

## ORIGINAL ARTICLE

## EFFICACY OF SUB-TENON'S BLOCK IN PAEDIATRIC STRABISMUS SURGERY IN TERMS OF REDUCTION IN OCULOCARDIAC REFLEX

Noor ul Hussain, Muhammad Naeem Khan

Pediatric Ophthalmology, MTI, Hayatabad Medical Complex, Peshawar-Pakistan

**Background:** Strabismus is a common disease entity in paediatric age group usually requiring surgical intervention under general anaesthesia and Oculocardiac reflex is the most dangerous complications intraoperatively. Various anaesthetic options have been evaluated to mitigate this complication. The objective of this study was to assess the efficacy of sub-tenon's block in paediatric strabismus surgery in terms of reduction in oculocardiac reflex. **Methods:** This prospective Randomized control trial was conducted at Department of ophthalmology, MTI, Hayatabad Medical complex, Peshawar over a period of six months from 1<sup>st</sup> July to 31<sup>st</sup> December 2021. A total of 124, were equally divided in sub-tenon's group (Group A) and placebo group (Group B). Intraoperatively, patients were assessed for Bradycardia and development of OCR. Data including demographics, intraoperative BP, HR and OCR development were noted and analysed with SPSS version 22. **Results:** The total number of patients were 124, 62 in each group with a mean age of  $9.45 \pm 1.61$ . Sixty-six (53.22%) patients were males and 58 (46.87%) patients were females. At 10-, 20- and 30-minutes interval, the SBP and DBP has no significant difference. At 10, 20, 30 minutes interval, the HR differed significantly ( $79.33 \pm 7.36$  vs  $66.65 \pm 6.83$  ( $p < 0.05$ ),  $79.78 \pm 7.63$  vs  $66.57 \pm 7.06$  ( $p < 0.05$ ),  $79.80 \pm 7.78$  vs  $66.52 \pm 7.01$  ( $p < 0.05$ ), respectively. Intraoperative OCR was recorded in 13 (21%) patients in sub-tenon's (Group A) versus 56 (90.30%) patients in placebo (Group B) with statistically significant difference between the two ( $p < 0.05$ ). **Conclusion:** Sub-tenon's injection of bupivacaine reduces the incidence of Bradycardia and OCR in squint surgery patients after general anaesthesia induction and usage is recommended in routine.

**Keywords:** Strabismus; Sub-Tenon's block; Oculocardiac reflex

**Citation:** Hussain N, Khan MN. Efficacy of Sub-Tenon's block in Paediatric strabismus surgery in terms of reduction in oculocardiac reflex. J Ayub Med Coll Abbottabad 2023;35(1):3-6.

**DOI:** 10.55519/JAMC-01-11512

## INTRODUCTION

Strabismus is known as the abnormal alignment of the eyes and is a common disease entity in paediatric age group varying from 3-5%.<sup>1-3</sup> Strabismus surgery is a routine procedure performed in paediatric ophthalmology.<sup>1,2</sup> Most of these cases are performed under general anaesthesia.<sup>4-6</sup>

One of the most common (32-90%) and dangerous complications experienced during strabismus surgery is the oculocardiac reflex, which is defined as the decrease in heart rate by more than 20% of the baseline, due to compression of the globe.<sup>7,8</sup> The oculocardiac reflex results due to traction on the extra-ocular muscles which stimulates the vagal (efferent) Center through the branches of the trigeminal (afferent) nerve, resulting in Bradycardia.<sup>9-12</sup> The oculocardiac reflex has always remained a main concern for paediatric ophthalmologist and anesthesiologist over the years. Various treatment modalities including different anaesthetic agents, intravenous injection of paracetamol, paracetamol suppositories, and topical anaesthetic agent has been tried to prevent the occurrence of oculocardiac reflex with variable results.<sup>2,4,7,13,14</sup> Some reported that depth of anaesthesia has also an association with OCR.<sup>15</sup>

One of the options is to give sub-tenon's injection of bupivacaine after the induction of general anaesthesia to prevent the occurrence of oculocardiac reflex.<sup>4,16,17</sup> Talebnejad *et al* reported 32% incidence of oculocardiac reflex in sub-tenon's group versus 100% in control group who received no injection ( $p=0.002$ ) which is statistically significant reduction.<sup>16</sup> Similarly, Bakr *et al.* reported incidence of oculocardiac reflex in 18% of patients versus 38% in those who received placebo (0.9% normal saline) injections ( $p=0.003$ ) which is statistically significant.<sup>18</sup> Though no local study is found available online on this topic to the best of our knowledge. The rationale of the study is to generate data of our own population as no local study is available on this topic and secondly to answer the question that whether the usage of sub-tenon's bupivacaine injection can help in the prevention of deadly complication of oculocardiac reflex. The results of this study will help us in improvising the intraoperative management of strabismus patients in paediatric age group.

## MATERIAL AND METHODS

This Prospective, double blinded, randomized controlled trial was performed at the Department of

Ophthalmology, MTI, Hayatabad Medical complex, Peshawar, over a period of six months, i.e., from 1<sup>st</sup> July to 31<sup>st</sup> December 2021. The total number of patients were 62 in each group using 18% proportion of oculocardiac reflex in sub-tenon's group versus 38% proportion of oculocardiac reflex in placebo (0.9% normal saline injection) group, with 95% confidence interval and 80% power of the test under WHO sample size calculations.<sup>18</sup> On-probability consecutive sampling technique was used. Patients of age 4–18 years, of either gender, with Unilateral or bilateral strabismus with ASA status I or II were included in the study. Patient with an ocular pathology other than strabismus, known drug allergy to bupivacaine, those with significant cardiac, respiratory, renal, hepatic, or neurological disorders, patient requiring redo surgery, patient requiring surgery of more than two muscles and patient with paralytic strabismus were excluded from the study as all the above conditions were confounders and if included would have introduced Bias in the results. Approval from the hospital ethical and research committee was obtained and the purpose, risks and benefits of the study were explained to all the included patients. They were assured that the study is purely for research and data publication purposes and a written informed consent was taken from all the participating patients. Diagnosis of strabismus was made on the basis of detailed history and thorough ophthalmic examination including visual acuity, slit lamp examination, refraction and dilated fundus examination. All the pre-op workup was done and after optimization of the patients they were put on the next OT list for surgery. The patients were randomly allocated in two groups by lottery method. One group received Sub-Tenon's injection after induction of general anaesthesia and were labelled as 'A' group, while the second one received placebo (0.9% normal saline injection) and were labelled as 'B' group in a double blinded manner such that the anaesthetist, surgeon and nurse were unaware of the nature of the injected solution. Data was collected using a special data collection questionnaire including the name, age, gender, type of solution injected, pre-operative BHR, SBP and DBP and post-operative BHR, SBP and DBP at 10, 20, 30 minutes and presence or absence of oculocardiac reflex during the procedure was noted.

**RESULTS**

The total number of patients were 124, 62 in each group (Group A & Group B). The mean age was 9.45±1.61 in both groups and 9.43±1.59, 9.46±1.65,

for Group A and Group B, respectively. The gender distribution is shown in figure-1.

The pre-operative variables, including ASA status, heart rate and systolic and diastolic blood pressure are represented in table-1.

The post-operative patient variables including basal heart rate, systolic and diastolic blood pressure at 10, 20 and 30 minutes are represented in table-2.

The occurrence of OCR was in 13(21%) patients in Group A versus 56(90.30%) in Group B with a *p*-value of <0.05, showing significant difference between the two, as represented in figure-2.

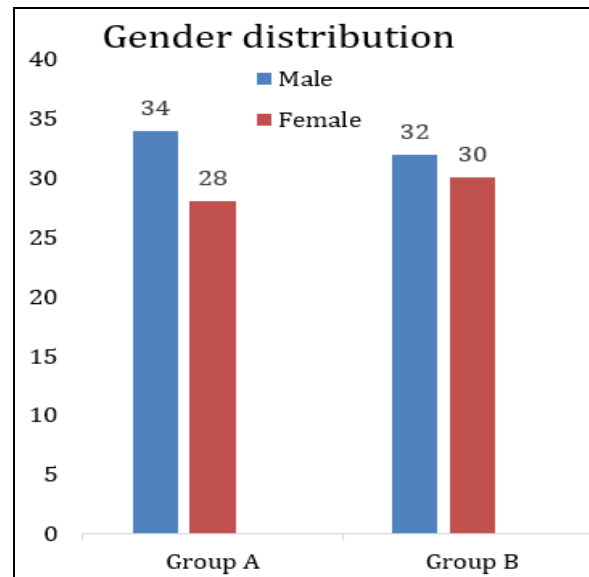


Figure-1: Gender distribution

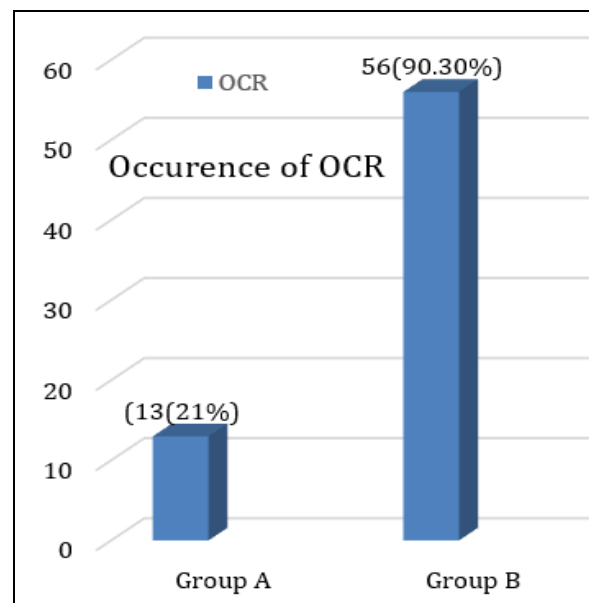


Figure-2: Occurrence of OCR

**Table-1: Preoperative Variables**

Variables	Group A	Group B	p-value
ASA 1	49 (79%)	46 (74.20%)	0.09
ASA 2	13 (21%)	16 (25.80%)	
BHR	84.30±3.33	82.33±4.14	0.56
SBP	99.83±6.95	100.64±7.27	0.45
DBP	62.58±5.56	62.66±6.51	0.23

**Table-2: Postoperative Variables**

Variables	Group A	Group B	p-value
SBP at 10 minutes	102.66±8.47	105.88±8.07	0.79
SBP at 20 minutes	98.06±5.83	100.48±6.87	0.83
SBP at 30 minutes	94.83±5.43	98.23±7.19	0.91
DBP at 10 minutes	57.67±5.17	59.11±4.39	0.74
DBP at 20 minutes	57.50±4.23	57.09±4.29	0.63
DBP at 30 minutes	58.14±3.75	58.62±3.02	0.95
HR at 10 minutes	79.33±7.36	66.65±6.83	<0.05
HR at 20 minutes	79.78±7.63	66.57±7.06	<0.05
HR at 30 minutes	79.80±7.78	66.52±7.01	<0.05

## DISCUSSION

Strabismus surgery is the most common procedure performed in paediatric age group and oculocardiac reflex is a dreadful complication and a big concern for operating surgeon and anaesthesiologist. Various options are utilized to mitigate the occurrence of this dangerous complication. One of the options is the usage of sub-tenon's injection of bupivacaine.

Abbas *et al* compared 0.5% topical anaesthesia drops with placebo and concluded that there was significant reduction in oculocardiac reflex in those patients receiving topical anaesthesia ( $p<0.001$ ) and the mean heart rate in these patients was significantly higher compared to placebo group, ( $p<0.001$ ).<sup>2</sup> In our study though topical anaesthesia was replaced with sub-tenon's injection but the results are comparable and suggest that both sub-tenon's and topical anaesthesia can result in reduction of Bradycardia and oculocardiac reflex.

Ibrahim *et al* divided the patients in three groups and compared the sub-Tenon's injection of bupivacaine with intravenous injection and rectal suppositories administration of paracetamol and established the fact that there was no significant difference in occurrence of oculocardiac reflex among the sub groups which contradicts our findings in the study.<sup>4</sup> The study concluded that though there is no difference in oculocardiac reflex but sub-tenon's injection of bupivacaine is associated with decreased frequency of post-operative agitation and vomiting.

The study of Talebnejad *et al* is very similar to our study comparing the same sub-tenon's bupivacaine injection with placebo, reported 32% (sub-tenon's group) versus 100% (placebo group) incidence of oculocardiac reflex with a  $p<0.002$ . This study also shows that sub-tenon's injection of

bupivacaine is associated with decreased postoperative pain.<sup>16</sup>

Varposhti *et al* compared the effect of Tetracaine topical eye drops with placebo and found the incidence and severity of oculocardiac reflex was more in placebo group during the muscle cutting phase of the surgery but there was no difference between the two during the muscle release stage.<sup>13</sup> In our study we did not sub classify the results in to release and cutting phase.

Tuzcu *et al* studied the same anaesthetic agents like ours comparing sub-tenon's injection of bupivacaine with no anaesthesia at all but with different results denying the role of sub-tenon's injection in reduction of oculocardiac reflex. Though pain scores were lower in sub-tenon's group. There was a slight difference in occurrence of oculocardiac reflex between the two groups but couldn't achieve the level of significance. The reason why there was no significant difference between the two, couldn't be ascertained.<sup>17</sup>

Bakr *et al* in their study supported our findings in contrast to what was found in Tuzcu *et al* study and showed that the occurrence of oculocardiac reflex was significantly lower in sub-tenon's group versus placebo ( $p<0.001$ ).<sup>17,18</sup>

Gilani *et al* studied the effect of anticholinergic premedication in strabismus surgery patients and reported that it can similarly reduce the incidence of oculocardiac reflex significantly ( $p<0.001$ ) and recommended its usage in routine in strabismus surgery patient. Though in our study we did not premedicate any patient with anticholinergic, this can open up another window for further research in this regard where the patients receiving sub-tenon's injection of bupivacaine can be combined with premedication of anticholinergics and the cumulative effect can be evaluated.<sup>19</sup>

Sajedi *et al* instead of combining the two, compared the effect of topical lidocaine drops with atropine injection and established the superiority of atropine injection in terms of reduction of oculocardiac reflex and Bradycardia significantly  $p < 0.001$ ), suggesting that atropine should be used in routine.<sup>20</sup> Their study excluded strabismus patients and was only meant for vitrectomies.

Though a few studies might contradict our findings but most of them are comparable, suggesting that sub-tenon's injection of bupivacaine in strabismus surgery is a viable option and need to be investigated further with more studies.

## CONCLUSION

Our study concludes that sub-tenon's injection of bupivacaine can significantly reduce the incidence of oculocardiac reflex in patients undergoing strabismus surgery and should be used in routine in paediatric age group with safety.

## AUTHORS' CONTRIBUTION

NUH: Literature review, conceptualization of study design, data collection, data analysis, data interpretation, write-up. MNK: Proof reading, review

## REFERENCES

1. Chua AW, Chua MJ, Leung H, Kam PC. Anaesthetic considerations for strabismus surgery in children and adults. *Anaesth Intensive Care* 2020;48(4):277–88.
2. Abbas S, Zafar O, Awais M, Abbas B, Hayat U, Mehmood B. Efficacy of topical anaesthesia in reduction of oculocardiac reflex during squint surgery. *Pak Armed Forces Med J* 2020;70(3):855–61.
3. Gujjula S, Chakrapani K, Harsha N, Karanam S, Nambula S. Occurrence of oculo cardiac reflex during strabismus surgery. *Off Sci J Delhi Ophthalmol Soc* 2019;30(1):28–31.
4. Ibrahim AN, Shabana T. Sub-Tenon's injection versus paracetamol in paediatric strabismus surgery. *Saudi J Anaesth* 2017;11(1):72–6.
5. Elgebaly AS. Sub-Tenon's lidocaine injection improves emergence agitation after general anaesthesia in paediatric ocular surgery. *South Afr J Anaesth Analg* 2013;19(2):114–9.
6. Arnold RW. The Oculocardiac Reflex: A Review. *Clin Ophthalmol* 2021;15:2693–2725.
7. Taghavi Gilani M, Sharifi M, Najaf Najafi M, Etemadi Mashhadi MG. Oculocardiac reflex during strabismus surgery. *Rev Clin Med* 2016;3(1):4–7.
8. Shin SY, Kim MJ, Joo J. Oculocardiac reflex and oculo-respiratory reflex during strabismus surgery under general anaesthesia using the laryngeal mask airway with maintenance of spontaneous respiration: a retrospective study. *J Int Med Res* 2020;48(8):0300060520945158.
9. Arnold RW, Rinner AR, Arnold AW, Beerle BJ. The Impact of Re-Operation, Relatives and Race on the Oculocardiac Reflex During Strabismus Surgery. *Clin Ophthalmol* 2020;14:4253–61.
10. Paciu-Beja M, Meizner-Grezemkovsky D, Paciu M, Sanchez-Santos I, Ruiz-Roman A, Fack A, *et al*. Oculocardiac reflex during intravitreal injection. *Med Hypothesis Discov Innov Ophthalmol* 2020;9(2):111–7.
11. Okülo kardiyak PŞ. Factors Affecting Oculocardiac Reflex Incidence In Paediatric Strabismus Surgery: retrospective Study. *Group* 2021;3:4.
12. Ha SG, Huh J, Lee BR, Kim SH. Surgical factors affecting oculocardiac reflex during strabismus surgery. *BMC Ophthalmol* 2018;18(1):1–5.
13. Rahimi Varposhti M, Moradi Farsani D, Ghadimi K, Asadi M. Reduction of oculocardiac reflex with Tetracaine eye drop in strabismus surgery. *Strabismus* 2019;27(1):1–5.
14. Choi SR, Park SW, Lee JH, Lee SC, Chung CJ. Effect of different anaesthetic agents on oculocardiac reflex in paediatric strabismus surgery. *J Anesth* 2009;23(4):489–93.
15. Yi C, Jee D. Influence of the anaesthetic depth on the inhibition of the oculocardiac reflex during sevoflurane anaesthesia for paediatric strabismus surgery. *Br J Anaesth* 2008;101(2):234–8.
16. Talebnejad MR, Khademi S, Ghani M, Khalili MR, Nowroozzadeh MH. The Effect of Sub-Tenon's Bupivacaine on Oculocardiac reflex during Strabismus Surgery and Postoperative Pain: A Randomized Clinical Trial. *J Ophthalmic Vis Res* 2017;12(3):296–300.
17. Tuzcu K, Coskun M, Tuzcu EA, Karcioğlu M, Davarci I, Hakimoglu S, *et al*. Effectiveness of sub-Tenon's block in paediatric strabismus surgery. *Rev Bras Anesthesiol* 2015;65(5):349–52.
18. Bakr RH, Abdelaziz HM. Subtenon bupivacaine injection for postoperative pain relief following paediatric strabismus surgery: A randomized controlled double blind trial. *Middle East J Anaesthesiol* 2016;23(1):91–9.
19. Gilani SM, Jamil M, Akbar F, Jehangir R. Anticholinergic premedication for prevention of oculocardiac reflex during squint surgery. *J Ayub Med Coll Abbottabad* 2005;17(4):57–9.
20. Sajedi P, Nejad MS, Montazeri K, Baloochestani E. Comparing the preventive effect of 2 percent topical lidocaine and intravenous atropine on oculocardiac reflex in ophthalmological surgeries under general anaesthesia. *Int J Prev Med* 2013;4(11):1258–65.

Submitted: November 8, 2022

Revised: December 26, 2022

Accepted: January 1, 2023

## Address for Correspondence:

**Dr. Noor ul Hussain**, Fellow in Pediatric ophthalmology, MTI, Hayatabad Medical complex, Peshawar-Pakistan

**Cell:** +92 334 843 1898

**Email:** noor.ophthalmologist@gmail.com