Original Article

Observation of clinical efficacy after surgical removal of deep corneal plant foreign bodies

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Abstract

Purpose: To describe a technique for removing deep corneal plant foreign bodies.

Methods: Twelve patients (7 males and 5 females, aged between 5 to 56 years) with plant foreign bodies embedded in the deep cornea were treated between July 2011 and December 2012. The course of disease ranged from 1 to 11 d. Four of the patients had wooden foreign bodies, 3 had bamboo foreign bodies, and 5 had flower thorns; all underwent surgical removal. During the surgery, a self-made suture needle was used to remove the foreign bodies. For injuries with a deep tunnel caused by the foreign bodies, the tunnel was cut open with a keratome. The foreign bodies were then removed and necrotic tissues infiltrated by corneal stroma were thoroughly scraped. Incisions were intermittently sutured. The corneal foreign bodies were collected postoperatively for fungus and bacterial culture and proper medical treatment was provided.

Results: Bacteria were identified in 3 cases, fungus in 3 cases, and no bacteria or fungus in 6 cases. All corneal foreign bodies were embedded deep in the corneal stroma without penetrating corneal full-thickness or intraocular infection.

Conclusion: plant foreign bodies embedded in the deep cornea should be removed immediately. During the surgery, the foreign bodies and surrounding necrotic corneal stroma should be completely removed. The injured cornea should be cut open to eliminate necrotic tissues when necessary.

Keywords: corneal foreign bodies, plant foreign bodies, surgical removal of foreign bodies

A deep corneal foreign body is a common ocular injury seen in clinics[1]. Most plant foreign bodies are flower thorns. Plant foreign bodies penetrate the cornea and make narrow and deep tunnels. In addition, plant foreign bodies have a fragile texture and are likely to break and leave residues. At the same time, foreign body reactions, corneal ulcers, and necrotic tissues increase the difficulty of removing foreign bodies. Postoperatively, a cavity may form in the deep corneal stromal tunnel made by foreign bodies. The risk of infection can be greatly increased by residual pathogens. Proper removal of deep corneal plant foreign bodies and prevention of postoperative complications are challenging tasks[2,3]. This paper describes twelve cases of deep corneal plant foreign bodies that were successfully treated by cutting open the corneal tunnel and removing plant foreign bodies using a self-made removal device based on a suture needle.

Materials and methods

Clinical information

Twelve patients (12 eyes) with deep corneal plant foreign bodies were admitted to The Second Hospital of Foshan between July 2011 and December 2012. There were 7 male and 5 female, aged from 5 and 56 years. The time of onset ranged from 1 to 11 d. Four cases had wooden foreign bodies, 3 had bamboo foreign bodies, and 5 had flower thorns. Bacterial culture outcomes revealed that 3 patients were positive for bacteria, 3 had fungus infection, and 6 had no bacteria or fungus. All the foreign bodies were embedded in the deep corneal stroma and showed corneal stromal infiltration, but no penetration into corneal full-thickness or intraocular infection was observed. Preoperative visual acuity ranged from 0.05 to 0.3. Five cases had kerotopathy involved with pupillary area and one had hypopyon.

Surgical approach

The necrotic tissues on the corneal surface were thoroughly removed under surface anesthesia. The

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end of the foreign body was exposed. Using the foreign body as a center, the corneal stroma was cut open with a scalpel and a 'V-shaped' incision was made on the cornea. The end of the foreign body was held with a 0.12 mm microforceps and the foreign body was gently loosened. A hook was self-made from a 40G needle by bending the 0.5 mm needle tip by 90 degrees. The hook was inserted into the tunnel to completely clear the foreign bodies. The corneal stroma surrounding the tunnel was treated with radical debridement and the suppurative tissues and necrotic corneal stroma were cleared. The corneal wound was rinsed with PBS and intermittently sutured with 10–0 nylon thread. The cavities were closed and the thread was embedded in corneal stroma to reduce the stimulation of postoperative sutures and the invasion of new vessels.

Postoperative treatment

The choice of medicine therapy was decided according to the outcomes for bacterial and fungus culture. Except for patients with fungus infection, glucocorticoid in combination with artificial tears was administered to alleviate the inflammatory response.

Subsequent follow-up

The patients were asked to pay return visits every week during the postoperative first month and then every 1 or 2 months for visual acuity and corneal transparency tests. If the wounds were loosely sutured, the threads were removed or even resutured if necessary. At 1 to 2 months postoperatively, the stitches were removed according to the healing of corneal wound. The follow-up lasted from 3 to 8 months (3.7 months on average).

Results

The corneal foreign bodies were completely eliminated, the corneal stroma infiltration was absorbed, the corneal was healed, and the ocular infection was controlled. The three cases with fungal infection were treated with anti-fungal therapy consisting of natamycin and amphotericin B. Two months postoperatively, corneal infiltration was fully absorbed and the condition of disease was properly controlled. The remaining three patients infected by bacteria and the six with no pathogens received anti-inflammatory treatment combined with topical use of glucocorticoid. The postoperative inflammatory response was immediately alleviated and full recovery was seen by two weeks post operation. Although the foreign bodies were involved with the pupillary area in five patients, the postoperative visual acuity was not significantly affected since the foreign bodies were embedded in the pupil margin and did not cover the optical axis.

One 5-year-old child was admitted to a local hospital with aloe thorns in the eyes. The foreign bodies were removed but the corneal infiltration and tunnel were given timely treatment and the patient presented at our hospital with corneal abscess. We eliminated the necrotic tissues and resutured the wound. Early after the surgery, the patient showed defects between the layers of corneal stromal tissues and presented with corneal leucoma. The symptoms recovered at 1 month postoperatively. The infection was eased and the anterior chamber reactions disappeared. The visual acuity reached 0.7 and the corrected visual acuity was restored up to 1.0.

The mean follow-up period for all patients was 3.7 months (ranging from 2 to 8 months). The visual acuity was improved to 0.6 to 1.0 postoperatively, as shown in Figures 1 and 2.

Discussion

Previous studies indicated that most deep corneal plant foreign bodies were from thorny plants, especially chestnut[1]. When foreign bodies penetrated the deep corneal stroma, a narrow and deep tunnel was made in the corneal stroma. After the foreign body was removed, the residual cavity acted as a favorable environment for pathogen proliferation, so the incidence of infection was enhanced after removing foreign bodies from the deep cornea[4]. Plant foreign body penetration provoked a series of symptoms including apparent inflammatory response, infiltration surrounding foreign bodies, and formation of necrotic tissues, leading to topical corneal stromal abscess. In the present study, one case with aloe thorn injury presented with a topical corneal abscess and a stroma infiltrated ulcer after removal surgery. The postoperative infection was healed through topical debridement and suturing.

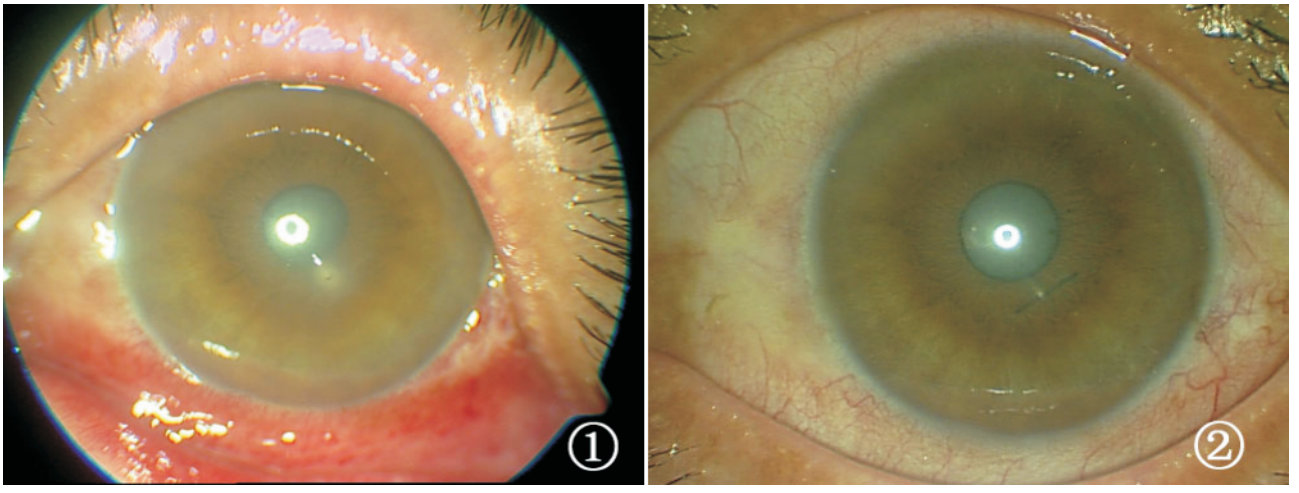

Figure 1 Wood injury. (1) Before operation, corneal stromal infiltration and topical edema were evident; (2) At two weeks after operation, the cornea became transparent, the infiltration was absorbed, and visual acuity was restored to 1.0.

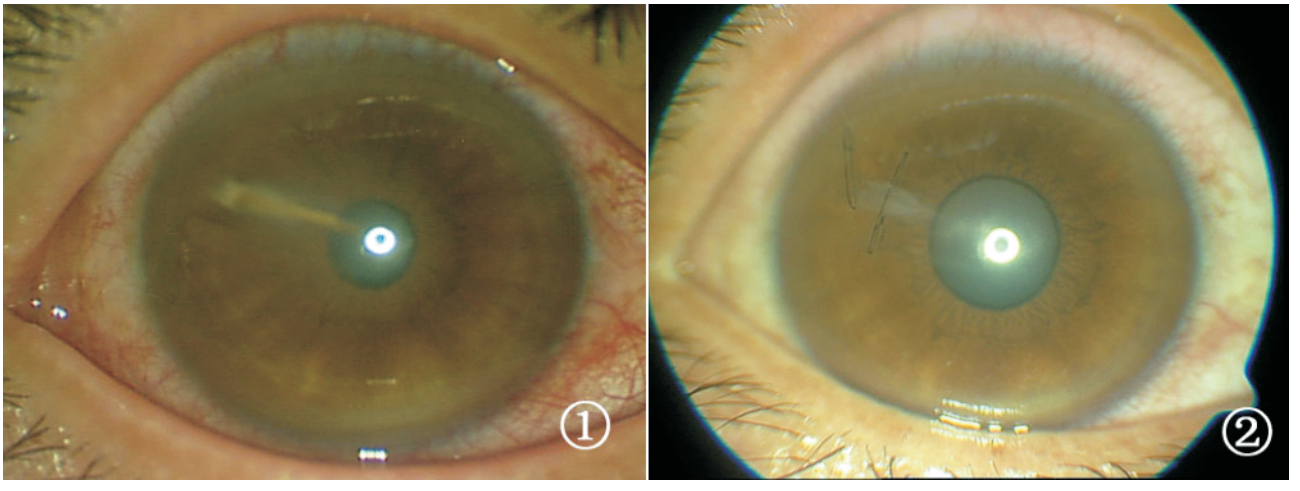

Figure 2 Bamboo injury. (1) Before operation, corneal stromal infiltration was present in the pupillary area; (2) After operation, the patient developed a fungal infection and received fungal medicine therapy for 1 month. The corneal infiltration was absorbed and the visual acuity restored to 0.9.

We strongly suggest that the necrotic tissues surrounding a corneal stromal tunnel should be radically cleared. The tunnel should be cut open to expose the necrotic tissues if necessary, as this not only enlarges the room for the surgical procedure but also closes the cavity after debridement to prevent the incidence of infection. During the surgery, the pupil optical zone should be avoided to restore postoperative visual acuity and reduce surgically induced astigmatism. In clinical practice, corneal stromal infiltration and corneal scarring were noted if the tunnel was not treated properly. The corneal stroma could recover to transparency if the tunnel was cut open. In addition, surgically induced astigmatism could be effectively avoided if the wound was sutured carefully and neatly without involvement of the optical area and if the sutures were removed in a timely manner[5].

The challenges for removing deep corneal foreign bodies included deep penetration and a narrow tunnel. Surgery can fail to prevent the incidence of intraocular infection if the foreign bodies penetrate the cornea into the anterior chamber. Self-made hooks were used to loosen the embedded foreign bodies and prevent them from penetrating the anterior chamber. The hooks were made based on the method of the capculorhexis hook. A 40G insulin injection syringe was used and the head was curved at 90 de-

grees. The foreign bodies were hooked at the opening of the tunnel and gently removed after loosening. Any tiny residuals should be loosened and cleared by a self-made hook rather than a forceps to prevent the foreign bodies from penetrating into the anterior chamber.

The patients with deep corneal foreign bodies should be diagnosed and surgically treated as early as possible[6] to prevent the incidence of corneal infection and severe postoperative complications.

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