

Successful Insertion of Endotracheal Tube in Neonates by Suprasternal Palpation

SAJID ULLAH¹, WAJIHA RIZWAN², ASMA MUSHTAQ³, JAVERIA NAYYAR⁴, MUHAMMAD SAHIR SAUD⁵, MUHAMMAD SHEHRAM⁶

^{1,4,5}Senior Registrar Paediatrics, The Children's Hospital and Institute of Child Health, Lahore

^{2,6}Assistant Professor Paediatrics, The Children's Hospital and Institute of Child Health, Lahore

³Associate Professor Paediatrics, The Children's Hospital and Institute of Child Health, Lahore

Correspondence to: Dr. Sajid Ullah, Email: Sajid_buzdar92@yahoo.com

ABSTRACT

Background: Neonatal resuscitation many times requires endotracheal intubation and correct placement of endotracheal tube determines success of resuscitation and avoids complications.

Aim: To determine frequency of successful insertion of endotracheal tube by suprasternal palpation in neonates.

Methods: A descriptive study was done at Nursery department of The Children's Hospital, Lahore. A total of 197 patients were taken. After passing Endotracheal tube (ETT), tip of ETT was very gently palpated in suprasternal notch of newborn. The position of ETT was considered correct only if its tip was palpable in suprasternal notch. Successful insertion was followed by its confirmation by X-ray chest taken in supine position. Baby's gestational age when born and weight was also measured. All data including age, weight and outcome of insertion was collected on Performa.

Results: In our study, out of 197 cases, 101(51.27%) were between 1-10 days of life while 96(48.73%) were between 11-28 days of life, mean+SD was calculated as 10.09+5.79 days, 106(53.81%) were male and 91(46.19%) were females. Frequency of successful insertion of endotracheal tube by suprasternal palpation in neonates was calculated as 174(88.32%).

Conclusion: We concluded that the frequency of successful insertion of endotracheal tube by suprasternal palpation in neonates is higher and may be recommended in future but our findings are limited to one center and needs some-other trials for its validation.

Keywords: Neonates, resuscitation, insertion of endotracheal tube, suprasternal palpation, successful

INTRODUCTION

Neonatal endotracheal intubation is highly life-saving yet risky procedure¹ that is performed during cardiopulmonary resuscitation, surfactant administration, airway protection and administration of certain drugs^{2,3}. If the ETT tip is at mid tracheal position i.e., mid-way between clavicles and carina it is considered to be correctly placed and prevents ventilation related complications.² It is always considered difficult to correctly place ETT in newborn because of small length of their trachea and anatomical variations. Even after many recent advances in field of neonatology, proportion of inappropriately placed ETT is still significant^{4,5}

Tracheal intubation being a common lifesaving emergency procedure requires immediate confirmation of correct placement of tube as its mal-position can lead to serious complications like vocal cord trauma, laceration of trachea or even perforation^{6,7}. At present the chest radiograph is considered to be the gold standard to confirm tube position⁸. However it is often much delayed many times because of non-availability of machine or technician.

A study reported that the percentage of correct tube placements was 85% using suprasternal palpation⁹. One more study reported that successful insertion was 83% when consider suprasternal palpation of tube tip combined with the weight related nomogram.² The rationale of this study is to determine the frequency of successful insertion of endotracheal tube by suprasternal palpation in neonates. As no local study is available and international data

supports that suprasternal notch palpation is safe and simple method to confirm ETT position in newborns especially if chest roentgenogram is not available. Furthermore sometimes multiple radiographs are needed for successful and correct placement of ETT and resulting in repeated harmful radiations exposures to neonates and also waste of resources, this method may be in particular helpful during newborn resuscitation or administration of surfactant⁹. Furthermore in 2014 Rama V et al also stated that that suprasternal notch palpation of tube tip is the only effective clinical method to determine the depth of tube insertion but it requires some more clinical trials before recommendation of this method be made⁴. Hence through this study we can recommend the method of endotracheal tube insertion by suprasternal palpation to all our concerned health care providers.

METHODS

A descriptive study was conducted at Neonatology department, The Children hospital (CHL), Lahore. This study was done in six month after approval from ethical review board of The CHL from 1st July 2019 to 31st December 2019. Using non-probability consecutive sampling, 197 sample size of newborns was taken in this study by using expected percentage of successful insertion i.e. 85% using suprasternal palpation.⁷ we used 95% confidence level and 5% margins of error. Any term and preterm baby with age less than or 28 days of any weight, either male or female requiring endotracheal intubation whether on emergency basis or elective was included in

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study. Any newborn having any congenital/acquired abnormality of airways/esophagus/oral cavity/spines assessed on physical examination was excluded. The residents involved in this study were first trained regarding this procedure. After taking an informed consent form their parents or attendants their basic demographical history (such as name, age, gender and contact details) the procedure of ETT was explained to patient’s attendants. After tube placement, the tip of ETT was very gently palpated in suprasternal notch at point midway between the medial ends of two clavicles also called at level of intervertebral space of thoracic vertebrae T-1 and T-2 in neonates with the little or index finger of the left hand while with the fingers of right hand were used to hold the body of the tube. Tube position was noted as high enough when neither tip nor body was palpable in suprasternal notch and was considered low when only body but not the tube tip was palpable. Whereas the position of tube was considered to be correct when the tip of the tube was palpable in the suprasternal notch. Successful insertion was taken as insertion of ETT at midpoint between thoracic inlet and carina at suprasternal level as confirmed by supine chest radiograph. Baby’s gestational age when born and weight will also be measured. All data was collected on Performa. All data was entered in SPSS version 20. Quantitative data such as age and gestational age of neonate when born was presented as mean±S.D. Qualitative data like successful tube insertion and gender was presented in form of frequency (%). Data was stratified for age, gender, weight and gestational age of baby and to control the effect modifier, post stratification chi-square test was applied. The P-value ≤ 0.05 was considered to be significant.

RESULTS

A total of 197 cases fulfilling the inclusion criteria were included to find out the frequency of successful insertion of endotracheal tube by suprasternal palpation in neonates. The 101(51.27%) newborn were between 1-10 days of life, mean age+SD was calculated as 10.09+5.79 days (Fig. 1). The 53.81% were males (Table 2).Frequency of successful insertion of endotracheal tube by suprasternal palpation in neonates was calculated as 174(88.32%) (Table 3). The data was stratified for age, gender, weight and gestational age of baby and to control the effect modifier, post stratification chi-square test applied. The P-value ≤ 0.05 was taken as significant (Table 4).

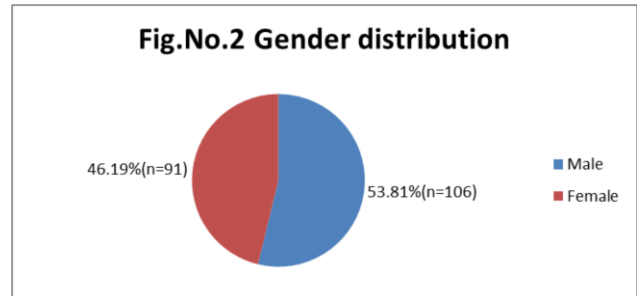
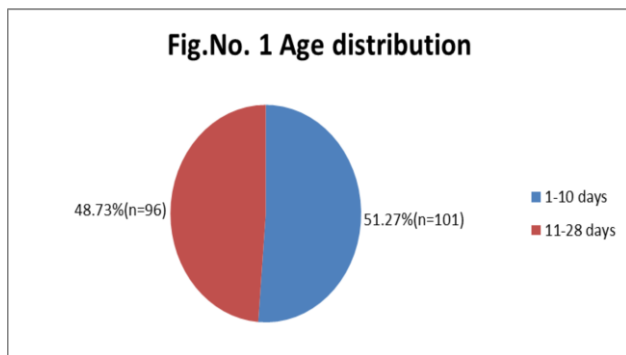


Table 3: Frequency of successful insertion of endotracheal tube by suprasternal palpation in neonates (n=197)

Successful insertion	No. of patients	%
Yes	174	88.32
No	23	11.68
Total	197	100

Table 4: Stratification for successful insertion with regards to age, gender, weight and gestational age (n = 197)

Parameters		Successful Insertion		P Value
		Yes	NO	
Age in days	1-10	90	11	0.72
	11-28	84	12	
Gender	Male	98	8	0.05
	Female	76	15	
Wt in KG	1-3	111	18	0.17
	>3	63	5	
Gestational age in week	<37	57	14	0.00
	>37	117	9	

DISCUSSION

International newborn resuscitation guidelines advice that newborns having apnea, inadequate or gasping like respiration and/or bradycardia should be immediately provided positive pressure mechanical ventilation with a manual ventilation device like ambu bag with appropriate size face mask or ETT¹⁰. The endotracheal intubation in newborn is crucial procedure and proper placement determines success of resuscitation.

In our study, mean age ± SD was 10.09+5.79 days, 106(53.81%) were male and 91(46.19%) were females. Frequency of successful insertion of endotracheal tube by suprasternal palpation in neonates was calculated as 174(88.32%).

The findings of our study are in agreement with a study reported that the percentage of correct tube placements was 85% using suprasternal palpation.⁹One more study reported that successful insertion was 83% when consider suprasternal palpation of tube tip combined with weight related nomogram². In adults as well McKay/WP et al study shows 77% correct tube placement using suprasternal palpation method¹¹.

Bednarek FJ et al¹² are of the view that in order to minimize complications of improper ETT positioning, a method of tube insertion by palpating the tube tip within the suprasternal notch may be helpful. The is simple and very effective procedure having no observed complications. The accuracy was later verified by fluoroscopy. The radiological evidence from 142 infants showed that a point midway between medial ends of two clavicles was a reliable position as it’s close to actual tracheal midpoint.

Very few studies are done on this method; however, in accordance with the findings of this study, we are of the view that suprasternal palpation is safe and simple method to confirm endotracheal tube position in neonates especially when chest roentgenogram is not available. Furthermore sometimes multiple radiographs are needed for successful and correct placement of ETT and resulting in repeated harmful radiations exposures to neonates and also waste of resources, this method may be specifically helpful during newborn resuscitation or administration of surfactant⁹.

Through this study confirmed the frequency of successful insertion by suprasternal palpation and considering its higher percentage of successful insertion we may recommend this method of endotracheal tube insertion to all our concerned health care providers. However, as the post graduate trainees at our institute were well trained in this procedure before this study and our data is primary in this regard, it needs some other trials to validate our findings.

CONCLUSION

The suprasternal palpation of tip of ETT during intubation has a good accuracy to confirm tube position may be recommended in future especially in emergency situation, this method can be used to guide correct tube placement before radiological confirmation. But our findings are primary and limited to our institute, so needs some-other trials for its validation.

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