



Complete Airway Obstruction and Massive Hemorrhage from Post-Thyroidectomy Neck Hematoma: A Case Report and Management Algorithm

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Abstract

Postoperative Neck Hematoma (PONH) is a potentially life-threatening complication of neck/thyroid procedures due to massive hemorrhage and/or acute airway compromise (often associated with difficult airway management) requiring immediate surgical re-intervention. Patient survival often relies on optimal crisis resource management skills of the care team. We describe the case of a PONH in an elderly patient in the immediate post-thyroidectomy period, presenting with acute respiratory failure/arrest and massive hemorrhage with hemodynamic instability. We outline the approach taken to successfully manage this emergency and highlight critical management steps including the leadership role of the anesthesiologist that ultimately resulted in a positive outcome.

Received: Feb 08, 2022

Accepted: Feb 28, 2022

Published Online: Mar 04, 2022

Journal: Annals of Anesthesia and Pain Medicine

Publisher: MedDocs Publishers LLC

Online edition: <http://meddocsonline.org/>

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Keywords: Airway obstruction; Massive transfusion; Perioperative emergency; Perioperative respiratory arrest; Neck hematoma; Thyroidectomy.

Abbreviations: CRM: Crisis Resource Management; OR: Operating Room; PONH: Postoperative Neck Hematoma; PACU: Post-Anesthetic Care Unit.

Cite this article: Stirling D, Klar G, Franklin J, Mizubuti GB. Complete Airway Obstruction and Massive Hemorrhage from Post-Thyroidectomy Neck Hematoma: A Case Report and Management Algorithm. *Ann Anesth Pain Med.* 2022; 5(1): 1026.



Introduction

Postoperative Neck Hematoma (PONH) is an uncommon but life-threatening complication of thyroid surgeries; it can rapidly expand resulting in airway compromise and massive bleeding. Prompt recognition/management is critical to ensure a favorable outcome. We present the case of a rapidly expanding PONH causing severe upper airway obstruction and massive hemorrhage in the Post-Anesthetic Care Unit (PACU). We also review and highlight crucial points of the stepwise approach taken to effectively evaluate and manage this emergency. Written informed patient consent and institutional ethics approval were obtained for publication of this report, which adheres to the applicable EQUATOR guideline.

Case description

An 85-year-old man with atrial fibrillation (on aspirin 81 mg daily - held for 5 days preoperatively), and mild/controlled asthma (no treatment required) presented for elective left hemithyroidectomy due to biopsy-proven carcinoma. Past surgical history was significant for right hemithyroidectomy remotely. Preoperative laboratory tests were unremarkable except for a brain natriuretic peptide of 442 ng/L. Computed tomography scan revealed an 8.5 x 5.8 x 6.7 cm left thyroid lesion with retrosternal extension leading to right tracheal deviation without luminal involvement.

Upon induction of general anesthesia, the patient's trachea was intubated (7.0 mm-cuffed tube) on first attempt using videolaryngoscopy. Tranexamic acid 1 g was administered intraoperatively. Upon uneventful surgical completion (estimated blood loss ~ 100 mL), the patient was extubated and transferred to PACU in stable condition.

One hour postoperatively, the patient complained of sudden onset and rapidly progressive respiratory distress. Initial assessment by the on-call anesthesiologist revealed a diaphoretic patient in respiratory extremis – visibly cyanotic, with no detectable breath sounds bilaterally (despite frank use of accessory respiratory musculature), and a large, tense, and rapidly expanding neck mass, consistent with PONH. The patient became rapidly unresponsive prompting the anesthesiologist to proceed with emergency incision/decompression of the surgical wound, followed by tracheal intubation under direct laryngoscopy. The latter proved challenging with a Cormack-Lehane grade 4 view associated with significant airway swelling and anatomical distortion. Given the urgency of the situation, no (sedative/paralytic) medication was administered which likely contributed to the difficult laryngoscopy. Nevertheless, the anesthesiologist was able to blindly intubate the patient's trachea on first attempt, who was then transferred to the Operating Room (OR) for definitive surgical management.

Upon admission to the OR, an estimated (and ongoing) 1.5 L blood loss associated with hemodynamic instability (heart rate 150 bpm, systolic blood pressure 50-60 mmHg) prompted the anesthesia team to initiate the institutional massive transfusion protocol and administer another 2 grams of Tranexamic acid. The arterial bleeding source was rapidly identified and controlled by the otolaryngologist. Following hemodynamic stabilization with crystalloids (2 L), red blood cells (3 units), fresh frozen plasma (2 units), and platelets (1 adult unit), the patient was transferred to the intensive care unit and later discharged from hospital with no further complications or recollection of the preceding events.

Discussion

PONH affects 0.7-4.3% of post-thyroidectomy patients [1-6] usually occurring in the immediate (≤ 6 hours) postoperative, although cases have been reported after days/weeks of surgical intervention [3,5,7,8]. Risk factors include male gender, elderly, Grave's disease, postoperative pain, hypertension, antithrombotic use, pre-existing bleeding disorder, bilateral operation, repeat thyroid surgery, larger size of dominant nodule, and neck dissection [2,4-6]. Additionally, the extensive dead space (allowing blood accumulation) generated by resection of a large goiter (with intrathoracic/retrosternal extension) likely contributed to hemodynamic instability in our patient, suggesting a heightened postoperative vigilance is prudent in such cases. Given that ambulatory thyroid surgery is a frequent practice (especially for "low-risk" patients [5,8]) recognition of PONH risk factors is important to identify individuals who would benefit from prolonged in-hospital monitoring. Interestingly, no association has been documented between benign vs. malignant thyroid lesions, and/or the presence of postoperative drainage devices and PONH formation [5,6].

The presentation of a PONH varies according to the rate and source (venous vs. arterial) of bleeding potentially resulting in tachycardia, hypotension, neck pain/pressure, respiratory distress, stridor, dysphagia, progressive neck swelling, suture line bleeding, and high drain output [2,3,7,8]. Ecchymosis can occur, especially in deeper hematomas which are more likely to cause airway compromise [8]. Airway edema, when present, results from venous/lymphatic drainage obstruction in the neck [3]. The degree of airway compromise will dictate initial management (**Figure 1**). In cases of respiratory extremis, immediate hematoma evacuation is crucial to alleviate airway edema and the mechanical effect/pressure over the upper airway, thereby re-establishing ventilation/oxygenation. Emergency hematoma decompression (required in 38% of PONH patients as a life-saving measure [3]) may also correct anatomical distortions, thereby facilitating subsequent airway management. Hence, scalpel/scissors should be immediately available in the vicinity of post-thyroidectomy patients in PACU and on the surgical ward. Importantly, while opening the surgical suture line often suffices to relieve the hematoma-induced airway obstruction/edema, some patients may require deeper (into fascial planes) exploration to adequately re-establish ventilation/oxygenation [8].

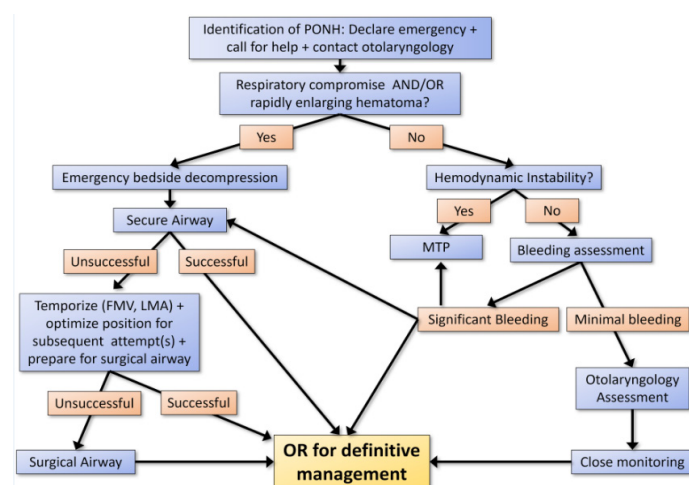


Figure 1: Algorithm for management of Postoperative Neck Hematoma (PONH). Surgical airway should be performed by the most skilled practitioner available.

FMV: Face-Mask Ventilation; LMA: Laryngeal Mask Airway; MTP: Massive Transfusion Protocol; OR: Operating Room.

Crisis Resource Management (CRM) skills are a key component to successfully managing medical emergencies [9]. Using our case as an example, early establishment of leadership (on-call anesthesiologist); clear, direct, and closed-loop communication; adequate resource utilization (e.g., delegating tasks that are appropriate to the skillset of the available personnel); situation awareness and anticipation (e.g., considering the possibility of rapid respiratory/hemodynamic deterioration, possible/likely difficult airway management); decision-making and problem solving (with a patient-centered approach), among others, were crucial to promptly diagnose and effectively manage this patient which ultimately led to his full recovery. Notably, CRM has historically been an integral component of anesthesia training at our institution; hence, both the attending anesthesiologist (G.K.) and the anesthesia trainee (D.S.) involved in this case were well equipped to manage this crisis. We propose that management of such rare but life-threatening event should be rehearsed and included as part of high-fidelity simulation training to help protocolize response (**Figure 1**). Concurrent to opening the surgical wound, the anesthesia team immediately notified the on-call otolaryngologist and arranged for an emergency take-back to the OR. Additionally, in face of the hypoxic respiratory arrest, the most experienced (attending) anesthesiologist proceeded with a (luckily successful) attempt to emergently intubate the patient under (the readily available) direct laryngoscopy while support personnel arranged for extra airway equipment and rescue medications. In such instances, it is important to understand that airway management is likely to be difficult - even if it had been previously straightforward [10]. Hence, having back-up methods available is paramount and recommended by airway management algorithms [11]. Similarly, surgical airway techniques - generally recommended as the last resource to re-establish oxygenation upon failure of other/less-invasive methods [11] are likely to be challenging in the setting of PONH given the altered anatomy, airway edema, and bloody surgical field rendered by the hematoma. This task, therefore, should be delegated to the most experienced (surgeon/otolaryngologist) clinician available, keeping in mind that anesthesiologists were successful in only 36% of the times they were required to perform an emergency surgical airway [12]. Nevertheless, as airway experts, anesthesiologists should strive to be comfortable with managing all aspects of airways (including surgical techniques) as help from experienced surgeons may not be readily available. Regular training is recommended to ensure that anesthesiologists are comfortable with and able to perform an emergency cricothyroidotomy [13].

Definitive management of clinically significant PONH requires surgical re-intervention (**Figure 1**). An arterial source is usually identified in cases of early and/or large/severe PONHs [14]. Although uncommon, the potential for massive blood loss (as in the present case) must be considered [15]. With prompt/appropriate assessment and management ensuring adequate oxygenation, hemodynamic resuscitation, and definitive surgical control, outcomes are usually favorable [3].

Anesthesiologists play an important role in the prevention and (as demonstrated herein) management of PONH. Ensuring a smooth wake-up and postoperative course with special attention to avoiding maneuvers that increase venous congestion is a perioperative goal since retching/vomiting and excessive coughing may trigger the events leading to PONH [3,7,8]. Indeed, the anesthesiologist is often requested to increase venous pressure (e.g., Valsalva maneuver, reverse Trendelenburg) intraoperatively in order to identify bleeding sites thereby facili-

tating optimal hemostasis [7].

For at-risk patients, it is important that members of the care team are aware of the possibility of PONH and, most importantly, how to proceed should this complication arise. Accordingly, having scalpel/scissors and emergency airway equipment readily available is essential and should be included as part of the surgical debrief and PACU handover. Also noteworthy, $\frac{1}{3}$ of PONHs occur overnight [3] (where otolaryngology is not immediately available), which further highlights the importance of anesthesiologists to be competent at immediate emergency management (including surgical airway skills) of these patients. The finding that $\frac{2}{3}$ of anesthesiologists were unable to successfully perform an emergency surgical airway [12] serves to highlight the importance of maintaining these skills through ongoing training.

In conclusion, this case highlights the crucial role of the anesthesiologist in managing a PONH patient in acute respiratory extremis/arrest who required an emergency hematoma decompression and endotracheal intubation in the immediate postoperative period, followed by surgical re-intervention with ongoing massive blood loss. It also emphasizes the importance of CRM skills involved in successfully managing such cases, and the role of proper PACU handover including communication surrounding the possibility of, and the initial steps to be taken should a PONH develop, which include having scalpel/scissors and airway equipment (considered critical/lifesaving in such dire situations) immediately available.

Authors' contributions

Devin Stirling: This author was directly involved in the care of this patient and helped by drafting and revising the manuscript, and approving the final version for publication.

Gregory Klar: This author was directly involved in the care of this patient and helped by drafting and revising the manuscript, and approving the final version for publication.

Jason Franklin: This author was directly involved in the care of this patient and helped by critically revising the manuscript, and approving the final version for publication.

Glenio B Mizubuti: This author helped by drafting and critically revising the manuscript, formatting it according to the Journal's requirements, and approving the final version for publication.

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