Paraglossal straight blade intubation in syndromic children

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Syndromic children have an increased association with difficult airways, which may lead to difficulties and dangers even when anticipated and planned for. Hypoxia, with its risk of brain injury, cardiac arrest and even death, may follow induction of anaesthesia with subsequent airway management failure. Video-assisted devices have helped significantly with the management of difficult airways in children; however, these devices are not always available and have their own limitations. An alternative approach to the difficult airway, although seldom used, is the paraglossal straight blade approach. This technique, originally described by Jackson and Magill and later modified by Henderson, has successfully been used in both the paediatric and adult populations for the management of a difficult airway. The paraglottal intubation technique has frequently been used for successful intubation in Pierre Robin syndrome and cleft palate surgery, but only isolated case reports are available to indicate its effectiveness in other abnormalities such as tongue tie, macroglossia, arthrogryposis multiplex congenita, Treacher Collins syndrome and glossopalatine ankylosis.

Keywords: intubation in syndromic children, paraglossal intubation, straight blade intubation, syndromic children

Introduction

Syndromic children have an increased association with difficult airways, which may lead to difficulty in achieving intubation. Hypoxia, with its risk of brain injury, cardiac arrest and even death, may follow induction of anaesthesia with subsequent airway management failure.

The Macintosh laryngoscopy technique is usually atraumatic and gives a good view of the glottis. Because it is easy to use in most patients, if any difficulties arise during laryngoscopy the user is likely to believe that any problems encountered must be the fault of the patient or the user, and not the technique being used.

The high success rate associated with midline Macintosh laryngoscopy may lead to complacency regarding the role of alternative laryngoscopy blades and techniques, with consequent failure to develop skill in their use.

Video-assisted devices have helped significantly with the management of difficult airways in children, but these devices are not always available and have their own limitations. An alternative approach to the difficult airway using readily available equipment is the paraglossal straight blade approach.

Paraglossal intubation technique

For a right paraglossal laryngoscopy, a Miller or equivalent straight blade is passed from the right corner of the mouth. The blade is inserted at the far right-hand corner of the mouth and passed along the groove between the tongue and the tonsillar bed, as seen in Figure 1.

Anterior and leftward lift is used to keep the tongue out of the line of vision. The blade tip is moved towards the midline and the blade is advanced on the right side of the tongue to its base. Advancement will lead to visualisation of the glottis. The tip of the blade is passed posteriorly to the glottis. With subsequent direct anterior lift of the glottis, the vocal cords can be visualised as seen in Figure 2.

In most patients the proximal part of the blade can then be moved towards the midline whilst keeping the distal tip in place. This will displace the tongue even more and lead to a wider view of the vocal cords. If the larynx cannot be properly visualised, it might be helpful to rotate the head to the left.

For a left paraglossal laryngoscopy, a Miller or equivalent straight blade is passed from the left corner of the mouth. The same technique and manoeuvres are applied as for the right paraglottal laryngoscopy, with the exception of the retraction of the corner of the mouth. Rotation of the head to the right might improve laryngeal visualisation.

Paraglossal straight blade intubation can be particularly helpful in children where the second molar has not yet erupted. This will provide an unobstructed window for the ETT to be passed retro-molarly. The first permanent molar eruption happens at the age of 6 years with the second permanent molar eruption usually by the age of 12 years. Even after the eruption of the permanent first and the second molars, it has been shown that an ETT placed retro-molarly will not be obstructed with centric occlusion.

Theoretical basis of the improved view

The view of the larynx depends on achieving a line-of-sight from above the prominent part of the maxilla to the larynx. This is known as the anterior airway line.

The anterior airway line is determined by the relationship between three factors:

1. The anatomy of the larynx itself;
2. The ability of the laryngoscope to displace the tongue out of the line of view – conventional curved blades work by
displacing the tongue to one side, but will also displace some of the tongue muscle bulk into the submandibular space;

(3) The most prominent part of the maxilla – depends on the maxillary and dental anatomy.

Table 1 summarises the mechanisms that are responsible for the improved laryngeal view with the paraglossal approach and the use of a straight blade.

| Mechanism* | Contribution of the paraglossal technique | Contribution of a straight blade |
|------------|------------------------------------------|---------------------------------|
| Central compartment of the line of sight | Reduces tongue compression when the blade is inserted on the side of the tongue | Reduced bulk of a Miller blade decreases soft tissue compression. This translates into a 30% decrease in lifting force needed compared with a Macintosh blade. |
| Lowering the proximal end of the line of sight | Blade inserted lateral to the incisors, thereby avoiding space occupation by large central incisors, a small submandibular space and a large tongue | No curvature to obstruct the glottic view (compared with a Macintosh blade). |
| Distance to glottis opening | Shorter distance compared to the conventional midline technique | Neck extension will improve view with a straight blade. |

*The first two mechanisms decrease the extent of soft tissue compression.
and conventional midline Macintosh technique in adults. These patients had no features that might indicate a possible difficult airway. Unfortunately, there are no equivalent trials for the paediatric population.

Pierre Robin syndrome

The basis for airway obstruction in Pierre Robin syndrome is micrognathia, retrognathia and glossoptosis. These abnormalities can also be accompanied by a cleft palate in up to 50% of patients. Because of this combination of facial abnormalities, conventional midline laryngoscopy is often unsuccessful and can cause soft tissue trauma. The efficacy of paraglossal straight blade laryngoscopy was shown in a series of neonates with severe Pierre Robin syndrome undergoing elective glossopy. Further case reports have also demonstrated the efficacy of paraglossal laryngoscopy in this subset of patients.

Cleft palate

A paraglossal approach will help to prevent some of the difficulties encountered during airway management in patients with orofacial cleft abnormalities. One of the commonest obstacles encountered during laryngoscopy is the body of the Macintosh blade slipping into the midline defect and causing iatrogenic tissue trauma. A left paraglossal technique has been demonstrated to improve intubation conditions in children with bilateral cleft palates.

Table 3 summarises case reports where paraglossal laryngoscopy has been beneficial in obtaining an improved laryngeal view.

Table 2: Comparative laryngeal views of paraglossal and midline approaches

| Authors* | Study design | Result | Statistical significance |
|----------|--------------|--------|-------------------------|
| Reiterer et al. | Randomised crossover study of 100 adult patients Both approaches used on the same patient | Details not accessible | Retromolar technique achieved lower Cormack-Lehane scores compared with the conventional technique (p < 0.0001) |
| Jindal et al. | Randomised controlled trial of 140 patients randomly divided into the paraglossal or conventional group | Cormack-Lehane grade 1 view in 68 patients (97.1%) with the paraglossal approach compared with 47 patients (67.1%) in the conventional group | Paraglossal approach improves the glottic visualisation compared with midline Macintosh approach (p = 0.02) |
| Achen et al. | Randomised controlled trial of 161 adult patients randomly divided into the Macintosh or Miller group | Cormack-Lehane grade 1 in 96.5% with the paraglossal approach compared with 85% in the conventional group | Direct laryngoscopy using the Miller blade and paraglossal approach results in much improved view of the larynx in the majority of cases (p = 0.02) |
| Yamamoto et al. | Comparative series of 1 015 adult patients After a difficult airway was identified, both left and right molar approaches were evaluated | Difficult laryngoscopy with a midline approach encountered in 66 cases Left molar approach decreased this to 7 cases Right molar approach decreased this to 18 cases | Difficult laryngoscopy encountered with a conventional midline position was improved with a left > right paraglossal technique (p < 0.05) |
| Bozdogan et al. | Comparative series of 1 386 adult patients After a difficult airway was identified, the left molar laryngoscopy was also evaluated | 20 patients were identified with a Cormack-Lehane view grade 3–4 In 18 patients the laryngeal view improved with the paraglossal approach | Left molar laryngoscopy can make unexpected difficult intubation easier (p < 0.01) |

*Operator bias could not be eliminated in these studies.

Table 3: Case reports where paraglossal laryngoscopy has been beneficial

| Authors | Clinical setting | Technique used | Experience |
|---------|------------------|----------------|------------|
| Ahlawat et al. | Absolute macroglossia in a 6-year-old boy | Left paraglossal laryngoscopy with a Macintosh blade | External laryngeal manipulation needed to improve view |
| Mittal et al. | Lymphangioma/cystic mass of the tongue in a 24-day-old neonate | Right paraglossal laryngoscopy with a Macintosh blade | Unsuccessful intubation with conventional midline laryngoscopy |
| Asthana et al. | Arthrogryposis multiplex congenita in a 5-year-old girl | Right paraglossal laryngoscopy with an unspecified straight blade | Cormack-Lehane grade 3 on conventional midline approach Successful intubation with the paraglossal approach |
| Mukharjee et al. | Glossopalatine ankylosis in a 7-day-old girl | Right paraglossal laryngoscopy with a Miller blade | Significant improvement in the glottic view compared with the initial conventional midline approach |
| Jain et al. | Second stage palatal fistula repair in a 7-year-old boy | Right paraglossal laryngoscopy with a Miller blade | Successful intubation after numerous failed attempts at blind nasal intubation |
| Agrawal et al. | Treacher Collins syndrome in a 9-year-old boy with tonsillar hypertrophy | Right paraglossal laryngoscopy with an unspecified straight blade | Cormack-Lehane grade 3 glottic view with a midline Macintosh blade Improved to a grade 2 view with paraglossal straight blade technique |
| Kose et al. | Walker–Warburg syndrome in a 2-month-old boy | Right paraglossal laryngoscopy with a Miller blade | Cormack-Lehane grade 4 glottic view with a midline approach – curved blade unspecified View improved with paraglossal straight blade approach; however, a blind intubation was required |
Prevention of dental injuries

Poor or abnormal dentition is regularly encountered in syndromic children, making them vulnerable to dental trauma. The paraglossal straight blade approach reduces the tendency to lever on the maxillary dentures in order to achieve a view of the larynx (a practice often encountered with midline Macintosh laryngoscopy, particularly amongst inexperienced laryngoscopists); this may reduce the likelihood of iatrogenic dental injury.

Conclusion

Although the paraglossal laryngoscopy technique is well described in the airway management of Pierre Robin syndrome and cleft palate surgery, only isolated case reports are available to indicate its effectiveness in the airway management of other syndromes or children with syndromic features that are associated with difficult endotracheal intubation.

There is insufficient evidence to suggest that the paraglossal straight blade intubation is the answer to every scenario of difficult endotracheal intubation. However, this technique does seem capable of overcoming most of the obstacles that are frequently encountered during difficult intubations. Its use of readily available simple airway equipment makes widespread application of this technique possible.

This technique should regularly be practised on normal, uncomplicated airway anatomy before it is used in the difficult, sometimes emergency scenario.

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References

1. Henderson JJ. The use of paraglossal straight blade laryngoscopy in difficult tracheal intubation. Anaesthesia. 1997;52:552–560.
2. Arora S, Rattan V, Bhardwaj N. An evaluation of the retromolar space for oral tracheal tube placement for maxillofacial surgery in children. Anesth Analg. 2006;103(5):1122–1125.
3. Hastings RH, Hon ED, Nghiem C, et al. Force and torque vary between laryngoscopists and laryngealoscope blades. Anesth Analg. 1996;82:462–468.
4. Walker RWM, Ellwood J. The management of difficult intubation in children. Pediatr Anesth. 2005;19(1):77–87.
5. Henderson JJ. Solutions to the problem of difficult tracheal tube passage associated with the paraglossal straight laryngoscopy technique. Anaesthesia. 1999;54:601–602.
6. Ali MG, Charters P. Alternative techniques for tracheal intubation. Anaesth Intens Care Med. 2008;9(7):286–289.
7. Reiterer C, Waltl B, Kabon B. Retromolar laryngoscopy: a randomized crossover vocal cords visualization study. Minerva Anestesiologica. 2017;83(8):798–803.
8. Yamamoto K, Tsukobawa T, Ohmura S, et al. Left-molar approach improves the laryngeal view in patients with difficult laryngoscopy. Anesthesiology. 2000;92:70–74.
9. Jindal P, Khurana G, Gupta D. Can paraglossal approach be an effective alternative to the conventional laryngoscopy in routine anesthestic practice – A comparative study. J Anesth Clin Res. 2014;5:1–4.
10. 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 IntensCare. 2008;56:175–178.
11. Bozdogan N, Sener M, Bilen A, et al. Does left molar approach to laryngoscopy make difficult intubation easier than the conventional midline approach? Eur J Anaesth. 2008;25:681–684.
12. Semjen F, Bordes M, Cros A-M. Intubation of infants with Pierre Robin syndrome: the use of the paraglossal approach combined with a gum-elastic bougie in six consecutive cases. Anaesthesia. 2008;63:147–150.
13. Sonwane RB, Patil TS, Jewalkar S, et al. Airway management for Pierre Robin sequence: An anesthetic challenge. Ann Interv Dent Res. 2017;3(2):5–8.
14. Sen I, Kumar S, Bhardwaj N, et al. A left paraglossal approach for oral intubation in children scheduled for bilateral orofacial cleft reconstruction surgery – a prospective observational study. Pediatr Anesth. 2009;19:159–163.
15. Ahlawat G, Saini S, Kumar V, et al. Molar approach intubation: A good choice for macroglossia. Int J Health Sci Res. 2016;6(6):428–430.
16. Mittal A, Dwivedi Y, Joshi K, et al. Molar approach of intubation in a neonate with large intraoral swelling. Indian J Anaesth. 2011;55(3):312–313.
17. Asthana V, Jindal P, Mehrotra S, et al. Anaesthetic management of a child with arthrogryposis multiplex congenital. Anaesth Crit Care Med J. 2016;1(3):1–3.
18. Mukharjee S, Mitra D, Sen A, et al. Intubation of a neonate with glosso-palatine ankylosis using a paraglossal approach and a laryngoscope with a straight blade. S Afr J Anaesth Analg. 2014;20(5):218–219.
19. Jain R, Bhandari P. Palatal fistula repair by tongue flap – A challenge to anaesthesiologist. Indian J Clin Anaesth. 2016;3(4):640–642.
20. Agrawal S, Asthana V, Sharma J, et al. Alternative intubation technique in a case of Treacher Collins Syndrome. Internet J Anaesthesiology. 2005;11:1–8.
21. Rose EA, Bakar B, Ates G, et al. Anaesthesia for a child with Walker-Warburg syndrome. Rev Bras Anesthesiologia. 2014;64(2):128–130.

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