

# Deep anterior lamellar keratoscleroplasty using the anterior corneal cap of pre-cut cornea for limbal dermoid

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**Objective:** To evaluate the surgical and clinical outcomes of deep anterior lamellar keratoscleroplasty using the anterior corneal cap of pre-cut donor tissues (for Descemet Stripping Automated Endothelial Keratoplasty - DSAEK) for limbal dermoid management.

**Methods:** Retrospective data from 39 eyes (37 patients) with limbal dermoid, treated between February 2013 and January 2017 at Vietnam National Institute of Ophthalmology. Donor corneas for DSAEK were cut into anterior and posterior lamellae in the eye bank. Anterior corneal caps were stored for up to 1 week in Optisol before being used as patch grafts for deep anterior lamellar keratoscleroplasty.

**Results:** Corneoscleral integrity was preserved in all cases. All 39 eyes had satisfactory cosmetic results after surgery. Thirteen (13) of the 39 eyes showed improved best-corrected visual acuity after surgery. Fifteen patients' astigmatism reduced by more than 0.75 diopters. Neo-vascularization at the graft–host junction and graft edema were noted in 1 eye and was treated using topical steroids.

**Conclusion:** The anterior cap obtained from pre-cut corneas for DSAEK can be used as patch grafts for surgical management of limbal dermoids. This procedure achieved satisfactory cosmetic and visual outcomes in our study, and might potentially maximize the use of corneal tissues.

**Conflicts of interest:** None

**Key words:** deep anterior lamellar keratoscleroplasty, limbal dermoid, pre-cut cornea

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## Introduction

Corneal limbal dermoids are choristomas usually seen in the inferior-temporal quadrant of the cornea. They are mainly composed of keratinized epithelium, an underlying dermal layer containing fibrous fatty

tissue, and occasionally hair with sebaceous glands<sup>1,2</sup>. Small limbal dermoids are usually treated only for cosmetic concerns<sup>3,4</sup>. Large lesions which affect the visual axis, induce significant astigmatism, cause irritation or dellen formation, should be surgically managed early<sup>4,5,6</sup>. Treatment often involves surgical excision, followed by amblyopia therapy to improve visual acuity<sup>6,7</sup>. The surgical techniques for removing limbal dermoid include simple excision<sup>7,8,9</sup>

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excision with amniotic membrane transplantation<sup>5,7</sup>, excision with tattooing<sup>10,11,12</sup>, excision with Mitomycin C application<sup>5</sup>, excision with limbal stem cell transplantation<sup>13</sup>, lamellar keratoscleroplasty<sup>14</sup>, and penetrating keratoscleroplasty<sup>15</sup>. Lamellar keratoscleroplasty is one of the most preferred technique to treat limbal dermoid, because it is a non-penetrating procedure that can remove the entire lesion and restore the ocular surface's integrity<sup>6,16,17,18,19</sup>. In recent years, pre-cut corneas have been used for Descemet stripping automated endothelial keratoplasty<sup>20,21</sup>. Some authors have reported the use of the pre-cut cornea's cap (for DSAEK) to treat limbal dermoid with very good outcomes. In Vietnam, DSAEK has been performed since 2010 to treat endothelial decompensation. Due to lack of domestic donated cornea, all tissue for DSAEK are pre-cut corneas imported from international eye banks. We use only the posterior DSAEK button, and the anterior cap is discarded<sup>22</sup>. Due to the lack of local tissue, we would like to maximize the use of donated corneas by using the anterior cap for limbal dermoid. This study is performed to evaluate the surgical outcomes and complications of dermoid excision combined with anterior lamellar keratoplasty using the anterior cap of pre-cut corneas. The anatomical, functional, and cosmetic results were discussed in this report.

### **Materials and methods**

A retrospective study was performed in 39 eyes of 37 patients who underwent deep anterior lamellar keratoscleroplasty with the DSAEK anterior corneal cap between February 2012 and January 2017, at the Vietnam National Institute of Ophthalmology. Pre-operative data including age, sex, lesion location, pre-operative best-corrected visual acuity (BCVA), refraction, and slit-lamp examination were collected. All patients had at least 6 months of postoperative

follow-up. Our study was approved by the VNIO Ethics Committee.

### **Donor tissue preparation**

After punching the pre-cut cornea for DSAEK (during a previous surgery), the anterior cap was checked. If the cap was round, the diameter was noted, and it was kept immediately in the preserved chamber with Optisol, at 2 – 4°C for maximum 2 weeks.

### **Surgical Technique**

The diameter of dermoid was evaluated to make sure that its dimensions were suitable with the thickness and diameter of the corneal anterior cap.

Conjunctival peritomy was performed. The lesion was then cut using the smallest size trephine that encompassed the entire lesion by using the hand held trephine. The dermoid was removed completely by manual DALK. We used dissectors to peel off the dermoid layer by layer until the clear cornea was seen, to create the recipient bed.

The corneal graft was then trephined (with a hand held trephine) from the anterior corneal cap, 0.5 mm larger than the size of the recipient bed. The graft was then sutured to the recipient bed with 10-0 nylon interrupted sutures, and the conjunctiva was re-attached to the limbus. All patients received topical levofloxacin (1 drop; 4 times/day), dexamethasone (1 drop; 4 times/day for 3 months and then tapered to 1 drop/day for 6 months) and sodium hyaluronate after surgery. The patients were followed up weekly in the first postoperative month. Monthly visits were arranged from the second month to the fourth month, and every three months thereafter.

### **Outcome Measurements**

The main outcomes included the last visit's structural integrity, graft clarity, the best-corrected visual acuity and cosmetic outcomes. Surgical complications, corneal

astigmatism were also analyzed. For the cosmetic outcome, opacity of the graft was graded clinically on a 0 to 4+ scale<sup>23</sup>.

### ***Amblyopia Treatment***

All patients received age-appropriate amblyopia treatments until they reached a BCVA of 20/30, or age above 12 years. Amblyopia treatments involved wearing adequate glasses and occlusion of the fellow eyes if indicated.

## **Results**

### ***Demographics***

Our study included 39 eyes of 37 patients (23 female and 14 male), with age ranging from 8 months to 50 years (mean age =  $6.74 \pm 8.27$  years old). Three patients had bilateral limbal dermoids but only two of them had surgery on both eyes; the last one had surgery on only one eye (Figure 2). Patients were followed up from 6 to 60 months (mean time =  $21.3 \pm 13.1$  months). Sixteen surgeries were done on the right eye and the other 23 on the left. Indications for surgery were as follows: cosmetic problem (100%), risk of amblyopia (45%), surface irritation (36.5%) and increase in the size of the tumors (17%).

### ***Presentations of the Limbal Dermoid and Size of the Graft***

All limbal dermoids were grade II lesions and located in the inferior-temporal quadrant (28 eyes), superior-temporal quadrant (11 eyes) with an extension of 2.5 to 4 clock hours of the limbus. One patient had very large bilateral limbal dermoid (Figure 1). The diameter ranged from 4 to 8 mm (mean of  $7.04 \pm 1.42$ mm). Corneal involvement was 3 to 7 mm from the limbus.

### ***Storage Time of Donor Tissue***

The mean storage time of the anterior cap of pre-cut donor tissue was  $10.2 \pm 6.4$  days (range, 7-14 days). Nearly all surgeries (31/39 eyes) were done on the same day of

DSAEK surgery.

### ***Cosmetic and Visual Outcome***

All patients had satisfactory cosmetic results after surgery with a graft opacity score ranging from 0 to 3 (mean  $\pm$  SD =  $1.2 \pm 0.4$ ). Figure 1 shows a 14 months old baby with bilateral limbal dermoid. The tumor covered nearly 2/3 diameter of the cornea in the right eye and the entire cornea in other eye. Surgery was done early on the right eye to help him to see by liberating the visual axis but the left eye had not been touched because it's dermoid involved entire cornea (Figure 2).



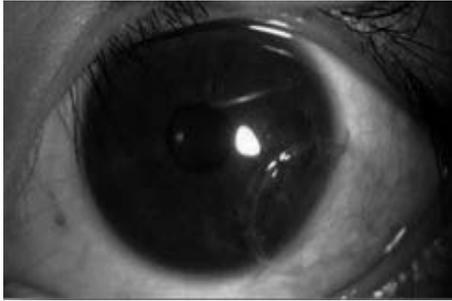
**Figure 1:** Bilateral dermoid



**Figure 2:** OD 6 months after DALK



**Figure 3:** Dermoid before DALK



**Figure4:** 6 months after DALK

All 15 measurable eyes showed decreased astigmatism after surgery [range, 0.75 to 5.5 diopter (D), mean  $\pm$  SD = 1.89 + 1.67 D]. Astigmatism reduction of more than 1.50 D was seen in 6 eyes, more than 2.5 D in 4 eyes and a significant reduction of more than 5.5 D was seen in one eye.

Visual acuity was measurable in 28 eyes, 13 of whom showed improvement in BCVA. The BCVA remained unchanged in 15 eyes (6 eyes had normal BCVA before the operation, and 9 eyes was diagnosed with severe amblyopia before the surgery and had passed the best age for amblyopia treatment). Other 11 patients were too young to evaluate visual acuity.

### **Complications**

Three cases had perforated cornea during dissection. The perforation was small and surgeries were continued. It was more difficult to continue the surgery when the globe was soft. After suturing the graft, the anterior chamber was reformed by injecting air and Ringer's lactate via the paracentesis.

Two eyes were found with blood in the interface between graft and recipient bed. Blood was absorbed after 3 weeks and left mild scar.

Loose suture was a quite common complication, seen in 15 eyes. For small children, examination and suture removal were performed under general anesthesia. For other cases, all sutures were removed 1 year after surgery.

One patient had graft–host interface neovascularization and stromal edema of the graft at 6 month follow-up, which dramatically improved after topical use of prednisolone acetate for 1 month. Conjunctival injection, interface neovascularization, and stromal edema of the graft decreased significantly. Only mild corneal haze remained in the graft tissue.

### **Discussion**

Traditional treatment for limbal dermoids included simple excision<sup>7,9,10</sup>, lamellar keratoscleroplasty<sup>14</sup>, lamellar keratoscleroplasty with full-thickness central corneal grafts and penetrating keratoscleroplasty<sup>23</sup>. Grafts for these cases may be taken from: (1) a corneoscleral flap with an adequate scleral rim<sup>1</sup>, (2) corneoscleral segment of a whole eyeball<sup>1</sup> or (3) full-thickness central corneal grafts<sup>23</sup>.

However, these sources of graft are not usually available in countries in which donated corneas have limited remnant scleral tissue or no whole globe donation is available, like Vietnam. On the other hand, manual lamellar dissection may create an uneven dissection plane and then it may leave the opaque interface of the graft. For cases in which the dermoids do not involve the entire cornea, full-thickness grafts may be too thick to match the defects after a surgical excision.

Sharma et al reported 12 cases of dermoids treated with lamellar keratoscleroplasty using the anterior cap from DSAEK. The outcome was good with satisfactory results. In their study, the anterior cap was transplanted simultaneously with DSAEK<sup>24</sup>. Chu et al found satisfactory outcomes using anterior caps from DSAEK donor tissue. Anterior caps from DSAEK donor tissue may be stored in Optisol GS for later use in tectonic patch grafting. This method obviates longer operating time required for the surgeon to manually dissect the donor cornea in the operating room, and reduces

the wastage of precious donor corneas in countries where there are chronic shortages of eye bank donor tissue<sup>25</sup>.

Wu et al confirmed that anterior corneal caps obtained from DSAEK could be used as patch grafts for surgical management of limbal dermoids. This procedure achieved satisfactory cosmetic and visual outcomes and may potentially allow one corneal tissue to be received by multiple patients<sup>19</sup>. In the current study, we treated limbal dermoid with deep anterior lamellar keratoscleroplasty as Chu and Wu et al. This method is suitable for grade II dermoids in which the entire corneal thickness is not affected, given the thickness of the anterior corneal flap is around of 350µm. Our postoperative results (average size of limbal dermoids 6.56 ± 1.42 mm) were comparable to other reports using full-thickness central corneal grafts (average size of limbal dermoids 6.4 ± 1.0 mm) to cover the corneoscleral defects after a dermoid excision<sup>23</sup>. All of the 39 cases had no tissue overriding or wound gap after surgery. The cosmetic results were comparable to operations that used full-thickness corneal grafts. These results demonstrated that anterior corneal caps from DSAEK donor tissue could replace full-thickness grafts to treat limbal dermoids with partial intrastromal involvement.

Although this is not a new concept, the benefits of this method included using an appropriate donor graft thickness to cover the defect after a dermoid excision. The similar surgical and clinical outcomes compared with those of transplantation of a full-thickness donor corneal graft after dermoid removal shows the potential of this surgical technique<sup>23</sup>. For the grade II superficial limbal dermoid, which involved only partial thickness of limbal tissue, this technique may provide a more convenient choice than does a full-thickness corneal graft because there is no need for trimming the thick donor tissue to

fit the shallow tissue defect after removal of the limbal dermoid. This technique also adopts the concept of using pre-cut cornea to help overcome the global problem of corneal tissue shortage, and the cost and waiting time for corneal transplantation could be significantly reduced<sup>26</sup>. In some cases in which only anterior or posterior corneal replacement is needed, the remnant of the donor tissue could be saved for another patient<sup>26,27</sup>. This method is less time consuming and less labor intensive compared with other methods of tissue preservation. However, the risk of graft rejection should be noted because early intervention may be needed. Continuing patient and family education should be given to ensure adequate awareness of rejection. There are some limitations in this method. First, because of limited diameter of anterior cap (usually less than 9mm) so this method can be used only for the limbal dermoid having diameter less than 9mm. Secondly, if the depth of limbal dermoid is thicker than that of anterior cap, the entire lesion could not be removed. Finally, ethical and legal issues of sharing corneal tissues among different recipients may be of concern.

### **Conclusion**

Deep anterior lamellar keratoscleroplasty using the anterior corneal cap of pre-cut cornea is an alternative method to manage limbal dermoids. Anterior corneal cap from pre-cur donated cornea for DSAEK showed great success in treating grade II dermoids in terms of eyeball integrity, cosmetic and visual results. This report not only demonstrates a successful surgical technique but also shows a method with great potential for reducing the global crisis of corneal tissue shortage for transplantation.

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