

The effects of dexmedetomidine on cardiac electrophysiology in children.

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Introduction: Dexmedetomidine (DEX) is an α_2 -adrenergic agonist that is approved by the FDA for short-term (<24 hours) sedation in adults and is not approved for use in children. Nevertheless, the use of DEX for sedation and anesthesia in infants and children appears to be increasing. There are some concerns regarding the hemodynamic effects of the drug, including bradycardia, hypertension and hypotension. No data regarding the effects of DEX on the cardiac conduction system have been described. This study aimed to characterize the effects of DEX on cardiac conduction in pediatric patients.

Methods. Twelve children between the ages of 5 and 17 years undergoing electrophysiology (EP) study and ablation of supraventricular accessory pathways had hemodynamic and cardiac electrophysiologic variables measured before and during administration of DEX (1 mcg/kg IV over 10 minutes followed by a 10 minute continuous infusion of 0.7 mcg/kg/hr). All children were sedated with propofol and ketamine infusions, the doses of which were not changed between 15 minutes prior to and completion of the study.

Results. A significant increase in mean arterial pressure (MAP) was seen compared to baseline (66.2 ± 9.3 mmHg) at both 10 minutes (78.5 ± 8.9 mmHg, $p = 0.001$) and 20 minutes (71.3 ± 9.1 mmHg, $p = 0.038$) during administration of dexmedetomidine. This was accompanied by a significant decrease in heart rate at both time points (baseline: 94.3 ± 19.8 bpm; 10 minutes: 75.9 ± 17.1 bpm, $p < 0.001$; 20 minutes: 80.1 ± 16.8 bpm, $p < 0.001$). Respiratory rate did not change with administration of DEX, although a slight increase in $ETCO_2$ was observed. Sinus node function was significantly depressed following administration of DEX. Corrected sinus node recovery times increased significantly from baseline. AV nodal function also showed depression following administration of DEX. AV nodal block cycle lengths and PR intervals significantly lengthened. Neither atrial nor ventricular muscle refractoriness changed significantly, although the change in ventricular effective refractory period (VERP) did approach statistical significance. QTc, a measure of ventricular repolarization that is influenced by autonomic input, also significantly increased, but no patient had an abnormally prolonged (ie, QTc > 445 msec).

Discussion. DEX significantly depressed sinus and AV nodal function in pediatric patients. Heart rate decreased and blood pressure increased during administration of DEX. The use of DEX may not be desirable during EP study and may be associated with adverse effects in patients at risk for bradycardia or AV nodal block.

Refs:

1. Bloor BC et. al, Anesthesiology 1992
2. Ebert TJ et. al, Anesthesiology 2000