

New superior modified fornix-based twin-site phacotrabeculectomy

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Phacotrabeculectomy is the preferred surgical management of coexisting visually significant cataract and moderate to advanced glaucoma. We report the surgical technique of a new modified fornix-based separate-site phacotrabeculectomy, with mitomycin C (MMC) application, in both primary open angle and angle closure glaucoma. In this new separate-site technique, both phaco and filtration are accommodated superiorly, side by side, hence called twin-site. This was achieved in an efficacious and safe manner with sparing of limbal stem cells without compromising safety. It is not only MMC-compatible but also has a low incidence of wound leak. The technique has no adverse consequence on the survival of the bleb, and we achieved complete success in 79.2% and total success in 93.1% in 130 eyes of 117 patients, in the intermediate term. Furthermore, the time taken for this separate-site surgical technique is comparable to published one-site procedures.

Key words: Fornix-based, phacotrabeculectomy, separate-site phacotrabeculectomy, twin-site phacotrabeculectomy

Phacotrabeculectomy is the preferred surgical management of coexisting visually significant cataract and moderate to advanced glaucoma^[1] and can be performed through the same incision (one-site) or one can separate the incisions (two-site or separate-site). There are several reports of outcomes; one meta-analysis suggested no difference,^[2] while another evidence-based review demonstrated marginally lower intraocular pressure (IOP) in separate-site surgery.^[3] Nonetheless, separate-site is preferred by surgeons who believe that lesser manipulation of sclera and conjunctiva results in decreased postoperative inflammation.^[4]

Conventionally, separate-site phacotrabeculectomy consists of temporal phaco and a superior filter, which involves change in position for surgeon and microscope with consequent wastage of operating room (OR) time. Few modifications, if any, have been reported to circumvent this contention.

We report a technique of a superior, modified fornix-based, separate-site phacotrabeculectomy, where phaco and filter are accommodated side by side and hence "twinned," without need for change in position of surgeon. It is wholly compatible with Moorfields Safer Surgical System (SSS) of mitomycin C (MMC) application.^[5] The filtration procedure draws some inspiration from the technique as reported by Wise^[6] in 1993 and improvised by Prof. A. Crandall in Utah, USA,^[4] and adopted by Dr. Ike Ahmed at the University of Toronto, Canada.

Surgical Procedure

Informed consent was obtained for each surgery. All surgeries were performed for primary glaucomas Primary Open

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Angle Glaucoma (POAG) and Primary Angle Closure Glaucoma (PACG) with the exception of pseudoexfoliation glaucoma (PXFG). All procedures were performed by a fellowship-trained surgeon. Steps of surgery are indicated in Fig. 1 left schematic, Fig. 2 and Video 1.

Under low-volume peribulbar anesthesia and sterile conditions, a 3- to 4-mm circumferential superior conjunctival incision is made 1–1.5 mm posterior to the limbus, leaving a conjunctival frill, superonasally in the right eye (RE) and superotemporally in the left eye (LE). Deep conjunctival pocket is dissected superiorly, and a partial thickness 3 × 2 mm rectangular scleral flap is reflected. Four sponges are fashioned out of a weck-cel spear and are soaked with freshly reconstituted 0.4 mg/mL MMC. Three MMC-soaked sponges are placed deep into the conjunctival pocket for a broad and diffuse application and one is also placed under the scleral flap. Conjunctival wound edges are held with atraumatic forceps and kept dry with a weck-cel sponge. After 2 min of exposure, copious irrigation of MMC is done. Using a 2.8-mm keratome, anterior chamber (AC) is entered through a clear-corneal tunnel, also superiorly at an adjacent site (superotemporal RE and superonasal LE), and phacoemulsification is performed by direct-chop technique. The phaco incision is closed with an interrupted 10-0 nylon suture after injecting a foldable acrylic IOL. Deep scleral block excision is done using a Descemet-punch underneath the scleral

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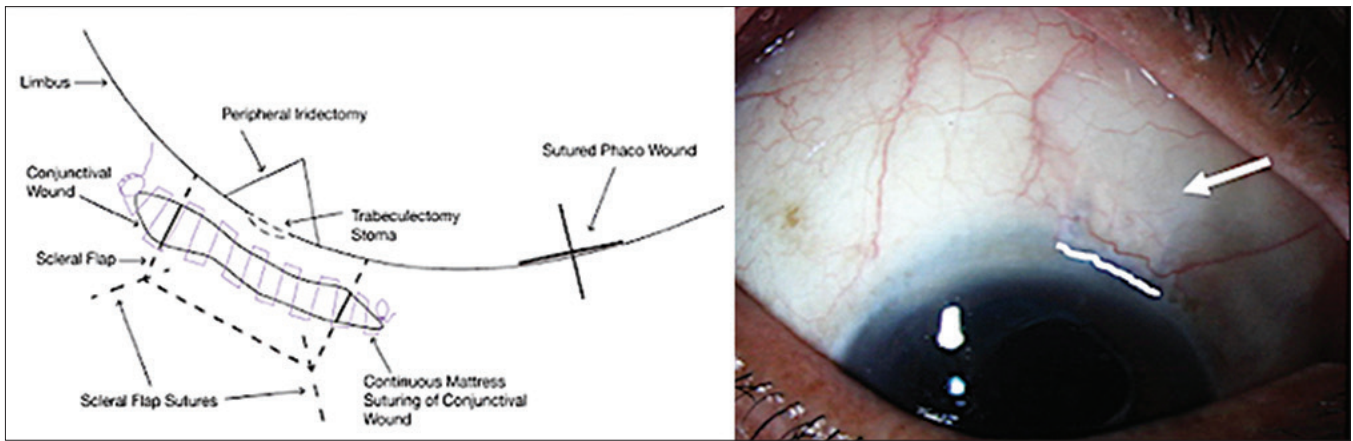


Figure 1: Left – schematic of a “twinned” separate-site phacotrabeculectomy (surgeons’s view, right eye) with details of 10-0 vicryl conjunctival continuous mattress suturing. Right – “twinned” phacotrabeculectomy 1-year postop; sqiggly white line just below a mild scar along line of conjunctival suturing and white arrow indicating the faint outline of the rectangular scleral flap

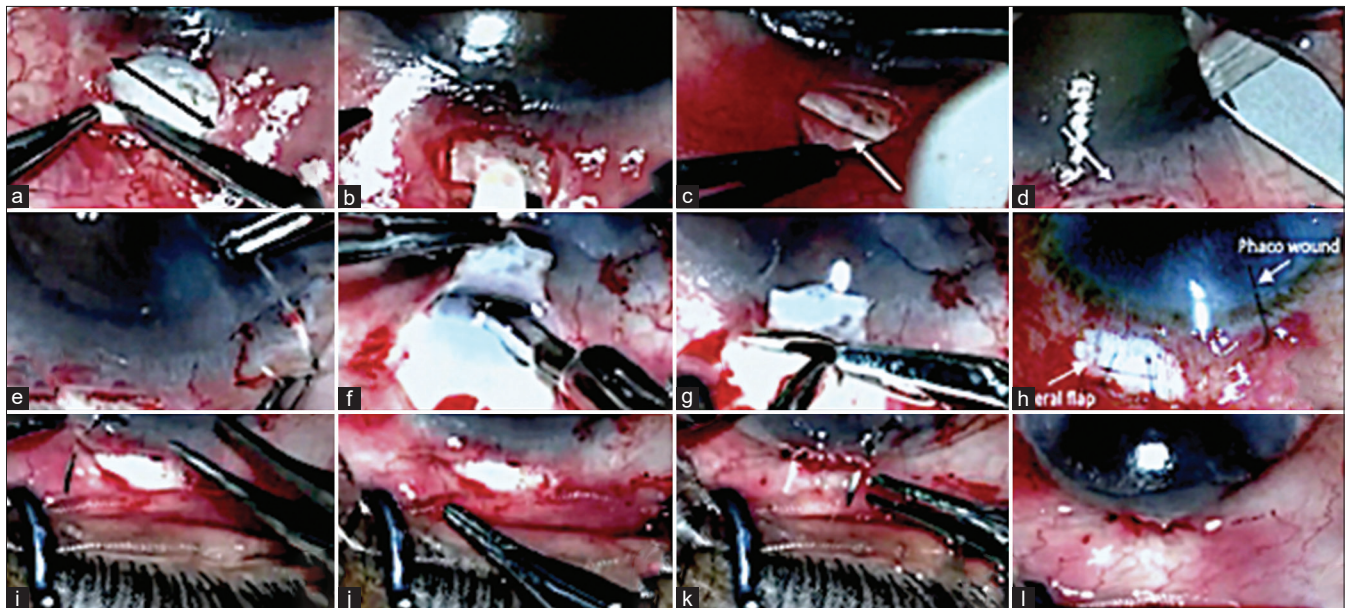


Figure 2: Twin-site surgery in steps in the right eye, surgeon’s view. (a) Superior circum-corneal conjunctival incision approximately 3–4 mm long, leaving a conjunctival frill 1.5 mm away from the limbus. (b) Partial thickness 3 x 2 mm rectangular scleral flap is reflected. (c) MMC-soaked sponge is placed under the scleral flap (white arrow) (they are also placed deep into the conjunctival pocket). (d) A 2.8-mm keratome entry through a clear-corneal tunnel, also superiorly, at an adjacent site so “twin”. White arrow showing trab site (e) Phaco wound sutured with 10-0 nylon suture. (f) AC is entered underneath the scleral flap and deep scleral block excision is done using a Descemet punch. (g) Peripheral iridectomy is done. (h) Scleral flap sutured with 2 x 10-0 nylon sutures. (i) Conjunctival wound approximated; 10-0 vicryl suturing started at the left edge with a knot. (j) Continuous mattress suturing of the conjunctiva completed (k) suture is tied off after creating a loop. (l) Wound is tested for leakage along with bleb formation by injecting balanced salt solution through the paracentesis

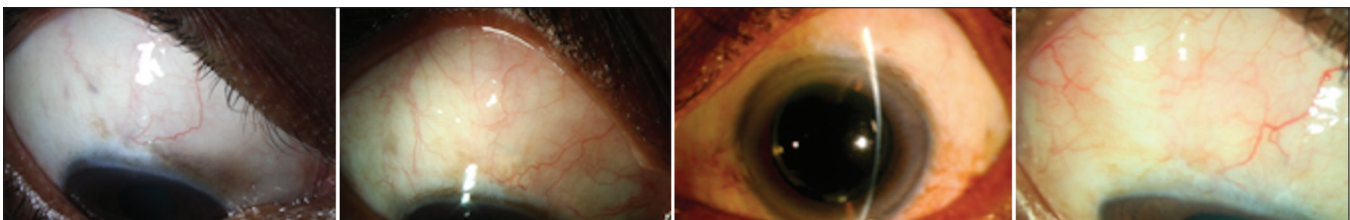


Figure 3: Diffuse, low-lying, posteriorly directed blebs with the new modified fornix-based, twin-site phacotrabeculectomy

flap; a peripheral iridectomy is performed in all cases. Scleral flap is closed with two 10-0 nylon sutures. Using 10-0 vicryl on a vascular tapering needle, conjunctiva-to-conjunctiva closure is done with running mattress suturing. After the initial pass

involving both edges of the conjunctiva, a knot is tied first at the left-hand side of the surgeon. Subsequently, 0.5-mm bites of the conjunctival edges are taken in one direction and the needle direction is then reversed; adjacent bites are taken

approximately 0.5 mm away [Fig. 1, left]. The entire length of the conjunctival wound is covered in this continuous mattress technique in approximately six to eight needle passes. The suture is then gently manipulated to squeeze the wound; this ensures water-tight closure. A knot is then tied at the right-hand side of the surgeon, by first creating a loop and then using the free-edge of the suture to create a 3-1-1 knot. Finally, the wound is tested for leakage along with bleb formation by injecting balanced salt solution through the paracentesis and subconjunctival dexamethasone 2mg is injected.

Postoperatively, all patients are treated with prednisolone acetate 1% eye drops in tapering dose over 8–10 weeks, antibiotic eye drops four times a day for a week, and homatropine 2% eye drops three times a day for 2–3 weeks. Data handling was as per the tenets laid down by the Declaration of Helsinki.

In all, 130 eyes of 117 patients underwent MMC phacotrab via this twin-site technique in the study period of April 2011–March 2016 by a single fellowship-trained surgeon. The mean follow-up was 22.2 months (± 18.1 , range 3–81 months). A total of 83 eyes (63.8%) were PACG and 47 (36.2%) were POAG eyes, including 8 PXFG eyes. The average time taken in OR was 38.5 ± 7.8 min. Statistically significant reductions in IOP (24.0 ± 11.9 mmHg preop vs. 13.5 ± 3.5 mmHg postop, $P < 0.001$) and number of antiglaucoma medications (AGM) (2.9 ± 1.1 vs. 0.4 ± 0.9 , $P < 0.001$) were seen. Complete success (IOP > 5 and ≤ 18 , without AGM) occurred in 79.2% eyes and qualified success (with AGM) in 13.8% (total 93.1%). Improvement in visual acuity occurred in 86.1% ($n = 112$). None of the eyes lost vision.

Mild suture track leak was seen in 11 eyes (8.5%) intraoperatively and bandage contact lens (BCL) was placed on-table. All but one eye (0.8%), which required resuturing, settled down within 1 week. We also encountered peroperative aqueous misdirection in three PACG eyes (2.3%), two of these in one subject alone. It was dealt with promptly with zonulo-hyaloidectomy via ostium and iridectomy. AC wash for hyphema and choroidal drainage were required in one eye each (0.8%). Needling was required in 10 eyes (7.7%) and repeat glaucoma surgery in 3 (2.3%). Five eyes (3.8%) had IOP > 18 mmHg at last follow-up, but only 1 (0.8%) had low IOP. One eye (0.8%) developed an overhanging bleb with dellen, requiring bleb repair; one eye (0.8%) developed trauma-related endophthalmitis.

Discussion

We modified the conventional separate-site technique and placed incisions for both surgeries, trabeculectomy and phacoemulsification, superiorly, and therefore “twinned” it with no change in surgeon (or microscope) position, hence preventing loss of OR time. Time taken in OR with this “twinned” surgery is comparable to published results for the single-site procedure.^[7] This modified technique of side-by-side phaco and filter has been devised by the first author; such a technique has hitherto been unreported. Our success rates are on par^[8] for lower target IOP of 18 mmHg.

Incidence of wound leak is low with this technique, compared with 12.4% reported by Wise,^[6] 14% reported by Kirwan *et al.*,^[9] and 17.8% reported by Edmunds *et al.*^[10] Yet it is possible that incidence of 8.5% in our cohort is an overestimate, as even the mildest of suture-track leak as seen intraoperatively received a BCL, which would probably settle with overnight patching. However, we preferred to place a BCL pre-emptively on table under sterile conditions. Incidence of adverse bleb morphology was also low, and we mostly achieved a diffuse, low, and posteriorly directed bleb [Fig. 1, right and Fig. 3].

We believe our technique of MMC application, pursuing the Moorfields SSS,^[5] coupled with sparing of limbal stem cells (by leaving a conjunctival frill) as well as use of a very fine vicryl suture (creating a barrier for corneal migration of bleb; Fig. 1, right). We believe this results in a favorable bleb morphology [Fig. 3], which includes diffuse, posteriorly directed blebs with low profile as opposed to high, anterior, localized blebs with conjunctivalization of the cornea. However, bleb morphology was not evaluated formally. Endophthalmitis that was encountered was due to trauma and was unrelated to bleb morphology; blebitis was not seen in this cohort.

Conclusion

To conclude, our technique of twin-site phacotrabeculectomy is a successful and efficient modification of the conventional separate-site surgery, without compromising safety. It is not only MMC-compatible but also has a low incidence of wound leak. Furthermore, the time taken for surgery is comparable to published one-site procedures.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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