Sudden Tachycardia Due to Submucosal Migration of an Epinephrine-Soaked Swab During Nasal Intubation

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A 23-year-old healthy man was scheduled for extraction of his mandibular third molars under general anesthesia with nasotracheal intubation. Sudden sinus tachycardia up to 170 beats/min occurred when applying an epinephrine solution-soaked swab into the nasal cavity for preventing epistaxis during intubation. This was presumably evoked by submucosal migration of the swab into a false passage created because of the force applied during a prior failed attempt at nasal passage of the tracheal tube, and rapid epinephrine absorption by the traumatized mucosa. The causes of the unexpected severe tachycardia in our patient are discussed.

Key Words: Epinephrine; Sinus tachycardia; Nasotracheal intubation; Submucosal dissection; Migration.

Nasal pretreatment with an epinephrine solution is an accepted technique for preventing epistaxis during nasotracheal intubation.^{1–3} Topical epinephrine used for this purpose normally has minimal hemodynamic effects in most patients.^{2,3} Recently, we encountered the sudden onset of severe tachycardia when applying a cotton swab soaked with epinephrine solution into the nasal cavities. We presume the tachycardia was evoked by submucosal migration of the epinephrine solution-soaked swab into the blind end of a false passage created by a prior failed attempt at nasal passage of the tracheal tube (TT).

CASE REPORT

A 23-year-old, 72-kg, male, American Society of Anesthesiologists (ASA) physical status 1 without significant medical history, was scheduled for removal of bilateral mandibular third molars under general anesthesia with nasotracheal intubation. His preinduction blood pressure was 123/76 mm Hg and heart rate

was 61 bpm. Anesthesia was induced with fentanyl 100 µg, propofol 120 mg, remifentanyl infusion 0.12 µg/kg/min, and rocuronium 50 mg.

To prevent epistaxis from intubation and to assess patency of both nasal passages, cotton swabs with a wooden stem and a head diameter of 10 mm, soaked with a mixture of a water soluble jelly lubricant and a few drops of a 0.02% epinephrine solution, were easily introduced into both nasal cavities, at which time the patient remained hemodynamically stable. However, a 7.5-mm internal diameter (ID) TT (Portex®, Ivory PVC, north facing, nasal profile soft seal cuff, polar preformed endotracheal tube; Smith Medical, Minneapolis, MN) could not be passed through both the nasal cavities because of resistance. We therefore introduced the swab into both cavities again (within approximately 1 minute of the first swab application) without resuming mask ventilation or additional propofol administration, slowly manipulating the swab back and forth to re-check the nasal passage and provide further lubrication for the next attempt. However, immediately after the second swab application, his heart rate rapidly rose to 170 bpm with sinus rhythm, and his blood pressure increased to 170/114 mm Hg. Landiolol 30 mg,⁴ an ultra-short acting β-blocker, was given and desflurane inhalation with mask ventilation was commenced for a few minutes. After obtaining hemodynamic stability, we again unsuccessfully attempted intubation of both nasal passages with a 7.0-mm ID TT. Then, we attempted manual ventilation through the TT, which had been advanced into the right nasal cavity until resistance was

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met, with manual occlusion of the mouth and nose by an assistant. No effective ventilation could be established due to rigid resistance. Immediate digital examination revealed the submucosally migrated distal tip of the TT that was palpable as a bulge on the posterior nasopharyngeal wall just behind the right posterior naris. The TT was removed and the lungs were manually ventilated again via a facemask.

We then prepared a 12-Fr, 56-cm long suction catheter, of which the 3.5-cm long connector portion was cut and removed. The catheter was easily inserted into the oral cavity via the left naris and its distal end was pulled out from the mouth. Next, a 6.5-mm ID Portex Nasal TT (RAE-type design), which was shortened by cutting 10 cm from the proximal end, was smoothly passed through the left nasal cavity under catheter guidance. Finally, the TT was successfully advanced into the glottis using McGill forceps under indirect visualization using a McGrath MAC[®] video-laryngoscope. The subsequent surgery and postoperative course were uneventful.

DISCUSSION

In the presented case, a healthy young man developed unexpected and remarkable sinus tachycardia following a second application of topical epinephrine, but not after the first application, during nasotracheal intubation. Our most likely explanation is that the initial intubation attempt presumably caused traumatic dissection of the nasopharyngeal mucosa,^{1,5} with formation of a false but firm blind passage from the right nostril to the posterior nasopharyngeal submucosa. The second swab for additional epinephrine application easily tracked along this false passage. This smooth tracking made us feel that the swab had passed through the nasal cavity. The second intubation attempt via the right nostril also tracked into the same false passage. Therefore, ventilation through the TT could not be achieved at all, which triggered awareness of the possibility of TT tip migration for the first time, and which was promptly confirmed by digital examination.

Application of topical epinephrine to the injured vessel-rich submucosa compared with the intact mucosa would have resulted in rapid systemic absorption of the epinephrine. The damaged submucosa would also have been more sensitive to the mechanical nociceptive stimulus of swab insertion than intact mucosa. Thus, we speculate that rapid epinephrine absorption and additional mucosal sensitivity to mechanical stimulation evoked the higher than expected tachycardic response.

There are other factors that could possibly have contributed to the development of the extreme tachy-

cardia. First, the depth of anesthesia might have been insufficient during the second swab application because no additional anesthetics were given prior to the application. Second, inadequate mixing of the lubricant and epinephrine solution might have resulted in a nonhomogeneous lubricant-epinephrine mixture, which could have led to a higher epinephrine concentration in the second application. Nevertheless, we still believe that submucosal migration of the swab was the most likely cause of the tachycardic episode.

Our experience also highlights the utility of a suction catheter as a guiding tool for preventing further mucosal injury during nasotracheal intubation, which enabled us to achieve less-traumatic intubation via the contralateral nostril. The usefulness of almost identical methods using a nasogastric tube has been reported elsewhere.^{6,7} Since the suction catheter used for tracheobronchial toilet in our routine clinical practice has insufficient length for this purpose, the TT was cut and shortened to facilitate intubation by this method. Since the connector portion of the catheter might cause friction against the inside of the TT, that portion was also cut and removed.

In conclusion, we report a case of the sudden onset of severe tachycardia during nasotracheal intubation. The tachycardia was assumed to be triggered by submucosal migration of an epinephrine-soaked swab.

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