Nonpenetrating Deep Sclerectomy For Glaucoma After Descemet Stripping Automated Endothelial Keratoplasty

Three Consecutive Case Reports

Francisco J. Muñoz-Negrete, MD, PhD, Francisco Arnalich-Montiel, MD, PhD, Alfonso Casado, MD, and Gema Rebolleda, MD, PhD

INTRODUCTION

Descemet stripping with automated endothelial keratoplasty (DSEAK) is one of the current preferred surgical techniques to treat permanent corneal endothelial dysfunction. Compared with penetrating keratoplasty (PK), DSEAK has a more rapid healing process, earlier and better visual recovery, with less astigmatism,1,2 lower risk of allograft rejection,3 and a better cost-effective ratio.4 However, as it occurs in PK, secondary glaucoma may develop after DSEAK. The real incidence of glaucoma after DSEAK is not clearly established and has been reported to range from 0% to 45%.5 Trabeculectomy is by far the most frequent filtering procedure reported for glaucoma after DSEAK,5,6 whereas to the best of our knowledge no cases undergoing a nonpenetrating deep sclerectomy (NPDS) have been previously published. NPDS could be advantageous because of the lower rate of postoperative complications.7 Herein, we report 3 consecutive DSEAK eyes with uncontrolled glaucoma that have undergone a NPDS with intraocular implant and intraoperative mitomycin C (MMC) (0.2 mg/mL 1 minute) after a patient informed consent was signed. All DSEAK surgeries were performed by another single surgeon (F.J.M.-N.) and all NPDS surgeries were performed by another single surgeon (F.J.M.-N.). Ethical approval for this study was obtained from Hospital Ramón y Cajal ethics committee.

Clinical Cases

Case 1

Seven months after uneventful DSEAK in the right eye of a 64-year-old woman, the IOP was 18 mm Hg with maximal medical therapy (travoprost, timolol–brimonidine fixed combination and systemic acetazolamide). NPDS with Esnoper implant and intraoperative MMC application was performed without complications (Figure 1). IOP was 12 and 10 mm Hg at 6 and 12 months, respectively, after NPDS. No glaucoma medication was needed to control IOP during the 3 months follow-up, and a fixed combination of timolol and brimonidine was used after 6 months follow-up. Fifteen months after NPDS an IOP spike of 40 mm Hg occurred. After neodymium-doped yttrium aluminium garnet (Nd:YAG) laser goniopuncture, the IOP was 18 mm Hg using a fixed combination of timolol and brimonidine. Five months after NPDS, the patient had an acute corneal graft rejection that was solved with intensive topical corticosteroids treatment.

Case 2

Eighteen months after uneventful DSEAK in the left eye of a 70-year-old woman the IOP rose to 32 mm Hg with maximal medical treatment (latanoprost, timolol–brimonidine fixed combination, and systemic acetazolamide) and NPDS was
scheduled. To avoid an anterior peripheral synchiae in the superior quadrant, filtering surgery was performed in the supero-temporal angle with Esnoper implant and intraoperative MMC application. One year after NPDS, IOP was 18 mm Hg with timolol drops. No antiglaucoma treatment was needed to control IOP in the first 6 months postoperative period.

Case 3
A 65-year-old female with inflammatory glaucoma and endothelial failure secondary to Fuchs heterochromic iridocyclitis in her left eye underwent a DSAEK in the affected eye. Seven months after corneal graft he IOP was 32 mm Hg using 3 glaucoma medications (brimonidine–timolol fixed combination and systemic acetazolamide). Uneventful NPDS with Esnoper implant and intraoperative MMC application was performed. A Nd:YAG laser goniopuncture was required 3 weeks and 4 months after NPDS. IOP was 15 mm Hg 1 year after glaucoma surgery without glaucoma medication.

DISCUSSION
Postkeratoplasty glaucoma is a common problem after corneal graft surgery and is a major risk factor for graft failure.1 It has been estimated that 13% of patients present an IOP rise >30 mm Hg during the first 6 months after DSAEK,2 but <8% of patients with preexisting glaucoma will need filtering surgery. The risk of glaucoma increases in eyes with previous glaucoma, reaching an incidence of 45%.5 The 3 patients of this series had preexisting glaucoma.

The mechanism of glaucoma after DSAEK is multifactorial. In the first postoperative hours, the air bubble could induce a pupillary block.2,3 After this early period, a sustained IOP elevation could be related to the prolonged steroid treatment, distortion of the angle, peripheral anterior synchiae, and postoperative inflammation.5 The management of glaucoma in these eyes includes firstly topical agents. Vajaranant et al8 reported that 33% of patients with preexisting glaucoma required increasing glaucoma medication after DSAEK.

The surgical approach of glaucoma after DSAEK does not differ from the recommendations for PK. Trabeculectomy, glaucoma drainage device and cyclodestructive procedures have been indicated,6,8 but the best cost-effective glaucoma surgery for this entity is not clearly established. Boey et al6 reported a comparative study of trabeculectomy with MMC after PK (41 patients) and after DSAEK (20 patients), excluding eyes with preexisting glaucoma. Trabeculectomy with MMC after DSAEK achieved a significant lower IOP 1 year after filtering surgery than after PK, with 80% of patients having an IOP <12 mm Hg.

Quek et al9 reported that 27.6% of DSAEK patients with preexisting glaucoma or ocular hypertension, required glaucoma filtration surgeries, but data about efficacy and safety of filtration procedures are absent.

NPDS main advantages are the fewer postoperative complications compared with trabeculectomy and the absence of intraoperative entry and iris manipulation7 that could be advantageous for graft survival.

To the best of our knowledge, we report the first clinical cases of NPDS after DSAEK. An open angle is mandatory to indicate this procedure. Only 1 eye presented a small area of closed angle and required to change to usual location of the NPDS to the superotemporal open angle area. All the surgeries were performed with intrascleral implant and intraoperative topical application of MMC. The association of implant and MMC to NPDS increases significantly the rate of success.10 No intraoperative complications were present. One year after surgery, the IOP was ≤18 mm Hg in all patients, although only 1 of them was controlled without glaucoma medication.

Two patients needed Nd:YAG laser goniopuncture (twice in 1 patient). This procedure is required in almost 50% of patients after NPDS.11 Although the central corneal thickness is increased after DSAEK,1,2 the graft does not reach the filtration area and thickening of the trabeculodescemetic membrane is not expected. Nevertheless, we do not know if goniopuncture would be more frequently required in eyes following DSAEK.

All the 3 cases had preexisting open-angle glaucoma. Eyes that had undergone trabeculectomy before DSAEK are less likely to require additional IOP-lowering treatment after DSAEK, suggesting that filtration surgery before DSAEK is able to control IOP elevations adequately after surgery in most eyes.9 Data about NPDS efficacy and safety before DSAEK are absent.

Seventeen percent of posterior lamellar grafts failed after DSAEK in preexisting glaucoma patients.9 One patient of our series developed an acute graft rejection that could be controlled with intensive steroid treatment. We cannot attribute this episode to the NPDS procedure. This study has the limitation of including only 3 cases with preexisting glaucoma and a short follow-up. However, it is important to note that in the 3 cases the IOP was controlled and glaucoma medication reduced or eliminated after 1-year follow-up. NPDS could be an attractive alternative to other filtration procedures in these patients because of the well-known lower rate of complications associated. However, a prospective long-term study with a large sample size is required to address the actual role of NPDS in DSAEK patients with glaucoma.

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