

# Ketamine Anesthesia For Intrathecal Chemotherapy And Bone Marrow Aspiration In Pediatric Oncology Procedures

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## Abstract

Ketamine is a phencyclidine and cyclohexamine derivative. It is unique among the sedative analgesics in producing dissociative state between the thalamus and the limbic system which is characterized by four features: sedation, analgesia, amnesia and catalepsy. Ketamine does not lead to loss of protective reflexes (1). Ketamine together with atropine and benzodiazepines has been increasingly used in recent years as an effective form of deep sedation/anesthesia in children in various emergency departments namely dental, radiation therapy, radiology suite and oncologic units (2). Office-based anesthesia is usually the commonly used anesthetic scheme in oncology units. However, to our knowledge there is no established anesthetic protocol yet. Therefore, the present study was conducted in a pediatric oncology day care unit where children requiring intrathecal chemotherapy and bone marrow aspiration under ketamine anesthesia was studied (3). The aim of the study was to evaluate the effectiveness and safety of using ketamine as a sole anesthetic agent for pediatric oncology procedures.

## PATIENTS & METHODS

After having written informed consent, 200 pediatric patients of both sexes (136 males and 64 females) were studied. Age ranged between 18 months to 14 years and body weight between 9 to 46 kg. The exclusion criteria are shown in table 1.

Table 1 Exclusion criteria

- Age less than 6 months.
- History of airway instability, tracheal surgery or tracheal stenosis.
- Active pulmonary infection (including upper respiratory infection except asthma).
- Full meal in 3 hours preceding the procedure.
- Cardiovascular disease including congenital heart disease.
- Central nervous system masses, abnormalities or hydrocephalus.
- Poorly controlled seizure disorders.

- Raised intracranial or intraocular pressure.

The patients were suffering from acute lymphoblastic leukemia and non Hodgkin's lymphoma without cerebro spinal fluid (C.S.F.) involvement. They underwent intrathecal chemotherapy and bone marrow aspiration for diagnostic as well as therapeutic purpose. All patients were fasting 6 hours for solids and 2 hours for clear fluids.

They had an i.v line inserted (22G/24G cannula) in the holding area. In the procedure Room, monitoring included pulse oximetry, non-invasive blood pressure and ECG. All patients received intravenous ketamine 2mg/kg b.w, with an additional dose of 0.5mg/kg if needed. Then they were turned to left lateral position. The procedure started within 2-3 minutes. Intrathecal chemotherapy alone or combined with bone marrow aspiration was performed in the same position and the same session. At the end of the procedure, patients were admitted into the recovery room. Later they were discharged following standard recovery room discharge criteria. The total numbers of procedures performed were 665. The degree of sedation and analgesia was assessed by response to painful stimuli using needle prick. Adverse

events were recorded in the procedure room as well as in the recovery room.

## RESULTS

All procedures were successfully completed and there were no failure in sedation. There was no incident of prolonged sedation, desaturation or cardiopulmonary resuscitation. The procedure performed included intrathecal chemotherapy alone or in combination with bone marrow aspiration for diagnostic and therapeutic purposes. There were 200 patients who underwent these interventional procedures multiple times. The total number of procedures was 665. No antisialogogue or sedation was given before or at induction.

Adequate anesthetic conditions achieved within 2-3 minutes. Additional doses of ketamine (0.5mg/kg) were given if the patient showed withdrawal movement on painful stimuli. The duration of the procedure ranged between 10-15 minutes (average 11.5) defined as time from initiation of the interventional procedure to termination of the procedure (end of painful stimuli). The duration of the sedation ranged between 25-35 min (average 27.8 min), defined as time from administration of ketamine to termination of surgical stimulation.

Behavior or emergence agitation was seen in 4 patients (2%), excess salivation in 2 patients (1%), vomiting in 2 patients (1%), and none had laryngospasm, bronchospasm, transient rash or nystagmus. None of the patients showed vital sign alterations requiring intervention. None of the patients required any repositioning (head extension or chin lift) to improve airway patency. The patient's of age 10 and above received diazepam 1-2mg intravenous immediately after the procedure. No patient required a hospital admission for any complication of ketamine.

## DISCUSSION

The day care center permits children to undergo treatment for many surgical problems without the necessity of any overnight stay in the hospital. This spares the trauma of hospitalization and permits convalescence at home. An educational visit prior to the scheduled procedure gives the child and the parent a chance to become familiar with the facility and to learn what to expect on the procedure day. While in the hospital, parents are allowed to be with their child as long as possible. One parent is almost always allowed to be present in the procedure room while the child is going to sleep. Children with long term serious illness or special needs whose parents are carrying out day to day care

at home should be treated on a day care basis whenever appropriate.

New advances in cancer chemotherapy and adjunctive therapy has made survival of cancer common in children. New therapies enhances quality of life and management of cancer. Dramatic advances in procedural sedation techniques has led to safer and more effective sedation and analgesia in children. In the present study, ketamine has proved to be an excellent choice since 97% of the patients are managed as day care. Intravenous ketamine was tolerated well in our series since the procedures were very short and required only 10-15 minutes. Only 2% of our patients experienced hyper salivation with no laryngospasm or bronchospasm most probably because all our patients receiving ketamine were turned laterally for the procedure so there was no triggering agent eg. saliva or posterior part of tongue to cause obstruction leading to laryngospasm or bronchospasm. No desaturation was observed since patients were given supplemental O<sub>2</sub> (4 L/min) by ordinary mask. Controversies exists regarding giving sedatives for emergence agitation or unusual behavior (<sup>4,5</sup>). In the current study no sedative was given as premedication. Ketamine has been given as a sole agent and proved as effective as in combination with other drugs in other studies (<sup>6,7</sup>). The so called emergence agitation or unusual behavior with ketamine occurs more often in older children (more than 10 yrs old) and adults rather than in young children (<sup>8,9</sup>). The behavioral side effects of ketamine may be due to its action on nicotinic receptor. In recent review of literature this phenomenon was found to be minimal in young children (<sup>10, 11,12</sup>). Among 40 patients above 10 years, only 4 patients required diazepam to reduce their unusual behavior, the rest of the children did not experience any unusual agitation. The most probable reason being that all our patients above 10 years were regularly counseled about the procedures and all these patients were kept in a quiet room with one of the parents or guardian accompanying them apart from regular monitoring of that patient by a nurse with minimal stimulation. Vomiting was also seen in 2% of our patients and settled without any medication.

## CONCLUSION

In conclusion, 2mg/kg intravenous ketamine was found effective and suitable dose in children requiring deep sedation for painful procedures like bone marrow aspiration as well as intrathecal chemotherapy with minimal side effects. All patients were discharged according to the

discharge criteria with no in-hospital admission. We believe that pediatric anesthesia and sedation using ketamine can be performed for painful procedures in a designated setting outside the operating room by experienced anesthetists following the standard guidelines for deep sedation which will allow painful procedures to be performed with less anxiety and discomfort.

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