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A New Cornea-Marking Device for Penetrating Keratoplasty and Refractive Corneal Procedures

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Key Words

Cornea-marking device
Double running suture
Penetrating keratoplasty

Abstract

In penetrating keratoplasty, postoperative astigmatism is determined by a number of factors, including adaptation of wound edges, mode of trephination of both donor and patient cornea and, last but not least, suture techniques. We would like to introduce a new cornea-marking device for use in keratoplasty and epikeratophakia. This device helps the surgeon to center the trephine and to perform a perfect double running torque-antitorque suture. Additional single sutures are not necessary. A study of postoperative astigmatism following operations in which this device was used is under way.

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Introduction

An optimum suture for penetrating keratoplasty and refractive procedures like epikeratophakia should meet the following criteria: the suture should be exactly reproducible; it should guarantee good, uniform wound adaptation; the distance between stitches and the angle of the stitches should be identical all around the wound.

These 'geometrical' criteria are fulfilled by the double running torque-antitorque suture, which was first described by Hoffmann [1]. This suture has resulted in less suture-dependent astigmatism [2, 3]. However, even with the use of radial corneal markers, it has not been possible so far to achieve an exactly duplicatable double running suture. We would like to introduce a new cornea-marking device (fig. 1). This marker temporarily 'stamps' the intended suture alignment on the cornea.

Fig. 1. The new cornea-marking device. The picture was taken from below. The cross in the center makes it easier to center the device along the optical axis. The surface of the star is bent to approximate the average corneal curvature.

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Operation Procedure and Instruments

First we mark the optical center of the cornea with a 20-gauge can-nula. Then we put the marker, which has been colored with marking ink, on the cornea. This marker is available from N. Quast, Ganten-bergstrasse 18, D⁴15307 Essen, Germany. The cross in the center of the marker (fig. 1) has to be right in the optical center. Now we trephine the patient's cornea. The guided trephine system [4] we use can also be exactly centered. After trephination, we fix the graft with temporary single sutures. Then we mark the dried cornea once again, so that an 8-pointed star can be printed on the cornea. This second marking step is necessary, because it allows us to position the stitches precisely. Now we do a first 10-0 running suture (fig. 2). The second continuous suture can be set exactly in between. Our experience has shown that it turns out more precisely if this second running suture is also previously marked (fig. 3).

Discussion

Unexpected high astigmatism and immunologic reactions are the most common complications following penetrating keratoplasty [5]. In fact, penetrating keratoplasty is a refractive surgical procedure [6, 7]. For optimum results with little postoperative astigmatism, a running suture style

is superior to single sutures [1-3,5,8]. The suture marker we describe here enables the surgeon to do a double running suture with optimum accuracy. Its main advantage is that additional single sutures are unnecessary. Hence there is less danger of inducing irregular astigmatism. The double running suture can be controlled better. The grafts can be centered exactly along the optical axis. We have performed keratoplasty in 35 cases with this new marking device, and the mean astigmatism was 2.0 ± 0.75 dpt 0.5 years after the operation. We do not know yet whether these values remain stable after suture removal, nor do we know what influence the guided trephine system has on our final results. It remains for a prospective, randomized study comparing different suture styles with and without star marker to assess the true value of this new surgical instrument.

Fig. 2. After the graft has been temporarily fixated with 4 cardinal sutures, the marker stamps the intended suture form on the cornea. Now the suturing exactly follows the stamped star.

Fig. 3. Example of a double running suture performed with the new marking device. The picture was taken 3 weeks after the operation. Astigmatism was 2.0 diopters.

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Cornea-Marking Device for Penetrating Keratoplasty Sutures