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Onset of Analgesia and Ocular Akinesia Following Posterior Sub-Tenon's Anesthesia With 2% Lignocaine Using a Blunt Cannula

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Abstract

Background

Posterior sub-Tenon’s anesthesia is widely used for ophthalmic surgery because it can provide effective analgesia and ocular akinesia while avoiding a sharp needle within the orbit. This study evaluated the onset of complete analgesia and ocular akinesia after posterior sub-Tenon’s administration of 2% lignocaine through a blunt cannula and documented associated complications.

Methods

This retrospective single-arm observational study included 50 eyes of 50 adult patients who underwent elective ophthalmic surgery at Birat Rani Eye Hospital, Biratnagar, Nepal. Patients aged 18 years or older who underwent elective ophthalmic surgery under posterior sub-Tenon’s anesthesia during the study period (3rd of February 2025 to 28th of April 2025) were eligible for inclusion. Patients were identified retrospectively from hospital medical records and included consecutively if they had complete documentation of the posterior sub-Tenon’s anesthesia procedure and the relevant postoperative clinical assessments.

Following topical anesthesia and aseptic preparation, 4 mL of 2% lignocaine was administered into the posterior sub-Tenon’s space through a blunt cannula. The time from completion of injection to complete analgesia and complete ocular akinesia was recorded as per hospital protocol. Block-related complications were documented during the peri-operative period.

Results

Of the 50 participants, 29 (58%) were female, and 21 (42%) were male. The mean time to complete analgesia was 189.24 seconds (three minutes nine seconds), ranging from 150 to 248 seconds. The mean time to complete ocular akinesia was 224.96 seconds (three minutes 45 seconds), ranging from 180 to 280 seconds. Chemosis occurred in 12 eyes (24%) and subconjunctival hemorrhage in seven eyes (14%). No cases of globe perforation, retrobulbar hemorrhage, optic nerve injury, extraocular muscle damage, vasovagal attack, inadvertent subarachnoid anesthesia, or globe ischemia were observed.

Conclusion

Posterior sub-Tenon’s anesthesia using 4 mL of 2% lignocaine administered through a blunt cannula provided rapid onset of analgesia and ocular akinesia in this series. The observed complications were predominantly minor, and no serious anesthesia-related complication was recorded. Larger comparative studies are required to establish the effectiveness and safety of this technique relative to other ophthalmic anesthetic approaches.

Categories: Ophthalmology
Keywords: blunt cannula, chemosis, lignocaine, ocular akinesia, ophthalmic anesthesia, posterior sub-tenon’s anesthesia, retrobulbar hemorrhage, sub-conjunctival hemorrhage

Introduction

Cataract and other ophthalmic surgeries are performed in large numbers worldwide, making the selection of an appropriate anesthetic technique important for ensuring patient comfort, adequate surgical conditions, and procedural safety. Cataract surgery is one of the most commonly performed and cost-effective interventions in medicine. Approximately 26 million cataract procedures are performed worldwide each year, contributing substantially to the restoration of vision, functional independence, and productivity [1-4].

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Cataract and other intraocular surgeries can be performed under various types of anesthesia, including general anesthesia, retrobulbar block, peribulbar block, posterior sub-Tenon's block, and topical anesthesia. The choice of anesthetic technique depends on several factors, including the type and duration of surgery, patient cooperation, systemic health status, ocular condition, and surgeon preference, with the overall aim of providing adequate analgesia, akinesia, and safe completion of surgery.

Retrobulbar and peribulbar blocks have traditionally been widely used for intraocular surgery because they can provide effective analgesia and ocular akinesia. However, these techniques involve the use of sharp needles within or around the orbit and are associated with rare but potentially serious complications. These include retrobulbar hemorrhage, globe perforation, optic nerve injury, and inadvertent spread of local anesthetic to adjacent structures [5,6]. Although such complications are uncommon, their potential severity has encouraged the development and increasing use of alternative regional anesthetic techniques.

Posterior sub-Tenon's anesthesia is an established regional anesthetic technique in which local anesthetic is administered into the potential space between Tenon's capsule and the sclera. The use of a blunt cannula allows the anesthetic to be delivered into the posterior sub-Tenon's space without the direct passage of a sharp needle through the orbital tissues. When performed appropriately, this technique can provide effective analgesia and ocular akinesia while potentially reducing the risk of certain needle-related complications [7-9]. The primary objective of this study was to determine the time required to achieve complete analgesia and complete ocular akinesia following posterior sub-Tenon's administration of 4 mL of 2% lignocaine through a blunt cannula in patients undergoing elective ophthalmic surgery. The secondary objective was to document the incidence and nature of perioperative complications associated with this technique.

Materials And Methods

Study design and setting

This was a retrospective, single-arm observational study conducted in the Department of Ophthalmology at Birat Rani Eye Hospital, Biratnagar, Nepal. The study included 50 eyes of 50 adult patients who underwent elective ophthalmic surgery for which posterior sub-Tenon's anesthesia was considered clinically appropriate.

The study period was three months, from February 3, 2025, to April 28, 2025. Ethical approval was obtained from the Birat Rani Eye Hospital Institutional Ethics Committee, Biratnagar, on September 1, 2026 (approval reference number: 053/083/084). Written informed consent was obtained from all participants.

Sampling technique

All eligible patients who underwent ophthalmic surgery under posterior sub-Tenon's anesthesia during the study period were searched from hospital records and were consecutively recruited. Data regarding the onset of analgesia, onset of ocular akinesia, and procedure-related complications were retrospectively retrieved from existing medical and anesthesia records.

Participants

Patients aged 18 years or older who underwent elective ophthalmic surgery under posterior sub-Tenon's anesthesia during the study period were eligible for inclusion. Patients were identified retrospectively from hospital medical records and included consecutively if they had complete documentation of the posterior sub-Tenon's anesthesia procedure and the relevant postoperative clinical assessments.

Patients were excluded if the medical records documented refusal of the anesthetic technique, known allergy to lignocaine, active ocular or periocular infection, severe ocular surface or orbital pathology, uncontrolled systemic illness, inability to cooperate or reliably report symptoms, previous orbital surgery or significant orbital anatomical abnormality, or a clinical requirement for general anesthesia or another primary anesthetic technique. Records with incomplete or insufficient information regarding the onset of analgesia, anesthesia, or ocular akinesia were also excluded from the analysis.

Anesthetic technique

As per the hospital's protocol, topical 4% lignocaine eye drops were administered, followed by painting of the ocular and periocular area with 5% povidone-iodine. The patient was then positioned and draped using standard aseptic technique. A small conjunctival incision was made approximately 5 mm posterior to the limbus in the selected inferonasal quadrant. The conjunctiva and Tenon's capsule were gently elevated with toothed forceps, and Westcott scissors were used to dissect into the sub-Tenon's space. A blunt cannula was then introduced toward the posterior sub-Tenon's space. After confirming that the cannula advanced without significant resistance, 4 mL of 2% lignocaine was injected slowly.

Assessment of analgesia and akinesia

As per the hospital protocol, the completion of anesthetic injection was considered time zero. The time to complete analgesia was recorded as the interval between completion of the injection and achievement of clinically complete analgesia as documented in the study proforma. The time to complete ocular akinesia was similarly recorded. Assessments were performed using the predefined clinical criteria used in the study protocol. Any need for supplemental anesthesia was recorded. The criteria for defining complete analgesia was no pain to the patient with touching the eyeball/ conjunctiva with cotton tip applicator, complete akinesia was defined by complete restriction of movement of eyeball on asking the patient to move his/her eyeball.

Assessment of complications

Patients were monitored for complications associated with posterior sub-Tenon's anesthesia from the record books. The recorded complications included chemosis, subconjunctival hemorrhage, extraocular muscle injury, retrobulbar hemorrhage, optic nerve injury, globe perforation, vasovagal attack, inadvertent subarachnoid anesthesia, and globe ischemia. Complications were documented at the time of occurrence and managed according to standard clinical practice.

Statistical analysis

Data were searched from the medical records of operation theater, entered and analyzed using appropriate statistical software IBM SPSS version 31.0.0 (IBM Corp., Armonk, NY). Continuous variables were summarized using mean and range, while categorical variables were summarized as frequencies and percentages. No comparative hypothesis testing was performed for the primary onset-time outcomes in the present analysis.

Results

Demographic characteristics

A total of 50 eyes from 50 patients were included. There were 29 females (58%) and 21 males (42%). The age of the participants ranged from 46 to 90 years. The largest age group was 56-60 years, comprising 12 patients (24%), followed by 51-55 years with eight patients (16%). Six patients (12%) each were aged 61-65, 66-70, and 71-75 years. Five patients (10%) were aged 76-80 years, three (6%) were aged 86-90 years, and two (4%) each were aged 46-50 and 81-85 years. No participant was younger than 46 years (Table *1*).

Age group (years)	Number (n)	Percentage (%)
46-50	2	4
51-55	8	16
56-60	12	24
61-65	6	12
66-70	6	12
71-75	6	12
76-80	5	10
81-85	2	4
86-90	3	6
Total	50	100

TABLE 1: Age Distribution of Study Participants

Onset of complete analgesia

The mean time to onset of complete analgesia following posterior sub-Tenon's administration of 4 mL of 2% lignocaine was found to be 189.24 seconds, equivalent to approximately three minutes and nine seconds. The fastest recorded onset was 150 seconds (two minutes 30 seconds), while the longest was 248 seconds (four minutes eight seconds).

Onset of complete ocular akinesia

The mean time to complete ocular akinesia was found to be 224.96 seconds, equivalent to approximately

three minutes and 45 seconds. The fastest recorded onset was 180 seconds (three minutes), and the longest was 280 seconds (four minutes 40 seconds). Thus, complete akinesia was achieved later than complete analgesia in the present series.

Complications

Chemosis was the most frequently observed complication, occurring in 12 eyes (24%). Subconjunctival hemorrhage occurred in seven eyes (14%). No cases of extraocular muscle damage, retrobulbar hemorrhage, optic nerve injury, globe perforation, vasovagal attack, inadvertent subarachnoid anesthesia, or globe ischemia were observed. Overall, 31 eyes (62%) had no recorded complication (Table *2*).

Complication	Number (n)	Percentage (%)
Chemosis	12	24
Subconjunctival hemorrhage	7	14
Extraocular muscle damage	0	0
Retrobulbar hemorrhage	0	0
Globe perforation	0	0
Vasovagal attack	0	0
Inadvertent subarachnoid anesthesia	0	0
No recorded complication	31	62

TABLE 2: Complications Following Posterior Sub-Tenon's Anesthesia

Discussion

The present study evaluated the onset of analgesia and ocular akinesia after posterior sub-Tenon's administration of 4 mL of 2% lignocaine through a blunt cannula. The findings were a mean onset of complete analgesia of 189.24 seconds and a mean onset of complete ocular akinesia of 224.96 seconds. These findings indicate that clinically useful analgesia and akinesia can develop within a few minutes following the block.

Chemosis was the most common complication in our study, occurring in 24% of eyes. Chemosis is a recognized minor complication of sub-Tenon's anesthesia and may be related to the site and depth of dissection, injection volume, and anterior placement of the anesthetic. Kumar et al. emphasized that chemosis and subconjunctival hemorrhage are among the most frequent complications of the technique [1]. McNeela and Kumar similarly reported minor chemosis in 43 of 59 patients, with moderate or severe chemosis in a subset of patients [5]. The frequency observed in our study therefore falls within the range reported in studies using blunt cannula techniques, although definitions and severity grading differ.

The relatively rapid onset observed in the present study is consistent with the established clinical utility of posterior sub-Tenon's anesthesia. Roman et al. reported effective anesthesia using only 1.5 mL of 2% lignocaine delivered through a blunt cannula, although their study performed surgery immediately after the block rather than systematically quantifying onset time in seconds. They reported no anesthesia-related complications and high rates of pain-free block administration and surgery [4]. The present study used a larger volume of 4 mL and specifically measured the interval to complete analgesia and akinesia, making direct numerical comparison with the earlier study inappropriate.

The onset of ocular akinesia in the present study is also broadly comparable with findings from McNeela and Kumar, who studied 59 patients receiving 5 mL of 2% lidocaine with adrenaline and hyaluronidase through an ultrashort blunt cannula. In that study, ocular movement and eyelid function were assessed at two and four minutes, and only one patient required supplementary anesthesia at 10 minutes [5]. Differences in anesthetic volume, additives, cannula dimensions, anatomical placement, and criteria used to define adequate akinesia may account for differences between studies. Therefore, the results should be interpreted as supportive rather than directly equivalent.

In a randomized comparative study of 152 eyes, Iganga et al. found that posterior sub-Tenon's and peribulbar anesthesia produced comparable levels of adequate akinesia and analgesia during cataract surgery. The authors also found that 97% of patients receiving posterior sub-Tenon's anesthesia reported mild or no pain during surgery [6]. These findings support the clinical effectiveness of posterior sub-Tenon's

anesthesia and are consistent with the satisfactory onset observed in the present series.

Subconjunctival hemorrhage occurred in 14% of eyes in the present study. This complication is generally related to trauma to small conjunctival or Tenon's vessels during incision and dissection. In the large retrospective series of 35,850 procedures reported by Lerch et al., subconjunctival hemorrhage related to sub-Tenon's anesthesia occurred in 4.3% of eyes. Their technique used a flexible polyurethane cannula and differed substantially from the present technique in cannula design, anesthetic formulation, and patient population [7]. The higher rate in our study may therefore reflect differences in technique, case mix, and complication ascertainment rather than a direct difference in intrinsic safety.

Importantly, no globe perforation, retrobulbar hemorrhage, optic nerve injury, extraocular muscle damage, globe ischemia, vasovagal attack, or inadvertent subarachnoid anesthesia was observed in the present series. Modern reviews describe sight- and life-threatening complications of posterior sub-Tenon's anesthesia as extremely uncommon, although they remain possible [2,3]. The absence of these complications in 50 cases is reassuring but should not be interpreted as evidence that such events cannot occur. A sample of this size is insufficient to estimate the incidence of rare adverse events with precision.

The findings have practical relevance for ophthalmic anesthesia. The mean onset of complete analgesia was slightly less than 3.5 minutes, while complete ocular akinesia occurred at approximately 3.75 minutes. This suggests that a short interval after administration can allow adequate assessment of the block before beginning surgery. The technique may be particularly attractive when avoidance of sharp-needle orbital injection is desirable.

Limitations

The sample size of our study was 50, which limits the statistical power of the study and makes it difficult to identify rare complications of the procedure. Also, the assessment of the onset of complete analgesia and ocular akinesia involved clinical judgment and may therefore be subject to interobserver or observer-related variability.

Conclusions

Posterior sub-Tenon's anesthesia using 4 mL of 2% lignocaine administered through a blunt cannula provided rapid onset of complete analgesia and ocular akinesia in this series, with mean onset times of approximately 3.2 and 3.7 minutes, respectively. Chemosis and subconjunctival hemorrhage were the principal complications, while no serious anesthesia-related complications were observed. The findings suggest that posterior sub-Tenon's anesthesia is an effective and relatively safe regional anesthetic technique for suitable ophthalmic surgery. Larger comparative studies are needed to confirm these findings and to better characterize rare complications.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Nischal Ghimire, Anima Deshar, Sundip D. Chhetri, Reema Bharati

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Disclosures

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References

1. Kumar CM, Eid H, Dodds C: Sub-Tenon's anaesthesia: complications and their prevention . Eye (Lond). 2011, 25:694-703. 10.1038/eye.2011.69
2. Chua MJ, Lersch F, Chua AW, Kumar CM, Eke T: Sub-Tenon's anaesthesia for modern eye surgery—clinicians' perspective, 30 years after re-introduction. Eye (Lond). 2021, 35:1295-304. 10.1038/s41433-021-01412-5
3. Guise PA: Sub-Tenon anesthesia: a prospective study of 6,000 blocks . Anesthesiology. 2003, 98:964-8. 10.1097/00000542-200304000-00025
4. Roman SJ, Chong Sit DA, Boureau CM, Auclin FX, Ullern MM: Sub-Tenon's anaesthesia: an efficient and safe technique. Br J Ophthalmol. 1997, 81:673-6. 10.1136/bjo.81.8.673
5. McNeela BJ, Kumar CM: Sub-Tenon's block with an ultrashort cannula . J Cataract Refract Surg. 2004, 30:858-62. 10.1016/S0886-3350(03)00555-8
6. Iganga ON, Fasina O, Bekibele CO, Ajayi BG, Ogundipe AO: Comparison of peribulbar with posterior sub-Tenon's anesthesia in cataract surgery among Nigerians. Middle East Afr J Ophthalmol. 2016, 23:195-200. 10.4103/0974-9233.164609
7. Lerch D, Venter JA, James AM, Pelouskova M, Collins BM, Schallhorn SC: Outcomes and adverse events of sub-Tenon's anesthesia with the use of a flexible cannula in 35,850 refractive lens exchange/cataract procedures. Clin Ophthalmol. 2020, 14:307-15. 10.2147/OPTH.S234807
8. Que L, Zhu Q, Jiang C, Lu Q: An analysis of the global, regional, and national burden of blindness and vision loss between 1990 and 2021: the findings of the Global Burden of Disease Study 2021. Front Public Health. 2025, 13:1560449. 10.3389/fpubh.2025.1560449
9. Davis G: The evolution of cataract surgery . Mo Med. 2016, 113:58-62.