

COMPARISON OF THE OUTCOME OF NASAL INTUBATION BY VIDEO-LARYNGOSCOPE WITH AND WITHOUT BOUGIE IN PATIENTS UNDERGOING MAXILLOFACIAL SURGERY AT TERTIARY CARE HOSPITAL KARACHI

Dr. Vinesh Kumar^{*1}, Dr. Syed Zafar Mehdi²

^{*1,2}Department of Anaesthesia at Shaheed Mohtarma Benazir Bhutto Institute of Trauma, Karachi

¹vineshkataria1@gmail.com, ²szafar_99@hotmail.com

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Corresponding Author: *

Dr. Vinesh Kumar

Abstract

BACKGROUND: Nasotracheal intubation is frequently performed during the maxillofacial and head and neck surgeries to offer secure airway access whereas maintaining surgical field visibility. The use of a bougie has been proposed to facilitate tube guidance and improve first-attempt success. Comparing the nasotracheal intubation using a video-laryngoscope with and without a bougie is thus critical to determine the most effective technique for safe and successful airway management.

OBJECTIVE: To compare the outcome of nasal intubation by video-laryngoscope with and without bougie in patients undergoing maxillofacial surgery at Tertiary Care Hospital, Karachi.

METHODOLOGY: In this prospective comparative cohort study over a period of four months . one hundred ninety-four patients were enrolled at department of maxillofacial surgery department, Shaheed Mohtarma Benazir Bhutto Institute of Trauma, Karachi. Patients were allocated into two groups. Group A had patients undergoing NTI using a video laryngoscope with a gum elastic bougie and group B had patients undergoing same procedure using video laryngoscopy without a bougie. We assessed the difficult intubation between both groups, using chi square test, where significance was set at $p \leq 0.05$.

RESULTS: One hundred ninety-four patients were analyzed and allocated to two groups. Majority of the patients in both groups were male, in VL with bougie 71 (73.2%) and in VL without bougie 67 (69.1%). Median intubation time was 58 (54-62) seconds in VL without bougie group and 62 (55-67) seconds in VL with bougie group. Statistically notable difference was observed between the groups in terms of difficult intubation, as only 4 (4.1%) patients in VL with bougie had difficult intubation and 12 (12.4%) in VL without bougie ($p = 0.03$).

CONCLUSION: The outcome in terms of difficult intubation of nasal intubation by video-laryngoscope with bougie in patients who underwent maxillofacial surgery was better than those without bougie.

INTRODUCTION: Developing a secure airway is vital for ensuring adequate ventilation and oxygenation throughout general anesthesia. This

component of anesthesia method presents major obstacles as well as any failure could result in serious consequences. Nasotracheal intubation

(NTI) usually takes place for general anesthesia in situations of temporomandibular joint disorder along with for individuals undergoing maxillofacial and oral surgical procedures.^{1, 2} In cases where opening mouth has been limited or not allowable due to surgical factors, oral intubation is not applicable for these patients.^{3, 4} Nasal intubation usually occurs using direct laryngoscopy in an anesthetized cases as well as fiberoptic laryngoscopy within conscious patient. This method might involve significant time investment along with necessitate a specialized anesthesia team who have the appropriate tools to address this difficulty effectively. Additionally, there's an elevated risk of trauma, and these can vary from minor soft tissue injuries that result in subsequent bleeding to more serious injuries resulting from false passage of device. This risk is highest in cases involving traumatic nasopharyngeal injury.⁵⁻⁷

Flexible bougies to steerable intubation provide a viable solution. By serving as a guide, they enable clinician to safely insert endotracheal tube through trachea, especially in circumstances where glottic view is beneficial but anatomical mobility is limited. Previous studies have shown that bougie guided intubation lessens the demand for Magill forceps and has potential to enhance success rates in challenging airway situations.⁸⁻¹⁰ A study indicate that use of bougies may extend duration for intubation, while other research indicates a reduction in difficulties, increased ease for intubation, as well as improved success rates.¹¹⁻¹³

Maxillofacial surgeries often necessitate nasal intubation to secure the airway while maintaining unobstructed surgical access. However, this procedure can be technically challenging due to altered anatomy and limited mouth opening. The advent of video laryngoscopes has improved glottic visualization and intubation success rates. Yet adjunctive use of a bougie during nasal intubation remains a subject of debate. There is limited comparative evidence assessing the efficiency of video-laryngoscope-guided nasal intubation with versus without a bougie particularly in context of maxillofacial surgeries. The aim of this study is to compare the outcome of nasal intubation by video-

laryngoscope with and without bougie in patients undergoing maxillofacial surgery.

METHODOLOGY:

This study was designed as a prospective comparative cohort study, which was conducted in the department of maxillofacial surgery, Shaheed Mohtarma Benazir Bhutto Institute of Trauma, Karachi after securing the ethical approval (Ref# IRB-000192/SMBBIT/Approval/2025) from the institute. One hundred ninety four patients were selected for this study, these patients were divided in two groups equally. This sample size was calculated using OpenEpi software with calculations based on an alpha 5% and a study power of 80% along with the difficult intubation rate of 3.6% in VL with bougie and 9.1% with VL without bougie.¹⁴ A non-probability consecutive sampling approach was used.

The enrolled patients had ages 20 to 70 years of either gender who were classified as American Society of Anesthesiologists (ASA) physical status II or higher, Mallampati score $\leq$ II and were scheduled for maxillofacial procedures. Patients with valvular heart disease, pulmonary hypertension, left ventricular ejection fraction below 35%, difficult airway, Mallampati score of IV, BMI > 35 kg/m², history of reactive airway disease, gastroesophageal reflux, vital organ dysfunction (creatinine >2 mg/dl, bilirubin >2 mg/dl, and liver enzymes >3 times normal and bleeding diathesis) and patients presented for emergency procedures were not enrolled..

After taking consent from the patients, they were allocated to the groups using non-randomization. Group A underwent nasotracheal intubation assisted by a gum elastic bougie under video laryngoscopy guidance while Group B underwent the same procedure using a video laryngoscope but without the bougie.

Before the induction of anesthesia, all patients underwent a standardized monitoring protocol which included electrocardiography, pulse oximetry and non-invasive blood pressure measurement. An intravenous line was secured and the nasal passages were prepared with a mesh soaked in an adrenaline solution (1:200000) combined with tetracycline ointment to achieve

decongestion and lubrication. The nasal trumpet maneuver was not used in this study. Preoxygenation was performed for three minutes followed by intravenous administration of midazolam (0.1-0.3 mg/kg) and fentanyl (3 µg/kg). Anesthesia was induced with propofol (2-2.5 mg/kg) and neuromuscular blockade to facilitate intubation was achieved with atracurium (0.5 mg/kg). Bag-mask ventilation was performed to ensure adequacy of ventilation and nasotracheal intubation was undertaken five minutes after induction confirmed by a "train of four" count of zero on a peripheral nerve stimulator. Difficult intubation was defined as intubation achieved in more than one attempt. The intubations were performed by an experience anesthesiologist with more than 10 years of experience and the patients will be monitored by the researcher and the outcome will be recorded on a proforma.

Data were collected on several demographic and clinical variables. BMI ≥ 27.5 kg/m² was defined as obese according to WHO guidelines for Asian populations.¹⁵ Smoking status was categorized as non-smoker, active smoker (consuming 10 cigarettes daily for two years) or ex-smoker (abstinent for at least six months).

SPSS 20 was used for analyzing the data which was gathered by the researcher. Age, BMI and intubation time were assessed using median IQR

after assessing for normality using Shapiro Wilk test. Gender, obesity and smoking were assessed using frequency and percentages. Chi square test, with p value considered statistically notable at ≤ 0.05 was performed to compare difficult intubation between both groups.

RESULTS:

In this study, 194 patients underwent maxillofacial surgery. The patients were divided in two groups, in which there were 97 patients in each group. Patients in group A had VL with bougie while the patients in group B had VL without bougie. Table I presents the demographic and clinical profile of the patients. Both groups had a higher majority of male patients 71 (73.2%) in VL with bougie group and 67 (69.1%) in VL without bougie. A small proportion of patients were identified with obesity, with 14 (14.4%) in Group A and 13 (13.4%) in Group B. Median duration of intubation was 62 (55-67) seconds for Group A while in Group B demonstrated a slightly shorter mean intubation time of 58 (54-62) seconds.

A statistically relevant difference was observed in the incidence of difficult intubation between the two groups. The bougie-assisted group experienced only 4 (4.1%) cases of difficult intubation while the non-bougie group had 12 (12.4%) cases of difficult intubation ($p = 0.03$) (Table II)

Table I Demographics & clinical profile

Demographics & clinical profile		Groups			
		Group A (VL with bougie)		Group B (VL without bougie)	
		Median/Mean	IQR/ $\pm$ SD	Median	IQR
Age (Years)		32	26-45.50	34	28-44.50
BMI (Kg/m ²)		25.38	1.73	25.25	1.78
Intubation time (Sec)		62	55-67	58	54-62
		n	%	n	%
Gender	Male	71	73.2%	67	69.1%
	Female	26	26.8%	30	30.9%
Smoking	Active smoker	28	28.9%	32	33.0%
	Non-smoker	50	51.5%	56	57.7%
	Ex-smoker	19	19.6%	9	9.3%
Obesity	Yes	14	14.4%	13	13.4%
	No	83	85.6%	84	86.6%

SD = Standard deviation; n = Frequency; % = Percentage

Table II Comparison of difficult intubation between both groups

Difficult intubation	Groups				p value
	Group A (VL with bougie)		Group B (VL without bougie)		
	n	%	n	%	
Yes	4	4.1%	12	12.4%	0.03
No	93	95.9%	85	87.6%	
<i>n = Frequency; % = Percentage; Chi square test used</i>					

DISCUSSION:

In clinical practices, especially during maxillofacial surgeries, two methods have been widely adopted by surgeons, video laryngoscope (VL) and direct approach. VL has been documented to provide better line of sight when compared with direct approach.¹⁶ VL with the use of bougie was compared to VL without bougie in this study, in patients who underwent maxillofacial surgery. When assessing the demographic profile of this study patients, it was found that in both groups, the patients were mostly in their 30's and majority were male patients. Khan *et al.* in their study documented that majority of their patients in either in their late 30's (DL group) and early 40's (VL group).¹⁷ Eldemrdash *et al.* reported a comparable mean age of around 30 years with a male percentage greater than 80% in their study of maxillofacial trauma patients.¹⁸

For this study, difficult intubation was defined as intubation requiring more than a single attempt. This study data revealed a superior advantage for the bougie-assisted VL technique which demonstrated a significantly lower incidence of difficult intubation at 4.1% compared to 12.4% in the group where VL was used without a bougie. This finding underscores the bougie's role as a valuable primary adjunct for enhancing procedural fluency.

A particularly interesting finding from this study was the slightly longer median intubation time in the bougie-assisted group (62 seconds) compared to the non-bougie group (58 seconds). This observation finds a clear alignment with Lalita *et al.* who reported a longer intubation time of 48.63 seconds in their bougie group versus 34.87

seconds in the non-bougie group.¹⁹ This consistent trend across studies suggests that the act of threading and railroading the endotracheal tube over the bougie introduces a measurable cost of time. However this must be interpreted in the context of superior outcomes. Lalita *et al.* demonstrated that their bougie group despite the longer time had a higher first-attempt success rate of 86.7% compared to 70%, which aligns well with this study lower incidence of difficult intubation in VL with bougie group.¹⁹ This study results reinforce this trade-off of longer intubation time demonstrating that a few additional seconds spent using the bougie can prevent the need for multiple potentially traumatic laryngoscopy attempts which can compromise the safety and efficiency of the procedure.

The study by Gautam *et al.* on bougie-assisted nasal intubation reported a first-attempt success rate of 77.8% and notably eliminated the need for Magill forceps entirely.²⁰ The avoidance of Magill forceps is a crucial point as their use is independently associated with oropharyngeal trauma, cuff damage and increased bleeding. Eldemrdash *et al.* found that the use of Magill forceps was notably lower in the video laryngoscopy group (46.9%) versus the direct laryngoscopy group (90.6%) but present study and Gautam's suggest that coupling VL with a bougie can reduce this need even further.^{18,20} The bougie acts as a guide navigating the anatomical curvature from the nasopharynx to the larynx with minimal tissue contact, hence reducing the friction and resistance that often requires forceps and causes epistaxis.

The utility of the bougie in challenging scenarios is further affirmed by Latimer *et al.* who found that

routine bougie use was independently associated with a higher first-attempt success rate an effect that was most pronounced in patients with poorer glottic views.²¹ This is a critical insight which demonstrates the bougie's value not just in optimal conditions but precisely when anatomy becomes difficult.

Based on this study findings and the findings of the aforementioned studies, it is suggested that the bougie assisted VL should be used in routine in maxillofacial surgery where bleeding and airway trauma are major concerns.

CONCLUSION:

From this study, it is concluded that nasal intubation by VL with bougie in patients who underwent maxillofacial surgery was significantly better than VL without the use of bougie in terms of difficult intubation.

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