

## PENETRATING CORNEAL GRAFTS

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In 1949 when I first developed an interest in keratoplasty, it was usual to secure penetrating corneal grafts by indirect fixation using crossover sutures.

At this time there was a large reserve of cases of corneal opacities due to past interstitial keratitis, and these provided much of the material for keratoplasty. Indeed, of the first hundred penetrating corneal grafts I performed, thirty-five were for interstitial keratitis.

Scarring due to this disease is one of the most favourable indications for corneal grafting. A small graft of only five millimetres is usually adequate and wound healing is very rapid. Thus conditions for success are almost ideal.

It became apparent, too, that the post-operative graft oedema which had so often spoiled the result in the earlier days of keratoplasty could be controlled by the newly available cortisone.

Nevertheless, even in these small grafts performed for interstitial keratitis, fixation by cross sutures was not always adequate unless the patient was very co-operative. For grafts of over five millimetres the method was much too unreliable.

Barraquer had already described edge to edge sutures for corneal graft fixation. (Barraquer Moner, J. I., 1948, 1949). Although this is now the method most frequently employed, initially the uncertainty in obtaining really fine needles and suture material made it difficult to apply universally. At the Ophthalmological Congress of the United Kingdom in 1952 Seymour Philips described a method of fixation using a solid plastic splint, in appearance like a corneal contact lens. (Philps, A. S. and Fincham, E. F., 1952).

The greatest disadvantage of the original splint method was a delay in healing of the wound, a serious matter since this splint could seldom be left in position for more than three weeks. Philps quickly observed that healing was slower than where cross sutures were used and considered that this was likely to be due to the exclusion of tears and air from the graft surface. To overcome this, he introduced the perforated "pepperpot" splint but little improvement resulted.

Thinking along the same lines, I introduced the largely fenestrated splint (Fig. 1). Another objection to the original splint was its thickness, as this caused

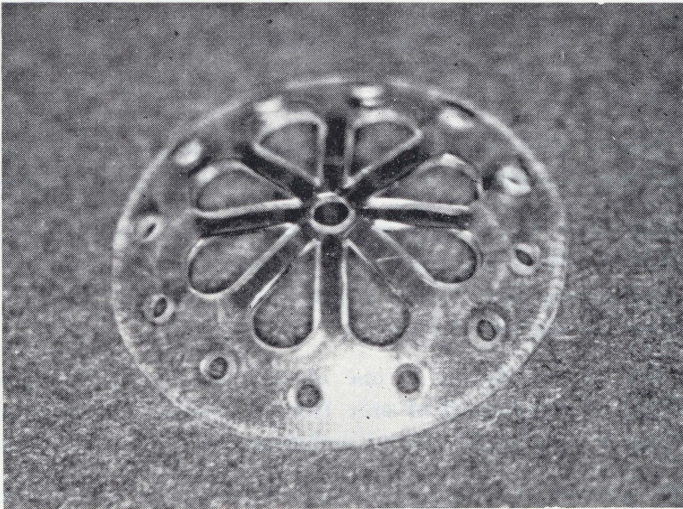


Fig. 1. The splint

undue discomfort to the patient and also led to earlier loosening of the sutures. Therefore, at the same time as altering the pattern, the thickness was reduced.

The improvement using the new splint was very marked but in retrospect it seems unlikely that this was due entirely or even mainly to the access of tear fluids to the graft. The introduction of the large fenestrations and the simultaneous decrease in thickness produced a pliable instead of a rigid splint.

An essential feature of a satisfactory splint is that, while it should retain its curvature, it should be springy and not rigid. With such a splint results became satisfactory though elevation of the graft edge occurred occasionally.

The original Philips splint had an inside radius of curvature of 8.5 mm. which corresponds approximately to the peripheral cornea, though it tends to be a little too curved. Frequently, however, this radius is considerably too small since scarred corneae are often flatter than normal.

The use of a splint with too great a curve inevitably leads to an elevated graft. It is important that the splint should fit as exactly as possible and to this end, splints should be available with radii of curvature increasing in steps of 0.1 mm. and the most appropriate curve should be selected prior to the operation. It is useful to check the fit with the operating microscope. The most usual range of curves required is from 8.5 mm. to 9.00 mm. At the present time work is proceeding with a view to providing exactly fitting splints made individually for each patient. This is being done in conjunction with Mr. Montague Ruben at the Contact Lens Department of Moorfields Eye Hospital.

The splint should be fixed by four tangential sutures (Figs. 2 and 3) and this will lead to very satisfactory healing provided the sutures are accurately

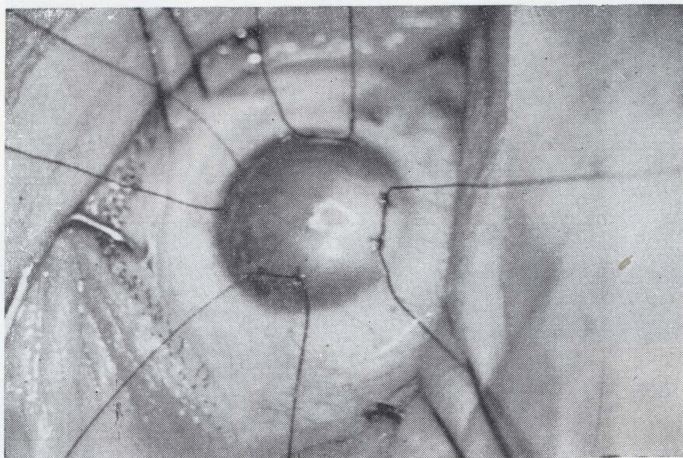


Fig. 2. Tangential sutures in place

placed. The placing is facilitated by a special maker. (Fig. 4). Fig. 5 shows the graft in place under the splint in the same case as Figs. 2 and 3. Little irritation is caused by the splint and it may remain in place for five weeks. The exact length of time for which the splint should remain varies with the type of case.

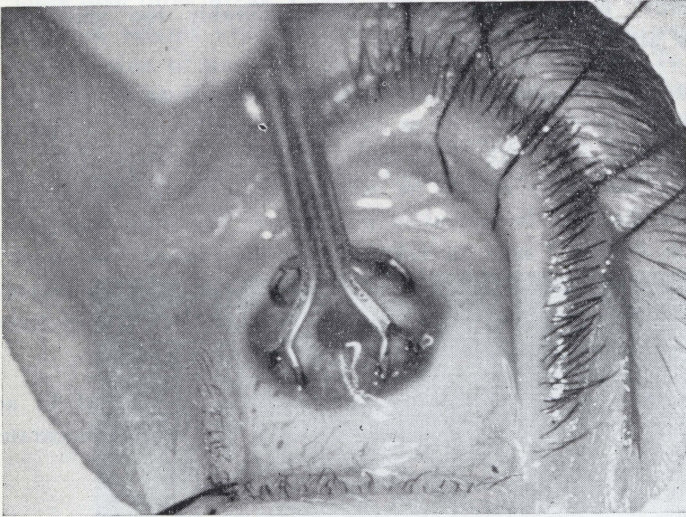


Fig 3. Marker on eye. The eight points, dipped in methylene blue, mark the positions for the suture and facilitate insertion.

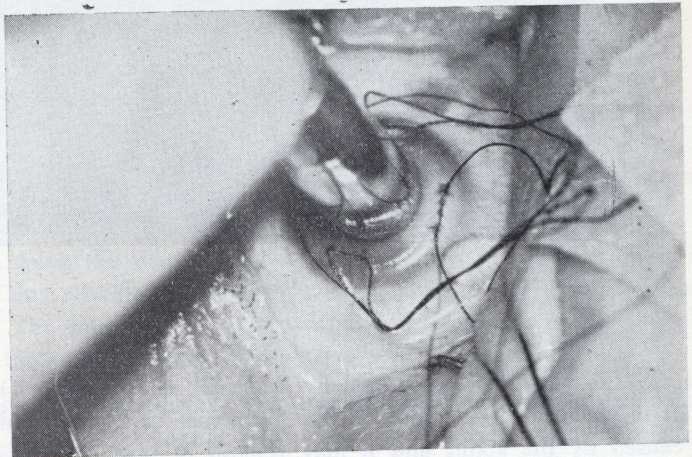


Fig. 4. Trephining past the preplaced sutures.

For example, as little as three weeks may be adequate for interstitial keratitis, but at least five weeks will be required for keratoconus.

Usually the splint starts to loosen slightly at about four weeks and may be easily removed after this. After cutting the sutures and before lifting the splint an attempt should be made to rotate it gently with a probe. If it does not rotate freely it should not be removed but left in position and the eye repadded. After twenty-four hours the splint will be found to rotate freely and can be removed easily.

If possible a penetrating graft should be kept to a size of seven millimetres or less because even in the absence of vascularization the immunological response is more severe in a graft larger than this. Grafts over seven millimetres seldom show a severe reaction while with those of over eight millimetres a reaction is almost inevitable. In addition, in vascularized cornea, spread of vessels to the

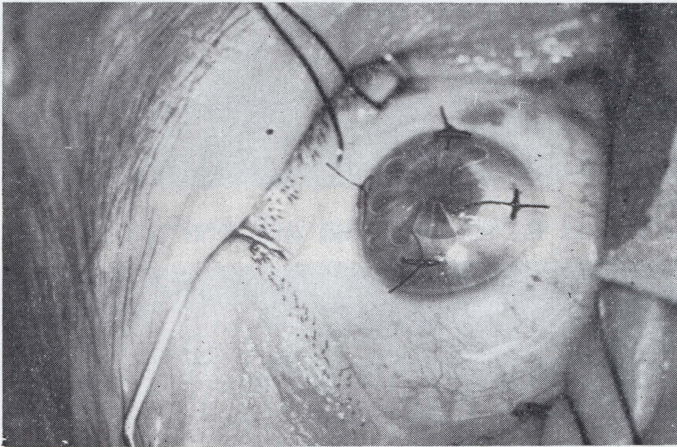


Fig. 5. The four sutures securing the splint over the graft.

graft occurs more readily the larger the graft. Thus where a penetrating graft is required in a vascularized cornea, it is especially desirable to perform a small graft whether a preliminary lamellar graft has been performed or not.

Under these circumstances, a very small graft of less than six millimetres may be the most likely to remain clear. In such grafts edge to edge sutures may encroach on the optical zone it is a great advantage to use a splint. The splint can be used successfully for grafts up to eight millimetres but edge to edge sutures are generally superior where the graft exceeds seven millimetres. With

grafts of diameter six millimetres to seven millimetres either splint fixation or direct suturing give equally good results. The most satisfactory method of direct suturing is to insert from four to eight interrupted sutures followed by a continuous suture.

Hitherto the suture material used has been entirely seven strand virgin silk but quite recently I have had the opportunity to try 10/0 perlon. Best results appear to be obtained using virgin silk for the interrupted suture and perlon for the continuous. The former can be removed after two weeks while the perlon should remain for at least six. It promotes much less reaction than the silk and can, therefore, be left much longer without causing tissue damage.

The fundamental basis of graft fixation should be to achieve good position of the graft relative to the recipient during a sufficient period for it to heal firmly, and at the same time to minimize trauma to the graft. In my experience, for grafts of a size six millimetres diameter or less, these conditions are always best met by a splint.

### SUMMARY

1. The development of a method of splint fixation for small corneal grafts is described.
2. The indications for the use of this method as opposed to edge to edge sutures are discussed.

### REFERENCES

- QUERATOPLASTIA, Barraquer Moner, J. I., *Estudios e Informaciones Oftalmológicas*, (1948), 1, 10.
- SAFETY TECHNIQUE IN PENETRATING KERATOPLASTY. Barraquer Moner, J. I., *Trans. Ophthal. Soc., U. K.*, (1949), 49, 77.
- CORNEAL GRAFT FIXATION AND ITS RELATION TO ASTIGMATISM, Philips A. S. and Fincham, E. F. *Trans. Ophthal. Soc. U. K.* (1952), 72, 21.

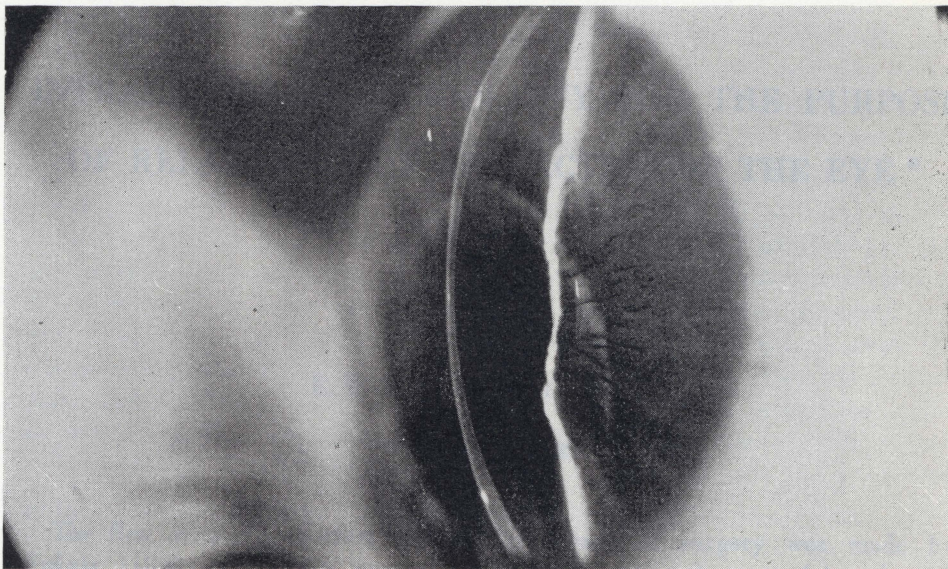
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\* Figs. 1 and 4: originally published in *Trans. Ophthal. Soc. U. K.*, 1959, 79, 209.

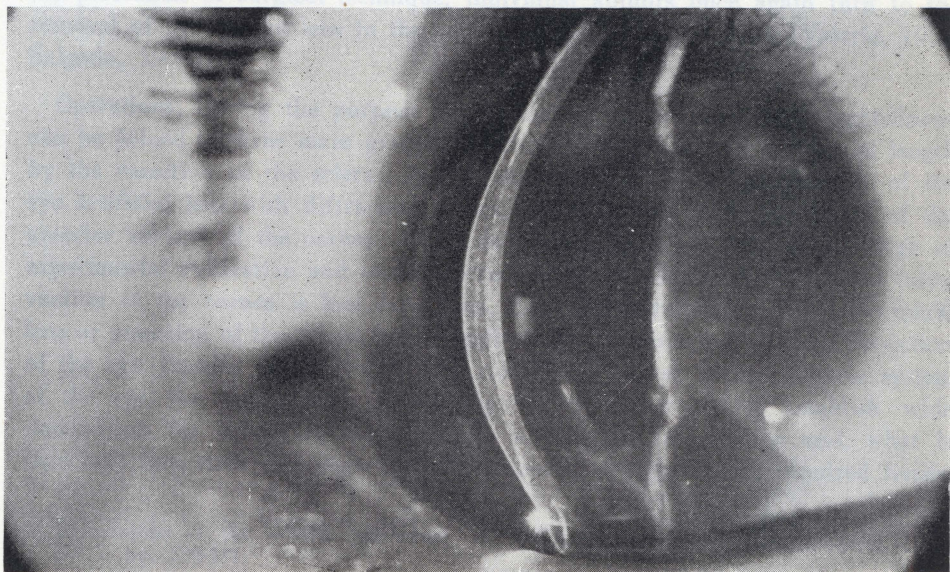
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