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Title: TRACHEAL TUBE SIZE AND POST-INTUBATION CROUP IN CHILDREN

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Introduction. Ulceration, edema, and cellular infiltration of the laryngeal and tracheal mucosa can be produced in anesthetized monkeys by insertion of an oversized endotracheal tube for a period of two hours(1). Therefore, the selection of a suitable size endotracheal tube is of paramount importance in preventing injury to the larynx and tracheal of infants and children with a previous history of croup. We undertook this study to determine the tracheal tube size for reasonable fit under these conditions in children with a history of croup.

Methods. Children undergoing endotracheal anesthesia for surgical procedures were studied. Group 1 patients (N = 145) had an apparently normal airway. Group 2 patients (N = 39) had a history of infectious or post-intubation croup. Endotracheal tube size was selected prospectively on the basis of the formula (2,3):

$$\text{Internal Diameter (ID)} = \frac{18 + \text{Age (yrs)}}{4}$$

Following intubation, an audible leak at the mouth was determined at a peak inflating pressure, held for a period of 10 seconds and measured with an aneroid manometer. The duration of intubation was 0.5 to 6 hours. Uncuffed Murphy PVC tracheal tubes, prepacked and sterile, from the same manufacturer, were used. Laryngoscopy and intubation were performed with the aid of neuromuscular blockade. In the Recovery Room, a diagnosis of post-intubation croup was made on the basis of one or more of the following clinical signs; moderate to severe hoarseness of voice or cry; barking cough; inspiratory stridor, or inspiratory retractions. The patients varied in age from pre-term neonates to 10 years, and were similarly distributed throughout both study groups. Informed consent was obtained from parents and approval was granted by the Committee for the Protection of Human Subjects.

Results. The frequency of post-intubation croup in both groups of patients in relation to the tightness of tube fit as indicated by the peak inflating pressure associated with an audible leak is summarized in Table 1. The incidence of post-intubation croup in the two patient groups is indicated in Table 2.

Table 1. POSTINTUBATION CROUP and AIRWAY LEAK PRESSURE

Leak Pressure: (cmH_2O)	50-60		40-50		30-40		20-30		10-20	
CROUP	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Group 1	21	0	23	1	9	2	53	3	33	0
Group 2	-	-	-	-	2	2	1	6	27	1

Table 2. INCIDENCE OF POST-INTUBATION CROUP

	N	No Croup	Croup (%)
Group 1:	145	140	5 (3.6)
Group 2:	39	30	9 (30.0)

$\chi = 15.6$, $p < 0.001$ (with Yates correction)

The results indicate a random distribution of post-intubation croup in Group 1 patients among the various degrees of tightness of tube fit. In Group 2 patients, the incident of post-intubation croup appeared to increase substantially with a tighter tube fit (leak pressure > 20cmH_2O). Chi square analysis of the data in Table 2 indicates a highly significant increase in the incidence of post-intubation croup in the Group 2 patients.

Discussion. A history of infectious or post-intubation croup significantly increases the incidence of post-intubation croup in infants and children undergoing elective anesthesia. The incidence does not appear related to tightness of tube fit in patients without a history of croup. However, the increased incidence of post-intubation croup with tighter fitting tubes in patients with a history of croup compels us to advocate a smaller tube with a leak at a peak inspiratory pressure of 10 to 20 cm water in this group.

References.

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