Vstavitev dihalne cevke z uporabo airtraq laringoskopa pri bolnicah z zmerno oteženo vzpostavitvijo dihalne poti

Tracheal intubation using the airtraq for moderately difficult airways

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Ključne besede:
vstavitev dihalne cevke, Airtraq, otežena vzpostavitev dihalne poti, splošna anestezija

Key words:
tracheal intubation, Airtraq, difficult airway, general anaesthesia

Članek prispel / Received
07.04.2011

Članek sprejet / Accepted
18.05.2011

Naslov za dopisovanje / Correspondence

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Izvleček

Namen: *Airtraq je optični laringoskop za enkratno uporabo, ki je oblikovan tako, da olajša vstavitev dihalne cevke pri bolnikih z običajno in oteženo dihalno potjo. Namen raziskave je bil preveriti učinkovitost Airtraq laringoskopa pri bolnikih, pri katerih smo na podlagi predoperativnega pregleda pričakovali povečano tveganje za težko vstavitev dihalne cevke. Pri predoperativnem pregledu smo ocenjevali naslednje napovedne dejavnike za težko vstavitev dihalne cevke: (1) oceno po Mallampatiju, (2) tiromentalno razdaljo, (3) sternomentalno razdaljo in (4) Cormack Lehanov točkovalnik.*

Metode: *V raziskavo smo vključili 29 bolnic ASA skupine 1–2, ki so bile predvidene za ginekološke operacije. Pri vsaki bolnici smo pred intubacijo s pomočjo Airtraq laringoskopa opravili direktno laringoskopijo z Macintoshovim laringoskopom in ocenili vidljivost*

Abstract

Purpose: *The Airtraq is a single–use optical laryngoscope designed to facilitate tracheal intubation of normal and difficult airway patients. The purpose of this study was to evaluate the performance of the Airtraq in patients who possessed characteristics associated with an increased risk for difficult intubation. These characteristics were defined based on the following assessments: (1) Mallampati score, (2) thyromental distance, (3) sternomental distance, (4) Cormack and Lehane score.*

Methods: *The present study included 29 patients with an ASA grade 1–2 who were scheduled to undergo gynaecological operations. In each patient, a direct laryngoscopy utilizing the Macintosh laryngoscope was performed prior to intubation with the Airtraq laryngoscope, and several characteristics were evaluated including visibility*

grla, odgovor obtočil na laringoskopijo, zasičenost hemoglobina s kisikom in čas do vstavitve dihalne cevke.

Rezultati: *Raziskava je pokazala, da je bila vidljivost grla boljša ob uporabi Airtraq laringoskopa kot ob uporabi Macintoschovega laringoskopa ($p = 0.02$). Srednji arterijski tlak se je med vstavitvijo dihalne cevke statistično značilno povečal ($p < 0.05$), ob tem sta ostala frekvenca srca in nasičenost hemoglobina s kisikom nespremenjena. Povprečen čas do vstavitve dihalne cevke s pomočjo Airtraq laringoskopa je bil 15 sekund z razponom od 5 do 45 sekund.*

Zaključek: *Rezultati raziskave kažejo, da je vstavitev dihalne cevke s pomočjo Airtraq laringoskopa hitra in varna pri bolnikih, pri katerih pričakujemo otežene pogoje za vstavitev dihalne cevke.*

of the glottis, haemodynamic response, oxygenation, and intubation time.

Results: *The findings of this study revealed that the Airtraq significantly improved the view of the glottis, as compared with the Macintosh laryngoscope ($p=0.02$). Likewise, the mean arterial pressure significantly increased ($p<0.05$) during intubation, whereas the heart rate and SpO_2 remained unchanged. The mean intubation time with the Airtraq was 15 seconds, and ranged from 5 to 45 seconds.*

Conclusion: *The results from this study demonstrate that intubation using the Airtraq laryngoscope appears to be both rapid and safe in patients who show an increased risk for difficult intubation.*

INTRODUCTION

The Airtraq is an indirect optical laryngoscope that provides a view of the glottis without an alignment of the oral, pharyngeal and tracheal axes. The Airtraq is anatomically shaped; therefore, standard tracheal tubes of all sizes can be used in a similar manner to the Macintosh laryngoscope, which has remained the gold standard. According to literature, the effectiveness of the Airtraq for tracheal intubation in normal airways is also similar to the reusable Macintosh bladed laryngoscope. However, previous studies suggested that the Airtraq provides better intubating conditions in difficult airways if used by an experienced anaesthetist (1–6). Therefore, the primary aim of our study was to assess the performance of the Airtraq in patients who show an increased risk for difficult intubation.

MATERIALS AND METHODS

The study was performed from May 2008 until January 2009. Patients who were evaluated in this study were scheduled to undergo gynaecological operations and showed an increased risk for difficult intubation. Patients were excluded if risk factors for gastric aspiration or a history of relevant drug allergies were present. The methods used in the present study were approved by the National Medical Ethics Committee, and the patients provided informed consent prior to their participation.

The criteria used to determine whether the intubation was expected to be difficult was based on the following risk factors: (1) Mallampati score 3 or 4, (2) thyromental distance < 6 cm, (3) sternomental distance < 12.5 cm, and (4) Cormack and Lehane grade (C–L) ≥ 2. The glottic view was evaluated as C–L grade 1, or defined as no additional manoeuvres needed to improve exposure of the vocal cords (e.g., external manipulation of the glottis, use of force at intubation). Additionally, opening of the mouth, the teeth, and any special features were also considered.

Before the procedure, all patients received general anaesthesia with standard monitoring, which included ECG, non–invasive mean arterial pressure measurement, peripheral oxygen saturation (SpO_2), and capnography ($ETCO_2$). An hour before the operation, the patients were premedicated with midazolam (7.5 mg) orally. Prior to induction of anaesthesia,

all patients were given sufentanil (0.2 μg kg–1) intravenously, and were preoxygenated for 4 minutes with 100% O_2 using a facemask. A sleep dose of propofol (2–3 mg kg–1) was then titrated to induce anaesthesia. Following induction of anaesthesia, all patients were manually ventilated, and rocuronium bromide (0.6 mg kg–1) was administered. A minute later, the glottis was visualized, and C–L visibility was evaluated. C–L visibility was first assessed using a Macintosh laryngoscope, and was then evaluated using the Airtraq, which was also used for intubation. The characteristics recorded during the procedure included the intubation time, the number of intubation attempts, the mean arterial pressure, heart rate, and SpO_2 (before and after intubation). Any injury to the teeth, lips or mucosa of the oral cavity, pharynx or larynx was also noted. After intubation, the patients were mechanically ventilated, and anaesthesia was maintained using sevoflurane (1–2.5%) in a mixture of air and oxygen. During the data collection period following tracheal intubation, no other medications were administered, and no additional procedures were performed. On the first postoperative day, all patients were assessed by their anaesthetist, who noted their status and inquired whether their throats were sore. Statistical analysis of the results was performed utilizing the χ^2 test and the t–test for paired samples. P values below 0.05 ($P<0.05$) were considered statistically significant.

RESULTS

In total, 29 patients were included in the present study. Table 1 summarizes the demographic data and data on risk factors for difficult intubation in the group of patients. The grade of difficulty of the intubation with direct laryngoscopy was evaluated according to the Cormack and Lehane grading system (Table 2). In addition, seven patients complained of a stiff neck, three weighed 100 kg or more, eight had a large tongue, and seven had a large epiglottis. Intubation with the Airtraq laryngoscope lasted on average 15 seconds, ranging from 5 to 45 seconds. Additionally, the first intubation attempt failed in four patients; however, the second attempt was successful in two of them, and the third attempt was successful in one of the remaining two patients. During intubation with the Airtraq laryngoscope, an excellent view of the glottis was obtained in all 29 patients, and the view of the glottis obtained with the Airtraq was significantly better than that obtained using direct laryngoscopy ($P = 0.002$). Slight superficial bleeding of the pharyngeal mucosa occurred during intubation in two patients. No other injuries were noted. Table 3 shows the haemodynamic parameters (mean arterial pressure, heart

Table 1. *Demographic data and risk factors for difficult intubation (n = 29)*

Height (cm)a	*163 (± 6)*
Weight (kg)a	*76 (± 17)*
Age (years)a	*51 (± 13)*
ASA	
I	*12*
II	*17*
Mallampati score	
3	*14*
4	*15*
Sternomental distance (cm)b	*9 (7–11)*
Thyromental distance (cm)b	*4.5 (3.5–5.5)*

[a]*Data are mean (± SD).*

[b]*Data are mean (range).*

Table 2. *Cormack and Lehane (C–L) grade view during direct laryngoscopy and during intubation with the Airtraq laryngoscope (P = 0.02)*

(n = 29)	Direct laryngoscopy	Airtraq
C–L1	0	29
C–L2	16	0
C–L3	12	0
C–L4	1	0

Table 3. *Mean arterial pressure (MAP), heart rate and peripheral oxygen saturation (SpO_2) before and after orotracheal intubation (OTI)*

(n = 29)	Before OTI	After OTI
*MAP (mmHg)**	*84 (± 6)*	*93 (± 24)*
Heart rate (min^{-1})	*70 (± 12)*	*71 (± 13)*
SpO_2 (%)	*99*	*99*

Data are mean (± SD).
**Statistically significant difference, $P < 0.05$*

rate) and SpO_2 values (before and after intubation) with the Airtraq laryngoscope. Mean arterial pressure significantly increased after intubation; however, no significant change in heart rate or SpO_2 was observed.

DISCUSSION

Our study demonstrates that the Airtraq provided a better Cormack and Lehane (C–L) view of the glottis than the Macintosh laryngoscope, and thereby, the Airtraq may improve intubation procedures for physicians. Furthermore, the grade of difficulty of intubation was comparatively lower with the Airtraq. In a previous study, Maharaj and co–workers found that the Airtraq provided improved conditions for intubation, as compared with those associated with the Macintosh laryngoscope (1–5). Maharaj and co–workers compared the Airtraq with the Macintosh laryngoscope assessing intubation in patients with normal airways. The Airtraq resulted in less stimulation of heart rate following tracheal intubation, as compared to the Macintosh laryngoscope. This finding likely reflects the observation that the Airtraq requires less force to be applied during laryngoscopy by providing a view of the glottis without requiring to the alignment of the oral, pharyngeal and tracheal axes (5). Maharaj and co–workers also compared the ease of intubation using the Airtraq with the Macintosh laryngoscope in patients with increased risk for difficult tracheal intubation, and found that the Airtraq also caused fewer injuries (less dental trauma and fewer oropharyngeal lesions) (2,4–6). These findings demonstrate that the Airtraq reduces the duration of intubation attempts, the need for additional manoeuvres, and the intubation difficulty scale score. The Airtraq also decreases the degree of haemodynamic stimulation (mean arterial pressure and heart rate) (2,4). Similarly, other authors report better conditions during intubation when using Airtraq in patients scheduled for elective thyroid surgery (7) and in morbidly obese patients (8,9). While a comparison of two groups of patients was not conducted in our study, each patient underwent direct laryngoscopy prior to intubation with the Airtraq. We found that the mean arterial pressure in these patients increased significantly after intubation; however, the heart rate and SpO_2 showed no significant changes. Therefore, our findings suggest that the significant increase in mean arterial pressure was likely caused by laryngoscopy with the Macintosh laryngoscope performed prior to intubation with the Airtraq.

CONCLUSION

Our study demonstrated that the Airtraq provides an improved view of the glottis, and creates better conditions for intubation in patients in whom a difficult intubation was expected. Using the Airtraq, intubation can be performed rapidly, and no additional optimization manoeuvres are required to improve the exposure of the vocal cords.

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