

Case Report

Unanticipated Difficult Nasal Intubation Due to a Prominent Anterior Tubercle of the First Cervical Spine

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ABSTRACT

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Nasal intubation is frequently used for airway management in patients undergoing many surgical procedures. This is a case report of an unanticipated difficult nasal intubation due to a prominent anterior tubercle of the first cervical spine vertebra (C1) resulting in aspiration of blood and hypoxemia following intubation. The subsequent airway management of the rescheduled elective case is also described. The specific difficulties in securing the airway for nasal intubation are described as well as the management strategies to circumvent this anatomical variant. This case report will be of interest to health care practitioners providing airway management via the nasal route for different populations.

This is a case report of an unanticipated difficult nasal intubation due to a prominent anterior tubercle of the first cervical spine vertebra (C1) resulting in aspiration of blood and hypoxemia following intubation and subsequent airway management of the rescheduled elective case. Nasal intubation is frequently used for airway management in patients undergoing oromaxillofacial surgical procedures. The specific difficulties in securing the airway for nasal intubation are described as well as the management strategies to circumvent this anatomical variant. This case report will be of interest to health care practitioners providing airway management via the nasal route for oromaxillofacial or other surgeries. Informed consent from the patient was obtained for this presentation.

CASE PRESENTATION

A healthy 17 year old female was scheduled for an elective Lefort procedure with bilateral sagittal split osteotomy re-

quiring a nasotracheal intubation. She took no medications and had no predictors of difficult direct laryngoscopy (DL) or bag-mask-ventilation (including Mallampati class 1, full neck range of motion, thyromental distance greater than three finger breadths, and normal body mass index). An intranasal vasoconstrictor (Xylo-metazoline) spray was used bilaterally prior to the induction of anesthesia and the nasal tube was lubricated. Nasotracheal intubation was attempted following denitrogenation and unremarkable induction of general anesthesia with fentanyl, propofol and rocuronium as muscle relaxant in standard induction doses. Bag-mask-ventilation was used without difficulty to ventilate the patient while the muscle relaxant took effect. Following this, difficulties were encountered during insertion of a lubricated 6.5 mm ID nasal RAE tube through the nostril with significant resistance being felt bilaterally. After several attempts, the tip of the nasotracheal tube (NTT) entered the nasopharynx and this was observed with direct laryngosco-

py. However, a large amount of blood was observed in the oropharynx. After suctioning the oropharynx, nasotracheal intubation was successfully and easily performed under direct vision using a # 3 Macintosh laryngoscope without any difficulties. This was able to be accomplished before the patient desaturated so bag-mask-ventilation was not used after the initial attempt at NTT placement.

Correct placement of the NTT was confirmed using end-tidal capnography, but on auscultation of the chest, there was a decrease in air entry on the right side. In addition, the oxygen saturation also decreased from pre-induction saturation of 100% to the around low 90s. The surgical procedure was put on hold to allow an intra-operative chest X-Ray which showed right upper lobe atelectasis consistent with aspiration of blood. A decision was made by the team that it was in the best interest of the patient to cancel the operation. Adequate time had elapsed for reversal of muscle relaxants and tracheal extubation took place in the operating room without any difficulties when the patient was awake and alert. She was subsequently admitted to the inpatient oro-maxillofacial service for an overnight observation. Since she was stable and her oxygen saturation gradually returned to normal on room air without intervention, she was discharged home after 24 hours observation. A review of the routine pre-operative lateral x-ray of the head and neck obtained for the first operation of the patient showed a prominent anterior tubercle on C1 (TC1).

The patient returned for her rescheduled operation 3 months later. There had been no change in her medical status in the interim. After placement of routine monitors, induction of anesthesia proceeded as per the previous attempt. Asleep flexible bronchoscopic intubation was not attempted at the discretion of the attending anesthesiologist. Once again, resistance was felt as the 6.5 mm ID nasal RAE tube was advanced through the right nostril. However, on this instance there was an appreciation of the prominent TC1. To facilitate the advancement of the tip of the NTT over the prominent TC1, the anesthesia practitioner placed the left index finger through the oral cavity into the nasopharynx and lifted the tip of the NTT over the prominent TC1 (Figure 1). The NTT was then advanced in-



Figure 1. To Facilitate the Advancement of the Nasotracheal Tube (NTT) over the Prominent Anterior Tubercle of C1 (TC1) under General Anesthesia, the Anesthesia Practitioner Placed the Left Index Finger through the Oral Cavity into the Nasopharynx and Lifted the Tip of the NTT over the Prominent TC1.

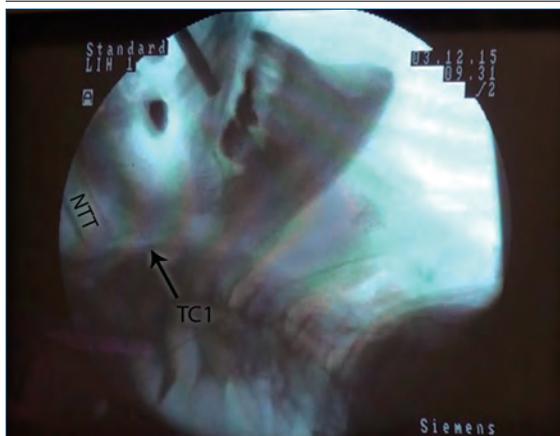


Figure 2. In this Simulation Study of Nasotracheal Intubation under Fluoroscopy using a Clinical Grade Cadaver, the Anesthesia Practitioner was unable to Advance the Tip of the NTT over the Prominent Anterior TC1.

to the tracheal using the light-guided technique with the Trachlight™ (1, 2) without any difficulties or complications. On inspection of the oropharynx following intubation, there was no sign of blood or mucosal damage. The surgical procedure was completed without any difficulties. Tracheal extubation and recovery of anesthesia were uneventful after the surgical procedure.

DISCUSSION

Epistaxis is a common complication of nasotracheal intubation with an incidence ranging from

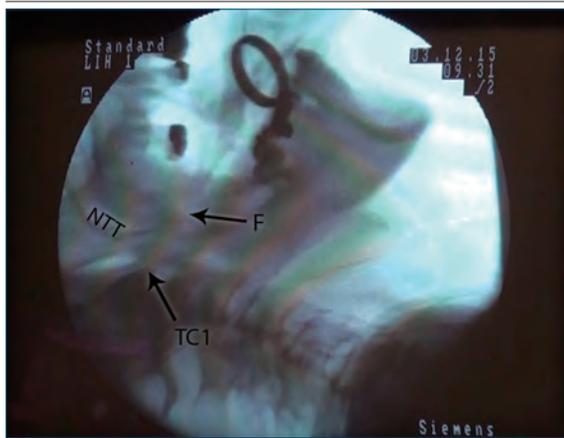


Figure 3. In this Simulation Study of Nasotracheal Intubation under Fluoroscopy Using a Clinical Grade Cadaver with a Prominent Anterior TC1, the Intra-orally Placed Index Finger (F) of the Anesthesia Practitioner was able to Lift the Tip of the NTT over the TC1.

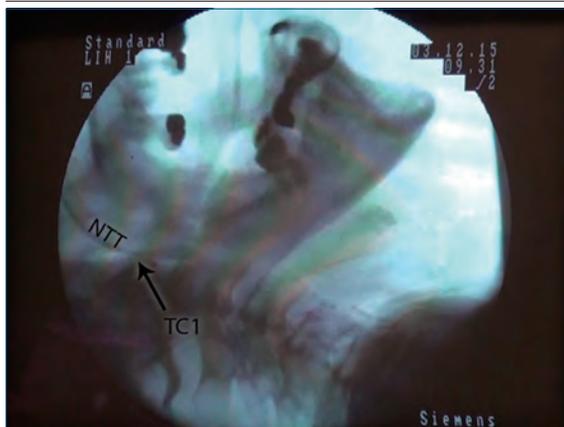


Figure 4. In this Simulation Study of Nasotracheal Intubation under Fluoroscopy using a Clinical Grade Cadaver with a Prominent Anterior TC1, the Finger-lifting Technique was able to Place the Tip of the NTT in the Nasopharynx Beyond the TC1.

10% to 80% (3). This can result in significant morbidity including aspiration and laryngospasm. A number of strategies have been suggested to potentially decrease the risk of epistaxis. These include immersing the NTT in a bottle of warm sterile water or saline (thermo-softening) to soften the tube prior to use (4, 5); the use of soft flexible nasotracheal tube (such as the Portex® Ivory PVC cuffed tube, Sims Portex Ltd., Kent, UK) (6); the use of a Parker-Flex tip ETT (7), application of a vasoconstricting nasal spray to the nasal mucosa prior to intubation (8); generous use of a lubricant to facilitate entry of the NTT through

the nose (9); telescoping the NTT through a red-rubber catheter (10); using the right nostril (11), preselecting the nare prior to placing the NTT using nasopharyngoscopy (12); and using a bronchoscope as an intubation guide (13). Other complications in addition to hemorrhage and inability to place the NTT are additionally possible including perforation of the pyriform fossa causing subcutaneous and/or mediastinal emphysema (14). Difficulty in advancing a NTT into the nasopharynx during nasal intubation may be associated with a number of anatomical variants, including septal deviations (12). But, difficulty in advancing the NTT into the nasopharynx secondary to the prominent anterior TC1 has not been reported in the past according to a PubMed search in August 2016. This is distinct from difficulties in advancing the NTT through the nasal cavity itself which would manifest as initial resistance, not resistance after several centimetres of advancement.

A number of methods may be used to circumvent the difficulty in advancing the NTT over the prominent TC1: 1) The method employed in this case. The left index finger (or the index finger of the non-dominant hand) of the practitioner can reach into the nasopharynx through the mouth in order to palpate the TC1 and then the tip of the NTT (Figure 1). The tip of the NTT can then either be lifted over the TC1 or pushed to one side and gently advanced past and into the oropharynx. These techniques can potentially be more effective than flexible bronchoscopy if epistaxis has occurred and there is blood in the airway. In one of our simulation teaching sessions using clinical grade cadavers at the Queen Elizabeth II Health Sciences Centre, we encountered a similar difficulty with one of the cadavers. The following series of figures obtained from the fluoroscopy during the nasotracheal intubation in the cadaver serve to illustrate the digital-lift technique used in our presented patient above. Figure 2 showed that the anesthesia practitioner was unable to advance the tip of the NTT over the prominent anterior TC1. Figure 3 showed that the intra-orally placed index finger of the anesthesia practitioner was able to lift the tip of the NTT over the TC1. Figure 4 showed that the tip of the NTT was placed in the nasopharynx beyond the TC1. 2) Insertion of a flexible atraumatic catheter through the nostril and into the nasopharynx before advancing the

NTT over the catheter. This includes a pediatric tube exchanger, urinary catheter, esophageal stethoscope or a cut nasogastric tube (15-20). The catheter can be advanced into the nasopharynx through a nasopharyngeal airway which can be removed prior to the passage of the NTT over the catheter. The NTT can then be easily advanced past the prominent anterior TC1. 3) The Endotrol® tracheal tube (Mallinckrodt, Hazelwood, MO) can be used to provide directional control of the tip of the tube to facilitate the advancement of the tip past the TC1. Finally, pre-operative review of the lateral x-ray could be a method that this issue could be anticipated.

CONCLUSIONS

Difficulties in advancing a nasotracheal tube into the nasopharynx can be associated with a

prominent TC1 as illustrated by this case presentation. Several simple maneuvers can be used to facilitate the advancement of the nasotracheal tube past a prominent anterior TC1. This can potentially avoid a difficult passage of the NTT which could result in a difficult or failed intubation, or complications such as epistaxis.

TAKE HOME MESSAGES

A prominent anterior tubercle of C1 may be associated with difficulty in the insertion of a nasotracheal tube through the nostril. To overcome this difficulty, the tip of the nasotracheal tube can be lifted over the anterior tubercle of C1 or pushed to one side by the intra-orally placed index finger of the non-dominant hand of the anesthesia practitioner.

No potential conflict of interest relevant to this article was reported.

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