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Local Anesthesia with Bupivacaine in Glaucoma Surgery

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Abstract

Aims: To compare the clinical efficacy of bupivacaine and lidocaine for regional glaucoma surgical anesthesia.
Study design: Cross-sectional comparative analysis
Place and Duration of Study: Department of Ophthalmology, clinic of Tashkent Medical Academy, between 2022 and 2024.
Methodology: We included 60 patients (60 eyes) with glaucoma; 28 men and 32 women; age range was 45-80 years. The patients were divided into two groups: 1st - 30 patients with lidocaine anesthesia and 2nd - 30 patients with bupivacaine anesthesia. The criteria for comparing the groups were: the rapidity of regional anesthesia, its duration, the general well-being of patients, the intensity of pain during the operation and in the early postoperative period on a visual analogue scale.
Results: In all patients of the 1st group anesthesia was achieved within 5-7 minutes, its duration was 40-50 minutes. In the second group anesthesia came later, after 10-14 minutes, but its duration was much longer, averaging 3 hours. Full ophthalmoplegia was received in 10 patients (33%) of the 1st group, and 21 patients (70%) of the 2nd group. Fifteen patients with bupivacaine and twelve patients with lidocaine had no pain during surgery. 8 (13%) patients experienced moderate pain (3-5 points). Five of them were operated under lidocaine anesthesia, three of which were operated with bupivacaine. Three patients experienced severe pain (6-10 points). Of these, two patients were operated on with lidocaine, and only one patient was operated. The average pain intensity was 2.0 ±0.4 , and 1.4 ±0.3 with lidocaine and bupivacaine, respectively. Statistically significant differences between these groups for intraoperative pain syndrome are not obtained ($p = 0.3$).
Conclusion: Good analgesic effect was achieved in all patients of both groups. Anesthesia with lidocaine occurs quickly, and anesthesia with bupivacaine is longer and better. The use of bupivacaine was associated with lower pain levels due to the longer duration of anesthesia, which has improved the quality of life.

Keywords: Anesthesia; Anti-Glaucoma Surgery; Pain Intensity; Visual Analogue Scale; Bupivacaine

Introduction

High-quality anesthesia during surgery and long-term pain relief in the early postoperative period improve the course of the disease and the outcome of treatment. The choice of the best anesthetic is especially important in glaucoma surgery. Often patients with angle-closure glaucoma have pain with irradiation to the corresponding half of the head

with a significant increase in the level of intraocular pressure (IOP). In addition, patients are more often elderly people with a burdened somatic status. A prolonged forced position on the back during surgery is often uncomfortable for them. Given these circumstances, our clinic uses various methods of general and local anesthesia. In most cases, patients are conscious during the operation, but should not experience pain and feel good in the postoperative period. Therefore, special requirements are placed on anesthesia during glaucoma surgery. When performing antiglaucomatous operations, we use anesthesia, including local (drip), regional anesthesia, and intravenous sedation. Regional anesthesia consists of akinesia (facial nerve block) according to Van Link and retrobulbar block. The preoperative mechanical reduction of IOP level by applying pressure on the eyeball, which is part of the anesthesia package for other eye surgeries (for example, cataract surgery), is not used for glaucoma, since this action leads to even greater compression of the optic nerve head.

We use a number of local anaesthetics for akinesia and retrobulbar blockade: bupivacaine and lidocaine. Bupivacaine is a modern, long-acting amide local anesthetic. The advantage of this drug is that it does not contain a cardiotoxic right-rotating isomer D (+). This minimizes its depressing effect on the central nervous system and the circulatory system [1]. It is actively used in ophthalmosurgery for application [2,3], peribulbar [4-9], retrobulbar [10], sub-Tenon [11], and conductive [12] anesthesia. Therefore, the aim of our study was to compare the clinical efficacy of bupivacaine and lidocaine for regional anaesthesia in glaucoma surgery.

Material and Methods

Clinical studies were conducted during surgical treatment of 60 patients (60 eyes) with glaucoma. The age range was 45 - 80 years, there were 28 men, 32 women. Most patients had accompanying somatic pathology: hypertensive disease, ischemic heart disease, diabetes mellitus, and general atherosclerosis. 35 patients had primary open-angle glaucoma, 25 patients had primary closed-angle glaucoma, of whom 6 had pain syndrome prior to surgery. Seven patients suffered COVID-19 [13], ten patients had diabetic retinopathy [14-18]. All patients were diagnosed with the following: visometry, biomicroscopy, perimetry, ophthalmoscopy, gonioscopy, tonography. The pre-operational training included an examination by a general practitioner, an anesthetist, and the collection of life history data, the presence of somatic diseases, their degree and the level of compensation. Laboratory indicators were analyzed and, where necessary, major diseases were treated. The study excluded patients with severe concomitant pathology, and inflammatory diseases such as conjunctivitis, keratitis, and uveitis.

All patients underwent deep valvular sclerectomy with basal iridectomy. Before the operation, premedication was carried out with a 50% solution of analgin 2.0 ml and a 1% solution of diphenhydramine 1.0 ml. Anesthetic management included sedation with intravenous fentanyl, Van Link facial nerve akinesia, and retrobulbar conduction anesthesia. When performing the retrobulbar anesthesia, we injected the local anesthetic behind the eyeball through the lower eyelid, 0.5 cm above the lower outer corner of the orbit, into the region of the ciliary node. We used a regular 4 cm intramuscular needle. The patient was asked to look up. We gradually pushed the needle four centimeters towards the top of the muscle funnel. We then used an aspiration sample to prevent vascular piercing and gently administered 3.0 ml of local anesthetic, after which the needle was removed. Patients were divided into two groups, roughly comparable in age, sex, stage, and degree of glaucoma compensation. Group 1 included 30 patients with 2% lidocaine solution; group 2 included 30 patients with 0.5% bupivacaine solution.

Intraoperative hemodynamics, pulse oximetry, and visual observation were performed on all patients.
The criteria for comparing the groups were: the speed of regional anesthesia, its duration, the level of ophthalmoplegia, complications and side effects of anesthetics, the general well-being of patients, the presence of postoperative nausea and vomiting, the intensity of pain during the operation and in the early postoperative period on a visual-analog scale -VAS.

Results & Discussion

In both groups, we have reached a sufficient level of anesthesia to complete the surgery. The duration of the operation was 15-20 minutes. In all patients of the 1st group, anesthesia was achieved within 5-7 minutes, its duration was 40-50 minutes. Full ophthalmoplegia was received in 10 patients (33%). At the request of the surgeon, 6 patients (20%) had to additionally inject sedatives and painkillers, as the patients behaved restlessly, moved their arms, moved their heads, talked a lot, and hardly carried out the surgeon's orders. In the second group, anesthesia came later, after 10-14 minutes, but its duration was much longer, averaging 3 hours. Ophthalmoplegia was achieved in 21 patients (70%). The movement of the eyeballs recovered, on average, 2 hours after surgery. At the same time, there was no unpleasant sensation in the eye.

As reported in Table 1, 27 (45%) patients had no pain during surgery. Among them were 15 patients operated on with bupivacaine and 12 patients operated on with lidocaine anesthesia. Minor pain (1-2 VAS) was experienced by 22 (37%) people during the operation, with the same frequency in groups with Lidocaine and Bupivacaine -37%. Moderate

pain (3-5 VAS) was experienced by 8 (13%) patients. Five of them were operated under anesthesia with 2% lidocaine, and three of them were operated with 0.5% bupivacaine. 3 patients experienced severe pain (6-10 points for VAS). Of these, two patients were operated on with lidocaine, and only one patient was operated on under anesthesia with a solution of bupivacaine. The mean pain intensity was 2.0± 0.4, and 1.4 ±0.3 with lidocaine and bupivacaine, respectively. Statistically significant differences between these groups for intraoperative pain syndrome are not obtained (p = 0.3).

VAS (Points)	Both Groups (n=60)	1st Lidocaine Group (n=30)	2nd Bupivacaine Group (n=30)
No pain (0 points)	n = 27 (45%)	n = 12 (40%)	n = 15 (50%)
Minor pain (1-2 points)	n = 22 (37%)	n = 11 (37%)	n = 11 (37%)
Moderate pain (3-5 points)	n = 8 (13%)	n = 5 (17%)	n = 3 (10%)
Severe pain (6-10 points)	n = 3 (5%)	n = 2 (6,7%)	n = 1 (3,3%)
Mean±SD		2,0±1,4	1,4±0,3

Table 1: The intensity of pain during Antiglaucomatous surgery during anesthesia with lidocaine and bupivacaine on a visual analogue scale (VAS).

It should be noted that all 6 patients with painful glaucoma have performed well. The Van Link akinesia and retrobulbar anesthesia effectively relieved severe pain syndrome in all cases. Moderate hypertension of blood pressure (140/70 to 180/90 Hg) was observed in all patients on the operating table. After sedation, hemodynamics (blood pressure and pulse) reached normal values within 7-10 minutes, roughly the same in all two groups. In the postoperative period, patients in all groups felt good. Patients had no postoperative nausea and vomiting syndrome, and appetite was maintained. However, group 2 patients were more comfortable. This was expressed in longer analgesia of the eyes, in a gradual comfortable recovery of their movements and sensitivity.

Thus, our study found that the use of bupivacaine for regional anesthesia in glaucoma surgery is preferable because it provides lasting and effective anesthesia without side effects. Balakrishnan K, et al. [19] confirms that bupivacaine provides better and longer analgesia and anesthesia during small surgery procedures performed in the chair. Oji E, et al. [20] concluded that bupivacaine does not give absolute ocular akinesia for ocular cataract surgery but provides adequate and prolonged pain relief. The authors suggest the mixture of the two local anesthetics in equal volumes.

Conclusions

Good analgesic effect was achieved in all patients of both groups. Lidocaine solution allowed to achieve quick anesthesia, and a solution of bupivacaine achieved long-term and quality anesthesia. The use of bupivacaine has improved the postoperative course due to the longer duration of the anesthesia. Accordingly, it has improved the quality of life, creating a comfortable environment and reducing psychoemotional stress.

Competing Interests

Authors have declared that no competing interests exist.

Authors Contributions

Author Kangilbaeva designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author Bektemirova managed the analyses of the study. Author Alimov managed the literature searches. All authors read and approved the final manuscript.

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