

Peribulbar versus Retrobulbar Block: A Comparative Study of Anesthetic Techniques in Cataract Surgery

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ABSTRACT

Background: Cataract surgery is among the most frequently performed ophthalmic procedures, and adequate anesthesia is essential to ensure patient comfort and optimal surgical conditions. Regional anesthesia techniques such as retrobulbar and peribulbar blocks are commonly used to achieve analgesia and immobilization of the eye during surgery. Retrobulbar block provides rapid onset and effective akinesia but may be associated with certain complications because the anesthetic is injected within the muscle cone. Peribulbar block, in contrast, involves injection outside the muscle cone and is generally considered safer, although the onset of anesthesia may be slower.

Methods: Eighty patients scheduled for cataract surgery were included and divided into two groups of forty each. Patients in Group A received peribulbar anesthesia, while those in Group B were administered retrobulbar anesthesia. The two techniques were evaluated based on onset of anesthesia, degree of ocular akinesia, adequacy of analgesia, quality of surgical conditions, patient comfort, need for additional anesthesia, and occurrence of complications.

Results: Both techniques provided adequate analgesia and satisfactory operating conditions for cataract surgery. Retrobulbar anesthesia demonstrated a quicker onset of action, whereas peribulbar anesthesia was associated with fewer complications. The findings suggest that although

retrobulbar block acts faster, peribulbar block offers a safer alternative while still maintaining effective anesthesia for cataract surgery.

Conclusion: Both peribulbar and retrobulbar blocks are effective techniques for providing regional anesthesia in cataract surgery. However, peribulbar block may be considered a safer alternative while still providing adequate analgesia and satisfactory surgical conditions.

Keywords: Cataract Surgery, Peribulbar Block, Retrobulbar Block, Regional Anesthesia, Ocular Akinesia.

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Article History:

Received: 12-04-2016, Revised: 08-05-2016, Accepted: 27-05-2016

Access this article online

Website: www.ijmrp.com	Quick Response code 
DOI: 10.21276/ijmrp.2016.2.3.069	

INTRODUCTION

Cataract is a major cause of visual impairment across the world and continues to represent an important public health challenge, particularly in developing countries^[1,2] where access to eye care services may be limited. The condition occurs due to progressive clouding of the crystalline lens, which gradually reduces visual acuity and interferes with daily activities. Surgical removal of the opacified lens remains the only definitive treatment and is one of the most commonly performed procedures in ophthalmology^[1,2].

Advancements in surgical techniques such as extracapsular cataract extraction and phacoemulsification have significantly improved the safety and effectiveness of cataract surgery. However, successful surgical outcomes depend not only on the operative technique but also on the choice of anesthesia. Adequate anesthesia is necessary to provide pain relief, prevent ocular movement, and create favorable conditions for the surgeon during the procedure^[3,4].

Several anesthesia methods are used in cataract surgery, including general anesthesia, regional anesthesia, and topical anesthesia. While general anesthesia may be indicated in specific situations such as pediatric patients or individuals who are unable

to cooperate, regional anesthesia is more commonly employed in adult patients. Regional blocks offer effective analgesia and immobilization of the eye while minimizing systemic effects^[3,4].

Retrobulbar block has historically been one of the most widely used regional anesthesia techniques for intraocular surgery. In this technique, the anesthetic solution is injected within the muscle cone behind the globe, allowing direct blockade of the ciliary nerves and motor nerves supplying the extraocular muscles. This approach generally produces rapid onset of anesthesia and effective ocular akinesia^[5,6].

Despite its effectiveness, retrobulbar anesthesia is associated with certain risks due to the deep placement of the needle. Potential complications may include globe perforation, hemorrhage within the orbit, optic nerve injury, and rarely, spread of anesthetic agents to the central nervous system. Although these complications occur infrequently, their severity has encouraged clinicians to explore safer alternatives^[7,8].

Peribulbar block was developed as a modification of retrobulbar anesthesia with the aim of reducing these risks. In this technique, the anesthetic solution is deposited outside the muscle cone

within the orbital space. The drug then diffuses gradually to achieve sensory and motor blockade^[9]. Because the injection is administered in a more superficial location, the likelihood of injury to the globe or optic nerve is reduced^[10]. However, the onset of anesthesia may be slower and a larger volume of anesthetic agent may be required. Both retrobulbar and peribulbar blocks are widely practiced in ophthalmic surgery, and each technique offers specific advantages. Retrobulbar block typically provides faster onset and more pronounced akinesia, while peribulbar block is generally regarded as safer due to its extraconal injection site^[11]. Consequently, the selection of anesthesia technique often depends on surgeon preference, patient characteristics, and clinical experience.

Numerous studies have attempted to compare these two techniques with respect to effectiveness, safety, patient comfort, and surgical conditions. While many reports indicate comparable anesthetic outcomes, some authors have suggested that peribulbar block may provide a better safety profile. Nevertheless, both approaches continue to be routinely used in cataract surgery^[12]. Considering the importance of providing safe and effective anesthesia, further evaluation of these techniques is valuable in determining their relative advantages. The present study was therefore conducted to compare peribulbar and retrobulbar blocks in patients undergoing cataract surgery, with particular emphasis on onset of anesthesia, ocular akinesia, patient comfort, and complications.

AIMS AND OBJECTIVES

Aim

To compare the effectiveness and safety of peribulbar block and retrobulbar block as regional anesthesia techniques in patients undergoing cataract surgery.

Objectives

1. To compare the onset time of anesthesia achieved with peribulbar block and retrobulbar block.
2. To evaluate the degree of ocular akinesia obtained with both techniques during cataract surgery.
3. To assess the adequacy of analgesia and patient comfort during the surgical procedure.
4. To evaluate the quality of surgical conditions and surgeon satisfaction during cataract surgery.
5. To determine the requirement of supplemental anesthesia in both groups.
6. To compare the incidence of intraoperative and postoperative complications associated with peribulbar and retrobulbar blocks.

METHODOLOGY

Study Design

A hospital-based prospective comparative study.

Study Population

Patients diagnosed with cataract and scheduled for cataract surgery were included in the study.

Sample Size

A total of 80 patients undergoing cataract surgery were included in the study.

Group Allocation

The patients were divided into two groups:

- **Group A:** 40 patients received peribulbar block.

- **Group B:** 40 patients received retrobulbar block.

Inclusion Criteria

1. Patients diagnosed with senile cataract scheduled for cataract surgery.
2. Patients aged above 40 years.
3. Patients willing to participate in the study and provide informed consent.

Exclusion Criteria

1. Patients with allergy to local anesthetic agents.
2. Patients with bleeding disorders or on anticoagulant therapy.
3. Patients with orbital infection or inflammation.
4. Patients who were uncooperative or unable to provide consent.

Preoperative Evaluation

All patients underwent detailed ophthalmological examination including visual acuity assessment, slit-lamp examination, intraocular pressure measurement, and fundus examination whenever possible. Routine systemic examination and relevant laboratory investigations were also performed prior to surgery.

Anesthetic Technique

Peribulbar Block

In Group A, peribulbar anesthesia was administered by injecting local anesthetic solution into the extraconal space of the orbit under aseptic precautions. Adequate time was allowed for diffusion of the anesthetic agent to achieve ocular anesthesia and akinesia.

Retrobulbar Block

In Group B, retrobulbar anesthesia was administered by injecting local anesthetic solution into the intraconal space behind the globe under aseptic technique to achieve rapid anesthesia and ocular akinesia.

Outcome Measures

The following parameters were assessed and compared between the two groups:

1. Onset time of anesthesia
2. Degree of ocular akinesia
3. Adequacy of analgesia and patient comfort
4. Quality of surgical conditions and surgeon satisfaction
5. Requirement of supplemental anesthesia
6. Intraoperative and postoperative complications

Postoperative Care and Follow-up

All patients received routine postoperative care and were monitored for any immediate postoperative complications.

Data Analysis

The collected data were recorded and analyzed using appropriate statistical methods.

Statistical Analysis

Data was analyzed using Student's t-test and Chi-square test. A p-value <0.05 was considered statistically significant. Results were presented in tabular form.

RESULTS

A total of 80 patients diagnosed with cataract and scheduled for cataract surgery were included in the study. All patients underwent surgery under regional anesthesia and were divided into two groups based on the anesthesia technique used. Group A consisted of 40 patients who received peribulbar block, while Group B consisted of 40 patients who received retrobulbar block.

Most patients presented with complaints of progressive painless diminution of vision, which is the most common presenting symptom of cataract. The majority of patients belonged to the age group of 51–60 years, indicating that cataract was more prevalent among middle-aged and elderly individuals. Both male and female patients were included in the study, with a slight female predominance observed in both groups.

The majority of patients in both groups were between 51 and 60 years of age. The difference in age distribution between the two groups was not statistically significant ($p > 0.05$). Female patients were slightly more common in both groups. The difference in gender distribution between the two groups was not statistically significant ($p > 0.05$). Retrobulbar block demonstrated a significantly faster onset of anesthesia compared to peribulbar

block ($p < 0.05$). Both techniques provided satisfactory ocular akinesia for cataract surgery. The difference between the two groups was not statistically significant ($p > 0.05$).

Supplemental anesthesia was required slightly more frequently in the peribulbar block group; however, the difference was not statistically significant ($p > 0.05$). Both techniques were generally safe with a low incidence of complications. Peribulbar block showed fewer serious complications, whereas retrobulbar block demonstrated faster onset of anesthesia.

Surgical Conditions and Patient Comfort

Surgical conditions were satisfactory in the majority of patients in both groups. Patient comfort during surgery was also adequate with both anesthesia techniques, and no procedure had to be abandoned due to inadequate anesthesia.

Table 1: Age Distribution of Patients

Age Group (years)	Peribulbar Block (n=40)	Retrobulbar Block (n=40)
40–50	8 (20%)	7 (17.5%)
51–60	14 (35%)	15 (37.5%)
61–70	12 (30%)	11 (27.5%)
>70	6 (15%)	7 (17.5%)

Table 2: Gender Distribution

Gender	Peribulbar Block (n=40)	Retrobulbar Block (n=40)
Male	18 (45%)	17 (42.5%)
Female	22 (55%)	23 (57.5%)

Table 3: Onset of Anesthesia

Parameter	Peribulbar Block	Retrobulbar Block
Mean onset time (minutes)	6.8 ± 1.2	4.5 ± 1.0

Table 4: Degree of Ocular Akinesia

Akinesia	Peribulbar Block (n=40)	Retrobulbar Block (n=40)
Complete	34 (85%)	36 (90%)
Partial	5 (12.5%)	3 (7.5%)
Inadequate	1 (2.5%)	1 (2.5%)

Table 5: Requirement of Supplemental Anesthesia

Requirement	Peribulbar Block	Retrobulbar Block
Required	4 (10%)	2 (5%)
Not Required	36 (90%)	38 (95%)

Table 6: Complications

Complication	Peribulbar Block	Retrobulbar Block
Chemosis	3 (7.5%)	1 (2.5%)
Retrobulbar hemorrhage	0	1 (2.5%)
Globe perforation	0	0
No complications	37 (92.5%)	38 (95%)

DISCUSSION

Regional anesthesia is widely used in cataract surgery because it provides effective pain control and minimizes ocular movement during the procedure. Adequate anesthesia allows the surgeon to

perform delicate intraocular maneuvers while maintaining patient comfort. Among the different regional anesthesia techniques available, peribulbar and retrobulbar blocks remain two of the most commonly employed methods in ophthalmic practice^[13].

Each technique has distinct advantages as well as potential limitations, which has led to continued comparison between them in clinical studies.

In the present study, a total of 80 patients undergoing cataract surgery were evaluated to assess the effectiveness and safety of peribulbar and retrobulbar anesthesia. The participants were equally distributed between the two study groups. Various parameters including onset of anesthesia, ocular akinesia, patient comfort, requirement of supplemental anesthesia, and occurrence of complications were analyzed.

The demographic characteristics of the patients in both groups were comparable. Most individuals belonged to the age group of 51–60 years. This distribution reflects the well-known association between increasing age and the development of cataract. Similar age patterns have been reported in several epidemiological studies of cataract surgery^[14], where the incidence rises progressively in middle-aged and elderly populations.

With regard to gender distribution, a slightly higher proportion of female patients was observed in the study population. This trend has also been described in other clinical studies and may be related to differences in life expectancy, health-seeking behavior, and demographic factors^[14].

One of the key findings of the present study was the difference in onset time between the two anesthetic techniques. Retrobulbar block demonstrated a faster onset of anesthesia compared with peribulbar block. The quicker onset associated with retrobulbar anesthesia can be explained by the deposition of the anesthetic solution within the muscle cone, allowing more direct and rapid action on the sensory and motor nerves supplying the eye. This observation is consistent with previously published studies that have reported rapid development of anesthesia and akinesia following retrobulbar injection^[15].

The degree of ocular akinesia achieved with both techniques was found to be satisfactory for cataract surgery. A high proportion of patients in each group achieved complete immobilization of the eye, while only a small number showed partial or inadequate akinesia^[16]. Although the retrobulbar group demonstrated slightly better akinesia rates, the difference between the groups was not statistically significant. These findings indicate that both techniques are capable of providing adequate ocular stability for intraocular procedures.

Patient comfort during surgery is another important factor when evaluating anesthesia techniques. In this study, most patients reported satisfactory comfort throughout the procedure. Only a small proportion required additional anesthesia, and this was slightly more frequent in the peribulbar group. The need for supplemental anesthesia in some cases may be attributed to slower diffusion of the anesthetic agent from the extraconal space into the intraconal region.

Complications related to the anesthesia techniques were infrequent in both groups. Minor complications such as chemosis were observed more commonly following peribulbar block. This may be related to the relatively larger volume of anesthetic solution used during the procedure. On the other hand, retrobulbar block was associated with a small risk of retrobulbar hemorrhage, which is a known complication due to the deeper needle placement within the orbit. Fortunately, no cases of severe complications such as globe perforation or optic nerve injury were observed in this study.

The overall findings of the study suggest that both peribulbar and retrobulbar anesthesia techniques are effective for cataract surgery. Retrobulbar block provides the advantage of rapid onset and slightly more pronounced akinesia. However, the peribulbar approach may offer improved safety because the injection is administered outside the muscle cone, reducing the risk of serious orbital complications^[17].

In clinical practice, the choice between these techniques may depend on several factors including surgeon experience, patient characteristics, and institutional preference. Both methods continue to play an important role in providing reliable anesthesia for cataract surgery^[18].

CONCLUSION

Both peribulbar block and retrobulbar block are effective regional anesthesia techniques for cataract surgery, providing adequate analgesia, ocular akinesia, and satisfactory surgical conditions. Retrobulbar block demonstrated a faster onset of anesthesia and slightly better ocular akinesia. However, peribulbar block showed a lower risk of serious complications and provided satisfactory patient comfort during surgery. Therefore, peribulbar block can be considered a safe and effective alternative to retrobulbar block for cataract surgery, while still providing adequate anesthesia and favorable surgical conditions.

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Source of Support: Nil.

Conflict of Interest: None Declared.

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Cite this article as: Akhil Agarwal & Chitra Pandey. Peribulbar versus Retrobulbar Block: A Comparative Study of Anesthetic Techniques in Cataract Surgery. *Int J Med Res Prof*.2016;2(3):302-6.