Abstract –

Title - AN OBSERVATIONAL STUDY TO DETERMINE THE UTILITY OF ULTRASOUND IN PREDICTION OF ENDOTRACHEAL TUBE SIZE IN PAEDIATRIC POPULATION

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Degree And Subject – MD Anaesthesia Batch 2013

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Key words- anaesthesia for children, uncuffed endotracheal tube, airway imaging, subglottic diameter

Objective

- To assess the utility of ultrasonography for selection of uncuffed endotracheal tube in paediatric population
- To compare ultrasound guided method to age based formula for calculation of endotracheal tube in paediatric population
- To compare length of endotracheal tube by age based formula vs. direct visualization of black line at vocal cords and estimation of endotracheal tube length at lips.

Materials and Methods –

This prospective observational study was carried out for children less than six years old undergoing elective general anaesthesia with endotracheal intubation excluding
difficult airway. Sample size was calculated to be 63 children with 90% power and 5% level of significance. Age based formula for ETT internal diameter, Cole’s formula (Age+4/4) was used for selection of ETT for children more than two years. Subglottic diameter of trachea for ETT size was measured using ultrasound method. Correct tube used for the patient was confirmed by air leak test, carried out after intubation. Agreement for correct ETT used with each of ultrasound ETT and age based formula ETT was assessed using kappa value for intra class correlation (ICC). Similarly the length of tube by age based formula and direct visualisation at vocal cords was analysed by using paired t test. Subgroup analysis was carried in the subgroups in terms of age (less than and more than one year), sex, and weight.

Results-

Total sixty six children (forty seven boys and nineteen girls) with mean age of 27.9 months (SD 19.6) were recruited. Mean of size of ETT diameter, calculated using age based formula was 4.3 mm. Mean subglottic diameter as measured using ultrasound was 6.1 mm (SD 0.9). Mean of size of these ETT was 4.6 mm. Mean of the correct size ETT was 4.7 (SD 0.6). Size of correct ETT matched with ETT size calculated using USG method in 44 patients (67%), whereas the age-based method selected the correct tracheal tube size in 32% (21) patients ($p<0.001$).

Agreement of ultrasound based method with the correct size tube was 0.902 which is considered as excellent however agreement for age based formula method and correct ETT was also 0.835 which is also considered good. These values suggest that USG based methods is better than age based formula in children. On subgroup analysis,
agreement between USG based tube size and correct tube size was excellent in boys and children with one year or less.

Mean of length of tube using age based formula is 12.6 (SD of 1.4) which is close to the mean of length of actual ETT used that is 12.3 (SD of 1.6) (p= 0.001). Values in both the groups matched in 28 patients while 36 patients the values strong correlation of 0.910

**Conclusion**

With ICC of 0.902, ultrasound can be a useful tool for selecting paediatric ETT size as compared to age based formula. This finding is significant especially in children under the age of one year.