Accuracy of Identifying the Cricothyroid Membrane in Children using Palpation: An Observational Study

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Background: Accurate identification of the cricothyroid membrane has paramount importance in the event of a ‘cannot intubate, cannot oxygenate’ scenario. However, the underdeveloped thyroid cartilage, more prominent hyoid bone, and smaller dimensions of the cricothyroid membrane in children may make this difficult. We sought to determine the ability of anesthesiologists to correctly identify the cricothyroid membrane in obese and non-obese children.

Methods: As participants, anesthesiologists were asked to mark the entry point of the cricothyroidotomy device with an ultraviolet invisible pen on obese and non-obese (BMI <95th percentile for age and sex) children aged 7-12years. Ultrasonography was used to mark the midpoint of the cricothyroid membrane and the distance between the two marks was measured. A correct estimation was defined as a mark made between the upper and lower borders of the cricothyroid membrane and within the 3-mm midline. Participants were also asked to define the task of palpation as easy, moderate, difficult, and impossible.

Results: Twenty participants palpated 30 obese and 50 non-obese children. The cricothyroid membrane was accurately identified with digital palpation in a total 55%of children, and there were no differences inaccurate identification rates of the cricothyroid membrane between obese and non-obese children (57% vs. 54% respectively; median difference 3%; 95% confidence interval -20 to 25%; P= 0.82). The anesthesiologists reported palpation of the cricothyroid membrane subjectively more difficult in obese children than in non-obese children. Accuracy was not correlated with any demographic or morphometric features of the children.

Conclusions: Percutaneous identification of the cricothyroid membrane in children aged 7-12 years was poor and not significantly different for obese and non-obese children. Pre-procedural ultrasonography may help to identify the landmarks for cricothyroidotomy.

Table 1: Data regarding accuracy of digital palpation of cricothyroid membrane

	Obese (n= 30)	Non-obese (n=50)	Test Statistic and p value
Time taken to palpate	11.52 (5.96)	11.75 (7.10)	t(78)=-0.15, p=0.88
Total numberof attempts	8 (26.67)	23 (46.0)	X ² (3)=3.0, p=0.39
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2	12 (40.0)	14 (28.0)	
3	6 (20.0)	8 (16.0)	
4+	4 (13.33)	5 (10.0)	
US-DP vertical distance (mm)	2.5 (6)	3 (6)	U(30,50)=1166.5, p=0.63
Experience of anesthesiologist (yr)	5 (8)	5 (5)	U(30,50)=1104.5, p=0.27
Accuracy of digital palpation	17 (56.67)	27 (54.0)	X ² (1)=0.05, p=0.82

Table 2: Univariate aalysis usig logistic regression. Composite outcome accuracy

Independent variables	P- value	Odds ratio (95%CI)
Age (yr)	0.50	1.10 (0.83-1.45)
Female ^a	0.90	1.06 (0.41-2.75)
Height (cm)	0.38	1.02 (0.98-1.06)
Weight (kg)	0.32	1.02 (0.98-1.07)
Neck circumference (cm)	0.73	1.03 (0.86-1.23)
CTML (mm)	0.84	0.96 (0.64-1.45)
Time taken to palpate	0.47	1.03 (0.96-1.10)
Total numberof attempts	0.44	1.17 (0.78-1.77)
Experience of anesthesiologist (yr)	0.32	1.05 (0.96-1.14)
Ease of Palpation (easy-moderate vs difficult-impossible)	0.85	1.11 (0.38-3.25)
Obese group ^a	0.82	1.11 (0.45-2.77)