

---

**SHORT COMMUNICATION**

---

# Band keratopathy: A modified treatment

D. DE ORTUETA, F. SCHREYGER, H. BAATZ

Eye Centre Recklinghausen, Recklinghausen - Germany

---

**PURPOSE.** *The surgical treatment of band keratopathy usually consists of abrasion of the corneal epithelium followed by removal of the subepithelial calcium deposits by means of an ethylenediamine-tetraacetic acid (EDTA) solution. In order to reduce the discomfort and pain that occur after corneal abrasion, the authors developed a modified technique that avoids the abrasion of the epithelium.*

**METHODS.** *In three patients (four eyes) with long-standing band keratopathy, the epithelium was detached with a 19% ethanol solution and placed gently toward the limbus, a method also used in laser-assisted subepithelial keratectomy (LASEK). After clearing the anterior stroma with EDTA solution, the epithelial flap is unrolled and a bandage contact lens applied.*

**RESULTS.** *Postoperative pain was greatly reduced and after removal of the contact lens no pain was reported.*

**CONCLUSIONS.** *This modified epithelium-sparing treatment of band keratopathy shows good results while reducing postoperative pain. (Eur J Ophthalmol 2006; 16: 618-20)*

**KEY WORDS.** *Band keratopathy, EDTA, Corneal epithelium, Ethanol solution*

---

*Accepted: February, 28, 2006*

## INTRODUCTION

Band keratopathy is a common corneal disease leading to reduced visual acuity. It is characterized by deposition of calcium salts in the subepithelial layers of the anterior stroma and in the anterior part of the Bowman membrane. The typical horizontal band of the deposits is likely due to a more alkaline pH within the tear film between the palpebrae, which favors precipitation of calcium phosphate (1).

Band keratopathy most commonly occurs in eyes with chronic disease such as uveitis, glaucoma, several forms of keratitis, ocular hypotony, or repeated ocular trauma. It also may appear in systemic conditions with elevated serum calcium/phosphate or rarely as an idiopathic condition (2).

The progression is variable and may take from months to many years. Band keratopathy is reported to develop more rapidly in dry eyes (3).

The treatment of relevant band keratopathy is surgical and consists of mechanical abrasion of the cornea followed by chemical resolution with ethylenediamine-tetraacetic acid (EDTA) solution or other techniques (4).

Abrasion causes discomfort and pain for the patient in the postoperative phase. The removal of the epithelium, however, is necessary to access the subepithelial location of the calcium deposits (5).

We present a new technique for treating band keratopathies which facilitates clearing the cornea but markedly reduces the painfulness of the procedure. Instead of a total abrasion the epithelium is only temporarily detached before the chemical treatment with EDTA solution and then replaced.

## METHODS

Since February 2004 we have treated three patients (four eyes) with long-standing band keratopathy with the new technique. Two patients (three eyes) were followed up for more than 3 months.

Prior to the treatment, informed consent was obtained from all patients; ethics committee approval was not required.

In this procedure, the patient receives topical anesthesia (oxybuprocaine chlorohydrate), the eye is draped, and an eyelid speculum is inserted. A funnel-shaped cone (Janach type J2906) with a diameter of 9 mm, i.e., less than the corneal diameter, is placed on the eye and filled with 5 mL of a 19% ethanol solution (1 mL 96% ethanol diluted in 4 mL of 0.9% sodium chloride solution). The solution is kept in contact with the cornea for approximately 30 seconds. However, alcohol exposure time depends on the firmness of the epithelial adhesion. In one case the solution had to be applied for a total of 40 seconds. After the alcohol has been removed with a sponge and the cone lifted, the cornea is rinsed using BSS solution. An epithelial microhoe (Janach type J2916A) is now used to carefully and completely peel off the soft alcohol-treated epithelium with its basal membrane from Bowman's layer and to shift it smoothly to the limbus at the 12 o'clock position. The detached and rolled-up epithelium is kept well hydrated. After this preparation the classic procedure for removing the band keratopathy is performed: sodium EDTA solution (0.01 mol/L) is applied with a saturated cellulose sponge on the Bowman's membrane and the anterior stroma. The EDTA forms chelate complexes with the calcium deposits, and can be removed with the same sponge. This procedure is repeated several times until the stroma is clear. The mean duration of this procedure is 10 to 15 minutes in all cases. After finishing EDTA application, the rolled-up epithelium is stretched out with a spatula (Janach type J2920A) on to the Bowman's membrane. A silicone bandage contact lens (Acuvue® Day & Night from Bausch & Lomb) is applied and antibiotic eyedrops (ofloxacin, Floxal® from Dr. Mann Pharma) are administered QID.

All procedures are performed by the same surgeon (D.O.).

One day later, a postoperative control is performed, and 3 days later the contact lens is removed. A further postoperative control is carried out on day 7.

## RESULTS

All three patients were free from pain on the first postoperative day. Only slight discomfort was reported by one patient. In two patients (three eyes) the bandage lens was removed within 1 week. One patient had a small epithelial defect postsurgically and the contact lens was left in place for 2 weeks. No patient reported any pain after removal of the contact lens.

Visual acuity did not change in a clinically relevant way as all patients had dense cataract. However, in two cases a subsequent cataract operation was carried out without the difficulty of an opaque cornea.

A 3-month follow-up revealed neither recalcification nor haze formation.

## DISCUSSION

The removal of calcific deposits in eyes with band keratopathy can be achieved effectively by different treatments, e.g., EDTA chelation, excimer laser phototherapeutic keratectomy (PTK), or lamellar keratoplasty (4, 6-8).

Regardless of the technique, an abrasion of the epithelium must be performed first. This constitutes a major disadvantage of all treatment methods and causes reduced visual acuity in the postoperative period.

With laser subepithelial keratectomy (LASEK) a new technique has been introduced in refractive surgery in recent years (9). Unlike in laser in situ keratomileusis (LASIK) an epithelial flap is created by treatment with an alcoholic solution (10). Using the LASEK method for displacing the epithelium instead of destroying it by an abrasion results in an almost pain-free way to operate subepithelially while sparing the epithelium and assuring quick healing.

The method of creating an epithelial flap has already been applied for the treatment of recurrent erosion syndrome (11).

As calcific deposits in band keratopathy are situated mainly in the superficial layer of Bowman's membrane and in the anterior stromal lamellae, displacement of the epithelium by ethanol opens the way for an effective EDTA treatment (5).

Calcific deposits that are situated in layers too deep for EDTA chelation may be treated by excimer laser (7).

Our method has the advantage of quickly restoring the transparency of the cornea so that subsequent treatments such as cataract or retinal surgery may be carried out soon after the procedure. One of our patients received uneventful cataract surgery 2 weeks later.

## CONCLUSIONS

Preparation of an epithelial flap with an alcohol solution and subsequent EDTA chelation is an effective and safe modification of the usual EDTA treatment with a prior

abrasion because it assures fast postoperative visual rehabilitation and markedly reduces ocular pain immediately after the intervention. A prospective clinical study is needed to prove this clinical impression.

*None of the authors has a financial or proprietary interest in any material or method mentioned.*

Reprint requests to:  
Diego de Ortueta, MD  
Augenzentrum Recklinghausen  
Erlbruch 34-36  
45657 Recklinghausen, Germany  
Diego.de.Ortueta@augenzentrum.org

---

## REFERENCES

1. O'Connor GR. Calcific band keratopathy. *Trans Am Ophthalmol Soc* 1972; 70: 58-81.
2. Sugar A. Corneal and conjunctival degenerations. In: Kaufman HE, Barron BA, McDonald MB. *The Cornea*. Boston: Butterworth-Heinemann; 477-96.
3. Lemp MA, Ralph RA. Rapid development of band keratopathy in dry eye. *Am J Ophthalmol* 1977; 83: 657-9.
4. Alonso Santiago MA, Ramirez Fe C. Transient band keratopathy associated with hypercalcemia [in Spanish]. *Arch Soc Esp Oftalmol* 2002; 77: 211-4.
5. Adenis JP, Catanzano G, Leboutet J, Rammaert B, Robin A. Calcareous band keratopathy and endocular calcifications. Ultrastructural study of the cornea [in French]. *Bull Soc Ophthalmol Fr* 1980; 80: 275-8.
6. Burillon C, Durand L, Berne E, Bouvier R. Band keratopathy. Symptomatology value based on 23 cases [in French]. *J Fr Ophtalmol* 1992; 15: 579-86.
7. Maloney RK, Thompson V, Ghiselli G, Durrie D, Waring GO, O'Connell M. A prospective multicenter trial of excimer laser phototherapeutic keratectomy for corneal vision loss. The Summit Phototherapeutic Keratectomy Study Group. *Am J Ophthalmol* 1996; 122: 149-60.
8. Najjar DM, Cohen EJ, Rapuano CJ, Laibson PR. EDTA chelation for calcific band keratopathy: results and long-term follow-up. *Am J Ophthalmol* 2004; 137: 1056-64.
9. Yee RW, Yee SW. Update on laser subepithelial keratectomy (LASEK). *Curr Opin Ophthalmol* 2004; 15: 333-41.
10. Laser epithelial keratomileusis (LASEK): histological investigations for vitality of corneal epithelial cells after alcohol exposure [in German]. *Klin Monatsbl Augenheilkd* 2002; 219: 365-9.
11. Ardjomand N, Fellner P, Vidic B. Phototherapeutic keratectomy with an epithelial flap for recurrent erosion syndrome. *J Cataract Refract Surg* 2004; 30: 543-5.