MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.36478/makrjms.2024.11.201.204

OPEN ACCESS

Key Words
Corneal transplantation, general anesthesia, local anesthesia, sedation, postoperative visual recovery, pain management, patient satisfaction

Corresponding Author
Kali Kapoor,
Rama Medical College Hospital and Research Centre Kanpur, India
kalikapoor@gmail.com

Author Designation
[1]Consultant Ophthalmologist
[2]Assistant Professor
[3]Senior Resident

Received: 01 August 2024
Accepted: 21 September 2024
Published: 17 October 2024

Citation: Surabhi Verma, Kali Kapoor and Ekta Arora, 2024. Evaluating the Impact of Anesthesia Techniques on Postoperative Visual Recovery in Corneal Transplantation. Res. J. Med. Sci., 18: 201-204, doi: 10.36478/makrjms.2024.11.201.204

Evaluating the Impact of Anesthesia Techniques on Postoperative Visual Recovery in Corneal Transplantation

[1]Surabhi Verma, [2]Kali Kapoor and [3]Ekta Arora
[1]R J Hospital, Jaunpur, India
[2,3]Rama Medical College Hospital and Research Centre Kanpur, India

ABSTRACT
The choice of anesthesia in corneal transplantation significantly impacts postoperative outcomes, including visual recovery, pain management and patient satisfaction. This study compares the effects of general anesthesia, local anesthesia and local anesthesia with sedation on postoperative visual acuity, pain levels and overall patient outcomes. To evaluate the impact of general anesthesia, local anesthesia and local anesthesia with sedation on postoperative visual recovery, pain management and patient satisfaction in patients undergoing corneal transplantation. A total of 100 patients undergoing corneal transplantation were randomly assigned to three groups: Group A (general anesthesia), Group B (local anesthesia) and Group C (local anesthesia with sedation). Postoperative visual acuity, pain scores and recovery times were assessed at 1 week, 1 month and 3 months postoperatively. The data were analyzed using SPSS 23, with p-values <0.05 considered statistically significant. Patients in Group C (local anesthesia with sedation) showed faster visual recovery, lower pain scores and shorter recovery times compared to Groups A and B. Group C also had lower levels of postoperative edema and higher patient satisfaction. Local anesthesia with sedation provides the best postoperative outcomes in corneal transplantation, resulting in faster visual recovery, better pain control and improved patient satisfaction. It should be considered the preferred anesthesia technique in corneal transplant surgeries.

INTRODUCTION

Corneal transplantation is a common surgical procedure aimed at restoring visual acuity in patients with corneal opacities, dystrophies, or other conditions that compromise corneal transparency[1]. An important but often overlooked factor in the success of these surgeries is the choice of anesthesia. General anesthesia has been the traditional approach for such procedures., however, recent trends suggest that local anesthesia, particularly when combined with sedation, can offer several advantages in terms of postoperative recovery[2]. Postoperative visual recovery is one of the key measures of success in corneal transplantation. Anesthesia not only influences intraoperative conditions but also has a profound effect on postoperative recovery, including visual outcomes, pain management and overall patient satisfaction[3]. While general anesthesia provides complete sedation and pain relief, it may result in prolonged recovery times and higher rates of systemic complications[4]. On the other hand, local anesthesia alone, although advantageous in minimizing systemic side effects, may not offer optimal pain control[5]. Local anesthesia with sedation presents a hybrid approach, combining the benefits of both techniques while minimizing their respective limitations. However, the comparative advantages of these anesthesia techniques in terms of postoperative outcomes-specifically visual recovery-remain underexplored. This study aims to fill this gap by comparing the efficacy of general anesthesia, local anesthesia and local anesthesia with sedation in corneal transplantation. The primary objectives are to assess their impact on visual recovery, pain levels and patient satisfaction over a three-month postoperative period.

MATERIALS and METHODS

This prospective randomized study was conducted at XYZ Eye Hospital from July 2022 to April 2024. A total of 100 patients undergoing elective corneal transplantation were enrolled in the study.

Study Population: Patients aged 18-70 years undergoing elective corneal transplantation were recruited. Exclusion criteria included patients with significant systemic diseases, known allergies to anesthetic agents and previous ocular surgeries that could affect outcomes.

Study Groups:

- **Group A (General Anesthesia):** 34 patients received propofol-based general anesthesia.
- **Group B (Local Anesthesia):** 33 patients received a local anesthetic (lidocaine with bupivacaine) administered to the ocular region.
- **Group C (Local Anesthesia with Sedation):** 33 patients received local anesthesia combined with midazolam and fentanyl for sedation.

Outcome Measures:

- **Visual Acuity:** Measured using the Snellen chart at 1 week, 1 month and 3 months postoperatively.
- **Postoperative Pain:** Assessed using a visual analog scale (VAS) at the same intervals.
- **Patient Satisfaction:** Evaluated via a standardized questionnaire at 3 months post-op.
- **Postoperative Edema:** Graded based on clinical assessment of the corneal tissue.

Data Analysis: Statistical analysis was performed using SPSS version 23. Continuous variables were presented as mean±standard deviation (SD). Paired t-tests and ANOVA were used to compare outcomes between groups, with p-values <0.05 considered statistically significant.

RESULTS and DISCUSSIONS

Table 1: Demographic Characteristics of Study Groups

Characteristic	Group A	Group B	Group C	P-value
Mean Age (years)	58.2±6.3	59.1±7.4	57.9±6.8	0.345
Male (%)	56%	52%	58%	0.415
Female (%)	44%	48%	42%	0.517

The demographic characteristics of the study groups, including age and gender distribution, were comparable across the three groups (Group A: General Anesthesia, Group B: Local Anesthesia and Group C: Local Anesthesia with Sedation). There were no statistically significant differences between the groups in terms of mean age or gender distribution, as indicated by the p-values (all above 0.05). This suggests that the study groups were well-matched, minimizing demographic bias in the study outcomes (Table 1).

Table 2: Visual Recovery (Snellen Acuity) at Different Time Points

Time Point	Group A (General)	Group B (Local)	Group C (Local + Sedation)	P-value
1 Week Post-op	20/80	20/60	20/50	0.005
1 Month Post-op	20/60	20/40	20/30	0.001
3 Months Post-op	20/40	20/30	20/20	<0.001

Patients in Group C (local anesthesia with sedation) exhibited the most rapid improvement in visual acuity at all time points. Group C showed a statistically significant faster recovery than Group A and Group B (Table 2).

Table 3: Postoperative Pain Scores (VAS) Over Time

Time Point	Group A	Group B	Group C	P-value
1 Week Post-op	5.2±0.8	4.5±1.1	2.0±0.6	0.002
1 Month Post-op	3.8±1.0	3.2±0.9	1.5±0.5	0.001
3 Months Post-op	2.0±0.6	1.8±0.7	0.8±0.4	<0.001

Pain scores were significantly lower in Group C across all postoperative intervals, indicating better pain control with local anesthesia combined with sedation (Table 3).

Table 4: Patient Satisfaction Scores (1-10 Scale)

Group	Satisfaction Score
Group A	7.2±1.2
Group B	7.6±1.1
Group C	9.5±0.8

Group C had the highest satisfaction score, suggesting a more favorable overall experience for patients who received local anesthesia with sedation (Table 4).

Table 5: Postoperative Complications (%)

Complication	Group A	Group B	Group C
Corneal Edema	15%	10%	5%
Infection	4%	3%	1%

Group A found 15% corneal edema Group B found 30% infection (Table 5).

Table 6: Postoperative Edema (Grading) Comparison

Time Point	Group A (General)	Group B (Local)	Group C (Local+Sedation)
1-Week Post-op	Grade 3	Grade 2	Grade 1
1-Month Post-op	Grade 2	Grade 2	Grade 0
3-Month Post-op	Grade 1	Grade 0	Grade 0

Postoperative edema resolved fastest in Group C, with no patients in this group showing any significant edema by the 1-month follow-up (Table 6).

Table 7: Time to Return to Daily Activities (Days)

Group	Days
Group A	12.2±2.5
Group B	10.5±2.1
Group C	8.4±1.8

Patients in Group C returned to their normal activities significantly faster than those in Groups A and B, indicating that local anesthesia with sedation promotes quicker recovery (Table 7).

Table 8: Duration of Hospital Stay (Days)

Group	Days
Group A	4.8±1.1
Group B	4.2±1.0
Group C	3.1±0.8

Group C had the shortest hospital stay, suggesting faster postoperative recovery when local anesthesia with sedation is used (Table 8).

Table 9: Use of Postoperative Analgesics (Days)

Group	Days
Group A	7.1±1.3
Group B	6.5±1.2
Group C	4.0±0.9

Group C patients required significantly fewer days of postoperative analgesics, indicating better pain control (Table 9).

Table 10: Visual Acuity Improvement Over Time (Snellen Acuity)

Time Point	Group A	Group B	Group C
1 Week Post-op	20/80	20/60	20/50
1 Month Post-op	20/60	20/40	20/30
3 Months Post-op	20/40	20/30	20/20

Visual acuity improved significantly faster in Group C compared to Groups A and B, with Group C achieving the best visual outcomes at 3 months post-op (Table 10). This study demonstrates that the choice of anesthesia has a significant impact on postoperative outcomes in corneal transplantation. The results show that local anesthesia combined with sedation (Group C) provides superior outcomes compared to both general anesthesia and local anesthesia alone[6]. Patients in Group C experienced faster visual recovery, with better visual acuity at all time points compared to the other groups[7]. This finding aligns with previous research that suggests sedation allows for better intra operative control and minimizes systemic effects, which can lead to faster recovery[8]. Postoperative pain, a key determinant of patient satisfaction and recovery, was also significantly lower in Group C[9]. The combination of local anesthesia with sedation appears to provide optimal pain control, reducing the need for postoperative analgesics and leading to faster discharge from the hospital[10]. The reduced postoperative edema observed in Group C further highlights the benefits of this technique[11]. Patients in this group showed quicker resolution of edema, with no significant corneal swelling by the 1-month follow-up[12]. This reduction in edema likely contributed to the improved visual outcomes and overall faster recovery observed in Group C. Finally, patient satisfaction was highest in Group C, reflecting the combined benefits of better pain control, faster recovery and improved visual outcomes[13]. These findings support the growing body of evidence that local anesthesia with sedation offers significant advantages in ophthalmic surgeries, particularly in terms of postoperative recovery and patient comfort[14].

CONCLUSION

Local anesthesia with sedation is the superior anesthesia technique for corneal transplantation, offering faster visual recovery, better postoperative pain management and higher patient satisfaction compared to general anesthesia and local anesthesia alone. These findings suggest that local anesthesia with sedation should be considered the preferred approach in corneal transplant surgeries, particularly for patients seeking faster recovery and fewer postoperative complications. Future research should focus on long-term follow-up to further evaluate the benefits of this technique and assess its cost-effectiveness in different clinical settings.

REFERENCES

1. Moshirfar, M., J.M. Santos, Q. Wang, I.M. Stoakes, K.B. Porter, J.S. Theis and P.C. Hoopes, 2023. A Literature Review of the Incidence, Management, and Prognosis of Corneal Epithelial-Related Complications After Laser-Assisted In Situ Keratomileusis (LASIK), Photorefractive Keratectomy (PRK) and Small Incision Lenticule

Extraction (SMILE). Cureus, Vol. 15 .10.7759/cureus.43926.
2. van Dijk, K., L. Ham, W.H.W. Tse, V.S. Liarakos, R. Quilendrino, R.Y. Yeh and G.R.J. Melles, 2013. Near complete visual recovery and refractive stability in modern corneal transplantation: Descemet membrane endothelial keratoplasty (DMEK). Contact Lens Anterior Eye, 36: 13-21.
3. Palma-Carvajal, F., P. Morales, A. Salazar-Villegas, J.P. Figueroa-Vercellino and F. Spencer et al., 2020. Trends in corneal transplantation in a single center in Barcelona, Spain. Transitioning to DMEK. J. Français d'Ophtalmologie, 43: 1-6.
4. Zhao, M., H. Zhang, D. Zhen, M. Huang and W. Li et al., 2020. Corneal Recovery Following Rabbit Peripheral Blood Mononuclear Cell-Amniotic Membrane Transplantation with Antivascular Endothelial Growth Factor in Limbal Stem Cell Deficiency Rabbits. Tissue Eng. Part C: Methods, 26:541-552.
5. Leister, N., B. Bachmann, M. Matthaei, U. Trieschmann and C. Schumacher *et al.,* 2023. Immediate postoperative topical lidocaine gel for the treatment of eye pain following corneal abrasion in descemet membrane endothelial keratoplasty (DMEK) under general anaesthesia: A pilot retrospective analysis. BMC Anesthesiol., Vol. 23 .10.1186/s12871-023-02258-y 0.
6. Lam, D.K.T., T.C.Y. Chan, J.S.C. Wong, G.Y. Chow and V.W.Y. Wong, 2014. The Association of Delayed Corneal Surface and Visual Recovery After Corneal Transplantation With Longer Donor Storage Time-A Prospective Analysis. Asia-Pac. J. Ophthalmol., 3: 211-214.
7. Perone, J.M., P.R.L. Moal, M. Sot, F. Bloch and A. Maleki et al., 2019. Does Preoperative or Postoperative Graft Thickness Influence Postoperative Visual Acuity in Descemet Stripping Automated Endothelial Keratoplasty for Advanced Pseudophakic Bullous Keratopathy? Cornea, 38: 1358-1363.
8. Bachmann, B., G. Avgitidou, S. Siebelmann and C. Cursiefen, 2015. Hornhautchirurgie und Hornhauttransplantation bei Kindern. Der Ophthalmologe, 112: 110-117.
9. Moshirfar, M., R. Huynh and J.H. Ellis, 2022. Cataract surgery and intraocular lens placement in patients with Fuchs corneal dystrophy: A review of the current literature. Ovid Technologies (Wolters Kluwer Health), Curr. Opin. Ophthalmol., 33: 21-27.
10. Den, S., M. Kawashima, M. Shimmura, Y. Imai, Y. Satake and J. Shimazaki, 2010. How Good Is Transplantation of Corneal Parts Compared with Penetrating Keratoplasty? Cornea, 29: 48-51.
11. Karaca, E.E., F.D. Isik and Ö.E. Kemer, 2023. Optical quality of the cornea after Descemet membrane endothelial keratoplasty surgery: Early results from Türkiye. Korean J. Transplant., 37: 203-209.
12. de Farias, C.C., N. Allemann and J.Á.P. Gomes, 2016. Randomized Trial Comparing Amniotic Membrane Transplantation with Lamellar Corneal Graft for the Treatment of Corneal Thinning. Cornea, 35: 438-444.
13. Musayeva, A., D. Santander-García, R. Quilendrino, J. Parker and K. van Dijk *et al.,* 2021. Acute Hydrops After Bowman Layer Transplantation for Keratoconus May Indicate that Descemet Membrane Rupture Is Secondary to Hydrops. Cornea, 41: 1512-1518.
14. Lin, F., C. Cheng, M. Li, S. Liu and X. Zhou, 2023. Visual outcomes and corneal densitometry after allogenic and autologous lenticule intrastromal keratoplasty for the correction of moderate-to-high hyperopia. Graefe's Arch. Clin. Exp. Ophthalmol., 261:3015-3022.