

# A 4.5 mm. penetrating keratoplasty for leucoma adherens of 4.5 mm. or less

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The aim of the present study is to determine the best size and type of corneal graft (lamellar or penetrating, as judged by the incidence of postoperative complications) for use in cases of central or peripheral leucoma adherens measuring 4.5 mm. or less. Penetrating grafts smaller than 4 mm. rarely remain transparent and those above 7 mm. also often become opaque and may be complicated by glaucoma (Stallard, 1965). In applying penetrating grafts of less than 4 mm., it is difficult to handle the direct sutures and to allow for peripheral opacification where the graft joins its bed.

## **Material**

The incidence of postoperative complications, such as loss of anterior chamber, anterior synechiae, iris prolapse, secondary glaucoma, and graft opacity, was studied in twenty cases:

- (1) Six cases of deep lamellar keratoplasty of 4.5 mm. diameter.
- (2) Four cases of deep lamellar keratectomy of 4.5 mm., with removal of a deeper and smaller corneal scar with adherent iris by penetrating keratectomy, using scissors or a smaller diameter trephine and a 4.5 mm. penetrating donor graft.
- (3) Four cases of penetrating keratoplasty of 6 mm.
- (4) Six cases of penetrating keratoplasty of 4.5 mm.

## **Case reports**

The twenty cases of leucoma adherens of 4.5 mm. or less were due to perforated ulcers caused by purulent conjunctivitis. The general condition of the patients was good. They were between 20 and 40 years of age, and the sexes were evenly divided. There were no septic foci and conjunctival cultures were negative. The blood pressure was normal. The urine was free from albumin and sugar. The visual acuity was less than 6/60, but the ocular tension was normal and there was no corneal vascularization.

The donor eyes were taken within 4 hours of death and the operation was performed immediately. Virgin silk was used for edge-to-edge sutures.

### *Operative technique*

To be sure that there was no possibility of anterior synechiae or iris prolapse, either during the insertion of the edge-to-edge sutures or because of loss of the anterior chamber, the following technique was adopted.

The operation begins with the host pupil constricted with pilocarpine to enable the trephine to be correctly centred on the cornea if there are central opacities. After the trephine marking has been made, a subconjunctival mydraine injection is given to dilate the pupil. After the scarred disc has been cut by the trephine, the attached iris is cut. The resultant iridectomy border and the

dilated pupillary border are free from the corneal graft (to prevent formation of synechiae in case of loss of anterior chamber). The 4.5 mm. penetrating donor graft is applied and eight edge-to-edge sutures are placed. Normal saline is injected to re-form the anterior chamber at the end of the operation (Rycroft, 1957). Atropine ointment 3 per cent. is applied at the daily postoperative dressing. Sutures are removed after 4 weeks.

#### *Complications*

The anterior chamber was lost more frequently in cases in which 6 mm. grafts were inserted. The loss usually occurred on the third postoperative day and persisted for about 4 days, and was the cause of anterior synechiae, iris prolapse, and secondary glaucoma. Anterior synechiae were treated by synechiotomy, iris prolapse by excision of the prolapse and wound suturing, and secondary glaucoma by an iris inclusion operation. The smaller 4.5 mm. grafts were accompanied by no postoperative complications.

#### **Discussion**

In cases of dense white central or peripheral leucoma adherens of 2 to 4.5 mm., which were not accompanied by secondary glaucoma, the following operations were performed:

(1) Although the opacity seems to be small, a junior surgeon fearing the possible complications of penetrating keratoplasty may try a deep lamellar keratoplasty of 4.5 mm. on the supposition that most of the leucoma will be removed and that the rest of the opacity will disappear by tissue therapy (being affected by the fresh donor graft). A deep lamellar keratectomy will not, however, remove the deepest layers of the white scar, and the patient will not be pleased with the cosmetic result. Furthermore, in cases of central opacity, there will be no visual improvement.

(2) A deep lamellar keratectomy of 4.5 mm. may be followed by the removal of the small deep scar by a smaller penetrating keratectomy by scissors or trephine. At the same time the attached part of the iris is removed and the keratectomized area is replaced by a 4.5 mm. penetrating donor graft. This procedure is difficult and there is a risk of the same complications as those which may follow a penetrating keratoplasty.

(3) A penetrating keratoplasty of 6 mm. is more likely to be followed by complications than one of 4.5 mm.

(4) The ideal operation in cases of leucoma adherens of 4.5 mm. or less is the 4.5 mm. penetrating keratoplasty, for the following reasons:

(a) All the scarred corneal leucoma with the attached part of the iris is removed.

(b) The edge of the centrally placed 4.5 mm. donor graft is away from the dilated pupillary margin; this minimizes the risk of anterior synechiae, iris prolapse, or secondary glaucoma.

(c) The small graft heals more quickly and is more likely to remain clear.

(d) Only eight edge-to-edge sutures are needed to fix the graft and give a hermetically sealed wound.

#### **Summary of results** (see Table)

The following operations were performed in twenty cases of central or peripheral leucoma adherens of 4.5 mm. or less with normal ocular tension:

(1) 4.5 mm. deep lamellar keratoplasty in six cases

This technique did not improve the deepest opaque part of the leucoma and the cosmetic and visual results were poor.

**Table** Results of operations using four types of graft in 20 cases of leucoma adherens

| Type of graft   | Size (mm.) | No. of cases | Site of opacity | Case no. | Preoperative corrected visual acuity | Complications                               | Postoperative corrected visual acuity | Result         |
|---|------------|--------------|-----------------|----------|--------------------------------------|---|---------------------------------------|----------------|
| Deep lamellar keratoplasty  | 4.5        | 4            | Central         | 1        | 50 cm. CF                            | Opacity still present                       | 50 cm. CF                             | No improvement |
|   |            |              |                 | 2        | 75 cm. CF                            | Opacity still present                       | 75 cm. CF                             |                |
|   |            |              |                 | 3        | 1/60                                 | Opacity still present                       | 1/60                                  |                |
|   |            |              |                 | 4        | 2/60                                 | Opacity still present                       | 2/60                                  |                |
|   |            | 2            | Peripheral      | 5        | 5/60                                 | Opacity still present                       | 5/60                                  | No improvement |
|   |            |              |                 | 6        | 6/60                                 | Opacity still present                       | 6/60                                  |                |
| Deep lamellar keratectomy with deep penetrating smaller keratectomy | 4.5        | 3            | Central         | 7        | 1/60                                 | Opaque graft                                | 50 cm. CF                             | Worse          |
|   |            |              |                 | 8        | 1/60                                 | Opaque graft                                | 50 cm. CF                             | Worse          |
|   |            |              |                 | 9        | 50 cm. CF                            | —   | 6/60                                  | Improved       |
| Penetrating keratoplasty  |            | 1            | Peripheral      | 10       | 6/60                                 | —   | 6/60                                  | No improvement |
| Penetrating keratoplasty  | 6          | 4            | Central         | 11       | 50 cm. CF                            | —   | 6/60                                  | Improved       |
|   |            |              |                 | 12       | 75 cm. CF                            | —   | 6/60                                  | Improved       |
|   |            |              |                 | 13       | 1/60                                 | Loss of anterior chamber/secondary glaucoma | 1/60                                  | No improvement |
|   |            |              |                 | 14       | 1/60                                 | Iris prolapse                               | 1/60                                  | No improvement |
| Penetrating keratoplasty  | 4.5        | 4            | Central         | 15       | 1/60                                 | —   | 6/60                                  | Improved       |
|   |            |              |                 | 16       | 50 cm. CF                            | —   | 5/60                                  | Improved       |
|   |            |              |                 | 17       | 75 cm. CF                            | —   | 5/60                                  | Improved       |
|   |            |              |                 | 18       | 1/60                                 | —   | 6/24                                  | Improved       |
|   |            | 2            | Peripheral      | 19       | 4/60                                 | —   | 4/60                                  | No improvement |
|   |            |              |                 | 20       | 3/60                                 | —   | 3/60                                  | No improvement |

## (2) 4.5 mm. deep lamellar keratectomy in four cases

The small deep corneal white scar with the attached iris was removed by a smaller penetrating keratectomy done with scissors or trephine and replaced by a 4.5 mm. penetrating corneal graft. This technique is difficult and it does not obviate the risk of oedema and opacity of the donor graft, the graft bed being partly of lamellar and partly of penetrating keratectomy.

## (3) 6 mm. penetrating keratoplasty in four cases

The larger graft was accompanied by such complications as loss of anterior chamber, anterior synechiae, iris prolapse, and secondary glaucoma.

## (4) 4.5 mm. penetrating keratoplasty in six cases

This proved to be the ideal method. The opacity and the adherent part of the iris were totally removed and the visual and cosmetic results were satisfactory.

**References**

- RYCROFT, B. W. (1957) *Brit. J. Ophthalm.*, **41**, 504  
 STALLARD, H. B. (1965) "Eye Surgery", 4th ed., p. 411. Wright, Bristol