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Operative management of catastrophic bleeding in the head and neck

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The otolaryngologist commonly performs several procedures in close proximity to the carotid and innominate arterial systems. In this article, we will discuss the management of catastrophic bleeding following adult tonsillectomy and tracheostomy, as well as the management of carotid blowout syndrome in head and neck cancer patients. Although the bleeding risk from tonsillectomy is considered very low, the acceptance of transoral robotic surgery as a treatment modality of oropharyngeal head and neck carcinomas makes the spectre of catastrophic oropharyngeal bleeding more real. Aggressive resection in this area can leave minimal parapharyngeal fat over the carotid artery and damage from manipulation of smaller vessels can lead to pseudoaneurysms. Tracheostomy also carries a very low but real risk of trachea-innominate artery fistula, which has devastating consequences. Finally, we will discuss how to identify head and neck cancer patients who are at risk for carotid blowout syndrome as well as appropriate interventions to manage this condition.

In this article, we will address and discuss catastrophic bleeding in the head and neck with respect to the carotid and innominate arterial systems. Specifically, we will discuss catastrophic bleeding secondary to adult tonsillectomy, tracheotomy (trachea-innominate fistula), and head and neck surgery or radiation (carotid blowout).

Tonsillectomy is one of the most common surgical procedures performed in the United States.[1] Although the risk of bleeding from this surgery is considered very low and the risk of catastrophic bleeding to be even less, it is important for the surgeon to realize the proximity of the surgical dissection to the major blood vessels of the head and neck. In patients without a medialized carotid artery, the distance between the peritonsillar plane and the carotid artery averages 1-2 cm.[2] In addition to large caliber vessels such as the internal carotid, a tonsillectomy procedure can put branching vessels off of, and including, the lingual artery and facial artery at risk, which can also lead to significant bleeding events.

With acceptance of transoral robotic surgery (TORS) of the oropharynx as a treatment modality of oropharyngeal head and neck carcinomas, the spectre of catastrophic oropharyngeal bleeding is even more real. In such surgeries for tonsillar carcinomas, the superior constrictor is often resected as the lateral margin of the specimen, sometimes leaving minimal parapharyngeal fat over the carotid artery. In some cases, resection of tumors involves reflecting the mass off of the carotid artery. Additionally, damage to the intima of smaller vessels from manipulation can lead to psuedoaneurysms.[3]

Tracheotomy is also commonly performed by the otolaryngologist—head and neck surgeon. Similar to tonsillectomy, the procedure is done adjacent to critical structures. Depending on the patient's anatomy, and

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especially in those with short necks, the distance between the proposed tracheotomy and the innominate artery can be very narrow. As such, delayed bleeding from injury to this vessel can be a very devastating complication, though extremely rare.

Additionally, as the surgical member of the head and neck cancer treatment team, otolaryngologists are aware that carotid blowout accounts for 11% of all mortality in patients with advanced head and neck disease.[4] Proper identification of at-risk patients and open communication with the patient, their family, and other interventional teams are paramount to obtaining the best outcomes possible in this potentially catastrophic event.

In this article, we will discuss several aspects of catastrophic bleeds from the oropharynx and neck and discuss surgical methods to address and control these bleeds.

Oropharyngeal bleeding

Posttonsillectomy hemorrhage

A relatively common yet potentially life-threatening complication of tonsillectomy is postoperative hemorrhage, with primary hemorrhage rates within 24 hours ranging from 0.3% -3.9% and secondary hemorrhage requiring admission to the hospital ranging from 2%-10.3%.[5-8] The tonsillar bed has a robust vascular supply from the following 5 major arteries: the tonsillar branch of dorsal lingual artery, tonsillar and ascending palatine branches of the facial artery, ascending pharyngeal artery, and the internal maxillary artery (Figure 1). Unlike other operative sites, there is no compression of the wound by nearby soft tissue that might aid in tamponade. Although rare, tonsillar hemorrhage can lead to hypovolemic shock, airway obstruction, and death.[9] Additionally, the use of TORS for oncologic tonsillectomy and tongue base resection introduces new challenges to managing intraoperative hemorrhage.

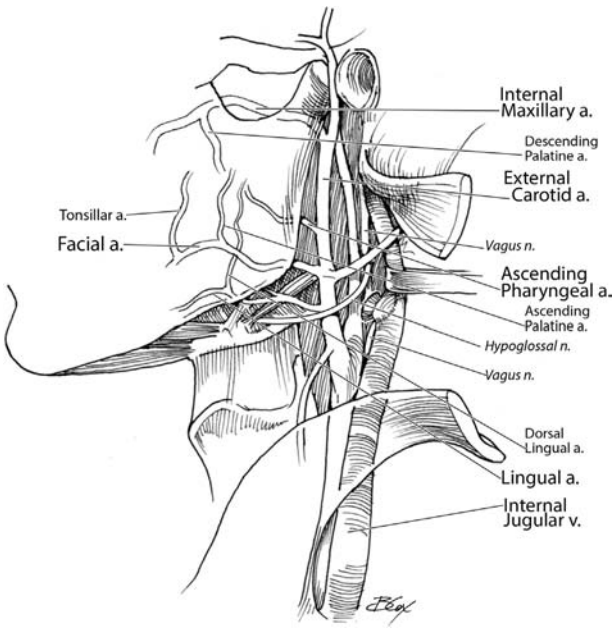

Figure 1 Vascular supply of the tonsillar fossa.

Etiology

Within 24 hours after tonsillectomy a fibrin clot forms over the tonsillar fossa. Bleeds occurring within 24 hours are referred to as primary hemorrhage. By postoperative day 5, the fibrin clot has proliferated and formed a thick cake. A week after tonsillectomy, the mucosa begins to grow into the wound, potentially separating the fibrin clot from the underlying tissue. The risk of secondary bleeding is highest during this period. A Cochrane review and systematic literature review showed no difference between diathermy and cold steel techniques and the risk of posttonsillectomy hemorrhage, though more recent literature suggests that coblative techniques are a risk factor.[7,10-13] It is generally accepted that male sex and patients between 10 and 17 years old are at increased risk for postoperative hemorrhage.[7,11,13]

Management

Initial management includes evaluation of the airway and hemodynamic stability. Access should be obtained with 2 large-bore intravenous lines. The patient should be in an upright position, leaning forward, to protect the airway and prevent aspiration. Patients may present with a history of bleeding or an active bleed. Pediatric histories may include blood on the pillowcase, excessive swallowing, or episodes of hemoptysis or hematemesis although this may be blood from the operation. A history of coagulation disorders should be elicited. During initial evaluation, a calm demeanor is useful when reassuring the patient and their family members. Obtain hemoglobin and hematocrit levels to establish a baseline for future decisions.

A light source should be used to inspect the oropharynx for signs of active bleeding or clots with the aim of localizing the source to the left or right, inferior or superior pole (Figure 2). A history of repeated bleeding events should be heeded as a warning of a major bleed. A history of bleeding increases the chances of another episode 2-fold.[14] The literature discusses a variety of techniques to control hemorrhage at the bedside with a range of reported efficacy.[15,16] In the authors' experience, bedside maneuvers to control bleeding are appropriate in carefully selected patients who are sufficiently cooperative and are not at risk for aggravating or initiating a significant bleed. This can include suctioning the clot from the fossa and applying a vasoconstrictive agent, or considering bedside cautery via electrical or chemical (silver nitrate) means. If there is no evidence of active bleeding, one can consider limited observation with discharge if no further bleeding events occur.

Uncooperative patients and those with large clots or active bleeding should be taken to the operating room (OR)