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New Trends In Pediatric Sedation For Magnetic Resonance Imaging

Essay

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بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

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Mohamed Sabry Ahmed

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List of Abbreviations

AAP	: American Academy of Pediatrics
AAPD	: American Academy of Pediatric Dentistry
ASA	: American Society of Anesthesiologists
ASN	: American Society of Neuroradiology
ASTM	: American Society for Testing and Materials
CH	: Chloral Hydrate
ECG	: Electrocardiogram
ETCO2	: End-Tidal Carbon Dioxide
FRC	: Functional Residual Capacity
JCAHO	: Joint Commission on Accreditation of Healthcare Organization
LMA	: Laryngeal Mask Airway
MRI	: Magnetic Resonance Imaging
NHS	: National Health Service
NIBP	: Non Invasive Blood Pressure
NICE	: National Institute for Health and Clinical Excellence
NMDA	: N-Methyl-D-Aspartate
NMR	: Nuclear Magnetic Resonance
NMRI	: Nuclear Magnetic Resonance Imaging
OSA	: Obstructive Sleep Apnea
PACU	: Post Anesthesia Care Unit
PALS	: Pediatric Advanced Life Support
PCP	: Phencyclidine
PEEP	: Positive End Expiratory Pressure
PSRC	: Pediatric Sedation Research Consortium
RF	: Radio Frequency
SpO2	: Oxygen Saturation

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Introduction

Introduction

Pediatric anesthesia involves more than simply adjusting drug doses and equipment for smaller patients. Safe anesthetic management depends on full appreciation of the physiological, anatomic, and pharmacological characteristics of each group. Indeed infants are at much greater risk of anesthetic morbidity and mortality than are older children; risk is generally inversely proportional to age, neonates being at highest risk. In addition, pediatric patients are prone to illnesses that require unique surgical and anesthetic strategies **(Morgan,2014).**

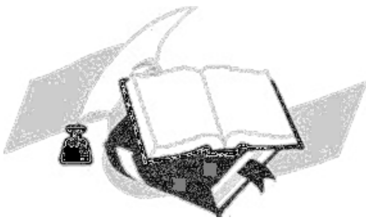
Magnetic resonance imaging **(MRI)** requires the patient to stay still up to an hour or more in a noisy and claustrophobic environment. Especially infants and children may not lie still for long enough without special care or drug-induced sleep. As a consequence, a variety of concepts are used by nurses, pediatricians, and anesthesiologists. Each concept has advantages and disadvantages **(Koroglu et al, 2005).**

A wide range of short-acting sedative-hypnotic and analgesic medications are available for pediatric procedural sedation. Many of these agents have multiple routes of administration. The choice of drug is based upon the type of procedure, the anticipated degree of pain, the targeted depth of sedation, and the patient's underlying medical condition. Procedures that are not painful but induce anxiety or require the child to remain still are usually performed with sedation alone **(Sahyoun et al, 2012).**

Sedation is commonly required for younger children or those with significant behavioral problems. Factors such as stress, pain, and illness play an important role in patient compliance, creating difficulties in establishing definitive age limits for identifying which children will require these procedures. Encouraging children to co-operate for an MRI examination and identifying those who cannot are arguably the most significant challenges in pediatric MRI **(Carter et al, 2010).**

Following adequate presedation assessment, monitoring and early warning of adverse events is a key to safety. In particular, continuous monitoring and response to the following are essential: depth of sedation, respiration, oxygen saturation, heart rate, pain, coping and distress. Where deep sedation is being used, ECG, end-tidal CO2 and blood pressure should also be assessed. All of the vital signs should have returned to normal levels with adequate pain relief and side-effect management prior to discharge **(Sury et al, 2010).**

Aim of work

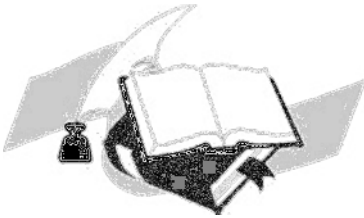


Aim of work

The purpose of this work is to focus on recent literature about sedation in pediatric MRI. Special features of the MRI working environment, recent studies about sedation, and success rates and risk profiles in this setting are presented.

Chapter (I) :

Pediatric Airway and Physiology



Chapter (1)
Pediatric Anatomy and Physiology

The provision of safe anesthesia for the pediatric patient requires a clear understanding of the anatomical and physiological differences between patients in different age epochs from newborn to adolescent. Consideration of these differences when providing anesthesia care to children specially premature infants, as well as to those with congenital malformations is critical to achieve high-quality and efficient care ***(Barash et al. , 2013)***.

Developmental anatomy and physiology of the infant

Prenatal growth is the most important phase in development, comprising organogenesis in the first 8 weeks (embryonic growth), followed by the functional development of organ systems and maturation of the fetus to full term (fetal growth). Rapid growth occurs particularly in the second trimester; a major increase in weight from subcutaneous tissue and muscle mass occurs in the third trimester ***(Cotè et al, 2009).***

A preterm infant is one born before 37 weeks gestation; a postmature infant is one born after 42 weeks gestation. Any infant born at less than 2500 g is considered a low-birth-weight infant. Plotting weight against gestational age allows classification into three general categories: small for gestational age, appropriate for gestational age, or large for gestational age. Infants who are small or large for gestational age often have developmental problems or difficulties associated with maternal disease ***(Miller et al. , 2013)***.

Pediatric age stages:

First of all, we should define pediatric age stages as shown below.

Table (1-1): *Pediatric age stages,*

Stage	Definitions
Preterm neonatal	born before the full gestational period
Term neonatal	Birth– 27 d
Infancy	28 d–12 mo
Toddler	13 mo–2 y
Early childhood	2–5 y
Middle childhood	6–11 y
Early adolescence	12–18 y
Late adolescence	19–21 y

(AAP, 2012)

Although the upper age limit used to define the pediatric population varies among experts, including adolescents up to the age of 21 is consistent with the definition found in several well-known sources ***(Rudolph et al., 2002).***

Through this essay we will be talking about sedation for pediatric patients with age group from 1 month to 12 years of age.