



Prognosis after lamellar keratoplasty for limbal dermoids using preserved corneas

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Abstract

Purpose To evaluate the safety and efficacy of lamellar keratoplasty using preserved donor corneas to treat limbal dermoids.

Study design Retrospective study.

Methods The clinical records of 19 patients with limbal dermoids, who underwent lamellar keratoplasty using preserved corneas that were observed for more than 6 months at the Keio University School of Medicine between January, 2000 and December, 2017, were retrospectively reviewed. We retrospectively analyzed demographics, surgical outcomes, the occurrence of any surgically induced changes in refraction, and intra and postoperative complications.

Results Patient age at surgery showed 2 peaks, the first ranged from 0 to 6 years, and the second from 13 to 20 years. All patients except one had good cosmetic results. Preoperative astigmatism was more than 2 diopters in 12 of 16 eyes for which refractive data were recorded. The refractive cylinder in 8 of the 16 eyes differed after surgery by less than 2 diopters. Treatment of amblyopia by occlusion of the fellow eye and spectacle prescription was done either prior to or following surgery, and resulted in improved visual acuity in 7 patients. Intraoperative complications did not occur in any of the patients. Postoperatively, all patients except one showed corneal re-epithelialization within a week.

Conclusion Lamellar keratoplasty using preserved corneas for limbal dermoid yields good cosmetic results. However, improvements in astigmatism and visual acuity are not guaranteed. Preoperative treatment of amblyopia gives a better prognosis for improved visual acuity postoperatively. Long-term observation including amblyopia treatment is required before and after surgery.

Keywords Limbal dermoid · Lamellar keratoplasty · Amblyopia

Introduction

Limbal dermoids are the most common tumors of the corneal limbus and ocular choristomas [1]. Histopathologically, they are part of a spectrum of choristomatous masses at the limbus with a prevalence of 1 in 10,000 [2]. They show a variety of sizes ranging from small lesions to larger masses in the epibulbar region [2]. Anatomically they have been classified into 3 grades: grade 1: superficial limbal dermoids, grade 2: involving part of the corneal stroma, and grade 3:

replacing the cornea and part of the anterior segment. Epibulbar dermoids, too are classified into three grades. Grade I, limbal, or epibulbar dermoids: lesions with a superficial tumor with a diameter of less than 5 mm. Grade II, limbal dermoids of larger size (> 5 mm) that extend into the corneal stroma down to Descemet's membrane. Grade III: limbal dermoids that involve the whole cornea and structures of the anterior chamber. The most common location for epibulbar dermoids is the temporal inferior quadrant of the limbus [3]. Though histologically a benign tumor, the removal of a limbal dermoid is not only performed to improve the cosmetic appearance of the eye, but more importantly, to prevent amblyopia. Vision is often impaired by astigmatic refractive errors caused by corneal astigmatism. In children this may lead to irreversible anisometric amblyopia [4, 5]. Large dermoids can also lead to surface irritation and discomfort or even central corneal opacification.

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The appropriate time of intervention and the best surgical technique for removal of the pediatric limbal dermoids are subject to discussion. In the past, several surgical techniques for the removal of dermoids have been described [6]. These techniques include bare excision [7], amniotic membrane transplantation [7, 8], corneal tattooing [9], lamellar keratoplasty with corneal graft [10] or with corneoscleral graft [11] and even penetrating keratoplasty [12]. These techniques have become less invasive with the progress in surgical instruments. The adequate choice depends on the location and size of the lesion. Recently, the intraoperative application of Mitomycin C to inhibit fibroblast growth is reported [13]. Major risks of the excision of limbal dermoids are intraoperative perforation, postoperative epithelial defects and peripheral vascularization of the cornea [14]. Lamellar keratoplasty is reported to result in the improvement of visual acuity, but may also lead to increased corneal astigmatism [15, 16]. The goal of our study was to evaluate the safety and efficacy of lamellar keratoplasty using cryopreserved donor corneas to treat limbal dermoids with emphasis on intra and postoperative complications.

Patients and methods

Patients

Patient records were analyzed in a single center, retrospective study. The study was approved by the Ethics Committee of Keio University School of Medicine, Tokyo, Japan (Approval Number: 20170355). All patients were treated during 17 years from 2000 to 2017. We included a total of 19 eyes of 19 consecutive patients who underwent lamellar keratoplasty for limbal dermoids using preserved donor corneas that were observed for more than 6 months. Seven patients were boys, and 12 were girls (Table 1). Six patients had a diagnosis of Goldenhar syndrome. Fourteen limbal dermoids were located in the temporal inferior quadrant of the eye, 4 were in the temporal quadrant and 1 was in the bottom quadrant of the eye. Three cases were classified as grade one (< 5 mm), and 16 cases were classified as grade two (> 5 mm). The average observation period since first visit was 26.6 ± 39.8 months.

Vision and refractive data

Landolt best-corrected visual acuity (BCVA) was recorded. The immediate preoperative and latest postoperative data were collected. In young infants where such examinations were not possible, angular vision was performed. In case 1, visual acuity could not be measured. Cases 4 and 14 were excluded because of complications leading to vision loss. All data obtained with decimal visual acuity were converted

to the base-10 logarithm of the minimum angle of resolution (log MAR) for calculating mean and standard deviation. Corneal topography data measured with Topographic Modeling System (software version 2.4.2 J, Tomey Corp), and anterior-segment optical coherence tomography (CASIA SS-1000, Tomey Corp.) was available in 5 patients (cases 5, 6, 15 and 17 measured by Topographic Modeling System and case 11 measured by CASIA SS-1000). The data analyzed included the topographic pattern, simulated keratometric power. The surgically induced topographic change was assessed by analyzing the immediate preoperative and latest stable postoperative data. In young infants where refractometer and keratometer examinations were not possible, cycloplegic retinoscopy was performed.

Indication for surgery

Priority was given to prevention of amblyopia. After careful evaluation of visual development, dermoids were excised and lamellar keratoplasty using preserved corneas was performed in all cases. However, due to the conspicuous nature of the disease, some families requested early surgery, and amblyopia therapy followed surgery.

Amblyopia

In seven cases (case 2, 3, 6, 7, 8, 10, 12) suspected of refractive amblyopia, amblyopia treatment was performed with eyeglasses and eye-patches. Four cases (case 6, 8, 10, 12) were treated prior to surgery, and three cases (case 2, 3, 7) were treated after surgery.

Lamellar keratoplasty

Surgery consisted of tumor resection and lamellar keratoplasty using cryopreserved corneas in all cases. The timing of surgery, cosmetic results, preoperative and postoperative astigmatism, and results of amblyopia treatment were examined. Surgery was performed under general anesthesia for young children, and under local anesthesia in the older group. First, a disposable trephine (Barron Precision Instruments) was used to incise the tumor circumference at a depth of 1/2 to 2/3 of the corneal thickness, and tumors including the sclera and peripheral cornea were excised. In case 9, adjoining gourd-shaped dermoids were resected to include both 2 tumors. In case 14, two dermoids were resected separately. Cryopreserved donor corneas were fixed to an artificial anterior chamber and grafts were prepared using the same trephine used for tumor resection, while paying attention not to perforate. Since compared to fresh corneas preserved corneas are swollen, the donor graft was made slightly thicker than the excised corneal bed. Trimming was performed

Table 1 Demographic data on the 19 patients receiving lamellar keratoscleroplasty for limbal dermoid

No.	Gender	Eye	Age at first visit	Pre-OP observation	Age at surgery	Site	Size (mm)	Follow-up post OP	BCVA preOP(logMAR)	BCVA postOP	Complications	Miscellaneous
1	F	R	0.4 months	24 months	24 months	T	7.5×7.5	11 months	-	-	Pseudopterygium	Goldenhar syndrome
2	M	L	35 months	3 months	38 months	TI	6.5×6.5	141 months	1.5	0.7	-	Hydrocele testis
3	M	R	36 months	3 months	39 months	T	4×4	54 months	0.4	-0.079	-	Goldenhar syndrome
4	F	L	0.5 months	50 months	50 months	TI	8×8	73 months	1.5	1.3	-	Choroidal coloboma, orbital tumor
5	M	L	4 months	46 months	50 months	TI	5×5	9 months	0	0.097	-	-
6	M	R	52 months	3 months	55 months	TI	6×6	53 months	0.22	-0.079	-	-
7	F	L	60 months	1 months	61 months	TI	7×7	10 months	1	0.82	-	-
8	F	R	46 months	16 months	62 months	TI	6×7	53 months	-0.079	-0.079	-	Goldenhar syndrome
9	F	L	35 months	29 months	64 months	TI	5×4, 2×2	141 months	0.4	0.097	-	Goldenhar syndrome
10	F	L	34 months	32 months	66 months	TI	8×8	30 months	0.7	0.15	-	Goldenhar syndrome
11	F	R	60 months	11 months	71 months	TI	5×6	6 months	-0.079	-0.079	-	-
12	M	L	45 months	34 months	79 months	TI	4×4	8 months	0.4	-0.079	-	-
13	M	R	158 months	5 months	163 months	T	5×5	11 months	0	0.046	-	-
14	F	R	182 months	1 months	183 months	I	5×5, 6×6	36 months	30 cm H.M.	20 cm C.F.	-	Retinal detachment, Iris anomaly
15	F	L	7 months	175 months	184 months	TI	3×3	43 months	-0.079	-0.079	-	-
16	M	R	194 months	1 months	195 months	TI	5×5	21 months	-0.079	-0.079	-	-
17	F	L	157 months	65 months	222 months	TI	6×5	10 months	-0.079	-0.079	-	-
18	F	L	226 months	2 months	228 months	T	6×6	6 months	0	-0.079	-	-
19	F	R	228 months	5 months	233 months	TI	6×5	8 months	-0.079	-0.079	-	Goldenhar syndrome

F female, M man, L left, R right, OP operation, BCVA best-corrected visual acuity, T temporal, I inferior, TI temporal inferior

so that the junction between the donor cornea and host were even. Interrupted 10-0 nylon sutures were used to fix the donor. Suture removal was performed under general or local anesthesia after surgery approximately 3 months following transplantation. Sutures that loosened earlier were removed and replaced as necessary.

Vector analysis

Vector analysis was done using a modified version of a previous report [15, 17]. Sphero-cylinder, or cross-cylinder forms of dioptric power analysis are popular clinically, and employ an unorthodox mathematical equation that does not obey the rules of addition and multiplication, or known mathematical behavior in general [18]. Jaffe et al. [19] report how changes in astigmatism before and after surgery were calculated. In their method the cylinder lens power before and after surgery is expressed as two vectors on a double-angle formula and the difference vector is obtained. The differential vector length before and after surgery was calculated according to the following formula with the cylinder power before and after surgery and its steepest meridian angle as K_1 and A_1 , K_2 and A_2 , respectively.

$$d = \sqrt{K_1^2 + K_2^2 - 2K_1K_2 \cos \{2(A_1 - A_2)\}}.$$

We used this method for calculating astigmatism changes in cases where both the corneal astigmatic power and the total cylindrical power were obtained by refraction examination. In young infants where such examinations were not possible, the total cylindrical power was calculated as cylinder power.

Statistical analysis

Data are presented as mean \pm SD and compared by Wilcoxon Signed rank test or Mann–Whitney's U test with the use of Excel 2007 software (Microsoft Corporation) and GraphPad prism 7 (GraphPad Software). A P value of <0.05 was considered statistically significant.

Results

Demography

Nineteen eyes of 19 patients (12 girls, 7 boys; median age at surgery 5.5 years; range 2–20 years, median age at first visit 3.8 years; range, 0–19 years,) were treated with lamellar keratoplasty using preserved corneas for limbal dermoid since 2000. The patients' age at the time of first visit and surgery was bimodal, with one group between 0 and 6 years old, and the other group between the ages of 13 and 20 (Table 1). Median follow up period prior to surgery was 11.0 months (range 1–175 months) and post-operation follow-up period was 21.0 months (range 6–141 months) (Table 1). All patients had histopathologic confirmation of the diagnosis of dermoids.

Representative case

Figure 1 shows slit lamp image of limbal dermoid in case 10 ranging from first visit to after 32 months. The limbal dermoid tumor grew from spherical to elliptical and overlapped the pupil edge. As the tumor became bigger, wide-opening the eyelid itself became difficult and accurate astigmatism measurements were also difficult (Fig. 2a). A 9 mm size of trephine encompassing the whole lesion and the dense lipid

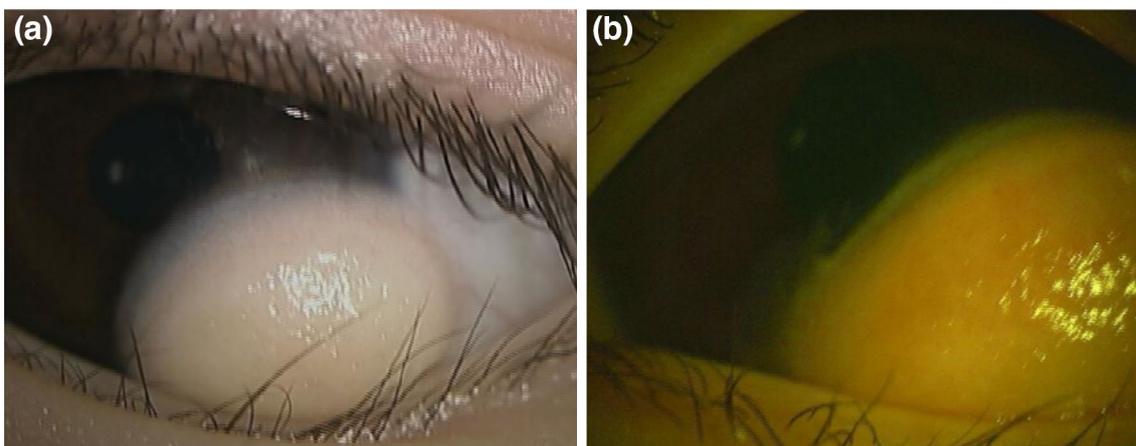


Fig. 1 Representative case (Case 10). **a** Slit lamp image of limbal dermoid at first visit. The tumor is spherical. **b** Slit lamp image of limbal dermoid 32 months after first visit. Tumors grew from spherical to elliptical and overlapped the pupil edge

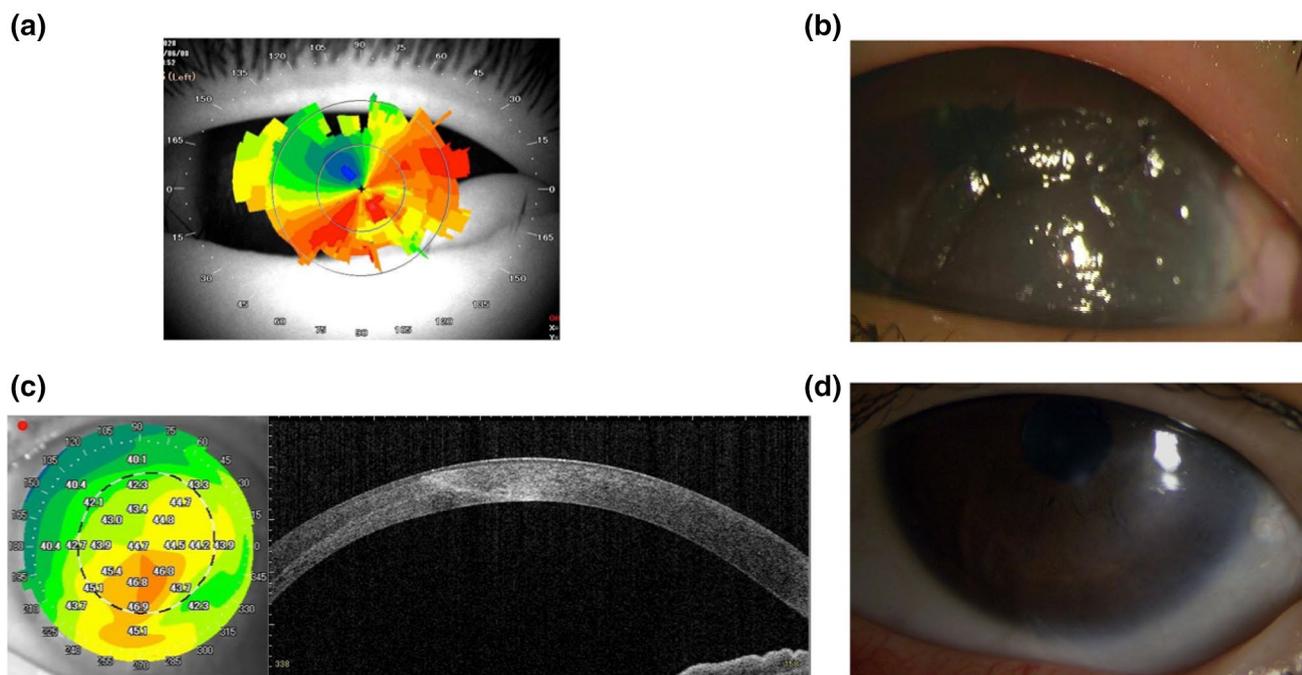


Fig. 2 Representative case (Case 10). **a** Anterior segment image captured by Topographic Modeling System before surgery. **b** Slit lamp image of limbal dermoid 1 day after surgery. **c** Anterior segment

image captured by CASIA 30 months after surgery. **d** Slit lamp image of limbal dermoid 30 months after surgery

infiltrate was used to define the cutting margin. The lesion was dissected carefully in lamellar fashion until the clear cornea was reached. There was corneal edema several days after surgery, however, transparency was maintained and re-epithelialization occurred in 1 week. Cosmetic appearance after surgery showed no opacity of the graft at the corneal side and no severity of bluish hue at the scleral side (Fig. 2b).

Complications

With the exception of one pseudopterygium case (case 1), all other cases had good post-operative results with clear corneas without vessel invasion, as well as a satisfactory cosmetic appearance (Table 1). The patient affected by pseudopterygium asked for a second opinion after surgery. We referred her to another hospital, resulting in an 11 months' follow-up period. 1 year after initial surgery she underwent Keratoepithelioplasty (KEP) using a preserved cornea at the referred hospital. However, the scar tissue proliferated and the graft became cloudy. Lamellar keratoplasty using a preserved cornea with mitomycin C and conjunctival flap transplantation was performed 4 years after first surgery. The donor cornea diameter was 7.5 mm. From the upper side of the recipient conjunctiva, the conjunctiva was sutured to the resected site with a free flap. The grafts show no recurrence,

and she is currently under observation with amblyopia treatment every 2–3 months.

Vision

Pre-operation best-corrected visual acuity (BCVA) was log MAR 0.25 ± 0.45 (range -0.079 – 1), and post-operation BCVA was log MAR 0.07 ± 0.27 (range -0.079 – 0.82). None of the patients with good BCVA lost significant vision, nor did patients with poor BCVA gain significant vision. Eyes with intermediate visual acuity (case 3, 6, 10) showed some improvement post-operatively (Table 2). Patients with large dermoids (case 2, 4, 7, 10, 14) had poor pre-operation BCVA, moreover, postoperative acuity was also poorer in this group. Pre and post-operative BCVA did not change significantly in dermoids of less than 5 mm (Table 2, $P=0.25$). However, post-operative BCVA significantly improved compared with pre-operative values in dermoids larger than 5 mm (Table 3, $P<0.05$).

Table 2 Scores of BCVA measured pre and post operation of length less than 5 mm (average \pm SD)

Time point	Pre	Post	<i>P</i> value
BCVA(log MAR)	0.24 ± 0.23	-0.079 ± 0	0.25

Table 3 Scores of BCVA measured pre and post operation of length more than 5 mm (average ± SD)

Time point	Pre	Post	P value
BCVA(log MAR)	0.26 ± 0.49	0.10 ± 0.29	*0.027

SD standard deviation, *P < 0.05, Wilcoxon Signed rank test

Table 4 Scores of BCVA measured pre and post operation of amblyopia treatment

Time point	Pre	Post	P value
BCVA(log MAR)	0.59 ± 0.49	0.19 ± 0.37	*0.016

SD standard deviation, *P < 0.05, Wilcoxon Signed rank test (Tables 2, 3 and 4)

Amblyopia

In seven cases suspected of refractive amblyopia, post-operative BCVA significantly improved compared with pre-operative values (Table 4, P < 0.05). Four cases (case 3, 6, 8, 12) showed the best corrected visual acuity after surgery. There was no difference between patients treated for amblyopia before and after surgery.

Table 6 Scores of ophthalmic parameters measured at pre-operation (average ± SD)

Size	Length < 5 mm	Length ≥ 5 mm	P value
Spherical power (diopter)	1.2 ± 1.0	3.1 ± 2.9	0.14
Spherical equivalent	0.25 ± 0.94	1.2 ± 3.0	0.32
Cylindrical power (diopter)	1.8 ± 0.24	3.9 ± 2.6	0.12

Refractive data

Refractive results are summarized in Table 5. With the exception of 3 cases (case 1, 4 and 14), preoperative refraction data and postoperative data upon last visit were available. The mean pre-operative spherical power in dermoids smaller than 5 mm (+1.2 ± 1.0 D) was not significantly different compared with dermoids larger than 5 mm (+3.1 ± 2.9 D) (Table 6). The mean preoperative spherical equivalent in dermoids smaller than 5 mm (0.25 D ± 0.94 D) was also not significantly different compared with in dermoids larger than 5 mm (1.2 ± 3.0 D) (Table 6). Irrespective of size, postoperative mean spherical power in all cases did not significantly change compared with preoperative mean spherical power (Tables 7, 8). Postoperative

Table 5 Preoperative and Postoperative Corneal Astigmatism

No.	Preoperative Refraction			Postoperative Refraction					
	Spherical Power(diopter)	Cylindrical Power (diopter)	Corrected Axis of cylinder	Spherical Equivalent (diopter)	Spherical Power (diopter)	Cylindrical Power (diopter)	Corrected Axis of cylinder	Spherical Equivalent (diopter)	Vector Analysis (d)
1	–	–	–	–	–	–	–	–	–
2	11	–5	170	8.5	7	–5	165	4.5	0.872
3	2.5	–2	0	1.5	2.75	–1.75	10	1.88	0.636
4	–	–	–	–	1.5	–4	150	–0.5	–
5	0	–3	35	–1.5	3.75	–3	165	2.25	4.6
6	6.5	–6	40	3.5	6.75	–7	45	3.25	1.51
7	1	–9.25	60	–3.63	8	–6	20	5	10.8
8	5.5	–2	10	4.5	4.25	–2.5	0	3	0.924
9	1	–6	135	–2	2	–6	125	–1	2.08
10	4	–8	135	0	0.5	–1	25	0	8.79
11	2	–2.75	60	0.63	2	–1.75	70	1.13	0.695
12	1	–2	170	0	2.5	–2.5	165	1.25	0.634
13	2.5	–2	55	1.5	2.5	–1.25	35	1.88	1.32
14	–	–	–	–	–	–	–	–	–
15	0	–1.5	130	–0.75	0	–1.5	130	–0.75	0
16	1.25	–1.5	30	0.5	0.5	–1	50	0	0.976
17	1.75	–1.5	105	1	0.5	–0.5	95	0.25	1.04
18	2	–3	175	0.5	2	–3	170	0.5	0.523
19	1.75	–0.5	60	1.5	1.5	–1.75	20	0.63	1.73

Table 7 Scores of ophthalmic parameters measured at pre and post operation of length less than 5 mm (average \pm SD)

Time point	Pre	Post	<i>P</i> value
Spherical power (diopter)	1.2 \pm 1.0	1.8 \pm 1.2	0.25
Spherical equivalent	0.25 \pm 0.94	0.79 \pm 1.1	0.25
Cylindrical power (diopter)	1.8 \pm 0.24	1.9 \pm 0.42	0.5

Table 8 Scores of ophthalmic parameters measured at pre and post operation of length more than 5 mm (average \pm SD)

Time point	Pre	Post	<i>P</i> value
Spherical power (diopter)	3.1 \pm 2.9	3.2 \pm 2.5	0.36
Spherical equivalent	1.2 \pm 3.0	1.7 \pm 1.8	0.49
Cylindrical power (diopter)	3.9 \pm 2.6	3.1 \pm 2.1	0.16

Table 9 Scores of Vector analysis (average \pm SD)

Size	Length < 5 mm	Length \geq 5 mm	<i>P</i> value
Vector analysis (d)	0.42 \pm 0.30	2.8 \pm 3.2	*0.0071

Mann–Whitney's U test (Tables 6, 9) and Wilcoxon Signed rank test (Tables 7, 8)

SD = standard deviation

**P* < 0.05

mean spherical equivalent also did not significantly change compared with preoperative mean spherical equivalent in all cases (Tables 7, 8). Large dermoids (> 5 mm) showed strong astigmatism, especially when their location coincided with the axis of the astigmatism (9 out of 11 cases). In dermoids smaller than 5 mm, the mean postoperative cylinder (1.9 D \pm 0.42 D) did not significantly change compared with the mean preoperative cylinder (1.8 D \pm 0.24 D) (Table 7). In dermoids larger than 5 mm, the mean postoperative cylinder (3.1 D \pm 2.1 D) also did not significantly change compared with the mean preoperative cylinder (3.9 D \pm 2.6 D) (Table 8).

Table 10 Preoperative and postoperative corneal topography data

No.	Preoperative				Postoperative			
	Astigmatism (D)	Steep K (D)	Flat K (D)	Axis	Astigmatism (D)	Steep K (D)	Flat K (D)	Axis
5	5	44.4	39.4	160	3.8	44	40.2	160
6	10.8	43.2	32.4	52	7	42.7	35.8	49
11	4.6	43.4	38.8	64	1.1	42.8	41.7	69
15	1.7	43.5	41.8	148	1.5	43.3	41.8	136
17	0.6	41.4	40.8	117	0.5	41.5	40.9	114

Table 11 Scores of ophthalmic parameters measured pre and post operation (average \pm SD)

Time point	Pre	Post	<i>P</i> value
Astigmatism (D)	4.54 \pm 3.55	2.78 \pm 2.39	*0.031
steep K (D)	43.2 \pm 0.981	42.9 \pm 0.821	0.063
flat K (D)	38.6 \pm 3.29	40.1 \pm 2.22	0.063
Axis	108.2 \pm 43.5	105.6 \pm 41.2	0.31

SD standard deviation

**P* < 0.05, Wilcoxon Signed rank test

Vector analysis

The mean vector analysis difference between preoperative and postoperative refractions in dermoids larger than 5 mm (2.8 \pm 3.2 D) was significantly larger than that in dermoids smaller than 5 mm (0.42 \pm 0.30 D) (Table 9).

Corneal topography

The preoperative and postoperative corneal refractive data are summarized in Table 10. In the 5 eyes with topographic data available, the mean preoperative astigmatism was 4.5 \pm 3.5 D. The mean postoperative astigmatism of the affected eye was 2.8 \pm 2.4 D, decreasing by 1.8 \pm 1.6 D compared with preoperative data (*P* = 0.031, Table 11). The change in corneal astigmatism is shown in Fig. 3a. After surgery, flat keratometric power (flat K) increased by 1.4 \pm 1.4 D (*P* = 0.063), steep keratometric power (steep K) decreased by 0.3 \pm 0.2 D (*P* = 0.063, Table 11). The mean change in astigmatism axis after surgery was 2.6 \pm 5.5° (*P* = 0.31, Table 11) (*n* = 5).

Discussion

Previous reports show that lamellar keratoscleroplasty using fresh corneas may be a better choice for treating limbal dermoids [15, 20, 21]. However, most of the donor corneas in Japan are imported from the United States, and only limited scleral tissue remains on the corneoscleral rings. Due

alternations and molding of the intrinsic structure of the corneal wall and thus cannot be corrected by surgery. Interestingly, 5 patients with available corneal topography were found to improve dramatically after surgery with a mean astigmatism reduction of 1.8 D, quite different from other studies where surgery did not effectively correct astigmatism [5, 14, 15]. We believe the change about steep keratometric power (steep K) and flat keratometric power (flat K) were not statistically significant most likely because of the small patient number. Shen et al. [24] report that the distortion in tear film at the advancing margin of the dermoids, similar to the mechanism in patients with pterygium, has a flattening effect on the semi-meridian and is an additional factor contributing to corneal astigmatism [10]. Further studies are needed for revealing how post-operative dermoids causes astigmatism.

The rate of amblyopia in patients suffering from limbal dermoids is reported to be present in up to 50% of the patients [6, 14]. Treatment of amblyopia is crucial in young cases, and in seven such cases (case 2, 3, 6, 7, 8, 10, 12) that we were able to follow, all had acquired good visual acuity following amblyopia treatment before and after surgery. Unfortunately, three cases with large dermoids (case 2, 7, 10) and poor BCVA at first visit did not show improvement following surgery. Sufficient amblyopia treatment could not be performed in these cases due to poor compliance. This shows how careful initial examination and early intervention with amblyopia treatment is important for visual development in dermoids.

In conclusion, our study shows good prognosis after lamellar keratoplasty using preserved corneas for limbal dermoids in a large series. Lamellar keratoplasty can be carried out safely, and is associated with no deterioration in the visual acuity postoperatively. Surgery may be associated with a higher incidence of astigmatism. While the size of the graft influenced the visual outcome, postoperative astigmatism was not influenced by the size of the graft. Long-term follow-up including amblyopia treatment is vital.

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