Clinical Case Report

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Progressive large pediatric corneal limbal dermoid management with tissue glue-assisted monolayer amniotic membrane transplantation

A case report

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Abstract

Rationale: Limbal dermoids are choristomas known as congenital benign tumors found in abnormal locations. Despite the benign nature, enlarging limbal dermoids may cause visual abnormalities by cornea infiltration with fat component, visual axis invasion, gradually induced corneal astigmatism, and finally result in anisometropic amblyopia. Here we report a rare case of progressive, large pediatric corneal limbal dermoid in a newborn, managed with tissue glue-assisted monolayer amniotic membrane transplantation.

Patient concerns: A 1-day-old male baby (gestational age, 36 ± 6 weeks; birth body weight, 2785 gram) presented to our clinic with a whitish mass on his right eye since birth.

Diagnosis: Ocular examination revealed a solid, whitish-yellow, and ovoid mass with central keratinized epithelium over the superior limbus; the lesion covered two-thirds of the cornea with rapid progression in size. The final pathological examination revealed that the lesion is composed of keratotic lining squamous epithelium resembling epidermis, underling dermal fibrotic connective tissue, and mature fat.

Interventions: The patient underwent deep lamellar excision followed by mitomycin C (MMC) soaking (0.2 mg/mL, 3 minutes) and tissue glue-assisted monolayer amniotic membrane transplantation with the ring conformer at 2 months of age.

Outcomes: The ring conformer was smoothly removed 2 weeks after the operation. The patient showed a smooth healing process with less pain and rapid corneal re-epithelization. The ocular surface was stable during the follow-up visits, and no complications were detected. Only mild post-operative scarring over the incision wound was observed.

Lessons: Although a combination of excision, lamellar keratoplasty, and multilayer amniotic membrane and limbal stem cell transplantation is advocated for the treatment of grade II and III pediatric corneal limbal dermoids, the procedure used in this study offers an alternative surgical approach. However, because of the large size of the lesion and the young age of the patient, the management of amblyopia with visual rehabilitation and corneal transplantation is still needed in the future.

Abbreviation: MMC = Mitomycin C.

Keywords: corneal limbal dermoids, pediatric, tissue glue-assisted amniotic membrane transplantation

1. Introduction

Limbal dermoids are the most common choristomas, which are known as congenital benign tumors and are found in abnormal locations. Limbal dermoids are commonly located in the inferotemporal quadrant; however, they may occasionally present entirely within the perilimbal cornea or may be confined to the conjunctiva and sclera. Limbal dermoids may contain a variety of histologically aberrant tissues, such as epidermal appendages, connective tissues, skin, fat, sweat glands, lacrimal glands, neurological tissues, or hyperplasia content.[1,2] Despite the benign nature, enlarging limbal dermoids may cause visual abnormalities by the gradual development of corneal astigmatism, encroachment in the visual axis, and corneal infiltration of fatty component; the abnormalities may result in anisometropic amblyopia. If a corneal dellen is formed, symptoms, such as surface irritation and discomfort, may be present because of disturbance to the ocular surface and tear film.[1,3]

Anatomically, limbal dermoids can be classified into 3 grades.[4] Grade I limbal dermoids are superficial tumor lesions (less than 5 mm in size), and current standard medical treatment is conservative. Grade II limbal dermoids are of large size and extend into the corneal stroma and the Descemet's membrane.

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Compliance with ethical standards.

All procedures involving human subjects adhered to the Declaration of Helsinki. Institutional Review Board (IRB)/Ethics Committee approval was obtained from the Committee of Medical Ethics and Human Experiments of Chang Gung Memorial Hospital (CGMH, Taiwan).

The authors have no conflicts of interest to disclose.

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Table 1

Medical History Timeline.

Age	Relevant past medical history and interventions		
1-day-old	male baby (gestational age, 36 ± 6 weeks; birth body weight, 2785 gram), no family history of eye diseases		
Age	**Summaries from Initial and Follow-up Visits**	**Interventions**	**Diagnostic Testing**
1-day-old	A solid, white, and ovoid mass over the superior limbus covering the upper one-third of the cornea		
2-month-old	The mass increased in size covering the upper two-thirds of the cornea with an obscured visual axis	Deep lamellar excision followed by MMC soaking (0.2 mg/mL, 3 minutes) and tissue glue-assisted monolayer amniotic membrane transplantation with the ring conformer	Pathological examination: keratotic lining squamous epithelium resembling epidermis, underling dermal fibrotic connective tissue, and mature fat
6-month-old	1. Transparent cornea and amniotic membrane graft with smooth corneal surface	In order to improve vision in the weaker eye, the patching treatment was attempted by covering his better-seeing eye with a patch for 30 minutes a day	
	2. Well maintenance of constant fixation without nystagmus, tracing and grabing moving objects without difficulty		

MMC = Mitomycin C.

Grade III limbal dermoids cover the whole cornea, penetrate the anterior chamber, and affect all histological structures between the anterior surface of the eyeball and the pigmented epithelium of the iris. Possible surgical approaches for Grade II and III limbal dermoids include excision, lamellar or penetrating keratoplasty, and amniotic membrane or limbal stem cell transplantation.[5] Moreover, Mitomycin C (MMC) is reported to have a protective effect against the occurrence of pseudopterygium.[6]

Depending on the tumor size, the tumor growth rate, and the involved areas, the appropriate time and techniques of surgical interventions are still controversy in infants and children.[5,7–9] The proper treatment is particularly challenging in young children because of several concerns, such as a tendency for a low visual acuity and astigmatism-related amblyopia.[8] In this study, we report a rare newborn case of progressive grade II to III pediatric corneal limbal dermoid. An alternative surgical approach of deep lamellar excision followed by MMC soaking (0.2 mg/mL, 3 minutes) and tissue glue-assisted monolayer amniotic membrane transplantation was administered, and favorable outcomes were achieved (Table 1).

2. Case presentation

2.1. Clinical history

A 1-day-old male baby (gestational age, 36 ± 6 weeks; birth body weight, 2785 gram) presented to our clinic with a whitish mass on his right eye since birth. His parents claimed that they had no family history of eye diseases. Ocular examination revealed a solid, white, and ovoid mass over the superior limbus, and the lesion covered the upper one-third of the cornea. No associated regional or systemic abnormalities were found. Two months later, the mass increased in size and covered the upper two-thirds of the cornea, and the patient showed an obscured visual axis. Partially keratinized epithelium and whitish-yellow were also observed (Fig. 1). Visual acuity and intraocular pressure could not be measured, but ocular ultrasonography revealed negative findings in the posterior pole.

2.2. Amniotic membrane graft preparation

In our facility, the wet amniotic membrane grafts were obtained from the placenta donation. After a newborn was delivered, the obstetrician would place the placenta in a sterile bag under 4°C. Amniotic membrane graft was prepared in the operating room. Ophthalmologist began the preparation by irrigating the placenta with normal saline solution to wash out the blood clots. The amniotic membrane graft was then peeled from the placenta and irrigated with copious normal saline solution until it became translucent. One vial of Gentamycin 80 mg was added in normal saline solution 1000 mL (0.08 mg/mL) to rinse the translucent amniotic membrane graft and copious normal saline solution irrigation was repeated for 3 times. The amniotic membrane graft was then cut into the size of 3 × 3 cm per piece and stocked in the sterile tubes containing 5 mL of Dulbecco's modified eagle medium (DMEM, Gibco, Thermo Fisher Scientific Inc.) and 5 mL of 85% glycerin. Once the blood tests associated with blood-borne diseases revealed negative results, amniotic membrane graft would be sent to the eye bank for storage under −80°C.

2.3. Surgical technique

At 2 months of age, the patient received the operation under general anesthesia. First, the border of the limbal dermoid was marked, and Westcott blunt scissors were used to make a conjunctival peritomy from the superior border of the lesion. Blunt dissection of the lesion from the sclera was carried out with cotton sticks, and lamellar dissection of the lesion from the cornea was made with crescent blade knife, initiating from the limbus towards the cornea. The residual adhesion band of the central cornea was excised by blunt scissors. Once the corneal limbal dermoid was excised, corneal surface bed was scraped with surgical scalpel blade No.15. After MMC soaking (0.2 mg/mL, 3 minutes), the monolayer amniotic membrane graft was then applied with the orientation of stromal side on the sclera-corneal surface and epithelial side up and trimmed to match the defect size (including the bare sclera area and the corneal defect). Finally, we injected tissue glue (Artiss, Baxter Inc.) underneath the amniotic membrane graft to strengthen the graft adherence. A ring conformer was inserted at the end of the surgery to better stabilize the graft and prevent unnecessary adhesions. After instilling tobradex ointment and cravit solution, the lesion eye was pressure-patched for 1 day.

The pathological examination revealed that the lesion is composed of keratotic lining squamous epithelium resembling epidermis, underling dermal fibrotic connective tissue, and

Figure 1. A preoperative clinical picture shows a raised whitish-yellow mass with partially keratinized epithelium. The lesion covers upper two-thirds of the cornea and the optical axis.

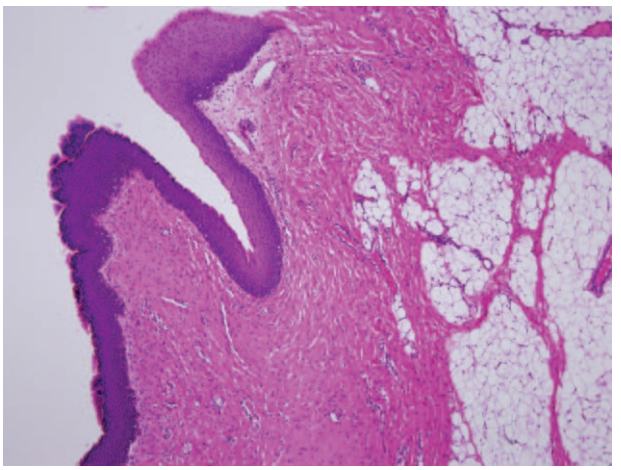

Figure 2. Pathological findings of the excised tumor (haematoxylin and eosin [H&E] staining, 40 ×). Microscopically, the lesion is composed of keratotic lining squamous epithelium resembling epidermis, underling dermal fibrotic connective tissue, and mature fat.

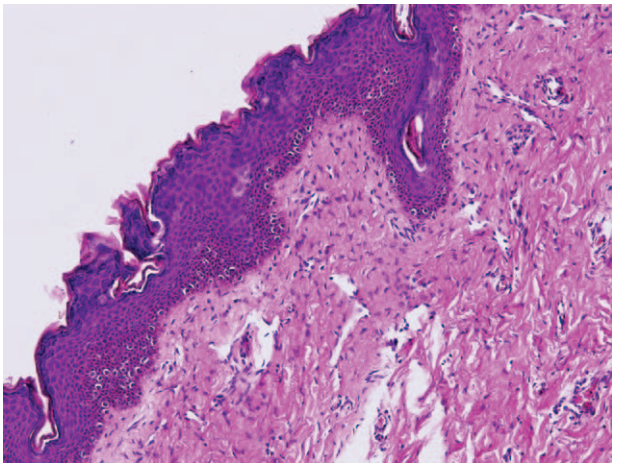

Figure 3. Pathological findings of the excised tumor (H&E staining, 100 ×). Focal melanin pigmentation and junctional activity are identified in the basal region of the epidermis. H&E = haematoxylin and eosin.

mature fat (Figs. 2 and 3,). The ring conformer was smoothly removed 2 weeks after the operation.

2.4. Follow-up course

It was observed that the patient had a smooth healing process with little pain and rapid corneal re-epithelization. The anterior chamber was well formed with clearly visible pupil margin. The ocular surface was stable, and no complications were detected during the follow-up visits. Only mild post-operative scarring over the incision wound was observed (Fig. 4, day 14 after operation). During the entire follow-up period (the most recent visit was at the 6-month follow-up after operation), the cornea and amniotic membrane graft remained transparent, and the corneal surface was smooth. Neovascularization over the incision regressed. The infant could maintain constant fixation without nystagmus, and he also could trace and grab moving objects without difficulty. The patching treatment was attempted by covering his better-seeing eye with a patch for 30 minutes a day in order to improve vision in the weaker eye. However, because of

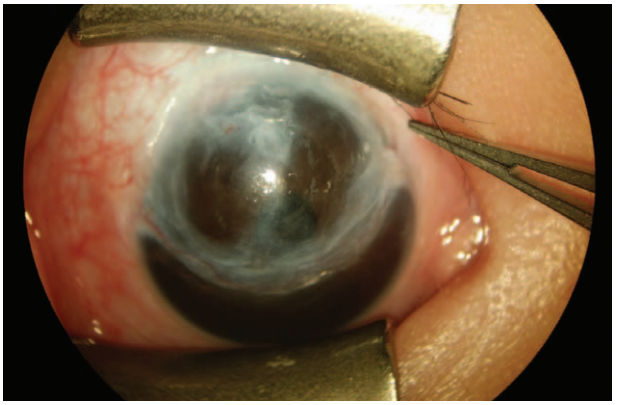

Figure 4. Follow-up examination at day 14 after operation. Satisfactory corneal re-epithelization and the well-formed anterior chamber are observed with the clearly visible pupil margin. Only mild post-operative scarring over the incision wound is noted.

the large size of the lesion, the cornea transplantation is still needed in the future.

3. Discussion

Previous studies had documented a variety of surgical techniques for the treatment of limbal dermoids. According to the depth, size, and site of such lesions, surgical interventions range from simple excision to complex procedures, such as lamellar and/or penetrating keratoplasty, corneal-limbal scleral donor graft transplantation, reconstructive sutureless multilayered amniotic membrane transplantation, and limbal stem cell transplantation.[5,7–9] Pirouzian et al,[5] thought that surgery is universally indicated for grade II and III limbal dermoids, and primary surgical intervention is indicated even in grade I limbal dermoids if progressive corneal surface decompensation, astigmatism, or encroaching into the optical zone is observed. In infants and children, the eyeball and the visual acuity are in the process of growth and development, and general anesthesia is required in pediatric eye surgeries.[10] Considering the tumor size, the tumor growth rate, and the involved areas, the appropriate time and techniques of surgical interventions are still controversy in infants and children. The proper treatment is particularly challenging in young children because of the tendency for a low visual acuity and astigmatism-related amblyopia. Therefore, prevention and prompt treatment of amblyopia play an important role in determining the timing of surgical intervention in pediatric eye diseases. In this study, the progression in size and visual axis involvement are the critical factors to be considered for the surgical interventions.

Amniotic membrane has been shown to differentiate into conjunctival epithelial cells, promote epithelization, prevent neovascularization, and suppress recurrent subconjunctival fibrosis; many studies have reported the wide application of amniotic membrane (fresh or preserved) with or without limbal allografts for the ocular and corneal surface reconstruction.[9,11,12] Moreover, by attenuating the post-operative corneal epithelial defect and restoring the corneal nerves, amniotic membrane transplantation can reduce the post-operative pain and associated inflammation, and the decreased inflammation helps to reduce the post-operative scarring.[9] It was reported that the multilayered amniotic membrane transplantation could lead to a complete volumetric filling of the defective area, which should be equal in height to that of the surrounding healthy corneal tissue.[9,13] In addition, it has been thought that the fibrin glue combined with amniotic membrane transplantation significantly enhances the application of tissue adhesives. In fact, in the pediatric corneal dermoid removal, tissue adhesives shorten the operating time because of the elimination of the suture placement procedure, and the sutureless procedure avoids the postoperative suture exposure and foreign body sensation.[9,14] With the time-saving procedure (the tissue glue-assisted monolayer amniotic membrane transplantation), the patient in this study went through a smooth healing process with rapid corneal re-epithelization, and the corneal surface was smooth with transparent corneas and amniotic membrane grafts.

Although fibrin glue-assisted amniotic membrane grafting is generally considered as a safe, effective, and complication-preventing method for the ocular surface reconstruction, patients treated with this procedure seem to have a high pterygium recurrence or pseudopterygium formation rate.[6,14] Limbal stem cell deficiency following the limbal dermoid removal has been reported to contribute dominantly to the pseudopterygium formation.[15] Lang et al[6] reported that MMC had a protective effect against the postoperative pseudopterygium formation, and it was hypothesized that MMC-induced growth inhibition in fibroblasts decreases the occurrence of pseudopterygium or corneal neovascularization. The additional intraoperative treatment with MMC is a new approach and has not been broadly described in the literature. During the close observation of several months, the patient had no pseudopterygium formation, and MMC showed a beneficial effect and did not result in any complications in this case.

A large number of surgical cases as well as a long follow-up period will be needed for the longitudinal observation of the surgical outcomes. More importantly, if the patient undergoes the surgery at a young age, the detection and management of amblyopia (such as occlusion treatment and chemical penalization with/without spectacle wear) must continue even if the surgical excision has yielded optimal results.[5] Because of the high tendency of amblyopia due to excessive astigmatism caused by the large lesion size and less cornea transparency in our case, it is no doubt that the early detection and management of amblyopia are essential for successful treatment.

4. Conclusion

In summary, although a combination of excision, lamellar keratoplasty, and multilayer amniotic membrane and limbal stem cell transplantation is suggested in the treatment of grade II and III pediatric corneal limbal dermoids in previous studies, the surgical technique in this study offers an alternative time-saving surgical approach. However, because of the large size of the lesion and the young age of the patient, the management of amblyopia with visual rehabilitation and corneal transplantation is still needed in the future.

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Author contributions

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