Hemostasis in Endoscopic Sinus Surgery

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KEYWORDS

• Sinus • Skull base • Bleeding • Hemostasis • Surgical field • Endoscopic
• Hypotensive anesthesia • Total intravenous anesthesia

KEY LEARNING POINTS

At the end of this article, the reader will:

- Apply key perioperative preventive strategies to minimize bleeding during sinus surgery.
- Critically assess named vessels that may be at risk of injury during sinonasal surgery.
- Understand the rational application of local vasoconstrictors.
- Understand the effects of relevant hemodynamic parameters during general anesthesia on the surgical field.
- Apply a logical approach in the management of intraoperative bleeding.
- Apply a rational approach in the management of suspected orbital compartment syndrome caused by anterior ethmoid artery bleed.

INTRODUCTION

Broad classification of hemostasis during endoscopic sinus surgery

- Management of expected bleeding
  - Microvascular circulation: mucosa, bone, vascular tumors
- Management of inadvertent vascular injury
  - Macrovascular circulation: named vessels

Endoscopic sinus surgery (ESS) is considered to be a moderate bleeding risk surgery. Bleeding is anticipated during sinonasal surgery when treating inflammatory and vascular disorders, and is due in part to the inherently rich blood supply derived from the external and internal carotid arteries in this region. Expected surgical bleeding is encountered from mucosa, bone and vascular tumors, such as juvenile angiofibroma and metastatic renal cell carcinoma.

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Why is hemostasis important in sinonasal surgery?

- To improve intraoperative surgical field and visualization
  - Avoid injury (vascular, cerebrospinal fluid leak, orbital)
  - Allow completion of the surgical procedure
- Minimize bleeding associated comorbidities
  - Nausea, emesis and aspiration
  - Significant blood loss, hypoxia and blood transfusion
- Prevent the need for nasal packing and related complications
- Prevent postoperative complications and improve healing
  - Hematoma and bleeding
  - Adhesions and scarring

Adequate hemostasis of the microvascular and macrovascular circulation is needed during endoscopic or open sinus surgery, performed under local or general anesthesia, to accomplish the surgical goals and avoid complications. A thorough risk assessment is required to prevent excessive bleeding. Correct assessment of the source of the bleeding, and a detailed knowledge of surgical vascular anatomy and of hemostatic techniques, is necessary to successfully manage intraoperative bleeding.

Risk of mucosal bleeding

- Disorders
  - Chronic rhinosinusitis with nasal polyps, eosinophilic mucus chronic rhinosinusitis (EMCRS), allergic fungal rhinosinusitis (AFRS)
  - Rhinitis medicamentosa
  - Infection, subperiosteal abscess
  - Thyroid eye disease for example, Graves ophthalmopathy
  - Immunopathology; for example, Sarcoidosis, Wegener granulomatosis, Churg-Strauss disease
  - Vascular tumors (juvenile angiofibroma, metastatic renal cell carcinoma)
- Prior surgery, radiotherapy
- Patient
  - Morbid obesity, hypertension
  - Chronic alcohol, liver, kidney disease
  - Smoking
  - Coagulopathies (congenital or acquired)

Risk of inadvertent vascular injury

- Incorrect diagnosis
  - Internal carotid artery aneurysm, vascular tumor
- Unfavorable vascular and sinonasal anatomy
  - Ethmoidal arteries (anterior, posterior, and sometimes middle)
  - Internal carotid artery
  - Onodi cell
  - Sphenoid sinus septations
- Previous sinonasal surgery
  - Bone dehiscence, scarring, altered or absent anatomic landmarks
- Surgical mistakes