

ENUCLEATION AND PRESERVATION OF EYE BALLS

Enucleation

Before the removal of the eyes from the body of the deceased person, the eyes are made aseptic by putting a few drops of antibiotics in the eyes. It is essential to prevent contamination of the cornea not only during the course of its removal but also while storing and preserving it.

The usual precautions such as sterilizing the instruments, wearing of the gloves, etc. are also taken. It takes about 15 to 20 minutes to remove the eyes. After the eyes have been removed, a ball of cotton wool is tightly packed in the empty eye socket. The eye lids are stitched with a black thread. It gives an appearance as if the donor is asleep. Sometimes, artificial eyes are inserted in the gap formed so as to give it a natural appearance. The belief that the donor's face is mutilated due to the removal of cornea is erroneous. Detailed guidelines on the procedure concerning enucleation including the handling and processing of the donor eye balls are provided in the paper written by Dr. G.N. Rao, Dr. V. Kalevar and Late Dr. R.P. Dhanda (See Appendix 'D').

Quality of Donor Corneas

1. **Age** : Although the age need not be the sole criterion, the death of an otherwise healthy young / middle aged person (age 10 to 50 years) provides better donor corneas.
2. **Time Interval** : The earlier the cornea is removed after the occurrence of death of the donor, the better will be its quality. Unless preserved at a temperature of 4° C, the corneal tissue degenerates completely after 6 hours of the death. In the cold climate, the rate of deterioration is slower.
3. **Other Factors** : It is wrongly believed that the corneas of people wearing spectacles for improving short or long distance vision or of patients operated for cataract (except those who have opted for intraocular surgery) cannot be used. In fact, the corneas of such donors are as useful as in the case of the other donors. However, corneas of patients suffering from Leukemia (blood-cancer), AIDS, rabies (hydrophobia), snakebite, tetanus, syphilis, viral hepatitis & brain tumour cannot be used for corneal transplant.

Time Limit

As it is essential to remove eyes as soon as possible after the death, the decision to donate eyes should be taken preferably before death and the nearest eye bank must be contacted immediately after death. Unless the decision to donate eyes is taken beforehand, the emotionally-charged atmosphere in the family prevailing after the death sometimes makes it difficult to arrive at a quick decision in favour of donating the eyes. Precious time can be saved if the death takes place in a hospital where facilities for removal of corneas are available. However, if the death takes place elsewhere, then organising the removal of eyes (enucleation) will take a lot more time and efforts. Since the cornea deteriorates with the passage of time after death and as the possibility of corneas getting infected also increases, the early removal and preservation of corneas is a must. It is also essential to prevent the cornea from drying up after the death to prevent its deterioration. It is, therefore, necessary that the eyes of the deceased are closed and should not be exposed to the breeze or wind, fan or any direct air-flow from air-conditioners.

Removal and Preservation of Cornea

The eye balls or corneas after enucleation are put in sterile bottles which contain metal clamps/stands to hold the eyeballs. They are then transported in thermocol box or thermos packed in natural ice or in igloos in which blue ice is used instead of natural ice. The temperature of 4°C is necessary for preventing deterioration of cornea. Blue ice is an artificially produced liquid having the advantage of being reusable and does not require thermal insulation like natural ice and hence is less bulky and more convenient to carry compared to thermocol box (see illustration 6). Later on, if the blood reports are favourable they are processed in the eye bank which also includes excision of corneas from eye balls and then if found viable for transplant or therapeutic use, they are put in preserving media, also popularly known as MK media in a bottle.

The use of MK medium has been a major breakthrough in the field of eye banking as it is now possible to prolong the life of corneas by 4 days if preserved in this media. In earlier times when the medium was not available, the cornea or the whole eye ball was stored in natural ice and the maximum life after the enucleation was 48 to 60 hours.

To organise everything involving the various stages from enucleation to transplantation is indeed very difficult and almost impossible if the cornea is to be sent to an outside destination or if it is a holiday. If the patient is not available on phone, a messenger has to go personally to inform him about his admission to the hospital for transplant. Alternatively, the patient has to be admitted to the hospital in advance without knowing as to when he would actually be operated upon. The surgeon also has to be available at a short notice. It was a common scenario of corneas deteriorating and transplants being

unsuccessful. Considering all the difficulties, the reader will appreciate the importance of preserving cornea in MK medium and the increase in shelf life from 48 to 60 hours to 4 days.

The medium is now indigenously produced in India at the L.V. Prasad Eye Institute, Hyderabad on behalf of Eye Bank Association of India (EBAI) and all member eye banks are eligible to get the same, the cost being Rs.200/- per vial.

In connection with the preservation of corneas in media, it must be mentioned that simultaneously with the use of the MK medium, adequate care and precaution need to be taken while cutting and separating the cornea from the eye ball and storing it in the medium so as to avoid contamination. In other words, the cornea preservation must be done in a totally aseptic environment; as otherwise, the ingredients of the medium whilst being useful in prolonging the life of corneal tissue can also prove nutritive to the harmful bacteria which can damage the tissue itself.

When the corneas are to be preserved for a longer period, a new medium has been developed known as **Optisol** which prolongs the life upto 14 days and is very useful if the cornea is to be sent to outstation destinations. The cost of optisol is much higher than the MK medium, being Rs.4000/- per vial.

It is now becoming a common practice to remove only the corneas instead of the whole eye ball. The cornea after being removed is straight away put in MK medium. This helps in increasing the viability of cornea as compared to removing and preserving the whole eye ball in ice at 4°C temperature and subsequently bringing it to the eye bank and then removing the cornea and putting in media. Although this requires some training for the General Practitioners involved in enucleation, this practice is recommended as it also helps in having the rest of the eye ball intact in the body of the deceased. (See Appendix E for procedure for In Situ Corneal Excision).

Removal of Cornea by Trained Technicians

As per the provisions of the "Transplantation of Human Organs Act, 1994," applicable to the States of Maharashtra, Goa and Himachal Pradesh and all Union Territories, in the first instance, and the Corneal Grafting Acts in force in other states, only a registered medical practitioner is permitted to 'enucleate' the eyes from a dead body. In the U.S.A and several other countries, any individual after undergoing proper training from an Ophthalmic Surgeon or from an Eye Bank having the necessary training facilities is permitted to remove the eyes for the purpose of transplant. This helps in saving the precious time of medical practitioners including eye surgeons. Such trained technicians with their exposure and experience employed full-time by an eye-bank can also provide valuable assistance in organizing several other activities including motivation for eye donation. As suggested in Chapter 3, a suitable amendment on similar lines should be made in the existing Acts including the Central Act mentioned above, so as to

permit any approved trained technician to remove the corneas after the Registered Medical Practitioner has confirmed the extinction of life of the person concerned. (See Clause 3(4) of the Model Corneal Grafting Act – Appendix 'A').

Corneal Endothelial Evaluation¹

“Endothelium is a single layer of cells that covers the inner aspect of the cornea and is primarily responsible in maintaining transparency. Therefore, assessment of its integrity is critical in making a judgement about its utility for corneal grafting.

The structure can be studied by slit lamp examination which provides reliable information. This should be performed in all eye banks by appropriately trained individuals. The technique of specular microscopy, however, provides more information on endothelium. This allows direct high magnification view of the endothelial cells and consequently better judgement of its status. However, it is quite expensive (costing around S 20,000 - 25,000) and not an absolute necessity for each eye bank.”

¹ Information furnished by Dr. Gullapalli N. Rao, Director, L.V. Prasad Eye Institute, Hyderabad



Illustration 3

Igloo containing blue ice and two bottles for holding eye balls.
The smaller bottle contains blood sample



Illustration 4

A briefcase carried by technician or doctor containing enucleation set
and other items while attending call for enucleation.

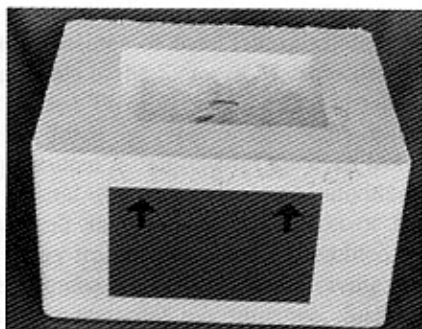


Illustration 5

Thermocole box (top cover removed) for transplant of eye balls /
corneas. The bottles containing eye balls / corneas are kept in the
hollow space in the middle and packed in ice all around