Corneal Neovascularization and Lipid Keratopathy after Intacs SK in Keratoconus

Adel Barbara, David Zadok, Shay Gutfreund, Ramez Barbara

ABSTRACT

Intacs have yielded positive results for the treatment of keratoconus in terms of reducing the keratometry readings astigmatism and spherical equivalent and consequently improving the uncorrected and best corrected visual acuity. Intacs severe keratoconus (SK) are new design of Intacs with a smaller optical zone (6 mm) and oval shape, they are indicated for severe keratoconus.

Pannus is one of the complications of Intacs, as it has never been reported after Intacs SK.

We report on corneal neovascularization in the corneal periphery which developed few months after Intacs SK implantation in the cornea of a young female who suffered from advanced keratoconus. The uncorrected visual (UCVA) acuity was satisfactory and the Intacs SK where not removed. Four years after the implantation she presented to our clinic complaining about eye irritation and photophobia, lipid keratopathy was observed.

We gave here the choice of explanting the Intacs SK or to try to treat the neovascularization by subconjunctival Avastin, we preferred the second option because of a satisfactory UCVA (0.9).

Avastin was injected in the subconjunctival, 10 weeks later Avastin and Kenelog were injected in the subconjunctival, few days after the second injection perforation and melting developed in the cornea, the patient underwent a tectonic graft and few months later penetrating keratoplasty with no intraoperative or postoperative complications.

Keywords: Intacs, Intacs SK, Intrastromal, Keratoconus, Corneal rings, Perforation, Pannus, Corneal neovascularization, Astigmatism, Irregular astigmatism Keratometry.

How to cite this article: Barbara A, Zadok D, Gutfreund S, Barbara R. Corneal Neovascularization and Lipid Keratopathy after Intacs SK in Keratoconus. J Kerat Ect Cor Dis 2013;2(3): 133-138.

Source of support: Nil

Conflict of interest: None declared

INTRODUCTION

The first Intacs implantation for improving visual acuity (VA) in a keratoconic patient was performed by Joseph Colin in 1997.1 Intacs were inserted in a contact lens intolerant patient with unsatisfactory VA, the astigmatism and the corneal steepening were reduced. This patient completed a 10-year follow-up with stable results. Since then, many studies have been published in the literature confirming the positive results of Intacs implantation in keratoconic eyes.

Indications for corneal rings in keratoconus include: unsatisfactory best spectacles corrected visual acuity (BSCVA), contact lenses intolerance, mild to moderate keratoconus, keratometry readings <58 Diopter (D), clear optical zone with no corneal scarring and corneal thickness >450 µm in the area of the proposed tunnels, where Intacs are expected to be inserted.

Improvement were reported in the mean spherical equivalent, sphere, cylinder and keratometry and gained lines of uncorrected visual acuity (UCVA) and best BSCVA.2,3 Rabinowitz in his review on Intacs for treating keratoconus states: ‘Most studies to date show an average of 2 to 3D of flattening accompanied by 2 to 3 lines of gain in best-corrected visual acuity (BCVA). However, the range is large and variable ranging from 2 lines of loss of BCVA to a gain in and BCVA, 70 to 80% of the patients treated in all the studies noted an improvement in the UCVA and BCVA, in addition to a decrease in higher order aberrations (HOA).4

Postoperative Complications of Intacs

Postoperative complications reported include segment extrusion, corneal neovascularization, infectious keratitis, mild channel deposits around Intacs ring segment, segment migration, epithelial plug at the incision site, corneal haze around segments or at the incision site, corneal melting, night halos, chronic pain and focal edema around segments.5 Other rare complications include persistent inflammation, persistent fluctuation of vision, intraocular inflammation, photophobia, loss of UCVA and BCVA.4

Pannus may compromise the results of penetrating keratoplasty (PKP) by increasing the chance of rejection. Regression of deep pannus was reported by Cosar et al.5 They reported on a case of late deep corneal vascularization noted 3 years after intrastromal corneal ring segments (Intacs) implantation for the treatment of keratoconus, which necessitated the removal of the rings. The pannus subsided 10 days after rings removal and topical treatment with corticosteroids. Ibrahim et al report on one case of corneal vascularization (0.53%) which appeared 18 months post-Intacs implantation in a patient who used soft contact lenses.6 Lovisolo et al reported on Intacs removal due to neovascularization around the edge of one Intac and extrusion one year postoperatively.7 Topography-guided PRK followed by collagen corneal cross-linking (CXL) was performed 6 months after the removal of Intacs. Six months after the novel PRK and CXL, the patient’s UCVA was 0.8 and BCVA 1.0, and the blood vessels disappeared.
**Intacs SK**

SK intends for severe keratoconus, are oval shape cornel rings, inner diameter 6 mm produced by addition technology product introduced in February 2007. Two thicknesses are available: 400 µm and indicated for keratometry (K) readings k 55-62 and astigmatism of <5 Diopters (D), thickness of 450 µm indicated for K readings of >62 and astigmatism of >5D.

Various reports in the literature confirm improvement in the mean spherical equivalent, sphere, cylinder and keratometry and gain lines of the UCV A and BSCVA A and decrease in HOA. Similar results were reported in post-LASIK (laser-assisted in situ keratomileusis) ectasia and, when combined with collagen corneal cross-linking (CXL). Intac SK 210° arc was implanted in a case of post-LASIK ectasia and 1 year postoperatively showed a decreased in maximum keratometry, vertical coma and improved visual acuity. No postoperative complication of corneal pannus was reported after Intacs SK, unlike Intacs.

**CASE REPORT**

We are reporting on pannus in the cornea of a 23 years old female which developed after implantation of Intacs SK because of keratoconus.

This young lady came to our medical center complaining on unsatisfactory BSCVA in her left eye, she was contact lenses intolerant and penetrating keratoplasty (PKP) was offered to this patient in other medical center.

The cornea could not be mapped with the Topcon Topographer KR-7000P, the Orbscan II could map it (Figs 1 and 2). The UCVA was 0.1, the BSCVA was 0.3 partial, the refraction +2.00 D and astigmatism of −8.00 D at 140° keratometry readings: K minimum (min) 44.1D, K maximum (max) 55.3 D, central corneal thickness (CCT) 412 µm. On the 23 of June 2008, a pair of Intacs SK 400 µm thick were implanted, the incision was made at the steep axis at a depth of 80% of the corneal thickness as measured by ultrasound pachymetry at the time of surgery, the Intacs SK were implanted by the manual technique using the special technique.
Corneal Neovascularization and Lipid Keratopathy after Intacs SK in Keratoconus

Dissectors produced by Addition Technology, no intra or postoperative complications were noted.

An immediate improvement in UCVA was noted; she was followed for few days after the surgery but she did not return for the regular follow-up.

Nine months postoperatively, she came for a control a gap at corneal incision site was noted with pannus in the area of the wound and at the upper part of the temporal Intac SK. She reported a trauma few weeks after surgery to her operated left eye.

The UCVA which was 0.9 at the time of control the topography could be recorded by the Topcon Topographer KR-7000P (Fig. 3) the K readings were K min 42.75D – K max 49.12 D, K average (ave) 45.75 D.

In July 2012, 5 years postoperatively, she complained about a recurrent irritation and photophobia which started a week earlier. A deep pannus was observed and a lipid deposit was seen over the middle part of her temporal Intac (Figs 4A to C). She was still very satisfied from her UCVA which was still 0.9 the K readings were K min 42.25 D

K max 47.5 D K average 44.75 D (Fig. 5). She was installing vigamox and dexamethasone 0.1 eye drops four times daily as recommended by an ophthalmologist in a public medical center where she was examined few days earlier because of her complains. We offered her the possibility to explant the Intacs SK or to try to keep them in the cornea and try to treat the pannus by injecting Avastin subconjunctivally and she chose the second option, 2.5 mg of Avastin (0.1 ml) was injected subconjunctivally on the 31st of July 2012. She came after almost 6 weeks with no more complains of photophobia and irritation and the UCVA was 0.9 (Fig. 6).

Because of economical reasons, she was referred to a public medical center for the subconjunctival injection of Avastin. Avastin 2.5 mg (0.1 ml) and Kenalog 0.4 CC were injected in the subconjunctiva in November 2012; few days after the injections, she complained about a continuous deterioration of vision. She was examined in our medical center, a marked regression of the pannus was noted and unexplained loss of UCVA and BCVA, her UCVA dropped to 0.1. The topography could not be recorded by the Topcon Topographer KR-7000P only by the TMS 5 (Tomey, Japan) (Figs 7 and 8). The rest of her ophthalmic exam including fundus after pupil dilatation was normal. One day later, she was examined in the public hospital because of further deterioration of vision. She felt that the eye is ‘soft’ her vision as reported by the public medical center report was 1.5 meter. Finger counting on examination of the eye flat anterior chamber was noted, and suspected perforation of the descemet by the temporal Intac SK, intraocular pressure (IOP) was 5 mm Hg, a therapeutic contact lens was inserted, few days later, her VA was 0.1 with pin hole 0.5, because of corneal thinning the Intacs were removed, perforation and melting were noted at the upper edge of the temporal Intac. The wound was sutured by 5 sutures of 10(0) nylon, a contact lens was inserted and she was released from the hospital with UCVA of 0.2 and 0.3 with pin hole. Few weeks later on 6th of January 2012, perforation and loss of anterior chamber was noted, a 5 mm tectonic graft was implanted. A month later, a leakage was noted from the lower part of the tectonic graft and the eye was hypotonic, the IOP was...
2 to 3 mm Hg, a therapeutic contact lens was inserted, the UCVA was 0.25 and 0.33 with pin hole. No more leakage was noted and she was scheduled for PKP.

Penetrating keratoplasty was performed on the 10th of May 2012, the size of the donor was 8 mm the same as the size of the recipient, the graft was sutured with 12 single 10(0) sutures and one continuous 10(0) suture, no intra or postoperative complications were reported. On the 30th of October 2013 (the last reported control), the BSCVA was 0.4 partial, the refraction: –3.0 D and –4.0 D cylinder at 150°. The graft was clear, the intraocular pressure 12 mm Hg and she was instilling dexamethasone 0.1% once a day.

DISCUSSION

Dr Kugler reports a rate of 0.7% of melting from a literature review on corneal melting, 12 eyes out of 1,835 eyes that had undergone implantation related to keratoconus or ectasia. Seven of the cases (58%) had an incision overlying the implant, five cases did not. The same author report on four cases of melting three because of ectasia after radial keratotomy and one in a case of pellucid marginal degeneration (PMD). In this case, there was no extrusion. Ruckhofer et al showed that ring segments induced keratocyte apoptosis, these changes are reversible after implant removal.

Pannus was reported after Intacs in several reports, but never reported after Intacs SK, the incision in Intacs SK is more central than in Intacs, the optical zone is 6 and 7 mm respectively, and the ISCR are farer from the limbus than Intacs.

Avastin as an antivascular endothelial growth factor (VEGF) used off label for the treatment of age-related macular degeneration initially and later for the treatment...
of diabetic macular edema, branch and central retinal vein occlusion. Subconjunctival Avastin was reported as a treatment for corneal pannus with variable results, no melting was reported after subconjunctival Avastin.15-17

Photodynamic therapy and fluorescein-potentiated argon laser (FPAL) treatment were reported as treatments for corneal neovascularization.17,18

In this case report, the melting developed after the injection of Avastin and steroids, steroids are known to cause delay in wound healing and induce melting, when the epithelium is damaged, steroids interfere with stromal healing by inhibiting the proliferation of keratoblasts and decrease the tensile strength of the corneal wound. Steroids were found to inhibit the formation of the fibrinous coagulum, cellular infiltration, fibroblastic repair and endothelial regeneration.19-22 Rimexolone (a steroid) has been suspected to be the cause of corneal melting in five eyes after PRK and in one eye after LASIK as reported by Dr Tervo at the 11 ESCRS winter meeting.23 Topical steroids are known to promote corneal melting in patients with epithelial defects.24 In our case, there was no epithelial defect.

In this case, two elements could provoke melting and the consequent perforation, the Intacs SK themselves and the injected steroids. Before the steroids injection, there was no perforation or melting. The melting did not occur after the Avastin injection, the patient came after 6 weeks of the injection with no signs of melting or perforation.

Does the combination of Avastin and steroids provoke melting and perforation? This remains an open question.

Another hypothesis could be suggested, the perforation developed slowly throughout the years and the pannus closed the gap and when the pannus regressed as was seen after the subconjunctival injection of Kenalog and Avastin the perforation became apparent. This hypothesis can explain only the perforation but not the melting.

From all the above-mentioned possibilities, we believe that the steroids induced the melting and the perforation as it occurred few days after the injection of the steroids.

This is the first case of late perforation and melting which is supposed to be induced by steroids injected subconjunctivally in a keratoconic eye implanted with Intacs SK and it is the first case of pannus and lipid keratopathy after implantation of Intacs SK.

REFERENCES


ABOUT THE AUTHORS

Adel Barbara
Ophthalmic Surgeon, Medical Director, Hadassah Optimal, Refractive Surgery Centre of Hadassah Hospital, Haifa, Israel
Correspondence Address: Hadassah Optimal, 157 Yaffo Street Haifa, Israel, Phone: +972528500061, Fax: +97248516999, e-mail: adelbarbara@yahoo.com

David Zadok
Department of Ophthalmology, Assaf HaRofeh Medical Center Tzrifin, Israel

Shay Gutfreund
Department of Ophthalmology, Assaf HaRofeh Medical Center Tzrifin, Israel

Ramez Barbara
Specialist, Department of Ophthalmology, Hadassah Optimal, Haifa, Israel