Brief Communication

Time to Switch to Sub-Tenon Anaesthesia – An Anaesthetist's Boon

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Introduction

Anatomical Foundations: Targeting the Sub-Tenon's Space

Sub-Tenon's space is the potential areolar plane between Tenon's capsule and the sclera, which contains the ciliary neurovascular structures and is the target for anesthetic delivery.

Structure	Location (from Limbus)	Relation to Equator	Relevance to STA
Globe Equator	**~13–14 mm** (avg. eye)	Anatomical midline landmark	Divides **anterior (entry)** from **posterior (target)** zone.
Anterior Ciliary Vessels	~7–10 mm	Anterior to equator	AVOIDED by posterior cannula direction.
Long Posterior Ciliary Nerves/Arteries	Enter globe ~2–4 mm from optic nerve	Trunks posterior; terminal plexus extends to limbus	Directly anesthetized in the space; blunt cannula only displaces them safely.

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Article History
Received: 12th November 2025
Revision: 22nd November 2025
Accepted: 28th December 2025
Published: 30th December

Key words
Sub-tenon anaesthesia, cataract surgery
Article History

How to cite this article: Srujathi M P, Raja N R, Dusa P. Time to Switch to Sub-Tenon Anaesthesia- An Anaesthetist's Boon. Ind J Ophthal Anaesth 2025;6(1):33-5

Structure	Location (from Limbus)	Relation to Equator	Relevance to STA
Short Posterior Ciliary Nerves/Arteries	**Pierce sclera posteriorly near optic nerve to enter choroid**	Posterior to equator	Indirectly anaesthetized via diffusion through sclera.
Vortex Vein Ampullae	~14–18 mm (within choroid)	At/just behind equator	Cannula passes over them in sub-Tenon's space.
Vortex Vein Scleral Exit	14–25 mm (commonly 18–22 mm)	Posterior to equator, more superiorly	CRITICAL to avoid; no major trunks exit in the inferonasal quadrant.

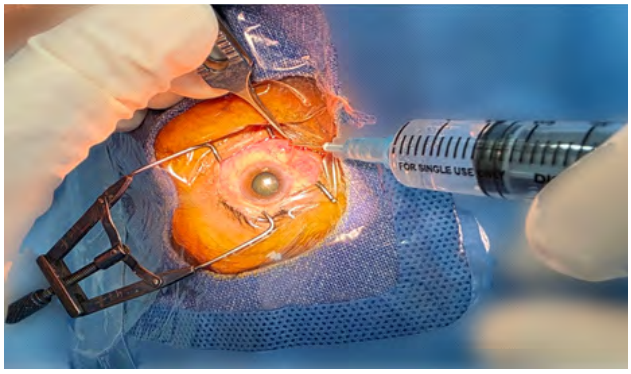

Figure 1: Subtenon's Anesthesia Injection (Left Eye)
Procedure depiction showing the injection site at the 7 o'clock position, 7 mm posterior to the limbus. A 25-gauge needle with 7 mm of exposed tip is used to administer 2 mL of local anesthetic agent into the subtenon's space.

The Injection Site

Inferonasal quadrant : 5'o clock -right eye, 7'o clock -left eye (figure:1)

a. Clear of the vortex vein.
b. Not the primary path of a major named long posterior bundle;
c. No large rectus muscle directly inserts here;
d. Inferior oblique insertion is more posterior.
e. Easy to expose by gently pulling the eye up and out.

Safety Summary: Enter within the anterior **vortex vein-free zone** (~10 mm from limbus) at 5-7 mm from limbus. Keep the cannula close to the globe, directing it posteriorly—not deep or nasally.

Precaution: If you meet resistance, stop, withdraw slightly, and redirect superficially; forcing could risk vessel injury.

The Procedure

A standardized approach is critical for safety and efficacy.

1. Informed Consent

2. Pre-Procedural Evaluation: about history of drug allergies (local anaesthetics).

3. Antithrombotic Management: sub-tenons anaesthesia is associated with low risk of significant orbital hemorrhage, hence in high risk patients antithrombotic medications are routinely continued. However, in low risk cases after consultation with a physician, a temporary perioperative pause may be considered.

4. **Topical Anaesthesia:** Proparacaine or tetracaine drops are applied to numb the conjunctiva.

5. **Antisepsis:** Povidone-iodine is applied to the ocular surface.

6. **Exposure:** A small eyelid speculum is inserted.

7. **Conjunctival Incision:** A small (~2-3 mm) snip or blunt dissection is made through the conjunctiva and Tenon's capsule at the inferonasal location. This is often done with Westcott conjunctival scissors with 2 blunt tips or a punctum dilator.

Note: extensive blunt dissection of the space by the two blunt tips should be avoided.

8. **Cannula Insertion:** A blunt, curved tip cannula 25-gauge of Length: 25 mm (approximately 1 inch) is inserted through the incision and gently advanced posteriorly, following the contour of the globe into the Sub-Tenon's space. There should be minimal resistance during insertion of needle.

Rule of Thumb: Never advance the cannula so far that the hub touches the conjunctiva. Leave a 5-10 mm gap (figure:1). This ensures the tip stays 5-10 mm anterior to the orbital apex.

9. **Anaesthetic mixture:** The local anaesthetic 2-3ml is slowly injected. The globe and eyelids may balloon slightly as the space expands.

   Administering high volumes could cause a raise in, positive pressure and excessive chemosis.

	COMPOSITION	TOTAL VOLUME	NOTES
Mixture A	Lidocaine with Hyaluronidase	2–3 mL	A standard preparation for subtenon's anaesthesia.
Mixture B	Lidocaine with Hyaluronidase + Ropivacaine	2–3 mL (1:1 mixture) • 1–1.5 mL Lidocaine/Hyal. • 1–1.5 mL Ropivacaine	This combination is often preferred. The rapid onset of lidocaine is complemented by the longer duration of ropivacaine, providing effective and sustained akinesia.

Purpose of Hyaluronidase: Acts as a "spreading agent" by hydrolyzing hyaluronic acid in the extracellular matrix enhancing the diffusion of the anesthetic mixture, leading to longer-lasting drug action.

10. **Managing Chemosis:** If significant chemosis develops during injection, the bent cannula tip can be used to gently direct and spread the fluid, often reducing the localized swelling.
11. **Diffusion:** The anaesthetic spreads circumferentially and posteriorly within the space, bathing the ciliary nerves.

Expected but Manageable Side Effects: Pre anaesthetic counseling required

Pressure/Ache: Normal, brief sensation during injection; slow injection of fluid reduces it.

Chemosis: Common, harmless swelling; resolves in hours. Gentle massage with cannula can help.

Hemorrhage: Harmless bruise; fades in 1–2 weeks.

Inadequate Akinesia: If eye moves after STA, a small supplemental dose via the same track is effective.

Although major complications like optic nerve damage or brainstem anaesthesia, retinal ischemia and rectus muscle injury are documented, I have successfully avoided them by adhering to strict procedural protocols regarding location, depth, and technique."

The benefits of routine Sub-Tenon anaesthesia are:

1. **Enhanced Surgical Control and Patient Cooperation:** As akinesia is not fully established, it allows for some amount of eye movement. This provides perfect exposure for the bridle suture without force, replacing mechanical manipulation on a frozen orbit.
2. **Superior for anterior segment procedures:** Suitable for pterygium surgery,. This provides immediate analgesia while preserving some eye movement, allowing easy manipulation to harvest the superior conjunctival graft.

   Importantly, anesthetic diffusion blocks the terminal small diameter motor nerves of CN VII (facial nerve), that supply orbicularis muscle fibers, providing effective orbicularis akinesia. This relaxes the eyelid, preventing squeezing and facilitating speculum manipulation.
3. **Quicker onset of analgesia:** STA provides near-instant onset analgesia (10–30 seconds), delivering optimal surgical conditions for all types of cataract surgeries. In retinal procedures, it acts as an effective primary or supplemental block, reliably extending pain relief and akinesia.

4. Reoperation Reliability: This is a game changer for patients requiring a second surgery-be it

- Secondary IOL implantation
- Anterior chamber wash
- Corticle wash
- IOL redialing
- IOL exchange
- Repeat conjunctival cautery
- AC reformation
- Suture removal

STA is unparalleled. It eliminates the fear of another sharp needle while providing far more effective akinesia than topical anesthesia alone, reducing stress for both patient and surgeon.

5. Logistical Versatility: This block is highly adaptable, safely performed in the operation room or preparatory area, and ideal for optimizing turnover in high-volume surgical settings

6. Operative Tranquility: This technique grants unparalleled peace of mind, virtually eliminating the fear of a catastrophic block complication.

Reasons for safety

- **Blunt Cannula, Low Perforation Risk:** Eliminates the risk of optic nerve injury, retrobulbar hemorrhage from vessel puncture, and inadvertent intracranial injection.
- **Direct Access to Nerves:** Causes efficient akinesia (no eye movement) and analgesia
- **Reduced Intraocular Pressure (IOP) Spike:** Leads to anaesthetic block in lesser volume of the LA solution.
- **Lower Systemic Toxicity Risk:** As only 2-3 ml 2% lignocaine (20mg/ml) with Hyalase (16.5 IU/ml), or 1ml lignocaine with hyalase and 1ml 0.75% rupivacaine (7.5mg/ml) is being used.

Below is the table comparing a 1 mL injection of each drug to its systemic toxic threshold for a 70 kg patient.

Drug & Concentration	Volume	Total Dose Administered	Max. Safe Dose (for 70 kg)	**% of Toxic Dose**
Lidocaine 2% (20 mg/mL)	1 mL	**20 mg**	~280 mg	**~7%**
Ropivacaine 0.75% (7.5 mg/mL)	1 mL	**7.5 mg**	~210 mg	**~4%**

Key Takeaway:

A 1 mL sub-Tenon's injection represents only 4–7% of the systemic toxic dose, demonstrating an exceptionally wide safety margin.

True anaesthetic allergies (IgE-mediated)are rare. Most "reactions" during injections are due to:

- Vasovagal episodes, Systemic toxicity from accidental intravascular injection of the drug. Reactions to additives like adrenaline (epinephrine), animal-derived hyaluronidase
- The modern hyaluronidase is a safer alternative but expensive, bacteria-produced recombinant human version, though animal-derived forms remain in common use

7. **An Imperative for Modern Surgical Training:** Updating our training paradigm is imperative. By prioritizing STA from the outset, we instill more than a technique—we instill a philosophy of safety and self-reliance. This empowers new surgeons to practice confidently, even in settings without sophisticated anaesthetic backup, freeing them from the fear of catastrophic complications inherent to sharp-needle blocks. It is an investment in autonomous, capable surgeons from day one.

Contraindications:

1. Patient refusal or inability to cooperate.
2. Active infection at the injection site (e.g., conjunctivitis, scleritis).
3. Severe coagulopathy or anticoagulant therapy with high bleeding risk.
4. Nanophthalmic eyes (due to risk of pressure spike).
5. Previous ocular surgery with scleral thinning or a glaucoma drainage device (risk of perforation or tube damage).
6. Extensive scarring and poor diffusion of the sub-tenons space, from prior surgery like scleral buckle surgery for RD or trauma.
7. Allergy to the anaesthetic agent.
8. Significant strabismus (risk of myotoxicity to extraocular muscles).

A Clear Choice for the Modern Cataract Surgeon

My journey from peribulbar to sub-Tenons anaesthesia has been one of progressive enlightenment. While I respect the role peribulbar blocks have played in our field, the evidence from my own practice is overwhelming. STA is safer, more patient-friendly, and provides a superior surgical environment for a wide spectrum of procedures, from any type of cataract surgery to pterygium excision and complex reoperations.

Its versatility in handling everything from routine surgeries to secondary interventions, combined with its logistical benefits for efficient high-volume care and its paramount importance in modern surgical training, makes it an indispensable tool.

For the sake of our patients' comfort, our own surgical confidence, and the competence of future ophthalmologists, it is indeed time to switch to sub-Tenons anaesthesia.

Financial support and sponsorship : Nil.

Conflicts of interest : There are no conflicts of interest.