INDONESIAN JOURNAL OF ANESTHESIOLOGY AND REANIMATION
Volume 3 (1), January 2021 : 1-9

Original Article

MODIFIED INFANT FEEDING TUBE AS AN INDIGENOUS ENDOTRACHEAL TUBE IN UNANTICIPATED CONGENITAL SUBGLOTTIC STENOSIS

Rahul Gupta[1a], Rama Chatterjee[2], Neelam Dogra[2], Dinesh Kumar Barolia[1], Pratibha Rathore[2], Pooja Mongia[2]

[1] SMS Medical College, Department of Paediatric Surgery, Rajasthan University of Health Sciences, Jaipur, (Rajasthan,) India
[2] SMS Medical College, Department of Anaesthesia, Rajasthan University of Health Sciences, Jaipur, (Rajasthan,) India
[a] Corresponding author: meetsurgeon007@gmail.com

ABSTRACT

Introduction: In neonates with an unanticipated difficult airway, there is an increased probability of failed intubation even with highly trained hands while performing direct laryngoscopy. **Objective:** To describe the experience of using a modified infant feeding tube (IFT) as an indigenous endotracheal tube (ETT) in a series of paediatric surgical patients with congenital subglottic stenosis (SGS). **Material and Method**: A retrospective study was performed in our institute from January 2018 to December 2019. ETT with modified 6 and 8 French (Fr) sized IFT's were used. A stylet obtained from the VP shunt system was used to aid in intubation. **Results and Discussion:** Out of 12,500 admissions in our department, there were 5 pediatric cases with SGS which were managed using modified IFT. Four were neonates and 1 infant (M:F = 2:3). Modified IFT(s) were used after failed intubation with ETT of size 2.5 mm in 4 patients (non-availability of ETT of size 2 mm), while in one neonate, even 2 mm ETT could not be negotiated due to SGS. In all the 5 children, successful intubation was finally performed with modified 8 French (Fr) IFT in 3, and with modified 6 Fr IFT in two cases. The surgical procedure was completed in 4 neonates out of 5 cases, while in one infant it was deferred due to the clinical condition of the patient and significant SGS. **Conclusion:** All 5 patients with SGS were managed without performing a tracheostomy. Modified IFT(s) is an effective alternative if smaller sized ETT(s) cannot be negotiated or unavailable in difficult neonatal and paediatric airway. This modified IFT as ETT has to be an important part of the emergency airway tray. It should not be considered as a replacement for routine use of standard ETT.

Keywords: Difficult Airway; Endotracheal Intubation; Modified Infant Feeding Tube; Neonates; Subglottic Stenosis; Unanticipated

Article info: Received: October, 21st 2020; Revised: January, 28th 2021; Accepted: February, 10th 2021; Published: February, 15th 2021

INTRODUCTION

The challenges of endotracheal intubation are more in paediatric patients especially in premature neonates with associated malformations(1)(2). In neonates with a difficult airways, there is an increased probability of failed intubation even with highly trained hands especially in resource-limited set-up(1)(2). Authors faced a series of pediatric patients with unanticipated congenital subglottic stenosis (SGS) which were successfully managed with modified infant feeding tubes (IFT's) stiffened with stylet obtained from Ventriculoperitoneal (VP) system in circumstances where small-sized endotracheal tube(s) (ETT) were unavailable or could not be negotiated.

MATERIAL AND METHODS

This is a retrospective study of 2 years from January 2018 to December 2019 performed in our tertiary care teaching institute. The clinical and operative records of paediatric patients who could not be intubated with standard ETT due to SGS were reviewed and analyzed.

Available at https://e-journal.unair.ac.id/IJAR | DOI: 10.20473/ijar.V3I12021.1-9

Inclusion criteria: All patients aged less than 1 year admitted in the department of paediatric surgery were included in the study.

Exclusion criteria: Patients for whom emergency tracheostomy was performed for failure to intubate / difficult airway were excluded.

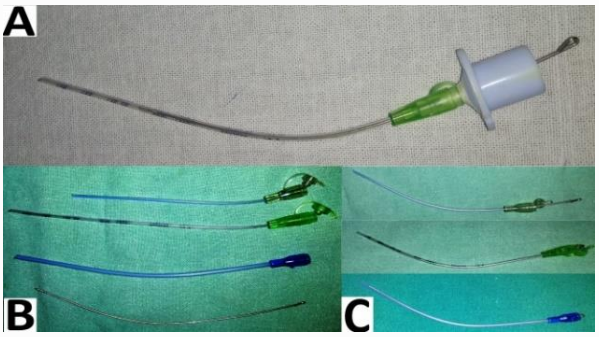

Figure 1. Modified 6 Fr sized IFT as ETT with attached 3 mm ETT connector and stylet inside to stiffen it (A); 5 Fr, 6 Fr, and 8 Fr IFT(s) cut obliquely to match the length and distal end of ETT and also seen is stylet taken from VP shunt system (B); modified IFT(s) with the stylet in situ prepared as ETT's (C).

Modified IFT(s) as ETT(s) were made from 5, 6 and 8 French gauge (Fr) sized IFT [Figure 1]. The lengths of IFT's were reduced to approximate the size of 2 or 2.5 mm ETT and the distal end was cut obliquely. A stylet obtained from the VP shunt system (for hydrocephalus) after proper sterilization was used to stiffen the IFT and aid in intubation The proximal end of the IFT was attached to a 3 mm ET tube connector to aid proper connection with Jackson Rees' modification of Ayres' T-piece. These tubes were kept in the difficult airway cart for an emergency with failed intubation with 3 mm, 2.5 mm, or 2 mm ET tubes.

The clinical, radiological, and operative records of all patients with failed intubation with ETT in difficult neonatal and paediatric airways were evaluated. The chart data were reviewed for causative factors and history of preceding illnesses. We evaluated the advantages and disadvantages with modified IFT as ETT.

RESULT AND DISCUSSION

In total, there were 12,500 admissions in our department. Out of these, there were 1,222 patients with Anorectal malformation (ARM) and 698 were diagnosed as esophageal atresia (EA). We successfully managed 5 pediatric cases (3 females and 2 males) with failed intubation with standard ETT due to SGS. Out of 5, four were neonates and 1 infant. Two patients were preterm; one was low birth weight and the other very low birth weight. Major congenital malformations included EA with tracheoesophageal fistula (TEF) -3, and ARM -2.

Associated malformations were cleft abnormalities -2 [Figure 2] and cardiac abnormalities -1. Standard procedures for anesthesia care were followed by a senior Paediatric anesthesiologists. Modified IFT(s) as ETT were used after failed intubation with ETT of size 2.5 mm in 4 patients (non-availability of ETT of size 2 mm), while in one neonate even 2 mm ETT could not be negotiated due to SGS. In all the 5 children, successful intubation was finally performed with modified 8 French (Fr) IFT in 3, and with modified 6 Fr IFT in two cases.

On laryngoscopy, Cormack-Lehane (CL) grade was II in all 5 patients, but ETT could not be advanced beyond the vocal cords. Difficult intubation was anticipated in 1 patient and modified IFT with stylet in-situ as ETT was kept in the difficult airway cart (emergency airway tray) for intubation. An anesthesia circuit was completed with Jackson Rees' modification of Ayres' T-piece [Figure 3]. In all 5 patients, modified IFT's were kept in

Available at https://e-journal.unair.ac.id/IJAR | DOI: 10.20473/ijar.V3I12021.1-9

position after securing it and holding it properly throughout the procedure. Ventilation with T-piece was satisfactory in all 5 cases. The surgical procedure was completed in all 4 neonates out of 5 cases, while in one infant it was deferred due to the clinical condition of the patient and significant SGS. No intraoperative complications related to displacement or blockage of modified IFT's were observed. Theutcomes were favorable in 3 patients, while 2 neonates had unfavorable outcomes due to the presence of sepsis and associated co-morbidities. Grade of SGS could be confirmed by bronchoscopy in 2 out 5 cases only. The detailed clinical and operative records of the five cases are described in Table1.

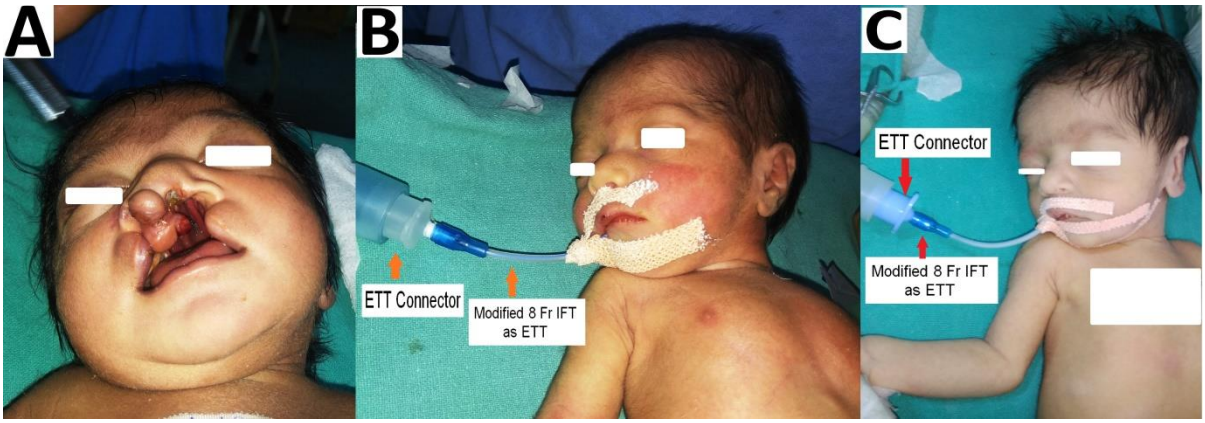

Figure 2. Neonate of EA with TEF with associated bilateral cleft lip and cleft palate and subglottic stenosis (SGS) as shown on left (A); Neonate of ARM with associated SGS with modified 8 Fr IFT being used as indigenous ETT and connected with 3 mm ETT connector (B); Neonate of EA with TEF with SGS intubated with modified 8 Fr IFT.

The paediatric airway is difficult because of fundamental anatomical factors like large occiput, narrow nares, large tongue, narrow epiglottis, high larynx, and narrow cricoid region(1). The incidence of difficult intubation in the pediatric population ranges from 0.7-4.7%(1). Difficulties increases with decreasing age and prematurity. In neonates, difficult airways may arise due to a variety of malformations ranging from congenital craniofacial syndromes, neoplasms, structural abnormalities, cleft palate, cystic hygromas, vascular and *veno*-lymphatic malformations(2)(3). The unanticipated difficult airway may come across either due to inadequate evaluation or absence of accurate preoperative predictors of a difficult airway in this age group. Some are encountered even in undistinguished morphological appearance, as in one of our studies. Difficult airway especially subglottic stenosis can be suspected in neonates with prematurity, antenatal history of Polyhydramnios, fetal ascites, hyperechoic lungs, a flattened diaphragm, associated congenital malformations, history of recurrent respiratory tract infections, and history of previously failed intubation(4)(5). Both the expected and unanticipated difficult pediatric airway demands experienced dedicated anesthesiologists with specialized setup.

The subglottic region is the narrowest part of the airway because it is complete and non-expandable(4)(6). Congenital SGS is a rare malformation with an incidence of 0.0 % to 2.0%(7). SGS is characterized by subglottic diameter <4 mm in term newborn and <3.5 mm in preterm neonates(7)(8). The degree of stridor, tachypnea, chest retraction, depends

Available at https://e-journal.unair.ac.id/IJAR | DOI: 10.20473/ijar.V3I12021.1-9

upon the extent of SGS(4)(6). Subglottic stenosis may be associated with aero-digestive tract malformations and genetic disorders(4)(6). There is a rare association of SGS and EA with TEF(4)(6), and we have the experience of facing SGS in 0.43% (3 out of 698) cases of EA. The incidence of SGS in ARM was only 0.16% (2 out of 1,222 cases).

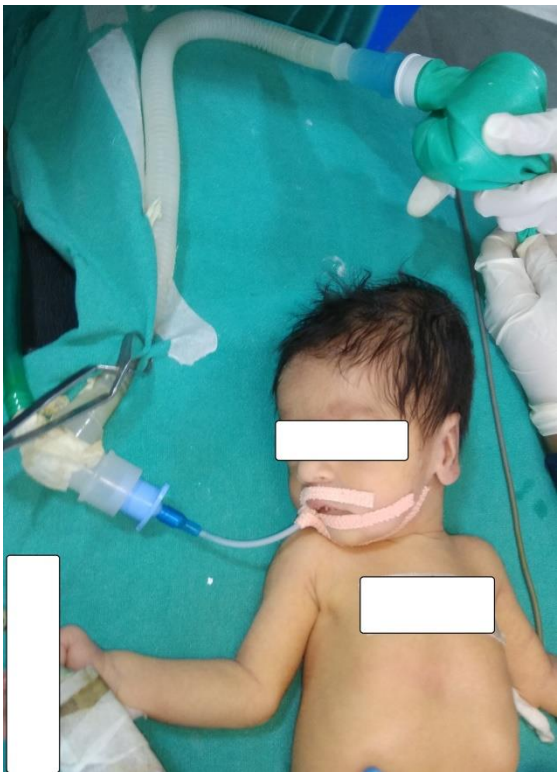

Figure 3. Intraoperative picture showing neonate of EA with TEF being ventilated using modified 8 Fr IFT as indigenous ETT

EA with TEF repair prerequisites lateral positioning, tracheal intubation with ETT tip beyond the fistula and controlled ventilation as trachea is communicating with esophagus; thus, it excludes the use of laryngeal mask airway (LMA). Also, LMA is not the airway of choice in neonates of ARM with a late presentation with marked abdominal distension (case 3). Paediatric fiberoptic bronchoscope (FOB) may not be helpful in intubation in such cases.

Complete evaluation for subglottic stenosis requires bronchoscopy. Grade 1 and 2 are < 50% and 51-70% obstruction respectively, grade 3 is 71-91% obstruction, while there is no detectable lumen in grade 4(6)(9). Only higher grades require intervention with either multiple sessions of dilatation with coronary angioplasty catheter under fluoroscopy (not available at our set-up) or tracheloplasty(6). Also, endoscopic dilatation may damage the exposed cartilage and lead to scarring and exacerbate the stenosis(10). Asymptomatic congenital SGS infants usually recover with increasing age.

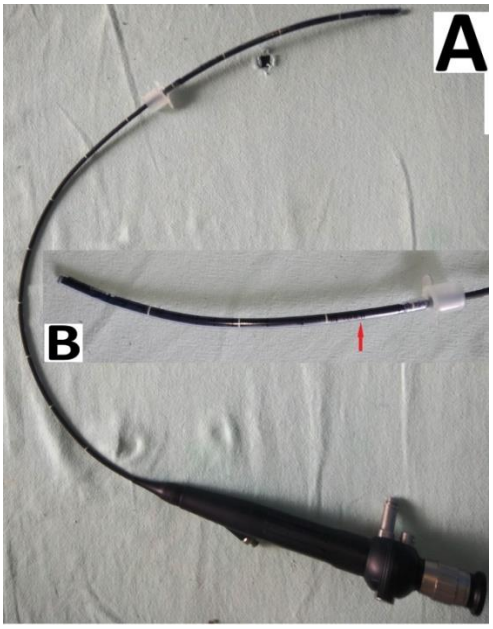

Figure 4. Paediatric fiberoptic bronchoscope (FOB) available at our institute (A). Inset image (B) showing size 4mm ETT negotiable over the FOB.

In paediatric patients with an anticipated difficult airway, plan 1 is followed with standard (well-prepared) difficult airway cart with ETT of different size including stylet, laryngeal mask airways (LMAs), oro-pharyngeal airway(11). Paediatric bougie, video-laryngoscope, and appropriate size (neonatal) FOB for diagnostic and therapeutic were not available at our institute. Available

Available at https://e-journal.unair.ac.id/IJAR | DOI: 10.20473/ijar.V3I12021.1-9

paediatric FOB could only negotiate size 4 mm ET tube, predisposing a very challenging situation [Figure 4]. In such asymptomatic congenital SGS, when the smallest available size 2 cannot be negotiated or is unavailable, our modified IFT's (depending on the airway obstruction) can be used to secure the airway. It is a lifesaving alternative option (conduit), though it has the limitation that there is a possibility of displacement and improper ventilation during the intraoperative period.

Most importantly, difficult intubation in a neonate should be undertaken by the most experienced dedicated anesthetist. Failed endotracheal intubation in neonates may have life-threatening complications especially in the hands of untrained personnel as there is a tendency to persist with repeated and forceful blind attempts leading to traumatic complications of the pharynx, laryngeal edema/perforation, consequently worsening an already compromised airway(12).

In neonates, the cricothyroid membrane (CTM) has a mean size of 2.6±0.7 mm (length) x 3±0.63 mm (width). Thus, cricothyroidotomy is unsafe as the smallest size 2 ETT [with an outer diameter (OD) of 3 mm] cannot be passed through CTM without damaging the larynx(13). Emergency tracheostomy or percutaneous assessment through the neck is not desirable in neonates and it should be the last option(4)(14). Front of neck access was not performed in any of our series as percutaneous tracheostomy in neonates is associated with injury to the cricoid cartilage, tracheal injury, bleeding, air leak, pneumothorax, pulmonary edema, and respiratory arrest(15). Also, delayed complications like airway obstruction and cartilage necrosis, and fistula formation are common in paediatric age group, especially in neonates(15). Mortality attributed to pediatric tracheostomy ranges from 0.5 to 5%(14)(15)(16). Moreover, in our center, there is non-availability of the in-house neonatologists and ENT surgeons.

The size of an ETT is expressed as ID. The OD of a 2 mm (ID of a tube) ETT is approximately 3 mm or 9 Fr(4)(6). Also, OD of 2.5 mm and 3 mm ETT is approximately 3.4 mm and 4.2mm respectively. Because of the unavailability of 2 mm ETT (OD = 3 mm or 9 Fr), we employed modified 6 Fr IFT (OD = 2 mm) in one neonate and 8 Fr IFT (OD = 2.7 mm) in three neonates, while in one patient with failure of even 2 mm ETT, we prepared modified 6 Fr IFT (OD = 2 mm) as ETT. By using modified 8 Fr IFT as ETT and similarly 6 Fr IFT which have outer diameter lesser than that of 2.5 and 2 ETT respectively, we managed neonatal difficult airway andaccomplished the surgical procedure in 4 out of 5 patients. In one infant, a difficult airway was also successfully managed, but the surgical procedure was deferred.

Successful use of modified 6 Fr IFT with and without stylet obtained from VP system as ETT in two neonates with ARM associated with SGS and other with EA with TEF have been described in the recent literature(4). This justifies the use of our modified IFT as ETT in difficult paediatric airway management in a resource-limited set up. Recently Shamshery et al. (2018) suggested modified IFT as ETT to be kept in an emergency airway tray for asymptomatic SGS. They used stylet obtained from the VP shunt system (as used in our series) to stiffen the IFT and aid in intubation(4). In our earlier report, modified IFT without stylet was also used successfully in a neonate with EA with TEF(6). Thampi et al. (2015) reported the successful use of IFT in managing the difficult paediatric airways, although they could not negotiate it beyond the vocal cords.

Earlier Kerai et al. (2016) reported unsuccessful use of similar modified ETT in one premature neonate with EA with TEF.

Available at https://e-journal.unair.ac.id/IJAR | DOI: 10.20473/ijar.V3I12021.1-9

They used the modified IFT without any stylet (due to its unavailability), as a result they could not pass the tip of the feeding tube below the vocal cords and resulted in dislodgement of the tube(8).

Kulkarni et al. (2017) reported a novel use of guidewire of a 7 Fr central venous catheter and a dilator for managing a difficult airway(10). A 2.0 mm ID ETT was railroaded over this guide wire; tracheostomy was finally performed before undertaking a surgical procedure(10).

We believe that in our series, intubation with our appropriate size modified IFT as ETT was successful owing to the appropriately sized stylet used for the purpose. The stylet in-situ helps in maneuvering the tip of the tube and its proper placement beyond the SGS. The importance of the stylet (from the VP shunt system) cannot be undermined. We strongly recommend appropriate size modified IFT as ETT to manage both anticipated and unanticipated difficult airway in neonates. It is safe in the hands of the trained and experienced paediatric anesthetist. It should not be considered as a replacement for routine use of standard ETT.

Notwithstanding there are some limitations of this novel lifesaving approach of using modified IFT as ETT: (i) IFT's are pliable, soft, and do not maintain the shape or curvature as compared to standard ETT, thus during intubation stylet in situ is obligatory(4). In one previous study, modified IFT was used without stylet(6). (ii) As its lumen is small, its length should remain small (as far as possible) to prevent airway resistance(3), (iii) it has an increased propensity to dislodge because of its pliability and may lead to its failure(8), (iv) Absence of Murphy's eye and its disadvantages in the event of tube blockage,(v) not suited for a longer duration of ventilation, (vi) it should be properly secured (vii) a very attentive approach is required, i.e. the tube (modified IFT) requires to be gently griped throughout the procedure to prevent its kinking and accidental dislodgement especially during positioning of the patient.

We have not found accidental dislodgement (or kinking) in any patient of our study. As per authors, it is very important to be careful and diligent during (a) removal of stylet, (b) fixation of the modified IFT, (c) positioning of the patient, and (d) during suctioning. With smaller sized modified IFT's, suctioning (if required) may be performed by gentle syringe suction after disconnecting the ETT connector.

CONCLUSION

In neonates having EA with TEF associated with cleft lip and palate, a high index of suspicion for difficult airway should be kept in mind. The association of SGS with EA was 0.43% and that of SGS and ARM was only 0.16% in our study. In paediatric patients especially neonates with difficult airway, there is an increased probability of failed intubation even with highly trained hands, especially in resource-limited set-up. We managed five patients including four neonates and one infant by a lifesaving technique with the utilization of modified IFT as appropriate sized ETT for both anticipated and unanticipated difficult airway. This modified IFT as ETT has to be an important part of emergency airway tray for paediatric especially neonatal procedures, particularly in resource-limited set-up. It should not be considered as a replacement for routine use of standard ETT.

ACKNOWLEDGEMENT

Conflict of Interest (financial or nonfinancial)

Available at https://e-journal.unair.ac.id/IJAR | DOI: 10.20473/ijar.V3I12021.1-9

The authors declare no conflict of interest regarding the publication of this paper.

Ethical Approval

A retrospective observational study

Consent

Due informed written consent taken from the patient's parents

Guarantor

Dr. Rahul Gupta

REFERENCES

1. Mirghassemi A, Soltani A, Abtahi M. Evaluation of laryngoscopic views and related influencing factors in a pediatric population. Paediatr Anaesth. 2011;21:663–7.
2. Heinrich S, Birkholz T, Ihmsen H, AL E. Incidence and predictors of difficult laryngoscopy in 11,219 pediatric anesthesia procedures. Paediatr Anaesth. 2012;22:729–36.
3. Johansen L, Mupanemunda R, Danha R. Managing the newborn infant with a difficult airway. Infant. 2012;8:116–9.
4. Shamshery C, Kannaujia A, Madabushi R, Al E. Asymptomatic congenital subglottic stenosis in a neonate – infant feeding tube as a "Guardian angel!" Saudi J Anaesth. 2018;12:357–8.
5. Viadeff A, Szmuk P, Mastrobattista J. More or less CHAOS: case report and literature review suggesting the existence of a distinct subtype of congenital high airway obstruction syndrome. Ultrasound Obstet Gynecol. 2007;30:114–7.
6. Kundal R, Bharadwaj A, Dogra N, Al E. Anaesthetic management of unexpected subglottic stenosis in a neonate with tracheoesophageal fistula. J Case Rep. 2013;3:217–9.
7. Walner D, Loewen M, Kimura R. Neonatal subglottic stenosis-incidence and trends. Laryngoscope. 2001;111:48–51.
8. Kerai S, Gupta A, Kohli J, Al E. Complicated airway management in a neonate of congenital trachea-oesophageal fistula with subglottic stenosis. Indian J Anaesth. 2016;60:142–3.
9. Davis P, Cladis F, Motoyama E. Anaesthesia for pediatric otorhinolaryngologic surgeries. In: Smith's Anaesthesia for Infants and children (8th ed). 8th ed. Philadelphia: Elsevier, Mosby; 2011. 786–820 p.
10. Kulkarni K, Dave N, Karnik P, Al E. Airway management in a neonate with tracheoesophageal fistula and subglottic stenosis. Pediatr Anesth. 2017;27:325–31.
11. Kadam S, Dhake S, Doshi K, Al E. Infant feeding tube stiffened with guide wire as endotracheal tube exchanger and introducer in difficult airways. Indian J Anaesth. 2014;58:501–2.
12. Thampi S, Salins S, Jacob D, Al E. The feeding tube- a simple yet handy aid to intubate an unanticipated difficult pediatric airway. J Nepal Med Assoc. 2015;53:141–3.
13. Navsa N, Tossel G, Boon J. Dimensions of the neonatal cricothyroid membrane - how feasible is a surgical cricothyroidotomy? Paediatr Anaesth. 2005;15:402–6.
14. Karnik P, Dave N, Garasia M. Unanticipated Difficult Airway in a Neonate: are we Prepared for this CHAOS? Turk J Anaesthesiol Reanim. 2017;45:318–9.
15. Watters K. Tracheostomy in Infants and Children. Respir Care. 2017;62:799–825.
16. Wetmore R, Marsh R, Thompson M, Al E. Pediatric tracheostomy: a changing procedure? Ann Otol Rhinol Laryngol. 1999;108:695–9.

Available at https://e-journal.unair.ac.id/IJAR | DOI: 10.20473/ijar.V3I12021.1-9

Table 1. Clinical Presentation, Diagnoses, Anaesthesia and Operative Management, Complications and Final Outcomes in Our Patients

Patients particulars	Case 1	Case 2	Case 3	Case 4	Case 5
Sex	Female	Female	Male	Male	Female
Age	1 day	3 days	1 day	1 day	4 month
Maturity	Preterm	Term	Term	Preterm(34weeks)	Term
Weight	1500g	2800g	2800g	1300g	3600 g
Clinical presentation Symptoms	Excessive frothing Drooling of saliva from the mouth	Respiratory distress Drooling of saliva from the mouth	Absent anal opening Progressive abdominal distension	Drooling of saliva from the mouth	Abnormally placed anal opening Running nose history of recurrent URTI; No history-cyanotic spells
Antenatal history	-	Polyhydramnios	-	-	
Clinical signs	Hemodynamically Stable H.R -146/min, R.R -45/min SpO2-95% on room air	Unstable H.R -166/min, R.R -55/min SpO2-90% on room air cleft anomaly	Hemodynamically Stable No dysmorphic features	Hemodynamically Stable SpO2-98% on room air	Hemodynamically Stable Mild pallor, fever (99 ^{0}F) Mild suprasternal retraction; Bilateral air entry-good. Perineal examination-anteriorly placed anus; No dysmorphic features.
Diagnoses	EA with TEF (type 3b) with cleft of soft palate	EA with TEF (type 3b) with bilateral cleft lip and cleft palate	High type ARM, CPC type 4	EA with TEF (type 3b)	ARM, with anteriorly placed anus
Associated conditions or illness or malformations	-	Physiological jaundice (serum bilirubin-12.3mg/dl) Dehydration (urea-46mg/dl %) ASD, VSD	-	VLBW	Bilateral polydactyl Anaemia (Hb-9.1gm %)
Standard procedures for anaesthesia care	Yes	Yes	Yes	Yes	Yes
Induction	Thiopentone (5mg/kg i,v.) succinylcholine (2mg/kg).	Thiopentone (5mg/kg i,v.) succinylcholine (2mg/kg).	Thiopentone (5mg/kg i,v.) succinylcholine (2mg/kg).	Thiopentone (5mg/kg i,v.) succinylcholine (2mg/kg).	Thiopentone (5mg/kg i,v.) succinylcholine (2mg/kg).
Cormack-Lehane view	Grade II	Grade II	Grade II	Grade II	Grade II
Endotracheal intubation attempted with size 0 Millers blade	ETT size 3 and 2.5 mm ID	ETT size 3, 2.5 and 2 mm ID	ETT size 3 and 2.5 mm ID	ETT size 2.5 mm ID	ETT size 3 and 2.5 mm ID
ETT negotiable beyond subglottic area.	No	No	No	No	No
Ventilation	Gentle bag and mask ventilation	Gentle bag and mask ventilation	Gentle bag and mask ventilation	Gentle bag and mask ventilation	Gentle bag and mask ventilation
Availability of ETT size 2 mm ID	No	Yes	No	No	No
Anticipated difficult airway	No	Yes	No	No	No

Available at https://e-journal.unair.ac.id/IJAR | DOI: 10.20473/ijar.V3I12021.1-9

Successful Intubation	Modified 6 French gauge (Fr) sized IFT stiffened with stylet	Modified 6 French IFT stiffened with stylet	Modified 8 French IFT stiffened with stylet	Modified 8 French IFT stiffened with stylet	Modified 8 French IFT stiffened with stylet
Attempt with Successful Intubation	First	First	First	First	First
Air leak	Absent	Absent	Absent	Absent	Minimum air leak
Securing the tube	Tip beyond the site of fistula after confirming bilateral equal air entry	Tip beyond the site of fistula after confirming bilateral equal air entry	Yes	Tip beyond the site of fistula after confirming bilateral equal air entry	Yes
Anaesthesia circuit- Jackson Rees' modification of Ayres' T-piece	Proximal end of the IFT attached to a 3mm ET tube connector	Proximal end of the IFT attached to a 3mm ET tube connector	Proximal end of the IFT attached to a 3mm ET tube connector	Proximal end of the IFT attached to a 3mm ET tube connector	Proximal end of the IFT attached to a 3mm ET tube connector
Maintenance of Anaesthesia	FiO_2 - 50% (O_2:air = 50:50)	Oxygen only	FiO_2 - 50%	FiO_2 - 50%	-
Procedure	Thoracotomy; fistula ligation and end to end esophageal anastomosis	Thoracotomy; fistula ligation and end to end esophageal anastomosis	Exploratory laparotomy, CPC type 4 with colo-vesical fistula. Fistula ligation, pouch excision end colostomy	Thoracotomy; Fistula ligation but long gap of >4 cm; esophagostomy and feeding gastrostomy	Procedure was deferred as definitive procedure (posterior sagittal ano-rectoplasty) had to be performed in the prone position and there was possibility of accidental dislodgement of the modified ETT
Intra operative complication	No	No	No	No	No
Intraoperative SpO_2 levels	Between 94 and 100%	Between 90 and 95%	100%	Between 95 and 100%	-
Reversal and extubation	After completion of procedure	Reversed but not extubated after completion of procedure	At the completion of procedure, adequate airway patency was confirmed and was extubated successfully	The patient could not be extubated postoperatively	Extubation - 10 minutes
Postoperative supplemental oxygen requirement	72 hours	Spontaneous ventilation via T-piece	48 hours	Spontaneous ventilation via T-piece	48 hours
Postoperative course	Uneventful	Sepsis	Uneventful	Sepsis, Sclerema	Stridor (responded to antibiotics and steroids)
Bronchoscopy by ENT surgeon	-	-	Grade II SGS	-	Grade II SGS
Outcome	Favourable	Unfavourable (3^{rd} postoperative day)	Favourable	Unfavourable (2^{nd} postoperative day)	Favourable Definitive surgery after 3 months, intubated with size 2.5 mm standard ETT

*Note: [ARM = Anorectal malformation, ASD = atrial septal defect, CPC= Congenital Pouch Colon, CVS= Cardiovascular system, EA = Esophageal atresia, ETT = Endotracheal Tube, FiO_2 = Fraction of inspired oxygen, H.R. = Heart rate, ID = internal diameter, IFT = infant feeding tube, i.v. = intravenous, R.R. = respiratory rate, SGS = Subglottic stenosis, SpO2 = oxygen saturation, TEF= Tracheoesophageal fistula, URTI = upper respiratory tract infection, VLBW = very low birth weight, VSD = ventricular septal defect].

Available at https://e-journal.unair.ac.id/IJAR | DOI: 10.20473/ijar.V3I12021.1-9