Acute Management of Massive Epistaxis After Nasotracheal Extubation

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Epistaxis is one of the most common complications of nasotracheal intubation and can be life-threatening. However, there is little discussion in the current literature on the acute management of massive epistaxis after nasotracheal extubation. This is a report of 2 patients who experienced severe unanticipated nasal bleeding immediately after extubation, 1 after a surgical procedure for oral cancer and another after restorative dental treatment. In both cases the significant epistaxis was managed successfully with a Foley balloon catheter used to pack the posterior nasal cavity. The Foley catheter technique may be useful for managing and arresting sudden postextubation epistaxis.

Key Words: Epistaxis; Nasotracheal extubation; Foley catheter.

Epistaxis is one of the most common complications of nasotracheal intubation.¹⁻³ Various methods have been developed to prevent or reduce bleeding, including thermosoftening of the nasal endotracheal tube as well as use of the gum elastic bougie technique.⁴⁻⁶ However, management of massive epistaxis after nasotracheal extubation has not been well addressed, even in reviews of nasotracheal intubation for head and neck surgery.^{1,3}

Depending on the surgical procedure, epistaxis may be more complicated and difficult to control after extubation than during intubation. Other potential aspects to consider include surgical factors, such as Le Fort I osteotomy or delicate reconstruction surgery, and patient factors, such as poor cooperation or concurrent anticoagulant therapy. A review by Hall and Shutt¹ recommended that epistaxis during nasotracheal intubation be managed as follows:

1. if bleeding occurs during tube insertion, intubation should be completed as rapidly as possible, with the

endotracheal tube itself acting to tamponade the bleeding; and

2. if tracheal intubation cannot be completed at that time and there is active bleeding during attempted intubation, the endotracheal tube may be withdrawn and repositioned with the inflated cuff within the postnasal space, to prevent blood passing into the oropharynx and to act simultaneously as a nasopharyngeal airway.

An additional option would be to first secure the airway by intubating the patient orally, so that if any problems during the nasotracheal intubation arise, such as massive hemorrhage or difficulty passing the endotracheal tube past the nasal anatomy, those issues can be addressed safely without compromise or loss of the patient's airway.

Massive hemorrhage after nasotracheal extubation may be associated with more severe complications compared to during intubation. First, it is often difficult to identify the bleeding source, as hemorrhage can originate anywhere along the path of the nasotracheal tube, extending from the nares to the glottis. Anatomic areas of higher risk for damage during passage of the nasal endotracheal tube include the nasal turbinates, adenoids, and delicate nasal mucosa lining the septum. Nasal bleeding may even have originated elsewhere, such as within the oral cavity or at the actual surgical sites; regardless, the source must be identified so that

Received September 18, 2018; accepted for publication February 28, 2019.

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Anesth Prog 66:211-217 2019 | DOI 10.2344/anpr-66-02-09
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hemostasis can be achieved. Second, any attempt at direct laryngoscopy, for visual inspection or for reintubation, or insertion of a supraglottic device is often quite difficult or impossible, as patients are typically conscious following extubation. Third, depending on the surgical procedure performed, which might include orthognathic surgery with maxillomandibular fixation or delicate free-flap reconstruction for oral cancer, reintubation without potentially compromising the surgical procedure becomes more difficult. Therefore, there is a need to identify a simple and effective technique that can be performed rapidly to stop unexpected bleeding following nasotracheal extubation.

Here we describe 2 cases in which management of unanticipated massive nasal bleeding, noted immediately after nasotracheal extubation, was successfully managed with a Foley balloon catheter. Written informed consent was obtained from both patients for publication of this report.

CASE REPORTS

Case 1

The patient was a 73-year-old man (weight 66 kg, height 157.6 cm, body mass index 26.6 kg/m²) who presented with a chief complaint of swelling in the anterior mandibular region for 6 months. He was diagnosed with clear cell salivary carcinoma of the anterior mandible and was scheduled for segmental mandibulectomy and placement of a titanium reconstruction plate with a pedicle flap. His medical history was significant for end-stage renal failure and chronic atrial fibrillation. He had been undergoing hemodialysis 3 times weekly for 8 years. His chronic atrial fibrillation was managed with warfarin (2.5 mg/d), which he had been taking for 4 years. Upon admission, his laboratory results included an international normalized ratio of 1.38 (normal <1.1) and an aPTT of 30.0 seconds (normal 26.9–38.1 seconds). His international normalized ratio approximated the targeted range for a hemodialysis patient with a history of chronic atrial fibrillation. Platelet aggregation test results using adenosine diphosphate, collagen, and epinephrine were almost within the normal range (the respective inhibition rates were 72% [normal range, 77–90%], 74% [normal range, 74–84%], and 78% [normal range, 66–85%], respectively). The patient was referred to a cardiologist, who suggested the use of heparin bridging for continued anticoagulation while stopping the warfarin for the surgical procedure. Warfarin was discontinued, and intravenous heparin was started 1 week before surgery and then discontinued 6 hours before

induction of anesthesia. The international normalized ratio and aPTT were 1.04 and 36.4 seconds, respectively, on the morning of the surgery. The patient's preoperative blood pressure was approximately 130/90 mm Hg, heart rate was 65 beats/min, and all other vital signs were within normal limits.

Anesthesia was induced with propofol (70 mg) and fentanyl (100 µg), and rocuronium (40 mg) was administered after loss of consciousness to help facilitate direct laryngoscopy. Cotton swabs soaked in 2 mL of 2% viscous lidocaine to which epinephrine 1:5000 (100 µg) had been added were inserted into the nares to help determine which was large enough to permit passage of the endotracheal tube and to help minimize the risk of epistaxis. A 7.0-mm flexible reinforced endotracheal tube (Mallinckrodt, Medtronic Inc, Minneapolis, MN), which was thermosoftened with warm water and lubricated to reduce the risk of nasal damage, was advanced through the right nostril without resistance. The direct laryngoscopic view was adequate (Cormack and Lehane grade II) with no bleeding noted. Nasal intubation was performed uneventfully on the first attempt. No bleeding was observed in the posterior oropharynx even when a saline-soaked throat pack was inserted.

Anesthesia was maintained with desflurane 3–5% in air and oxygen. The operative time was 278 minutes with no apparent complications. The patient emerged from anesthesia approximately 15 minutes after discontinuation of desflurane, at which point he opened his eyes and followed verbal commands. Tidal volume recovered to normal, end-tidal CO₂ was within the normal range, blood pressure was 160/100 mm Hg, heart rate was 110 beats/min, and SpO₂ was 99% on a fractional inspired oxygen concentration of 1.0. The patient was extubated easily after oral and endotracheal suctioning. However, immediately after extubation, copious fresh blood was noted from the right nostril, then from the left nostril and mouth. Nasal and oropharyngeal suctioning was performed immediately and repeated frequently, but the bleeding continued. The patient then developed respiratory compromise because of the copious amount of blood in the airway, with oxygen saturation levels decreasing to the low 90s. While preparing for emergency reintubation and tracheostomy, we attempted to arrest the hemorrhage with a Foley balloon catheter. A lubricated 14F Foley catheter was inserted along the floor of the right nostril until the tip passed through the posterior nasal aperture, which was confirmed by tactile feel by the anesthesiologist. The balloon was then inflated using 10 mL of water and traction was applied to the catheter until the balloon rested against the posterior choana. Gauze soaked in a solution containing epinephrine 1:5000 was

then inserted along the catheter into the nostril, and manual pressure was applied to compress the nose. The actual volume of epinephrine solution administered was not known as the gauze was soaked and wrung out prior to placement. The patient remained clearly awake and fully responsive throughout this time. During the event, both landiolol 2.5 mg and nicardipine 1 mg were administered to maintain the patient's blood pressure and heart rate within normal limits, which was repeated a second time (total dose of landiolol 5 mg and total dose of nicardipine 2 mg). Soon after posterior packing with the catheter, the bleeding decreased and became controllable. The patient's respiratory compromise rapidly improved after control of the hemorrhage, with his oxygen saturation increasing to 98% with oxygen being delivered at 5 L/min via a face mask. The total blood loss during the event was estimated to be around 200 mL. Chest radiographs obtained before leaving the operating room and the next morning in the intensive care unit to rule out aspiration or atelectasis revealed no abnormalities. The Foley catheter was taped to the patient's face using an elastic bandage to minimize the risk of tissue necrosis around the nose. The total anesthesia time was 400 minutes. After arrival in the intensive care unit, the intranasal gauze soaked in epinephrine was changed several times, and the catheter and gauze were finally removed after 24 hours without further bleeding or any complications. The patient never resumed heparin bridging but did restart warfarin on the morning of postoperative day 2 after the bleeding was arrested. Thereafter, there was no further bleeding.

Case 2

The patient was a 36-year-old woman (weight 82.1 kg, height 156 cm, body mass index 33.7 kg/m²) with moderate intellectual disability, obesity, and controlled epilepsy, who was scheduled for endodontic therapy and restorative dental treatment involving multiple teeth. She had been taking valproic acid 600 mg/d for 10 years, with no epileptic seizures during that time. Additionally, she had no history of epistaxis. Laboratory data and physical examination were otherwise unremarkable. Her baseline vital signs included blood pressure of 136/82 mm Hg and heart rate of 88 beats/min. She was unable to communicate clearly, so anesthesia was induced with 5% sevoflurane and 50/50% nitrous oxide/oxygen followed by rocuronium (50 mg). Cotton swabs soaked in 2 mL of 2% viscous lidocaine containing epinephrine 1:5000 (100 µg) were applied to both nostrils. Next, a lubricated nasopharyngeal airway with an inner diameter of 7.0 mm (Portex, Smith Medical, Dublin, OH)

Figure 1. Tamponade of the posterior nasal passage with a 14F Foley balloon catheter in case 2.

was inserted into the right nostril as a dilator. A 7.0-mm flexible reinforced endotracheal tube (Mallinckrodt) that had been thermosoftened with warm water and lubricated was passed uneventfully through the right nostril on the first attempt without any bleeding. Anesthesia was maintained with desflurane 3–5% in air and oxygen. The dental treatment was completed in 67 minutes without complications, and oral and endotracheal suctioning was performed before discontinuation of anesthesia. Her blood pressure before extubation was 114/58 mm Hg and her heart rate was 74 beats/min. The patient awakened 5 minutes later and the trachea was extubated easily with positive airway pressure that was delivered manually by a reservoir bag with 20 cm H₂O to prevent aspiration and atelectasis. However, immediately after extubation, the patient started coughing and then suddenly started spitting out fresh blood. She was not able to comply with the instruction to open her mouth, so it was opened using a laryngoscope with some physical restraint, and then oropharyngeal suctioning was performed. However, the bleeding continued, and the patient could no longer be restrained. Fortunately, her oxygen saturation levels did not decrease at this time. A 14F Foley catheter was promptly inserted into the right nostril for emergency management of the epistaxis. The balloon was inflated with 10 mL of air, and traction was applied to the catheter while she was physically restrained (Figure 1). The bleeding was controlled effectively by balloon tamponade. Propofol was administered at a rate of 2 mg/kg/h (33.3 µg/kg/min) to assist with patient compliance, while gauze soaked in a solution containing

epinephrine 1:5000 was applied along the catheter in the nostril until the hemorrhage stopped. The actual volume of epinephrine solution administered was not known as the gauze was soaked and wrung out prior to placement. Fifteen minutes after tamponade, the catheter and gauze were removed safely without any bleeding. During emergence from anesthesia, the patient's blood pressure range was 125–145/82–94 mm Hg, with a heart rate of 86–98 beats/min. The patient woke uneventfully from sedation and was returned to the general ward, where there were no additional complications. The total anesthesia time was 115 minutes.

DISCUSSION

Here we have described 2 patients in whom we used a Foley balloon catheter to help manage massive unexpected nasal hemorrhage immediately after nasotracheal extubation. Although epistaxis is one of the most common complications during nasotracheal intubation, there are no uniform guidelines for its diagnosis and treatment.⁷ However, the algorithms suggested for management of epistaxis recommend the following steps^{8,9}:

1. identify the site of bleeding;
2. stop the bleeding by chemical or electrical cauterization;
3. if cauterization is unsuccessful, start anterior nasal packing followed by posterior packing with a nasal tampon or ribbon gauze;
4. if packing is unsuccessful, repack using a Foley catheter or an inflatable balloon device; and
5. if the bleeding continues, start surgical intervention or artery embolization (Figure 2).

Khanna and Dagum¹⁰ proposed an algorithm for the management of life-threatening hemorrhage after maxillofacial surgery that was based on a literature review. Their algorithm recommends use of decongestants, intubation or tracheostomy, and anterior nasal packing with a Foley catheter as the first step for intractable epistaxis. In both cases presented, especially case 1, while we prepared for emergency reintubation and tracheostomy, we utilized a Foley balloon catheter to stop the bleeding. A supraglottic airway device, such as a laryngeal mask airway (LMA), could have been considered as an alternative means of isolating the airway in an emergency, particularly one involving bleeding in the nasal passages. However, in our patient, a large amount of blood had already filled the oropharynx, so we were concerned about possible aspiration and airway obstruction by blood clot. Furthermore, case 1 was undergoing segmental man-

dibulectomy and reconstruction with a pedicle flap. Therefore, we hesitated to use an LMA because its insertion could have damaged the delicate flap reconstruction. In case 2, use of an LMA might have been helpful for isolating bleeding from the airway; however, because the patient was unable to follow our instructions, we were not able to use an LMA while she was conscious.

The bleeding site is often difficult to identify in acute intractable epistaxis, particularly when the patient is supine. Vasoconstriction or use of a nasal tampon might not successfully arrest massive hemorrhage, particularly in the event of posterior bleeding. Ball et al¹¹ reported that a balloon catheter successfully arrested hemorrhage in almost all (93%) patients being treated for emergency trauma. Therefore, we opted for posterior nasal packing with a Foley catheter for faster and more reliable management of massive epistaxis in the 2 cases presented here. The most common site of bleeding is from the Kiesselbach plexus in the anterior nasal cavity,⁹ and most bleeding from this area is easily controllable. However, bleeding from the posterior nasal cavity, which contains the sphenopalatine and descending palatine arteries, may be more difficult to locate and control (Figure 3). In both cases, particularly case 1, the bleeding increased rapidly until the oropharynx was filled with blood, even though no bleeding was observed in the oropharyngeal space after intubation or just before extubation. It is possible that the endotracheal tube injured the posterior blood vessels when being passed through the nasal cavity during intubation while simultaneously stemming the bleeding until the tube was removed. Furthermore, in case 1, the increase in blood pressure was higher than usual, most likely because of oropharyngeal and endotracheal suctioning. The increase in blood pressure also might be one of the reasons for the epistaxis that occurred. Postoperative pain and emergence agitation were also potential causes; however, these were deemed unlikely as the patient had no complaints of discomfort after emergence, nor was he agitated prior to extubation.

When attempting the Foley catheter for epistaxis, there are some potential issues to consider. First, because the Foley catheter is unmarked, the balloon can be easily inflated in the wrong anatomic position, causing airway obstruction or nasal discomfort. Therefore, care must be taken to visually or physically confirm the location of the catheter in the posterior oropharynx before inflating the balloon. Visual confirmation may be especially difficult if patients are coughing, expectorating, extremely agitated, and/or fearful, as they may not tolerate use of a tongue depressor to visualize the catheter tip.¹² In case 1, we could not visualize the catheter in the patient's

Figure 2. Algorithm for the management of epistaxis. (From Mahmood S, Lowe T.⁸ Management of epistaxis in the oral and maxillofacial surgery setting: an update on current practice. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2003;95:23–29.)

oropharynx because of copious amounts of blood, so we had to estimate the position based on the tactile feel as well as anatomical length of the palate. Ho and Mansell¹² reported the distance from the proximal end of the inflated balloon to the nasal vestibule was around 8 cm in most adults. Second, we needed to utilize an inflating volume for the catheter balloon that was as small as possible. If excess volume is applied, the balloon might be wedged in the nasopharynx and push down on the soft palate, which causes airway obstruction or headaches.¹² Lee et al¹³ reported that balloon volumes of between 8 and 15 mL were effective at sealing the posterior choana. In these cases, we initially utilized 10 mL, which was likely to occlude the posterior choana. As the third point, the ideal substance to use

when inflating a Foley catheter balloon in this clinical setting is not known. However, the substances most often used are air, water, and saline. Rashid and Karagama¹⁴ reported that water is preferable to saline or air for inflating a Foley catheter balloon, at least for 48 hours. However, in an emergency, any substance may be acceptable, as water can be used as a replacement later without much difficulty.

There are several effective surgical treatments for severe posterior epistaxis, such as endoscopic diathermy or endoscopic artery ligation. However, tamponade with a Foley catheter is an effective and rapid nonsurgical option that warrants strong consideration, especially following nasotracheal extubation.¹² The Foley balloon catheter has been used in the management of posterior

Figure 3. Anatomy of the blood supply to the nose and Foley catheter insertion of epistaxis.

epistaxis for several decades. However, when a Foley catheter is used for epistaxis, several potential complications should be kept in mind, including necrosis of the nasal tissue, airway obstruction, localized infection, toxic shock syndrome, and the nasopulmonary reflex. Patients should be monitored carefully during tamponade to prevent and effectively manage these potential complications.^{15,16} Various new devices have been developed to address these problems, including a prepackaged long tampon and a double balloon.¹⁷ There were no such complications noted in either of our patients, likely because of the short-term use of the balloon catheter coupled with continued intraoperative monitoring.

In conclusion, use of a Foley balloon catheter may be a simple and effective method for managing sudden epistaxis after nasal extubation. Use of a supraglottic airway device, such as an LMA, might be considered depending on the specifics of the emergency. However, anesthesiologists should consider use of a Foley catheter for immediate management of unexpected or severe postextubation epistaxis.

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