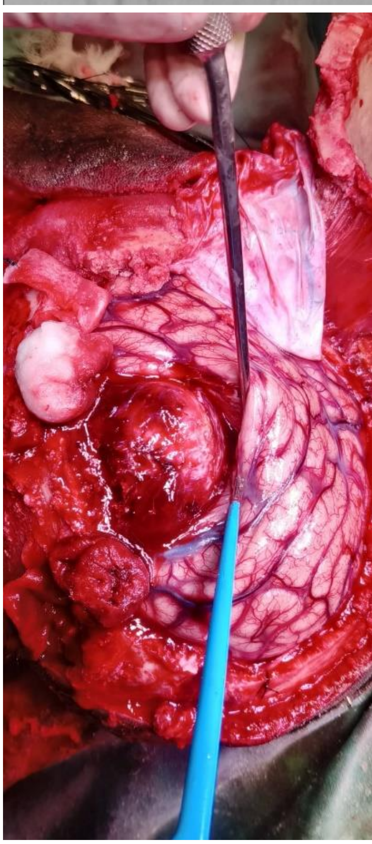


Figure 4. Preoperative endovascular embolization of the tumor's feeding vessels.

Craniotomy followed by tumor excision was performed after embolization, with minimal blood loss (Figure 5).

Figure 5. Intraoperative view following craniotomy and tumor excision. [The manuscript refers to this step as "Figure 5.0, 5.1," but only one image for this step was found in the submitted file; author to confirm whether a second image is missing.]

The patient was extubated on the table and had an uneventful postoperative course. Postoperatively, there was significant neurological improvement with gradual recovery of motor power in all four limbs. The patient was discharged on postoperative day 5.

Conclusion

Meningiomas, though often benign and slow-growing, can lead to significant neurological deficits when they exert mass effect on surrounding brain structures. This case highlights the importance of timely diagnosis through advanced imaging and a multidisciplinary approach to management. Preoperative embolization followed by surgical excision proved effective in reducing intraoperative complications and achieving a favourable clinical outcome. Early intervention and appropriate treatment planning are crucial for ensuring neurological recovery and improving patient quality of life.

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