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ORIGINAL ARTICLE

Outcomes of Trabeculectomy with Mitomycin C in Glaucoma Patients: A Study on the Mean Change in Intraocular Pressure in 200 Patients

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ABSTRACT

Objective: This study aims to evaluate the outcomes of trabeculectomy with Mitomycin C (MMC) in terms of mean change in intraocular pressure (IOP) in 200 glaucoma patients.

Methods: A cohort of 200 glaucoma patients undergoing trabeculectomy with MMC was analyzed. Preoperative and postoperative IOP measurements were taken at intervals (1 month, 3 months, 6 months, and 12 months). Demographic variables, surgical complications, and postoperative interventions were also recorded.

Results: The mean preoperative IOP was 26.4 mmHg, which decreased significantly to 12.3 mmHg at 12 months post-surgery. The success rate in achieving target IOP (< 21 mmHg) was 87%. The incidence of postoperative complications such as hypotony, infection, and bleb leaks was low.

Conclusion: Trabeculectomy with MMC is highly effective in reducing IOP in glaucoma patients, with a significant mean change in IOP from preoperative to postoperative stages. MMC plays a key role in improving surgical success by preventing scarring and bleb failure.

Keywords: Trabeculectomy, Mitomycin C, intraocular pressure, glaucoma, surgical outcomes, postoperative complications.

INTRODUCTION

Glaucoma is a group of eye diseases that result in damage to the optic nerve, often caused by an increase in intraocular pressure (IOP). It is one of the leading causes of blindness worldwide. The management of glaucoma is essential to prevent irreversible vision loss. Among the various surgical treatments available for glaucoma, trabeculectomy is considered one of the most effective options for reducing IOP in patients who do not respond well to medication. This procedure involves the creation of a filtration bleb to allow the aqueous humor to bypass the trabecular meshwork and drain into the subconjunctival space, thereby lowering IOP.

Mitomycin C (MMC) is an antimetabolite agent that is commonly used during trabeculectomy to prevent postoperative scarring and fibrosis, which can lead to the failure of the filtration bleb and increased IOP. The use of MMC has significantly improved the long-term success rates of trabeculectomy by inhibiting fibroblast proliferation, thus minimizing scarring and bleb failure. Previous studies have demonstrated that MMC enhances the success of trabeculectomy in both primary open-angle glaucoma (POAG) and other forms of glaucoma, such as angle-closure and secondary glaucoma[1-4].

However, despite its success, the use of MMC is not without risks. Postoperative complications, such as hypotony, infection, and bleb leaks, remain a concern, and careful postoperative management is required to mitigate these risks[5-7]. The aim of this study is to evaluate the mean change in IOP following trabeculectomy with MMC and to assess the surgical outcomes, including success rates, complications, and factors influencing the outcomes.

METHODOLOGY

This was a retrospective cohort study conducted at Department of Ophthalmology Bolan Medical college/ Helpers eye hospital Quetta a period of 1 years, from Sep 2022 to August 2023. We analyzed the outcomes of trabeculectomy with MMC in 200 glaucoma patients.

Inclusion Criteria:

- Diagnosis of primary open-angle glaucoma, angle-closure glaucoma, or secondary glaucoma.
- Age ≥ 18 years.
- No previous ocular surgery except cataract extraction.
- Adequate follow-up data for at least 12 months post-surgery.

Exclusion Criteria:

- Active ocular infections or other major ocular pathology.
- Incomplete follow-up data or loss to follow-up.

Data Collection:

The data for this study was collected from patient medical records. The following variables were recorded:

1. **Demographics:** Age, gender, type of glaucoma, and comorbidities (e.g., diabetes, hypertension).
2. **Preoperative IOP:** Measured using Goldmann applanation tonometry before surgery.
3. **Postoperative IOP:** Measured at 1 month, 3 months, 6 months, and 12 months after surgery.
4. **Complications:** Incidence of hypotony, infection, bleb leaks, and needling procedures.
5. **Surgical Success:** Success was defined as achieving target IOP (< 21 mmHg) without the need for additional interventions (e.g., needling or reoperation).

Surgical Procedure: All surgeries were performed by an experienced glaucoma surgeon using the standard trabeculectomy technique. Mitomycin C (0.2 mg/ml) was applied to the scleral flap for 3 minutes, after which the site was irrigated with balanced salt solution.

Statistical Analysis: Data were analyzed using SPSS version 25. Descriptive statistics were used to summarize demographic variables, preoperative, and postoperative IOP measurements. Paired t-tests were used to compare preoperative and postoperative IOP values at different time points. Logistic regression analysis was performed to assess the factors influencing surgical success, including age, gender, type of glaucoma, and preoperative IOP.

RESULTS

The study cohort consisted of 200 patients with a mean age of 58.2 ± 12.4 years. There were 120 males (60%) and 80 females (40%). The majority of the patients had primary open-angle glaucoma (POAG), comprising 140 patients (70%), followed by angle-closure glaucoma in 40 patients (20%) and secondary glaucoma in 20 patients (10%). (Table 1)

The mean preoperative IOP was 26.4 ± 4.5 mmHg. Postoperatively, the mean IOP significantly decreased at each follow-up point, as shown below: (Table 2)

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Out of the 200 patients, 174 patients (87%) achieved target IOP (< 21 mmHg) without the need for further interventions. The remaining 26 patients (13%) required additional procedures, such as needling or reoperation. (Table 3)

Table 1: Demographics of the Study Population

Demographic Factor	Frequency (%)
Age (mean ± SD)	58.2 ± 12.4
Gender (Male)	120 (60%)
Gender (Female)	80 (40%)
Type of Glaucoma (POAG)	140 (70%)
Type of Glaucoma (Angle-Closure)	40 (20%)
Type of Glaucoma (Secondary)	20 (10%)

Table 2: IOP Measurements at Different Time Points

Time Point	Mean IOP (mmHg)	Standard Deviation
Preoperative	26.4	4.5
1 Month	16.2	3.2
3 Months	14.5	3.1
6 Months	13.2	2.9
12 Months	12.3	2.8

Table 3: Surgical Success Rate

Surgical Outcome	Frequency (%)
Target IOP Achieved	174 (87%)
Additional Intervention Required	26 (13%)

The incidence of postoperative complications was low as 4 patients (2%) had Hypotony (<6 mmHg), 2 (1%) had infection and 6 (3%) had bleb leaks. (Table 4)

Table 4: Postoperative Complications

Complication	Frequency (%)
Hypotony (<6 mmHg)	4 (2%)
Infection	2 (1%)
Bleb Leaks	6 (3%)

Logistic regression analysis revealed that the type of glaucoma (p = 0.034) and preoperative IOP (p = 0.002) were significantly associated with surgical success. Patients with lower preoperative IOP and those with primary open-angle glaucoma had higher chances of achieving target IOP. (Table 4)

Table 5: Logistic Regression Analysis of Factors Influencing Surgical Success in Trabeculectomy with Mitomycin C

Variable	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Age (per year)	0.98	0.96 - 1.00	0.068
Gender (Male vs Female)	1.15	0.75 - 1.76	0.543
Type of Glaucoma (POAG vs Angle-closure)	2.37	1.10 - 5.11	0.034
Preoperative IOP (per mmHg increase)	0.88	0.82 - 0.95	0.002
Comorbidities (Present vs Absent)	0.78	0.51 - 1.21	0.271
Previous Eye Surgery (Yes vs No)	0.65	0.32 - 1.31	0.229

DISCUSSION

The results of our study demonstrate that trabeculectomy with Mitomycin C (MMC) is highly effective in lowering intraocular pressure (IOP) in patients with glaucoma. The mean reduction in IOP observed from preoperative to postoperative stages is consistent with existing literature, which supports the role of MMC in improving surgical outcomes. The success rate of 87% in achieving target IOP (<21 mmHg) is favorable and aligns with previous findings, where MMC-treated trabeculectomy has shown superior efficacy compared to conventional trabeculectomy[1,2].

The use of MMC in trabeculectomy significantly enhances the efficacy of the procedure by preventing the postoperative scarring and fibrosis that are major contributors to bleb failure[3,4]. MMC acts by inhibiting fibroblast proliferation and collagen synthesis, thus preventing wound healing that leads to scarring around the filtration site. This anti-fibrotic effect is crucial in the long-term success of trabeculectomy, as fibrotic encapsulation of the bleb can obstruct aqueous outflow and cause increased IOP[5].

Our study findings, which show a mean reduction of 14.1 mmHg in IOP over the course of one year, are consistent with those reported in other studies. For instance, a study by Sherwood et al.[6] observed similar reductions in IOP with trabeculectomy with MMC, where IOP decreased from an average of 24.5 mmHg preoperatively to 12.4 mmHg at 12 months. Similarly, Konstas et al.[7] reported a mean IOP reduction of 13.2 mmHg with MMC in their study. The significant decrease in IOP observed in our cohort further supports the notion that MMC enhances the success rate of trabeculectomy by providing better IOP control in the long term.

Our study also identified that 87% of patients achieved target IOP levels (<21 mmHg) without requiring additional interventions. This success rate is consistent with those reported in large, multicenter studies. For example, a study by Tsai et al.[8] demonstrated a surgical success rate of 85% in patients undergoing trabeculectomy with MMC, where success was defined as achieving IOP <21 mmHg without the need for additional procedures. The success rate in our cohort also highlights the importance of patient selection, technique, and postoperative care in achieving optimal results.

The logistic regression analysis in our study revealed that the type of glaucoma and preoperative IOP were significant predictors of surgical success. Patients with lower preoperative IOP and those with primary open-angle glaucoma (POAG) were more likely to achieve target IOP after surgery. This finding is in line with previous studies that have shown that lower preoperative IOP is associated with better surgical outcomes[9,10]. Additionally, POAG patients tend to have better surgical outcomes compared to those with angle-closure or secondary glaucomas, possibly due to differences in the anatomy of the eye and the response to surgical treatment[11,12].

While trabeculectomy with MMC is effective in reducing IOP, it is also associated with a risk of complications. In our study, the overall complication rate was low, with hypotony (2%), infection (1%), and bleb leaks (3%) being the most common adverse events. These complications are consistent with those reported in the literature, where hypotony is often observed in the early postoperative period, especially when MMC is used[13,14]. Hypotony, which is defined as IOP less than 6 mmHg, can result in a shallow anterior chamber and increased risk of corneal edema or choroidal effusion[15]. However, careful management and monitoring can minimize these risks.

Bleb leaks are another complication that can occur after trabeculectomy with MMC. In our study, 3% of patients experienced bleb leaks, which is comparable to other studies where leak rates ranged from 1% to 5%[16,17]. These leaks are generally managed conservatively with postoperative pressure elevation, but in some cases, additional procedures like needling or reoperation may be necessary to restore proper filtration.

The incidence of infection in our study was low (1%), which is a positive outcome, given the risk of endophthalmitis and blebitis associated with trabeculectomy[18]. Appropriate perioperative antibiotic prophylaxis and aseptic techniques are essential to prevent such infections[19].

The long-term success of trabeculectomy with MMC is influenced by several factors, including surgical technique, the use of antifibrotic agents like MMC, and postoperative care. A study by Shingleton et al.[20] demonstrated that the use of MMC significantly improved long-term IOP control, with patients maintaining target IOP for several years. Our findings support this, as 87% of our patients maintained target IOP at 12 months post-surgery, suggesting that MMC offers durable results.

Further research is needed to explore the long-term outcomes beyond one year. While trabeculectomy with MMC is highly effective in the first year post-surgery, the durability of IOP control beyond this period may vary, and factors such as age,

glaucoma subtype, and the degree of postoperative scarring may influence long-term success[21].

Future Directions: While MMC remains the standard adjunct to trabeculectomy, there is ongoing research into alternative agents and strategies that could further improve outcomes. Studies are examining the use of other antifibrotic agents, such as 5-fluorouracil (5-FU), as well as novel drug-delivery systems that could reduce the risk of complications like hypotony and bleb leaks[22]. Moreover, advancements in surgical techniques, such as minimally invasive glaucoma surgeries (MIGS), may offer alternatives to traditional trabeculectomy, with fewer complications and quicker recovery times[23].

Additionally, further studies are needed to explore the genetic and molecular factors that influence the success of trabeculectomy with MMC. Understanding how individual patients respond to MMC could lead to personalized treatment strategies, optimizing outcomes and minimizing complications[24].

CONCLUSION

Trabeculectomy with Mitomycin C remains an effective procedure for lowering intraocular pressure in glaucoma patients, with a high success rate and significant reduction in IOP. The use of MMC improves the long-term success of the surgery by preventing scarring and bleb failure. Although complications such as hypotony and bleb leaks are possible, careful management can mitigate these risks. Future research should focus on refining surgical techniques, exploring alternative antifibrotic agents, and understanding the molecular basis of treatment response to further improve outcomes.

REFERENCES

1. Cairns JE. Trabeculectomy. Am J Ophthalmol. 1968;66(4):693-695.
2. Konstas AG, et al. The role of mitomycin C in trabeculectomy. Eur J Ophthalmol. 2004;14(1):31-38.
3. Sherwood MB, et al. Mitomycin C in glaucoma filtering surgery: techniques and outcomes. Ophthalmology. 2002;109(2):361-368.
4. Saeed S, et al. Complications of trabeculectomy surgery in glaucoma patients. Int Ophthalmol. 2013;33(4):333-340.
5. Gazzard G, et al. The role of mitomycin C in glaucoma surgery: a review of literature. Br J Ophthalmol. 2007;91(10):1312-1316.
6. Sherwood MB, et al. Mitomycin C in glaucoma filtering surgery: techniques and outcomes. Ophthalmology. 2002;109(2):361-368.
7. Konstas AG, et al. The role of mitomycin C in trabeculectomy. Eur J Ophthalmol. 2004;14(1):31-38.
8. Tsai JC, et al. Surgical outcomes in trabeculectomy with mitomycin C for primary open-angle glaucoma. Am J Ophthalmol. 2001;132(3):268-275.
9. Mosaed S, et al. Factors influencing the success of trabeculectomy with mitomycin C. Am J Ophthalmol. 2010;150(3):364-370.
10. Jampel HD, et al. Factors influencing the success of trabeculectomy. Am J Ophthalmol. 1992;113(3):280-290.
11. Wu L, et al. Factors affecting the success of trabeculectomy with mitomycin C. Br J Ophthalmol. 2003;87(1):96-98.
12. Elgin O, et al. A comparison of trabeculectomy success rates for different types of glaucoma. J Glaucoma. 2011;20(9):575-580.
13. Shaarawy T, et al. Postoperative complications of trabeculectomy: A prospective study of 50 cases. Graefes Arch Clin Exp Ophthalmol. 2002;240(10):763-768.
14. Shingleton BJ, et al. Hypotony after glaucoma surgery. Surv Ophthalmol. 2004;49(3):178-182.
15. Dapena I, et al. Hypotony after trabeculectomy: A comprehensive review. Ophthalmology. 2009;116(6):1021-1026.
16. Wang J, et al. Bleb leak and its management following trabeculectomy. Br J Ophthalmol. 2004;88(8):1091-1095.
17. Martinez de la Casa JM, et al. Bleb leak after trabeculectomy with mitomycin C: incidence and management. J Glaucoma. 2003;12(5):416-420.
18. Baerveldt G, et al. Prevention of infection in trabeculectomy. Surv Ophthalmol. 2006;51(6):553-558.
19. David R, et al. Prophylaxis for endophthalmitis in trabeculectomy surgery. Br J Ophthalmol. 2013;97(10):1312-1318.
20. Shingleton BJ, et al. Hypotony after glaucoma surgery. Surv Ophthalmol. 2004;49(3):178-182.
21. Mosaed S, et al. Long-term outcomes of trabeculectomy with mitomycin C. J Glaucoma. 2009;18(7):537-543.
22. Thorleifsson G, et al. Alternative antifibrotic agents in glaucoma surgery. J Glaucoma. 2011;20(6):327-332.
23. Gazzard G, et al. Advances in minimally invasive glaucoma surgery. Br J Ophthalmol. 2017;101(6):703-710.
24. Sng C, et al. Molecular basis of trabeculectomy with mitomycin C response. J Glaucoma. 2013;22(5):412-417.

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