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STUDY ON PREDICTION OF ENDOTRACHEAL TUBE SIZE FOR PAEDIATRIC PATIENTS FROM THE EPIPHYSEAL DIAMETER OF RADIUS

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ABSTRACT

BACKGROUND: Using a too big or a too small size of an endotracheal tube in pediatric patients would result in tracheal injury or insufficient ventilation. Determining the appropriate endotracheal tube size is important because using an inappropriate size can cause complications. This study was performed to predict the appropriate endotracheal tube size by measuring the transverse diameter of the epiphysis of the distal radius under the assumption that the growth rates of cartilages in the entire body are close to each other.

AIM: This study was performed to predict the appropriate endotracheal tube size by measuring the transverse diameter of epiphysis of distal radius under the assumption that growth rate of cartilages in the entire body are close to each other. METHODS: Sixty children aged 3 to 10 years who required general anesthesia were intubated with an un cuffed endotracheal tube. The tube size was considered to be appropriate when leaks occurred at inspiratory peak pressures between 10 to 25 mmHg. The transverse diameters of the epiphysis were measured with an ultra-sonogram at the distal radius and the proximal phalanx of the third finger and the fifth finger. Correlations and prediction probabilities of measurements were evaluated.

RESULT: The correlation coefficient between the endotracheal tube and the epiphysis of the distal radius was 0.8878 .failure rate was 10%.

CONCLUSION: appropriate endotracheal tube selection by epiphyseal growth of the radius has a more close relationship and superior predictability than demographic variables.

KEYWORDS : Endotracheal tube, Epiphysis, Radius, General anesthesia, Children.

1. INTRODUCTION

Some of the commonly used methods for determination of ETT size are by using demographic data such as weight, height or age, width of child's fifth fingernail that have been tested & validated. In pediatric patients selection of appropriate size of endotracheal tube is one of the main issues because an inappropriately large or small size of the ETT causes tracheal edema or leakage . Many studies on selection of the appropriate size of an ETT in pediatric patients have been reported, and there have been many debates regarding which formula or method is superior to the other formulae or methods. The need for making a quick decision on the ETT size has led some of the anesthesiologists to use intuitive methods such as using the transverse diameter or width of the child's fifth fingernail to select the size of an ETT [1]. However, a few reports have stated that measuring the fingertip transverse diameter or width to predict the ETT size is unreliable [2]. Prediction of endotracheal tube size based on epiphyseal diameter was studied by Hee young kim et al [3] and by regression analysis , a formula was derived. The study was done on Korean population Extrapolation of the formula for Indian patients was applied and correlation coefficient was calculated.

2.AIM

This study was performed to predict the appropriate endotracheal tube size by measuring the transverse diameter of epiphysis of distal radius under the assumption that growth rate of cartilages in the entire body are close to each other.

3. METHODS AND MATERIALS:

INCLUSION CRITERIA:

ASA I And Il
Age Between 3 To 10 Years
Both Sexes
Requiring General Anaesthesia

EXCLUSION CRITERIA:

Children with known tracheal or laryngeal pathology

Musculoskeletal disorders
Congenital developmental disorders
Malformation of hand or extremities

STUDY DESIGN:

Observational study.

Institutional ethical committee of Madurai medical college approval was obtained. 60 Children were enrolled for the study. The transverse diameter of radial heads on both sides was measured and averaged .The formula based on regression analysis of correlation between transverse radius diameter and endotracheal tube, by Hee Young kim et al [3]was applied

FORMULA APPLIED:

(29.5+ Epiphyseal Diameter of Radius)/8

The derived value was approximated to the nearest size endotracheal tube Before induction , the calculated size endotracheal tube and one size up and down were made available (Portex , Smith Medical, uncuffed)Induction & muscle relaxation was done by standardized protocol based on weight of the child Intubation was done by experienced anesthesiologist Air leakage was monitored by performing auscultation over larynx with a stethoscope and the pressure at which air leaked was monitored. If the leak occurred at airway pressure less than 10 cm H2O , the tube was considered to be small , and re intubated with the next larger size If there was no audible leak above 25 cmH20 the tube was considered to be large and re intubated with next smaller size tube On a tube change maneuver, Inj. Dexamethasone 0.1 mg/kg was administered IV. Single attempt successful intubation was recorded with score of 0 , and a tube change maneuver was recorded as score of 1 in observation sheet.

PARAMETERS OBSERVED:

Age
Weight
Radial epiphyseal diameter
Calculated ETT size based on formula
Approximated ETT size
Actual ETT size
Attempt score

STATISTICAL ANALYSIS

The observed parameters were recorded in the master chart. Data analysis were done. Correlation coefficient was analyzed using SPSS software.

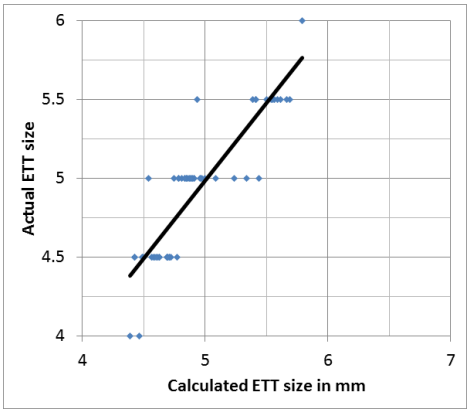
4. RESULT:

The formula was considered appropriate for Indian Population .If Correlation coefficient between Predicted Endotracheal tube and actual size used for intubation was above 0.8 and failure rate was less than 12.5%

TABLE 1: DEMOGRAPHIC CHARACTERS

	TOTAL N=60
AGE(MONTHS)	80± 40
SEX(M/F)	42/18
WEIGHT(Kg)	17±9

Figure No:2 Scatter Diagram Showing the Correlation Between Calculated ETT Size & Actual ETT Size



5. DISCUSSION &CONCLUSION:

Even though demographic data have the advantage that they can be easily obtained, the growth of the trachea would not always be proportional to the demographic data. From the view point that the tracheal ring is composed of cartilage, the measurement of cartilage growth of the body part, especially the hand, deserves attention as a surrogate marker of cartilage growth of the trachea and the appropriate ETT size. It might be difficult to use this method in pediatric patients who are so young that they do not show formation of the epiphysis or are so mature that epiphysis is already capped.

Figure No: 3 Ultrasound Picture Showing the Longitudinal-diameter of Radial Epiphysis

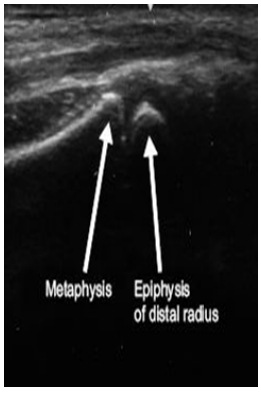
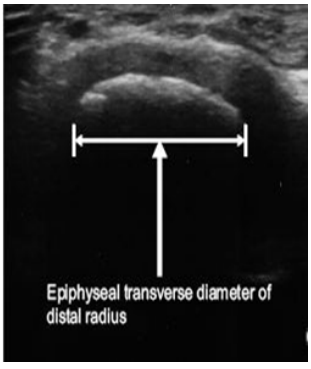


Figure No: 4 Ultrasound Picture Showing the Transverse Diameter of Radial Epiphysis



Even though the ages are equal, in the current study, the transverse diameters of the distal radius and the applied ETT sizes would be different. We hope that these types of modalities and viewpoints will help the physicians in predicting the appropriate ETT size more precisely in the field of difficult airways, growth retardation or overgrowth. The correlation coefficient between the endotracheal tube and the epiphysis of the distal radius was 0.8878 .failure rate : 10% .From this study we conclude that the appropriate endotracheal tube selection by epiphyseal growth of the radius has a more close relationship and superior predictability than demographic variables.

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