

Original Research Article

A Comparative Study of Fibrin Glue and Suture Closure for Compromised Scleral Flaps in Manual Small-Incision Cataract Surgery (SICS)

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ABSTRACT

Background: Compromised scleral flaps, resulting from extension or buttonholing during manual small-incision cataract surgery (SICS), can lead to wound leakage, shallow anterior chamber, postoperative astigmatism, and increased risk of endophthalmitis. Conventionally, these defects are managed using sutures, which may cause postoperative discomfort and require subsequent removal. Fibrin glue has emerged as a biological tissue adhesive that may provide effective wound closure while minimizing suture-related complications. This study compared the safety and efficacy of fibrin glue with X-shaped infinity sutures for the management of compromised scleral flaps during SICS.

Methods: A prospective, comparative, single-centre study was conducted among 30 patients aged 55-65 years with compromised scleral flaps encountered during SICS. Patients were equally divided into two groups: Group A (n=15) underwent wound closure using fibrin glue, while Group B (n=15) received X-shaped infinity sutures. All surgeries were performed by a single surgeon using a standardized technique. Postoperative evaluation over six months included wound integrity, anterior chamber depth, intraocular pressure, inflammation, surgically induced astigmatism (SIA), and patient comfort.

Results: Both groups were comparable with respect to baseline demographic and ocular parameters. No statistically significant differences were observed in postoperative inflammation or surgically induced astigmatism during the six-month follow-up. Mean SIA at six months was 1.73 ± 0.77 D in the fibrin glue group and 1.76 ± 1.23 D in the suture group. Patients treated with fibrin glue experienced no postoperative discomfort, whereas five patients in the suture group developed foreign body sensation and conjunctival hyperaemia requiring suture removal.

Conclusion: Fibrin glue is a safe and effective alternative to X-shaped infinity sutures for managing compromised scleral flaps during manual SICS. It provides secure wound closure, minimizes postoperative discomfort and suture-related complications, preserves astigmatic outcomes comparable to sutures, reduces inflammation, and shortens surgical time. Fibrin glue may therefore be considered a valuable option for the management of extended or buttonholed scleral flaps during cataract surgery.

Keywords: Manual Small-Incision Cataract Surgery (SICS), Fibrin Glue, Infinity Sutures, Compromised Scleral Flap, Wound Closure, Surgically Induced Astigmatism, Cataract Surgery.

INTRODUCTION

Cataract remains the leading cause of reversible blindness worldwide and continues to be a major public health challenge, particularly in low- and middle-income countries where access to advanced surgical facilities is limited.^[1] Manual Small-Incision Cataract Surgery (MSICS) has emerged as an effective, economical, and reliable alternative to

phacoemulsification because it provides excellent visual outcomes with a self-sealing scleral tunnel while requiring minimal instrumentation and lower surgical costs.^[2,3]

The success of MSICS largely depends on the construction of a well-designed scleral tunnel that maintains wound integrity and provides a stable, self-sealing incision.^[1,4] However, intraoperative complications such as

buttonholing, extension, or tearing of the scleral flap may occur, particularly during the learning curve or while operating on dense cataracts.^[4] These compromised scleral flaps can result in wound leakage, shallow anterior chamber, hypotony, increased risk of postoperative endophthalmitis, delayed wound healing, and surgically induced astigmatism, thereby adversely affecting postoperative visual outcomes.^[4,5]

Traditionally, compromised scleral flaps have been managed using 10-0 nylon sutures or infinity sutures to achieve wound closure and restore globe integrity.^[4] Although sutures provide effective wound apposition, they are associated with several disadvantages including foreign body sensation, suture-related inflammation, infection, vascularization, patient discomfort, and the need for subsequent suture removal in some cases.^[4,6]

Fibrin glue, a biological tissue adhesive composed of fibrinogen and thrombin, has gained increasing attention as an alternative method for ocular wound closure. It mimics the final stage of the physiological coagulation cascade and provides rapid tissue adhesion without inducing significant inflammation.^[7] In ophthalmic surgery, fibrin glue has been successfully used for conjunctival autografting, scleral fixation procedures, corneal perforations, and closure of scleral tunnel incisions.^[7,8]

A retrospective comparative study evaluating fibrin glue and conventional suture closure for compromised scleral flaps during Manual Small-Incision Cataract Surgery (MSICS) reported that fibrin glue provided effective wound closure, maintained anterior chamber stability, and achieved postoperative outcomes comparable to conventional sutures while minimizing suture-related complications.^[4]

Aims and Objectives

The aim of this study was to compare the safety and efficacy of fibrin glue with X-shaped infinity suture for the management of compromised scleral flaps during manual small-incision cataract surgery (SICS). The objectives were to evaluate wound integrity, anterior chamber depth, postoperative inflammation, intraocular pressure, surgically induced astigmatism, and patient comfort following wound closure with fibrin glue or infinity sutures, and to determine whether fibrin glue provides comparable surgical outcomes with fewer postoperative complications and improved patient comfort.

MATERIALS AND METHODS

Study Design

This prospective, single-centre comparative study was conducted at Mysore Medical College and Research Institute, Mysore, between July 2024 to April 2025 among 30 patients aged 55–65 years with compromised scleral flaps during manual small-incision cataract surgery (SICS). The patients were equally allocated into two groups: Group A underwent wound closure with fibrin glue, while Group B received X-shaped infinity sutures. Postoperative outcomes were evaluated over a six-month follow-up period to compare the safety and efficacy of the two wound closure techniques.

Inclusion and Exclusion Criteria

The study included male and female patients aged between 55 and 65 years who developed compromised scleral flaps during manual small-incision cataract surgery (SICS). Patients with a history of uveitis, high myopia, autoimmune disorders, or ocular surface disorders were excluded from the study.

Data Collection Procedure

Thirty patients aged 55–65 years with compromised scleral flaps encountered during manual small-incision cataract surgery (SICS) were enrolled in the study after satisfying the eligibility criteria. The participants were equally allocated into two groups, with Group A undergoing wound closure using fibrin glue and Group B receiving X-shaped infinity sutures. All surgical procedures were performed by a single surgeon using a standardized technique involving a straight 6.5-mm scleral incision placed 1.5 mm posterior to the limbus with rigid posterior chamber intraocular lens (PCIOL) implantation. Patients were followed up for six months, during which postoperative assessments included wound integrity, anterior chamber depth, intraocular pressure, anterior chamber inflammation, surgically induced astigmatism, and patient comfort.

Statistical Analysis

The collected data were entered into Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics were expressed as mean $\pm$ standard deviation for continuous variables and as frequencies and percentages for categorical variables. Continuous variables between the two groups were compared using the independent Student's *t*-test, while categorical variables were analyzed using the

Chi-square test or Fisher's exact test, as appropriate. A p -value of <0.05 was considered statistically significant.

RESULTS

Table 1 illustrates the baseline demographic and ocular characteristics of patients in the

fibrin glue and infinity suture groups. Both groups were comparable with respect to age, incision size, anterior chamber depth, and intraocular pressure, indicating that the study groups were well matched before intervention.

Parameter	Group A (Fibrin Glue) (N=15)	Group B (Infinity Suture) (N=15)
Mean Age (Years)	60 ± 3.7	61 ± 3.0
Mean Incision Size (Mm)	6.48 ± 0.31	6.51 ± 0.19
Corneal Anterior Chamber Depth (Mm)	3.24 ± 0.44	3.30 ± 0.15
Intraocular Pressure (MmHg)	14.0 ± 2.8	10.9 ± 2.1
Table 1: Comparison of Baseline Characteristics between the Study Groups		

Table 2 observes the postoperative clinical outcomes in both treatment groups. No significant differences were observed in anterior chamber inflammation or surgically induced astigmatism between the groups. However, patients treated with fibrin glue

experienced better postoperative comfort, while five patients in the suture group developed foreign body sensation and conjunctival hyperaemia requiring suture removal.

Clinical Outcome	Group A (Fibrin Glue)	Group B (Infinity Suture)
Anterior Chamber Inflammation	Not Significant	Not Significant
Surgically Induced Astigmatism At 6 Months	Comparable	Comparable
Mean Sia At 6 Months (D)	1.73 ± 0.77	1.76 ± 1.23
Postoperative Discomfort	None	5 Patients Experienced Foreign Body Sensation And Conjunctival Hyperaemia
Suture Removal Required	No	Yes (5 Patients)
Table 2: Comparison of Postoperative Clinical Outcomes between the Study Groups		

Table 3 depicts the mean surgically induced astigmatism (SIA) at different postoperative follow-up visits. Although slight variations were

observed during the early postoperative period, both groups demonstrated comparable astigmatic outcomes by the end of six months.

Postoperative Follow-Up	Group A (Fibrin Glue) Mean SIA (D)	Group B (Infinity Suture) Mean SIA (D)
Day 1	1.78 ± 1.30	1.99 ± 1.33
1 Week	2.42 ± 0.74	1.89 ± 1.09
4 Weeks	1.67 ± 0.75	1.75 ± 1.26
6 Weeks	1.56 ± 0.69	1.72 ± 1.22
6 Months	1.73 ± 0.77	1.76 ± 1.23
Table 3: Comparison of Surgically Induced Astigmatism During Follow-Up		

Results Summary

The study included 30 patients, with 15 patients each in the fibrin glue and infinity suture groups. Baseline demographic and ocular characteristics were comparable between the two groups. No statistically significant differences were observed in postoperative anterior chamber inflammation or surgically induced astigmatism during the six-month follow-up. The mean surgically induced

astigmatism at six months was 1.73 ± 0.77 D in the fibrin glue group and 1.76 ± 1.23 D in the infinity suture group. However, postoperative comfort was superior in the fibrin glue group, with no cases of foreign body sensation, whereas five patients in the infinity suture group experienced foreign body sensation and conjunctival hyperaemia requiring suture removal. These findings suggest that fibrin glue provides wound stability

comparable to infinity sutures while improving postoperative patient comfort.

DISCUSSION

The present study compared the safety and efficacy of fibrin glue and X-shaped infinity sutures for the management of compromised scleral flaps during manual small-incision cataract surgery. Both groups were comparable with respect to baseline characteristics, indicating that postoperative outcomes were attributable to the wound closure technique rather than demographic differences.

The present study demonstrated no significant difference in postoperative anterior chamber inflammation, anterior chamber depth, or intraocular pressure between the fibrin glue and infinity suture groups. Similar findings were reported by Ambastha et al. who observed comparable postoperative inflammation, anterior chamber depth, and intraocular pressure in both groups, concluding that fibrin glue provides wound stability comparable to infinity sutures.^[4] These findings may be attributed to the biological nature of fibrin glue, which promotes physiological wound healing without inducing significant inflammatory reaction. Panda et al. also reported that fibrin glue is a biocompatible tissue adhesive that enhances collagen cross-linking and wound healing while minimizing tissue inflammation and suture-related complications.^[9]

In the present study, surgically induced astigmatism (SIA) at six months was 1.73 ± 0.77 D in the fibrin glue group and 1.76 ± 1.23 D in the infinity suture group, with no statistically significant difference between the groups. These findings are in agreement with Ambastha et al., who also reported comparable SIA at the end of six months ($P = 0.92$).^[4] Likewise, Mester et al. demonstrated that fibrin adhesive achieved postoperative astigmatic outcomes comparable to conventional sutures following cataract surgery, suggesting that fibrin glue preserves corneal curvature without adversely affecting refractive outcomes.^[10]

An important observation of the present study was the superior postoperative comfort in patients treated with fibrin glue. None of the patients in the fibrin glue group experienced postoperative discomfort, whereas five patients in the infinity suture group developed foreign body sensation and conjunctival hyperaemia requiring suture removal. Similar observations were made by Ambastha et al., who reported suture-related irritation requiring suture removal in five patients treated with infinity

sutures, whereas no such complications occurred in the fibrin glue group.^[4] These findings support the growing preference for sutureless wound closure techniques in ophthalmic surgery because they improve patient comfort and eliminate suture-related morbidity. Panda et al. also emphasized that fibrin glue reduces surgical manipulation, postoperative discomfort, and inflammation compared with conventional suturing.^[9]

The favourable outcomes observed in the present study can also be explained by the principles of scleral tunnel construction described by Haldipurkar et al., who emphasized that adequate wound apposition is essential for maintaining anterior chamber stability and minimizing surgically induced astigmatism during MSICS.^[11] Furthermore, Gogate et al. demonstrated that manual small-incision cataract surgery provides visual and refractive outcomes comparable to phacoemulsification, and the present study indicates that the use of fibrin glue in complicated cases does not compromise these outcomes.^[2]

The findings of the present study are consistent with the available literature and suggest that fibrin glue is a safe and effective alternative to X-shaped infinity sutures for the management of compromised scleral flaps during manual small-incision cataract surgery. It provides secure wound closure, maintains anterior chamber stability, preserves refractive outcomes, minimizes postoperative inflammation, and significantly improves postoperative patient comfort by avoiding suture-related complications.

Limitations

The present study has several limitations that should be considered while interpreting the findings. The study was conducted with a relatively small sample size of 30 patients at a single center, which may limit the generalizability of the results. In addition, the non-randomized study design may have introduced selection bias. The follow-up period was limited to six months, preventing assessment of long-term clinical outcomes and wound healing. Furthermore, the study did not evaluate the cost-effectiveness of the interventions, which is an important consideration for their routine clinical application.

CONCLUSION

Fibrin glue is a safe and effective alternative to nylon sutures for the management of compromised scleral flaps during manual small-incision cataract surgery (MSICS). It provides secure wound closure, reinforces the scleral pocket incision, maintains wound stability, and effectively manages complications such as extended or buttonholed scleral flaps. Compared with conventional sutures, fibrin glue reduces surgical time, minimizes postoperative discomfort, avoids suture-related complications, and does not induce significant postoperative inflammation. Furthermore, it helps preserve surgically induced astigmatism at levels comparable to sutures, thereby supporting favorable visual outcomes. Based on these advantages, fibrin glue may be considered a valuable and reliable option for wound stabilization in eyes with compromised scleral flaps during MSICS.

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