Novel spatula and dissector for safer deep anterior lamellar keratoplasty

Uso de espátula e dissector para otimização da ceratoplastia lamelar anterior profunda (DALK)

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ABSTRACT

Objective: We describe a novel spatula and dissector to facilitate the big-bubble technique in deep anterior lamellar keratoplasty (DALK). Methods: A 29-year-old man who was diagnosed with bilateral keratoconus underwent deep anterior lamellar keratoplasty (DALK). After 350µm partial thickness incision of the recipient cornea, the Bonfadini dissector was inserted at the deepest point in the peripheral incision and could be advanced to the center of the cornea safely because of its “semi-sharp” tip. After achieving the big-bubble (BB) separation of Descemet membrane (DM) from the overlying stroma, the anterior stromal disc was removed. Viscoelastic material was placed on the stromal bed to prevent uncontrolled collapse and perforation of DM during the paracentesis blade incision into the BB. We could detect the safe opening of the BB using the Bonfadini dissector by the leakage of air bubbles into the viscoelastic material. After injecting viscoelastic material into the big-bubble safely because of its curved profile and blunt edges. The groove along the length of the Bonfadini spatula enables safe and efficient incision or the residual stromal tissue using the pointed end of a sharp blade while protecting the underlying DM. After removal of posterior stroma, the donor button was sutured with 16 interrupted 10-0 nylon sutures. Results: This technique and the use of the Bonfadini spatula and dissector facilitate exposure of Descemet membrane. Conclusion: The smooth Bonfadini DALK spatula and dissector facilitate safe and efficient completion of DALK surgery.

Keywords: Deep anterior lamellar keratoplasty; Corneal transplantation/methods; Keratoplasty; Bonfadini dissector; Bonfadini spatula

Resumo

Objetivo: Descrevemos o uso de novos instrumentais cirúrgicos para facilitar a técnica de “big-bubble” na ceratoplastia lamelar anterior profunda (DALK). Métodos: Paciente masculino, 29 anos, foi diagnosticado com ceratocone bilateral e submetido à ceratoplastia lamelar anterior profunda (DALK). Após incisão da córnea receptora numa profundidade de 350µm de espessura parcial, o dissector Bonfadini foi inserido no ponto mais profundo da incisão periférica e pode avançar para o centro da córnea com segurança devido à sua ponta semiafiada. Depois de realizar a “big-bubble” (BB) e atingir a separação da Membrana de Descemet (MD) do estroma sobrejacente, o disco corneano de estroma anterior foi removido. Um viscoelástico foi colocado sobre o leito do estroma remanescente para impedir o colapso não-controlado e perfuração da MD durante a incisão na BB com lâmina de paracentese. Verificamos segurança no rompimento do estroma remanescente com o auxílio do dissector Bonfadini, para liberação da bolha de ar da BB através do viscoelástico. Depois de injetar o viscoelástico no espaço da BB, inserimos a espátula Bonfadini neste espaço, o que demonstrou-se seguro devido ao formato curvo e das bordas arredondadas do instrumental. A chanfradura ao longo do comprimento da espátula Bonfadini permite a incisão pela ponta de uma lâmina afiada, protegendo assim a MD subjacente. Após a remoção do estroma posterior, o botão doador foi suturado com 16 pontos interrompidos de fio nylon 10.0. Resultados: Esta técnica e o uso da espátula Bonfadini e dissector facilitam a exposição de membrana de Descemet. Conclusão: A superfície lisa da espátula Bonfadini e dissector, facilita a realização segura e eficiente da ceratoplastia lamelar anterior profunda (DALK).

Descritores: Ceratoplastia lamelar anterior profunda; Transplante de córnea/métodos; Ceratoplastia; Dissector Bonfadini; Espátula Bonfadini

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INTRODUCTION

Deep anterior lamellar keratoplasty (DALK) has been proposed as an alternative to penetrating keratoplasty (PK) for the treatment of various corneal diseases not affecting the endothelium. DALK surgery removes the anterior layers of the cornea, cleaving the deep stroma from Descemet membrane (DM). The advantages of the DALK technique for corneal stromal diseases include absence of endothelial rejection, avoidance of potential open-sky intra-operative complications of PK, faster visual rehabilitation due to earlier suture removal, and a predicted longer graft survival because of the lower rate of endothelial cell loss (1).

DALK is a time-consuming and technically demanding procedure. The most frequent intraoperative complication is perforation of DM while attempting to separate it from the overlying stroma during creation of the big-bubble (BB) (2). Sarnicola et al. (3) reported that a smooth spatula and cannula can facilitate a high percentage of successful DALK and make the procedure more reliable than compared to air injection with a needle.

In this report, we describe a novel Bonfadini dissector and spatula for safely manipulating the big-bubble and removing posterior stroma.

Surgical technique

A 29-year-old man diagnosed with bilateral keratoconus 6 years ago, visited our service complaining of ocular pain and decreased vision in the right eye. He had worn rigid gas permeable (RGP) contact lenses for 16 years. His best spectacle corrected visual acuity OD was 20/80 and OS was 20/25. Slit-lamp examination revealed marked corneal stromal scarring and epithelial punctuate erosions on the right central cornea. Hence, deep anterior lamellar keratoplasty (DALK) was completed uneventfully in the right eye.

The operation was performed under sub-Tenon anesthesia by A.S.J; The technique described by Anwar et al. (4) was followed with the described modifications. A surgical marking pen was used to mark the center of the host cornea. An 8.5mm diameter trephine was used to lightly score the epithelium of the host cornea to outline the recipient bed. An astigmatic keratotomy blade was used to incise the recipient cornea to a depth of 350µm along the 8.5mm trephine mark. Through a small peripheral clear cornea paracentesis, the anterior chamber (AC) was filled with air, and approximately physiologic intraocular pressure confirmed.

The Bonfadini dissector (Katena Products, USA; Figure 1A) was inserted at the deepest point in the peripheral groove and was advanced toward the center of the cornea. Once the Bonfadini dissector was approximately 1-2mm from the apex of the cone (Figure 1B), it was removed and the Fogla 27 gauge air injection cannula (Bausch & Lomb Storz Ophthalmic, USA), attached to a 5mL syringe filled with air was introduced into the corneal tunnel. Air was then injected into the stroma to achieve the formation of a big-bubble (figure 1C). The central anterior stromal disc was removed with an angled crescent knife, and then air was evacuated through the previously placed paracentesis.

To enter into the big-bubble, we used the Ophthalmic Viscosurgical Device–Assisted Incision technique (5). A cohesive viscoelastic (Healon, Abbott Medical Optics) was placed on the stromal bed and a 1.0mm incision was then created with a paracentesis blade using only the tip of the blade with a “lifting” motion to prevent rapid collapse of the bubble which could result in Descemet membrane perforation. Entry into the big-bubble was confirmed by the appearance of a small bubble within the overlying viscoelastic material, which also served to prevent rapid egress of air from the big-bubble and rapid collapse leading to a higher probability of perforating the Descemet membrane (figure 1D).

Figure 1: The Bonfadini dissector has a fine, rounded tip to enable stromal dissection while preventing inadvertent perforation of Descemet membrane (A); use of the Bonfadini dissector to create a deep tunnel toward the center of the cornea from a peripheral partial thickness groove incision (B); big-bubble formation by deep intrastromal air injection with accompanying stromal opacification (C); opening of the big-bubble with a sharp blade was detected by air leaking into viscoelastic material placed on the posterior stromal bed (D).

Entry into the big-bubble was confirmed by the appearance of a small bubble within the overlying viscoelastic material, which also served to prevent rapid egress of air from the big-bubble and rapid collapse leading to a higher probability of perforating the Descemet membrane (figure 1D).
In the technique described here, viscoelastic material is placed on the stromal bed before opening the big-bubble (5). We can detect entry into the big-bubble (BB) by air leaking into the viscoelastic material. This sign allows a controlled entry into the BB as it is readily and immediately visible and prevents rapid egress of air and collapse of the BB. Once the BB is accessed and further expanded by injection of viscoelastic into the BB, the design of the Bonfadini spatula allows it to be manipulated within the BB space with minimal chance of inadvertent trauma to DM.

The groove along the length of the Bonfadini spatula also serves as a convenient guide to facilitate rapid incision of the posterior stroma into wedges, which can be excised at the periphery using standard corneal scissors. Thus, we present the novel Bonfadini dissector and spatula as aids for the successful completion of DALK surgery. In summary, the benefits of our proposed technique could be shown more conclusively in a case-control or prospective study with a larger number of patients to validate our findings.

**REFERENCES**


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