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Awake Fiberoptic Intubation: Comparison Of Three Techniques of Spray-As-You-Go.

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ABSTRACT

Background: Awake fiberoptic intubation is the gold standard technique for the management of the predicted difficult airway. The patient's tolerance and the success of fiberoptic-assisted nasotracheal intubation depends on the effectiveness of topical anaesthesia. Aim of this prospective randomized comparative study was to compare three techniques of spray-as-you-go using topical anaesthesia, namely lignocaine injected through working channel, epidural cathether and angiographic cathether taking into consideration - severity scale, patient reaction score, intubation time, total dose of lignocaine and complications in patients during intubation. **Methods:** Sixty ASA 1 or 2 patients of either sex aged 18-60 yrs scheduled for elective surgery with predicted difficult airway were equally divided into three groups(n=20),received 0.1% xylometazoline in both nostrils and 10% lignocaine sprayed into nares and posterior pharyngeal wall. Thereafter patients received 6ml of 4% lignocaine in four aliquots either by working channel in group A, or via epidural catheter in group B, or via angiographic catheter in group C along with oxygen attached through three way tap proximally. Intubation time, reaction score, cough count, stridor, extra local anaesthetic requirement, severity score were recorded. Vital parameters blood pressure, SpO2, ECG, pulse rate were monitored. **Results:** Group A patients showed shorter intubation time ($p<0.0005$) with better severity score and less local anaesthetic requirement maintaining stable vital parameters with lower incidence of cough. Reaction score was better in group A than Group B & C. **Conclusion:** In conclusion spraying directly through the working channel along with oxygen provided effective local anaesthesia and was preferred by both patient and endoscopist.

Keywords: Fiberoptic intubation, lignocaine, spray-as-you-go.

INTRODUCTION

Securing the airway during general anaesthesia in patients with difficult airway poses a risk to the patient and presents challenges for the anaesthesiologist. Fiberoptic intubation is the gold standard technique for the airway management in patients with difficult standard direct laryngoscopy.[1,2] A technique for topical anaesthesia of the airway was evolved for this purpose since it is an unpleasant procedure and most patients complain sensation of passage of the instrument through the nose and larynx, pain and coughing while bronchoscopists usually experience difficulty in laryngeal visualization due to secretions and inadequate local anaesthesia.[3-5]

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The patient's tolerance and the success of fiberoptic-assisted intubation depends on the effectiveness of topical anaesthesia and obtundation of pharyngeal, laryngeal and tracheobronchial reflexes which can be achieved either by topical administration of local anaesthetics or blockade of neural supply to oropharynx and larynx.[5,6]

Complete airway anaesthesia increases patient comfort and probability of success, decreases the response to intubation. Prior to intubation, upper airway is commonly anaesthetized by lignocaine spray while larynx and lower respiratory tract is anaesthetised by spraying lignocaine directly down the fiberscope side port by spray-as-you-go technique.[7-9] The spray-as-you-go technique involves local anaesthetic application while advancing the tip of the fibrescope. The spray-as-you-go technique using fiberoptic bronchoscope provides flexibility in selectively anaesthetizing respiratory passages.[10] This may be related to the fact that local anaesthetic injected by working channel of fiberscope or epidural catheter or angiographic catheter placed in working channel cannot be reduced to extremely fine cloud. Fine

spray can be achieved by addition of air or oxygen.[11,12] Classical bolus application of local anaesthetic through the working channel of the fibrescope is a routinely used method.[13]

Fiberoptic intubation can be performed either awake or under sedation. The aim of sedation is to facilitate patient comfort and satisfaction, and to alleviate patient anxiety, cough and to reduce complication.[14,15] Combined opiates and benzodiazepines or propofol are frequently used to achieve sedation during fiberoptic intubation. Due to rapid onset and amnestic properties propofol is an appealing agents for procedural sedation.[16,17]

Aim of our prospective randomized comparative study was to compare three different techniques of spray-as-you-go under sedation, namely lignocaine injected either directly through the working channel, via epidural catheter, via angiographic catheter. The primary objective was to compare the intubation time, evaluate patient comfort and to assess the quality of airway anaesthesia.

MATERIALS AND METHODS

After approval from ethical committee and informed consent from patient, 60 adult patients of both sexes aged 18–60 years with ASA status I–II and anticipated difficult airway with Mallampati class III-IV and restricted neck movement undergoing elective surgery under general anesthesia, were randomly selected. Patients with hypertension, diabetes, heart or liver disease, epilepsy, asthma, allergy to any of the study drug, pregnancy or deranged coagulation profile were excluded. Routine investigations like hemogram, blood sugar, blood urea, serum creatinine, bleeding time, clotting time, chest x-ray, ECG were done.

After pre-anaesthesia check-up, all patients received tablet alprazolam 0.25 mg and tablet ranitidine 150mg and were kept nil by mouth on the night before surgery. In theatre, monitoring with pulse oximetry, ECG, SpO2, and non-invasive blood pressure and an intravenous access was established. All patients received injection glycopyrrolate 4ug/kg IV. Two drops of 0.1% xylometazoline were instilled in both nostrils and nasal patency checked. Nasal passages were lubricated with 2 ml of 2% lignocaine jelly. Posterior pharynx was anaesthetized with 4 sprays of 10% lignocaine and all patients received injection fentanyl 1mcg/kg IV and injection midazolam 20 mcg/kg IV.

Patients were randomly allocated into three groups aiming to achieve laryngotracheal anaesthesia prior to nasotracheal intubation. Group A(n=20) patients had 6ml of 4% lignocaine in four aliquots sprayed directly into the working channel of intubating fiberscope (Fig 1) .Group B(n=20) patients had 18G end hole epidural catheter threaded through the working channel of fiberscope received 6ml of 4% lignocaine in four aliquots(Fig 2). Group C(n=20) patients had 6 Fr angiographic catheter threaded through the working channel of fiberscope received 6ml of 4% lignocaine in four aliquots (Fig 3).

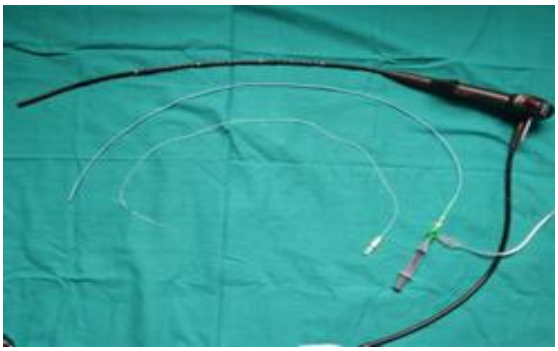

Figure 1: Fiberoptic bronchoscope, 6 Fr angiographic catheter, 18G end hole epidural catheter.

In each group, oxygen of 4litres/min was attached through three way tap proximally and four aliquots of lignocaine was sprayed in three steps which emerged distally as fine spray: two aliquots (1.5ml each) above the vocal cords, one aliquot (1.5ml) below the vocal cords during inspiration, one aliquot (1.5ml) above the carina where catheter tip was threaded distally during spraying followed by retracting into the working channel of fiberscope.

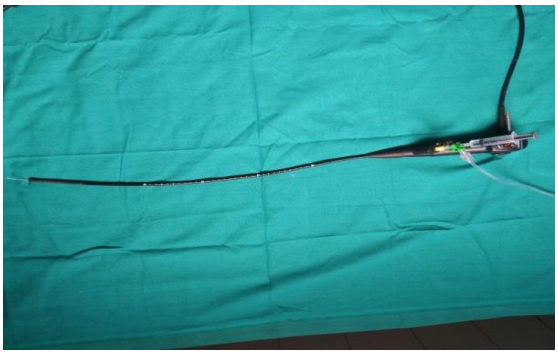

Figure 2: Epidural catheter threaded through working channel of fiberscope with three way tap attached proximaaly along with oxygen.

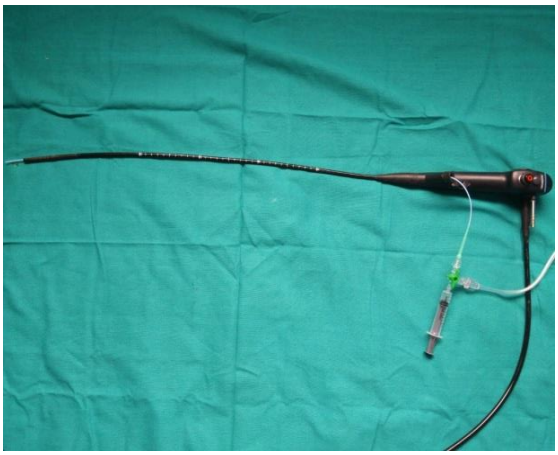

Figure 3: Angiographic catheter threaded through working channel of fiberscope with three way tap attached proximaaly along with oxygen

A waiting period of 30 seconds after every spray is done.In each group additional 1-2 ml aliquots of 4% lignocaine was administered if required. After passing through the vocal cords the fiberscope was advanced until carina were in view, injection propofol 2 mg/kg IV was given to all patients and endotracheal tube was advanced.

Vital parameters were observed at 1,3,5,10 min interval. Intubation time was defined as the time from passing the flexible fiberoptic bronchoscope tip through the nostril to the first reading obtained by the capnograph after endotracheal intubation. Intubation time, reaction scale, total dose of lignocaine, incidence of cough, stridor were noted by observer. Severity scale by patients recorded after procedure.

Reaction scale (by observer during procedure or intubation)

1= No reaction
2= Slight grimacing
3= Strong grimacing
4= Verbal objection
5= Defensive movement of head, hands or feet

Severity scale (reported by patient)

1= Not unpleasant
2= Uncomfortable
3= Unpleasant
4= Most unpleasant
5= Intolerable

General anesthesia was achieved with propofol (2 mg/kg IV) and vecuronium bromide (0.1 mg/kg IV).

RESULTS

Data was analysed statistically using Student's t test and chi-square test with computer software graphpad.com and probability values P <0.05 were taken significant. All three groups were similar demographically without significant difference [Table 1]. There were stable hemodynamics and no untoward incidents like desaturation or arrhythmias. Types of surgery included head and neck burn contractures.

Nasotracheal intubation was successful in all patients. The mean intubation time for Group A (232.55±16.94 s) [Table 3] was shorter than Group C (265± 19.18 s) and Group B (300.35±17.43 s) (P< 0.0005) (Fig 4).The quality of anaesthesia was significantly better in Group A [Table 2] as evidenced by lower severity score (P=0.00004) [Figure 5]. According to reaction scale patients were significantly more comfortable during procedure in Group A (1.2±0.41) [Table 2] than Group C (1.5±0.69) and Group B (2.15±0.67) (P=0.0001) [Figure 6]. The total dose of lignocaine including extra dose was significantly lesser in Group A (404±12.31 mg) [Table 3] than Group C (418±27.45mg) and Group B (436± 31.52mg) (P=0.001) [Figure 7]. Cough and stridor was uncommon during nasal and laryngeal passage of the fiberscope in all the groups. However, immediately following endotracheal intubation, 6,7,5 patients had cough in Group A, Group B, Group C respectively. There was no significant difference in the number of intubation attempts between the three groups.

Table 1: Demographic data.

Parameter	Group A	Group B	Group C
Age (years)	26 ± 1.8	25.95 ± 1.6	26.7 ± 1.1
Weight (kg)	57.1 ± 1.5	56.6 ± 2.3	56.55 ± 1.3
Sex (M:F)	12:8	11:9	10:10

Table 2: Subjective assessment

Parameters	Group A	Group B	Group C
Severity scale	1.15 ± 0.37	2.2 ± 0.77	1.5 ± 0.61
Reaction scale	1.2 ± 0.41	2.15 ± 0.67	1.5 ± 0.69

Table 3: Objective assessment

Parameters	Group A	Group B	Group C
Intubation time(s)	232.55 ± 16.94	300.35 ± 17.43	265 ± 19.18
Total dose of lignocaine(mg)	404 ± 12.31	436 ± 31.52	418 ± 27.45

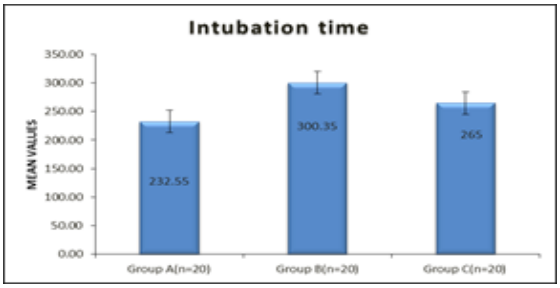

Figure 4: Comparison of intubation time

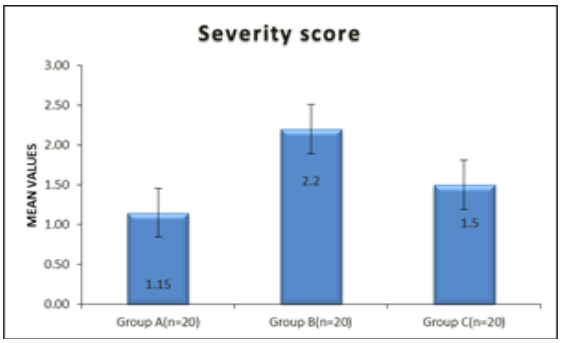

Figure 5: Comparison of Severity score between three groups

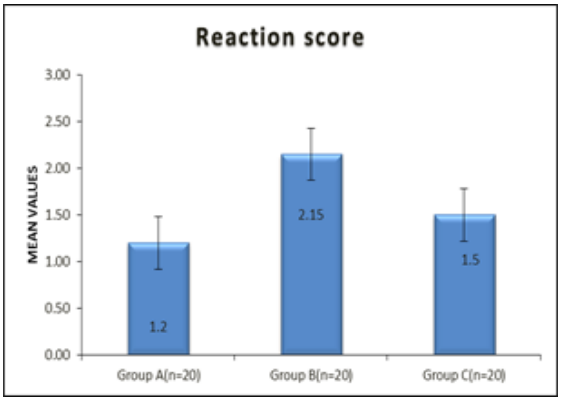

Figure 6: Comparison of Reaction score.

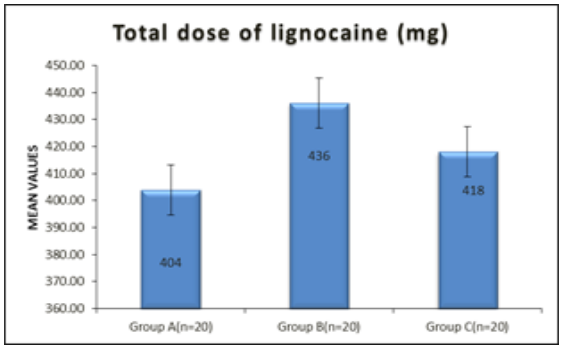

Figure 7: Total dose of lignocaine including extra dose used between three groups

DISCUSSION

The first fiberoptic nasotracheal intubation was performed with a fiberoptic choledoscope in a patient with still's disease.[18] The use of fiberoscope was expanded for airway management such as confirmation of proper placement of single and double lumen tubes, in intensive care unit, difficult airway management in both adults and children. Initial experiences with the spray-as-you-go technique for diagnostic bronchoscopy were published in the 1990s. The spray-as-you-go technique can also provide clinically good conditions for awake intubation and flexibility by selectively and repetitively anaesthetising the airway. Lignocaine is most commonly used local anaesthetic agent for fiberoptic intubation and has a wide margin of safety and absorption from respiratory mucosa is known to be rapid.[19]

This comparative, randomized, prospective study was undertaken to asses quality and compare the three different techniques of spray-as-you-go to achieve local anaesthesia of airway for fiberoptic intubation under sedation in terms of subjective assessment by patients and endoscopist using severity scale, reaction scale and objective measurement of cough, stridor, intubation time, any other complications and total dose of lignocaine required during procedure.

In our study, hemodynamic variables were stable during the procedure.The mean intubation time was significantly shorter in Group A(232 s) as compared to Group C (265s) and Group B(300s) which is a reflection of better quality of local anaesthesia and intubating condition afforded. The fiberoptic intubation time compare favourably with other authors.[5,21,29] However Alka Chandra et al,[22] in 2011 found that mean time to reach carina was significantly lesser in transcricoid group (57.33±12.98s) as compared to spray as you go group (79.33±22.35s) during fiberoptic bronchoscopy ($p<0.02$). Reasoner et al,[23] found no significant difference in intubation time between nerve block and topical anesthesia groups.

The total dose of lignocaine including extra dose was lesser in Group A(404mg) than Group C(418mg) and Group B(436mg).However Lt Col Sethi et al,[24] found lesser amount of extra dose of lignocaine in spray-as-you-go technique but was more than transcricoid injection technique and less than nebulisation. Most authors recommend higher safe dose of topical lignocaine viz 8-9mg/kg, except in elderly or those with hepatic or cardiac impairement.[30] The contention is that lignocaine is only partially absorbed across mucous membranes and some amount is reaspirated or swallowed during bronchoscopy. Peak systemic concentrations of lignocaine have been reported as early as 15 minutes following topical application while tissue bound lignocaine acts for 30-45 minutes. Adequate airway topical with minimum dosage of lignocaine is of supreme importance for patient safety .A reasonable waiting period after every spray is preferred.[27]

The quality of anaesthesia was significantly better in Group A as evidenced by significantly higher patients showed procedure was not unpleasant (Grade 1 Severity score).Similar to our study Lt Col Sethi et al,[24] found that quality of laryngeal anaesthesia was significantly better in spray-as-you-go method as evidenced by lower severity scale ($P<0.05$) where grading of overall intubation condition was better for spray-as-you-go group ($P<0.01$).However Graham et al,[25] Sharma et al,[26] reported better patient comfort by transtracheal injection of local anaesthetic than spray-as-you-go method. In our study, reaction score was significantly better in group A than Group C and Group B. However S Dhasmana et al,[27] found patient comfortable and no limb movement in both groups namely via nebulisation and injection into the working channel by spray-as-you-go technique and Xue FS et al,[20] found patient reaction score better with orotracheal intubation than nasotracheal intubation.

Both patients and endoscopists reported reduced tendency to cough with spray-as-you-go technique which was exemplified by reduced cough counts. Webb et al,[7] found transcricoid injection of lignocaine produced less cough than spray-as-you-go technique. However one third of patients found the cricothyroid puncture to be unpleasant and better acceptance of spray-as-you-go- technique. No major complications were encountered in the present study. Thus the inherent safety of spray-as-you-go technique is an important advantage. In fact a postal survey of fiberoptic bronchoscopy in the UK and recent reviews show that the majority of bronchoscopists spray the upper airways with local anaesthetic and inject lignocaine via suction channel of the bronchoscope.[28,30]

CONCLUSION

Fiberoptic guided intubation under sedation with lignocaine sprayed through working channel along with oxygen produced excellent topical anaesthesia

of airway and was the method preferred by both patients and endoscopists with negligible side effects.

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