

Outcomes of Combined Phacovitrectomy Without Corneal Suturing

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ABSTRACT **Background:** During combined phacovitrectomy, it is common practice to suture the main corneal incision to prevent intraoperative and postoperative wound leak. However, it may be possible to avoid suturing using a self-sealing corneal incision technique as in standard cataract surgery.

Objectives: To evaluate the clinical outcome, safety, and complications of combined phacovitrectomy without preventive suturing.

Methods: This retrospective case series study included consecutive patients who underwent combined phacovitrectomy between January 2018 and June 2019 for mixed indications. Surgeries were performed at a tertiary university hospital. All surgeries were performed by the same two retinal surgeons. Cataract surgery was performed first, followed by insertion of trocars and vitrectomy. Corneal sutures were not planned but were used at the discretion of the surgeon.

Results: The cohort included 106 eyes of 102 patients. Suturing of the main corneal incision was deemed necessary in five cases (5%) because of a main incision leak or anterior chamber shallowing during trocar insertion. No other complications related to the absence of prophylactic corneal sutures were encountered during surgery or follow-up.

Conclusions: Preventive corneal suturing may not be necessary in combined phacovitrectomy surgery and can be used in the few cases in which it is indicated during surgery.

IMAJ 2023; 25: 608–611

KEY WORDS: cataract, combined surgery, phacoemulsification, sutureless, vitrectomy

During phacovitrectomy, it is common practice to suture the main corneal incision, and some surgeons advocate suturing the corneal side ports as well [3,6,8]. This procedure is done to prevent intraoperative and postoperative leak from the incisions, especially considering the forces exerted by trocar insertion and manipulation during vitrectomy [10] as well as to prevent endophthalmitis [11].

However, it is possible to close corneal incisions without suturing by creating self-sealing corneal tunnels [12]. The tunnels are imbued with balanced salt solution (BSS), which induces temporary localized iatrogenic corneal edema that tightens the wound lips. Self-sealing corneal incisions are common practice in cataract surgery worldwide [11,13]. The technique has been found to be safe and efficient, reducing operative time and lowering costs [14]. It also eliminates the risk of suture-related complications such as astigmatism, infection, and corneal opacities [11,14].

The aim of the current study was to report the outcomes, safety, and complications of combined phacovitrectomy without preventive suturing of the corneal wounds.

PATIENTS AND METHODS

STUDY DESIGN

This study was performed at a tertiary university medical center in accordance with the tenants of the Declaration of Helsinki following approval by the institutional review board. The requirement for informed consent was waived since this was a retrospective chart study.

A retrospective case series study design was used. The electronic medical database was queried using ICD-10 codes for cataract surgery and vitrectomy. Included in the study were consecutive patients who underwent combined phacoemulsification and pars plana vitrectomy by two retinal surgeons between January 2018 and June 2019. Patients were followed for at least 3 months. Exclusion criteria were any trauma preceding the surgery, non-phacoemulsification cataract surgery, and any other combination surgeries such as glaucoma and cornea.

Cataract surgery and vitrectomy have evolved separately and are classically performed by different surgeons trained separately using different instruments. There has been a growing trend to combine the two surgeries. Studies have shown that phacovitrectomy can be routinely performed for most indications, including retinal detachment, epiretinal peeling, and macular hole repair [1–9].

SURGICAL TECHNIQUE

Surgeries were performed under either peribulbar or general anesthesia as dictated by case complexity and patient cooperation. Cataract surgery was performed first, followed by vitrectomy. Two microsurgical platforms designed for both anterior-segment and posterior-segment surgery were used depending on operating room availability: Constellation Vision System (Alcon, Fort Worth, TX, USA) and Stellaris PC (Bausch and Lomb, Rochester, NY, USA). The non-contact Resight 700 system (Oberkochen, Germany) was used in all cases for visualization during vitrectomy.

Cataract surgery was performed with a 2.4-mm main clear corneal incision and three 1.0 mm stiletto incisions, two for manipulation and one for anterior chamber maintainer. All incisions were constructed in a bi-planar fashion aimed at obtaining a squared corneal tunnel. After phacoemulsification of the cataract, a foldable intraocular lens was implanted. The viscoelastic was then evacuated and the anterior chamber maintainer was removed. The corneal incisions were imbibed with BSS, as in standard cataract surgery. At the end of this stage, the corneal incisions were carefully inspected for leaks. Suturing was not planned, but 10/0 nylon corneal sutures could be placed if the surgeon believed it necessary. Attention was then directed to the vitrectomy.

For the vitrectomy, three trocars were inserted according to the standard approach in the superotemporal, superonasal, and inferotemporal positions, 3.5 mm from the limbus. An additional trocar was inserted for a chandelier if necessary. During trocar insertion, care was taken to avoid gaping of the corneal incisions. Pars plana vitrectomy was performed as required by the individual scenario. Corneal sutures and anterior chamber viscoelastic could be used at the surgeon's discretion to ensure safety. Next, the trocars were removed and the wounds were inspected for leakage; 8/0 Vicryl sutures (Ethicon, Somerville, NJ, USA) were placed as necessary. Antibiotics and steroids were injected subconjunctivally, and standard postoperative drops were instilled. The eye was patched with a plastic shield.

FOLLOW-UP

The patients were then followed 1 day, 1 week, 1 month, and 3 months postoperative. Each examination included best corrected visual acuity (BCVA), full slit-lamp examination, Goldmann applanation tonometry and dilated pupil fundus examination. Macular optical coherence tomography (OCT) using Spectralis OCT (Heidelberg Engineering, Heidelberg, Germany) was also performed in all patients.

DATA COLLECTION

Background, disease-related, and procedure-related data were collected from the medical files. In addition, the following variables were recorded for each patient: use of corneal sutures, intraoperative and early postoperative complications, intraocular pressure, and the logarithm of the minimum angle of resolution (logMAR) BCVA. Visual acuities of counting fingers and hand

movement were estimated as 2 and 2.3 logMAR, respectively. Visual acuities of light perception and no light perception were estimated as 2.7 and 3 logMAR, respectively [15,16].

STATISTICAL ANALYSIS

Data were analyzed with descriptive statistics and paired *t*-test for comparison of mean BCVA before and after intervention. The statistical analysis was performed using Microsoft Excel™ 2016 (Microsoft® Corporation, Redmond, WA, USA). Raw data are available on request from the corresponding author.

RESULTS

The study group included 106 eyes of 102 patients, 54 male (51%) and 52 female (49%) aged 44 to 86 years (mean 66 years). Table 1 shows patient demographics, past medical histories, and indications for surgery. The main co-morbidities were diabetes mellitus (47%), hypertension (42%), and dyslipidemia (39%). Nearly half of the patients (49%) had a history of epiretinal membrane or vitreomacular traction and 24% had proliferative diabetic retinopathy. The main indication for surgery was epiretinal membrane or vitreomacular traction in 50% of patients followed by retinal detachment in 34%.

Local anesthesia was used in 80% of cases. Vitrectomy was performed with 25G instrumentation in 54% of cases, 23G in 44%, and 27G in 2%. Suturing of the main corneal incision due to corneal leak was required in five cases (5%). This need was identified either by observing an apparent incision leak or anterior chamber shallowing during trocar insertion. In one case, suturing was required because of a corneal burn.

Mean logMAR BCVA was improved from 1.00 to 0.80 at 3 months post-surgery ($P < 0.05$). Three cases (2.8%) were complicated by moderate intraoperative floppy iris syndrome, but all were managed successfully without significant iris damage and without corneal suturing. Although iris prolapse was documented initially during cataract surgery, it was not documented later after the corneal incisions were imbibed with salt solution and specifically not during trocar insertion, during vitrectomy, or any time during follow-up. There were two cases with posterior capsular tear, one of them in a case in which corneal suturing was performed.

On the first postoperative day, there were no cases of corneal wound leak (Seidel test). One patient had a shallow anterior chamber, but it resolved spontaneously and was thought to be related to a sclerotomy leak and not the corneal incisions. In addition, three patients had mild vitreous hemorrhage, which resolved spontaneously. One patient had mild toxic anterior segment syndrome, which promptly resolved with regular postoperative antibiotic and steroid drops. During follow-up, there were three cases of mild choroidal effusion, all of which spontaneously and rapidly resolved. No evidence was found of choroidal hemorrhage, iris incarceration, or infection. Table 2 presents the clinical results and complications in detail.

Table 1. Patient demographics and preoperative data

Characteristic	Value
Sex, n (%)	
Male	54 (50.9)
Female	52 (49.1)
Mean age in years	66.4 ± 10.2
Past medical history, n (%)*	
Diabetes mellitus	50 (47.2)
Hypertension	45 (42.5)
CVA	4 (3.8)
Dyslipidemia	41 (38.7)
Past ocular history, n (%)*	
Non-proliferative diabetic retinopathy	5 (4.7)
Proliferative diabetic retinopathy	25 (23.6)
Macular hole	5 (4.7)
Epiretinal membrane + vitreomacular traction	52 (49.1)
Exudative age-related macular degeneration	5 (4.7)
Indications for surgery, n (%)*	
Epiretinal membrane	50 (47.2)
Vitreomacular traction	7 (6.6)
Proliferative vitreoretinopathy	9 (8.5)
Macular hole	5 (4.7)
Retinal detachment	30 (28.3)
Vitreous hemorrhage	10 (9.4)
Mean BCVA before surgery (logMAR)	1.0 ± 0.72
Total number of eyes	106

logMAR BCVA = logarithm of the minimum angle of resolution best corrected visual acuity

*Some patients had more than one condition

Table 2. Clinical results and complications rates

Characteristic	Value
Mean postoperative BCVA (logMAR)	
at 1 month	0.83 ± 0.72
at 3 months	0.80 ± 0.75
Corneal suturing, n (%)	5 (4.7)
Intraoperative complications, n (%)	
Floppy iris syndrome (during cataract extraction)	3 (2.8)
Difficult trocar insertion	0 (0)
Posterior capsular tears	2 (1.9)
Total	5 (4.7)
Abnormal intraocular pressure at day 1 after surgery, n (%)	
Hypotonia intraocular pressure ≤ 5 mmHg	5 (4.7)
Elevated intraocular pressure ≥ 22 mmHg	16 (15.1)
Elevated intraocular pressure ≥ 24 mmHg	13 (12.3)
Total	21 (19.8)
Early postoperative complications, n (%)	
Postoperative corneal wound leak	0 (0)
Shallowed anterior chamber	1 (0.9)
Vitreous hemorrhage	3 (2.8)
Toxic anterior segment syndrome	1 (0.9)
Infection	0 (0)
Total*	5 (4.7)
Late postoperative complications, n (%)	
Choroidal effusion	3 (2.8)
Choroidal hemorrhage	0 (0)
Iris incarceration	0 (0)
Infection	0 (0)
Total	3 (2.8)

logMAR BCVA = logarithm of the minimum angle of resolution best corrected visual acuity, SD = standard deviation

*Total was calculated conservatively, using elevated intraocular pressure of ≥ 22 mmHg

DISCUSSION

The shift toward combined cataract and vitrectomy surgery in recent years can be attributed to improvements in the surgical equipment, experience gained in each individual surgery as well as in the combined surgery, and better clinical outcomes of the combined surgery. A recent systematic review and meta-analysis demonstrated no significant difference in final BCVA after sequential versus combined phacovitrectomy surgery [17]. Another literature review found that combined surgery was more cost-effective than sequential surgeries, allowed for faster visual rehabilitation, and reduced the treatment burden [14].

Traditionally, the cornea was routinely sutured in cataract surgery, especially when larger corneal incisions were used. This practice has largely been replaced by self-sealing clear corneal incisions, which are now considered the standard of

care worldwide [11]. Although self-sealing corneal incisions are gaining popularity also for combined phacovitrectomy [3-6,8], to our knowledge, the safety of combined surgery without preventive corneal suturing has not yet been specifically evaluated. The present retrospective study reveals the results of 106 eyes of 102 patients who underwent combined phacovitrectomy for various indications at a tertiary medical center over an 18-month period. In our series, which represents real-world data due to its retrospective nature, we did not encounter complications that are likely to be attributed to the lack of preventive suturing, such as endophthalmitis [11]. Therefore, like for cataract surgery alone, corneal suturing should not be considered mandatory for combined surgery, and indeed, may often be unnecessary. We found that after the cataract surgery, trocar insertion performed in the standard fashion without modifications was easy and safe and did not cause corneal incision

gaping in most cases. Although the elimination of preventive corneal suturing sounds counterintuitive given that intraocular pressure rises acutely during trocar insertion, we observed that when a self-sealing corneal incision was well-constructed, the rise in intraocular pressure tightened the wound lips and prevented leakage. The same principle also applied to other stages of vitrectomy including scleral depression.

Sizmaz and colleagues [2] reported a corneal suturing rate of 34.5% for combined phacovitrectomy. In the cases in which the corneas were not sutured none encountered incision-related leaks on postoperative day 1. Elimination of suturing has been found to lower the risk of astigmatism, corneal opacity, and suture-related infections. In addition, it decreases operative time and lowers the cost of surgery [2,11].

In a large series of clear cornea cataract surgeries of 3500 eyes, Monica et al. [12] reported the use of corneal suture in only 56 cases (1.6%). Complication rate was low. Compared to these results, in our series a higher rate of unplanned suture was deemed as needed during surgery. This result may be related to the combined procedure, which requires a stable anterior chamber. Nonetheless, as sutures can be completed at the discretion of the surgeon, we did not find the higher incidence problematic by itself.

During phacovitrectomy, the trocars may be inserted either at the beginning of the combined procedure or after the cataract part. Both approaches are acceptable and efficient, but we preferred the latter for several reasons. When the trocars are inserted at the onset, the surgeon, in a sense, commits to vitrectomy. In patients with a small palpebral fissure the vitrectomy ports may move underneath the speculum or eyelids, making it hard for the surgeon to manipulate the eye. Furthermore, insertion of the trocars may make the eye hypotonic, especially if previously vitrectomized or if there is a valve leak. This procedure may significantly complicate the cataract surgery, leading to a deep unstable lens and difficult capsulorrhexis.

This study has a few limitations. We used a retrospective design, which has some inherent biases, and no comparison group was included. These results need to be validated in randomized controlled trials to compare combined sutureless phacovitrectomy with phacovitrectomy and planned suturing. Given the rarity of severe complications in cataract surgery, our sample size is rather small. Although we did not encounter difficulties using sutureless technique, a learning curve would be expected to achieve a smooth sutureless combined phacovitrectomy. Our findings should not weaken the general recommendation of using corneal sutures any time or situation in which they are indicated to avoid corneal wound leaks. At the same time, corneal sutures can be safely avoided when the corneal incision is found to be well sealed after imbibing it with BSS.

CONCLUSIONS

Preventive corneal suturing may not be necessary in combined phacovitrectomy. We encountered no significant complications during surgery or follow-up related to lack of corneal suturing. Further prospective studies are needed to corroborate our findings.

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