Facial Artery Pseudoaneurysm: Challenges of Airway Management

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A patient with recent jaw reconstruction presented for treatment of postoperative oropharyngeal hemorrhage. Asleep nasal fiberoptic intubation was attempted, but a rare and unanticipated complication ensued: rupture of right facial artery pseudoaneurysm. The difficult airway algorithm was followed up to the point of surgical airway. While nasal or oral fiberoptic intubation is often perceived as the safest approach for management of a difficult airway, we discuss alternative treatment strategies for patients with a facial pseudoaneurysm. Such alternatives include preoperative angiographic endovascular embolization of the vessel(s) feeding the pseudoaneurysm, and/or elective tracheostomy.

Key Words: Case report; Airway management; Nasotracheal fiberoptic intubation; Facial pseudoaneurysm; Oropharyngeal hemorrhage; Difficult airway; Emergent tracheostomy.

Nasal or oral fiberoptic intubations are often perceived to be the safest options to manage a challenging airway. Patients undergoing intraoral, oropharyngeal, maxillary, mandibular, and dental procedures or reconstructions are usually intubated nasally to facilitate surgical exposure.¹ Nasotracheal intubation can be achieved by various methods, including direct laryngoscopy with or without McGill forceps, video laryngoscopy, and awake or asleep flexible fiberoptic bronchoscopy; however, when attempting to intubate a difficult airway, a fiberoptic approach will often be chosen. While there are many cases in which flexible fiberoptic bronchoscopy may facilitate a safe intubation, it is not without risks.

Arguably, the most feared complication of nasotracheal intubation, regardless of the method, is hemorrhage. Blood may completely obstruct the anesthesiologist's view, making intubation very difficult or even impossible. Aspiration of blood may induce pulmonary alveolar damage and lead to severe acute respiratory distress syndrome.² Bleeding is more commonly associated with nasotracheal compared with

oro-tracheal intubation,³ and is usually secondary to trauma to Kisselbach's plexus in the anterior nasal septum.¹

Facial artery pseudoaneurysms are rare and are usually the result of direct arterial injury secondary to orthognathic surgery, other maxillofacial surgery, or facial trauma. A hole is formed in the artery through which blood extravasates and forms a communicating and pulsating hematoma that is confined by the surrounding tissues. The extravasation of blood will continue until the pressure of the cavity is equal to the mean arterial pressure.⁴ A patient undergoing facial pseudoaneurysm repair by an open surgical approach will likely be intubated nasally. The risk of hemorrhage with intubation of such a patient is high secondary to potential for pseudoaneurysm rupture.

Here, we present a case of nasotracheal fiberoptic intubation complicated by the unanticipated rupture of a facial artery pseudoaneurysm, ultimately resulting in an emergency surgical airway. Written consent was obtained to publish this case report.

CASE DESCRIPTION

A 21-year-old otherwise healthy male patient who had undergone corrective jaw surgery in South America a few weeks prior presented for treatment of postoperative oropharyngeal hemorrhage. The patient had been

Received June 30, 2017; accepted for publication August 27, 2017.

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Anesth Prog 65:52–55 2018 | DOI 10.2344/anpr-65-02-09

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Figure 1. Computed tomography angiogram significant for a small, 2×1 cm pseudoaneurysm originating off of a branch of the right external carotid artery with active extravasation of blood.

transfused 5 units of packed red blood cells and had undergone attempted interventions in his home country in the week leading up to his transfer to our institution. Upon arrival, the patient appeared stable with minimal intraoral bleeding.

On preanesthetic evaluation, his vitals were stable: he was afebrile with blood pressure of 121/68 mm Hg, pulse of 67 beats per minute, and oxygen saturation of 97% on room air. He was of normal body habitus and in no acute distress. He was unable to participate with the airway exam as he reported that opening his mouth was too painful. His mouth was packed with gauze. He had full range of motion of his neck, and his thyromental distance was greater than 6 cm. His nasal anatomy was within normal limits, with a midline septum and no signs of hypertrophic turbinates. His labs were remarkable for an elevated white blood cell count ($11,900/\text{mm}^3$) and anemia (hemoglobin, 8.8 g/dL; hematocrit, 25.1%). Computed tomography angiogram showed a small, 2×1 cm pseudoaneurysm originating off of a branch of the right external carotid artery with active extravasation of blood (Figure 1).

A difficult airway was anticipated secondary to several factors including: high risk of bleeding, expansion of hematoma, poor mouth opening (due to severe pain), and a large oropharyngeal hematoma potentially obstructing endotracheal tube passage. Taking these

factors into account, and because of surgeon request for a nasal intubation, a nasal fiberoptic intubation was planned. The intubation was to be performed asleep rather than awake in the absence of difficult mask ventilation predictors and in order to minimize hemodynamic stress. The risk of tracheostomy in the case of failed intubation was discussed with the patient and surgeons and was included in the anesthesia informed consent. The oral and maxillofacial surgery fellow was to be present for intubation, with a tracheostomy kit in the operating room.

In the preoperative holding area, the patient was administered 2 to 3 sprays of Afrin nasal spray to each nostril, glycopyrrolate 0.2 mg intravenously, and midazolam 2 mg intravenously. In the operating room, he underwent preoxygenation with 100% oxygen via face mask prior to induction, and was subsequently given propofol 120 mg and succinylcholine 80 mg intravenously. He was easily ventilated, and a lubricated nasal trumpet was passed easily and without resistance into his left nare, and then removed. The DCI® Intubating fiberoptic scope 5.2×65 mm (Karl Storz®, El Segundo, CA) primed with a prewarmed 7.0-mm Mallinckrodt™ Nasal RAE (Medline, Munelelin, IL) endotracheal tube was gently inserted past the nasopharynx, and the mouth was gently opened in an attempt to improve visualization. First intubation attempt was performed by anesthesiology resident in the second year of clinical training. Upon mouth opening, the patient immediately began hemorrhaging from his oral cavity, with complete obstruction of view despite continuous use of suction. The patient maintained oxygen saturation of 100%, heart rate of 108 beats per minute, and blood pressure 116/87 mm Hg. It became apparent that the gauze in his mouth had been tamponading the facial artery pseudoaneurysm. The fiberoptic scope was removed and intubation was re-attempted using a C-MAC® video laryngoscope (Karl Storz®) and then a direct laryngoscope; however, 2 separate attending anesthesiologists were unable to visualize any airway structures due to excessive bleeding. Ventilation was also unsuccessfully attempted via facemask or laryngeal mask airway, which was attributed to blood obstructing his airway. The patient maintained stable vital signs, oxygen saturation above 96%, and did not regain consciousness throughout this less than 10-minute ordeal, but given the lack of success at intubation and ventilation, the decision was made to proceed with an emergent surgical airway (Figure 2). Digital pressure was applied over the ipsilateral border of the mandible, where the facial artery anatomically lies, in order to tamponade the vessel (Figure 3). At this juncture, the patient had recovered from neuromuscular blockade and regained spontaneous respiration. Tamponade of the vessel was

Figure 2. Sequence of events in management of this patient's difficult airway.

sufficient to stop hemorrhage and prevent further blood aspiration. A tracheostomy was then successfully performed, in which an 8.0 reinforced endotracheal tube was inserted. Anesthesia was then maintained throughout the remaining procedure with sevoflurane while spontaneous ventilation and oxygenation were adequate. Digital pressure was maintained on the mandible, and the patient was prepped and draped. A cut down in the neck was performed, and the source of the bleed was confirmed as a ruptured pseudoaneurysm of the facial artery. The vessels were clamped and ligated (Figure 4). The patient had an estimated blood loss of 1500 mL and was transfused 3 units of packed red blood cells intraoperatively. No further complications ensued. He was transferred to the intensive care unit in stable condition; postoperative hemoglobin was 11 g/dL and hematocrit 31.5%. His tracheostomy was removed within a few days, prior to his discharge.

DISCUSSION

Fiberoptic nasotracheal intubation has a high success rate (88–100%) for difficult airways.⁵ However, there

are cases in which it is unsuccessful. In 1983, Ovassapian et al⁶ reported that failed nasotracheal fiberoptic intubation occurred in 5 out of 413 cases (1.2%) due to poor visualization, inability to advance the endotracheal tube, or deviated nasal septum. The most common complication of nasotracheal intubation is bleeding, which can result in poor visualization. Usually, the bleeding results from epistaxis secondary to trauma to Kisselbach's plexus in the anterior nasal septum, with an incidence ranging from 18 to 66%.³ However, in an analysis of 1612 cases, only 1.3% of nasal fiberoptic intubations resulted in hemorrhage severe enough to require suctioning.⁷ Of course, in cases of a pseudoaneurysm of a branch of the external carotid artery, the risk of severe hemorrhage is much higher. Less common complications of nasotracheal intubation include accidental turbinectomy, polypectomy, adenoidectomy, retropharyngeal perforation, and bacteremia.^{8,9}

Facial artery pseudoaneurysms can be treated via an open surgical or an angiographic approach.¹⁰ While an angiographic endovascular embolization is recommended as the first line of treatment, it is associated with some rare risks, including neurologic complications and facial skin necrosis.¹⁰ The open surgical approach can be useful in cases in which the lesion is superficial and easily accessible (as was the case for our patient), or when attempting to minimize radiation exposure.¹⁰ It involves isolation and ligation of the vessels feeding the pseudoaneurysm and evacuation of the existing hematoma.¹¹ The open surgical approach is associated with a higher risk of bleeding, not only related to the surgical procedure itself,¹⁰ but also because it requires intubation for administration of general anesthesia. Intubation can cause bleeding

Figure 3. Oral and maxillofacial surgeon applies digital pressure to the facial artery to temporize bleeding, while surgical colleague performs tracheostomy.

Figure 4. Clips applied to the facial artery via an open surgical approach; note its superficial and easily accessible location.

secondary to mechanical disruption of the pseudoaneurysm, but can also increase the mean arterial pressure above the pressure of the periarterial zone, leading to increased extravasation of blood and potential pseudoaneurysm rupture.¹² Of note, in the case of intraoral hemorrhage in which there is a superficial vessel “feeding” the distal, bleeding vessels, digital point pressure may be utilized to temporize the bleeding (as was done in this case; Figure 3).

Patients undergoing complex head and neck surgery almost invariably undergo computed tomography scanning preoperatively. Some authors have recommended that the anesthesiology team review maxillofacial computed tomography scans prior to induction (especially in patients with poor mouth opening) to examine the patients’ nasal anatomy, which may be predictive of difficult nasal intubation.^{13,14} Taking the recommendation a step further, examination of oral anatomy and the local vasculature (when contrast has been used) may also prove helpful when assessing risk of difficult intubation, should time allow.

Although it may not have changed the outcome in this case (the patient would still likely have needed to open his mouth, dislodging the clot/gauze, which was tamponading the vessel), many authors have recommended awake fiberoptic nasotracheal intubation, or at least maintenance of spontaneous respiration during intubation of patients with intraoral pathology.^{1,5,12} Although awake fiberoptic intubation often is the safest strategy when intubating a difficult airway, we argue that it would *not necessarily* have been the safest approach in the intubation of this patient, or any other patient with such a high risk of brisk and uncontrollable intraoral or intranasal arterial hemorrhage. Minimizing the hemodynamic stress of intubation is important, and may require sedation despite adequate topicalization.¹⁵ Recent literature suggests that the first line of treatment for external carotid pseudoaneurysm should be interventional radiology endovascular embolization,^{4,10,11} which, if successful, would lessen the risk of oropharyngeal hemorrhage and airway compromise. Given this, we suggest discussion with the surgical team, in which preoperative embolization should be considered. However, in the case that a patient with a pseudoaneurysm of a branch of the external carotid should require a controlled airway, a tracheostomy should be considered before any intubation attempts, under controlled and intentional conditions, to prevent hemorrhage. At the very least, we recommend tracheostomy or cricothyrotomy kit be set up in the operating room and surgical back up immediately available prior to attempted airway management.

ACKNOWLEDGMENT

There are no conflicts of interest to report.

REFERENCES

1. Hall CE, Shutt LE. Nasotracheal intubation for head and neck surgery. *Anaesthesia*. 2003;58:249–256.
2. Raghavendran K, Nemzek J, Napolitano LM, Knight PR. Aspiration-induced lung injury. *Crit Care Med*. 2011;39:818–826.
3. Piepho T, Thierbach A, Werner C. Nasotracheal intubation: look before you leap. *Br J Anaesthesia*. 2005;94:859–860.
4. Madani M, Veznedaroglu E, Pazoki A, Danesh J, Matson SL. Pseudoaneurysm of the facial artery as a late complication of bilateral sagittal split osteotomy and facial trauma. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2010;110:579–584.
5. Apfelbaum JL, Hagberg CA, Caplan RA, et al. Practice guidelines for management of the difficult airway: an updated report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway. *Anesthesiology*. 2013;118:251–270.
6. Ovassapian A, Yelich SJ, Dykes MH, Brunner EE. Fiberoptic nasotracheal intubation—incidence and causes of failure. *Anesth Analg*. 1983;62:692–695.
7. Heidegger T, Gerig HJ, Ulrich B, Schnider TW. Structure and process quality illustrated by fiberoptic intubation: analysis of 1612 cases. *Anaesthesia*. 2003;58:734–739.
8. Chen HH, Chen LC, Hsieh YH, Chen MK, Chen CH, Cheng KI. Unintended avulsion of hypertrophic adenoids in posterior nasopharynx: a case report of a rare complication caused by nasotracheal intubation. *Case Rep Anesthesiol*. 2014;2014:980930.
9. Prasanna D, Bhat S. Nasotracheal intubation: an overview. *J Maxillofac Oral Surg*. 2014;13:366–372.
10. Jo HW, Kim YS, Kang DH, Lee SH, Kwon TG. Pseudoaneurysm of the facial artery occurred after mandibular sagittal split ramus osteotomy. *Oral Maxillofac Surg*. 2013;17:151–154.
11. Pappa H, Richardson D, Niven S. False aneurysm of the facial artery as complication of sagittal split osteotomy. *J Craniomaxillofac Surg*. 2008;36:180–182.
12. Subrat Kumar S, Sriganesh K, Suneel PR. Successful airway management in a patient with giant internal carotid artery pseudoaneurysm occupying the oral cavity. *J Neurosurg Anesthesiol*. 2008;20:210–211.
13. Grimes D, MacLeod I, Taylor T, O'Connor M, Sidebottom A. Computed tomography as an aid to planning intubation in the difficult airway. *Br J Oral Maxillofac Surg*. 2016;54:80–82.
14. O'Connor M, Sidebottom AJ. Is the 3-D CT model useful to our anaesthetists? *Br J Oral Maxillofac Surg*. 2013;51:262–263.
15. Woodall NM, Harwood RJ, Barker GL. Complications of awake fiberoptic intubation without sedation in 200 healthy anaesthetists attending a training course. *Br J Anaesthesia*. 2008;100:850–855.