Revisiting Angle Surgery for Management of Open-angle Glaucoma: Ab Interno Trabeculotomy

Don Minckler

University of California Irvine, Irvine, CA, USA, e-mail: minckler@uci.edu

INTRODUCTION

New ab interno and ab externo approaches to angle surgery in adults and children with open-angle glaucoma show promise for improving intraocular pressure (IOP) control less invasively and with fewer complications than current ab externo filtering procedures. These include the Trabectome™ Science canaloplasty, Glaukos™ Laser goniopuncture and Solx.

AB INTERNO TRABECULOTOMY

The Trabectome™ permits ab interno trabeculotomy which involves ablation of a strip of trabecular meshwork and inner wall of Schlemm’s canal with simultaneous aspiration and irrigation to remove tissue debris with a stable anterior chamber.1,2 The device includes a ceramic coated insulated footplate that acts as a glide within Schlemm’s and also functions to protect adjacent tissues from heat or mechanical injury.3

Technique

This procedure is done via a 1.6 mm clear corneal incision temporally under direct gonioscopic control utilizing a modified Swan-Jacob goniolens with the goal of opening a 90 to 120° arc of Schlemm’s canal so that aqueous has direct access to collector channels.

The procedure is performed using Trabectome™ (Fig. 1) approved by the US FDA. The trabectome handpiece (Fig. 2) is a disposable device that incorporates bipolar micro-electrocautery for safe ablation and removal of trabecular meshwork, unroofing Schlemm’s canal and exposing the natural drainage pathway of the eye (collector channels) to aqueous humor with simultaneous irrigation and aspiration. It has got a footplate at the tip which protects collector channels. A foot pedal control activates aspiration and ablation.

The most useful anatomic landmarks for identifying Schlemm’s intraoperatively include the scleral spur and pigmented meshwork, if present. Alternatively, blood in Schlemm’s canal after installation of viscoelastic into the anterior chamber often clearly marks the location of Schlemm’s. The inferior nasal quadrant is specifically targeted as collector channels are thought most numerous there. As ablation proceeds, the back wall of Schlemm’s appears as a white band in the trail of the instrument’s footplate. Back bleeding from exposed collector channels or Schlemm’s canal typically occurs during the later part of canal opening or when IOP drops as the instrument is removed. Back bleeding typically stops spontaneously over minutes or when an internal tamponade via fluid or an air bubble is installed. Figures 3 and 4 show histopathology of tissue structure from in vitro corneal rim after ab interno trabeculotomy.

Only rarely among the nearly 400 procedures so far performed and reported by the authors, has the resulting hyphema been more than 10 to 20 percent or persisted for more than a few days or been associated with a postoperative IOP spike. Intraoperative back bleeding is probably decreased by preoperative use of apraclonidine. A single 10-0 nylon or polyglactin suture is placed across the corneal wound. Postoperatively, most eyes are treated with 1 to 2 percent pilocarpine for two weeks and preoperative medications resumed temporarily pending IOP results over ensuing weeks.

Reduction of IOP in an ongoing prospective case series involving nearly 400 eyes has averaged 40 percent (mean preoperative IOP of 24 mm Hg) to mid-teen levels (mean postoperative IOP of 16 mm Hg) persisting for at least 40 months in 15 patients. Overall topical medications have been reduced from a preoperative mean of 2.7 to a postoperative mean of 0.8.

Advantages and Disadvantages of Trabectomy

To date disadvantages of the Trabectome™ include only single use of the handpiece and IOP outcomes in the mid-teens, limiting its use to patients with mid-teen IOP goal ranges.

Its advantages include short surgical times, simplified postoperative follow-up, no bleb formation or late infection risk, and no damage to conjunctiva precluding standard surgery thereafter, if necessary. Thus far progression of cataract in phakic eyes has been minimal, also in sharp contrast to standard filtering procedures. Complications in general, other than expected back-bleeding, have been minimal and nonvision-threatening.
In theory, this procedure should improve outcomes in children compared to ab externo trabeculotomy or goniotomy but the clinical experience to date has been too minimal for comparative assessment.
The Trabectome™ procedure has also been combined with cataract extraction (phacoemulsification and IOL placement) in approximately 100 cases with reasonable IOP improvement.

Skill transfer has been easy among the approximately 25 surgeons so far involved. This procedure probably best fits into current management schemes for open-angle glaucoma between laser trabeculoplasty and standard filtering procedures. No prospective trials comparing Trabectome™ to standard filtering surgery or to medicine and laser have yet been performed.

(Disclosure: Minckler is a paid consultant for NeoMedix, manufacturer of the Trabectome®).

REFERENCES

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