Unit 4 — Sañjñāharaṇa in Netraroga (Anesthesia in Ophthalmology)

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Goal: by the end of this chapter you will be able to choose, administer, and monitor appropriate anesthesia for common ophthalmic procedures, anticipate complications (especially the oculocardiac reflex), and write exam-ready notes that integrate Ayurvedic context with contemporary standards of care.

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1) Concept & Scope

Sañjñāharaṇa (abolition of sensation/awareness for painless procedures) is indispensable in **Śālākya—Netra** practice. While classical Ayurveda acknowledges the need to reduce pain, fear, and reflexes before sharp/operative measures, today's ophthalmic anesthesia is delivered by **local/topical techniques, regional orbital blocks, monitored sedation, and general anesthesia**—selected according to **surgery type, patient factors, and surgeon skill**. Your exam answers should show:

- Clear **indications/contraindications** for each technique.
- **Drug names, concentrations, volumes, and adjuvants**.
- **Complication recognition + first-line management** (especially **LAST**, **retrobulbar hemorrhage**, **globe perforation**, **brainstem anesthesia**, **oculocardiac reflex**).

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2) Pre-anesthetic Assessment & Preparation (Netra Focus)

History & risks: previous reactions to local anesthetics, bleeding disorders/anticoagulants, uncontrolled **HTN/DM**, asthma/COPD, **axial high myopia** (globe perforation risk), glaucoma, psychiatric illness, communication barriers.
Examination: vitals, airway (if sedation/GA), ocular status (axial length if available), **IOP trends**, extra-ocular movements, lids, conjunctiva.
Consent & instructions: fasting (if sedation/GA), avoid eye rubbing, arrange escort.
Monitoring (minimum): pulse oximetry, NIBP, +/- **ECG** in elderly/comorbid.
Rescue readiness: oxygen, suction, bag–mask, IV access, **lipid emulsion 20%**, benzodiazepine for seizures, **atropine** for bradycardia, emergency cart.

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3) Types of Ophthalmic Anesthesia

A) Topical Anesthesia (surface corneal/conjunctival block)

Agents (typical):

- **Proparacaine 0.5%** (rapid onset ~20–30 s; duration ~10–15 min)
- **Tetracaine 0.5%** (similar profile; more sting)
- **Lignocaine (lidocaine) 2% gel** (longer contact, useful in phaco)
- **Oxybuprocaine 0.4%** (where available)

Indications: phacoemulsification (many cases), pterygium excision (with subconjunctival supplement), foreign-body removal, suture removal, diagnostic procedures.
Advantages: easy, quick, maintains ocular motility/airway reflexes.
Limitations: no akinesia, poor for long/painful intraocular steps; epithelial toxicity if repeatedly instilled.

Pearls: add **intracameral preservative-free lidocaine 1% (0.1–0.2 ml)** during cataract as needed.

B) Infiltration & Regional Anesthesia

1) Subconjunctival Anesthesia

- **Drug:** lignocaine 2% (0.2–0.5 ml) +/- small adrenaline for lid hemostasis **(avoid intraocular vasoconstrictor)**.
- **Use:** pterygium, conjunctival suturing, superficial procedures.

2) Intracameral Anesthesia

- **Drug: preservative-free** lignocaine 1% (0.1–0.2 ml) via paracentesis.
- **Use:** cataract (with topical), anterior chamber manipulation.

3) Sub-Tenon's (Episcleral) Block — preferred regional for many intraocular surgeries

- **Cannula:** blunt 19–23G through a small inferonasal conjunctival/Tenon's nick.
- **Volume/Drugs: 3–5 ml** mixture (e.g., **lignocaine 2% + bupivacaine 0.5%**), often with **hyaluronidase 7.5–15 IU/ml**.
- **Advantages:** excellent anesthesia, good akinesia with low risk of globe perforation, optic nerve injury, or brainstem spread.
- **Indications:** cataract, trabeculectomy, many vitreo-retinal procedures in cooperative adults.

4) Peribulbar Block

- **Needle:** 25–27G, 25–38 mm; 1–2 injection sites (inferotemporal ± superonasal).
- **Volume/Drugs: 6–10 ml** of lignocaine 2% + bupivacaine 0.5% + hyaluronidase 7.5–15 IU/ml; onset 5–10 min.
- **Advantages:** reliable **akinesia**; safer than retrobulbar.
- **Cautions:** chemosis/eyelid edema, raised IOP; gentle **ocular compression** (e.g., Honan device 10–15 mmHg for ~10 min) can help.

5) Retrobulbar Block (posterior intraconal) — declining use

- **Needle:** 23–25G, ~31–38 mm via inferotemporal fornix; **2–4 ml** of agent.
- **Pros:** rapid, dense block.
- **Cons/risks: retrobulbar hemorrhage**, **optic nerve injury**, **globe perforation**, **brainstem anesthesia**; now replaced by sub-Tenon's/peribulbar in many centers.

6) Facial Nerve Blocks (for lid akinesia in selected lid/orbital surgery)

- **Van Lint, O'Brien, Atkinson** techniques—targeting branches of **VII nerve** to prevent forceful squeezing.
- Often unnecessary if peribulbar/sub-Tenon's already provide adequate orbicularis relaxation; still useful in **blepharoplasty, entropion/ectropion repair**.

7) Eyelid Infiltration

- **Drug:** lignocaine 2% with or without **adrenaline 1:200,000** for hemostasis (**avoid if peripheral perfusion is compromised**).
- **Use: chalazion**, lid lacerations, minor lid procedures; inject **subcutaneously along lid margin**, respecting septum and avoiding globe.

C) Monitored Anesthesia Care (MAC) / Sedation

- **Goals:** anxiolysis and analgesia **without** airway compromise.
- **Common regimens:**

- **Midazolam 0.5–2 mg IV** titrated;
- **Fentanyl 25–50 µg IV** (cautious in elderly);
- **Dexmedetomidine infusion** for cooperative sedation (bradycardia risk—monitor).

- **Precautions:** supplemental oxygen via nasal cannula; continuous SpO_2/NIBP; avoid oversedation (especially in **topical** cases where patient feedback is valuable).

D) General Anesthesia (GA)

Indications: infants/children, **uncooperative/anxious** adults, **long vitreoretinal/orbital** surgeries, **open globe trauma**, combined procedures.
Airway/Agents: IV induction (e.g., **propofol**), **sevoflurane** maintenance; **LMA** or **ETT** based on aspiration risk; multimodal analgesia; antiemetic prophylaxis (**ondansetron**).
Special issues: prevention/management of **oculocardiac reflex**, gentle emergence to avoid IOP spikes, protection of the operated eye.

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4) Drugs in Ophthalmic Anesthesia — Quick Reference

Class	Examples	Key points (dose/conc.)
Local anesthetics	**Lignocaine 2%**, **Bupivacaine 0.5%**, **Ropivacaine 0.5–0.75%**	Onset: lignocaine fast; duration: bupivacaine long. **Max safe dose (general guide):** lignocaine **3–5 mg/kg** (plain), **up to ~7 mg/kg** with adrenaline; bupivacaine **≤ 2.5 mg/kg**; ropivacaine **≤ 3 mg/kg**. Use **small orbital volumes**.
Topicals	Proparacaine 0.5%, Tetracaine 0.5%, Lignocaine gel 2%	Rapid onset; avoid frequent repeat → epithelial toxicity/delayed healing.
Adjuvants	**Hyaluronidase 7.5–15 IU/ml**	Improves spread/akinesia; beware allergy.
Vasoconstrictor (limited use)	Adrenaline 1:200,000	**For skin/lid infiltration** to reduce bleeding; **avoid** mixing in peri/retrobulbar solution (ischemia risk).
Sedatives/analgesics	Midazolam, Fentanyl, Dexmedetomidine	Titrate slowly; monitor airway.
Anticholinergic	**Atropine** (OCR)	For bradycardia during extraocular muscle traction.
Rescue for LAST	**Lipid emulsion 20%**	**Bolus 1.5 ml/kg**, then infusion per protocol if systemic toxicity occurs.

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5) Complications & Their Management

A) Oculocardiac Reflex (OCR)

Trigger: traction on extraocular muscles, pressure on globe, retrobulbar injection.
Pathway: Afferent—V1 (trigeminal) → brainstem → **Efferent—vagus** → **bradycardia, AV block, asystole** in severe cases.
Management: Stop stimulus, call out; ensure oxygenation, deepen anesthesia/sedation; **atropine IV** if bradycardia persists. **Prevention:** adequate block; prophylactic anticholinergics in high-risk pediatric strabismus surgery.

B) Retrobulbar Hemorrhage

Clues: sudden proptosis, tense lids, pain, rapidly rising IOP, loss of red reflex.
Immediate actions: stop, call help, **IOP-lowering measures** (IV mannitol if available), **lateral canthotomy/cantholysis** if optic nerve perfusion is threatened; postpone surgery.

C) Globe Perforation

Risk: high axial myopia, posterior staphyloma, long sharp needle use.
Signs: sudden pain, hypotony, decreased vision, vitreous hemorrhage.
Action: stop injection, **urgent retina consult**, B-scan/ocular exam, manage retinal tears/detachment promptly.

D) Local Anesthetic Systemic Toxicity (LAST)

Early signs: perioral numbness, tinnitus, metallic taste, agitation → **seizures**, CNS depression; later **arrhythmias**.
Treatment: secure airway, oxygen, **benzodiazepine** for seizures, start **20% lipid emulsion** (bolus 1.5 ml/kg → infusion), ALS protocol.

E) Brainstem Anesthesia

Mechanism: inadvertent spread along optic nerve sheath.
Presentation: contralateral amaurosis, dysarthria, apnea.
Management: airway support, oxygenation, cardiovascular stabilization; observe till recovery.

F) Myotoxicity / Diplopia

Cause: direct injection into extraocular muscle, high-concentration bupivacaine.
Prevention: correct needle path; prefer **sub-Tenon's** or lower-concentration mixes.

G) Topical Toxicity

Excess proparacaine/tetracaine → punctate keratopathy, delayed healing; **counsel** against self-use.

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6) Choosing the Technique — Procedure-wise Matrix

Procedure	First choice	Alternatives	Notes
Phacoemulsification (adult)	**Topical + intracameral**	Sub-Tenon's / Peribulbar (anxious/unsteady)	No globe akinesia with topical; talk through steps.
Trabeculectomy	**Sub-Tenon's**	Peribulbar	Avoid adrenaline near filtration tissues.
Pterygium	**Topical + subconjunctival**	Sub-Tenon's for extensive cases	Adequate topical is often sufficient.
Vitreoretinal (selected)	**Sub-Tenon's/Peribulbar**	**GA** (long/complex)	Surgeon preference; patient cooperation crucial.
Strabismus (children)	**GA**	—	OCR risk high; use anticholinergic prophylaxis.
Chalazion / Lid surgery	**Lid infiltration**	+ Sedation if anxious	Consider facial nerve block for blepharoplasty.
Open-globe trauma	**GA**	—	Prevent extrusion; do not compress globe.

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7) Practical Steps (checklist style)

1. **Confirm plan** with surgeon (topical vs block vs GA).
2. **Mark eye**, establish IV line (for blocks/MAC/GA), monitors on.
3. **Asepsis:** povidone-iodine 5% into fornices before block.
4. **Perform block** (prefer **sub-Tenon's** where feasible).
5. **Ocular compression** (peribulbar) to reduce IOP and spread agent.
6. **Reassess akinesia/analgesia** before draping; top-up if needed.

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7. **Intra-op vigilance:** OCR watch, patient communication (topical).
8. **Post-op:** shield, analgesia, nausea control, discharge advice.

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8) Ayurvedic Context (framing for viva)

In classical surgical thought, eliminating pain and fear before **śastra/yantra** use is emphasized; in the **ūrdhvajatru** region this aligns with **gentle handling, mind-body calming**, and appropriate **śodhana/śamana** sequencing for recovery. In practice today, **contemporary ophthalmic anesthesia** is the standard of care, while **pathya-apathya** (light diet, sleep hygiene, wind/sun protection) and **snehana/rasāyana after** the acute phase may aid ocular surface homeostasis. Use this framing to show integrative understanding—**do not substitute modern anesthesia with traditional measures in the operative setting.**

Assessment (Exam-Ready)

Long Essays (10 marks each; attempt any 1)

1. **Enumerate the types of anesthesia used in ophthalmology** and detail indications, drugs (concentration/volume), steps, and complications of **sub-Tenon's** and **peribulbar** blocks.
2. **Discuss the oculocardiac reflex** in detail—mechanism, risk factors, prevention, and stepwise management. Add how choice of block modifies its incidence.

Short Essays (5 marks each; attempt any 3)

1. Compare **topical anesthesia** vs **intracameral anesthesia** for cataract surgery.
2. Outline the technique, advantages, and risks of a **retrobulbar block** and explain why many centers prefer **sub-Tenon's** today.
3. Write notes on **sedation (MAC)** in ophthalmology—drug choices and safety.
4. Indications and technique of **facial nerve blocks** in eyelid surgery.

Short Notes (3 marks each; attempt any 4)

- **Hyaluronidase**: role, dose, cautions.
- **Lipid emulsion therapy** in **LAST** (dose and triggers).
- **Retrobulbar hemorrhage**: recognition and immediate actions.
- **Intracameral lignocaine**: dose, use, precautions.
- **Adrenaline** in lid infiltration: when to avoid.
- **Brainstem anesthesia**: presentation and first aid.

MCQs (1 mark × 5)

1. Typical hyaluronidase concentration in orbital blocks is:
   a) 1–2 IU/ml b) **7.5–15 IU/ml** c) 50 IU/ml d) 100 IU/ml
2. First-line response to **oculocardiac reflex** is:
   a) Give atropine immediately b) Increase IV fluids c) **Stop the stimulus and ensure oxygenation** d) Start chest compressions
3. The **safest regional technique** for many intraocular surgeries with lowest risk of globe perforation is:
   a) Retrobulbar b) **Sub-Tenon's** c) Peribulbar d) Facial nerve block
4. **Intracameral lignocaine** for phaco is usually given as:
   a) 1 ml of 2% b) **0.1–0.2 ml of 1% (preservative-free)** c) 1 ml of 1% with adrenaline d) 2 ml of 0.5%
5. The afferent limb of the **oculocardiac reflex** is via:
   a) Facial nerve b) Optic nerve c) **Trigeminal nerve (V)** d) Glossopharyngeal nerve

Answer key: 1-b, 2-c, 3-b, 4-b, 5-c.

60-Second Recap (for viva)

- **Topical + intracameral** is enough for many phaco cases; **sub-Tenon's** is the versatile, safer regional block; **peribulbar** gives strong akinesia; **retrobulbar** is powerful but riskier.
- Know **drug concentrations, volumes, adjuvants (hyaluronidase)**, and **what not to mix** (avoid adrenaline in orbital solutions).
- Recognize and manage **OCR**, **retrobulbar hemorrhage**, **LAST**, **globe perforation**, **brainstem anesthesia**—these fetch marks.
- Integrate Ayurvedic framing ethically: pain-free, calm, and protected eyes—**but** use **modern anesthesia standards** in the OR.