Original Article

A study to evaluate nasotracheal intubation using Airtraq laryngoscope with a bougie and without a bougie

Address for correspondence:
Dr. Teena Bansal,
19/6 J Medical Campus,
PGIMS, Rohtak - 124 001,
Haryana, India.
E-mail: aggarwalteenu@rediffmail.com

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Teena Bansal, Suresh Singhal, Komal Dhingra
Department of Anaesthesiology and Critical Care, Pt B D Sharma University of Health Sciences, Rohtak, Haryana, India

ABSTRACT

Background and Aims: Airtraq has been found to be useful in improving the view of the glottis. However, directing the tube tip into the glottis can be challenging during nasotracheal intubation. This problem gets resolved if the bougie is placed first. The present study was conducted for the evaluation of nasotracheal intubation using a nasal Airtraq laryngoscope with and without a bougie. **Methods:** Fifty patients of either gender, aged between 18 and 60 years, who belonged to the American Society of Anesthesiologists physical status (PS) I or II, requiring nasotracheal intubation were included. In group I (number (*n*) = 25), nasotracheal intubation was performed with a bougie, and in group II (*n* = 25), it was performed without a bougie. The primary objective was a comparison of the time taken to achieve successful nasotracheal intubation. Secondary objectives were ease of intubation and additional manoeuvres required for intubation. **Results:** The mean (± standard deviation) for time for intubation in group I was 59.24 ± 9.98 s and that in group II was 41.00 ± 4.23 s (*P* = 0.001). Two patients (8%) in group I and ten patients (40%) in group II required additional manoeuvres for intubation (*P* = 0.008). Twenty-three patients (92%) in group I and 15 patients (60%) in group II had easy intubation (*P* = 0.030). In group I, no patient had trauma, whereas, in group II, four patients (16%) had trauma (*P* = 0.030) during intubation. **Conclusion:** The time taken for nasotracheal intubation using an Airtraq laryngoscope was more with the use of a bougie as compared to the non-bougie technique. However, bougie-guided intubation was easier with less requirement of additional manoeuvres. In addition, trauma was also significantly less with the bougie technique.

Key words: Airway management, anaesthesia, intubation, laryngoscope, laryngoscopy, nose, time

INTRODUCTION

Direct laryngoscopy with the Macintosh laryngoscope and intubation of the trachea using the Magill forceps is the routinely employed method for nasotracheal intubation. However, this requires the alignment of the oropharyngeal and laryngeal axes for visualisation of the glottis and intubation of the trachea. In addition, the Magill forceps can damage the cuff of the tube.[1]

Developments in the technology of video and optics have led to the introduction of new devices of intubation like Airtraq which is a battery-powered optical device that helps to achieve a better view of the glottis without aligning the oropharyngeal and laryngeal axis. The anatomical shape of the blade of the Airtraq laryngoscope results in lesser airway injury as compared to the Macintosh blade.[2,3]

Unlike oral intubation, during nasotracheal intubation, the intubation time depends less on the time required

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to expose the glottis and more on the time needed to advance the endotracheal tube from the nasopharynx towards the glottis.[4] When nasotracheal intubation is performed with the Airtraq, it may be difficult to direct the tip of the endotracheal tube into the glottis. Thus, different optimising manoeuvres, like cricoid pressure, changing the head and neck position, guidance by an Eschmann stylet (bougie) and Magill forceps have been used for directing the tip of the endotracheal tube (ETT) into the trachea. However, all of these manoeuvres are likely to increase the intubation time.[5,6]

A bougie is easily available in all operating rooms and guiding a bougie into the glottis first can protect the cuff of the ETT. There is no study in the literature that compares nasotracheal intubation with bougie assistance and without bougie assistance using the Airtraq laryngoscope. We hypothesised that intubation with bougie assistance may or may not affect intubation time. The primary objective was a comparison of the time taken to achieve successful nasotracheal intubation with and without the use of a bougie. The secondary objectives were ease of intubation and additional manoeuvres required for intubation.

METHODS

This prospective, randomised, single-blind study was conducted following the approval from the institutional ethics committee (No IEC/Th/19/Anst33) in accordance with the principles of the Declaration of Helsinki. The study was registered in the Clinical Trial Registry of India before the enrolment of cases (CTRI/2020/08/027412). The study was conducted in a tertiary-care hospital from September 2020 to August 2021. Fifty patients of either gender, aged between 18 and 60 years, who belonged to the American Society of Anesthesiologists (ASA) physical status (PS) I or II, posted for elective surgery under general anaesthesia and requiring nasotracheal intubation, were included. Patients with anticipated difficult airway (inter-incisor gap <3 cm, Mallampati grade III and IV, body mass index (BMI) (>35 kg/m^2), pregnancy, full stomach, nasal deformity and refusal to consent to participate in the study were excluded.

Patients were assessed during the preoperative visit a day before surgery. After taking a detailed history, a general physical examination along with a systemic examination was carried out. Routine investigations like haemoglobin, bleeding time, clotting time and urine examination were carried out in all patients. Other investigations were carried out as per requirements. All patients underwent preoperative examination for nasal patency.

Informed written consent was taken from the patients after explaining the purpose and protocol of the study. Patients were instructed to be fasting for 6 hours for light meals before the scheduled time of surgery. Premedication was given with tablet alprazolam 0.25 mg and tablet pantoprazole on the night prior and in the morning, 2 hours before surgery. Xylometazoline nasal drops were instilled in both nostrils in the premedication room 30 minutes before shifting to the operation theatre. Upon arrival in the operating room, nasal drops were instilled again. Standard monitors were attached, and baseline values were noted.

Just before the induction of anaesthesia, a random allocation of patients was done to one of the two groups using a computer-generated sequence of random numbers. In group I (number (n) = 25), nasotracheal intubation was performed with a bougie, and in group II (n = 25), nasotracheal intubation was performed without a bougie. In both groups, an Airtraq laryngoscope was used. All intubations were performed by the same experienced anaesthesiologist who had experience of doing more than 100 nasal intubations.

The standardised anaesthesia protocol was used. After securing the peripheral intravenous line with an 18 gauge cannula, preoxygenation was performed with 100% oxygen for 3 minutes. Intravenous glycopyrrolate was given. Induction of anaesthesia was performed using intravenous fentanyl 2 μg kg^{-1} and propofol, titrated to loss of consciousness and loss of response to verbal commands. After assessing the adequacy of ventilation, atracurium 0.5 mg kg^{-1} was given for muscle relaxation. Patients were ventilated for 3 minutes using 2% sevoflurane in 100% oxygen. A water-soluble lubricating jelly was instilled into the more patent nostril. For females, an endotracheal tube of 7 mm internal diameter was used, and for males, 7.5 mm was used. A 1 mm smaller-sized tube was used. If resistance was encountered, in group I, the bougie was inserted into the nasopharynx through the more patent nostril in the sniffing position. The Airtraq laryngoscope was introduced, and after visualisation of the glottis, the tip of the bougie was directed towards the glottis using Magill forceps and

advanced into the trachea. The nasotracheal tube was railroaded over the bougie. In group II, the tracheal tube was inserted through the more patent nostril into the nasopharynx in the sniffing position. The Airtraq laryngoscope was then inserted, and after visualisation of the glottis, the tracheal tube was advanced through the glottis into the trachea using Magill forceps. In case of difficulty in guiding the tube, cricoid pressure, changes in head and neck position and rotation of the tube were performed in any order. The cuff of the tracheal tube was inflated, and the breathing circuit was connected to the tube in both groups. Confirmation of tube placement was made by chest auscultation and capnography. Anaesthesia was maintained with 2% sevoflurane and 67% nitrous oxide. After surgery, a reversal of neuromuscular blockade was performed using neostigmine (0.05 mg/kg) and glycopyrrolate (0.01 mg/kg). After the extubation of the trachea, patients were shifted to the post-anaesthesia care unit.

The parameters recorded were Cormack–Lehane grade, time for intubation, ease of intubation, additional manoeuvres required and complications if any. The time for intubation was measured using a stopwatch and was defined as the time from insertion of the bougie/endotracheal tube up to the display of the square wave capnograph on the monitor. The ability to intubate the trachea without additional manoeuvres was considered easy. The presence of blood on the Airtraq laryngoscope blade and oral cavity was defined as intubation trauma. At the end of the surgery, all patients were reviewed for hoarseness of voice.[7]

The primary objective was to compare the time for intubation in the two groups. With reference to a previous study,[4] the mean time for intubation with Airtraq without a bougie was 45.8 s with a standard deviation of 20.3 s. Assuming a difference of 20 s in the time for intubation, between the groups to be clinically significant, based on $\alpha = 0.05$ and $\beta = 0.1$ for a study design incorporating two groups of equal size, a sample size of 22 patients per group was required with an effect size of 1.0. Twenty-five patients per group were taken to count for any dropouts.

At the end of the study, all data were compiled and analysed using Statistical Package for the Social Sciences (SPSS) version 17.0 (International Business Machines Corporation, Armonk, New York, United States). Quantitative variables were presented as mean ± standard deviation and an unpaired t-test was used for comparison between the groups. Qualitative variables were presented in the form of frequencies/percentages, and a Chi-square test was used for comparison. A P value of ≤0.05 was considered statistically significant.

RESULTS

Fifty patients were recruited, and all patients completed the study [Figure 1]. Both groups were comparable with respect to the demographic profile and Cormack–Lehane grade [Table 1]. The time for intubation in group I was 59.24 ± 9.98 s and that in group II was 41.00 ± 4.23 s ($P = 0.001$) [Table 2]. In group I, two patients (8%) required additional manoeuvres for insertion. In group II, 10 patients (40%) required the use of manoeuvres ($P = 0.008$) [Table 3]. In group I, 23 patients (92%) had easy intubation, and in group II, 15 patients (60%) had easy intubation ($P = 0.030$). In group I, no patient had trauma, whereas, in

Table 1: Demographic profile

Variable	Group I (*n*=25) Mean±SD	Group II (*n*=25) Mean±SD	*P*
Age (years)	32.84±11.80	39.24±10.64	0.060
BMI (kg/m^2)	21.89±2.22	22.54±2.82	0.870
Gender			
Males/Females	17/8	11/14	0.080
	68%/32%	44%/56%	
ASA grade			
I/II	8/17	11/14	0.380
	32%/68%	44%/56%	

n=number, SD=standard deviation, BMI=body mass index, ASA=American Society of Anesthesiologists. Gender and ASA grade are expressed as number and frequency

Table 2: Time taken for intubation

Parameter	Group I (*n*=25) Mean±SD	Group II (*n*=25) Mean±SD	*P*
Time for intubation (s)	59.24±9.98	41.00±4.23	0.001

Unpaired *t*-test was applied, *n*=number, SD=standard deviation

Table 3: Manoeuvres and complications (trauma and hoarseness)

Group I		Group II		*P*
Manoeuvres				
Y	N	Y	N	
2	23	10	15	0.008
(8%)	(92%)	(40%)	(60%)	
Trauma				
Y	N	Y	N	0.030
0	25	4	21	
(0.0%)	(100.0%)	(16.0%)	(84.0%)	
Hoarseness				
Y	N	Y	N	0.070
0	25	3	22	
(0.0%)	(100.0%)	(12.0%)	(88.0%)	

Y=yes, N=no

group II, four patients (16%) had trauma during intubation ($P = 0.030$). In group I, no hoarseness was observed, whereas, in group II, three patients (12%) had hoarseness [Table 3].

DISCUSSION

Currently, videolaryngoscopes have evolved into different types, and the current trend is more towards the use of videolaryngoscopes over direct laryngoscopy as they provide a superior glottic view. The nasal Airtraq [Figure 2] has been found to be useful in improving the view of the glottis and hence the ease of tracheal intubation.[8,9] However, directing the tube tip into the visualised glottis can be challenging when nasotracheal intubation is performed. Magill forceps are commonly used to guide the tube; however, they can cause airway trauma and, in some cases, cuff perforation.[10,11] This problem gets resolved if the bougie is placed first. The present study was conducted for the evaluation of nasotracheal intubation using an Airtraq laryngoscope with and without a bougie: group I was with a bougie and group II was without a bougie.

In the present study, the time for intubation in group I was 59.24 ± 9.98 s, whereas, in group II, it was 41.00 ± 4.23 s [Table 2]. The difference between the two groups was found to be highly significant. The results of the present study are in concordance with a study in which the authors compared conventional nasotracheal intubation and the bougie technique of nasotracheal intubation using a glideoscope.[12] They observed that the time to intubate with the conventional technique was 70 s as compared to 81 s when the bougie technique was used. Another study also found more time of intubation in the bougie group compared to the non-bougie group (30.45 s versus 18.25 s, $P < 0.01$).[13] However, the difference from the present study is that these authors used a Macintosh laryngoscope. In the present study, the increased time of intubation in group I is most likely due to the additional time taken in railroading the endotracheal tube over the bougie and then removing the bougie. The additional time taken in railroading the tracheal tube was because the tracheal tube got caught on glottic structures, and it was rotated anticlockwise to make it free. To prevent the tissues from getting in between the bougie and bevel of the ETT, it is very essential to obtain a snug fit between the bougie and the ETT.[14]

The authors in another study used the nasopharyngeal airway as a conduit for bougie. According to these authors, when a paediatric bougie is introduced via the nasopharyngeal airway, the tracheal advancement of the bougie needs only little manipulation.[12] We did not use the nasopharyngeal airway as a conduit because we used Magill forceps for directing the bougie into the glottic opening and the use of a nasopharyngeal airway could have resulted in difficulty. The benefits of a paediatric bougie include the relative firmness and Coude tip which help in easy manipulation and, in addition, limit pressure on the contacted tissues. A Coude tip is beneficial as it also allows easy intrapharyngeal guidance and rotation of the bougie if the glottis is not immediately approximated.[12]

In the present study, two patients (8%) in the bougie group required the use of additional manoeuvres, whereas, in the non-bougie group, 10 patients (40%) required the manoeuvre of intubation [Table 3]. This is most likely because it is easier to manipulate the bougie with Magill forceps than the tube due to the

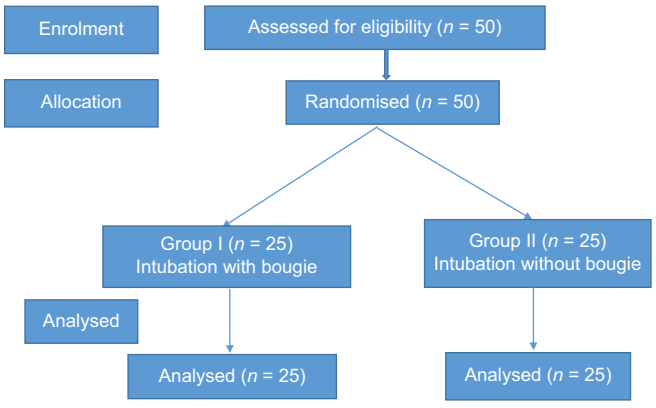

Figure 1: Consolidated Standards of Reporting Trials (CONSORT) flowchart

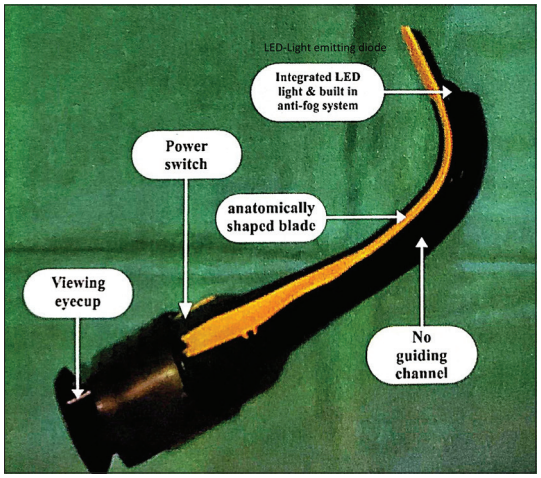

Figure 2: Nasal Airtraq laryngoscope

more pliable nature of the bougie.[7] Similar to the present study, the authors of a study observed that Magill forceps was required in 9% of patients in the bougie group versus 28% in the conventional group.[12] A study compared nasotracheal intubation using the Airtraq versus Macintosh laryngoscope. These authors observed less need for Magill forceps with the Airtraq than with the Macintosh laryngoscope ($P < 0.01$). An anatomically shaped blade involves minimal movement of the larynx from the original position and allows easy entry of the tube tip through the glottis.[3] Another study compared the Macintosh and Airtraq laryngoscope for nasotracheal intubation. To optimise intubations, the authors of this study used four different optimising manoeuvres, namely, cricoid pressure, guiding by an Eschmann stylet, change in head positioning and the use of Magill forceps, either alone or in combination. These authors observed that the number of manoeuvres was reduced with a nasal Airtraq.[2]

In the present study, 23 patients (92%) in the bougie group had easy intubation, whereas, in the non-bougie group, 15 patients (60%) had easy intubation. Similar to the present study, the authors of a study observed that the ease of intubation was better in the bougie group.[13]

In the present study, no patient had trauma in the bougie group, whereas four patients (96%) in the non-bougie group had trauma [Table 3]. These results are in agreement with a couple of other studies.[12,13] The authors of another study observed that using a bougie resulted in a lesser incidence of bleeding in comparison to the conventional method (55% versus 68%, $P = 0.033$). Furthermore, these authors also assessed the severity of nasopharyngeal trauma and concluded that bougie-guided nasal intubation lessens the incidence and severity of nasopharyngeal trauma significantly.[12] Similarly, bougie-guided intubation resulted in less bleeding as compared to the conventional group in another study [9 patients (45%) versus 17 patients (85%) $P = 0.020$.] The researchers of this study concluded that it is of significant importance to pass a bougie atraumatically and then thread an ETT over it.[13] Thermosoftening of an endotracheal tube reduces the risk of epistaxis during nasotracheal intubation.[15] In the present study, none of the patients in the bougie group had hoarseness and three patients (12%) in the non-bougie group had hoarseness [Table 3]. However, the difference was found to be statistically insignificant ($P = 0.070$).

The present study has a few limitations. Only patients with normal airways were included. Only patients with ASA PS I and II were chosen, and a haemodynamic comparison was not made between the two groups.

CONCLUSION

The time taken for bougie-guided intubation through the Airtraq laryngoscope was more compared to intubation without the bougie. With less number of manoeuvres, the ease of intubation through Airtraq was better in the bougie-guided technique as compared to non-bougie-guided intubation. In addition, trauma was also significantly less with the bougie technique.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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