Child Obesity and Anesthetic Complications

Essay

Submitted for partial fulfillment of master degree in
Anesthesia

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بسم الله الرحمن الرحيم

قَالُوا سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

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Maher Hussen El Amin

Content

List of Abbreviations

ADHD	:	Attention-deficit hyperactivity disorder
AHI	:	Apnea hypopnea index
BIS	:	Bispectral index
BMI	:	Body mass index
BP	:	Blood pressure
CPAP	:	Continuous positive airway pressure
DA	:	Difficult airway
DA	:	Difficult airway
DI	:	Difficult intubation
ERV	:	Expiratory reserve volume
ETs	:	Endotracheal tubes
FRC	:	Functional residual capacity
HHNS	:	Or hyperglycemic hyperosmolar nonketotic syndrome
IBW	:	Ideal body weight
ICU	:	Intensive Care Unit
IGF	:	Insulin like growth factor
IGFBP-3	:	Insulin like growth factor binding protein
IIH	:	Idiopathic intracranial hypertension
LMA	:	Laryngeal mask airway
LVEDP	:	Left ventricular end diastolic volume
NAFLD	:	Nonalcoholic fatty liver disease
NHANES	:	National Health and Nutrition Examination Survey
NO	:	Nitric oxide

List of Abbreviations (Cont.)

Non-REM sleep: Non rapid eye movement sleep

OD	:	Outer diameter
OELM	:	Optimum external laryngeal manipulation
OHS	:	Obesity hypoventilation syndrome
OR	:	Operating room
OSA	:	Obstructive sleep apnea
Pcrit	:	Critical closing pressure
PDA	:	Patent ductus arteriosus
TBW	:	Total body weight
TTJV	:	Transtracheal jet ventilation

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Introduction

The definition of childhood obesity has not been standardized in the past, making studies difficult to compare. In spite of this, the increase in the incidence of childhood obesity is evident and has now reached epidemic proportions (***Smith et al., 2002)*.**

Childhood and adolescent obesity are important risk factors for adult obesity, which its consequent morbidity and mortality ***(Freedman et al., 2005)*.**

Obese children experience few of the medical complications seen in obese adults. Respiratory physiology appears to be most affected, the degree of which is determined by the level of obesity. Although there is a considerable amount of information on the anesthetic management of the obese adult, very little has been written concerning the obese child. There is less pathology in the obese child when compared with the adult but some evidence shows a higher likelihood of a critical incident occurring when anesthetizing such children. This shows that we need to be as worried about anesthetizing the obese child as we are for the obese adult. This concern should increase with increasing body mass index ***(Smith et al., 2002)*.**

Obesity is a systemic disease process that alters the physiology and psychology of the pediatric patient. Obese children are a special population requiring more planning, consultations, management, and time to successfully anticipate their anesthetic needs. These children are more likely to present for certain invasive procedures related to airway management, musculoskeletal correction, and even surgical intervention for obesity. Obese children have a higher risk for airway complications, anesthesia-related adverse events, and surgical complications ***(Leet et al., 2005)***

Aim of The Work

The aim of the work is to sensitize the anesthesiologists to newly addressed problems in the anesthetic management of child obesity.

Anatomical and Physiological Differences between Pediatrics and Adults

Regardless of all the advances in equipment, monitoring, and patient safety initiatives, pediatric anesthesia still requires a special understanding of anatomic, psychological, and physiologic development. The reason for undertaking a special study of pediatric anesthesia is that children, especially infants younger than a few months, differ markedly from adolescents and adults ***(Dutta and Albanese, 2008)***.

An anesthetic workstation to be used for pediatric anesthesia has to meet numerous requirements and must take into consideration the special physiological aspects of the various age groups of children, from premature babies to school children.

Next table showing the age limet of the different stages of growth.

Table (1): Table showing the age limet of the different stages of growth

Newborns	1 to 28 days
Infants	Up to end of 1st year
Small children	2 to 5 years
School-aged children	6 to 14 years

(Wheeler, 1998)

<u>Respiratory system :</u>

1. Pediatric airway*:*

The pediatric airway, particularly in infants, is different from the adult airway. Understanding the differences between the two is important when managing the pediatric airway. Following is a brief review of the anatomy of the normal pediatric airway ***(Cote and Todress, 2004).***

A. Larynx :

The larynx is situated more cephalad at C3-4 in the infant and migrates to the adult level of C5 by 6 years. Because the infant's larynx is more rostral (higher), the tongue is located closer to the palate and more easily opposes the palate. As a result, airway obstruction may occur during induction of or emergence from anesthesia. A common misnomer is that the infant's larynx is more “anterior” when it is really more “rostral” or “superior” in the neck (compared with the adult larynx). In syndromes associated with mandibular hypoplasia, such as Pierre Robin, the larynx is actually positioned more posteriorly than normal. This results in a greater acute angulation between the laryngeal inlet and the base of the tongue. In this circumstance, direct visualization of the glottis may be difficult or impossible. Because of the cephalad position of the larynx and the large occiput, the “sniffing” position does not assist in visualization of the larynx.. Elevating the head only moves the larynx into a more anterior position. Infants should be positioned with the head and shoulders on a flat surface with the head in a neutral position and the neck neither flexed nor extended ***(Cote and Todress, 2004).***

B. Epiglottis:

The infant epiglottis is longer, stiff, and often described as omega or U shaped. It projects posteriorly above the glottis at a 45-degree angle. Because the epiglottis is more obliquely angled, visualization of the vocal cords may be difficult during direct laryngoscopy. It may be necessary to lift the tip of the epiglottis with a laryngoscope blade in order to visualize the vocal cords. Straight laryngoscope blades are often preferred for this reason (***Crosbya and Skene, 2003).***

C. Subglottis :

The cricoid cartilage is the narrowest portion of the infant's airway (about 5 mm in diameter) versus the vocal cords of the adult airway. The infant's larynx is funnel shaped with a narrow cricoid cartilage, whereas the adult airway is cylindrical. Tight-fitting endotracheal tubes (ETs) that compress the mucosa at this level may cause edema and increase resistance to flow. Resistance to flow is inversely proportional to the radius of the lumen to the fourth power. One millimeter of edema can reduce the cross-sectional area of the infant trachea by 75% versus 44% in the adult trachea (***Crosbya and Skene, 2003)***.