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Reverse big bubble: a new technique for preparing donor tissue of Descemet membrane endothelial keratoplasty

Recently, endothelial keratoplasty has been shown to offer a promising alternative to penetrating keratoplasty for the management of corneal endothelial failure. Melles et al introduced a new technique for transplantation of Descemet membrane (DM) through a self-sealing incision, which they referred to as Descemet membrane endothelial keratoplasty (DMEK). They obtained donor material by stripping DM with fine forceps. This is a challenging and time-consuming procedure with inevitable endothelial cell loss and possibility of DM tear. Herein, we describe a new technique to prepare donor tissue for DMEK, the reverse big-bubble technique.

SURGICAL TECHNIQUE
A corneoscleral button was placed endothelial side up on a donor Barron punch and fixed by grasping the outer scleral edge. The endothelial layer was stained with trypan blue. A 27-gauge bevel-up needle attached to a 2 ml syringe filled with air was inserted into the posterior stroma with the entry point located just outside of the Schwalbe line. The needle was advanced to the central cornea. Air was gently injected causing corneal emphysema. The small air bubbles that formed rapidly coalesced into a big bubble detaching DM from the posterior stoma. The needle was removed from the cornea and introduced into the big bubble from the scleral part of the corneoscleral rim to collapse the bubble by aspirating the air. Finally, a Barron punch (8.5 mm in diameter) was used to punch donor the DM from endothelial side (figure 1).

DISCUSSION
Endothelial keratoplasty has become a popular procedure for treatment of corneal endothelial disorders. This leaves a secure eye with less postoperative astigmatism when compared with penetrating keratoplasty. In recent years, various techniques for endothelial keratoplasty have been described, namely, deep lamellar EK (DLEK), Descemet stripping (automated) endothelial keratoplasty (DSEK/DSAEK) and DMEK. Preliminary results have shown that DMEK offers a faster visual rehabilitation and better optical quality than DSAEK. Although donor tissue preparation for DMEK is not dependent on expensive equipment, the manual dissection is difficult and tedious for many surgeons. Use of the air injection into the cornea and introduced into the big bubble from the scleral part of the corneoscleral rim to collapse the bubble by aspirating the air. Finally, a Barron punch (8.5 mm in diameter) was used to punch donor the DM from endothelial side (figure 1).

In comparison with manual dissection of donor DM, it can be done faster, easier and without endothelial cell touch during the detachment. In addition, the technique is familiar to many surgeons and has a short learning curve. Lie JT et al reported 4% to 7% endothelial cell loss after stripping DM. We did not perform specular microscopy, but we suppose less endothelial loss rate would be less because it requires minimal touch and is a less traumatizing procedure.

As this was an experimental study, we used trypan blue to visualise the endothelium. The procedure can be performed without trypan blue staining because this dye can be toxic to the endothelium and would not be recommended in actual surgical practice.

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MAILBOX
A new method to prevent loss of mitomycin C soaked sponges under the conjunctiva during trabeculectomy

Surgically acquired foreign body is a serious complication of microscopic surgery. In fornix-based trabeculectomy with mitomycin C, sponges soaked with mitomycin C are placed under the conjunctival flap for 3–5 min, after which the sponges are removed with a toothed forceps. Sponges may be lost under the conjunctival flap because in fornix-based trabeculectomy, the sponges are inserted deep into the conjunctival–scleral interface. Numerous complications due to retained cellulose sponges after trabeculectomy with mitomycin C such as granulomas or conjunctival hole formation have already been reported.

We used DELICOT (Cat # 63-01, American Surgical Sponges, Lynn, Massachusetts; figure 1) as a device to deliver mitomycin C to the sclera during trabeculectomy. The devices for delivering mitomycin C during trabeculectomy include regular surgical sponges, scleral shields and soft contact lenses. Surgical sponge is the most popular devise to soak mitomycin C during trabeculectomy. However, sponges may be retained under the conjunctiva due to carelessness or posterior migration of sponges during surgery. We report the efficacy of DELICOT as a tool to soak mitomycin C during trabeculectomy, which we believe can prevent such complications.

DELICOT is made specifically for neuro- microsurgery to absorb cerebrospinal fluid or haemorrhage in the deep areas of the brain. DELICOT consisted of 8 mm×5 mm cotton sponges and a 30 cm cotton string tied previously to the sponges by a knot. After a fornix-based conjunctival incision, three to 10 DELICOTs soaked in a 0.4 mg/ml solution of mitomycin C were applied for 3–5 min at the sclera. The sponges soaked in mitomycin C were easily placed under the conjunctiva with forceps and were removed by just pulling the cotton string tied to the sponge. Between 1 April 2005 and 30 March 2006, we performed 84 consecutive fornix-based trabeculectomy with usual surgical sponges (age 59.6±19.2, sex male; 46; female; 38; type of glaucoma; POAG; 37 secondary glaucoma; 40; chronic angle closure glaucoma 5; developmental glaucoma; 2). Throughout this period, there were three incidents where the number of retrieved sponges at the end of surgery did not match. Intraoperative search revealed the sponges at a posterior location near the equator in all incidents. We then performed 351 consecutive fornix-based trabeculectomy with DELICOT between 1 April 2006 and 30 March 2009 (age 62.3±15.0, sex male; 211; female; 140; type of glaucoma; POAG; 128 secondary glaucoma; 179; chronic angle closure glaucoma 50; developmental glaucoma; 14). We did not observe any incidences of sponge migration during the surgery. The incidence of sponge migration was noted, which we believe reduced the risk of sponge retention or loss during surgery.

With our new methodology, no incidence of sponge migration was noted, which we believe reduced the risk of sponge retention or loss during surgery.

In brief, sponges tied to a cotton thread provide ease and safety in removal of sponges.

Figure 1 (A) DELICOT sponge tied to a cotton thread and (B) magnified image showing the knot.

Removing the sponges inside the conjunctival–scleral interface with forceps is challenging. A blind search for migrated sponges with toothed forceps may introduce complications such as unnecessary damage to the subconjunctival tissues with or without bleeding or disintegration of the sponge material.

Poole et al reported that pieces of cellulose sponges used for soaking antiproliferative agents in trabeculectomy left behind fragments at the conjunctival–scleral interface, degrading slowly inside the bleb after surgery initiated a foreign-body reaction, which might affect the surgical outcome.

With our new methodology, no incidence of sponge migration was noted, which we believe reduced the risk of sponge retention or loss during surgery.

In brief, sponges tied to a cotton thread provide ease and safety in removal of sponges.

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