Dexmedetomidine as a Solitary Agent for Sedation of Neonates in the MRI Environment

Primary Author: Irim Salik MD
New York Medical College - Westchester Medical Center

Co-Authors: Ji Hong, MD;

Summary:
We present a series of six neonates who were successfully sedated with dexmedetomidine for MRI imaging studies. The anesthetic implications and benefits of this mode of sedation are reviewed.

Case presentations:
The infants were transported to the MRI suite where standard ASA MRI compatible monitoring (EKG, non-invasive blood pressure, pulse oximetry, temperature, end tidal CO2 via nasal cannula) were applied. If a working intravenous catheter was in place the neonates received a bolus of dexmedetomidine 1 mcg/kg of over ~ 10 min and were then placed on an infusion at 0.5 – 1.0 mcg/kg/hr. If the infants did not have vascular access, an IV was established while the child was sedated with inhalational anesthetic agents and then started on dexmedetomidine. In infants who were deemed not to be adequately sedated, a second bolus of up to 1 mcg/kg was administered. The average age and weight of our patients was 2.5 months old and 3.5 kg. Extreme premature infants < 32 wks or < 2 kg were excluded. The average scan duration was 35 min. Two patients of the six required a rescue bolus to achieve an adequate level of sedation.

Discussion:
Movement artifacts during an MRI study can result in poor imaging and can necessitate repeating sequences thus prolonging the study. Neonates often require general anesthesia with endotracheal intubation for appropriate imaging due to the remote nature of the patient in the MRI environment. General anesthesia can increase the risk of postoperative apnea and hypothermia due to vasodilation in this patient population. In addition, more recent concerns about risks posed to very young patients exposed to general anesthesia is currently a subject of intense research. Hypothermia in neonates has far reaching consequences including lethargy, bradycardia, apnea,
poor feeding, increased metabolism, electrolyte abnormalities such as hypoglycemia, hypoxia, metabolic acidosis, and an increase in pulmonary arterial pressure.

An effective and efficient way to forego intubation in this patient population while maintaining the neonate’s spontaneous ventilation is with dexmedetomidine.

Dexmedetomidine is a centrally acting alpha2-adrenoceptor agonist that has sedative and anesthetic properties, exerting its hypnotic action through activation of central pre- and postsynaptic α2-receptors in the locus ceruleus. Dexmedetomidine does not significantly alter a patient’s respiratory rate, oxygen saturation, arterial pH or arterial carbon dioxide tension. Preterm neonates have decreased plasma clearance and a longer elimination half-life than term neonates. Currently, it is Food and Drug Administration (FDA)-approved for sedation in intubated and mechanically ventilated adult patients in an intensive care unit setting and for procedural sedation of non-intubated adult patients, for a maximum of 24 hours. Although use in pediatric ICUs is widespread, limited pediatric pharmacokinetic data are available in neonates and infants. It is well recognized that newborns have immature metabolic capacity for many medications. Dexmedetomidine is extensively metabolized in the liver by direct glucuronidation by uridine 5′-diphosphate-glucuronosyltransferases and cytochrome P450 CYP2A6-mediated aliphatic hydroxylation. The impact of immature drug-metabolizing enzyme systems, altered physiology, and intraoperative procedures has not been well studied in neonates (age, 0–1 month). More specific to neonates, the immature drug-metabolizing enzyme systems during the newborn period may result in reduced dexmedetomidine clearance.

Amongst our neonates, there were slight decreases from baseline in blood pressure and heart rate, but parameters remained within normal limits for age. Although clinically significant episodes of bradycardia and sinus arrest have been reported with administration of the drug in patients with high vagal tone or with rapid intravenous or bolus administration, none of these effects were seen with controlled administration over 10 minutes. Dexmedetomidine was avoided in neonates with extreme prematurity, a difficulty airway, history of or current episodes of apnea, concomitant arrhythmias, and an inappropriate NPO status. Dexmedetomidine in this population has been shown to reduce rates of hypothermia, lead to more rapid emergence as compared to a general anesthetic, and reduce rates of traumatic intubation and post-operative stridor.

References: