



Technical Note

Intra-operative N-butyl cyanoacrylate embolization arrest of uncontrollable hemorrhage during meningioma resection



Ajeet Gordhan*

Neuroradiology, Saint Joseph Medical Center, 2200 East Washington Street, 11 Lexis Court, Bloomington, IL 61704, USA

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ABSTRACT

During the surgical resection of a convexity meningioma in a 63-year-old woman, an uncontrollable active hemorrhage from the operative bed was arrested with microcatheter N-butyl cyanoacrylate (NBCA) embolization after superselective angiography. To date, an uncontrollable neurosurgical intraprocedural hemorrhage terminated by NBCA embolization has not been previously reported. The embolization risk relative to the benefit needs to be carefully considered prior to the surgical removal of a meningioma. This report emphasizes the potential value of embolization with NBCA for arresting active bleeding intraoperatively.

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1. Introduction

N-butyl cyanoacrylate (NBCA; Cordis Neurovascular, Fremont, CA, USA) embolization for the arrest of active hemorrhage from non-neurologic locations has been described. To date, intraoperative NBCA embolization to terminate uncontrolled bleeding in a hemodynamically compromised patient during surgical resection of a convexity meningioma has not been reported.

2. Clinical presentation

A 63-year-old woman underwent a surgical resection of a right lower occipital convexity meningioma. She presented with a mental status change and visual disturbance, with no other significant comorbidities. A brain MRI identified a 3 cm extraaxial mass along the right occipital convexity, with extensive peri-lesional increased T2-weighted signal, vasogenic edema and tumor penetration into the contiguous right transverse sinus (Fig. 1). She was agreeable to surgical resection.

A longitudinal right paramedian occipital dermatotomy was made, followed by creation of a craniotomy flap. The ultrasound localization revealed tumor attachment to the contiguous transverse sinus, prior to performance of a cruciate durotomy. The release of the deepest portion of the tumor resulted in bleeding into the surgical bed. After achieving control of the bleeding, brain swelling and herniation through the craniotomy defect were identified. An amputation of part of the herniated occipital lobe and a

temporary skin closure were performed so that a head CT scan could be obtained. The CT scan identified occipital lobe herniation through the craniotomy and acute hemorrhage deep to the surgical site, as well as along the right peritentorial subdural space (Fig. 2A). After the initial control of the hemorrhage, a repeat CT scan showed progression of the acute bleeding deep within the operative site, the right convexity and peritentorial subdural spaces, as well as within the ventricles (Fig. 2B). The active bleeding from the operative bed could not be controlled with cautery and placement of temporary aneurysm clips. The scalp was closed and a sterile dressing was placed, prior to transferring her to the angiography suite.

She remained intubated after she was transferred to the angiography suite. Access to the right common femoral artery was achieved with placement of a 6F sheath, followed by placement of a 5F guide catheter into the right external carotid artery. A Prowler plus microcatheter (Codman Neurovascular, Raynham, MA, USA), in tandem with a Synchro 14 microguidewire (Stryker, Kalamazoo, MI, USA), was used to select the right middle meningeal artery (MMA). The digital subtraction angiography (DSA) revealed large volume extravascular contrast accumulation, arising from a posterior branch of the MMA (Fig. 3A). NBCA, in a 1:1 mixture with ethiodol, was injected under fluoroscopic observation (total 1.5 cm³). The immediate DSA, obtained through the guide catheter, revealed a glue cast in the operative bed with cessation of contrast extravasation (Fig. 3B).

A postendovascular intervention head CT scan revealed that the glue cast was marginating the operative bed (Fig. 3C). The scan also showed a significant increase in the midline shift (Fig. 4A). A right convexity craniotomy and surgical evacuation of the right

* Corresponding author. Tel.: +1 309 8266009; fax: +1 309 6623135.

E-mail address: agordhan@hotmail.com

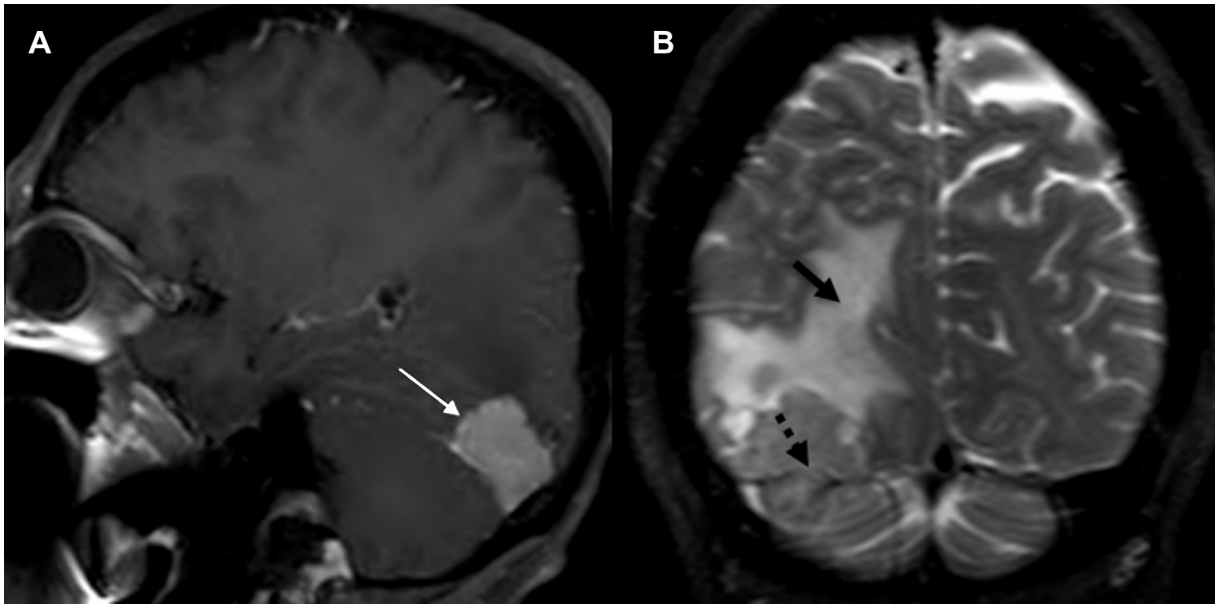


Fig. 1. (A) Sagittal T1-weighted MRI with gadolinium contrast, demonstrating an avidly enhancing extraaxial mass in close approximation to the right transverse sinus (arrow). (B) Coronal T2-weighted MRI, showing extensive perilesional edema (solid arrow) and tumor penetration into the right transverse sinus (dotted arrow).

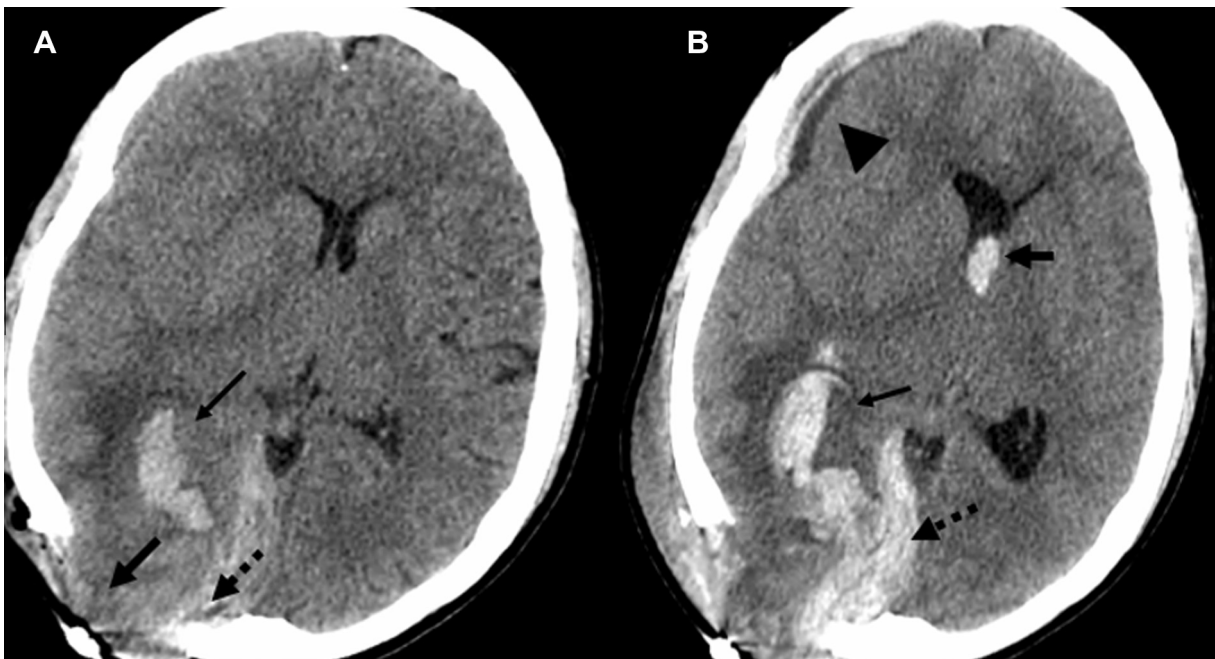


Fig. 2. (A) Axial non-contrast head CT scan, demonstrating occipital lobe herniation through the craniotomy defect (thick arrow). Acute hemorrhage identified deep within the operative bed (thin arrow), and medially along the right subdural tentorial leaf (dotted arrow). (B) Increased acute hemorrhage within the deep operative bed (thin arrow), the right peritentorial (dotted arrow) and convexity subdural spaces (arrow head). Midline shift with interventricular hemorrhage (thick arrow).

convexity subdural hematoma was then performed, with resolution of the midline shift (Fig. 4B). No persistent bleeding at the initial operative site was noted. The estimated total blood loss was 2000 ml. To maintain hemodynamic stability, 8 units of packed cells, 4 units of fresh frozen plasma, 1 unit of cryoprecipitate and 1 unit of platelets were infused. The pathology of the lesion was a World Health Organization Grade 1 meningothelial meningioma.

She remained in the intensive care unit for 10 days prior to being considered medically stable for transition to the acute inpatient rehabilitation unit, where she made a gradual neurologic recovery. At 46 days post resection, a head CT scan showed resolution of the right hemispheric cerebral edema and acute intracranial

hemorrhage, with right occipital lobe postsurgical encephalomalacia (Fig. 4C). The skull flap retained in the abdominal cavity was repositioned with primary closure of the dura. At the clinical follow-up, a left lateral hemianopia was present with no other neurologic deficit. She was able to conduct activities of daily living independently.

3. Discussion

NBCA embolization for the arrest of active hemorrhage from locations such as the gastrointestinal tract, abdominal viscera, uterus and chest has been previously described [1]. The safety

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