Management of the Difficult Paediatric Airway with a Simple Fiberoptic-Assisted Laryngoscope: A Report of Two Cases with Pierre Robin and Patau's (Trisomy 13) Syndrome

Alper Kılıçaslan¹, Atilla Erol¹, Ahmet Topal¹, Tayfun Et², Şeref Otelcioğlu¹

¹Department of Anaesthesiology and Reanimation, Necmettin Erbakan University Faculty of Medicine, Konya, Turkey

²Clinic of Anaesthesiology and Reanimation, Karaman State Hospital, Karaman, Turkey

Airway management of children with congenital craniofacial anomalies is a challenge for paediatric anaesthesiologists. We do not have any video-assisted airway device in our department for difficult paediatric intubations. We decided to attach a regular fiberoptic (outer diameter; 3.7 mm, Karl Storz, Germany) scope to a conventional Macintosh Laryngoscope (size 1). We describe two cases of Pierre Robin and Patau's (Trisomy 13) syndrome successfully intubated with a fiberoptic-assisted laryngoscope (FOL). A fiberoptic scope and any size of a laryngoscope blade can be easily assembled in the operating room. The FOL may be a useful device in the setting of difficult paediatric intubation.

Key Words: Paediatric difficult airway, video laryngoscope, equipment, Pierre Robin syndrome, Patau's syndrome (trisomy 13)

Introduction

Patients with Pierre Robin syndrome, which presents with craniofacial anomalies, also have airway obstructions and a difficult airway (1). It is known that difficult intubation can develop in patients with Patau syndrome (trisomy 13), who have various congenital malformations and facial dysmorphism due to chromosomal defects (2). Since the functional residual capacity of paediatric patients is low, it can lead to unsuccessful intubation, hypoxemia, bradycardia and even cardiac arrest (3). Airway management of paediatric patients with congenital craniofacial anomalies is a challenge for anaesthesiologists, and special equipment and techniques can be required for providing airway safety in these patients. Although many airway instruments are available for difficult airway management of adults due to the advantage of size, the devices that can be used for paediatric patients are restricted (3, 4).

We do not have video laryngoscopic or fiberoptic imaging that can be used for challenging airway management of paediatric patients in our operating room. There is a fiberoptic (FO) bronchoscope (outer diameter; 3.7 mm, Karl Storz, Germany) that is not suitable for endotracheal tubes (inner diameter; <4 mm) used for newborn and infant patients. We decided to attach this fiberoptic bronchoscope to a conventional Macintosh laryngoscope blade (no: 1) in order to scan children's airways. First of all, the light source and its housing on the blade were removed. A plastic pipe (adaptor providing connection of an aspirator hose and aspiration catheter) was cut in fitting length and attached to the blade. The end of the FO was passed through this pipe and placed into the light source gutter on the blade (Figure 1).

This study presents two cases in infancy and newborn age, whose challenging airway management was conducted successfully by using a fiberoptic-assisted laryngoscope (FOL).

Case Presentations

In the preoperative period, the parents of the patients were informed about the anaesthesia methods in detail, and their written informed consent was obtained.

Case 1

A 60-day-old and 3300-g boy baby with Pierre Robin syndrome was preoperatively evaluated for pyloromyotomy repair. His physical examination revealed generalised hypotonia, micrognathia and cleft palate (Figure 2). No pathology was observed in

Figure 1. Laryngoscope combined with fibreoptics (Macintosh)

Figure 2. View of a case with Pierre Robin syndrome

the cardiac examination and echocardiography. Since the patient had difficult airway findings, his parents were informed, and their permission was obtained to perform a tracheostomy when necessary. Oral-nasal airways, endotracheal tubes, Macintosh and Miller blades and supraglottic airway devices (laryngeal mask and laryngeal tubes) were prepared considering the age and weight of the patient. Two anaesthesiologists participated in the airway management. Also, an otorhinolaryngologist was involved for the possibility of urgent tracheostomy due to the development of a “non-intubated, non-ventilated” condition. Before anaesthesia induction, standard monitoring [EKG, peripheral oxygen saturation (SpO_2), temperature measurement, capnography and non-invasive blood pressure] was performed for the patient, who did not take any premedication. After anaesthesia induction, carried out in 100% oxygen with 8% sevoflurane, intravenous (i.v.) vascular access was established. Because mask ventilation was easy, 0.6 mg kg^{-1} rocuronium was given. Three minutes later, a laryngoscope was tried with an FOL. Although the larynx could not be seen directly with the naked eye, the end of the epiglottis could be seen, and it was graded as Grade 3 according to the Cormack-Lehane (CL) classification (5). In the indirect image obtained from the monitor unit through the fibreoptic camera on the tip of the blade, the glottis could be seen partially (CL grade 2). Despite the fact that the glottic gap was completely monitored by pushing the tip of fibreoptic camera forward and giving minimal anterior direction, an endotracheal tube (ETT) could not be advanced at the first effort. The tube was shaped

Figure 3. View of a case with Patau (trisomy 13) syndrome

as a hockey stick by using a stylet (4-cm distal end with an angle of 100°), and an ETT (no: 4) was placed into the trachea in the second effort. The location of tube was confirmed with capnography and auscultation. The patient, whose SpO_2 did not decrease under 97% during the operation, was extubated after the re-occurrence of spontaneous respiration and active extremity movements.

Case 2

A 1-day-old and 2500-g newborn boy was planned to undergo surgery for omphalocele repair. The patient, diagnosed with Patau syndrome (trisomy 13) in the physical examination, had craniofacial anomalies (short neck, micrognathia, bulbous nose, cleft lip, cleft palate) (Figure 3). His general examination revealed hypotony and ocular hypertelorism, and patent ductus arteriosus was detected through the echocardiography. Because the patient had difficult airway findings, his parents were informed, and their permission was obtained to perform a tracheostomy when necessary. In accordance with the age and weight of the patient, oral-nasal airways, endotracheal tubes, Macintosh and Miller blades and subglottic airway devices (laryngeal mask and laryngeal tubes) were prepared. Two anaesthesiologists were included in the airway management. Also, an otorhinolaryngologist was involved for the possibility of an urgent tracheostomy due to the development of a “non-intubated, non-ventilated” condition. Standard monitoring was performed for the patient, who did not take any premedication. Anaesthesia induction was carried out with a mask at 100% oxygen with 8% sevoflurane after it was observed that the initial SpO_2

was 97% and heart rate was 140 beats min⁻¹. Although his heart rate was 85 beats min⁻¹ during induction, atropine was not administered, because SpO₂ was 99%. There was an air leak from the edge of the facial mask because of his wide lip and facial anomaly. His respiration was maintained during ventilation, and intubation was planned to be performed without any muscle relaxant after the occurrence of the loss of consciousness. Laryngoscopy was tried with an FOL, and only the epiglottis could be seen directly (CL grade: 3). In the indirect image obtained from the monitor unit through the fiberoptic camera on the tip of the blade, a glottic gap could be seen completely (CL grade: 1). In the first trial with an ETT (no. 3) that was shaped as a hockey stick by using a stylet, intubation was conducted. Capnography and auscultation confirmed the location of the tube. Following the re-occurrence of spontaneous respiration and active extremity movements, the patient, whose SpO₂ did not decrease under 96% during the operation, was extubated.

Discussion

Existing problems associated with airway management have caused the development of alternative techniques to conventional intubation and airway tools and instruments having different designs and technologies. Besides them, the flexible fiberoptic bronchoscope is still the gold standard for the placement of an endotracheal tube in the management of expected intubation, and it has been revealed recently that the video laryngoscope method is also effective in difficult airway conditions (6, 7).

The blades of video laryngoscopes, including the McGrath (8) and GlideScope (9), are more inclined than the conventional Macintosh blade. The blade of the C-MAC video laryngoscope is similar to that of the conventional Macintosh blade. Different from other video laryngoscopes with sharp-angled blades, it is possible to see the glottis in two different ways: first, the view of the glottis directly with naked eye, and second, an indirect view from the monitor unit through a miniature camera on the tip of the blade (10). We tried to produce an airway device similar to the design of the video laryngoscope by combining the conventional Macintosh blade and adult-size fiberoptic bronchoscope using simple materials that can be obtained from the operating room.

A laryngoscope on which a fiberoptic bronchoscope (FLS, Acoma Medical Industry Co. Ltd., Tokyo, Japan) can be installed was produced commercially and used in the model study of Komiya et al., in which paediatric difficult airway was generated. Thus, it was demonstrated that all intubation interventions were successful (11). It was reported that three paediatric patients with Treacher Collins syndrome and difficult airway were successfully intubated using the FLS (12). To the best of our knowledge, this device is not available in our country.

The reason for the success of the FOL in difficult airway conditions may be that a closer and larger image can be obtained

with the fiberoptic camera located on the tip of the blade compared to the direct image obtained with a Macintosh laryngoscope. Additionally, the glottic gap can be searched by directing the tip of the FO bronchoscope through which an adequate image can not be obtained. Moreover, manoeuvres, such as laryngeal manipulation, can be carried out more effectively, because the image on the monitor screen can also be seen by the people helping to intubate.

In order to perform tracheal intubation through the fiberoptic bronchoscopy method, one should be educated and experienced in this issue. However, further education is not needed in the FOL method, because the Macintosh laryngoscope, which is already known well by anaesthesiologists, is used in this method. By using simple materials in the operating room, a laryngoscope of any size or any type can be easily combined with FO bronchoscopy, and this device can be useful, especially for difficult paediatric airways, for which equipment is limited. In this way, a clinic having FO bronchoscopy can create its own simple video laryngoscope.

Conclusion

In conclusion, we presented the successful intubation of two cases with a difficult airway and Pierre Robin and Patau (Trisomy 13) syndromes by using an FOL. For use of a laryngoscope combined with fiberoptics in difficult paediatric airway conditions as an alternative airway instrument, further studies, especially model studies including various difficult intubation scenarios, are needed.

Informed Consent: Written informed consent was obtained from the parents of the patients who participated in this case.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - A.K.; Design - A.K., A.E., A.T.; Supervision - A.T., Ş.O.; Funding - A.K., T.E.; Materials - A.K., A.E., A.T.; Data Collection and/or Processing - A.K., A.E., A.T.; Analysis and/or Interpretation - A.K., A.E., A.T., Ş.O.; Literature Review - A.K., A.T.; Writer - A.K., A.E., A.T.; Critical Review - A.E., Ş.O.; Other - A.K., T.E.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

1. Chadha IA, Chadha A, Vakil SD. Pierre Robin syndrome-obstructive airway and anaesthetic management. *J Anaesth Clin Pharmacol* 2002; 18: 91-3.
2. Pollard RC, Beasley JM. Anaesthesia for patients with Trisomy 13 (Patau's syndrome). *Pediatr Anesth* 1996; 6: 151-3. [\[CrossRef\]](#)
3. Gruppo di Studio SIAARTI "Vie Aeree Difficili", Frova G, Guarino A, Petrini F, Merli G, Sorbello M, et al. Recommendations for airway control and difficult airway management in paediatric patients. *Minerva Anestesiol* 2006; 72: 723-48.

4. Holm-Knudsen R, Eriksen K, Rasmussen LS. Using a nasopharyngeal airway during fiberoptic intubation in small children with a difficult airway. *Paediatr Anaesth* 2005; 15: 839-45. [\[CrossRef\]](#)
5. Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. *Anaesthesia* 1984; 39: 1105-18. [\[CrossRef\]](#)
6. Stroumpoulis K, Pagoulatou A, Violari M, Ikonomou I, Kalantzi N, Kastrinaki K, et al. Videolaryngoscopy in the management of the difficult airway: a comparison with the Macintosh blade. *Eur J Anaesthesiol* 2009; 26: 218-25. [\[CrossRef\]](#)
7. Kılıçaslan A, Topal A, Tavlan A, Erol A, Otelcioglu S. Effectiveness of the C-MAC video laryngoscope in the management of unexpected failed intubations. *Braz J Anesthesiol* 2014; 64: 62-5. [\[CrossRef\]](#)
8. Shippey B, Ray D, McKeown D. Case series: The McGrath videolaryngoscope-an initial clinical evaluation. *Can J Anaesth* 2007; 54: 307-13. [\[CrossRef\]](#)
9. Cooper RM, Pacey JA, Bishop MJ, McCluskey SA. Early clinical experience with a new videolaryngoscope (Glidescope) in 728 patients. *Can J Anaesth* 2005; 52: 191-8. [\[CrossRef\]](#)
10. Cavus E, Kieckhafer J, Doerges V, Moeller T, Thee C, Wagner K. The C-MAC Videolaryngoscope: First Experiences with a New Device for Videolaryngoscopy-Guided Intubation. *Anesth Analg* 2010; 110: 473-7. [\[CrossRef\]](#)
11. Komiya K, Inagawa G, Nakamura K, Kikuchi T, Fujimoto J, Sugawara Y, et al. A simple fiberoptic assisted laryngoscope for paediatric difficult intubation: a manikin study. *Anaesthesia* 2009; 64: 425-9. [\[CrossRef\]](#)
12. Sugawara Y, Inagawa G, Satoh K, Kikuchi T, Goto T. Successful intubation using a simple fiberoptic assisted laryngoscope for Treacher Collins syndrome. *Pediatr Anesth* 2009; 19: 1031-3. [\[CrossRef\]](#)