

## **Short Communication**

# **Efficacy and safety of procedural sedation and analgesia by paediatric intensivist in paediatric oncology unit**

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### **Abstract**

Children with cancer especially acute leukaemia undergo multiple painful procedures like bone marrow biopsy (BM) and lumbar puncture (LP) for intrathecal chemotherapy during their first year of treatment. The purpose of this study is to report safety and efficacy of Procedural Sedation and Analgesia (PSA) by paediatric intensivist for oncology procedures in controlled setting in paediatric oncology unit. During 20 months, 124 children received PSA for 499 procedures. 324 LP alone, 175 BM alone and 40 combined LP and BM were done. The most common diagnosis was acute leukaemia and lymphoma. All procedures were in compliance with American Society of Anaesthesiology guidelines. A small-dose of ketamine and intermittent doses of propofol was administered intravenously until needed. No procedure was aborted due to sedation. All patients tolerated the procedure well without any major adverse events. There were few transient respiratory adverse events which resolved with minor interventions. PSA for children undergoing oncology procedures, can safely and effectively be provided by paediatric intensivist in controlled setting by using a standardized sedation protocol outside the operating room.

### **Introduction**

Children with cancer, especially acute leukaemia undergo multiple diagnostic and therapeutic procedures like lumbar puncture (LP) and bone marrow aspiration/biopsy (BM) during their first year of treatment. Although these invasive procedures are short in duration but are most stressful and traumatic for children and their families.<sup>1,2</sup> Adequate sedation and analgesia decreases anxiety, discomfort, pain in children and may increase the success rate of the procedures required. The American Academy of Paediatrics (AAP) and Joint Commission International Accreditation (JCIA) proposed the recommendations on the management of pain and anxiety related to procedures in children with cancer.<sup>3,4</sup> Many hospitals abroad have designed clinical policy and procedures of "Conscious/Moderate Sedation" for procedures in children. Recently, it is called "Procedural Sedation and Analgesia."<sup>5</sup> The objective of this study is to assess the efficacy and

safety of small-dose ketamine and propofol administered by paediatric intensivist for procedural sedation analgesia in children with cancer undergoing diagnostic and therapeutic procedures in controlled setting in paediatric oncology unit of a large tertiary care teaching hospital.

### **Methods**

A retrospective cohort study of children receiving PSA for paediatric oncology procedures in paediatric oncology unit during 20 months from January 2007 to August 2008 was reviewed. Informed consent for oncology procedure and PSA was obtained from parents of each patient. All oncology procedures (including lumbar puncture with intrathecal chemotherapy, and/ or bone marrow aspiration± biopsy) were done by paediatric oncology team. PSA was provided by paediatric intensivist and a nurse. We have a standardized protocol of PSA which was approved by chairs of department of paediatric and anaesthesiology as well as by credentialing committee of AKUH. Our PSA protocol is in accordance with guidelines as outlined by American Academy of Paediatrics (AAP) and American Society of Anaesthesiology (ASA). Intravenous access was obtained either through central indwelling catheter or through a catheter placed in a peripheral vein. All children were receiving isotonic intravenous fluid during the procedure. Cardiorespiratory monitoring including continuous electrocardiography, respiratory rate and pulse oximetry measurement was initiated before induction and continued till recovery. All children received oxygen by face mask throughout the procedure. The resuscitation cart was made available close to treatment room. A single low-dose ketamine (0.5mg/kg) was administered intravenously. Propofol was started at 1 mg/kg intravenously and then additional dose of 0.5mg/kg repeated until needed to keep patient comfortable and sleepy with minimal or no movement. Success of sedation was defined as successful completion of procedure. Adverse events were defined as apnoea, desaturation (SpO<sub>2</sub> <93%) or arrhythmias. Descriptive statistics were presented for patients demographic, procedure performed medication dose and adverse events. Ethical Committee of AKUH has approved this audit.

## Results

During 20 months, 124 children of ASA physical status I and II received PSA for 499 procedures; 324 LP alone, 175 BM alone and 40 combined LP and BM were done. The children ranged from 6 months to 14 years (median 4.2 year) and 62% were male. Most common diagnosis was leukaemia and lymphoma followed by aplastic anaemia or pancytopenia. The mean dose of propofol was 2.5 mg/kg for LP and 4.5 mg/kg for BM/BM and LP. No procedure was aborted due to failure of sedation. Adverse events were noted on 15 occasions (3%) which included 11 episodes (2.4%) of transient desaturation, which was improved by head re-positioning and increasing oxygen flow. Three episodes (0.6%) of apnoea which required bag-mask ventilation for less than a minute. No patient required endotracheal intubation. No cardiovascular complications were noted.

## Discussion

In 1990, the American Academy of Paediatrics (AAP) specifically addressed the importance of optimizing procedural sedation and pain control in children with cancer and published guidelines.<sup>6</sup> Since that time various sedative drugs have been studied in this patient population. Several reports have demonstrated the successful use of Propofol in children undergoing oncology procedures by both paediatric intensivist and anaesthesiologist outside the operating room in a controlled setting.<sup>7-11</sup> Propofol (2, 6 diisopropylphenol) is an ultra-short acting anaesthetic, easily-titrable, dose-dependant sedative effect, with smooth and quick recovery, and an anti-emetic.<sup>12</sup> Despite these advantages, propofol has cardiopulmonary depressant effects when used as a single agent.<sup>7,8</sup> Recent studies have shown that the addition of low-dose ketamine to propofol was thought to counteract the cardiorespiratory depression that occurs when propofol is used alone, whereas propofol blunts the psychotomimetic and nauseant effects of ketamine.<sup>13-16</sup> Ketamine provides an analgesic effect too. The potential advantage of combination of ketamine and propofol is to provide better sedation and analgesia with less toxicity than either drug alone. The emergence phenomenon or psychotomimetic effects of ketamine is observed predominantly in adults or when administered in large dose.<sup>17</sup> Aouad et al found that the combination of ketamine and propofol significantly reduced the need for supplemental doses of propofol and preserve haemodynamic stability for painful procedures in paediatric oncology patients.<sup>18</sup> This is the first report from Pakistan describing the safety and efficacy of Propofol sedation by paediatric intensivists used for paediatric oncologic procedures. We found that Propofol based sedation was safe and effective in our children with cancers for invasive

painful procedures. The most common PSA-related adverse events associated with ketamine-propofol were respiratory in nature. The frequency of these events appeared consistent with other published studies.<sup>10,19</sup> Majority (2.4%) of them had transient desaturation and resolved with opening of airway maneuvers and increasing oxygen flow. Few (0.6% of all cases) developed apnoea in beginning which required bag-mask ventilation for less than one minute. None of our patients required endotracheal intubation. All procedures were successfully completed.

## Conclusion

We conclude that the combination of low-dose ketamine and propofol administered by a qualified person seems highly effective and safe to facilitate the performance of painful procedures in children with cancer by using standardized protocol in a controlled setting outside the operating room. There were only a few transient respiratory adverse events which resolved with minor interventions.

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