Strategies for Improving Visualization During Endoscopic Skull Base Surgery

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KEYWORDS

• Hemostasis • Endoscopic • Skull base • Surgery • Paranasal sinus • Cavernous sinus

KEY POINTS

- A comprehensive preoperative history and review of medications and supplements are important to identify and optimize patients with an increased risk of bleeding.
- Intraoperatively, total intravenous anesthesia, controlled hypotension, controlled heart rate, and a reverse Trendelenburg position can reduce blood loss and improve visibility.
- Hot saline irrigation improves the surgical view, particularly in cases longer than 2 hours.
- Embolization or intraoperative arterial control should be considered preoperatively in vascular tumors.
- Cavernous sinus bleeding can be reliably controlled using FloSeal and pressure applied with a cottonoid.

INTRODUCTION

Minimally invasive skull base surgery is a technique that provides a panoramic view to the surgeon through a 4-mm telescope. This technique has many advantages over open approaches, including the avoidance of an external scar, shortened hospital stays and recovery time, and improved visualization. However, visualization and

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operative times can be hindered if hemostasis is not optimized. The nasal cavity has a robust vascular supply, and a primary obstacle to the minimally invasive technique is the prevention of blood from obscuring the endoscope and narrowing the surgical field. The risk of serious complications increases when important landmarks cannot be clearly delineated.

Many of the techniques for improving hemostasis are derived from the endoscopic sinus surgery literature and include preoperative evaluation, anesthetic techniques, and intraoperative considerations. Although hemostasis is the primary method for improving visualization, there are other techniques and advances in technology that have allowed for improved visualization and efficiency.

HEMOSTASIS

Preoperative Evaluation

A thorough preoperative patient history is paramount in assessing an increased bleeding risk. Questions about epistaxis, gingival bleeding with brushing, excessive bruising, and severe bleeding with trauma or previous surgery help rule out hereditary disorders. Patients should be asked about medications, supplements, and alternative therapies that may affect coagulation. Medical conditions that inhibit platelet function or cause thrombocytopenia should also be elucidated in the history.

The routine use of coagulation studies is not recommended but should be considered in patients with histories of abnormal bleeding.[1–3] A panel of laboratory tests should be ordered when the history is concerning for a bleeding abnormality and include an activated partial thromboplastin time, prothrombin time, platelet count, fibrinogen, and a von Willebrand panel or thromboelastogram[1,4] If an abnormality is found, further testing and a hematology evaluation are warranted.

The American Society of Anesthesiologists recommends that patients stop all herbal medications 2 to 3 weeks before surgery.[5] Antiplatelet and anticoagulant medications should be stopped before surgery according to the most recent *Chest* guidelines.[6] Bridging with heparin or low-molecular-weight heparin is recommended for patients with a strong indication for anticoagulation (patients who have a mechanical heart valve, atrial fibrillation, or venothromboembolism and high risk for thromboembolism).[7] It is recommended to stop warfarin 5 days, low-molecular-weight heparin 24 hours, and heparin 4 to 6 hours before surgery. Aspirin and nonsteroidal antiinflammatory medications should be stopped 7 to 10 days before but may need to be continued perioperatively in high-risk patients. Thienopyridines (clopidogrel) are stopped 10 days and glycoprotein IIb (GpIIb)/GpIIIa antagonists 24 to 72 hours before surgery. Surgery should be deferred for 6 weeks after bare-metal stent placement and 6 months after drug-eluting stent placement instead of undertaking elective surgery within these periods. Cardiologists should be consulted regarding management of anticoagulation in the perioperative period in high-risk patients; require perioperative antiplatelet therapy may be required in urgent situations.

INTRAOPERATIVE CONSIDERATIONS

Anesthetic Techniques

Total intravenous anesthesia (TIVA) with a combination of propofol and remifentanil has been shown to provide a more optimal surgical field compared with inhalation anesthesia.[8,9] This finding is believed in large part to be related to hemodynamic advantages seen with TIVA compared with inhalation anesthesia. More specifically, TIVA has been associated with lower mean arterial pressures (MAPs), and lower MAP has been shown to affect both blood loss and visibility.[8] MAP and controlled hypotension