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More than just a urinary catheter: achieving hemostasis using Foley catheter in deep cerebral cavities—technical nuances

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Abstract

Background: Achieving hemostasis during neurosurgical procedures within deep seated tumors is of paramount importance. Chemical methods like using ORC and gel foam are preferred to bipolar cautery as bipolar cautery causes thermal injury to the normal eloquent surrounding white matter fibers, thereby causing significant morbidities. In addition to the chemical methods, we advocate a new relatively simple mechanical method by using small size Foley catheter inflated with saline can achieve hemostasis in case of deep locating brain tumor surgery with diffuse oozing from the tumor bed and surrounding white matter tissues are of concern. The balloon tamponade effect of the inflated Foley catheter helps in achieving complete hemostasis without damaging the surrounding normal white matter parenchyma.

Case presentation: A 52-years-old female admitted with history of progressive drowsiness and altered sensorium. Brain MRI was done showing large right-sided trigonal meningioma. Right parieto-occipital craniotomy was done, through the superior parietal lobe, corticotomy was done, and tumor was reached. Gentle retraction was done using curved blades in between the tumor and normal brain parenchyma. During surgery, following tumor removal, there was a diffuse oozing from tumor bed and the surrounding stretched white matter fibers. Hemostasis was attempted with chemical methods like ORC and gel foam. We avoided bipolar cautery to prevent thermal injury to the normal stretched eloquent white matter, as bleeding was not settled over the period of 45 min using chemical methods. Then, we placed a 10 F size Foley catheter in the tumor cavity and inflated with 6 ml of saline over the period of 10 min. Prior to Foley placement, we coated ORC over the tumor bed and the surrounding white matter. This achieved hemostasis to a significant extent and the same was repeated for another 10 min, and finally, complete hemostasis was achieved. Postoperative period went uneventful. Patient was discharged with good neurological recovery.

Conclusion: Inflatable Foley catheter balloon is a simple, cost-effective technique for achieving hemostasis in deep white matter tumors in addition to the routinely available hemostatic techniques.

Keywords: Foley catheter, Thermal injury, Oxidized regenerated cellulose (ORC)

Background

Achieving hemostasis during neurosurgical procedures within deep seated tumors is of paramount importance. There are various options available to achieve hemostasis in deep seated brain tumor surgery like electrical, chemical, and mechanical methods [1, 2]. Chemical methods like using oxidized regenerated cellulose (ORC) and gel foam are preferred to bipolar cautery as bipolar cautery causes thermal injury to the normal eloquent surrounding white matter fibers, thereby causing significant morbidities [3–5]. In addition to the chemical methods, we advocate a new relatively simple mechanical method by using small size Foley catheter inflated with saline which can achieve hemostasis in case of deep locating brain tumor surgery with diffuse oozing from the tumor bed and surrounding white matter tissues are of concern. The balloon tamponade effect of the inflated

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Foley catheter helps in achieving complete hemostasis without damaging the surrounding normal white matter parenchyma.

Case presentation

A 52-year-old female admitted with history of progressive drowsiness and altered sensorium. Brain magnetic resonance imaging (MRI) was done showing large right-sided trigonal meningioma (Fig. 1). Right parieto-occipital craniotomy was done, through the superior parietal lobe, corticotomy was done, and tumor was reached. Using judicious microsurgical technique, tumor debulking was done using ultrasonic aspirator. Gentle retraction was done using curved blades in between the tumor and normal brain parenchyma. During surgery, following tumor removal, there was a diffuse oozing from tumor bed and the surrounding stretched white matter fibers. Hemostasis was attempted with chemical methods like ORC and gel foam. We avoided bipolar cautery to prevent thermal injury to the normal stretched eloquent white matter, as bleeding was not settled over the period of 45 min using chemical methods. Then, we placed a 10 F size Foley catheter in the tumor cavity and inflated with 6 ml of saline over the period of 10 min. Prior to Foley placement, we coated ORC over the tumor bed and the surrounding white matter (Fig. 2). This achieved hemostasis to a significant extent and the same was repeated for another 10 min and finally complete hemostasis was achieved. Postoperative period went uneventful. Patient was discharged with good neurological recovery.

Discussion

Tumors in a deep seated location pose significant surgical challenges. For excising these difficult tumors meticulous microsurgical debulking of the tumors, piece meal removal of tumors using ultrasonic aspirator, gentle retraction with curved blades, vascular pedicle control, and newer hemostatic agents. Usually, bleeding in deep cavity causes challenges in various ways like brain bulge, difficult visualization, and acute hydrocephalus (bleeding into ventricle) all of which can lead to post op significant morbidity; the technical nuances in achieving hemostasis in deeper location include simple techniques like warm saline irrigation, gel foam in case of venous bleeding, and ORC in case of capillary and small arteriolar bleeding. Obvious pulsatile bleeding from larger vessels requires bipolar coagulation. The newer technique include flowable gelatin which is of help in difficult to reach location [6, 7]. Fibrin glue which is primarily used as dural sealant is also of help in difficult bleeding scenario especially in cavernous sinus bleeding [2, 8–10]. Nevertheless, most of these methods require good coagulation profile of the patient. If deranged coagulation, the appropriate replacement of blood component is mandatory to achieve hemostasis. We describe a relatively simple, cost-effective technique which is described in other location but not in the brain. Small size Foley catheter after inflating the balloon with saline can cause circumferential, uniform tamponade which does not cause any permanent damage to neurons or white matter and is reversible. They can be utilized especially in deep location where surrounding white matter can be used as the gradient. Diffuse oozing along the tumor bed

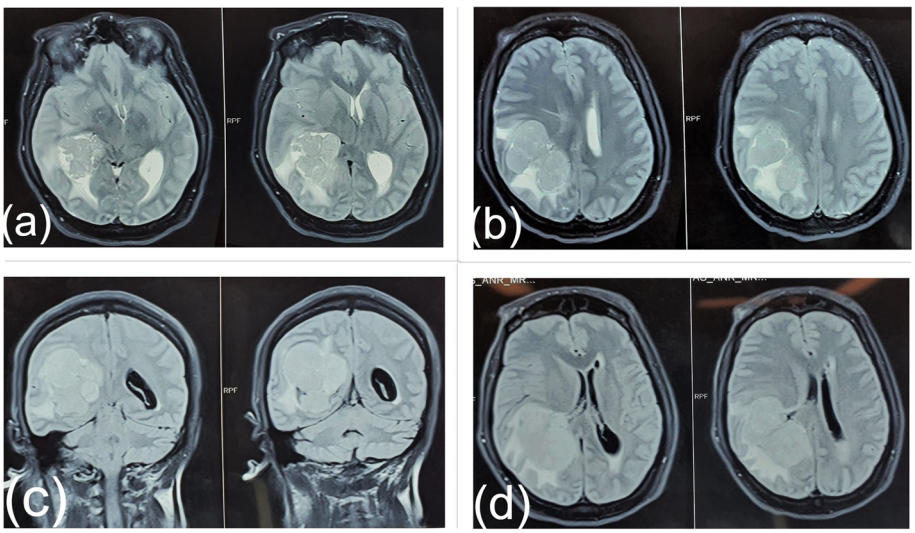

Fig. 1 **a**, **b** MRI scan brain T2WI axial image shows large trigonal meningioma. **c**, **d** Brain MRI FLAIR image shows trigonal meningioma with mass effect

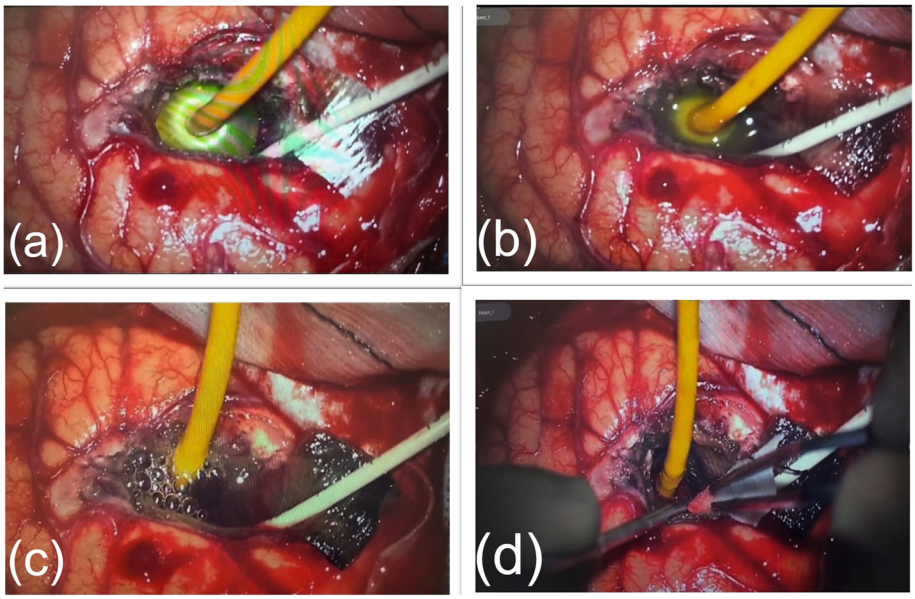

Fig. 2 **a**, **b** Placement of Foley catheter into the tumor cavity after tumor resection and inflation of bulb. **c**, **d** Deflation of Foley bulb and complete hemostasis achieved

especially near the eloquent cortex would be the ideal scenario.

Conclusion

Inflatable Foley catheter balloon is a simple, cost-effective technique for achieving hemostasis in deep white matter tumors in addition to the routinely available hemostatic techniques.

Abbreviations

ORC: Oxidized regenerated cellulose; MRI: Magnetic resonance imaging

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Authors' contributions

VS and RK performed the clinical part of this study, and all authors have read and approved the final manuscript.

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Availability of data and materials

The data supporting our findings can be found with the corresponding author and can be contacted through the following e-mails: sanjeevivenkatesan@gmail.com, roops1975@gmail.com

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Available, written informed consent was obtained from patient for publication.

Competing interests

The authors declare that they have no conflict of interest.

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