Original Research Article

Comparison of two different tracheal tube designs for awake fibreoptic nasotracheal intubation

Guruprasad Shetty[1*], Nanditha S[2], Rajesh Mane[2], Manjunath Shivapujimath[2]

[1,2]Department of Anaesthesiology, J N Medical College, Belagavi, Karnataka, INDIA.
Email: dr.gpshetty@hotmail.com, dr.gpshetty@hotmail.com

Abstract

Background and Aims: The most fundamental part of anesthesia is management of difficult airways using Awake fiberoptic intubation. However, trauma to the upper airways structure due to impingement of the endotracheal tube (ETT) while railroading over the fibreoptic bronchoscope is an acute underlying problem. In this study we compared the standard poly vinyl chloride tube with silicone tipped tube for impingement of the tube while railroading it over the fibreoptic bronchoscope and duration required to railroad the tube from proximal part of the scope till it gets inserted into the glottic aperture during awake fibreoptic nasotracheal intubation. **Methods:** In total 40 patients were included and divided into 2 groups to receive either PVC tube (Group P) or silicone tipped tube (Group S). Patients were randomly allocated, by computer generated randomization table. Impingement of the tube and the time required for passage of the ETT were noted. Fisher exact test was used to assess grading of impingement and significant difference for duration of intubation was analysed using Student T test. **Results**: Difficulty requiring 90degree anticlockwise rotation of ETT was more in Group P when compared to Group S and 4 Group P required manipulation while none in Group S. The mean duration required to railroad the ETT through the glottic opening (intubation time) was lesser in Group S than Group P. **Conclusion**: Silicone tipped tube available with the I-LMA is easier to insert, significantly reduces impingement and thus can replace conventional PVC tube for awake fibreoptic intubation.

Key Words: Awake fiberoptic intubation, PVC tube, Silicone tube, cervical spine injury, endotracheal tube

[*]**Address for Correspondence:**
Dr. Guruprasad Shetty, Department of Anesthesiology, J N Medical College, Belagavi, Karnataka, INDIA.
Email: dr.gpshetty@hotmail.com

Received Date: 02/08/2019 Revised Date: 13/09/2019 Accepted Date: 11/10/2019
DOI: https://doi.org/10.26611/101512113

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 26 October 2019

INTRODUCTION

Airway management is the most essential factor to be considered while giving anaesthesia and tracheal intubation is often mandatory to make sure that substantial airway control is maintained. Intubation by direct laryngoscopy often yields better results, however it can be detrimental in cases of cervical instability therefore, to establish an adequate way of securing airway in such patients. Awake fibreoptic intubation is the most suitable technique as it involves minimal or no movement of the neck. However, obstruction of the upper airway structures caused due to the impingement of the endotracheal tube (ETT) during passage over the fibreoptic bronchoscope (FOB) remains an acute problem. Arterial desaturation and trauma to upper airway structures caused due to increased intubation time or failure of intubation remains the most serious complication of ETT impingement [1]. It has been reported that passage of the tube through the glottis is dependent on variations in the tube design. In the current study we compared the standard poly vinyl chloride (PVC) tube with silicone tipped tube available commercially with an intubating laryngeal mask airway (I-LMA) for ease of insertion into the glottis while sliding over the FOB. Both the tubes were assessed for impingement while sliding over the fiberoptic bronchoscope and the duration

How to site this article: Guruprasad Shetty, Nanditha S, Rajesh Mane, Manjunath Shivapujimath. Comparison of two different tracheal tube designs for awake fibreoptic nasotracheal intubation. *MedPulse International Journal of Anesthesiology.* October 2019; 12(1): 64-66. http://medpulse.in/Anesthsiology/index.php

required for the tube from proximal part of the scope to pass through the glottic aperture in patients with elective cervical spine surgeries undergoing awake fiberoptic nasotracheal intubation.

METHODOLOGY

After obtaining the institute's ethical committee approval along with written informed consent, 40 patients of ASA physical status I-III aged between 18 -60 years and weighing 55-80 kg, scheduled for elective surgeries of the cervical spine and requiring awake fiberoptic intubation, were enrolled for the study. Patients with anticipated airway difficulties were excluded from study. Nasal decongestion and packing with 4 ml of 4% lignocaine was performed and IM glycopyrrolate 10 g/kg administered 20 mins prior to taking the patient to operating room. Routine monitors (ECG, non-invasive blood pressure and pulse oximetry) were attached in the operation room. All patients were anesthetized using bilateral Superior laryngeal nerve block with 2ml of 2% lignocaine and transtracheal injection of 2 ml of 4% lignocaine.

Patients were randomly allocated, using a computer-generated randomization table to undergo intubation with either 8mm ID PVC tube (Group P) or 8mm ID silicone tipped tube (Group S). The endoscope measuring 3.7 mm OD and 65 cm in length was introduced nasally and into the glottis by a senior anesthesiologist experienced in fiberoptic intubation.

The time duration for the passage of ETT and impingement of the tube was recorded. In all cases tubes were maneuvered initially with the bevel facing anteriorly. Ease of intubation was assessed and graded as follows:

Grade of ETT impingement [2]

Grade I ------- No impingement

Grade II ------ Impingement relieved by 90° counter clockwise rotation

Grade III----- Impingement requiring more than one rotation, tongue traction, or the additional use of a rigid laryngoscope

Grade IV----- Failure (ETT not able to be positioned in the trachea despite visualization of the carina with the FOB)

The intubation time was defined as the time from the start of railroading of the tracheal tube over the FOB to its passage through the glottis.

If the passage of the FOB caused arterial desaturation SpO2 <90% with visualization of the carina taking longer than 5 min then in that case the study was abandoned to proceed with appropriate standard anesthesia protocol. Parameters such as hemodynamic changes and oxygen saturation were constantly monitored.

Statistical Analysis

Based on the outcomes of the previous study regarding the incidence of impingement a difference of 20% between two tubes, with the power of the study being 80%, effect size 43%, Level of significance 0 .05 and allowable error 0.2, a sample size of 20 in each group was obtained.

RESULTS

40 patients enrolled in the study were categorized into 2 groups that would either receive PVC tube (Group P) or silicone tipped tube (Group S) for intubation. The patient's Physical characteristics were compared in both the groups and were successfully intubated through the FOB. Impingement grade was assessed (table 1) and it was observed that, no difficulty was encountered in railroading of ETT in 10 patients in Group P and 17 patients in Group S. Difficulty requiring 90 degree anticlockwise rotation of ETT was encountered in 6 patients in Group P compared to 3 in Group S and 4 patients in Group P required more than 1 manipulation while none in Group S thus statistically suggesting in a significant p value (p=0.032)

Table 1

	Group P	Group S
Grade I	10 (50%)	17 (85%)
Grade II	6 (30%)	3 (15%)
Grade III	4 (20%)	-
Grade IV	-	-

The mean duration required to railroad the ETT through the glottic opening (intubation time) was 15.4 seconds in Group S compared to 22.7 seconds in Group P which is statistically significant (p<0.001)

Table 2

	Group P	Group S	P-value
Mean Duration of intubation (seconds)	22.7±3.77	15.4±1.82	0.001*

DISCUSSION

To minimize the risk of cervical spine injury in cases of cervical instability fiber aided intubation is the most preferable option as it maintains neutral position, and also the neurological status can be assessed preoperatively after intubation and positioning of the patients [2].However endotracheal tube causing impingement of the surrounding structures while passing over the fiberoptic bronchoscope is a common problem. The incidence of impingement due to fiberscope tube diameter, design and tip is around 23% to 46%[3]. Multiple manipulations need to be done so as to overcome the impingement thus considerably reducing the risk of upper airway trauma and other complications which include supraglottic

edema, vocal cord bruising, serious laryngeal trauma and extensive hematoma of the pharyngeal mucosa. Various methods such as a 90° counterclockwise rotation of the ETT, the use of a smaller diameter ETT, alternatively shaped ETT tips and the double setup ETT have all been previously studied so as to reduce the complications of ETT impingement. The concept of a smaller diameter ETT causing reduction in the size of the gap between the outer surface of the fiberoptic bronchoscope and the inner surface of the ETT[3] is considered inappropriate due to increased resistance to ventilation caused by decreased internal diameter of the ETT. Therefore, FOB with an appropriate diameter, is considered suitable as it not only reduces the gap between the ETT and the FOB but also decreases the complications of tube impingement, however, a major disadvantage of Fiberoptic bronchoscopes of different diameters is that they are expensive and unlikely to be easily available. Sharma *et al*, in a study have observed that impingement can usually be overcome by a counterclockwise rotation of 90º of the ETT.[4] In a study by Hakala and Rendall *et al*, a smaller diameter ETT significantly reduced impingement during fiberoptic intubation [5]. According to a study by Jackson *et al*, a double setup ETT use suggested of a lower case of impingement in comparison to a the single ETT use. In the current study it was observed that since the incidence of impingement, the requirement of rotation of tube and median intubation time were lower in the group with the silicone tipped tube as compared to the group with the conventional PVC tube, therefore, silicone tipped tube was easier to insert over the fiberoptic bronchoscope into glottis than the conventional PVC tube . The silicone rubber tipped tube is a fast track tube used for intubation along with the I-LMA, with a softer hemispherical bevel and a leading edge in the midline. It is relatively less stiff than the normal PVC tube, conforms better to the fiberoptic bronchoscope and thus allows easier passage into the glottis.

CONCLUSION

In conclusion, from our study the silicone tipped tube available with the I-LMA can replace conventional PVC tube for awake fiberoptic intubation since it's much easier to insert with minimal impingement

REFERENCES

1) A. H. Jackson, P. Wong and B.Orr. Randomized, controlled trial of the double setup tracheal tube during fibreoptic orotracheal intubation under general anaesthesia. Brit J Anaesth 2004;2 (4): 536±40
2) Umamaheswara. Airway management in neurosurgical patients. Indian J. Anaesth 2005; 49 (4) :336 -343
3) J. Ruari Greer, Sharon P. Smith,TimStrang. A Comparison of Tracheal Tube Tip Designs on the passage of an Endotracheal Tube during Oral fibreoptic Intubation. Anesthesiology 2001; 94:729–31
4) D.Sharma, P.K.Binthal, G.P.Rath, M.P.Pandia. Effect of orientation of a standard polyvinyl chloride tracheal tube on success rates during awake flexible fibreoptic intubation. Anesthesiology 2006;61:845-848
5) P.Halaka, T.Rendall, H.Valli. Comparison between tracheal tubes for orotracheal fibreoptic intubation. Brit J Anaesth 1999;82(1):135-6

Source of Support: None Declared
Conflict of Interest: None Declared