A **Case Report**

Vision Rehabilitation with a Native Pintucci-type Keratoprosthesis

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Abstract

Purpose: To report visual rehabilitation with a native Pintucci keratoprosthesis (KPro) after a severe ocular surface chemical burn in a male patient.
Case Report: A 41-year-old man experienced a bilateral severe chemical burn 5 years previously. Earlier penetrating keratoplasty and keratolimbal allografts were unsuccessful in both eyes, and neither of the eyes had vision better than light perception. Both corneas were opaque and conjunctivalized. Because of severe dry eye and total limbal stem cell deficiency, the left eye was considered for a Pintucci-type KPro. In the first stage, the ocular surface was reconstructed with an oral mucus membrane graft, and a KPro was placed under the skin and orbicularis oculi muscle. Three months later, the KPro was removed and implanted in the left eye. During seven months after the KPro implantation, the anatomical position was acceptable, and his best corrected visual acuity was 2/10.
Conclusion: Bearing in mind the successful results of the native Pintucci KPro in this case of severe acid burn, using this type of keratoprosthesis in patients with total limbal stem cell deficiency and severe dry eye is recommended.

Keywords: Chemical Burn; Keratoprosthesis; Pintucci Keratoprosthesis

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INTRODUCTION

Several corneal diseases can cause severe vision deficiency and even blindness.[1] Ocular chemical burn, ocular cicatrizing pemphigoid (OCP) and Stevens-Johnson syndrome (SJS) are commonly associated with limbal stem cell deficiency (LSCD), ocular surface keratinization and severe dry eye.[2,3] In these cases, common treatment procedures, such as penetrating keratoplasty (PK), are not applicable or successful, and a keratoprosthesis (artificial cornea) will be the last option to restore vision.[1] The idea of a keratoprosthesis (KPro) was first

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introduced in 1789 by Pellier de Quengsy. Afterwards, several investigators have made great efforts to improve KPro structure and function.[4,5] Currently, the Boston KPro (Dohlman I, II) and Osteo-Odonto KPro (OOKP) are the most popular types of KPros worldwide.[6] The OOKP has an optical cylinder of polymethylmethacrylate (PMMA) and a skirt that is made of the patient's alveolar or tibial bone. The OOKP, which indicated for SJS, OCP, lid deficiencies, surface keratinization and severe dry eye, has an anatomical retention rate of 47-100%.[5] The Boston KPro is the new type of the Dohlman–Doane KPro. It is a hard design KPro made of PMMA, and it has two types: Boston I and Boston II. The Boston I is the most commonly used KPro in the world. It is generally used in cases with a high risk of PK failure and opaque cornea with extensive vascularization. Aniridia, special corneal dystrophies and degeneration, herpetic keratitis and scars due to corneal infections are other indications for the Boston I KPro, while the Boston II KPro is used for severe corneal scars with tear deficiency, such as SJS, OCP and severe chemical burns.[7] The Pintucci KPro was introduced by Pintucci in 1979 and has been used for patients with corneal chemical burns, trachoma, recurrent severe herpetic keratitis, OCP and severe dry eye. It has a similar structure as the OOKP, but Dacron tissue is used instead of the bony skirt. Dacron is a synthetic biointegrable material through which vascular tissue can penetrate easily.[8] The success rate and postoperative visual acuity improvement are dependent on the patient's preoperative condition and appropriate KPro selection.[5] In addition, retinal and choroidal detachment, endophthalmitis, glaucoma and extrusion are the common complications of KPros.[9]

In Iran, few studies have been published about KPro implementation. In one study, the authors implanted different types of KPro in 29 eyes with ocular burn, SJS, OCP, corneal re-transplantation or scarring. The KPros used were Girard, Tibiakeratoprosthesis, Dohlman (I, II) and Pintucci. Postoperative visual acuity improved in 21 cases. Some complications, such as bacterial endophthalmitis, retinal detachment, uncontrolled glaucoma, and KPro extrusion were diagnosed postoperatively.[10]

We report a patient implanted with a modified native Pintucci-type KPro following repeated unsuccessful limbal stem cell grafts and PKs after a severe ocular chemical burn.

CASE PRESENTATION

A 41-year-old man presented to Labbafinejad Medical Center 5 years after a severe corneal chemical burn. He had undergone limbal stem cell transplantations and PKs 4 times on his right eye and once on his left eye which were unsuccessful due to severe dry eye [Figure 1].

Visual acuity was light perception (LP) in both eyes, and both corneas were opaque and conjunctivalized. Assessment of the anterior chamber was impossible,

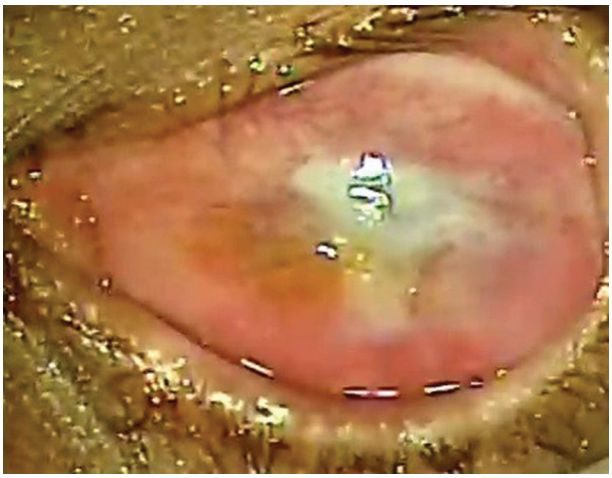

Figure 1. Preoperative clinical picture of the left eye.

but B scan echography showed that both retinas were attached. Binocular severe dry eye was diagnosed. Because of severe corneal scarring and vascularization, the evaluation of intraocular pressure (IOP) with Goldmann applanation and Tonopen® tonometry was not possible. Preoperative tactile (digital) estimation of IOP was about 15-20 mmHg. Due to severe dry eye and total LSCD, his left eye was considered for a Pintucci-type KPro.

The KPro was manufactured at the Ophthalmic Research Center, Shahid Beheshti University of Medical sciences, Tehran, Iran. It contains a PMMA optical cylinder and a Dacron tissue skirt. The materials used for the both cylinder and skirt were the same as the original Pintucci KPro, but the length of the cylinder of this KPro was modified to be approximately 2 mm longer than original one. Anterior and posterior surfaces of the cylinder were convex and flat, respectively. Total optical power of the KPro cylinder was approximately +55.00 diopters. Plasma was used to sterilized the KPro preoperatively. Figure 2 depicts the schematic design of the KPro.

According to Pintucci, a two stage surgery was performed.[8,11] In the first stage (March 2016), surface reconstruction with an oral mucus membrane graft (MMG) was performed as follows: a large graft was removed from mucosal side of the lower lip. The graft was placed on a flat surface, and appropriate thinning was performed. After 360 degree peritomy, superficial keratectomy (SK) was conducted, and the corneal epithelium was completely removed. The MMG was placed over the cornea and sutured with 7/0 Vicryl sutures to the conjunctiva and rectus muscles. Afterwards, a linear incision was made through the lower lid and orbicularis oculi muscle of the opposite eye, and the sterile KPro was placed under the muscle [Figure 3]. Postoperatively, simple ocular ointment (every 3 hours), chloramphenicol (0.5%) eye drops (every 6 hours for one month), and oral diamox (250 mg every 8 hours) were prescribed for the patient.

After 3 months, stage 2 of the surgery was performed. The KPro with vascularized Dacron skirt was removed with an incision through the lower lid. Granulation tissue surrounding the cylinder was cleaned. The mucosal graft was incised from the superior section and removed from the cornea. Central corneal trephination was performed with a 3-mm dermal punch. The crystalline lens and iris were completely removed, and anterior vitrectomy was performed. Finally, the KPro was placed on the eye so that the posterior part of the cylinder was projected into the anterior chamber, and the skirt was sutured to the cornea using 7/0 Vicryl sutures. The mucosal graft was returned on the KPro, and central trephination was performed to expose the anterior pole of the cylinder. Then, the mucosal graft was sutured with 7/0 Vicryl sutures. Chloramphenicol (0.5%) eye drops (every 6 hours), artificial tears (every 2 hours) and oral diamox (every 8 hours) were prescribed postoperatively. The patient was examined one day, one week, one month and three months postoperatively. At the final follow-up examination which was performed seven months after the second surgery, his best distance corrected visual acuity was approximately 2/10 with a + 3.00 diopter lens. The anatomic position of the KPro and mucus graft was acceptable and showed no complications; tactile tonometry was less than 15 mm Hg with oral diamox. Funduscopy revealed pale optic disc with near total cup/disc ratio [Figure 4].

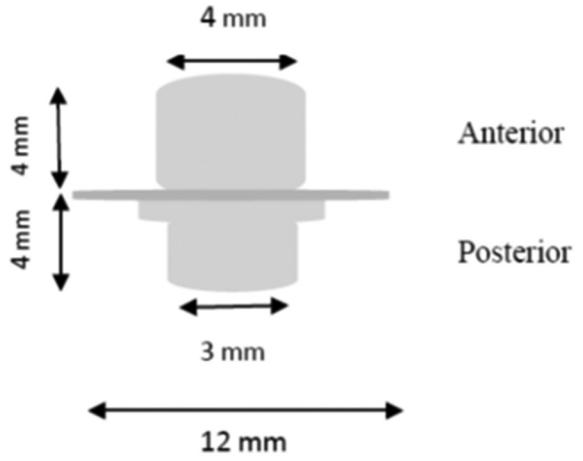

Figure 2. Modified native Pintucci-type KPro.

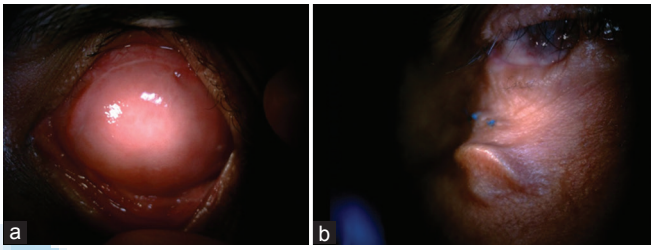

Figure 3. (a) Oral mucus membrane graft over the cornea and conjunctiva, (b) KPro under the lower lid skin.

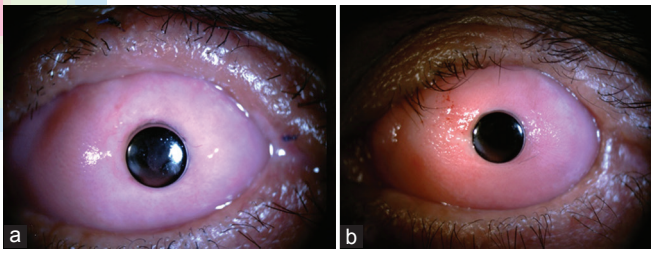

Figure 4. (a) The KPro implant one month after surgery, (b) The KPro implant three months after surgery.

DISCUSSION

The Pintucci KPro is a biointegrable type of artificial cornea that is a suitable option for patients with severe dry eye. Although the OOKP is the gold standard for such patients, it requires extensive surgery of alveolar bone; in these cases, the Pintucci KPro is an alternative and vital option for vision rehabilitation as it is less invasive than the OOKP.[5,9]

In a study conducted by Pintucci et al, 20 eyes of twenty patients with chemical burn, SJS, OCP and other disaeses underwent Pintucci KPro implantation. After a follow-up period ranging from 24 to 96 months, they reported different complications, including oral mucus graft necrosis, membrane formation over optic cylinder and choroidal detachment.[8] In another study, Maskati et al reported on eleven of thirty-one patients with chemical burn who underwent Pintucci biointegrable KProsurgery with follow-up ranging from 6 months to 7 years. Preoperatively, the patients' visual acuity levels were not better than hand motion in the better eye. Visual acuity improved to 20/200 or better at least in 4 of 31 eyes, postoperatively. None of the patients had an infection or retro-prosthetic membrane, but in some cases, complications such as glaucoma and retinal detachment were seen.[11] Glaucoma is a common complication encountered among patients with chemical burn who undergo KPro implantation.[12] Chemical substance penetration into the eye and previous surgeries are factors that increase IOP in these patients. Since IOP measurement is difficult in eyes, monitoring for development of glaucoma should be performed frequently with optic nerve head observation and imaging procedures.[13] In addition, use of anti-glaucoma medications throughout the patient's life is recommended. In our case, during seven months of follow-up, no common complications of KPro implantation had developed, and corrected visual acuity was improved to approximately 2/10, which allows the patient to perform his daily activities independently.

In conclusion, the modified native Pintucci-type KPro could successfully improve vision in a patient with severe chemical burn. Since this is the first case report of KPro implantation, use of the KPro may be useful in similar cases.

Declaration of Patient Consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of Interest

There are no conflicts of interest.

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