Short communication

Improving the visualization of non-absorbable T-Flux® implants in deep sclerectomy. Colouring technique☆,☆☆

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ABSTRACT

Purpose: To describe a staining technique that will enhance the visualization of non-absorbable T-Flux implants.
Methods: The technique was applied to non-absorbable T-Flux implants. The implants were submerged for 5–10 min in a sodium fluorescein solution, and dried with a sponge when removed from the solution.
Discussion: This is a very simple and easy procedure that uses a common fluorescein solution to enhance the contrast between the surgical field and a transparent implant used in deep sclerectomy. This colour technique will decrease the risk of loss of the implant in the surgical field.

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Mejorando la visualización del implante no absorbible T-Flux® para esclerectomía profunda. Técnica de tinción

RESUMEN

Objetivo: Describir una técnica de coloración que aumente la visualización del implante no absorbible T-Flux.
Método: La técnica se emplea en el implante no absorbible T-Flux. Este se sumerge en una solución de fluoresceína sódica entre 5 y 10 min, posteriormente se retira y se seca con un hemosteta.
Discusión: Esta técnica fácil y sencilla que usa una solución común de fluoresceína nos permite aumentar el contraste en el campo quirúrgico entre este y el implante transparente empleado en la esclerectomía profunda. Esta técnica disminuye el riesgo de pérdida del implante.

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**Introduction**

Glaucoma surgery is based on 2 main techniques: trabeculectomy, described by Cairns in 1968 and modified by Watson and others in the seventies, and nonpenetrating deep sclerectomy described by Epstein and Krasnov in the late fifties and early sixties and reviewed by Fyodorov and others. In 1994, Zimmerman reported comparable results between trabeculectomy and nonpenetrating deep sclerectomy in what concerns intraocular pressure (IOP) levels but with an important difference in post-surgery complications such as hypothalamic, uveitis, hyphema and vitreous losses.

An increasing number of surgeons in Europe are preferring nonpenetrating surgery. Perhaps the main reason is the lower proportion of potential risk as well as IOP control comparable to that of trabeculectomy.

Long-term results of nonpenetrating deep sclerectomy appear to be better if combined with implants. Utilizing absorbable collagen implants, Shaarawy, with a mean follow-up of 64 months, concluded that they provide stable IOP control with very few short-term post-surgery complications.

With a follow-up of 30 months, Dahan et al. compared nonpenetrating surgery combined with the use of T-Flux nonabsorbable implants, obtaining better IOP control in absolute values as well as in reduction percentages (62 ± 6% in the implant group vs 34 ± 13% in the implant-free group). A significant detail of this study is that during the first 18 months of follow-up no differences were observed in the mean IOP between both groups, although it began to increase in the implant-free group as of month 23. This increased the frequency of hypotensor treatment in this group at month 30.

The fact of maintaining the suprachoroidal space with the use of nonabsorbable implants which additionally prevents sclerectomy closure assists in maintaining good IOP levels even in the absence of filtration blebs. However, the use of these implants has not demonstrated clear advantages over other methods such as viscocanalostomy utilizing viscoelastic materials.

T-Flux nonabsorbable implants (Fig. 1) (Zeiss, La Rochelle, France) are biocompatible, hydrophilic with a high content of water (38%) and transparent. The vertical portion of its T-shape has a wider part of 3.4 mm × 1.7 mm and 0.45 mm in the apical area, while in the central area the thickness is of 0.15 mm. The horizontal or haptic portion is 4 mm long and 0.25 mm wide. At the extremes, these portions are raised and have 0.35 mm thickness. It has 2 fixation holes in the body of 0.47 mm diameter. The transparency and fragility of this implant make its manipulation more difficult due to increased risk of misplacement during surgery despite the increase provided by microscopes.

The description of the T-Flux nonabsorbable implant staining technique presented herein does not aim at analyzing the advantages or disadvantages of its use and focuses exclusively on describing a procedure for improving its visualization and manipulation.

**Surgical technique**

Nonpenetrating deep sclerectomy is the procedure which applies T-Flux nonabsorbable implants. Subtenon anesthesia is applied in the inferior temporal quadrant with a mixture of 5% lidocaine and 0.75% bupivacaine in a proportion of 50:50, administering a volume of 1–1.5 ml of this mixture. Subsequently, a traction stitch in clear cornea H-12 with 8-0 silk is made. The conjunctival flap based on the limbus is performed and subsequently the two scleral flaps are prepared: the superficial one, having 1/3 the thickness of the sclera, and the deep one comprising 90% of the overall sclera thickness. The trapezoidal superficial flap measures 5 mm × 5 mm × 3 mm, and the deep flap (also trapezoidal) measures 4 mm × 4 mm × 1.5 mm. During the preparation of the deep flap and the peeling of Schlemm’s canal the stain is applied in the implant container. The stain is 20 mg/ml commercial solution Alcon Cusi sodium fluorescein for corneal samples or IOP taking without anesthetic. Four or five stain drops are applied in the implant container and remain submerged in the solution during 5–10 min although time is not of the essence for the intensity of the implant staining (Fig. 2). Subsequently and with the scleral bed ready for fixation, the implant is

**Fig. 1** – T-Flux nonabsorbable implant in the scleral bed without stain. Note the week contrast with surrounding environment.

**Fig. 2** – T-Flux stained with fluorescein in position, preparing fixation with suture.
withdrawn from the solution, drying the excess stain on both sides with a surgical sponge (John Weiss International, Milton Keynes, United Kingdom). The implant is placed in the previously prepared scleral space, observing adequate contrast with surrounding tissue. Thereafter, the implant is fixed according to the preferred technique, stitching with 10–0 nylon or inserting it in the suprachoroidal space according to the technique described by Muñoz. The scleral flaps and the conjunctiva are closed following the standard procedure.

Discussion

In our hospital environment, surgery staff is frequently renewed. In some cases, they are not familiar with the use of fragile implants. In the experience of the authors, the use of T-Flux implants is greatly facilitated when stained as it reduces the risk of misplacement in the surgical field.

Sodium fluorescein is a product with demonstrated ocular and systemic tolerance, easily available in ophthalmology centers and of low cost. It produces adequate implant staining which does not seem to involve the hydrophilic matrix, i.e., it does not bind strongly to the implant which can be washed to make the staining disappear if necessary. In our experience, we only tried the excess stain in the implant with a surgical sponge in order to remove excess liquid in a field which was already inundated. The staining was temporary and after 48 h no trace can be observed in surrounding tissue, to the point that when viewing T-Flux under gonioscopy (8 weeks later), it was completely transparent.

During the follow-up of patients we did not observe any alteration that cannot be included within the post-surgery of glaucoma surgery for this type of nonpenetrating deep sclerectomy. We consider it a simple and safe technique which in addition facilitates implant manipulation, not only for the surgeon but also for assistant staff or trainees.

Even though it seems unlikely that ophthalmological stains such as fluorescein could modify or alter the natural course or longevity of filtrating surgery, it is necessary to carry out longer series of patients with stained implants, probably comparing them with a control group without stained implants to determine whether these products are able to modify filtrating surgery. This could pave the way for impregnating implants with slow releasing products to regulate filtrating surgery cicatrization which, at this date, subsists as the biggest challenge.

Conflict of interest

No conflict of interest has been declared by the authors.

References