

## 5<sup>th</sup> finger nail width as size of endotracheal tube – A case report.

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**Abstract:** Selection of endotracheal tube size is very crucial in paediatric anaesthesia due to fear of increased airway resistance and subglottic edema. Age related formula is being applied to select appropriate size, some time smaller endotracheal tubes are required due to various reasons, like formula calculated to western standards, reduced weight to the age, poor nourishment. We describe a case where age related formulas to predict endotracheal tube size were fallacious.

**Keywords:** 5<sup>th</sup> finger nail width, endotracheal tube size, microcephaly, paediatric anaesthesia.

### I. Introduction

For successful intubation, selection of optimal diameter of endotracheal tube is important as the subglottic region is narrowest in paediatric airway where some leak is recommended during ventilation to prevent airway edema. When age related formula fails, endotracheal tube size is selected by visualising the 5<sup>th</sup> finger nail width of child<sup>1</sup>. Here we report an incidence where 5<sup>th</sup> finger nail width of child was taken as guide in selecting size of endotracheal tube.

#### Case report:

A 4 year old boy weighing 3 kg was scheduled for cleft lip and palate surgery under general anaesthesia. On pre-anaesthetic evaluation microcephaly (head circumference 35cm), low set ears, syndromic facies, retractile testis, brown hair was present.

Investigation reports showed Hb-10gm%, PCV-30%. ECG, CXR and ECHO reports were found to be normal.

**Preparation of patient for surgery:** Patient was kept nil per orally, written informed consent was taken, premedication i.e 2.5 ml (250mg) triclofos syrup, 0.5ml (0.3mg) atropine mixed and given orally 2 hrs prior to induction of anaesthesia.

According to the age based formula endotracheal tube RAE (Ring, Adair and Elwyn) uncuffed of 4.0, 4.5 and 5.0mm I.D size were kept ready. General anaesthesia was induced with 100% O<sub>2</sub> and sevoflurane 0.2-7% by gradual increasing method. Secured an Intravenous line with 22g cannula on the dorsum of right hand. 5µg Fentanyl and 2 mg Atracurim given intravenous, then ventilated for 4 minutes. On attempting intubation with 4.5, 4.0, 3.5mm oral RAE uncuffed were unsuccessful in spite of vocal cords being visualised. To prevent desaturation, pt was ventilated with 100% oxygen. Then finally 3.0 size oral RAE uncuffed was passed. Correct placement of Endotracheal tube was confirmed by 5 point auscultation method and End tidal carbon dioxide measurement. Tube is fixed at 9cm. IPPV maintained with N<sub>2</sub>O:O<sub>2</sub> 2:2 and sevoflurane 0.5% with Jackson Ree's circuit. Course of anaesthesia during surgery was uneventful. Total duration of surgery was 2 & 1/2 hrs and extubation was uneventful. After extubation size of the tube was compared to the size of 5<sup>th</sup> finger nail width of child which was comparable.

### II. Discussion:

Predictive formulas to determine appropriate endotracheal tube size<sup>1</sup>

1. Width of fifth finger.
2. Direct comparison with diameter of fifth finger using ring sizing device.
3. Comparison of width of fifth finger nail, is used for calculation when child age is unknown / calculation is awkward- accurate estimate is made using 5<sup>th</sup> finger nail width<sup>1</sup>
4. Using formula (Age in years +16)/4.

88% paediatric anaesthesiologists use age based formula (penglinton's formula)<sup>2</sup>

< 6 ½ years = Age (yrs) + 3.5/3

> 6 ½ years = Age (yrs) + 4.5/4

70% use modified Cole formula<sup>2</sup>

Age based formula is most widely accepted, reliable, easily applied. This calculation over estimates the correct size in > 1 in 4 cases<sup>5</sup>

Weight based formula for tracheal tube size in children is inferior to ABF in selecting the best tube size for children. Age based formula tend to underestimate while weight based formula tend to overestimate the appropriate size of tracheal tube in pediatric anesthesia<sup>4</sup>

Wang *etal* demonstrated that body weight is best to determine an uncuffed oral endotracheal tube size in chinese children in contrast to caucasians<sup>7</sup>

Using ultrasonography is a better predictor for measurement of subglottic airway diameter predicts appropriate size endotracheal tube than formula using Age and height.<sup>3</sup>

Disadvantages with these ultrasonographic measurement performed without ventilation or positive end expiration pressure to minimize fluctuation in tracheal diameter. These measurement take approximately 30 sec apneic period(extended).

Width of 5<sup>th</sup> finger nail based formula for prediction of ETT size are more accurate than length based and multivariate based formula (Turkish *etal*)<sup>4</sup>

Multivariate based formula (ID in mm=2.44 + Age in yr X 0.1 + height in cm X 0.02 + Wt in Kg X 0.016)<sup>8</sup>.

### III. Conclusion

This case highlights that predicting endotracheal tube size especially in pediatric age group, the diameter of 5<sup>th</sup> finger nail width which is a better predictor in some cases than age based formula .

This knowledge may be applied in cases where child is under nourished or small for his age.



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