

# Intravenous Infusion of Ketamine in Children Undergoing Strabismus Surgery - A Prospective Study

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## Abstract

**Introduction:** Strabismus surgery may be associated with significant post-operative pain. Conjunctiva is the main source of this pain.

**Aim:** The aim of the study was to study the effects of intravenous infusion of ketamine in children undergoing strabismus surgery.

**Materials and Methods:** A total of 40 patients were enrolled in the study. 20 patients were infused 1–3 mg/kg/h ketamine, (a bolus of 0.1–0.2 mg/kg and a maintenance infusion of 0.0025–0.02 mg/kg/min) after giving fentanyl 1 mic/kg and atracurium 0.5 mg/kg patient were intubated (ketamine group) and for other 20 patients after giving fentanyl 1 mic/kg and atracurium 0.5 mg/kg patient were intubated and supplemented with sevoflurane 2% (control group).

**Results:** The consumption of anesthetics and antiemetics, the incidence of oculocardiac reflex (OCR) in these patients was significantly low. The recovery time, Ramsay sedation score, and face pain scale were significantly lower in ketamine anesthesia.

**Conclusion:** The ketamine infusion is more advantageous and safer in pediatrics for strabismus surgery with an insignificant incidence of intraoperative OCR and post-operative pain, post-operative nausea and vomiting.

**Key words:** Ketamine, Pediatrics, Strabismus surgery

## INTRODUCTION

Strabismus surgery is associated with significant oculocardiac reflex (OCR) (14–90%), intractable post-operative pain and post-operative nausea and vomiting (PONV) (20–30%). As these complications cause distress for children and anxiety among the parents, it is important to provide safe and effective analgesia, antiemetics, and anesthesia.<sup>[1,2]</sup> For the effective management of these cases with less incidence of undesired events, there were so many clinical studies have been done like a good premedication with various drug combinations and pre-operative counseling for the

parents and the children.<sup>[3,4]</sup> In spite of all these preparatory measures intraoperative and post-operative unwanted physiological sequel is likely to occur but with less intensity.

OCR occurs through the trigeminal-vagal reflex arc and can be triggered by mechanical stimulation such as pressure on the eye, traction, on extraocular muscles. OCR may be the life-threatening event if not monitored vigilantly, immediate remedial measures such as withholding the surgical procedure and administering necessary pharmacological agents swiftly will prevent catastrophe. A variety of methods such as normoxia, normocapnia, premedication using atropine or glycopyrrolate, and adequate anesthetic depth have been to prevent OCR. However, none of them has been found satisfactory.<sup>[5]</sup>

Ketamine anesthesia is associated with a relatively rapid onset of action and fast recovery and will minimize the hemodynamic changes induced by OCR during strabismus surgery in pediatric patients.<sup>[6]</sup>

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**Aim**

The aim of the study was to study the effects of intravenous infusion of ketamine in children undergoing strabismus surgery.

**MATERIALS AND METHODS**

This observational study was undertaken in 40 patients at the Department of Anaesthesiology, Chengalpattu Medical College, informed consent obtained with all 40 patients belonging to age group 4–10 years of age from both gender and ASA status 1 and 2 are included. Patient excluded include those with ASA physical status >2; those with congenital anomalies, drug allergy, and coagulopathy; or those whose families did not approve inclusion. After securing an intravenous line and Anaesthesia Workstation check, multiparameter monitor connected to read pulse, NIBP, SpO<sub>2</sub>, and emergency drugs were kept ready, patient premedicated with injection: Glycopyrrolate 20 µg/kg injection, Midazolam 0.05 mg/kg, and Ondansetron 75 µg/kg.

After preoxygenation, with oxygen 6 L/min, fentanyl 1 µg/kg and ketamine 1 mg/kg, and atracurium 0.5 mg/kg and patient were intubated. The patient was infused with ketamine 1–3 mg/kg/h. During surgery, if any traction over extraocular muscles and if associated with a decrease in heart rate by 20 beats per minute surgeon was asked to release extraocular muscle and to locally infiltrate the surgical site with local anesthesia lignocaine 2%. If bradycardia do not resolve, atropine 10 µg/kg was given. Neuromuscular blockade was reversed. The pre-operative and post-operative status of the children were observed and evaluated through numeric rank score for PONV, FPS pain scale and Ramsay Sedation Score for post-operative pain and sedation status and for agitation using an emergency agitation score.

**Statistical Methods**

The results of the study were evaluated using statistical analysis package. Among the patients, age, weight, recovery time, heart rate, mean arterial pressure, the consumption of anesthetics and antiemetics, and anesthesia time were compared using independent sample *t*-test. The incidence of OCR, FPS, RSS the incidence of PONV was compared using Kruskal–Wallis test. Data were presented as the mean, standard deviation, or median values.

**RESULTS**

The mental orientation, agitation score was compared and PONV and hemodynamic status and recovery time in Group K were significantly shorter ( $P = 0.008$ ) [Figure 1]. The consumption of ketamine was  $53.3 \pm 19.3$  mg. The consumption of anesthetic and antiemetic drugs was significantly lower, respectively. Agitation score in ketamine infusion was significantly lower. The time of intraoperative OCR ( $P = 0.02$ ) and FPS ( $P = 0.001$ ) during awakening is significantly lower. The heart rate and blood pressure significantly higher ( $P < 0.05$ ).

**DISCUSSION**

The main findings of this paper indicate that ketamine anesthesia is more effective in decreasing the consumption of anesthetics, antiemetics, the incidence of OCR, FPS, agitation score, and shortening the recovery time of children undergoing strabismus surgery. Furthermore, ketamine provides a higher grade of sedation. Strabismus surgery is performed to restore single binocular vision and for cosmetic reasons (extensively in childhood). There are some undesired effects of surgery such as post-operative pain, anxiety, agitation, PONV, and OCR. These effects are frequent complications secondary to anesthesia and

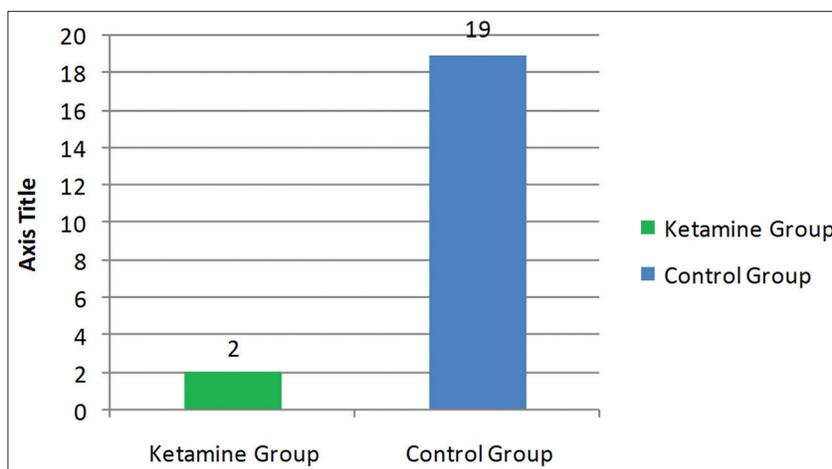


Figure 1: Post-operative nausea and vomiting

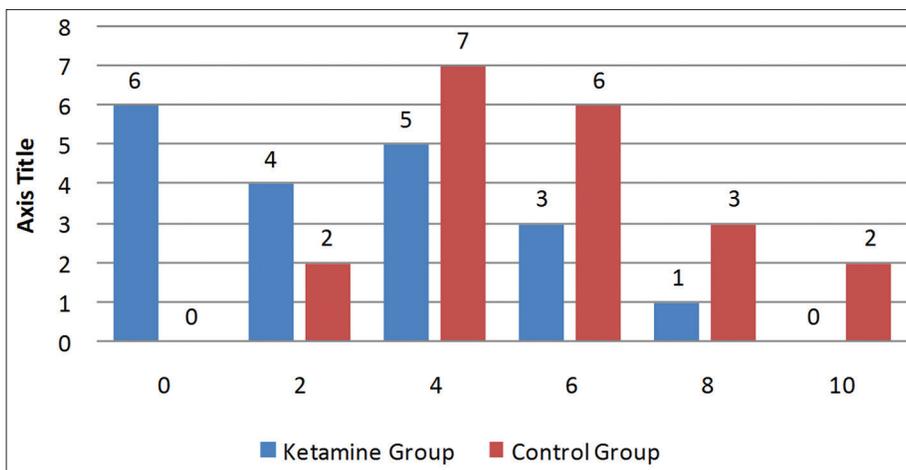


Figure 2: Facial pain score

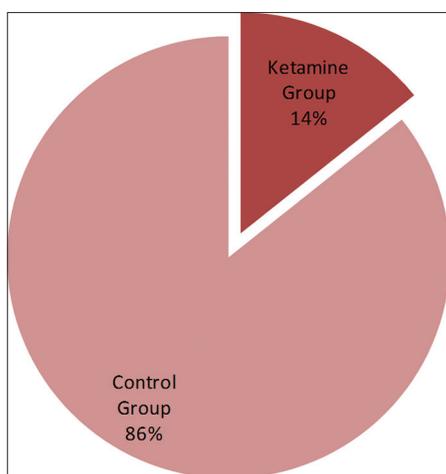
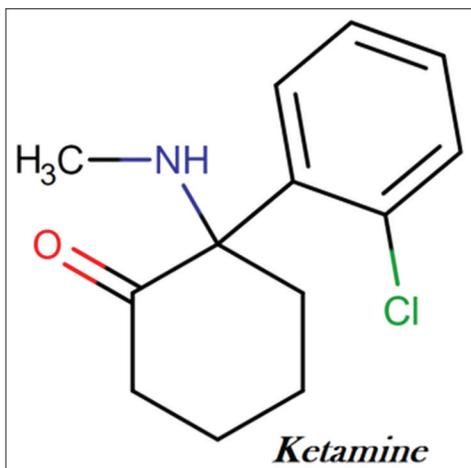


Figure 3: Oculocardiac reflex

the leading cause of distress in the patient recovering from general anesthesia.<sup>[7,8]</sup>



Ketamine (2-(2-chlorophenyl)-2-(methylamino)-cyclohexanone) is an aryl cycloalkyl amine structurally related to phencyclidine.<sup>[9]</sup>

Ketamine has intrinsic analgesic and amnestic properties and protects airway reflexes. Ketamine is N-methyl-D-aspartate receptor antagonist. It is an antihyperalgesic and anti-pro-inflammatory drug. This drug provides safe and effective sedation for short, painful procedures performed. Excessive pain can significantly lengthen the post-operative stay, induce PONV [Figure 2].<sup>[10]</sup>

It is also cost-effective. Thorp *et al.*<sup>[11]</sup> reported that intravenous doses of ketamine associated vomiting are not related to either initial loading dose or total dose but the modest increase in receiving high cumulative doses (>7 mg/kg), heart rate and mean arterial blood pressure were within an acceptable range consequently no patient needed treatment. Hence ketamine anesthesia which can eliminate the discomfort of children by increasing sedation, decreasing the pain and thus agitation. Ketamine seems to protect against the parasympathetic activation induced by OCR. Oh *et al.*<sup>[12]</sup> reported that 1–2 mg/kg of ketamine for anesthetic induction results in lower incidence of OCR [Figure 3]. Demographic status of the children has no role to play in all these events.

## CONCLUSION

Our data suggest ketamine infusion as anesthetic with a single dose of fentanyl as analgesic without volatiles may form a better combination in children undergoing strabismus surgery to provide excellent post-operative pain relief and negligible incidence of PONV and OCR irrespective of the different demographic status of the children.

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