·Clinical Research·

Visual impact of sub-Tenon anesthesia during combined phacoemulsification and vitrectomy surgery

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Abstract

•AIM: To investigate the visual impact of sub-Tenon anesthesia during combined phacoemulsification and vitrectomy surgery.

•METHODS: In this prospective case series, consecutive patients who underwent combined phacoemulsification and pars plana vitrectomy (PPV) under sub-Tenon anesthesia between October 2008 and September 2009 were enrolled. The patients were asked whether they could see the light of the operating microscope or not between various surgical steps with their contralateral eye being covered.

•RESULTS: A total of 163 eyes of 163 patients were enrolled in this study. After their contralateral eyes were covered, 152 (93.3%) patients said that they could not see any light at least during one of the surgical steps. All eyes recovered to at least light perception on the first postoperative day. The incidence of no light perception during the surgery was not related to demographic factors, including age, gender, or type of ocular diseases.

•CONCLUSION: The incidence of no light perception during combined phacoemulsification and vitrectomy under sub-Tenon anesthesia was high in our study. Patients should be duly informed about this temporary but potential intraoperative event.

•KEYWORDS: visual impact; sub-Tenon anesthesia; phacoemulsification; vitrectomy

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INTRODUCTION

Local anesthesia (LA) is gradually replacing general anesthesia (GA) in ophthalmic surgeries. An increasing number of ophthalmic procedures are now being performed under local anesthesia [1-3]. One of the m ajor differences between LA and GA is the ability of the patient to visually experience the surgical steps when they are operated under LA. In the current study, we recorded the visual experiences of the patients who underwent combined phacoemulsification and pars plana vitrectomy (PPV) under sub-Tenon anesthesia.

SUBJECTS AND METHODS

This was a prospective study of 163 consecutive patients who underwent combined phacoemulsification and PPV at the Joint Shantou International Eye Center between October 2008 and September 2009. The study followed the tenets of the Declaration of Helsinki and was approved by a local Research Ethics Committee. Patients were excluded if they had received any prior ocular surgery, had a preoperative visual acuity of no light perception in either eye, or were unable to respond independently to the study questionnaire.

All patients received oral diazepam 5 mg and topical 0.5% proparacaine hydrochloride (Alcaine, Alcon, Fort Worth, TX, USA) eyedrops before the surgery. All regional anesthesia administration as well as surgeries were conducted by the same surgeon. The anesthetic mixture was prepared by mixing 2% lidocaine and 0.75% bupivacaine solution (without epinephrine) in a ratio of 1:1. This anesthetic mixture (3.5 mL) was injected in the sub-Tenon's space in the inferonasal quadrant using a 2.5 cm curved blunt needle. The needle used for performing sub-Tenon injection was the one that comes in the pack with hydroxypropyl methylcellulose viscoelastic (Henan Universe IOL R&M Co. Ltd, Henan Province, China). Phacoemulsification and PPV were performed using a standard surgical technique. The height of

the irrigation bottle was kept constant at 40 cm throughout the PPV surgery while maintaining an intraocular pressure of about 30 mm Hg. All surgeries were performed with the same microscope (M820 F19, Leica, Germany) using a light intensity of 60% -90% . The room lights were turned off during vitrectomy when an endoillumination was used with a fiber optic light.

During the surgery the surgeon covered the patient's contralateral eye, turn on the light of microscope, and asked the patients if they could see the light of the microscope while survey. The question was asked between various surgical steps including conjunctival incision, sclerotomy, phacoemulsification and PPV, and at the end of the surgery. A nurse recorded all results immediately during the surgery. If the patients reported that they could not see any light at all, they were reassured.

All data were recorded on an Excel sheet and analyzed using the statistical package for the social sciences (SPSS) program. Patients who reported light perception and patients who reported no light perception were compared using t-test or Chi-square test. The primary assessment criterion was the incidence of loss of light perception in patients with sub-Tenon anesthesia and microscope illumination. Secondary criterion was time between sub-Tenon anesthesia injection and loss of light perception of illumination, and duration of loss of light perception.

RESULTS

A total of 163 eyes of 163 patients were enrolled in this study. The mean age of the participants was 55.9 ±9.3y (22-82y), 87 males, 76 females. The indications for surgery included rhegmatogenous retinal detachment (n=0), macular diseases (n=30), proliferative diabetic retinopathy (n=28), ocular trauma (n=6), and miscellaneous (n=9).

Overall, majority of the patients (n=152, 93.3%) reported loss of perception of light at least during one of the surgical steps after the contralateral eye was covered intraoperatively. The visual acuity of all patients recovered to at least light perception on the first postopertaive day.

The average duration of surgery was 82.0±18.1min. The time of losing light perception ranged from 4-90min from the start of the surgery (Figure 1). Most of the patients (81%) reported losing light perception between 6min and 30min from the commencement of the surgery. The median time to lose light perception was 15min.

There was no difference between the two groups in terms of primary diagnosis (P=0.454, Chi-square test, Table 1) as well as the pain score (all P>0.05, Mann-Whitney U-test, Table 1).

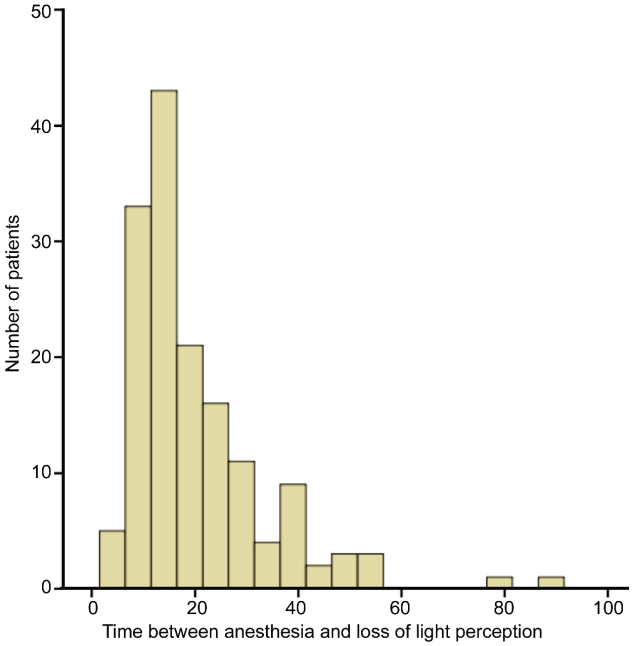

Figure 1 Histogram showing the absence of light perception (with the contralateral eye covered) from the beginning of the surgery. X-axis denotes the time in minutes.

Table 1 Comparison of demographic and clinical characteristics in patient groups with and without light perception during combined phacoemulsification and vitrectomy under sub-Tenon anesthesia

Patient's data	No light perception	Light perception
Total	152	11
Sex		
M	80	7
F	72	4
Age	55.7±9.4	58.3±7.3
Eye		
Left	73	4
Right	79	7
Diseases		
MD	28	2
RD	85	5
PDR	24	4
OT	6	0
Others	9	0
Pain during surgery	2.26±1.06	2.00±0.00
Pain during anesthesia	2.66±2.98	2.55±0.93
Pain ratio	0.91±0.46	0.86±0.23

MD: Macular disease; RD: Retinal detachment; PDR: Proliferative diabetic retinopathy; OT: Ocular trauma.

DISCUSSION

Loss of light perception has been reported during extracapsular cataract extraction in 3.6% to 20% of the patients under retrobulbar or peribulbar anesthesia [4,5]. Later, when phacoemulsification was introduced and more

anesthesia options were available, 0% to 10.3% of the patients were reported to experience no light perception under topical anesthesia, and 9.3% to 25% of the patients experienced no light perception under regional anesthesia[6-8]. It was also reported that 6.7% to 53.8% of the patients developed no light perception during vitrectomy under regional anesthesia[9,10].

In our study, majority of the patients (93.3%) reported no perception of light intraoperatively after their contralateral eyes were covered. The possible mechanism of light perception loss under LA may be due to several mechanisms including blocking of optic nerve transportation by the anesthetic, low perfusion of blood supply to the optic nerve and retina caused by high intraorbital pressure, vascular spasm caused by epinephrine (epinephrine was not used in our cases); direct trauma by the needle during anesthetic injection, and retinal ischemia caused by elevated intraocular pressure [8,11-13]. Local anesthetics inhibit the influx of Na^+ into the nerve cell membrane, reducing the excitability and action potential amplitude. This can lead to a prolongation of the refractory period temporarily as well as a reversible loss of the action potential, excitability, conductivity, and pain. In addition, the blockage of visual signaling by regional anesthesia has been reported to cause a reduction in visual acuity, inhibited visual evoked potential, and a relative afferent pupil defect [14-16]. Although sub-Tenon anesthesia is safer than retrobulbar or peribulbar anesthesia, anesthetic injection into the sub-Tenon space may reach the optic nerve therefore causing amaurosis[17,18].

One of the confounding factors in our study is the preoperative sedation with diazepam that may have caused a low perception level. However, we conducted our questionnaire during the surgery in order to ensure that the patients were awake when answering the questions. Also, the volume of regional anesthetic used in our study was lower as compared to previous studies [10]. Therefore we do not think that the high incidence of loss of light perception was due to excessive anesthesia in our study. Other possible explanations for a high incidence of loss of light perception may include, severe preoperative ocular pathology with poor vision, temporary blinding due to microscope light. These questions can be answered in future studies with control groups.

The understanding of visual experience during ocular surgery under LA has been reported in the past. Although it is believed that the patients may experience some visual sense intraoperatively, some of the ophthalmologists reported that some patients have no light perception during phacoemulsification or PPV [4,5,9,10]. In a survey of patients undergoing cataract surgery, about one third of the patients expected at least light perception while another third expected no light perception[19]. Even doctors have no unified opinions[20]. This is clearly an important source of anxiety and stress for the patients, which demands preoperative provision of information to patients scheduled for ocular surgery under local anesthesia[21-23]. Further studies with control groups using other types of LA are recommended.

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