CASE REPORT

Prevention of Dental Damage and Improvement of Difficult Intubation Using a Paraglossal Technique With a Straight Miller Blade

Yu-Feng Huang, Chien-Kun Ting, Wen-Kuei Chang, Kwok-Hon Chan, Pin-Tarng Chen*

Department of Anesthesiology, Taipei Veterans General Hospital, and National Yang-Ming University School of Medicine, Taipei, Taiwan, R.O.C.

Patients with diseased teeth, or those who are difficult to intubate, have a higher risk of dental injury during laryngoscopy. We report 3 cases of smooth endotracheal intubation using a paraglossal technique with a straight Miller blade in patients with poor dentition. Three patients with poor dentition were scheduled to undergo surgery under general anesthesia. All patients presented with extremely loose upper central incisors and had lost the other right upper teeth, while micrognathia and prominent, loose upper incisors were noted in 1 case. We elected to use a straight Miller blade using a paraglossal approach. A nasopharyngeal airway was inserted after induction of general anesthesia to facilitate mask ventilation and prevent air leakage from the mask. The Miller blade was then inserted from the right corner of the mouth, avoiding contact with the vulnerable incisors, and advanced along the groove between the tongue and tonsil. The endotracheal tube was subsequently smoothly inserted after obtaining a grade 1 Cormack and Lehane view without dental trauma in all 3 cases. Direct laryngoscopy using the paraglossal straight blade technique avoids dental damage in patients with mobile upper incisors and no right maxillary molars. It is a practical alternative method that differs from the traditional Macintosh laryngoscope in patients with a high risk of dental injury during the procedure. This technique, which provides an improved view of the larynx, might also be helpful with patients in whom intubation is difficult. [*J Chin Med Assoc* 2010;73(10):553–556]

Key Words: dental trauma, difficult intubation, laryngoscope, Miller blade, paraglossal technique

Introduction

Endotracheal intubation is crucial in cases that require general anesthesia and airway management during resuscitation. Many serious complications are associated with endotracheal intubation, such as hypoxemia, soft tissue damage to the pharynx and esophagus, and dental damage. Dental damage, including subluxation, fracture, and avulsion of teeth, has been reported to be the most frequent cause of complaints against anesthesiologists.[1] Diseased teeth are at particularly high risk, but healthy teeth can also be injured. We report a successful endotracheal intubation using a paraglossal straight blade technique in 3 patients with poor dentition.

Case Reports

Case 1

A 72-year-old woman with a medical history of hypertension presented with a change in bowel habits and tenesmus for several months. Colonoscopy revealed a mass approximately 5 cm in size located in the sigmoid colon, which was biopsied, and adenocarcinoma was diagnosed according to the pathology report. Surgical resection of the colon cancer under general anesthesia was proposed.

During the preanesthesia evaluation, the patient's poor dentition was noted. Figure 1 shows a photograph that was taken while she was unconscious after induction of general anesthesia. Severe periodontitis

*Correspondence to: Dr Pin-Tarng Chen, Department of Anesthesiology, Taipei Veterans General Hospital, 201, Section 2, Shih-Pai Road, Taipei 112, Taiwan, R.O.C.
E-mail: ptchen@vghtpe.gov.tw • Received: March 3, 2010 • Accepted: May 24, 2010

Figure 1. Poor dentition in Case 1. Severe periodontitis over the upper central incisors with gingival recession and reduced bony support of the roots resulted in extremely mobile teeth. With the exception of the incisors, the right maxillary teeth had been lost.

over the upper central incisors with gingival recession and reduced bony support of the roots had resulted in extremely mobile teeth, and with the exception of the incisors, the right maxillary teeth had been lost.

Fearing damage to the patient's significantly loose teeth if the Macintosh technique using a curved laryngoscope blade was adopted, a paraglossal technique using a straight blade (size 2 Miller blade) for endotracheal intubation was used instead (Figure 2).[2] General anesthesia was cautiously induced with intravenous atropine 0.5 mg, fentanyl 150 μg, propofol 120 mg and rocuronium 50 mg. Mask ventilation was achieved with a #7.0 nasopharyngeal airway inserted via the left nostril without leakage from the mask. The size 2 Miller blade was then inserted from the right corner of the mouth after mask ventilation for 2 minutes and removal of the nasopharyngeal airway. The blade was then advanced along the groove between the tongue and tonsil using leftward and anterior pressure to displace the tongue to the left of the laryngoscope. After the epiglottis was identified, the tip of the blade was passed posterior to the epiglottis, and the glottic opening became visible when a grade 1 Cormack and Lehane view was obtained. An assistant then retracted the corner of the mouth laterally on the cheek and the laryngoscope remained lateral to the tongue while the endotracheal tube (ETT) was inserted into the trachea. The procedure was completed uneventfully without dental injury.

Case 2

A 56-year-old man with no underlying medical disease presented with gallbladder stones, which had been diagnosed during an episode of acute cholecystitis 2 months

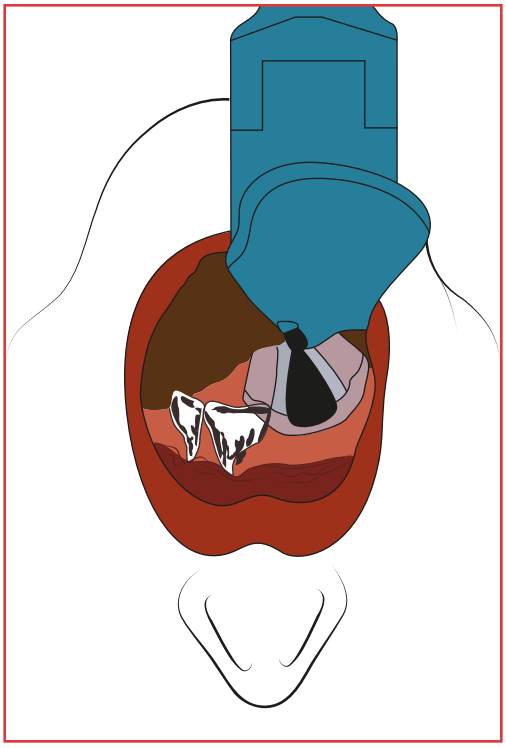

Figure 2. Direct laryngoscopy using the paraglossal straight blade technique in Case 1. The drawing shows that a size 2 Miller blade was inserted from the right-hand side of the mouth and a grade 1 Cormack and Lehane larynx view was obtained. An endotracheal tube was then inserted by the paraglossal straight blade technique without dental damage.

previously. He was also found to have extremely loose upper central incisors and had lost the other right upper teeth. After adequate preoxygenation, intravenous general anesthetics were injected for induction, and a #7.5 nasopharyngeal airway was inserted to facilitate mask ventilation. The paraglossal straight blade technique with a size 3 Miller blade for direct laryngoscopy was used for endotracheal intubation, which proceeded smoothly without complications.

Case 3

A 76-year-old man with a previous surgical history of instrumentation and fixation over the lumbar spine for spinal stenosis presented with bilateral knee pain of a few years' duration. He was scheduled to undergo right total knee arthroplasty under spinal anesthesia, and multiple attempts at spinal anesthesia had been made but had failed due to previous surgery. Thus, general anesthesia was required, but intubation was considered difficult as micrognathia and prominent, loose upper incisors were noted. The patient had also lost his right maxillary canine, premolars and molars (Figure 3). The soft palate and base of the uvula were found to be Mallampati class 3 when the patient opened his mouth.

Figure 3. Micrognathia and poor dentition in Case 3. Micrognathia with over-riding upper central teeth and no premolars and molars were observed.

To prevent dental injury and overcome difficult intubation, we decided to use the paraglossal straight blade technique with a size 2 Miller blade for direct laryngoscopy. General anesthesia was induced cautiously and mask ventilation was maintained during insertion of a #7.5 nasopharyngeal airway. The patient was intubated smoothly after obtaining a grade 1 Cormack and Lehane view.

Discussion

Airway management is an important issue in daily clinical practice, and endotracheal intubation in adults is presently almost exclusively achieved using the curved laryngoscope blade introduced by Macintosh in 1943.[3] Laryngoscopy for endotracheal intubation was first performed using a straight laryngoscope, which remains the diagnostic and therapeutic laryngoscope favored by otolaryngologists. The Miller laryngoscope was introduced in 1941 for endotracheal intubation[4] and the paraglossal approach was described by Magill in 1930,[5] but currently, both are seldom used or taught. Many studies have reported successful endotracheal intubation with a straight laryngoscope in patients not able to be intubated using a Macintosh laryngoscope.[6] The straight laryngoscope is of particular value in patients with laryngeal lesions or a hypoplastic mandible; it is also useful in patients with awkward dentition[7] or a floppy epiglottis.[8]

Perioperative dental damage is one of the most common anesthesia-related adverse events and is responsible for the greatest number of malpractice claims against anesthesiologists.[9–12] Warner et al[13] analyzed dental injuries in 598,904 consecutive cases and found that the upper incisors were the most commonly involved teeth, and most injuries were crown fractures and partial dislocations and dislodgments. Patients most at risk of perianesthetic dental injury include those with preexisting poor dentition who have 1 or more risk factors of difficult laryngoscopy and endotracheal intubation.[13] In another case-control study, patients with poor dentition or reconstructive work whose tracheas were moderately difficult or difficult to intubate were found to be at much higher risk (approximately 20-fold) of dental injury than those with good dentition who were easy to intubate.[14]

The first priority of airway management in these cases is to ensure adequate mask ventilation, as difficult mask ventilation is common to edentulous patients owing to air leakage from the mask.[15] Therefore, we advocate the use of a nasopharyngeal airway to assist mask ventilation in patients with missing teeth.

Avoiding collision with vulnerable incisors is the best way to prevent dental damage. There are many different devices and methods for airway management. With regard to alternatives in intubation instruments, the curved blades of both the Macintosh laryngoscope and videolaryngoscopes (such as GlideScope) are wider than the Miller blade, causing teeth avulsion to be more likely in patients with poor dentition. Furthermore, the traditional midline approach is needed to view the glottis when using the Macintosh blade, which carries a great risk of trauma to the incisors in these patients. Although cautious laryngoscopy by an experienced anesthesiologist might prevent such a complication, it is usually a troublesome issue in these patients. Laryngoscopy should be performed with great caution and the tension increased to minimize dental trauma during endotracheal intubation. Fiberoptic nasal intubation while sedated or awake is another alternative to prevent dental trauma in these patients, but more instruments and greater experience are required for this procedure. In the laryngeal mask airway procedure, the airway tube is also wide, meaning that damage of these vulnerable teeth can easily occur during insertion, fixation and removal of the laryngeal mask airway.

In our cases, the right maxillary molars were noted to be missing during preanesthesia evaluation. We hypothesized that this might provide an easier and safer space in which to insert the blade of a laryngoscope, avoiding contact with the incisors by insertion into the space via the right upper mouth angle. After considering all the factors involved in airway management, we chose the paraglossal straight blade technique as a safe and comfortable intubation method.[2] Using this method, the laryngoscope was in a paraglossal position and the ETT was inserted into the mouth from

the lateral aspect. The ETT was then directed underneath the laryngoscope blade, and its natural curvature brought it back up towards the vocal cords as it was advanced.

A previous report showed that the paraglossal straight blade technique was used successfully in 10 cases of unexpected difficult endotracheal intubation using the Macintosh laryngoscope blade when the larynx could not be seen.[2] The improved view obtained with this technique was considered a consequence of reduced tongue compression, which led to both an improved line of sight and to a reduced risk of backward displacement of the tongue and epiglottis. In another study by Achen et al,[16] direct laryngoscopy using a Miller blade in a paraglossal approach was found to afford a much-improved view of the larynx in the majority of cases. Arino et al[17] also reported that the laryngoscopic views obtained using Belscope and Miller laryngoscopes were better than those achieved with other types of laryngoscope.

Previous studies have investigated the paraglossal straight blade technique[2,16] in patients in whom the right maxillary molars are still present. The lack of the right maxillary teeth in our cases provided more space for insertion of the blade. Achievement of the required view using the paraglossal technique required only 1 attempt in all cases, even in Case 3, in whom poor dentition with micrognathia of Mallampati class III were noted before induction, and difficult intubation with a high risk of dental trauma was expected. A grade 1 Cormack and Lehane view was obtained in this case using the technique described, and all ETTs were advanced without difficulty. We advocate the use of the paraglossal straight blade technique as a helpful intubation method in cases in which the right maxillary teeth are missing. In the cases reported here, we chose to use sizes 2 and 3 Miller straight blades, because although a size 4 Miller straight blade has been used in some studies,[16] we believe that the smaller size blades are large enough for use in Asian patients.

Airway management is crucial in cases of resuscitation. In addition to anesthesiologists, other physicians need to be able to perform endotracheal intubation in patients with poor dentition outside of the operating theater, and the rate of dental trauma is higher in ordinary wards because of a lack of experience of physicians and resources. The paraglossal straight blade technique provides a useful method of preventing dental damage by avoiding collision with vulnerable incisors and can be generalized for ordinary use.

In conclusion, direct laryngoscopy using the paraglossal straight blade technique enables prevention of dental damage in patients with mobile upper incisors and no right maxillary molars. This is a practical method, which differs from traditional laryngoscopy, and can be used in patients who are difficult to intubate; it can also improve the view of the larynx.

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References

1. Henderson J. Airway management in the adult. In: Miller RD, ed. *Miller's Anesthesia,* 7th edition. New York: Churchill Livingstone, 2009:1604.
2. Henderson JJ. The use of paraglossal straight blade laryngoscopy in difficult tracheal intubation. *Anaesthesia* 1997;52: 552–60.
3. Macintosh RR. New inventions. A new laryngoscope. *Lancet* 1943;1:205.
4. Miller RA. A new laryngoscope. *Anesthesiology* 1941;2:317–20.
5. Magill IW. Technique in endotracheal anesthesia. *Br Med J* 1930; 2:817–9.
6. Henderson JJ. Questions about the Macintosh laryngoscope and technique of laryngoscopy. *Eur J Anaesthesiol* 2000;17:2–5.
7. Benumof JL. Difficult laryngoscopy: obtaining the best view [Editorial]. *Can J Anesth* 1994;41:351–5.
8. King TA, Adams AP. Failed tracheal intubation. *Br J Anaesth* 1990;65:400–14.
9. Givol N, Gershtansky Y, Halamish-Shani T, Taicher S, Perel A, Segal E. Perianesthetic dental injuries: analysis of incidence reports. *J Clin Anesth* 2004;16:173–6.
10. Owen H, Waddell-Smith I. Dental trauma associated with anesthesia. *Anaesth Intensive Care* 2000;28:133–45.
11. Cass NM. Medicolegal claims against anaesthetists: a 20 year study. *Anaesth Intensive Care* 2004;32:47–58.
12. Yasny JS. Perioperative dental considerations for the anesthesiologist. *Anesth Analg* 2009;108:1564–73.
13. Warner M, Benenfeld S, Warner M, Schroeder D, Maxson P. Perianesthetic dental injuries: frequency, outcomes, and risk factors. *Anesthesiology* 1999;90:1302–5.
14. Newland MC, Ellis SJ, Peters KR, Simonson JA, Durham TM, Ullrich FA, Tinker JH. Dental injury associated with anaesthesia: a report of 161,687 anaesthetics given over 14 years. *J Clin Anesth* 2007;19:339–45.
15. El-Orbany M, Woehlck HJ. Difficult mask ventilation. *Anesth Analg* 2009;109:1870–80.
16. Achen B, Terblanche OC, Finucane BT. View of the larynx obtained using the Miller blade and paraglossal approach, compared to that with the Macintosh blade. *Anaesth Intensive Care* 2008;36:717–21.
17. Arino JJ, Velasco JM, Gasco C, Lopez-Timoneda F. Straight blades improve visualization of the larynx while curved blades increase ease of intubation: a comparison of the Macintosh, Miller, McCoy, Belscope and Lee-Fiberview blades. *Can J Anesth* 2003;50:501–6.