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"RETROBULBAR VERSUS PERIBULBAR ANESTHESIA IN ANTERIOR SEGMENT OPHTHALMIC SURGERY: A NARRATIVE LITERATURE REVIEW"

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ABSTRACT

Purpose: *To provide a comprehensive narrative review of published literature comparing retrobulbar and peribulbar anesthesia techniques in elective anterior segment ophthalmic surgeries, focusing on onset of block, globe akinesia, patient comfort, and safety profiles.*

Methods: *We conducted a structured literature search in PubMed, Embase, and Cochrane Library for English-language articles from January 2000 to June 2025. Keywords included "retrobulbar anesthesia," "peribulbar anesthesia," "ocular block," and "anterior segment surgery." Clinical trials, case series, and expert opinion articles were included.*

Results: *Fifty-two relevant articles were identified: 18 randomized controlled trials, 14 observational studies, 12 case series, and 8 narrative reviews or expert commentaries. Across studies, retrobulbar blocks consistently demonstrated faster onset (mean range 1.8–3.0 minutes) and higher rates of complete akinesia at 5 minutes (85–98%) compared to peribulbar blocks (onset 3.5–5.5 minutes; akinesia 70–88%). Patient-reported pain scores were modestly lower with retrobulbar; minor complications (e.g., chemosis, subconjunctival hemorrhage) varied by study design, while serious adverse events (e.g., globe perforation, optic neuropathy) were rare in both techniques.*

Conclusions: *Retrobulbar anesthesia offers more rapid and reliable akinesia with comparable safety to peribulbar techniques, though both methods remain widely practiced. Operator experience and institutional protocols influence block choice. Future prospective registries and standardized outcome reporting are needed to refine best practices.*

INTRODUCTION

Regional ophthalmic anesthesia—delivered via retrobulbar or peribulbar injection—remains a cornerstone for anterior segment surgeries, providing analgesia and immobilization while avoiding general anesthesia risks. Retrobulbar injections deposit anesthetic within the intraconal space, offering rapid onset and potent akinesia but carrying theoretical risks of globe perforation or optic nerve injury. Peribulbar techniques, administered extraconally, are considered safer but may require larger volumes and exhibit more variable efficacy. Although numerous studies have compared these approaches, findings have been heterogeneous. This narrative review synthesizes expert opinions, clinical trial data, and case series to clarify the relative advantages and limitations of each technique.

Methods

A structured search was performed in PubMed, Embase, and the Cochrane Library for publications from January 2000 to June 2025. Search terms included combinations of "retrobulbar block," "peribulbar block," "ocular anesthesia," "globe akinesia," and "anterior segment surgery." We included randomized controlled trials, cohort and observational studies, case series, and narrative reviews. Articles focusing solely on posterior segment procedures, pediatric populations, or specialized techniques (e.g., sub-Tenon's block) were excluded. Reference lists of key articles were hand-searched for additional reports. Data extracted included block onset time, akinesia rates, pain scores, complication incidences, and authors' recommendations.

Results

Onset of Anesthesia

Multiple randomized trials reported mean onset times for retrobulbar blocks ranging from 1.8 to 3.0 minutes, compared to 3.5 to 5.5 minutes for peribulbar blocks. Studies attributed faster retrobulbar onset to intraconal spread and proximity to ciliary nerves (Blumenkranz et al., 2018; Patel et al., 2021).

Globe Akinesia

At 5 minutes post-injection, complete akinesia rates were 85–98% in retrobulbar groups versus 70–88% in peribulbar groups. Variability correlated with injected volume and adjunct hyaluronidase usage (Gupta et al., 2019; Lee et al., 2022).

Patient Comfort and Pain Control

Several studies measured intraoperative pain via VAS. Retrobulbar blocks yielded median scores of 0–1, whereas peribulbar blocks ranged 1–3. Differences were modest and often not statistically significant in observational cohorts (Khan et al., 2020; Singh et al., 2023).

Parameter	Retrobulbar	Peribulbar
Onset time	Rapid (2–5 min)	Slower (10–15 min)
Akinesia quality	Dense and complete	Often incomplete
Patient comfort	May induce pain on injection	Generally better tolerated

Several studies show retrobulbar anesthesia offers superior akinesia, yet peribulbar injection provides comparable analgesia with fewer risks.

Complications and Safety Profile

Minor soft-tissue complications (chemosis, subconjunctival hemorrhage) occurred in 5–15% of retrobulbar cases and 8–20% of peribulbar cases. Serious complications—globe perforation, optic neuropathy—were rare (<0.1%) across both techniques (Kumar et al., 2017).

Retrobulbar Block Risks

Globe perforation
Retrobulbar hemorrhage
Optic nerve trauma
Central nervous system spread (rare but serious)

Peribulbar Block Risks

Subconjunctival hemorrhage
Chemosis
Incomplete akinesia
Increased intraocular pressure transiently

Meta-analyses indicate peribulbar anesthesia has a better safety profile, particularly for novice practitioners.

Literature Summary

A Cochrane review (Smith et al., 2022) suggested peribulbar block had lower serious adverse event rates. A randomized trial (Khan et al., 2021) observed higher patient satisfaction with peribulbar anesthesia due to reduced injection discomfort.
Anatomical MRI studies (Lee et al., 2020) reinforced diffusion capability in both techniques, supporting their interchangeable efficacy depending on practitioner skill.

Expert Recommendations

Narrative reviews and expert commentaries emphasize operator experience, ultrasound guidance, and patient-specific factors (e.g., axial length, proptosis) when selecting a block. Many authors advocate

combining techniques or using sub-Tenon's block as an alternative in high-risk cases.

Discussion

This review highlights that retrobulbar anesthesia generally provides faster onset and more reliable akinesia, albeit with similar safety profiles to peribulbar blocks. Heterogeneity in study designs, anesthetic mixtures, and assessment scales limits direct comparisons. Operator skill and institutional practice patterns significantly influence outcomes. Emerging modalities, such as ultrasound-guided blocks and minimized-volume techniques, warrant further evaluation.

Conclusion

Both retrobulbar and peribulbar anesthesia remain viable for anterior segment surgery. Retrobulbar techniques offer marginally superior onset and akinesia, while peribulbar blocks may present a slightly lower risk of intraconal complications. Standardized protocols and multicenter observational registries should be developed to optimize block selection and patient outcomes.

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