

Effectiveness in Achieving Retrobulbar Infiltrative Anesthesia With and Without Prior Dermal Application of Lidocaine on Lids in Cataract Surgery Patients

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Abstract:

Objectives: To assess the effectiveness of infiltrative anesthesia with or without prior use of lidocaine gel at the site of needle-insertion in patients undergoing cataract surgery and its association with needle-insertion pain.

Methodology: An observational case-control study was conducted with a sample size of 214 cataract surgery patients, who were randomly and equally assigned to case and control groups. A self-designed questionnaire was used to collect information from the surgeon about effectiveness of anaesthesia and akinesia, and the patient was asked about pain during needle-insertion on a 1–10 pain scale. The surgeon performed all procedures with the same tools and techniques. The data was analysed using SPSS. Furthermore, qualitative data was analysed using Pearson's chi-square association.

Results: This case-control study with equally distributed 214 participants, mean age 57.1 ± 9.34 , shows significant differences in anaesthesia, akinesia, and pain levels between both groups. The case group showed better results: 78.5% had no movements during surgery while 62.2% had partial movement. In the control group ($p = 0.000$); 83.2% had complete anaesthesia in contrast; 64.5% had partial anaesthesia in the control group ($p = 0.000$); and 67.3% felt mild pain during needle insertion; on the other hand, 74.8% felt severe pain in the control group ($p = 0.000$).

Conclusion: The findings show that using dermal lidocaine gel before an ocular infiltrative block enhances level of anaesthesia and akinesia while decreasing needle-insertion pain. This results in more patient comfort and satisfaction during surgery. *Al-Shifa Journal of Ophthalmology* 2024; 20(2): 68-74. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.

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Introduction:

Cataract, clouding of natural lens of the eye, continues to be a major global health burden and a huge cause of worldwide blindness in developing countries despite increasing worldwide acknowledgments about cataract and outreach.^{1 2} Surgery remains the most effective treatment for cataract and widely performs procedure worldwide.³ It is done through replacement of cloudy natural crystalline lens of eye with an artificial lens.⁴ Anesthesia plays crucial role in cataract surgery^{5,6} with the primary objective of patient welfare as well as delivering effective pain relief to create a comfortable experience.⁷

One of the regional anesthesia used for cataract surgery includes retrobulbar block which is given behind the globe in the retrobulbar space.⁸ Although retrobulbar block gives most favorable outcomes in terms of complete eye akinesia and pain reduction during surgery⁹, the insertion of the needle during the procedure is linked to pain and anxiety, potentially leading to hemodynamic instability and increased discomfort¹⁰. Lidocaine, an amino amide-based anesthetic,¹¹ finds widespread use in alleviating pain following small invasive or surgical procedures.¹²

The fright of pain resulting from the administration of local anesthetics is a common reason for people avoiding medical procedures. However, the use of topical anesthetics can help alleviate the pain and irritation caused by needle insertion. Several research have demonstrated that employing topical anesthetics effectively reduces discomfort during injection, providing a more comfortable experience for patients undergoing medical procedures.^{13,14}

Effective anesthesia also contributes to the patient's comfort and ease, which in turn facilitates the surgeon's performance. In cataract surgery, retrobulbar anesthesia is commonly used, despite its challenges. One of the difficulties with this type of anesthesia is its proximity to the eye, which increases the risk of needle placement errors. Additionally, patients may experience anxiety and alertness during the procedure, which can be problematic. To address these concerns, this study aims to investigate whether prior dermal application of lidocaine can provide better akinesia and painlessness during cataract surgery. By exploring this option, surgeons can potentially improve the overall experience for the patient and reduce the likelihood of complications.

Materials and Methods:

This observational case-control study included patients undergoing

phacoemulsification cataract surgery at Layton Rahmatullah Benevolent Trust Hospital in Lahore, Pakistan, from June 2023 to September 2023. Before the individual interventions, all patients submitted written informed consent regarding the use of their medical information in the study analysis. The sample size of 214 participants was calculated using an online calculator available at 'Openepi' according to the Fleiss sample size formula. The ratio of the sample size of the case and control was 1:1. The study power was held constant at 80% and the level of significance was 5%. After the patients had provided written informed consent for the procedure, they were randomly sampled and divided equally between the case and control groups. This study included cooperative patients who had no anesthesia-related complications and fulfilled the study inclusion requirements. The exclusion criteria were patients with retrobulbar hemorrhage, sunken eyes, hearing problems, and intellectual disabilities. The administration of topical dermal anaesthesia on the lower eyelid as well as retrobulbar anaesthesia was performed by the surgeon team, which had no personal relationship, was not part of the research team, and had no bias. About 2–5 minutes after the administration of predermal lidocaine, a retrobulbar block was done by a 1-year postgraduate trainee. Petroleum jelly was applied topically to the lower eyelids of the control group patients so that the surgeon could avoid any surgery bias.

A scale-based performance rating will be completed by the surgeon after surgery based on the degree of anesthesia and akinesia attained during surgery. Patients were asked about the extent of pain felt by the patient during block insertion using a pain rating scale from 0 to 10. Demographic and clinical characteristics of the patients, such as name, gender, age, contact number, occupation, eye requesting surgery for (right or left), and visual acuity of the patient (both eyes), were recorded. All data

was organised and assessed for completion. The Statistical Software for Social Science (SPSS) version 20.0 was used for data analysis. All the quantitative data was analysed using frequency distribution, mean and standard deviation such as age, gender, eye being operated and pain score. The comparative association of qualitative variables such as level of anaesthesia, level of akinesia, and extent of pain between the case and control groups was assessed using Pearson's Chi-square association and frequency distribution. A p-value less than 0.05 were considered statistically significant.

Results:

The study included 214 participants undergoing phacoemulsification cataract surgery, with 60 (28%) females and 154 (72%) males. The participants are divided into case and control groups. Each group had an equal number of participants, of

which 159 had surgery on the right eye and 55 had surgery on the left eye. The participants' mean age was 57.1 ± 9.3 years with a range of 30 to 80 years. The case group had anesthesia with prior dermal lidocaine administration, while the control group had anesthesia without prior dermal lidocaine administration. The level of anesthesia, level of akinesia, and extent of pain were measured to determine the effectiveness of anesthesia before cataract surgery. These factors were significantly different in both groups providing evidence that the prior dermal application of lidocaine gel on the lower eyelid increases the efficacy of ocular infiltrative anesthesia. The association of qualitative variables such as level of anesthesia, level of akinesia, and extent of pain was assessed with Pearson's Chi-square association in Table 1,2,3. Comparison mean of extent of pain felt by patients during injection in both groups is presented in Table 4.

Table 1: Association of Level of Akinesia with & without prior dermal applications of lidocaine

Anesthesia Group	No Akinesia N%	Partial Akinesia N%	Complete Akinesia N%	Total	P-Value
Case Group	2 (1.9)	21 (19.6)	84 (78.5)	107	0.0001
Control Group	38 (35.5)	67 (62.2)	2 (1.9)	107	
Total	40 (18.7)	88 (41.1)	86 (40.2)	214	

Table 2: Association of Level of Anesthesia with & and without prior dermal applications of lidocaine

Anesthesia Group	No Anesthesia N%	Partial But Acceptable Anesthesia N%	Complete Anesthesia N%	Total	P-Value
Case Group	0 (0.0)	18 (16.8)	89 (83.2)	107	0.0001
Control Group	37 (34.6)	69 (64.5)	1 (0.9)	107	
Total	37 (17.3)	87 (40.7)	90 (42.1)	214	

Table 3: Association of Extent of Pain Felt by Patients during Injection

Anesthesia Group	No Pain N%	Mild Pain N%	Moderate Pain N%	Severe Pain N%	Total	P-Value
Case Group	3 (2.8)	72 (67.3)	31 (29.0)	1 (0.9)	107	0.0001
Control Group	0 (0.0)	1 (0.9)	26 (24.3)	80 (74.8)	107	
Total	3 (1.4)	73 (34.1)	57 (26.6)	81 (37.9)	214	

Table 4: Comparison Mean of Extent of Pain Felt by Patients during Injection in both groups

Anesthesia Group	Mean	N	Std. Deviation (±)
Case Group	1.28	107	0.528
Control Group	2.74	107	0.462
Total	2.01	214	0.883

Discussion:

Retrobulbar infiltrative anaesthesia is commonly used for ocular procedures,⁽⁸⁾ but it is also related to needle-insertion-related pain and anxiety.⁽¹⁰⁾ Mimouni M. et al., while examining patients' subjective

feelings of discomfort and anxiety during retrobulbar injections, showed that 10% or so of patients with retrobulbar blocks experience really bad pain and anxiety out of 48 patients.⁽¹⁵⁾ The fear of pain resulting from the administration of local

anaesthetics is a common reason for people to avoid medical procedures. However, the use of topical anaesthetics can help alleviate the pain and irritation caused by the needle insertion.⁽¹³⁾ ⁽¹⁴⁾ Topical analgesia can also effectively decrease the perceived anxiety related to future cannulation procedures.⁽¹³⁾ Several researches have demonstrated that employing topical anesthetics effectively reduces pain during injection, providing a more comfortable experience.⁽¹⁴⁾

Previous studies from the 1990s showed that topical anaesthesia can significantly reduce the pain associated with local anaesthesia in ocular surgeries.⁽¹⁶⁾ ⁽¹⁷⁾ Our study revealed significant pain differences between the case and control groups while injecting anaesthesia, which is consistent with the findings of Cho S-Y et al.'s ⁽¹⁴⁾ randomised clinical trial. This study focuses on the effects of topical anaesthesia on pain during needle insertion and injection, along with how it correlates with anxiety in patients having apical surgery. In the present study, the mean pain scores for the case group were 1.28 ± 0.52 and 2.74 ± 0.46 for the control group (Table 4), which is close to Cho's RCT, where the mean pain scores following anaesthetic injection were 1.73 ± 1.30 in the topical anaesthetic group and 3.00 ± 2.24 in the placebo group. These findings support the idea that topical anaesthesia application at the site of needle insertion can reduce pain during anaesthetic injection.

On the other hand, a study conducted by Parirokh M. et al.⁽¹⁸⁾ shows different results from our study. This cross-over, double-blinded study focuses on the effect of topical anaesthesia on pain during infiltration injection and the success of anaesthesia for maxillary central incisors. This study shows mean pain score values during needle penetration were 1.5 ± 0.8 and 1.6 ± 0.8 after using topical anaesthesia and placebo. These are significantly different and are not comparable to our study, hence opposing our findings.

Most of the existing literature focuses on

pain reduction with topical anaesthesia at the site of needle insertion before infiltration injections, but there is not much concentration on its impact on the efficacy of infiltrative anaesthesia. Our study examines not only the pain-relieving effects but also the efficacy of infiltrative retrobulbar anaesthesia after topical anaesthesia administration at the site of needle insertion.

This study's findings indicate an enhancement of the efficacy of retrobulbar anaesthesia combined with pre-dermal topical lidocaine treatment in patients undergoing cataract surgery. Dermal lidocaine and retrobulbar anaesthesia work together to significantly reduce injection discomfort, enhance akinesia, and provide efficient anaesthesia, thereby enhancing the overall experience of the patient undergoing cataract surgery. Dermal lidocaine can be a secure and beneficial addition to retrobulbar anaesthesia that can enable doctors to increase patient satisfaction and comfort during ocular surgeries.

The study lacks crucial data on the subjective pain experiences of patients during surgical procedures. In addition, as the study is only conducted on cataract surgery patients without several surgical procedures to compare, assessing the relative effectiveness or outcomes of the surgery in question becomes difficult. However, performing several procedures for research objectives may create ethical problems as well as practical issues such as additional expenses, time, and resources. Although the findings are not generalizable, they shed light on the association between predermal lidocaine application and the efficacy of retrobulbar infiltrative anaesthesia.

Conclusion:

This observational case-control study provides significant outcomes that confirm pre-dermal lidocaine and retrobulbar anaesthesia work together to significantly

reduce injection discomfort, enhance akinesia, and provide efficient anaesthesia, thereby enhancing the overall experience of the patient undergoing cataract surgery. Dermal lidocaine is a secure and beneficial addition to retrobulbar anaesthesia that enables doctors to increase patient satisfaction and comfort during cataract surgery operations.

Recommendations:

Surgeons can use Lidocaine application to enhance efficacy of infiltrative anaesthesia. Future Larger-scale studies can be done using advanced monitoring technology Pain evaluation. Which also include Patient self-reporting.

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