CORNEAL GRAFT DONOR MATERIAL FROM THE CADAVER*†

INFLUENCE OF AUTOPSY FROM THE BACTERIOLOGICAL AND CLINICAL ASPECTS

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THE first Corneal Grafting Act was passed in England in 1952, and since then surgeons have made increasing use of the eye tissues for therapeutic purposes. Before that time one of the greatest limiting factors was the dearth of suitable tissue because this material had to come legally from eyes removed from the living subject. Two successive Acts of Parliament have facilitated the supply to such an extent that there is now abundant material, except perhaps in places with a high demand or lingering local prejudice. The main difficulties for the ophthalmic clinician are the collection of material and the preparation of the donor eyes to make them safe for use at operation.

The purpose of this paper is to show that the collection of material *post mortem* is a clinically acceptable and straightforward practice and that minimal preparation of donor eyes is necessary.

Material

Fifty keratoplasties carried out in this Infirmary since 1960 are summarized in Table I.

TABLE I
PARTICULARS OF FIFTY KERATOPLASTIES

Grafts	Total	Visual	Therapeutic	Tectonic	Cosmetic
No.	50	35	13	1	1
Per cent.	100	70	26	2	2

Every patient had a pre-operative conjunctival culture and no case came to the theatre without treatment to the eye during the previous 48 hours with 1 per cent. chloramphenicol ointment applied twice daily. This routine, together with a knowledge of the bacterial flora and its sensitivity to chloramphenicol, was evolved to ensure that the patient's conjunctival sac was not contaminated with a pathogen before operation. In every case chloramphenicol was applied locally on completion of the operation.

Donor eyes were taken *post mortem* from subjects whose eyes were seen to be free from crusting or stickiness of the lids and without exposure of the cornea. Conjunctival exposure was not regarded as a contraindication to the use of the eyes as donor material. To be acceptable the cornea had to look clinically healthy and unscarred by recent disease (Rycroft, 1955). This did not exclude the mottled-grey appearance of the partially hydrated stroma. Cadavers were stored

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in the mortuary refrigerator at $+2^{\circ}\text{C}$. and all eyes were removed within 48 hours of death. After removal, eyes were stored in liquid paraffin for the minimum time at $+4^{\circ}\text{C}$. according to the technique of Bürki (1947). They were taken out of liquid paraffin in the theatre and washed in sterile normal saline immediately before cutting the graft. Autopsy had been carried out on eighteen of the fifty subjects, and had involved opening the skull after drawing down the scalp over the face to expose the cranium to the saw. The final stage in cleaning was to wash with cold water and a sponge, which might well have contaminated the conjunctivae with organisms from any part of the body.

Bacteriological Investigation

To determine whether autopsy might affect the bacterial flora, conjunctival cultures were taken from fifty subjects. A swab was taken from each conjunctiva both before preparation for autopsy and again after autopsy was completed. Two hundred swabs were cultured on blood agar and incubated aerobically at 37°C .

Bacteriological Findings.—Table II shows an analysis of the organisms isolated. Only one culture failed to yield growth. The same organisms occurred in 21 subjects in both eyes before and after autopsy. In seventeen subjects the same organisms were found in one eye before and after autopsy, and in twelve subjects the organisms were all different both before and after autopsy, this last being the group containing the culture without growth.

TABLE II
BACTERIOLOGICAL FINDINGS IN 100 EYES (50 CADAVERS)
BEFORE AND AFTER AUTOPSY

Organisms Present	No.	Per cent.
<i>Staph. aureus</i>	48	24.0
Mixed (two or more organisms)	93	46.5
<i>Esch. coli</i>	17	8.5
Others	41	20.5
Sterile	1	0.5
Total	200	100.0

Clinical Results

Neither post-operative infection nor delayed healing occurred in this series of fifty corneal grafts. In twenty of the fifty patients the pre-operative cultures yielded bacterial growth but all the organisms isolated were sensitive to chloramphenicol. In the remaining thirty patients the cultures were sterile.

Discussion

In this series of swab cultures contamination of *post mortem* material was almost invariable and it thus compares unfavourably with the 52 per cent. reported by Kanski (1965) for cultures taken 9 to 11 hours *post mortem*, although his contamination rate was 63.8 per cent. only 1 to 2 hours *post mortem*. Boberg-Ans, Badsberg, and Rasmussen (1962) found that 87.3 per cent. of cultures from donor eyes after death yielded bacterial growth. The difference may be due to Kanski's technique of culturing with a platinum loop instead of with a swab. Kanski (1965) reported an increase in the *Esch. coli* contamination of up to 16 per cent. with time after death, but did not mention the frequency with which he

found mixed cultures. The present series shows only 8.5 per cent. *Esch. coli*, but 46.5 per cent. mixed bacterial growth. The influence of autopsy on bacterial change is not pronounced, in that 38 subjects (76 per cent.) showed no change in the flora after autopsy. On twelve occasions all four cultures from a given subject yielded different organisms. The fact that about 20 per cent. of conjunctival cultures yielded different organisms on second swabbing (after autopsy) is probably because contamination had changed the flora. The very high rate of contamination of donor material from random *post mortem* sources might seem to preclude the use of such material for therapeutic purposes, but the clinical results in this series do not support this view. Leigh (1966) has pointed out that infection of the operated eye from infected donor material is a most serious complication, although it is uncommon (Romanes, 1958). The advantages of obtaining sterility of donor material must be balanced against the risk of reducing graft vitality by the method of obtaining it.

Conclusions

Experience gained in this series of fifty cases points to the following conclusions:

- (1) That no infection developed because the organisms from the donor material were sensitive to the chloramphenicol which was administered post-operatively. Since no investigation of the chloramphenicol sensitivity of organisms from cadavers was made, this conclusion must be based upon current experience of the incidence of resistance found to this agent.
- (2) That all the grafts were sterile at the time of operation. It is unlikely that grafts taken from eyes which had been removed up to 48 hours *post mortem* would become sterile under the influence of moderate temperature reduction only. It may be possible to investigate this point, but there are technical difficulties and these might lead to false negative results. For example, the oily nature of liquid paraffin may prevent the organism from reaching the culture medium; or that collection of the organism should be done consistently with either loop or swab.
- (3) That infection of material does not matter so much as has been thought hitherto. The last is probably the most reasonable conclusion.

Summary

- (a) Corneal grafts may be done with reasonable safety using *post mortem* material taken before or after autopsy.
- (b) Such material requires the minimum of preparation if taken from a refrigerated subject and used without prolonged subsequent storage.
- (c) Patients about to receive corneal grafts from untreated material should receive local antibiotics pre-operatively and post-operatively.

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