

Hemostasis in Skull Base Surgery



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KEYWORDS

• Hemostasis • Bleeding • Skull base • Pituitary • Coagulation • Hemostatic agents

KEY LEARNING POINTS

At the end of this article, the reader will:

- Understand the importance of hemostasis during endoscopic endonasal approach to skull base and intradural surgery.
- Be able to better understand the techniques for hemostasis in endoscopic endonasal surgery, including pituitary surgery.

INTRODUCTION

Why hemostasis is important

- Bleeding makes visualization difficult, which makes the surgical approach unsafe.
- Increased risk of intraoperative complications and inadvertent neurovascular injury.
- Poor hemostasis is the major leading cause of postoperative hematoma, which is the most common cause for reoperation, and surgical morbidity and mortality.
- The widespread use of antiplatelets and anticoagulation for cardiovascular diseases adds greater challenges for surgeons.
- Increased risk of blood transfusion, which had its own risks:
 - Infection
 - Coagulopathy
 - Fluid overload

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Skull base surgery, whether transcranial or endoscopic, is based on good exposure and visualization. Surgeons achieve that by better anatomic understanding, appropriate access, generous bone removal, and the adjunct use of neuronavigation. However, visualization can be jeopardized by uncontrolled bleeding. If hemostasis is not achieved, this delays the procedure and puts the patient at risk for intraoperative complications, including inadvertent vascular injury and postoperative hemorrhage. The cause of difficult intraoperative hemostasis in neurosurgical patients is multifactorial.¹ Degree of vascularity of the tumor, thromboplastin released from neural tissues,² presence of vascular malformation, intrinsic hemostatic abnormality, or antiplatelet and anticoagulation therapy are all possible causes of difficult hemostasis, in addition to inadequate surgical technique.

PREOPERATIVE WORK-UP AND INTERVENTIONS

Patient history is an important element to detect patients at risk for difficult hemostasis despite normal routine coagulation profile.³ A suggested list of questions that can be asked in preadmission evaluation can detect those patients at risk (**Box 1**).

In addition to preoperative patient assessment and laboratory tests, review of medical imaging for features of hypervascularity, such as flow void in MRI, and risk for potential vascular injury, such as close proximity to internal carotid artery (ICA) or any of its branches, is essential. Preoperative embolization is an important adjunct that should be considered in some cases. Embolization should be performed 24 to 72 hours before surgery to allow adequate thrombosis and avoid recanalization.⁴ The external carotid artery branches can be accessed for embolization, if there is no contraindication, such as direct anastomosis between ophthalmic and middle meningeal arteries. Access through the ICA or vertebral artery is not feasible most of the time and it is limited to balloon test occlusion or complete occlusion if radical

Box 1

Preoperative questions to detect patients with bleeding tendency

1. Have you noticed any nose bleeding without obvious trauma?
2. Do you often develop bruises even without bumping into anything?
3. Have you noticed that your gums are bleeding without any obvious cause?
4. Do you develop bleeds or hematomas more than once a week?
5. Do you think that after cuts or abrasion you bleed for longer than usual?
6. Have you ever had prolonged or severe bleeding after an operation?
7. Have you ever had prolonged bleeding after tooth extraction?
8. Have you ever received blood or blood products during an operation?
9. Do you have a family member who had a bleeding problem?
10. Are you taking any pain killer, in particularly antiinflammatory medications?
11. Are you taking any medications, in particularly aspirin or blood thinners?
12. Do you think that you have prolonged menstruation (>7 days) and/or a high frequency of tampon change?

Any affirmative answers require further history, investigation, hematology consult, or postponement of the surgery.

Adapted from Gerlach R, Krause M, Seifert V, et al. Hemostatic and hemorrhagic problems in neurosurgical patients. *Acta Neurochir (Wien)* 2009;151(8):873–900; with permission.

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