

Commentary: Long-term solutions to revive eye banking in India in COVID-19 era - Needs more than long-term corneal preservation

Eye banking and keratoplasty is one of the worst hit sectors in ophthalmology because of COVID-19. Soon after the pandemic started, there were restrictions on cornea retrieval from governing bodies.^[1] This led to a dearth of tissues for performing emergency and eye-saving therapeutic or tectonic keratoplasties. Without fewer collections and continued surgical demand, most eye banks depleted their stored corneas in a few days.

Under these trying circumstances, the focus has shifted again to very-long term cornea preservation. This comprehensive review article by Chaurasia *et al.*, describes various methods of long-term preservation.^[2] It goes into detail about the processing methods, structural changes of cornea, and relevant surgical outcomes.

The rationale for long-term storage is: usually the poor grade tissues are discarded anyway. Instead, storing them for such emergencies is a relevant and better option. Most long-term storage methods lead to endothelial damage and decellularized cornea. But for globe-saving surgeries the tissue quality and endothelial count is of secondary importance.

In the current scenario, cornea retrieval is few and far between, and patient footfall is less due to travel restrictions. So precious tissues might not be used within the 14 days of intermediate storage and lead to discarding! So, there is definite role for long-term storage.

Few practical points to consider for very long-term storage are:

1. Should be easy to implement with minimum infrastructural changes: This includes space taken up by the instruments and technician training
2. Should be cost-effective: Most of these patients requiring these eye-saving procedures are from poor socioeconomic background. Cost involved in tissue retrieval has already increased due to personal protective equipment, expensive transport, and more disposables. Sophisticated long-term storage methods will further add to the tissue processing cost
3. Should be scalable: Be able to scale easily with size of the eye bank.

Glycerol preserved cornea (GPC) fits the Indian scenario perfectly. It is inexpensive, there is no extra processing or instruments involved, and storage is possible even at room temperature. The other methods like cryo-preservation, vitrification, gamma irradiation and lyophilization requires expensive investment in new equipment and personnel training. Then, there is recurring cost for each tissue.

Gupta *et al.* has published outcomes of therapeutic keratoplasty using GPCs with encouraging anatomical and infection-control outcomes.^[3] Other methods have similar outcome and complications as described in the current article, so there no added advantage over GPC.

The next question is – how many tissues to store?

A rough rule of thumb may be 3-months' worth of supply based on individual centre volume. Eye banks that distribute to multiple surgeons can store more.

Another important aspect to realize is that this is a very temporary measure. Once we get adapted to "new normal," the cornea retrieval will improve, and the requirement of long-term storage will gradually decrease.

Interestingly, while various eye banking associations, All India Ophthalmological Society (AIOS) and the Indian health ministry have issued guidelines about selection criteria for donors at this crucial pandemic COVID-19 phase, there is no directives about the cornea storage.^[4-7]

Desautels *et al.* explain the rationality of why donors with certain viral infections are excluded.^[8] We have only few confirmatory data on viral sero-conversion after corneal transplant and most guidelines are based on risk-benefit balance. Therefore, viruses like Zika, West Nile, Ebola, etc., which pose higher risk are excluded. However, non-septicaemic influenza viral death, adenoviral infection and cytomegalovirus sero-positivity are not part of exclusion criteria. The reason is two-fold: firstly, the prevalence of these viruses is relatively high and excluding contracts the donor pool significantly; and secondly the disease caused is relatively mild with available treatment.

Gradually, our understanding of COVID-19 will improve, efficient rapid testing will be available, and definite drug and/or vaccine will be approved by appropriate authority. Then, COVID-19 may not be a contraindication for cornea retrieval. With current guidelines, donors with symptoms resembling COVID-19 are to be avoided.^[9] This unfortunately is limiting our donor pool.

Moving forward with eye banking in COVID-19 era we need certain long-term protocol changes in addition to long-term cornea preservation. The focus should be on two ideas:

Firstly, how to increase the donor pool without compromising the safety of everyone involved. While we are considering emergency eye saving situations now, the "so-called elective" surgeries are also affected due to delay. A bullous keratopathy might develop ulcer due to lack of timely endothelial keratoplasty. The eye banking community and government should start looking at how improve cornea retrieval and restart full-fledged all types of keratoplasty procedure.

The Indian government guidelines mention that COVID-19 status to be considered for 28 days prior to death.^[9] Similar rule is followed by certain eye banks in the US. So, someone who had COVID-19, recovered, and later died from cardiac arrest after 6 to 8 weeks may be considered as an eligible donor.

Secondly, we have to implement long-term storage tissues as back-up for emergency situations for performing eye-saving surgeries.

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