ORIGINAL ARTICLE

Comparison of Pain in Topical, Sub-Tenon and Retrobulbar Anesthesia for 23g Pars Plana Vitrectomy

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ABSTRACT

Aim: To compare the effectiveness and safety among topical, sub-tenon and retro-bulbar anesthesia in 23-gauge pars plana vitrectomy (PPV).
Study design: Randomized Control Trail.
Place and duration of study: Vitreo-Retinal Unit, Ophthalmology Department, Al-Ehsan Welfare Eye Hospital, Lahore, from July 2019 to December 2019.
Methods: 45 patients requiring pars plana vitrectomy (PPV) were randomized into Group A (topical anesthesia), Group B (sub-tenon anesthesia) and Group C (retro-bulbar anesthesia), and underwent 23-gauge PPV. A pain scale (VAPS) was used to assess patients' pain experience during administration of anesthesia, pain during surgery, and postoperative pain.
Results: The results showed that there is statistically significant difference in the pain score between the different anesthetic routes of administration. The least painful route of administration was topical with a mean pain score of 8.00 while a score of 31.00 for retro bulbar anesthesia. However with per-operative mean pain score of 10.87 and 13.73 post operatively, retro bulbar anesthesia was the most comfortable.
Conclusion: The study suggested that topical anesthesia is a safe and effective anesthetic approach for patients undergoing 23G PPV along with other methods sub-tenon and retro bulbar anesthesia. It helps with the conduct of high volume surgeries by reducing requirements and burden on the healthcare team however retro bulbar and sub tenon anesthesia are the most potent in reducing per-operative and post-operative pain during surgery.
Keywords: Retrobulbar anesthesia, virectomy,

INTRODUCTION

Vitreoretinal surgical procedures have evolved over the course of time from external buckles to advance small gauge sutureless vitrectomies. The surgical numbers have increased dramatically over the course of time with advent of new techniques. Disease awareness, availability of diagnostic tools and treating surgeons has all lead to an increase in treatment dispensing. However this also places a strain on resources.

Almost all retinal surgeries are performed under some type of anesthesia the choice of which depends upon on multiple factors. Different types of anesthesia are employed for vitreoretinal procedures that include topical, sub-tenon, retro bulbar and general anesthesia depending upon the patient and surgical procedure requirements[1-3]. All the procedures have different requirements for administration with distinct merits and demerits.

Retro bulbar anesthesia is the most prevalent anesthetic method employed in ophthalmic procedures in our settings.The drug that was administered via retro bulbar route was bupivacaine and lignocaine along with 2%lignocaine jelly[4,5]. So this prospective study was designed to compare topical, sub-tenon and retro bulbar methods of anesthesia[4-6]. On the other hand Sub tenon injection are more feasible with greater efficacy[7] as they do not require the availability of anesthetist. Most of the patients requiring sub tenon injection do not need additional supplemented doses of anesthesia with greater post-operative outcome[8].

METHODS

The study was conducted at Vitreo-Retinal department of Al-Ehsan Welfare Eye Hospital, Lahore from July 2019 to December 2019.The study was designed as a randomized control trail and comprised of 45 eyes assigned randomly into three groups, each comprising of 15 eyes. The Excel randomization formula was used to produce randomization order in advance.

The inclusion criteria included the patients with ages 25 years or above, requiring three port pars-plana vitrectomy for macular peels, vitreous hemorrhage, floaters and simple rhegmatogenous retinal detachment. The exclusion criteria included those requiring scleral buckling, history of previous posterior segment surgery, ocular inflammation or infection, known allergy to any anesthetic drug, respiratory problem, claustrophobia, communication problem, and dementia.

All patients were explained in detail about the purpose of the study, the surgical procedure and about different methods of the anesthesia. They were advised to inform the surgeon in case they experience pain during or after the procedure so that the further anesthesia or painkiller is provided.

A comprehensive ophthalmic examination was carried out pre-operatively and 1 day post-op including BCVA, IOP, fundal examination and multimodal images, if required. This study followed the tenets of the Declaration of Helsinki and was approved by the local Ethics Committee. Written, informed-consent of patients was obtained in all cases.

On the day of surgery, baseline vitals were checked before the procedure. Pupillary dilatation was achieved with 1 drop each of 1% Tropicamide (Mydriacyl, Alcon Pharma) and 1% Cyclopentolate HCl (Cyclogyl, Alcon Pharma) instilled three times every 10 minutes after the admission. After local anesthetic eye drop, 5% Povidone Iodine drop was also instilled in all patients before the patient enters theatre, providing ample time to work.

In Group A, conjunctival sac was anesthetized with Alcaine Eye Drops 0.5% (Alcon Pharma) containing 0.5% Proparacaine Hydrocloride, 3 times every 5 mins before the patient enters theatre, instilled by the same nurse.After draping and insertion of speculum, the sponge soaked with 0.5% Proparacaine Hydrochloride were placed at trocar entry point for 1 min before trocar insertion.

In Group B, after a single Alcaine Eye Drop (Alcon Pharma), all patients received 4-5 mL of 0.5% Bupivacaine Hydrocloride and 2% Lignocaine Hydrochloride in a 1: 1 ratio into the sub tenon space by using a sub tenon cannula through a small peritomyinfero-nasally, to make an entry point into the sub-tenon space.

Similarly, in Group C all patients after a single Alcaine Eye Drop (Alcon Pharma) received 4-5mL of 0.5% Bupivacaine Hydrocloride and 2% Lignocaine Hydrochloride in a 1: 1 into the retro-bulbar space by using a 27G needle. All retro-bulbar and sub-tenon anesthesia procedures were performed by the same doctor. After both anesthesia, a pressure pad was applied for 5 mins.

All surgeries were performed by a single surgeon within the same setting. Standard three ports 23G pars plana vitrectomy was performed, using Orteli Faros (Switzerland) vitrectomy system. At the end of the surgical procedures the sclerotomies were either compressed with a cotton tip and if leakage was present a suture was placed.

After the surgery, patients were taken to the recovery area where vital signs were obtained. Patients were asked about their pain score using VAPS, during administration of anesthesia, pain during surgery, and 1 hour postoperative pain at all stages by the same observer. In addition, the details of any extra anesthesia or painkiller required during the surgery and after the surgery was noted.

RESULTS

All the data entered is analyzed by using SPSS 22. Normality assumption is checked by using Shapiro-wilk test. All quantitative variables were considered to have normal distribution with p-value > 0.05 while the p-value of ≤ 0.05 was considered as not normally distributed.Number of patients in topical, retro bulbar and sub-tenon anesthesia.

Site of injection	N
Topical	15
Retro bulbar	15
Sub Tenon	15

Pre-Operatively:

Site of injection	N	Mean Rank
Pre-operative pain		
Retro bulbar	15	31.00
Topical	15	8.00
Subtenon	15	30.00

A Kruskal-Wallis H test was used to show the pain score before, during and post-operatively by using different routes of anesthesia (i.e., topical, sub-tenon retro bulbar).

Test Statisticsa,b	
	Pre-operative pain
Chi-Square	33.196
Df	2
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: site of injection	

The tableshowed that there is statistically significant difference in pre-operative pain score between the different anesthetic routes of administration, χ^2 (2) = 33.1, p = 0.00, with a mean rank pain score of 31.00 for retro bulbar, 8.00 for topical and 30.00 for subtenon.

Per-Operative: Ranks

Site of injection	N	Mean Rank
Retro bulbar	15	10.80
Topical	15	33.07
Subtenon	15	25.13
Total	45	

Test Statistics a,b	
Per-operate pain	
Chi-Square	27.471
Df	2
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: site of injection	

The results showed that there is statistically significant difference in pain score calculating during surgery between the different anesthetic routes of administration, $\chi^2(2)=33.07$, p= 0.00, with a mean rank pain score of 10.80 for retro bulbar, 33.07 for topical and 25.13 for subtenon.

Post-Operatively: Ranks

Post-operate pain		
Site of injection	N	Mean Rank
Retro bulbar	15	13.73
Topical	15	28.43
Subtenon	15	26.83
Total	45	

Test Statistics[a,b]	
	Post-operative pain
Chi-Square	13.961
Df	2
Asymp. Sig.	.001
a. Kruskal Wallis Test	
b. Grouping Variable: site of injection	

Table showed that there is statistically significant difference in post-operative pain score with $\chi^2(2)=28.43$, p=0.00, with a mean rank pain score of 13.73 for retro bulbar, 28.43 for topical and 26.83 for subtenon.

For inter-routes comparison, we use the turkey post-hoc test for comparing the difference in pain level of these three routes pre-operatively, per operatively and post operatively.

Multiple Comparisons; Tukey HSD							
Dependent Variable	(I) site of injection	(J) site of injection	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Pre-operativee pain	Retrobulbar	Topical	1.6000*	.1526	.000	1.229	1.971
		Subtenon	.0667	.1526	.900	-.304	.437
	Topical	retrobulbar	-1.6000*	.1526	.000	-1.971	-1.229
		Subtenon	-1.5333*	.1526	.000	-1.904	-1.163
	Subtenon	retrobulbar	-.0667	.1526	.900	-.437	.304
		Topical	1.5333*	.1526	.000	1.163	1.904
Per-operate pain	Retrobulbar	Topical	-1.2667*	.1553	.000	-1.644	-.889
		Subtenon	-.8000*	.1553	.000	-1.177	-.423
	Topical	retrobulbar	1.2667*	.1553	.000	.889	1.644
		Subtenon	.4667*	.1553	.012	.089	.844
	Subtenon	retrobulbar	.8000*	.1553	.000	.423	1.177
		Topical	-.4667*	.1553	.012	-.844	-.089
Post-operate pain	Retrobulbar	Topical	-.8000*	.2037	.001	-1.295	-.305
		Subtenon	-.6667*	.2037	.006	-1.161	-.172
	Topical	retrobulbar	.8000*	.2037	.001	.305	1.295
		Subtenon	.1333	.2037	.791	-.361	.628
	Subtenon	retrobulbar	.6667*	.2037	.006	.172	1.161
		Topical	-.1333	.2037	.791	-.628	.361
*The mean difference is significant at the 0.05 level.							

According to this test, pre-operatively there is significant difference in pain score during subtenon and retrobulbar routes of anesthesia when compared with topical administration of anesthesia with p value <0.05. Satisfaction with the mitigation of pain was statistically significantly greater in topical anesthesia compared toretro bulbar and subtenon routes of anesthesia.

While Per-operatively and post-operatively, there is statistically significant p value (<0.05)of pain scale forretro bulbar route of anesthesia when compared with topical and subtenon anesthesia resulting in greater mitigation of pain.

DISCUSSION

The research conducted at Al-Ehsan Welfare Hospital gave us the opportunity to observe different modalities of anesthesia whether invasive or non-invasive and to check and compare which mode of anesthesia is suitable for the patients and gives a better outcome pre and post operatively. Topical Anesthesia is by far the most convenient mode of anesthesia with less preoperative pain, however patients do experience some extent of discomfort post operatively[1]. Different modalities are used for topical anesthesia which includes gels, drops and sponges that are applied in the fornixes. Topical anesthesia however does not provide sufficient akinesia of extraocular muscles which is required during surgery and can render the surgery challenging and may lead to certain complications such as holes, tears, retinal hemorrhages etc. On the other hand its does offer quick anesthesia and doesn't alter the patient's ability of blinking soon afterwards. The study results clearly show that it was the easiest to administer with minimum requirements and was the earliest to provide anesthetic cover. However during the surgery and afterwards the patients were not comfortable and it required frequent topping up the anesthesia. The results indicate that it can be safely employed for internal approach for retinal surgical procedures provided the patients are adequately counseled about the anesthetic choice.

Retro bulbar mode of anesthesia requires specialized anesthetist care. It involves the injection of local anesthetic agent into the muscle cone. This technique is also being employees in peribulbar blocks but can be done with a smaller gauge needle with lesser risks. This technique provides ideal conditions for surgery and high level of patient comfort is achieved per and post operatively, as clearly shown by our study results with the most pain felt during administration. However it requires specialized anesthetic facilities and anesthesia doctor to be on hand as it carries potential side effect of brainstem anesthesia which can lead to respiratory arrest, cranial nerve palsy which are life threatening. Other side effects include ptosis and bruising around the eyes which is cosmetically unacceptable in most of the patients[9].

Tenon's capsule is thick, elastic and fibrous that surrounds the extra ocular muscles, and there is a potential space between the capsule and the sclera, hence this potential space is ideal for administration of anesthesia and is a favored mode of anesthetic administration in majority of surgical theaters[10]. As per our study sub tenon mode of anesthesia provided a safe and stable anesthetic cover with lesser risks, safer administration mode and long term anesthetic cover with no requirement of top ups if administered properly when compared to the other anesthetic choices. In comparison to retro bulbar block it doesn't require the use of sharp needles or special anesthetic care availability and due to episcleral approach and risk of brainstem anesthesia is rare[11-13].

The study results conclude that all the three methods of anesthesia can be administered in retinal surgery just as used for anterior segment surgeries and are safe, convenient with no risks if administered following proper guidelines[14]. Though topical anesthesia is not utilized in routine retinal surgeries it's a feasible and viable alternate to other modes of anesthesia. Retro bulbar anesthesia requires specialized anesthetist care but is the most potent. Over all sub tenon injection offer the most comprehensive

anesthesia with minimal side effects and overall the most affective anesthetist cover**.**

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