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Research article

Nasal fiberoptic intubation with and without split nasopharyngeal airway: Time to view the larynx & intubate

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ABSTRACT

Background: Fiberoptic intubation requires long nasopharyngeal journey and mostly requiring jaw thrust to visualize larynx especially if done under general anesthesia. Use of split nasopharyngeal airway of appropriate length for better glottis visualization has been compared with the classic one.

Methods: Adult 68 patients; ASA I and II; undergoing surgery under general anesthesia were allocated randomly and equally into CL group in which classic nasal FOI with jaw thrust was done and NP group in which appropriate length of SNPA was inserted nasally followed by insertion of the scope with the application of jaw thrust if needed. Preprocedural heart rate, blood pressure and saturation and every minute for 5 min and also procedure and endoscopy time required to visualize the larynx (T1 and T3 respectively), carina (T4) and to remove the scope (T5) were recorded.

Results: Heart rate showed a statistically significant increase in CL and NP group during study time compared to pre-procedure reading. The MAP showed also statistical increase but only in CL group. There was a statistical (not clinical) significant increase between the percent of HR and MAP change in the CL group compared to NP group. T1, T3, and T5 in NP group were significantly shorter than in CL group but not for T4. Seven cases after SNPA needed jaw thrust.

Conclusion: Use of SNPA is safe and effective in reducing time to visualize larynx and intubate trachea. Developing longer specific "Naso-laryngeal (not nasopharyngeal) FOB intubating aid" is assumed to be more appropriate.

1. Introduction

Typically Fiberoptic bronchoscope is passed through the more patent nostril to follow the major nasal pathway at the floor of the nose along the superior aspect of the hard palate, the lateral aspect of the nasal septum inferior to the most lower turbinate to reach the nasopharynx where the operator identifies the pharyngeal structures, such as the base of the tongue and/or the epiglottis that are mostly "in-fall" precluding clear views of the larynx requiring a jaw thrust to visualize the laryngeal structures for patients planned to be intubated under general anesthesia [1,2].

Inserting a modified split tube nasally down to or near-by the larynx allows the FOB cable inserted through to be immediately in front of the larynx without need to verify the anatomical details of nasopharyngeal-laryngeal journey required during classic nasal FOB intubation and at the same time to peel it off away from the FOB allowing endotracheal tube (ETT) to be inserted along the FOB cable already advanced into the trachea making FOB nasal intubation done easier and in a shorter time.

In the present study, the authors performed FOB nasal intubation as classically done (classic "CL" group) and thorough a longitudinally cut nasopharyngeal airway of an appropriate length (nasopharyngeal "NP" group) comparing the effectiveness and safety in each group done by junior staff inexpert endoscopically.

2. Patients and methods

The present randomized control prospective study was done at Zagazig University Hospital after obtaining institutional review board approval and informed consent from all patients. Thirty-four adult patients in each group classified as ASA physical status I and II were included as sample size according to the mean of the total time (time starting from insertion of FOB in the nares till intubation and FOB removal) of a pilot study where mean I was 176.2 ± 100 s for CL group and mean II was 120 ± 66 for modified NP group, at 80% power and

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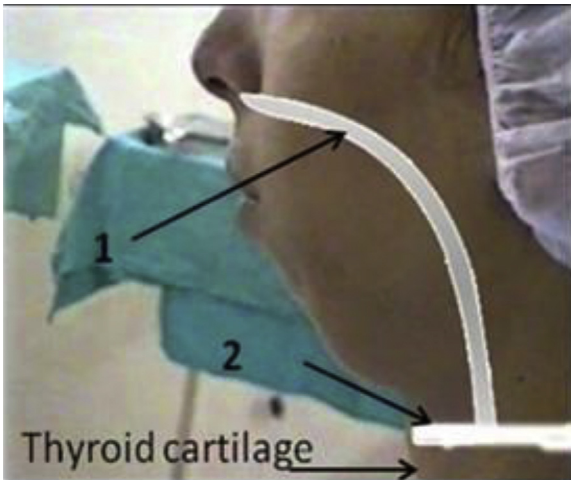

Fig. 1. The appropriate length of assumed split nasopharyngeal (actually Naso-laryngeal) airway is represented by a line (1) between the patient's nostril, that passes parallel to the floor of the nose, to meet a horizontal line (2) passing through the thyroid notch level at the neck laterally.

95% Confidence Interval. All patients were undergoing elective surgery under general anesthesia; requiring nasotracheal intubation. All patients had accepted routine laboratory investigations including coagulation profile (i.e. platelet count is ≥100,000/cc and INR is ≤1.45). Hypertensive patients and cases predicted to have difficult airway have been excluded from the study. The Patients were randomized by Computer Generated Random Numbers into two equal groups, Classic nasal FOI group (CL group) and Nasal FOI through split nasopharyngeal airway group (NP group).

The cases were done by junior inexpert staff in using FOB under supervision and guidance of a senior expert one. All patients were given atropine 20 μg kg^{-1} I.M (1 mg maximum) one hour before surgery. At induction room appropriate IV cannula was inserted, wider nostril was selected and irrigated with vasoconstrictor (xylometazoline hydrochloride 0.1% solution drops with appropriate length of longitudinally split nasopharyngeal airway 3,4 for the NP group was chosen (Fig. 1) that was represented by a line (1) passing between the patient's nostril and parallel to the floor of the nose, to meet a horizontal line (2) passing through the thyroid notch level at the neck laterally. ECG, non-invasive blood pressure (NIBP), end-tidal carbon dioxide ($Etco_2$) and oxygen saturation (Spo_2) monitoring were applied. After Pre-oxygenation with 100% oxygen, Fentanyl (1 μg kg^{-1}) IV, propofol (2 mg kg^{-1}) IV. cisatracurium (0.15 mg kg^{-1}) IV were given as induction agents after testing the ability to ventilate the patient. Well lubricated ETT (one-half size smaller than assumed) with well-deflated cuff were used.

In CL group: the ETT was mounted around the fiberoptic cable before the fiberoptic cable was inserted through the wider nostril inferior to inferior turbinate along floor of the nose to the nasopharynx where FOB tip was slightly angulated anteriorly to visualize the larynx and get inside trachea till visualizing the carina followed by inserting ETT over the fiberoptic cable. In all cases, Jaw thrust was applied to prevent falling back of the tongue and obscuring the view.

In NP group: the ETT was mounted around the fiberoptic cable before the fiberoptic cable was inserted and advanced through manually performed appropriate Split Nasopharyngeal Airway (Fig. 2) that was already inserted into the wider nostril to get the larynx visualized once the fiberoptic cable passed the longitudinally split nasopharyngeal airway otherwise jaw thrust maneuver was done. After getting the FOB inside the trachea and visualizing the carina, the split nasopharyngeal airway was removed by the assistant (Fig. 3) and then ETT tube was inserted over the fiberoptic cable as in the classic group.

In both groups and after confirming ETT placement ($Etco_2$ tracing or fiberoptic carina visualization), FOB was removed to fix the ETT and continue the case routinely.

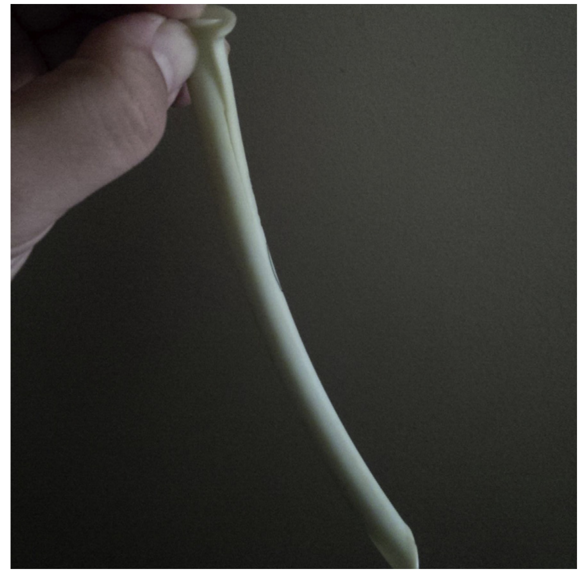

Fig. 2. The Split Nasopharyngeal Airway. (The nasopharyngeal airway is longitudinally cut to facilitate removal after getting fiberoptic cable inside the trachea).

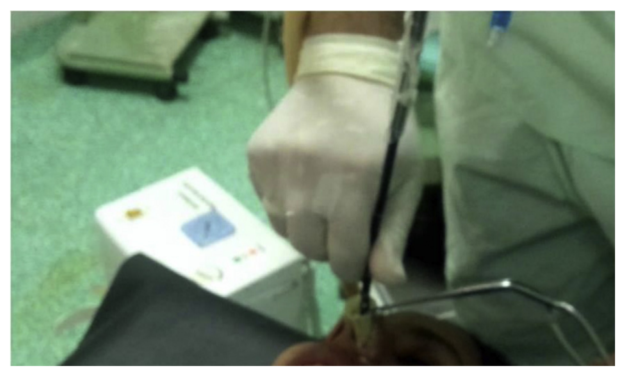

Fig. 3. The removal of split nasopharyngeal airway through its longitudinal cut using Magill forceps after getting the fiberoptic cable inside the trachea.

Heart Rate, Blood Pressure and Spo_2 every minute during the procedure for 5 min and percentage of change of each was calculated (reading at the study time minus pre-procedural reading divided by the pre-procedural one).

Concerning time measurement (seconds), the authors were concerned to clarify all times involved including endoscopic and/or nasopharyngeal airway insertion time in studied groups. T1 is the time from insertion of the FOB in the selected nostril in CL group and insertion of the split nasopharyngeal airway in the NP group till visualization of the larynx i.e. procedure time to visualize the larynx. T2 is the duration of insertion of the split nasopharyngeal airway in NP group. T3 is the time from insertion of the FOB in NP group till ability to visualize the larynx i.e. only endoscopic time to visualize the larynx in NP group which equals T1 minus T2 in NP group. T4 is the time from visualization of the larynx till visualization of the tracheal bifurcation in both groups. T5 is the time from insertion of FOB in the selected nostril in (CL group) and the split nasopharyngeal airway in the (NP group) till ability to remove FOB.

Nasal bleeding was considered present when blood was seen collected at the nose before ETT Insertion. The success rate was considered if FOB was removed within 3 min from starting to insert either of the split nasopharyngeal airways in NP group or FOB nasally in CL group otherwise the patient was then intubated using a different modality.

Table 1
Patients' characteristics. (Demographic data).

Parameters	CL group (N = 34)		NP group (N = 34)		Test	p-value
Age (years)	31 ± 10.01		31.12 ± 10.24		0.086‡	0.931
Sex						
Male	24	(70.6%)	22	(64.7%)	0.269§	0.604
Female	10	(29.4%)	12	(35.3%)		
Weight (kg)	83.06 ± 5.91		82.18 ± 5.20		−0.817‡	0.414
Height (cm)	179.35 ± 5.71		177.26 ± 5.57		−1.506‡	0.132
BMI (kg/m²)	23.51 ± 1.41		23.34 ± 1.08		−0.907‡	0.364

Quantative variables were expressed as mean ± SD, Qualitative variables were expressed as number & percent (%); ‡Mann Whitney *U* test; §chi-square test; $P < 0.05$ is significant.

All data were collected, tabulated and statistically analyzed using SPSS 22.0 for Windows (SPSS Inc., Chicago, IL, USA) and MedCalc 13 for windows (MedCalc Software bvba, Ostend, Belgium). Mann-Whitney U (MW), Wilcoxon Signed Ranks and Chi-square ($\chi 2$) tests were used. $P < 0.05$, $p < 0.01$ and $p \geq 0.05$ was considered statistically significant, highly significant, and non-significant respectively.

3. Results

There was no significant difference between CL group and NP group as regard patient's demographic data (Table 1). Heart Rate (HR) showed a statistically significant increase in CL group and NP group during the 5 min study time compared to pre-procedural reading, there was statistically significant MAP increase in CL and not NP group with a significant difference between percent of change of HR and MAP at 1st, 2nd and 3rd minute in the CL group compared to NP group (Table 2).

Spo_2 showed no significant change between and within the studied groups except at the 2nd minute time in NP group (Table 2). Percentage of change of HR, MAP and Spo_2 data was maximal in both HR and MAP that was less than 4% and 8% respectively during the study period.

Time: T1, T3, and T5 in NP group were significantly shorter than in CL group but without significant difference concerning T4 (Table 3, Fig. 4).

One patient had nasal bleeding in NP group that was excluded from the study and replaced by another one. In all patients, FOB was removed within 3 min since nasal insertion of either FOB in CL group or split nasopharyngeal airway in NP group. Seven cases after in NP group needed jaw thrust to visualize the larynx and complete the intubation process as done in CL group.

Table 3
Required time (s) for intubation procedure till removal of the FOB cable.

Required time (s)	CL group (N = 34)	NP group (N = 34)	p-value
T1 (procedure time)	53.53 ± 4.52	37.06 ± 5.38*	< 0.001
T2	–	5.94 ± 1.51	
T3 (endoscopy time)	53.53 ± 4.52	31.12 ± 4.24*	< 0.001
T4	10.47 ± 1.74	9.82 ± 0.57	0.100
T5	88.24 ± 5.48	64.25 ± 8.36*	< 0.001

Quantative variables were expressed as mean ± SD; done by Mann Whitney *U* test. $P < 0.05$ is significant. $P \geq 0.05$ is non significant (NS). Cl group: Classical nasal fiberoptic intubation group. NP group: Nasopharyngeal airway fiberoptic intubation group.
T1 – is the time from insertion of FOB in the selected nostril in CL group and insertion of split nasopharyngeal airway in NP group till visualization of the larynx i.e. procedure as well as endoscopy time in CL group.
T2 – is the duration of insertion of split nasopharyngeal airway in NP group.
T3 – is the time since insertion of the FOB in NP group till visualization of the larynx i.e. endoscopic time. (Plus T2 will be the procedure time in NP group).
T4 – is the time from visualization of the larynx till visualization of the tracheal bifurcation in both groups.
Time from insertion of FOB in the selected nostril in (CL group) and insertion of the nasopharyngeal airway in the (NP group) till be able to remove the scope.
* Significant change between the required time for intubation procedure till removal of FOB cable between the CL and NP groups.

4. Discussion

Epistaxis is the most frequent complication of nasotracheal intubation [4]. In our study, all selected patients were not hypertensive, with

Table 2
Comparison between CL group and NP group as regard hemodynamic parameters: Heart rate (b/m), Mean arterial pressure (MAP, mmHg) and hemoglobin oxygen saturation (Spo_2, %) measured as pre-procedure and at 1st through to 5th minute during the procedure.

Parameters	CL group	NP group	Test "W"		P-Value	
			CL	NP	CL	NP
Heart rate (b/m)						
Pre-procedure	78.15 ± 6.62	75.91 ± 5.51				
1st minute	80.56 ± 6.41*	77.18 ± 5.20*	−5.168	−4.465	< 0.001	< 0.001
2nd minute	81.50 ± 6.53*	77.38 ± 5.08*	−5.128	−4.829	< 0.001	< 0.001
3rd minute	82.65 ± 6.45*	77.5 ± 4.44*	−5.168	−4.060	< 0.001	< 0.001
4th minute	83.03 ± 6.74*	77.5 ± 4.38*	−5.125	−4.539	< 0.001	< 0.001
5th minute	82.76 ± 6.54*	77.24 ± 4.39*	−5.142	−3.983	< 0.001	< 0.001
MAP (mmHg)						
Pre-procedure	93.67 ± 5.33	98.23 ± 3.55				
1st minute	100.57 ± 4.69*	99.90 ± 4.58	−4.392	−1.780	< 0.001	0.075
2nd minute	104.36 ± 2.98*	99.11 ± 3.85	−5.101	−1.013	< 0.001	0.311
3rd minute	100.04 ± 3.81*	97.35 ± 1.88	−4.457	−1.536	< 0.001	0.125
4th minute	100.88 ± 2.50*	98.48 ± 2.50	−5.133	−0.011	< 0.001	0.991
5th minute	101.02 ± 2.98*	97.20 ± 3.52	−4.476	−0.316	< 0.001	0.752
SPO_2 (%)						
Pre-procedure	98.91 ± 0.28	99 ± 0				
1st minute	98.91 ± 0.28	98.91 ± 0.28	0.000	−1.732	1.000	0.083
2nd minute	99.68 ± 0.47	98.88 ± 0.32*	−2.828	−2.000	0.005	0.046
3rd minute	98.76 ± 0.55	98.94 ± 0.23	−1.633	−1.414	0.102	0.157
4th minute	98.91 ± 0.28	99 ± 0	0.000	−1.414	1.000	1.000
5th minute	99 ± 0	99 ± 0	−1.732	−1.414	0.083	1.000

Quantative variables were expressed as mean ± SD. Cl group: Classical nasal fiberoptic intubation group. NP group: Nasopharyngeal airway fiberoptic intubation group. W: Wilcoxon Signed Ranks test. P values of data measured at 1st through to 5th minute compared to pre-procedure data. $P < 0.05$ is significant.
* Significant change between the time reading and pre-procedure reading.

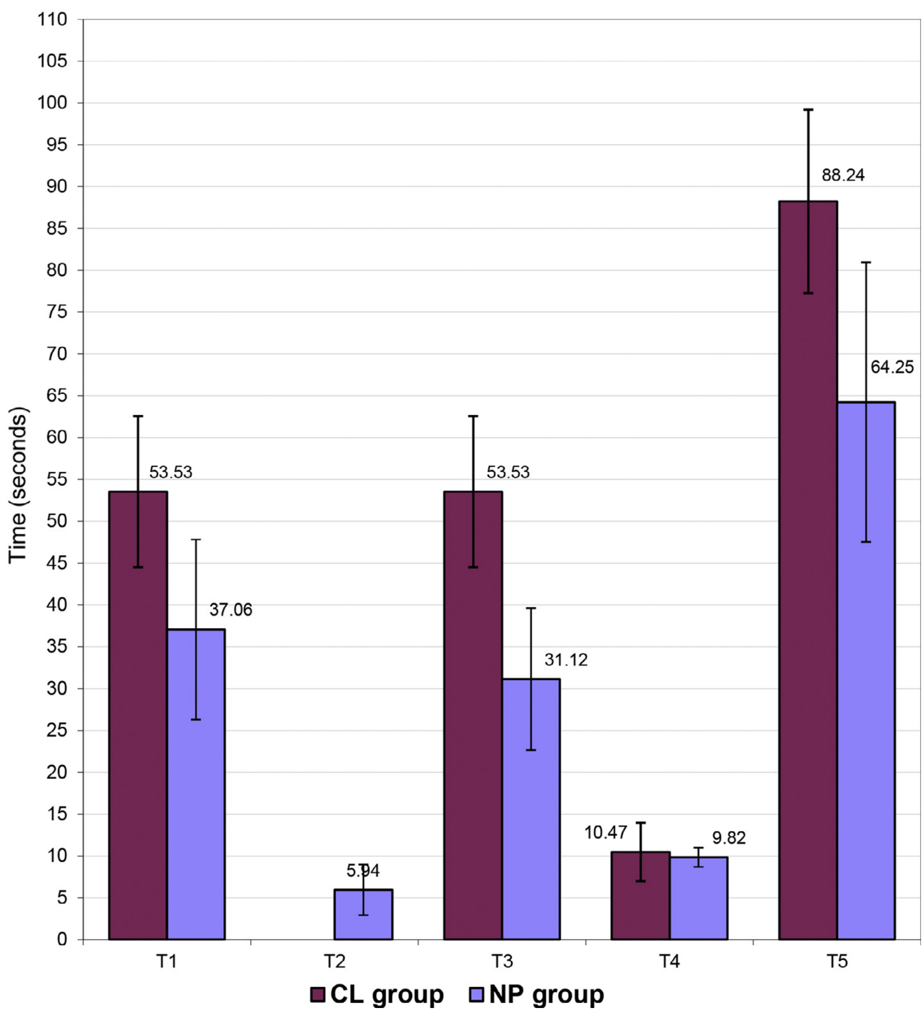

Fig. 4. Error Bar chart shows required time: bar represent mean; Y-error bar represents 95% confidence interval of mean. T1 is the time from insertion of the FOB in the selected nostril in CL group and insertion of split nasopharyngeal airway in the NP group till visualization of the larynx. T2 is the duration of insertion of split nasopharyngeal airway in NP group. T3 is the time from insertion of the FOB in NP group till ability to visualize the larynx i.e. only endoscopic time to visualize the larynx in NP group which equals T1 minus T2 in NP group. T4 is the time from visualization of the larynx till visualization of the tracheal bifurcation in both groups. T5 is the time from insertion of FOB in the selected nostril in (CL group) and the split nasopharyngeal airway in the (NP group) till ability to remove FOB.

normal coagulation profile, installing their wider nostril with a decongestant and using well-lubricated one-half size smaller endotracheal tube than assumed with a well-deflated cuff to avoid the risk of expected bleeding with the nasal instrumentation. Vasoconstriction of the nasal mucosa is necessary to increase the diameter of the passage and to decrease the risk of bleeding [5,6].

Although all cases were young adults, not obese, scheduled for elective operations and fasting, to avoid the problem of difficult airway unpredictability and desaturation, all cases were pre-oxygenated [7,8] and tested for the ability to ventilate before giving muscle relaxant.

In healthy individuals breathing air, desaturation to 70% can occur within 1 min and after 5 min with adequate pre-oxygenation [9] keeping patients well saturated without significant difference in between studied groups.

Koerner and Brambrink (2005) [10] reported that while fiberoptic intubation can be achieved with brief apnea, preoxygenation is necessary. Eipe et al. (2013) [11] used two nasopharyngeal airways, the first one to ensure delivery of adequate oxygen and the second one was a split nasopharyngeal airway to facilitate fibreoptic intubation.

Atropine 20 $\mu k\, g^{-1}$ IM was given one hour preoperatively to get dry upper airway for more successful FOB service [10,12] through preventing the formation of new secretions and getting enough time (at least 30 min) to eliminate the already formed secretions [13].

The statistically significant increase in heart rate within both groups can be explained by the light level of anesthesia (no sedative premedication and a lower dose of fentanyl used ($1\,\mu g\, kg^{-1}$). The statistically significant difference between CL and NP group in relation to percent of change of heart rate and MAP may be explained by the stressful stimulation of the inserted FOB cable being in direct contact with the upper airway mucous membrane in the CL group during its journey but not in the NP group being moving within the inserted split nasopharyngeal airway. However, the significant difference in hemodynamics is of statistical and not of clinical value with the maximum percentage of change in HR and MAP is less than 4% and 8% respectively.

The statistically high significant decrease of T1, T3 and T5 in the NP group compared to CL group denotes that the use of the split nasopharyngeal airway is effective in reducing the time for nasal fiberoptic visualization and intubation especially with lack of experience of the operator to visualize the anatomy of the nasopharyngeal journey which begins through the nostril, below the lower nasal turbinate (the inferior, largest) and identification of nasal septum medially, floor of nose inferiorly and turbinate laterally. After entering the nasopharynx and steering the fibrescope into the oropharynx, you may see the epiglottis which is the first landmark for the larynx and then advances the scope into the laryngeal opening. On the other hand, in the NP group and after insertion of the appropriate length nasopharyngeal airway, the FOB cable tip and after exiting the airway will be in front of the laryngeal inlet without the need to verify the long stressful (for both patients and operator) anatomical journey in CL group. In spite of jaw thrust applied to all cases in CL group (for rapid and easier laryngeal visualization), T1, T3, T5 were significantly shorter in NP group compared to CL one. In agreement with such assumption is the non-significant difference between T4 in both groups managed by the same operator without the use of split nasopharyngeal airway and in spite of being T4 is included within T5 (weakening the difference), still T5 shows a significant decrease in NP group.

Our results are in agreement with Chakravarthy et al., 2007 [14] who reported that the natural curve of the nasopharyngeal airway allows the tip of the bronchoscope to orient toward the vocal cords that makes maneuvering of the tip of the bronchoscope into the trachea easier and hastens atraumatic nasal intubations.

Jaw thrust was applied to prevent falling back of the tongue and obscuring the glottis view for all CL group and when needed for NP group. Loss of muscle tonicity under general anesthesia may cause the tongue and pharyngeal tissue to fall back and compromise the pharyngeal space and glottis view [10]. Applying a jaw thrust (ideally by a second person) can help to improve the view and so increases the success rate and decreases the time to visualize the cord and intubate the case [15,16].

Seven cases (out of 34 cases) required jaw thrust in NP group means that the assumed appropriate NP airway length (size) was not actually appropriate i.e. not passing the pharynx to get its tip just in front of the larynx to view the laryngeal inlet once FOB tip pass the NP airway tip. *Actually, we are in need of Naso-laryngeal and not nasopharyngeal airway as FOB nasal intubation aid.* Nasopharyngeal airway is originally designed to keep airway patent by passing the relaxed redundant collapsible pharyngeal structure obstructing the airway. we are in need to modify (increase) its length to bypass the pharynx to end nearby the laryngeal inlet i.e. to be Naso-laryngeal and not nasopharyngeal airway achieving two targets at the same time i.e. keeping the airway patent as well as transporting (carrying) the FOB tip immediately in front of the laryngeal inlet facilitating the process of laryngeal visualization and intubation especially useful for inexpert junior staff and in hurry, much secretion and/or bloody airway situation in which direct visualization through FOB may be technically challenging [17] even with expert endoscopist.

The study of Watnabe et al., 1999 [3], about how long the length of nasopharyngeal airway should be, revealed that nasopharyngeal airway length to release airway obstruction was 12.73 ± 0.85 cm and 11.70 ± 0.75 cm in male and female group respectively and to get the most effective ventilation was 14.55 ± 0.96 cm and 13.93 ± 1.12 cm in male and female group respectively and nostril to arytenoid distance was 18.84 ± 0.90 cm and 17.40 ± 0.97 cm in male and female group respectively concluding that most of the standard nasopharyngeal airways commercially available are too short to give the most effective ventilation to the patients with airway obstruction. Stackhouse and Infosino 2011 [16] reported that to relieve airway obstruction, nasal airway must be long enough to pass through the nasopharynx, but short enough that it still remains above the glottis. Inserting nasal tube till mark 18 as an intubating aid [18] with higher success rate and shorter time to visualize the vocal cords (faster glottic exposure) supports our assumption to manufacture and use a Naso-laryngeal (longer) and not the commercial available Nasopharyngeal (shorter) airway as a better intubating aid.

Now the question will be what is the appropriate length required to get the nasopharyngeal airway as FOB intubation aid. Definitely it will be better if it is slightly longer than that required to get the most effective ventilation and slightly shorter than the nostril arytenoids distance i.e. about 16.5 cm and 15.5 cm in male and female group respectively waiting for future studies.

5. Conclusion and recommendations

The use of selected appropriate length of nasopharyngeal airway as FOB nasal intubation aid is safe and effective in reducing the time to visualize the larynx and intubate the trachea, however we recommend to develop a specific "Naso-laryngeal FOB intubating aid" by- passing the pharyngeal structure (keeping patent airway with less need for jaw thrust maneuver) and carrying the FOB tip in line with and to be just in front of glottis opening for faster laryngeal visualization and tracheal intubation. We recommend also studying the efficacy of the new recommended intubating aid by both expert and inexpert endoscopists.

Previous publication or presentation

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No conflict of interest.

References

[1] Wheeler M, Ovassapian A. Fiberoptic endoscopy-aided techniques. In: Benumof's airway management: principles and practice, 2nd ed., vol. 27(5). Mosby Elsevier Philadelphia; 2010. p. 461–67.
[2] Murphy MF. Applied functional anatomy of the airway. In: Manual of emergency airway management, 3rd ed., vol. 3(2). USA: Lippincott Williams & Wilkins; 2008. p. 37–46.
[3] Watanabe k, kihara M, Miura M, et al. Optimal length of nasopharyngeal airway and its correlation with height and body weight. Japanese J Anesthesiol 1999;48(10):368–71.
[4] Enk D, Palmes AM, Van Aken H, et al. Nasotracheal intubation: a simple and effective technique to reduce nasopharyngeal trauma and tube contamination. Anesth Analg 2002;95(5):1432–6.
[5] Coe TR, Human M. The peri-operative complications of nasal intubation: a comparison of nostril side. Anaesthesia 2001;56(3):447–84.
[6] Gil KS, Diemunsch PA. Fiberoptic and flexible endoscopic-aided techniques. In: Hagberg CA, editor. Benumof and Hagberg's airway management, 3rd ed. Elsevier Saunders; 2013. p. 365–1.
[7] Reed AP. Evaluation and recognition of the difficult airway. In: Hagberg CA, editor. Benumof and Hagberg's airway management, 3rd ed. Elsevier Saunders; 2013. p. 209–1.
[8] Benumof JL. Preoxygenation: best method for both efficacy and efficiency [editorial]. Anesthesiology 1999; 91: p. 603–05.
[9] Baraka AS, Salem MR. Preoxygenation. In: Hagberg CA, editor. Benumof and Hagberg's airway management, 3rd ed. Elsevier Saunders; 2013. p. 280–300.
[10] Koerner IP, Brambrink AM. Difficult airway management, fiberoptic techniques. Best Practice Res Clin Anaesthesiol 2005;19(4):611–21.
[11] Eipe N, Fossey S, Kingwell SP. Airway management in cervical spine ankylosing spondylitis: between a rock and a hard place. Indian J Anaesthesia 2013;57(8):592–5.
[12] Murrin K. Awake intubation. In: Latto P, and Vaughan S, editors. Difficulties in tracheal intubation, 2nd ed. W.B Saunders Company Ltd.; 1997. p. 161–6.
[13] Artime CA, Sanchez A. Preparation of the patient for awake intubation. In: Hagberg CA, editor. Benumof and Hagberg's airway management, 3rd Ed. Elsevier Saunders; 2013. p. 243–4.
[14] Chakravarthy M, Thimmannagowda P, Jawali V. An aid to awake bronchoscopic nasal intubation. J Cardiothorac Vasc Anesth 2007;21(3):476–7.
[15] Stackhouse RA. Fiberoptic airway management. Anesthesiol Clinic North Am 2002;20(5):933–51.
[16] Stackhouse RA, Infosino A. Airway management. In: Miller RD, Pardo MC, editors. Basics of anesthesia, 6th ed. Elsevier Saunders; 2011. p. 219–1.
[17] Brambrink AM, Hagberg CA. The ASA difficult airway algorithm: analysis and presentation of a new algorithm. In: Hagberg CA, editor. Benumof and Hagberg's airway management, 3rd ed. Elsevier Saunders; 2013. p. 222–2.
[18] Mohammadzadeh A, Haghighi M, Naderi B, et al. Comparison of two different methods of fiberoptic nasal intubation: conventional method versus facilitated method (NASAL-18). Upsala J Med Sci 2011;116(2):138–41.