

# Oculocardiac Reflex during Strabismus Surgery in Pediatric Patients: A Randomized Case-Control Study

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## Abstract

**Introduction:** Maintaining the adequate depth of anesthesia and use of anti-cholinergics is the mainstay to reduce or eliminate the risk of oculocardiac reflex (OCR). If stimulus for OCR is reduced or completely stopped OCR can be reduced or eliminated.

**Aims and Objective:** (1) To evaluate the overall incidence the of OCR, (2) to evaluate the incidence of OCR in patients under general anesthesia with peribulbar block, (3) to evaluate the effect of peribulbar block with general anesthesia on post-operative nausea and vomiting (PONV).

**Materials and Methods:** It is a prospective, randomized, case-control study. Total 32 cases are evaluated. Group GA: Total 15 cases received general anesthesia only, i.e. without peribulbar block. Group GB: Total 17 cases received general anesthesia with peribulbar block using injection lignocaine 2% in the dose of 3 mg/kg body weight.

**Observations:** Among the 15 patients from Group GA, two had ventricular ectopic beats and one patient had bradycardia during the handling of rectus muscles. After surgical stimulus is withdrawn cardiac activity is regained. Total 20% of Group GA cases had OCR. However, PONV was observed in four patients in this group. None of 17 patients from Group GB suffered from OCR, and three patients had PONV.

**Conclusion:** Use of peribulbar block with injection lignocaine along with general anesthesia can reduces or eliminates the incidence of OCR. Moreover, use of injection ketamine may be an additional factor for not to have OCR. There is no effect of peribulbar block on the incidence of PONV.

**Key words:** Anesthesia general, Arrhythmia, Local anesthesia, Pediatric, Reflex oculocardiac, Strabismus

## INTRODUCTION

Strabismus is one of the common health problems among the children.<sup>1</sup> It is being taken care of by the health workers under the school health program. The cases are identified and further followed up to ensure the proper surgical treatment. For these surgeries, anesthesia services are rendered by the anesthesia department. The cases, in this

study, are done at Civil Hospital, Nandurbar and at Shree Bhausaheb Hire Govt. Medical College.

Patients of strabismus surgery are high risk for the oculocardiac reflex (OCR). Exaggerated OCR may be life threatening. Maintenance of the adequate depth of anesthesia and use of anti-cholinergics is the mainstay to reduce this risk. The routine prophylaxis could not eliminate the risk of OCR.<sup>2</sup>

The incidence of the OCR during strabismus varies with the premedication and use of an anesthetic agent. There are studies which conclude that general anesthesia is with a higher incidence of OCR as compared with regional anesthesia.<sup>3</sup> Strabismus surgery in pediatric patient calls for the general anesthesia and consequently aggravates the

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risk of OCR. There are various prophylactic measures to minimize the OCR. As no one measure is reliable, there is continuous effort to search for the better option to decrease this risk.

In a recent study by Karaman *et al.*, it is again confirmed that depth of anesthesia reduces the incidence of OCR. But, even with the advance mode of monitoring like bispectral index (BIS) strabismus surgery is not free of OCR.<sup>4</sup> The reflex arc is trigeminovagal. The afferents are from the eyeball and the extra ocular tissue including the periosteum. If the surgical stimulus is reduced or completely stopped, OCR can be reduced significantly or eliminated. The surgical stimulus can be minimized or stopped with the help of peribulbar block. With this background, the peribulbar block was used to evaluate its effect on OCR.

It is also correlated that manipulation of extraocular muscles may aggravate post-operative nausea and vomiting (PONV).<sup>5,6</sup> Along with OCR this finding is also evaluated.

#### Aims and Objective

1. To evaluate the overall incidence of OCR
2. To evaluate the incidence of OCR in patients under general anesthesia with peribulbar block
3. To evaluate the effect of peribulbar block with general anesthesia on PONV.

#### MATERIALS AND METHODS

This is the randomized case-control study. The cases were divided into two groups.

Group GA: Total 15 cases who received general anesthesia only, i.e., without peribulbar block.

Group GB: Total 17 cases who received general anesthesia with peribulbar block using injection lignocaine 2% in the dose of 3 mg/kg body weight.

All cases had a routine pre-operative check-up, starved for 6 h and hydration was maintained with the intravenous (IV) fluid ringer lactate. Written informed consent taken. All cases premedicated using injection glycopyrrolate 0.01 mg/kg of body weight IV, injection ondansetron 0.1 mg/kg IV, injection midazolam 0.05 mg/kg IV, and injection pentazocine 0.3 mg/kg IV.

After adequate pre-oxygenation, induction accomplished with injection propofol 2 mg/kg IV and injection ketamine 0.5 mg/kg IV. Endotracheal intubation was facilitated by injection succinylcholine 1.5 mg/kg IV. General anesthesia was maintained with a combination of oxygen, nitrous oxide, and 0.7-1.0% of halothane.

Muscle relaxation is achieved with non-depolarizing muscle relaxant injection vecuronium 0.08 mg/kg IV. It was reversed with injection glycopyrrolate 0.01 mg/kg body weight and injection neostigmine 0.05 mg/kg body weight IV.

In Group GB - After induction of anesthesia peribulbar block was given with injection lignocaine 2%, 3 mg/kg body weight.

Intra operative continuous monitoring with electrocardiography monitor and pulse oximeter was done, and adequate hydration was taken care with IV fluid ringer lactate until the oral intake was allowed.

In both the group adequate depth of anesthesia was maintained. The stable vital parameters, i.e., no tachycardia or rise in blood pressure and clear surgical field without excessive oozing or bleeding was considered as the adequate depth of anesthesia.

All the patients were observed for PONV. Oral intake is allowed after 3-4 h.

#### OBSERVATIONS

Demographic comparison is shown in (Table 1). Among 15 patients from Group GA, two had ventricular ectopic beats and one patient had bradycardia during the handling of rectus muscles. In all the three cases, the surgical stimulus was stopped and observed for any further cardiac irregularity. After surgical stimulus is withdrawn cardiac activity is regained to a normal pattern. Rest of the intra operative period was uneventful for these patients and no other patients in this group had shown any cardiac irregularity. Total 20% of Group GA cases had OCR (Table 2).

However, PONV was observed in four patients in Group GA (Table 3). These patients responded to the adequate analgesia with paracetamol suppository 25 mg/kg of bodyweight and injection ondansetron 0.1 mg/kg.

None of 17 patients from Group GB suffered with OCR. Three patients had PONV. These patients also responded to the adequate analgesia with paracetamol suppository and injection ondansetron.

PONV was present among 23.5% of participants of Group A as compared to 17.6% among the Group B participants. The association between type of anesthesia and PONV is considered to be not statistically significant (Fisher's exact test: The two-tailed  $P = 0.6783$ ).

**Table 1: Age group sex and weight wise distribution of the study participants**

Group	Age group Mean±SD	Sex (%)		Weight Mean±SD
		Male	Female	
Group GA (general anesthesia only)	10.46±2.89 years (range 7-15 years)	11 (63.6)	04 (36.4)	25.3±9.8 kg (14-45 kg)
Group GA (general anesthesia with peribulbar block)	9.8±2.76 years (range 7-15 years)	09 (53)	08 (47)	22.4±9.4 kg (11-45 kg)

SD: Standard deviation

**Table 2: Comparison of the presence of OCR among the study groups**

Group	OCR (%)		Total
	Present	Absent	
Group GA (general anesthesia only)	03 (20.0)	12 (80.0)	15
Group GA (general anesthesia with peribulbar block)	00 (0.0)	17 (100.0)	17
Total	03 (9.4)	25 (90.6)	32

OCR: Oculocardiac reflex

**Table 3: Comparison of the PONV among the study groups**

Group	PONV (%)		Total
	Present	Absent	
Group GA (general anesthesia only)	04 (23.5)	11 (76.5)	15
Group GA (general anesthesia with peribulbar block)	03 (17.6)	14 (82.4)	17
Total	07 (21.9)	25 (78.1)	32

P&gt;0.05 not significant. PONV: Post-operative nausea vomiting

## DISCUSSION

The OCR was first described by Aschner and Dagnini in 1908. Traction on the extraocular muscles or pressure on the globe causes bradycardia, atrioventricular block, ventricular ectopy, or asystole. In particular, it is seen with traction on the medial rectus muscle, but it can occur with stimulation of any of the orbital content including the periosteum.<sup>7</sup>

The reflex arc is trigeminovagal. The afferent limb is from orbital contents to ciliary ganglion to ophthalmic division of the trigeminal nerve which relays to the sensory nucleus of the trigeminal nerve near the fourth ventricle. The efferent limb is via the vagus nerve to the heart.<sup>8</sup>

### Definition

The OCR is defined as a 20% decrease in heart rate (HR) from baseline, dysrhythmias, or sinoatrial arrest associated with ocular muscle traction or pressure on the globe.

Many studies have defined this reflex to include a 10-30% decrease in HR from baseline.<sup>9</sup>

OCR is of high concern to the anesthesiologist during the management of squint surgery. Various anesthesia regimes and BIS monitors are used to minimize or prevent the OCR. However, no single regime is surely effective.<sup>10</sup> Use of anti-cholinergics is not adequate to prevent the OCR.<sup>11,12</sup> There are chances of ventricular arrhythmia.<sup>9</sup>

It remains controversial whether the anesthetic depth, as assessed by BIS monitoring influences the OCR during squint surgery. BIS value of 40-60 is of adequate depth of anesthesia to minimize the incidence of OCR. But, monitoring with BIS does not ensure the prevention of OCR.<sup>13</sup>

Use of injection ketamine reduces the incidence of OCR.<sup>3,14,15</sup> However, it does not eliminate it. Sevoflurane is the agent of choice among the inhalational agents for maintenance of anesthesia. The BIS monitoring and use of sevoflurane decreased the incidence of OCR but does not assure the prevention of OCR.<sup>16,17</sup> To assess the depth of anesthesia BIS monitoring is desirable. Yet, its availability in every set up of developing country like India is not possible. Grover *et al.* claimed its reduced incidence is because of peribulbar block as against of conventional general anesthesia. The ocular cardiac reflex is observed because of stimulus in the afferent limb of which the origin is in the eyeball and peribulbar tissue. If we prevent this stimulus with adequate use of local anesthetic like injection lignocaine along with the adequate depth of anesthesia significant reduction or elimination of OCR is possible. This will ensure the high safety level for OCR.<sup>18</sup>

Gupta *et al.* also found that the incidence and severity of OCR intra operatively was significantly reduced in children who received a peribulbar block. The incidence of PONV was significantly reduced in patients receiving either peribulbar block or topical local anesthesia combined with general anesthesia, compared to general anesthesia alone.<sup>19</sup> However, our study revealed no significant difference in both groups.

Adequate blocked of stimulus in an afferent limb by local anesthetics along with anti-cholinergics will help in preventing OCR.

In Group GA, out of 15 patients, 3 had OCR which amounts to 20% and other Group GB is not with any case of OCR. In this group, in addition to peribulbar block injection ketamine is also used at the time of induction of general anesthesia. To evaluate the significance of PONV, the data were analyzed by unpaired *t*-test. It is not found statistically significant. It is said that patients with OCR do show more incidence of PONV, but we do not find such association.

## CONCLUSION

Use of peribulbar block with injection lignocaine along with general anesthesia can reduce or eliminate the incidence of OCR. Moreover, use of injection ketamine may be an additional factor for not to have OCR. There is no effect of peribulbar block on the incidence of PONV.

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