

## ORIGINAL RESEARCH

# General Anesthesia vs. Local Anesthesia in Retinal Detachment Surgery: A Prospective Comparative Study of Visual Outcomes and Recovery Times

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Received Date: 23 August, 2020

Acceptance Date: 26 September, 2020

### ABSTRACT

**Aim:** This prospective comparative study aimed to evaluate the visual outcomes and recovery times of patients undergoing retinal detachment surgery under general anesthesia (GA) versus local anesthesia (LA), to provide a comprehensive comparison of these two techniques in terms of their impact on surgical success and postoperative recovery. **Materials and Methods:** A total of 100 patients diagnosed with retinal detachment were enrolled in this study. Patients were randomly assigned to two groups: Group 1 (General Anesthesia) and Group 2 (Local Anesthesia). The surgeries were performed using either vitrectomy or scleral buckle techniques by the same experienced retinal surgeon. Visual acuity was measured preoperatively and at 1 and 6 months postoperatively using Snellen charts. Secondary outcomes included intraoperative complications, recovery time (time to first postoperative ambulation and discharge), and postoperative adverse events. Statistical analysis was performed using SPSS software, with significance defined as  $p < 0.05$ . **Results:** Both groups were comparable at baseline in terms of age, gender, comorbidities, and type of surgery. Visual acuity at 1 and 6 months postoperatively did not differ significantly between the two groups. Intraoperative complications were rare and included retinal tears, hypotension, and nausea/vomiting, with general anesthesia showing a statistically significant higher incidence of hypotension ( $p=0.03$ ). Recovery time was significantly shorter in the local anesthesia group, with a faster time to first ambulation (3.7 hours vs. 6.5 hours,  $p=0.001$ ) and shorter time to discharge (7.2 hours vs. 10.4 hours,  $p=0.002$ ). Postoperative pain levels and infection rates were similar across both groups. **Conclusion:** This study suggests that local anesthesia offers faster recovery times without compromising visual outcomes compared to general anesthesia. Although both techniques have their advantages, the choice of anesthesia should be tailored to the individual patient's needs and surgical complexity. Local anesthesia may be a preferable option for patients seeking quicker postoperative recovery and reduced hospitalization.

**Keywords:** General Anesthesia, Local Anesthesia, Retinal Detachment Surgery, Visual Outcomes, Recovery Times

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### INTRODUCTION

Retinal detachment is a serious condition in which the retina, the thin layer of tissue at the back of the eye, pulls away from its normal position. This detachment can lead to severe visual impairment or even blindness if not treated promptly. Surgical intervention is often required to repair the detachment, and the choice of anesthesia during this procedure plays a crucial role in influencing the patient's experience, the surgeon's ability to perform the

surgery effectively, and the overall outcomes of the operation.<sup>1</sup>

There are two primary types of anesthesia used in retinal detachment surgery: general anesthesia (GA) and local anesthesia (LA). Both approaches have their advantages and limitations, and their application depends on a variety of factors, including the patient's medical condition, the complexity of the surgery, and the surgeon's preference. General anesthesia involves rendering the patient unconscious and unable to feel pain throughout the procedure, while local anesthesia

numbs only the specific area around the eye, allowing the patient to remain awake and aware during the surgery.<sup>2</sup>

In recent years, there has been growing interest in evaluating the comparative efficacy of these two anesthesia techniques, particularly concerning the visual outcomes and recovery times following retinal detachment surgery. Traditional practice has often favored general anesthesia due to its ability to ensure complete immobility and prevent discomfort during complex and delicate procedures. However, with advancements in anesthetic techniques and increased focus on outpatient care, local anesthesia has become an increasingly viable option for certain patients, offering the potential for faster recovery and fewer complications.<sup>3</sup>

One of the primary concerns with general anesthesia in retinal detachment surgery is the longer recovery time. After the surgery, patients who have undergone general anesthesia often experience post-operative sedation and the need for extended monitoring before they are allowed to go home. These extended recovery periods can increase the burden on both healthcare facilities and patients, particularly in the case of outpatient procedures. Furthermore, general anesthesia can be associated with risks such as nausea, vomiting, and respiratory complications, especially in patients with pre-existing conditions or those who are elderly.

On the other hand, local anesthesia offers the potential for a quicker recovery process, as patients remain conscious during the surgery and are typically able to leave the hospital soon after the procedure. Local anesthesia also reduces the risk of complications related to systemic anesthesia, such as airway management issues, cardiovascular instability, or medication reactions. However, this approach requires that the patient remain still and cooperate throughout the surgery, which can sometimes be challenging for individuals who experience anxiety or discomfort. In addition, while the surgeon may benefit from a cooperative patient who can respond to instructions, the lack of complete unconsciousness may lead to some challenges in ensuring complete immobility of the eye, especially during complex procedures that require precise movements.<sup>4</sup>

Comparing the visual outcomes between general and local anesthesia is also a critical component of understanding which anesthesia method may provide better results for patients. While both anesthesia techniques aim to achieve the same surgical outcome—repairing the detached retina—there is some debate as to whether one may be superior in terms of postoperative visual acuity and the likelihood of complications. For example, local anesthesia may allow the patient to avoid some of the blurred vision or disorientation that can occur with general anesthesia as a result of sedation and longer recovery times. However, other studies suggest that general anesthesia may provide better control over the

surgical field, potentially leading to more precise surgical outcomes in certain cases.<sup>5</sup>

Additionally, recovery times after retinal detachment surgery are an important factor for both patients and healthcare providers. The traditional use of general anesthesia often leads to a longer and more monitored recovery process, which can add to the overall cost and time burden of the surgery. Patients under general anesthesia typically require more time to regain full consciousness and may need to stay in the hospital for longer periods after the procedure. Local anesthesia, in contrast, is often associated with quicker recovery times, as patients may regain full alertness almost immediately following the surgery, reducing the need for extended post-operative monitoring and facilitating faster discharge from the hospital.<sup>6</sup>

The comparison of these two anesthetic techniques is not only of interest for their clinical implications but also for the economic impact on healthcare systems. The choice of anesthesia can influence the duration of hospitalization, the need for postoperative care, and the associated costs of the surgical procedure. In healthcare environments where cost-effectiveness and patient throughput are important considerations, local anesthesia may offer a distinct advantage in terms of reducing the overall financial burden associated with retinal detachment surgery.<sup>7</sup>

Despite the clear differences in these two anesthetic approaches, there remains a lack of consensus on which method is definitively superior in terms of visual outcomes, complication rates, and recovery times. Some studies suggest that local anesthesia may be equally effective as general anesthesia, particularly for less complicated retinal surgeries or in patients who are able to tolerate the procedure without significant discomfort. However, other research supports the notion that general anesthesia provides a more stable environment for the surgery, especially in cases where the patient may be unable to remain still or where the surgical procedure is more complex.

## MATERIALS AND METHODS

This prospective comparative study was conducted to evaluate the visual outcomes and recovery times of patients undergoing retinal detachment surgery under general anesthesia (GA) versus local anesthesia (LA). A total of 100 patients diagnosed with retinal detachment were enrolled in the study. Inclusion criteria included patients aged 18–75 years with a primary diagnosis of retinal detachment requiring surgical intervention. Patients were randomly assigned to one of two groups: Group 1 (General Anesthesia) and Group 2 (Local Anesthesia). Group 1 underwent surgery under general anesthesia, while Group 2 received local anesthesia with sedation. All surgeries were performed by the same experienced retinal surgeon using standard scleral buckle or vitrectomy techniques, depending on the type and extent of the retinal detachment. Preoperative data, including age, gender, and comorbidities, were

recorded, and visual acuity was measured using Snellen charts at baseline, 1 month, and 6 months postoperatively. The primary outcome measures were visual acuity at the specified intervals, and secondary outcome measures included intraoperative complications, recovery time (defined as time to first postoperative ambulation and discharge), and any postoperative adverse events. Statistical analysis was performed using SPSS software, with a p-value of  $<0.05$  considered statistically significant. Ethical approval for the study was obtained from the institutional review board, and informed consent was obtained from all participants prior to surgery.

## RESULTS

**Table 1: Demographic and Baseline Characteristics of the Study Population**

Table 1 outlines the demographic and baseline characteristics of the study population, with 50 patients in each of the two groups: General Anesthesia (Group 1) and Local Anesthesia (Group 2). The mean age of the patients in Group 1 was 56.4 years, while Group 2 had a slightly older average age of 57.2 years. The difference in age between the groups was minimal and statistically insignificant ( $p = 0.76$ ). Regarding gender distribution, 30 males and 20 females were in Group 1, and 32 males and 18 females were in Group 2. This difference was also statistically insignificant ( $p = 0.62$ ). Both groups had similar proportions of patients with comorbidities, with 36% of patients in Group 1 and 32% in Group 2 reporting comorbid conditions ( $p = 0.68$ ). Finally, the types of surgeries performed, either vitrectomy or scleral buckle, were also comparable between the two groups, with 35 patients in Group 1 undergoing vitrectomy and 33 in Group 2. The differences in surgery types were not statistically significant ( $p = 0.54$ ). These findings suggest that the two groups were comparable at baseline in terms of age, gender, comorbidities, and type of surgery.

**Table 2: Preoperative and Postoperative Visual Acuity (Snellen Chart)**

Table 2 presents the visual acuity results, measured using Snellen charts, at baseline and at 1 month and 6 months postoperatively. At baseline, the mean visual acuity in Group 1 was  $1.03 \pm 0.22$  and in Group 2 it was  $1.05 \pm 0.19$ , with no statistically significant difference ( $p = 0.81$ ). One month postoperatively, the mean visual acuity for Group 1 improved to  $0.56 \pm 0.16$ , while Group 2 showed a slightly better visual acuity of  $0.58 \pm 0.18$ , but the difference remained statistically insignificant ( $p = 0.79$ ). At 6 months postoperatively, both groups showed further

improvement in visual acuity, with Group 1 at  $0.32 \pm 0.12$  and Group 2 at  $0.35 \pm 0.14$ , again with no significant difference ( $p = 0.62$ ). These results indicate that the type of anesthesia (general vs. local) did not significantly impact the visual acuity outcomes at any of the time points assessed.

**Table 3: Intraoperative Complications**

In Table 3, the intraoperative complications are summarized for both groups. Retinal tears occurred in 4% of patients in Group 1 and 6% in Group 2, but the difference was not statistically significant ( $p = 0.56$ ). Hypotension was more common in Group 1, affecting 10% of patients, whereas no patients in Group 2 experienced hypotension. This difference was statistically significant ( $p = 0.03$ ), suggesting that general anesthesia may have been associated with a higher risk of hypotension. Nausea and vomiting were reported in 6% of Group 1 patients, but no patients in Group 2 experienced these symptoms ( $p = 0.09$ ), though the result was not statistically significant. Mild bleeding was observed in 2% of patients in Group 1 and 4% of patients in Group 2 ( $p = 0.64$ ), indicating no significant difference in bleeding complications between the two groups. Overall, while the complications were relatively rare, general anesthesia appeared to be associated with more instances of hypotension and nausea/vomiting.

**Table 4: Recovery Time and Postoperative Adverse Events**

Table 4 presents data on recovery time and postoperative adverse events. Group 2 (Local Anesthesia) had a significantly shorter time to first ambulation ( $3.7 \pm 1.8$  hours) compared to Group 1 ( $6.5 \pm 2.1$  hours), with a p-value of 0.001, indicating a faster recovery after surgery in the local anesthesia group. Similarly, the time to discharge was significantly shorter in Group 2 ( $7.2 \pm 2.6$  hours) compared to Group 1 ( $10.4 \pm 3.4$  hours), with a p-value of 0.002. These results suggest that patients who received local anesthesia were able to recover more quickly and were discharged sooner than those who underwent surgery with general anesthesia. In terms of postoperative pain, measured by the Visual Analog Scale (VAS), Group 1 reported a mean pain score of  $4.3 \pm 1.5$ , while Group 2 had a slightly lower mean pain score of  $3.9 \pm 1.2$ . The difference was not statistically significant ( $p = 0.22$ ), indicating that pain levels were similar between the two groups. Postoperative infections were rare in both groups, with 4% of Group 1 patients and 2% of Group 2 patients experiencing infections. This difference was not statistically significant ( $p = 0.56$ ).

**Table 1: Demographic and Baseline Characteristics of the Study Population**

Characteristic	Group 1 (General Anesthesia)	Group 2 (Local Anesthesia)	p-value
Number of patients	50	50	-
Age (mean $\pm$ SD)	$56.4 \pm 10.2$	$57.2 \pm 9.8$	0.76

Gender (Male/Female)	30/20	32/18	0.62
Comorbidities (n, %)	18 (36%)	16 (32%)	0.68
Type of surgery (Vitreotomy/Scleral Buckle)	35/15	33/17	0.54

**Table 2: Preoperative and Postoperative Visual Acuity (Snellen Chart)**

Timepoint	Group 1 (GA) Mean Visual Acuity	Group 2 (LA) Mean Visual Acuity	p-value
Baseline	1.03 ± 0.22	1.05 ± 0.19	0.81
1 month post-op	0.56 ± 0.16	0.58 ± 0.18	0.79
6 months post-op	0.32 ± 0.12	0.35 ± 0.14	0.62

**Table 3: Intraoperative Complications**

Complication Type	Group 1 (GA) (%)	Group 2 (LA) (%)	p-value
Retinal Tear	2 (4%)	3 (6%)	0.56
Hypotension	5 (10%)	0 (0%)	0.03
Nausea/Vomiting	3 (6%)	0 (0%)	0.09
Bleeding (mild)	1 (2%)	2 (4%)	0.64

**Table 4: Recovery Time and Postoperative Adverse Events**

Parameter	Group 1 (GA) Mean ± SD	Group 2 (LA) Mean ± SD	p-value
Time to First Ambulation (hours)	6.5 ± 2.1	3.7 ± 1.8	0.001
Time to Discharge (hours)	10.4 ± 3.4	7.2 ± 2.6	0.002
Postoperative Pain (VAS score)	4.3 ± 1.5	3.9 ± 1.2	0.22
Postoperative Infections (%)	2 (4%)	1 (2%)	0.56

## DISCUSSION

The results of this study provide valuable insight into the comparative efficacy of general anesthesia (GA) versus local anesthesia (LA) in retinal detachment surgeries. Both anesthesia methods demonstrated similar visual acuity outcomes, as shown in Table 2, with no statistically significant differences observed at baseline, 1 month, or 6 months postoperatively ( $p = 0.81, 0.79, \text{ and } 0.62$ , respectively). This finding aligns with previous studies that also reported comparable visual outcomes between the two anesthesia methods. For instance, Tan et al. (2012) conducted a similar study and found no significant difference in the visual acuity of patients undergoing vitrectomy for retinal detachment under GA versus LA. The lack of a significant impact of anesthesia type on visual outcomes is reassuring, as it suggests that the choice of anesthesia does not compromise the ultimate goal of surgery: the preservation and restoration of vision.<sup>8</sup> The demographic and baseline characteristics of the study population in this study were well-balanced between the two groups, as indicated in Table 1. The age, gender, comorbidities, and type of surgery were comparable between the GA and LA groups. These findings are consistent with those of a similar study by Kobayashi et al. (2013), which ensured no baseline disparities between patients undergoing vitrectomy under different anesthesia techniques, thus minimizing the potential for confounding factors. The comparability of these characteristics ensures that the observed differences in recovery times and complications are primarily attributable to the anesthesia methods rather than underlying patient differences.<sup>9</sup>

In terms of intraoperative complications, the study revealed that hypotension was more common in the GA group, with 10% of patients affected, compared to none in the LA group ( $p = 0.03$ ) (Table 3). This result is consistent with previous reports, such as that by Miller et al. (2011), who found that patients receiving GA were more likely to experience hemodynamic instability, including hypotension, during surgery.<sup>10</sup> This may be due to the systemic effects of GA, which depresses autonomic function and can result in blood pressure fluctuations. In contrast, LA, being less invasive, may have fewer systemic effects, contributing to a more stable hemodynamic profile during surgery. The higher incidence of nausea and vomiting in the GA group (6%) also supports previous studies, such as those by Harrington et al. (2010), which documented a higher incidence of postoperative nausea and vomiting in patients receiving GA compared to those receiving LA.<sup>11</sup> Regarding recovery time, the local anesthesia group demonstrated a significantly faster recovery, with earlier ambulation ( $3.7 \pm 1.8$  hours vs.  $6.5 \pm 2.1$  hours) and discharge ( $7.2 \pm 2.6$  hours vs.  $10.4 \pm 3.4$  hours) compared to the GA group (Table 4). This finding is in line with studies by Gass et al. (2010), who reported that patients who underwent retinal surgery with local anesthesia had significantly shorter recovery times and were able to resume normal activities more quickly than those who received GA. The quicker recovery times observed in this study's LA group could be due to the less invasive nature of local anesthesia, which avoids the need for a prolonged recovery from the systemic effects of GA. These findings are particularly significant for

improving patient satisfaction and reducing healthcare costs associated with prolonged hospital stays.<sup>12</sup>

While the postoperative pain levels in this study were slightly lower in the LA group (VAS score of  $3.9 \pm 1.2$  vs.  $4.3 \pm 1.5$  in the GA group), the difference was not statistically significant ( $p = 0.22$ ) (Table 4). This result contrasts with the findings of Ang et al. (2011), who reported that patients who underwent retinal surgery under LA had lower postoperative pain scores compared to those under GA, possibly due to the avoidance of postoperative sedation and the reduced need for analgesics. However, the lack of significant differences in pain scores in this study suggests that both anesthesia techniques may provide adequate pain control, though LA might offer a slight edge in terms of reducing the need for additional pain management interventions.<sup>13</sup>

Lastly, postoperative infection rates were low in both groups (4% in the GA group vs. 2% in the LA group), with no significant difference observed ( $p = 0.56$ ). This finding is consistent with the results of previous studies, such as those by Ang et al. (2011), which reported no significant differences in infection rates between patients who received GA or LA for retinal detachment surgery. Infection rates in retinal surgeries are generally low due to strict aseptic techniques and prophylactic antibiotic use, and this study supports the notion that anesthesia type does not significantly influence infection risk.<sup>13</sup>

## CONCLUSION

In conclusion, this study provides valuable insights into the comparative effects of general anesthesia and local anesthesia in retinal detachment surgery. While both approaches offer distinct advantages, including faster recovery times with local anesthesia and improved surgical control with general anesthesia, the choice of technique ultimately depends on the individual patient's needs and the complexity of the surgery.

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