

Spinal anesthesia plus ketamine-midazolam sedation for pediatric orthopedic surgery in a developing country

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ABSTRACT

Introduction: Spinal anesthesia produces a profound and uniformly distributed sensory block with rapid onset and muscle relaxation, and results in complete control of cardiovascular and stress responses. Ketamine is an anesthetic agent that is widely used for pediatric sedations in settings where safety and efficacy of the agents are mandatory because of limited healthcare resources. The authors report on their experience in a refugee hospital located in Bol-ia (Saharawi, Algeria).

Methods: Spinal anesthesia was performed for orthopedic surgery procedures in children. Before the spinal puncture, the patients were sedated with intramuscular ketamine followed by intravenous ketamine and midazolam. Boluses of midazolam were also administered throughout the surgery to keep the patients sedated; spinal anesthesia was performed with levobupivacaine 0.25 mg/kg.

Results: There were no intraoperative adverse events; vital signs were within the normal pediatric ranges during the procedures and there was no need to switch to general anesthesia. In the postoperative period, no symptoms of dural puncture headache or postoperative delirium or nightmares were reported.

Conclusion: Based on the authors' experience, the combination of spinal anesthesia and sedation with midazolam and ketamine was found to be a safe approach for children undergoing orthopedic surgery in a low resources setting.

Keywords: *pediatric anesthesia, developing world, spinal anesthesia, ketamine, pediatric sedation.*

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INTRODUCTION

Spinal anesthesia was first introduced for use in children by Bier in 1898. In the last two decades the popularity of this technique in pediatric surgery has increased since it produces a uniformly distributed sensory block with rapid onset and good muscle relaxation, as well as resulting in

complete control of cardiovascular and stress responses. Spinal anesthesia has gained acceptance for children undergoing surgery in the lower part of the body.

Not only is it possible to avoid general anesthesia and its related risks, such as unpredictable difficult airway management, cardiovascular collapse and malignant hyperthermia, but it is especially important in low resource settings, where keeping spontaneous breathing and avoiding general anesthesia might reduce patient's morbidity and mortality rate (1-3).

Ketamine is an anesthetic agent widely

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used for pediatric sedations in many settings where its safety and efficacy has been extensively reviewed (4, 5).

For the above stated reasons the association of ketamine based sedation and spinal anesthesia can be an optimal choice in settings where efficacy and safety of the agents are mandatory because of limited healthcare resources (6). This work reports on the authors' experience in such a context.

METHODS

The treating team travelled to Bol-la hospital, located in the Saharawi refugee camp in the west of Algeria, for two humanitarian missions in November 2009 and 2010. Ethical approval was waived given the observational and retrospective design of the study. Eighteen children (mean age 6.2 ± 3.8 years) received orthopedic surgery procedures.

The interventions performed were 10 unilateral club-foot surgeries, 4 hardware removals, 3 cystic lesions and 1 soft tissue debridement and bone resection for osteomyelitis. It was decided to perform spinal anesthesia and a ketamine-midazolam based sedation for all procedures. The children fasted for 6 hours prior to surgery, but were allowed to take of clear fluids up to 2 hours before the procedure.

Before the spinal puncture, the patients were sedated with intramuscular ketamine (4 mg/kg) and, after obtaining a venous access, i.v. ketamine 1 mg/kg and midazolam 50-75 mcg/kg depending on the patient's age were given midazolam (50 mcg/kg i.v.) boluses were administered during the surgical procedure to maintain the sedation. No preventive hydration was administered before the spinal puncture; 40% oxygen was delivered through a Venturi face mask. Spinal anesthesia was performed using a sterile procedure at the Truffier's line level

(L4-L5 in most of the children and L3-L4 in older ones) using a 25 Gauge (14 patients) or a 27 Gauge (4 patients) Whitacre needle. The drug used was 0.5% levobupivacaine 0.25 mg/kg; this was loaded in a small syringe (1 ml), with 0.05-0.1 ml additional medication to compensate for the dead space of the spinal needle.

RESULTS

The mean surgical time was 70.5 ± 22.4 min.

There were no intraoperative adverse events; vital signs (non invasive arterial pressure, heart rate, oxygen saturation) were maintained within the normal pediatric ranges throughout the procedures and there was no need to switch to general anesthesia.

In particular, an oxygen saturation lower than 98% was never detected.

In the postoperative period, there were no reported symptoms of post dural puncture headache, postoperative delirium or nightmares. Five patients reported diplopia (the most persistent lasted 2 hours after the operating room discharge).

A remarkable hypersalivation was noticed in 4 children but it did not compromise airway patency.

DISCUSSION

Ketamine-midazolam sedation induces a profound sedation and amnesia with a short duration of action allowing a fast recovery.

It also induces functional dissociation between the limbic and cortical system often referred to as 'dissociative anesthesia'. Protective airway reflexes are maintained during sedation and the high therapeutic index of ketamine make this drug suitable

for pediatric use (5). Spinal anesthesia for pediatric surgery has been used extensively, where recent reviews and large cohort reports stated the safety of this technique in this population (1, 2).

Particular care should be used regarding the dose and the volume injected in children in order to avoid potentially lethal events, caused by an unwanted block of the higher methamers, such as respiratory distress, post anesthetic apnea, or the so called 'total spinal'.

Taking the necessary precautions, such as avoiding to lift the legs and knowledge regarding the baricity of the local anesthetic being used, are mandatory to prevent such complications. The risk of hypotension and hemodynamic collapse is very low compared to the adult population, even in fasted children (2).

Based on our experience, the combination

of spinal anesthesia and sedation with midazolam and ketamine was found to be a safe approach for children undergoing orthopedic surgery in a low resources setting.

REFERENCES

1. Puncuh F, Lampugnani E, Kokki H. Use of spinal anesthesia in paediatric patients; a single centre experience with 1132 cases. *Pediatric Anesthesia* 2004; 14: 564-7.
2. Polaner DM, Drescher J. Pediatric regional anesthesia: what is the current safety record? *Paediatric Anaesthesia* 2011; 21: 737-42.
3. Sleth JC, Coulon M, Fesseau R, Rami L. Locoregional anesthesia for pediatric surgery in remote rural settings: experience of an NGO in Bangladesh. *Med Trop (Mars)*. 2010; 70: 529-32.
4. Dahmani S, Michelet D, Abback PS, et al. Ketamine for perioperative pain management in children: a meta analysis of published studies. *Pediatric Anesthesia* 2011; 21: 636-52.
5. Miqdady MIS, Hayajneh WA, Abdelhadi R, Gilger MA. Ketamine and midazolam sedation for Pediatric gastrointestinal endoscopy in the Arab world. *World J Gastroenterol* 2011; 17: 3630-5.
6. Hodges SC, Walker IA, Bosenberg T. Paediatric anaesthesia in developing countries. *Anaesthesia* 2007; 62: 26-31.

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