Airtraq™ versus Macintosh laryngoscope in intubation performance in the pediatric population

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ABSTRACT

Purpose: Airtraq™ is an optical laryngoscope that allows viewing of the vocal cords without a direct line of sight. The main objective of this prospective, randomized, controlled trial was to evaluate Airtraq intubation characteristics, mainly intubation time and cardiovascular changes in the pediatric patients.

Methods: Fifty children of American Society of Anesthesiologists class I, 2–10 years of age were divided into 2 groups using sealed envelope technique. Children were premedicated with midazolam. Anesthesia was induced with sevoflurane, fentanyl, and atracurium. Patients were randomly allocated to be intubated with either Airtraq (Airtraq group) or Macintosh laryngoscope (Macintosh group). Intubation time, number of intubation attempts, optimization maneuvers, and ease of intubation were recorded. Hemodynamic variables were recorded before and after anesthetic induction, 1, 3, and 5 min after tracheal intubation.

Results: The mean age of children was 6.1 years. Compared with Macintosh group, the use of Airtraq was associated with shorter intubation time (51.6±26.7 s vs 22.8±6.1 s, respectively, \(P=0.001\)), less median number of intubation attempts 2 (1–2) versus 1 (1–1), \(P=0.001\), more ease of intubation [2 (1–3) versus 1 (1–1), \(P=0.001\)] and less increase in the heart rate 5 min after intubation (\(P=0.007\)). No optimization maneuvers required for Airtraq laryngoscope (\(P=0.001\)).

Conclusion: Airtraq decreases intubation time, number of attempts, and optimization maneuvers, less heart rate changes during intubation compared with Macintosh laryngoscope.

Key words: Airtraq, airway, pediatric, videolaryngoscope

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INTRODUCTION

The Airtraq™ (Prodol Meditec S.A., Vizcaya, Spain) is a disposable battery operated laryngoscope that allows high-quality viewing of the vocal cords without requiring a straight line of sight from outside of the patient to the vocal cords.[1] The Airtraq has a short learning curve even for medical personnel inexperienced with laryngoscopy.[2] Use of the Airtraq does not require displacement of the tongue and forceful elevation of the epiglottis resulting in less application of force compared with the conventional direct laryngoscopy.[3]

Advantages of Airtraq laryngoscopy in adult patients include lower alteration of hemodynamic parameters,[4] reduced duration of endotracheal intubation, reduced airway trauma, and a reduced need for assistance.[5] A recent study compared the use of Airtraq to the standard Macintosh laryngoscope in adults;[6] however, there are no randomized controlled studies of Airtraq laryngoscopy in pediatric patients. Studies on pediatric patients are necessary due to the differences in the airway of pediatric subjects compared with adult subjects.[7] These differences are due to the large head, short jaw, higher larynx, anterior angulation of the vocal cords, and long bifid epiglottis in pediatric subjects.[7]

Recently, a small version of the Airtraq has been introduced for pediatric use. Two sizes of this pediatric version are available, one that accepts an endotracheal tube between 4.00 and 5.50 mm internal diameter and another that accepts a tube size between 2.50 and 3.50 mm for use in infants. Compared with Airtraq studies in adults, the authors hypothesize that pediatric Airtraq scope will be easy to use. The main objective of this study was to evaluate the intubation time of Airtraq compared with Macintosh laryngoscope in pediatric patients, number of intubation...
attempts, optimization maneuvers, ease of intubation, and cardiovascular changes during intubation.

**METHODS**

Ethical approval for this study was provided by the local research ethics board. Written parental informed consent was obtained for all the subjects. Fifty healthy children aged 2–10 years of American Society of Anesthesiologists class I, who were scheduled for elective surgery under general anesthesia requiring endotracheal intubation were enrolled in this prospective, randomized study. Exclusion criteria included subjects with a history of difficult intubation, risk of gastric aspiration, cardiovascular disease, respiratory disease, metabolic disease, and central nervous system disease. Solid food was not allowed for 6 h preoperatively and clear liquids were permitted up to 3 h prior to induction of anesthesia.

Subjects were premedicated with oral midazolam 0.5 mg/kg (with a maximum dose of 10 mg) 1 h before surgery. Baseline hemodynamic data were recorded after placement of routine monitors when the subject arrived in the operating room. Anesthesia was induced with inhalational sevoflurane in oxygen–air mixture. After induction and establishment of an intravenous line, fentanyl 2 µg/kg, glycopyrrolate 0.04 µg/kg, and atracurium 0.5 mg/kg were administered. Sealed envelopes opened by the anesthesiologist prior to induction were used to randomize subjects to undergo intubation with the Airtraq laryngoscope (Airtraq™ group) or Macintosh laryngoscope (Macintosh group). Both anesthesiologists (WR and AM) in this study had 15 or more years of experience.

The parameters under study included intubation time (primary outcome), number of intubation attempts, and number of optimization maneuvers required, such as repositioning the head or the need for a second assistant to aid tracheal intubation. Intubation time was recorded as the period from termination of manual ventilation with a facemask to initiation of ventilation through the endotracheal tube. After successful tracheal intubation the ease of intubation was recorded by the investigator using a visual analog scale (0 = extremely easy to 10 = extremely difficult). Tracheal intubation requiring 120 s or more was classified as a failed intubation.[9]

Hemodynamic variables, including systolic, diastolic, mean arterial blood pressure, and heart rate were recorded before and after anesthetic induction, and at 1, 3, and 5 min after tracheal intubation. An independent research assistant recorded all data.

**Statistical analysis**

Data were analyzed with SPPS version 14 (SPSS Inc., Chicago, IL, USA). Power analysis indicated that 25 subjects per group are required based on a 25 s (50%) reduction in the intubation time comparing Airtraq[9] to direct laryngoscope.[10] The alpha error was set at 0.05 and type II error was set at 0.20. The independent sample, two-tailed t test or one-way analysis of variance was used for parametric data while Mann–Whitney U test used or Chi-square test was used for nonparametric data as appropriate. A P value less than 0.05 was considered statistically significant.

**RESULTS**

The study comprised 50 subjects divided into 2 groups of 25 subjects each. Demographic and descriptive data are presented in Table 1. The age, height, weight, gender, and duration of anesthesia were not statistically significantly different between the groups [Table 1].

Intubation characteristics are presented in Table 2. Time of intubation was 22.8±6.1 s in the Airtraq group compared with 51.6±26.7 s in the Macintosh group (P=0.001). The median and interquartile range of intubation attempts was 1 (1–1) for Airtraq compared with 2 (1–2) in Macintosh group (P=0.001). No optimization maneuver was required for Airtraq group, whereas the median of optimization maneuver was

| Table 1: Demographic and descriptive data |
|------------------------------------------|
| **Group 1 Airtraq** (n=25)               | **Group 2 Macintosh** (n=25)             |
| Age (years)     | 5.76±2.2                              | 5.88±2.6                                 |
| Height (cm)     | 99.88±23.9                            | 104.56±26.6                              |
| Weight (kg)     | 23.98±11.7                            | 24.79±14.8                               |
| Gender          |                                       |                                        |
| Male            | 13 (52%)                              | 14 (56%)                                 |
| Female          | 12 (48%)                              | 11 (44%)                                 |
| Duration of anesthesia (min)             | 72.08±25.8                            | 63.61±24.7                               |

Data expressed as mean±SD or number (percentage)

| Table 2: Intubation time and other characteristics |
|---------------------------------------------------|
| **Group 1 (Airtraq)** (n=25)                      | **Group 2 (Macintosh)** (n=25)                |
| Intubation time (s)                               | 22.8±6.1*                                 | 51.6±26.7*                                |
| Numbers of intubation attempts                    | 1 (1–2)*                                  | 2 (1–2)                                  |
| Numbers of optimization maneuvers                 | 0 (0–0)*                                  | 1 (1–1)                                  |
| Ease of intubation                               | 1 (1–3)*                                  | 2 (1–3)                                  |

Data expressed as mean±SD or median (IQR). * P value<0.001
1 (1–1) for Macintosh laryngoscope (P=0.001). The median for ease of intubation was 1 (1–1) for Airtraq compared with 2 (1–3) for Macintosh laryngoscope (P=0.001). A significant increase in the heart rate 5 min after intubation was observed in Macintosh group (P=0.002). All subjects in the study were successfully intubated in less than 120 s.

Systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) were not significantly different between the 2 groups (P=0.86, 0.67, and 0.72 respectively). Figure 1 shows a significant increase in the heart rate (HR) 5 min after intubation in the Macintosh group (P=0.007).

**DISCUSSION**

The result of the current study indicates that Airtraq intubation in pediatric subjects by experienced caregivers was faster than traditional intubation with the Macintosh laryngoscope. The subjects in this study were not expected to be difficult to intubate. However, assorted case reports do report successful intubation with the Airtraq in difficult cases. For example, Vlatten and Soder described the successful use of Airtraq for the management of a difficult airway in an infant with Robin Sequence, which is marked by micrognathia, retrognathia, and glossoptosis.[11]

Recently, Iwai and colleagues also reported success with the Airtraq in a 1-year 5-month-old male child with Robin Sequence.[12] Similarly, Hirabayshi and colleagues reported improved view of the glottis and successful intubation with the use of the pediatric Airtraq in a 9-year-old child with Treacher–Collin syndrome compared with the Macintosh laryngoscope.[13] Piraccini and colleagues reported a case series of 7 children in whom Airtraq was used as a rescue device for intubation.[14] Piraccini and colleagues recommend the pediatric Airtraq for cases suspected to be difficult intubations or Cormack and Lehane grade 3 or 4 when using the Macintosh laryngoscope.[14]

Piraccini and colleagues successfully intubated all subjects at first attempt in less than 30 s.[14]

In agreement with our results but in adult Chalkeidis and colleagues reported that it is easy to use Airtraq videolaryngoscope but no clear advantage in patients with normal airway.[6] They did not find any significant difference as regard the intubation time, need for intubation assistance and complications rate.

Our results differ from those of Maharaj and colleagues[8] who reported less alteration of the stress response to intubation with Airtraq in adult patients. We found a lower heart rate in the Airtraq group. This difference between studies can be attributed to the difference in the physiology of the study populations.

There are several limitations to this study. First, this study was conducted in children with normal airway, and the results may not be extrapolated to children with difficult airways. Second, experienced airway operators in a tertiary care center conducted intubations in this study and the results may not apply to other settings.

In conclusion, Airtraq decreases intubation time, number of intubation attempts, and optimization maneuvers in pediatric patients. It was easier to use by the investigators. It results in a lower alteration in the heart rate compared with direct visualization by the standard Macintosh laryngoscope.

**REFERENCES**

1. Neustein SM. Use of the Airtraq Laryngoscope. Anesthesiology 2007;107:674.
2. Maharaj CH, Costello JF, Higgins BD, Harte BH, Laffey JG. Learning and performance of tracheal intubation by novice personnel: A comparison of the Airtraq and Macintosh laryngoscope. Anaesthesia 2006;61:671-7.
3. Suzuki A, Toyama Y, Iwasaki H, Henderson J. Airtraq for awake tracheal intubation. Anaesthesia 2007;62:746-7.
4. Maharaj CH, Buckley E, Harte BH, Laffey JG. Endotracheal intubation in patients with cervical spine immobilization. A comparison of Macintosh and Airtraq laryngoscopes. Anesthesiology 2007;107:53-9.
5. Maharaj CH, Costello JF, Harte BH, Laffey JG. Evaluation of the Airtraq and Macintosh laryngoscopes in patients at increased risk for difficult tracheal intubation. Anaesthesia 2008;63:182-8.
6. Chalkeidis O, Kotsovolis G, Kalakonas A, Filippidou M, Triantafyllou C, Vaikos D, et al. A comparison between the Airtraq and Macintosh laryngoscope for routine airway management by experienced anesthesiologists: A randomized clinical trial. Acta Anaesthesiol Taiwan 2010;48:15-20.
7. Holm-Knudsen RJ, Rasmussen LS. Pediatric airway management: Basic Aspects. Acta Anaesthesiol Scand 2009;53:1-9.
8. Maharaj CH, Costello J, Higgins BD, Harte BH, Laffey JG. Retention of tracheal intubation skills by novice personnel: A comparison of the Airtraq and Macintosh Laryngoscope. Anaesthesia 2007;62:272-8.
9. Riad W, Ansari T. Effect of cricoid pressure on the laryngoscopic view by Airtraq in elective caesarean section: A pilot study. Eur J Anaesthesiol 2009;26:981-2.
10. Riad W, Moussa A. Lornoxicam attenuates the haemodynamic responses to laryngoscopy and tracheal intubation in the elderly. Eur J Anaesthesiol 2008;25:732-6.
11. Valatten A, Soder C. Airtraq optical laryngoscope intubation in a 5 month old infant with a difficult airway because of Robin sequence. Paediatr Anaesth 2010;20:374-5.
12. Iwai H, Kanai R, Takaku Y, Hirabayashi Y, Seo N. Successful tracheal intubation using the pediatric Airtraq optical laryngoscope in pediatric patient with Robin Sequence. Masui 2011;60:189-91.
13. Hirabayashi Y, Shimada N, Nagashima S. Tracheal intubation using Pediatric Airtraq optical laryngoscope in a patient with Treacher Collins syndrome. Paediatr Anaesth 2009;19:915-6.
14. Piraccini E, Corso RM, Agnoletti V, Vicini C, Gambale G. Pediatric Airtraq for airway rescue in developing world setting. Minerva Anestesi 2011;76:1-2.

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