

Novel sub-flap mattress suture with Deep Sclerectomy: Complications and Modifications

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How has Deep Sclerectomy (DS) evolved?

- Deep sclerectomy, a type of non-penetrating glaucoma surgery (NPGS) was pioneered more than twenty years ago as an alternative to standard trabeculectomy by Fyodorov and Kozlov^{1,2}.
- In NPDS surgery, Schlemm's canal (SC) remains isolated from the anterior chamber, as during excision of SC the microperforated peripheral terminus of the Descemet's membrane is left intact.
- To keep the intrascleral space created patent, Kozlov proposed a collagen implant which resorbs itself within 6-9 months. Ever since Kozlov et al first utilised these implants in 1990, the use of spacer devices has been the subject of constant research and refinement⁴.
- NPGS was reported to be favourable to trabeculectomy due to **lower complication rates**, whilst maintaining a **comparable intraocular pressure (IOP)-lowering effect**.

Results

- **Patient 1:** Slow anterior leak at the first post-operative visit, which resolved without intervention at week two. The IOP was 12mmHg at week 2 and 17mmHg at 4 months post-op, and the VA remained constant at LogMAR 0.2.
- **Patient 2:** Seidel's test was performed intra-operatively and was positive on table. An additional conjunctival mattress suture was hence created to secure the wound. The IOP remained constant at 6mmHg over the following 6 months, whilst the VA improved from a pre-operative baseline of LogMAR 0.4 to LogMAR 0.34 at 6 months post-op.
- **Patient 3:** Seidel's negative intraoperatively; however, at the first post-operative visit a large subconjunctival bleb, hypotony (IOP 2mmHg) and choroidal detachments with macular folds were found. This was treated conservatively with a reduction in topical steroid and commencement of Atropine 1% eye drops for cycloplegia. All hypotonous sequelae resolved by 2 weeks post-op without the need for any further surgical intervention. The IOP rose to 11mmHg in the subsequent follow-up visits with VA also improving from hand movements at the first post-operative visit to LogMAR 0.04 at 6 months.

Note: None of the above patients had obvious predisposing factors for hypotony, such as myopia.

References:

- 1: Fyodorov SN. Nonpenetrating deep sclerectomy in open angle glaucoma. *Ophthalmosurgery* 1989; 3-4: 52-55.
- 2: Kozlov V, Bagrov S, Anisimova SY, et al. Nonpenetrating deep sclerectomy with collagen. *Eye Microsurgery* 1990; 3: 44-46.
- 3: Mercieca K, Shevade B and Anand N. Outcomes of combined phacoemulsification and deep sclerectomy: a 10-year UK single-centre study. *Eye (Lond)* 2015; 29: 1495-1503. 2015/09/05. DOI: 10.1038/eye.2015.163.
- 4: Funnell CL, Clowes M and Anand N. Combined cataract and glaucoma surgery with mitomycin C: phacoemulsification-trabeculectomy compared to phacoemulsification-deep sclerectomy. *Br J Ophthalmol* 2005; 89: 694-698. 2005/06/01. DOI: 10.1136/bjo.2004.055319.
- 5: Abdelrahman AM and Habib MM. Sub-flap Mattress Suture With Deep Sclerectomy: A Novel Step. *J Glaucoma* 2020; 29: e127-e129. 2020/08/23. DOI: 10.1097/jjg.0000000000001639.

Our standard Deep Sclerectomy^{3,4}

- A trapezoid superficial scleral flap of around 1/3 thickness is created, measuring 5mm x4mm² extending from the limbus. A deeper trapezoid scleral flap of approximately 95% thickness is then fashioned within the bed of the superficial flap.
- An HEMA spacer (Esnoper V2000®, AJL ophthalmic, Álava, Spain) is secured with a single 10-0 nylon suture under the superficial flap.
- The superficial flap is placed back over the spacer device and sutured with a single interrupted 10-0 nylon suture.

Novel DS technique proposed by Abdelrahman et al⁵

- 4x3-mm² rectangular superficial scleral flap with a similarly-shaped 95% thickness deep flap within the resultant scleral bed.
- A 10-0 nylon mattress suture between the deep and superficial scleral flaps is then placed in a 'figure-of-eight' configuration, without the use of a spacer device. This should tent up the superficial flap enabling maintenance of the scleral lake beneath.
- The superficial flap is placed back very loosely either with a single interrupted 10-0 nylon suture or none at all.
- The authors reported superior IOP reduction with their modified technique and did not report any revisions or complications in the article.

What did we do?

- We performed the mattress suture proposed by Abdelrahman et al⁵ instead of our usual spacer device, and trialled it in three consecutive eyes (individual patients).
- Our aim was to assess the results obtained with this spacer-less technique and suggest any further modifications.
- All of these surgeries were performed by the same experienced DS surgeon (KM), to limit operator bias. The patients were followed up routinely post-operatively, over a total of six months.

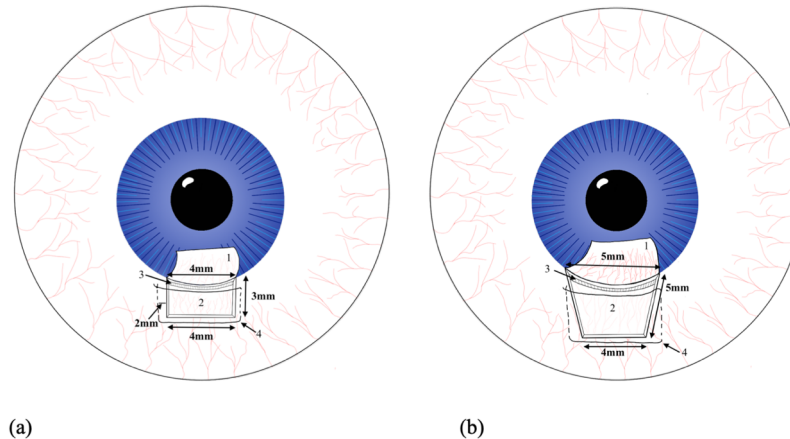


Figure 1 A comparison of the two surgical techniques. (a) Abdelrahman et al novel deep sclerectomy technique (b) Our own modified deep sclerectomy technique. [1: superficial flap; 2: scleral bed, after dissection of deep flap; 3: de-roofed trabecular meshwork; 4: 10-0 nylon mattress suture].

Disclosures

I was involved in patient follow-up over the 6 months following surgery, and I was the lead in writing up this study. Patient consent was obtained for this study.

Conclusions

- **Observation:** The use of the spacer in our standard technique encourages suprachoroidal drainage hence promoting less subconjunctival flow and a lower bleb profile. This has enabled our conjunctival closure technique to be less watertight as flow is not only restricted by the TDM but is also directed posteriorly into the supra-choroidal space by the grooves within the spacer. Published rates of conjunctival leakage and hypotony for DS and combined phaco-DS vary between 2 to 7.7% and 1.4 to 3.9% respectively^{3,4}. The rate of the former in our ongoing internal audits has been consistently less than 1% over the last five years and it was therefore considered significant to have two consecutive cases after this change in technique.
- **Suggestion:** We suggest greater awareness and attention to watertight conjunctival closure, as well as avoidance of the TDM window when performing the mattress suture. An intraoperative Seidel's test might also help identify and/or exclude leaks.
- **Observation:** The dimensions (wider and longer) and shape (trapezoid) of our scleral flaps may have contributed to these unexpected outcomes; the mattress suture technique may result in upward tenting of the anterior aspect of the flap resulting in more anteriorly located, lower-resistance, subconjunctival drainage, predisposing to leakage and hypotony.
- **Suggestion:** One should therefore consider modifying scleral flap structure, shape and size as this may have an effect on the amount and direction of aqueous drainage with the potential consequence of hypotony and conjunctival leakage.
- **Final conclusion:** This novel technique offers a simple modification which is of **particular use when a spacer device is not available**. We highlight the risk of **conjunctival leakage** and **hypotony** as possible consequences and suggest that **further adaptation of one's personal technique** should be considered.
- **Limitations:** Our patient cohort is relatively small and could limit findings. However, finding similar outcomes in all operated eyes strengthens our findings' significance. Another limitation is the short post-operative follow-up. Longer follow-up and a larger cohort are needed to assess further refinement of this cost-saving technique.