Original Research Article

Peribulbar anesthesia: efficacy of a single injection with a limited local anesthetic Volume

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Abstract

Introduction: Cataract surgery can be performed with peribulbar anesthesia. The classical technique consists of two injections of local anesthetics. The purpose of our Study was to assess peribulbar anesthesia with a single injection and a limited volume of local anesthetics. **Material and method:** After local ethics committee agreement and oral consent, patients scheduled for cataract surgery using peribulbar anesthesia were prospectively included. The lower temporal puncture was performed with a peribulbar needle with lignocaine sedation. The mixture of local anesthetics was administered with tactile control of orbital pressure. The punch was followed by a 10 min compression of the ocular globe. Akinesia, analgesia, complications, and surgical conditions were noted. **Results:** A total of 100 patients were included in the Study. Lignocaine was given at a rate of 1.2 mg/kg. The total amount of local anesthetics used was 4.0 ± 0.9 ml. At 15 minutes, ninety patients had akinesia, and 7% had mild chemosis. There were no complications from the puncture. At 5 minutes, 92 percent of patients had akinesia, and at 15 minutes, 94 percent of patients had it. In 94 percent of patients, fixed the eye, and in 94 percent of patients, the vision was central. In 86 percent of cases, the levator muscle motor of the eyelid was blocked. In 7% of patients, moderate chemosis was found. Many of the patients had positive surgical outcomes. **Conclusion:** Peribulbar anesthesia performed with a single injection and a limited volume of local anesthetics allows cataract surgery in good conditions for the surgeon with excellent analgesia for the patient.

Keywords: Peribulbar anesthesia, cataract, sedation, lignocaine

Introduction

Local anesthetic or regional anesthesia should be used for ophthalmic procedures, including cataract extraction with phacoemulsification [1]. Regional anesthesia is still commonly used in complex surgeries and surgeries that take a long time [1].In ophthalmic surgery, retrobulbar anesthesia is the standard procedure for regional anesthesia; however, although complications are rare, they can be fatal. However, the risks associated with retrobulbar anesthesia have been linked to peribulbar anesthesia with a lower, though still intolerable, frequency [2–7]. Cataract surgery is a procedure that can be performed under local anesthesia. According to the technique first identified by Davis and Mandel in 1986 [8], peribulbar anesthesia (PBA) is one of the potential therapies that usually involves two injections and the administration of a volume necessary local anesthetics. This procedure carries a low chance of complications [9]; this may include both general (bradycardia, cardio-respiratory arrest, and seizures as a result of subarachnoid local anesthetic administration) and local anesthetics (perforation of the eyeball [10], diplopia as a result of local anesthetic myotoxicity, and injection intramuscular solution anesthetic [11, 12]. Perforations of the eyeballs seem to be more common after superior temporal puncture than inferior temporal puncture [13]. They can also occur after the second puncture [14]. This research aims to see how successful a PBA clinic with a single inferior temporal injection and a low amount of local anesthetics is for cataract surgery.

Material and Method

Since receiving support from our institution's ethics committee and verbal, informed consent from the patients, the research was carry out. From September 2020 to March 2021, one hundred patients scheduled for elective ophthalmic procedures at the Department of Ophthalmological Surgery, Section of Ophthalmology, Osmania General Hospital, were included. Patients who underwent minor incision cataract surgery were studied in a hospital setting. Many of the patients were hospitalized. A thorough history and review of vision tests, anterior section examinations, and slit-lamp examinations were performed until surgery. The fundus was examined using overt and indirect ophthalmoscopy, tonometry, and sac syringing in both cases.Preliminary examination under torchlight and visual acuity testing by Snellen's chart were done for all patients participating in the Study. Slit-lamp examination, Schiotz tonometry, Lacrimal sac syringing, Direct and indirect ophthalmoscopy. Preoperatively ciprofloxacin eye drops were instilled hourly one day before surgery. The pupil was dilated with tropicamide 0.5%, phenylephrine 5%, and flurbiprofen 0.03%, used three times in one hour for two hours before surgery. Sensitivity to local anesthetics is tested with the lignocaine test dose.

Preparation of anesthetic solution

Lignocaine 2% with adrenaline 1: 200000 was used. Hyaluronidase 1500 IU was dissolved in 30 ml of 2% lignocaine with adrenaline (1:200000), resulting in 50 IU/ml of the anesthetic mixture.

Anesthetic Technique

This was a prospective, descriptive study, not modifying the usual practices of the service, conducted after the agreement of the local ethics committee. In this study, patients had to undergo cataracts programmed by phacoemulsification and did not present any exclusion criteria (patient refusal, contraindication to PDB). In the operating room, the patient was receiving standard monitoring with locoregional anesthesia. The punctures were performed by the same experienced anesthesiologist to limit technical biases. The injections were given with a 5 ml syringe with a 24 gauge2.5 cm needle will be taken. The infusion was injected inferior-temporally by inserting the needle transcutaneously at the lower orbital margin between medial 2/3 and lateral 1/3. The hand was advanced parallel to the plane of

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the orbital floor till 2.5 cm and 4 ml of anesthetic solution injected after careful aspiration to rule out intra-vascular placements (Fig-1). IOP was recorded at 1min, and the massage was given to the eyeball. Super pinky was applied over the eyeball for 1-2min. Akinesia at 5 and 15 minutes later the injection, the operating conditions (fixed eye, central, existence or not of chemosis), the surgeon's satisfaction, and complications from PDB were noted. Intraoperative analgesia was assessed using a visual analog scale (VAS) with the patient in the post-intervention surveillance room (SSPI). Continuous variables were compared by a test-t of Study for unpaired data. The qualitative data tests were compared by a Chi test ^{2} and a Fisher exact test (Origin Pro 8.0).

Fig 1:Peribulbar anesthesia, the Patient position was Supine

Results

A total of 100 patients were selected for the current Study under peribulbar anesthesia of single injection with limited volume satisfying all inclusion and exclusion criteria. In our study, patient's ages were ranging from 42-80 years. In our Study, out of 100 patients, 42 were males, 58 were females the ratio was 1:1.3. Demographic data are presented in Table 1

Table 1: Preoperative data

	mean ± SD	Extreme [min; max]
Age (years)	68 ±12	42 ; 80
Weight (kg)	62 ± 08	45; 102
Size (cm)	162 ± 8	143 ; 186
Body mass index	25.6 ± 4.3	17.6 ; 36.2
Axial length (mm)	23.4 ± 1.6	19.8 ; 27.2
Gender M / F	42/58	
Side D / L	54/45*	
Coronary artery disease Y / N	10/90	

The values are expressed as mean ± SD for continuous data and the number of patients for qualitative data. Extreme values are also given for quantitative data. (*) Missing data (<2%).

PDB was performed under lignocaine sedation. The amounts of lignocaine administered on average thus that complications related to sedation are indicated in Table II. The lowest value of the pulsed oxygen saturation observed after injection of lignocaine was 85%. Desaturation episodes mainly occurred at the beginning of the study, resulting in a modification of the technique of pre-oxygenation. The volume of local anesthetics injected was an average of 5.4 ± 0.9 ml, with a minimum volume of 4 ml and a maximum of 8 ml. Akinesia was obtained in 92% of patients at 5 minutes and 94% at the 15 minutes. The eye was fixed in 94% of patients and central in 94% of patients. A block levator muscle motor of the eyelid was observed in 86% of cases. Moderate chemosis was noted in 7% of patients. Efficacy parameters of peribulbar anesthesia are given in Table-2.

Table 2: Parameters of peribulbar anesthesia

	Mean ± SD	Extreme [min; max]
EVA / 100	0.3 ± 2.2	0.0 ; 10
Akinesia M5 Y / N	92/8	
Akinesia M15 Y / N	94/6	
Eyelid lift Y / N	86/14	
Fixed eye Y / N	94/6	
Central eye Y / N	94/6	
Chemosis Y / N	7/93	

The values are expressed as mean ± SD for continuous data and several patients for qualitative data. Extreme values are also given for quantitative data. (*) Missing data (<2%).

No complications related to puncture was not observed. The operating conditions were rated well by surgeons for all patients. Intraocular pressure was comparable immediately after the injection and after ten minutes of compression ocular (Table-3).

Table 3: Amount of lignocaine administered, complications associated with sedation and intraocular pressure

	Mean ± SD	Extreme [min; max]
lignocaine (mg / kg)	1.2 ± 0,5	0.2 ; 4.1
Desaturation Y / N	18/82*	
Hypotension Y / N	1/99*	
IOP T0 (mmHg)	15.78 ±2.7	10; 18
IOP T1 (mmHg)	17.15 ± 6.48	10:18
	9.8 ± 2.05	10:18

The values are expressed as mean ± SD for continuous data and several patients for qualitative data. Extreme values are also given for quantitative data. (*) Missing data (<2%).

Discussion

The Study's key finding is that a PDB with a single puncture and a small number of local anesthetics can be used to conduct surgery. For both doctors and patients, the treatment of cataracts is in excellent condition. About the fact that the number of PDBs in France is steadily declining, our center performs the vast majority of cataract surgeries using this procedure. Indeed, regional anesthesia for cataract surgery provides greater patient and surgeon support and is associated with fewer posterior capsular lesions than topical anesthesia [15]. Boezaart*et al*. [16], in their report, four patients who had a PBA during a previous procedure declined to have it repeated under topical anesthesia, necessitating the need for a PDB. The surgical difficulty rating out of 5 (1.06 ± 0.97 vs. 0.47 ± 0.68, p = 0.0004)) and pain rated out of 10 (1.63 ± 2.52 vs. 0.06 ± 0.32, p = 0.0001) were both more relevant in the category topical anesthesia. As a result, the average volume injected is lower than in other studies [17]. In particular, in some studies, we've seen an initial volume of 12 ml injected, followed by a 6 to 8 ml reinjection, taking the total volume injected to 20 ml [17].Akinesia was achieved in 92 percent of patients after 5 minutes and 94 percent after 15 minutes in our sample. The effectiveness of a single injection administered inferno-laterally with a fixed volume of 6.65 ml was 74 percent in a retrospective sample of 1,074 patients by Hendrick et al. [18]; this percentage increased to 96 percent when an additional injection in peribulbar of 3 ml was performed at the same puncture site (total volume injected: 9.65 ml).

There are some benefits of working with a small amount of material. The injection of a small amount of product into the orbital cavity tends to keep the intraocular pressure rising too far. In our research, we discovered that intraocular pressure remained normal after peribulbar anesthesia was administered. A 12 ml injection, on the other hand, resulted in a substantial rise in intraocular pressure, measured directly after the injection, of up to 30 mmHg in the Gillart research et al. [17]. Other researchers have also shown that peribulbar anesthesia causes a more significant rise in intraocular pressure than retrobulbar anesthesia, which requires the least amount of solution [19].

A reduction in injected volume makes for a minor effect on ocular perfusion parameters. Intraocular infusion pressure control is critical in persons with arterial disease or hypertension, which is not uncommon in cataract patients. In these patients, any reduction in central retinal artery pressure will result in ocular ischemia. In the analysis by Lung et al. [20], a 2 ml injection resulted in a lower reduction in visual perfusion parameters than a 5 ml injection (2 ml: systolic velocity-10.6 percent, velocity diastolic - 8.4 percent; 5 ml: systolic velocity-19.5 percent, diastolic velocity-16.5 percent). A similar effect was observed after a 10 ml injection [21].

The use of low-volume anesthetics would then be able to limit the muscle toxicity of local drugs. As a local anesthetic is injected into the periphery of a nerve, it spreads into the surrounding muscle masses. The myotoxicity of painkillers localized on the musculature of the eye can result in transient postoperative ptosis [22] and diplopia that can last for months. A retrospective review by Gomez-Arnau et al. [23] included 3,587 cataract procedures. There have been 26 cases of chronic diplopia reported, with 9 of them being due to peri or retrobulbar anesthesia (no claim has been reported since general or topical anesthesia).This research proposed many mechanisms to understand diplopia, including direct needle trauma causing intramuscular leakage, intramuscular injection of anesthetic fluid causing direct myotoxicity, and elevated blood pressure in the muscles causing muscle ischemia. The findings of their research point to a direct injury to the force generated by a needle or a solution anesthetic. In our research, no complications linked to puncture or the use of local anesthetics were discovered. Several forms of complications have been identified in the literature. During the realization of peribulbar anesthesia, an arteriovenous fistula at the level of the supraorbital vessels was recalled due to a traumatic puncture of a container situated in the superonasal [24]. The pulley of the superior oblique muscle is at risk of damage at this stage of superonasal punch, and the globe is potentially at a greater risk of perforation: the gap between the world and the roof of the orbit is negligible at this point, and the eye is ascended by a local anesthetic applied during the lower puncture. We choose a puncture point where the gap between the orbit and the eyeball is ample and free of vascular elements in our research. This puncture point is inferotemporal, near the angle formed by the orbit's floor and sidewall. Brainstem anesthesia will make peribulbar anesthesia more complex [25]. During peribulbar anesthesia, poor intracolonic needle placement can result in involuntary retrobulbar anesthesia, with potential sleeve optic nerve puncture. Aphasia with facial paralysis [26], complete spinal anesthesia with convulsions, apnea, and even cardiac arrest [27] are some of the clinical manifestations of brainstem anesthesia. A complication identified in the literature is the perforation of the eyeball. For peribulbar anesthesia, the rate of puncture of the eyeball during locoregional anesthesia is calculated to be less than 0.1 percent [28]. Peribulbar anesthesia is fraught with morbidity whose incidence is low but whose consequences can be dramatic. Despite this, the anesthesia peribulbar remains a safe technique when performed by experienced anesthetists with knowledge of the anatomy of the orbital cavity, using a suitable material (short needle), making anesthesia by a puncture point located at a distance from structures that could be damaged (muscles, vessels) and avoiding multiple punctures [29]. Sedation was administered before the needle puncture as part of our locoregional anesthesia protocol. When locoregional anesthesia, the patient's lack of cooperation will raise the risk of perforation [13]. This sedation is often used in conjunction with puncture to ensure the patient's comfort during the injection and to ensure amnesia with a minor but highly anxiety-inducing gesture [30]. This sedation could, in theory, aid patient collaboration during locoregional anesthesia, be quickly reversible, and have minor side effects.

Lignocaine works rapidly and makes for a swift waking due to its fast brain diffusion and limited elimination half-life. The average dose of lignocaine given to a patient is between 1.2 and 0.5 mg/kg. Lignocaine has few side effects at low doses, such as hypoventilation, hypoxia, and arterial hypotension, and ensures anterograde amnesia, but it can also induce restlessness and involuntary activity. For many factors, we preferred the realization of sedation that was more significant. First and foremost, this sedation causes the patient's intense eye muscles to relax, making it easier to

administer a locoregional anesthesia agent into the orbital cavity. They were encountering less resistance during injection limits the volume injected. The desaturations were mainly observed at the start of the Study.

Conclusion

Peribulbar anesthesia with a single injection and a small volume of local anesthetics helps cataract surgery is done safely for the surgeon, with excellent analgesia for the patient and no anesthesia-related complications.

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