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Donor Related Factors Influencing Corneal Graft Survival in Western India

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Abstract: ***Objective: To evaluate the donor-related factors influencing corneal graft survival following penetrating keratoplasty (PK) in Western India. Methods: A prospective study of 40 patients undergoing PK for corneal opacity and pseudophakic bullous keratopathy was conducted. Donor-related parameters including age, sex, cause of death, death-to-enucleation time, preservation media, and environmental factors were analyzed. Surgical outcomes were assessed in terms of graft clarity, survival, and complications. Results: Donor age and sex had no significant effect on graft survival. Donor cornea size >8 mm was associated with increased risk of graft failure. Preservation technique (moist chamber vs MK medium) showed no significant difference, although MK medium grafts had slower postoperative recovery. Shorter death-to-enucleation times showed trends toward better survival. Infections were associated with corneas procured from home settings. At 24 months, 52.5% of grafts remained clear. Conclusion: Optimizing donor corneal utilization requires strict aseptic techniques, proper preservation, and enhanced postoperative compliance. Donor age, sex, and short death-to-enucleation intervals do not significantly affect graft clarity, while graft size >8 mm increases risk of failure.***

Keywords: Corneal transplantation, Penetrating keratoplasty, Donor factors, Graft survival, Preservation media

1.Introduction

WHO estimates that 40-45 million people are blind worldwide, with nearly 60% in Africa, China, and India. In India alone, about 10 million are blind, including 2.5 million with corneal blindness, over 1.5 million of whom are children.

Corneal transplantation can restore sight, but scarcity of donor tissue and poor graft survival especially in developing countries due to socioeconomic, climatic, and healthcare challenges limit outcomes. In India, trauma and infections are the leading causes, while pseudophakic keratopathy and dystrophies predominate in developed nations. Cases of pseudophakic bullous keratopathy are also increasing.

This study evaluates donor-related factors affecting corneal graft survival in western India, where a high number of penetrating keratoplasties are performed, to optimize the use and success of donor tissue.

Aims and Objectives

1) To study the effect of donor corneal morbidity on graft quality and keratoplasty outcomes.
2) To analyze the influence of death-to-enucleation interval in relation to:
   - Time of day (morning, afternoon, night)
   - Season (summer, winter, rainy)
3) To evaluate the impact of preservative media and techniques on donor corneal quality and graft success.
4) To assess environmental and clinical factors influencing donor cornea, including:
   - Place of death (home, hospital, RTA)
   - Surroundings and enucleation site (home, ICU, acute or chronic ward).

2.Material and Methods

A total of 40 cases were included from western Maharashtra and referred hospitals attending a tertiary eye care center. Patients were of all ages and both sexes. The study group comprised uncomplicated cases of corneal opacity and pseudophakic bullous keratopathy undergoing penetrating keratoplasty. Other causes of opacity (e.g., interstitial keratitis, herpes, corneal ulcer, perforation) formed the control group.

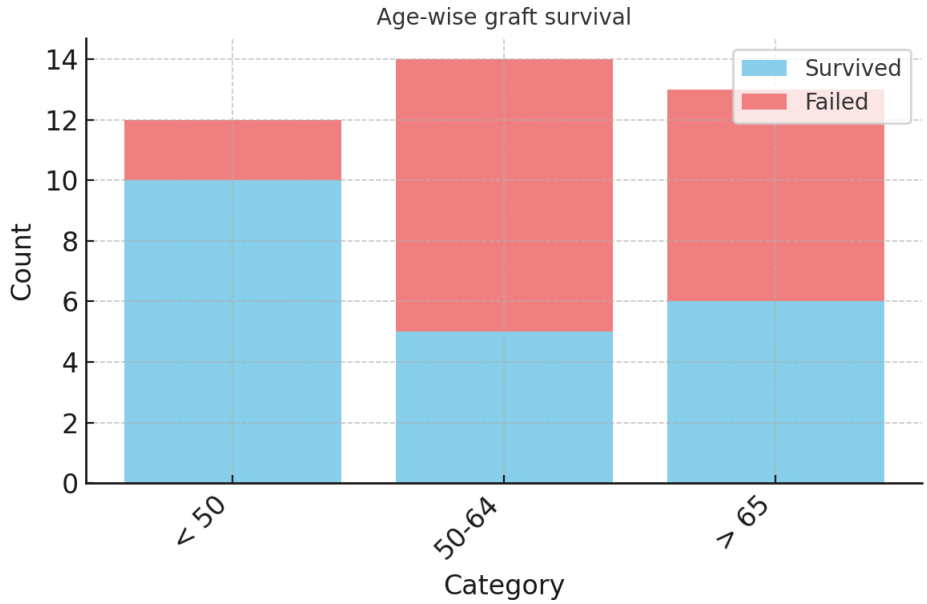
Donor eyes were procured through the hospital corneal retrieval program after obtaining consent from relatives. Contraindicated cases (HIV, HBsAg positive, malignancy, rabies, severe infection, etc.) were excluded. Enucleation was performed within 6 hours, followed by rinsing, disinfection, and corneal grading. Donor buttons were prepared using the posterior punch method.

Recipient eyes were prepared under aseptic precautions. Corneal trephination was performed, and in complex cases additional procedures (e. g., synechiolysis, pupilloplasty, ECCE ± PCIOL) were done. Donor grafts were secured with 10-0 nylon sutures. Patients received systemic antibiotics and analgesics, along with topical antibiotics and steroids. Follow-up was scheduled daily (first 2 days), weekly (2 months), bi-monthly (6 months), and monthly (up to 1 year). Evaluations included vision, graft clarity, refraction, keratometry, IOP, rejection signs, and suture status.

3.Results

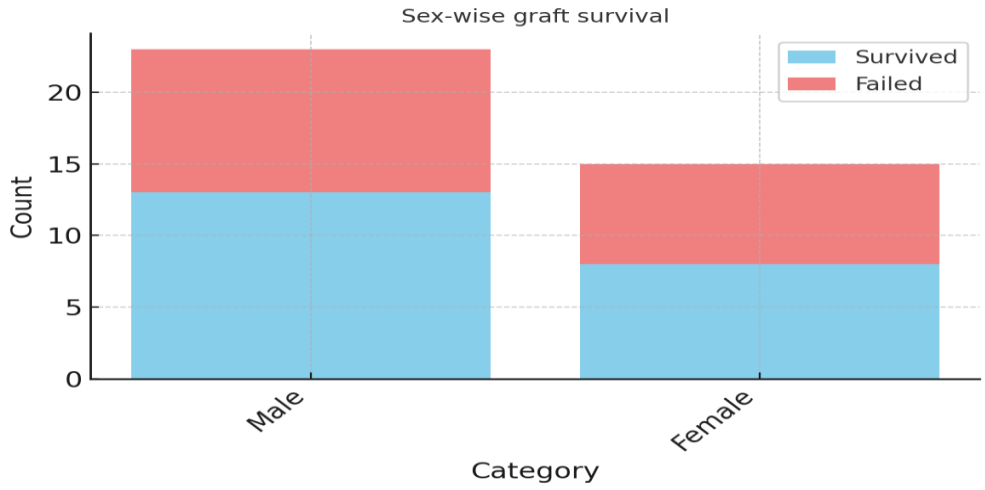
Age-wise graft survival

Age Group	Total No.	Survived	Failed	Survival %
< 50	12	10	2	83.33
50-64	14	5	9	35.71
> 65	14	6	7	42.85



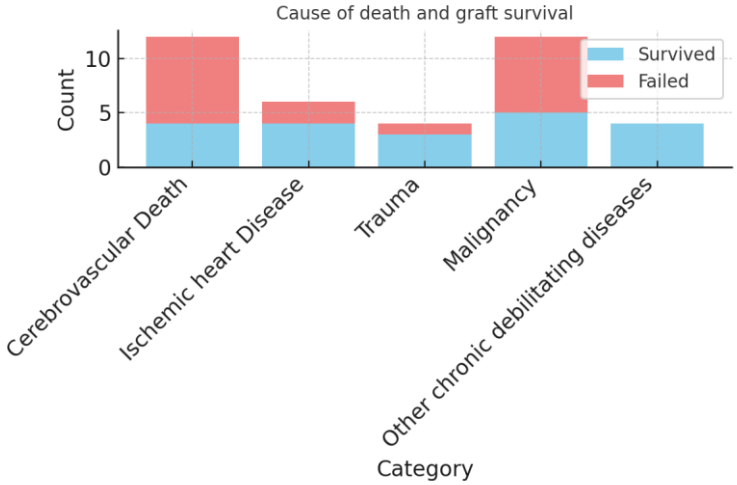
Sex-wise graft survival

Sex	Total No.	Survived	Failed	Survival %
Male	23	13	10	56.52
Female	17	8	7	47.05



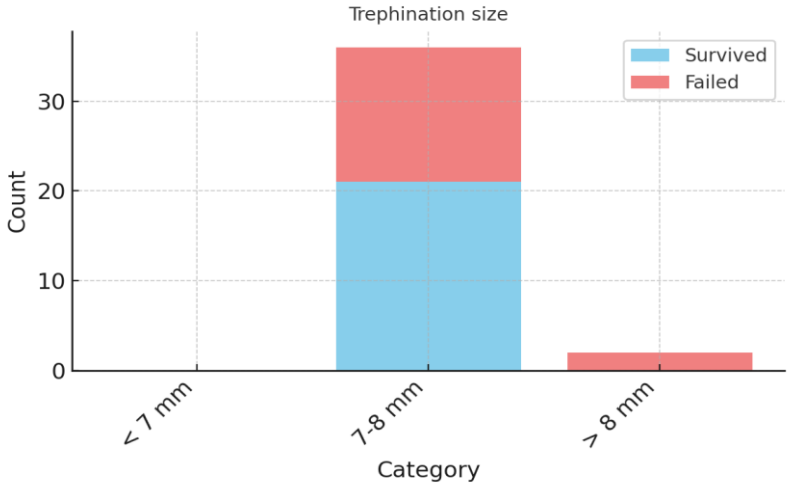
Cause of death and graft survival

Cause of Death	Total No.	Survived	Failed	Survival %
Cerebrovascular Death	14	4	8	28.57
Ischemic heart Disease	6	4	2	66.67
Trauma	4	3	1	75.0
Malignancy	12	5	7	41.66
Other chronic debilitating diseases	4	4	0	100.0



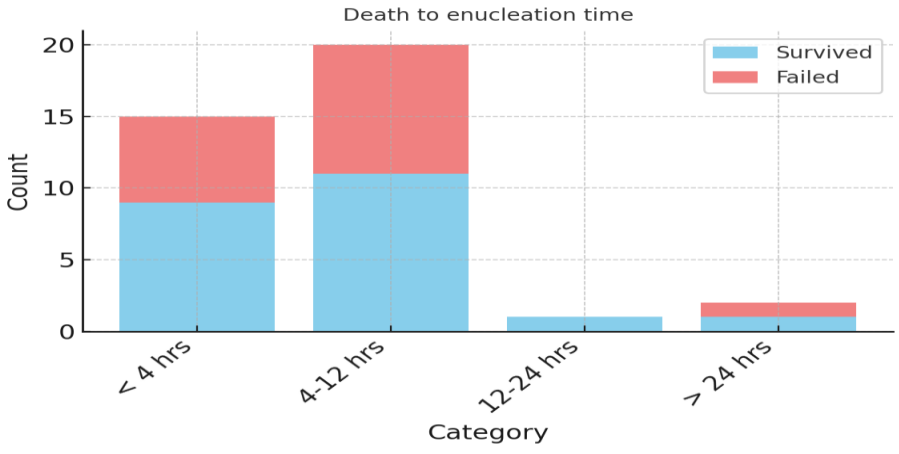
Trephination size

Graft Size	Total	Survived	Failed	Survival %
< 7 mm	0	0	0	-
7-8 mm	38	21	15	55.26
> 8 mm	2	0	2	-



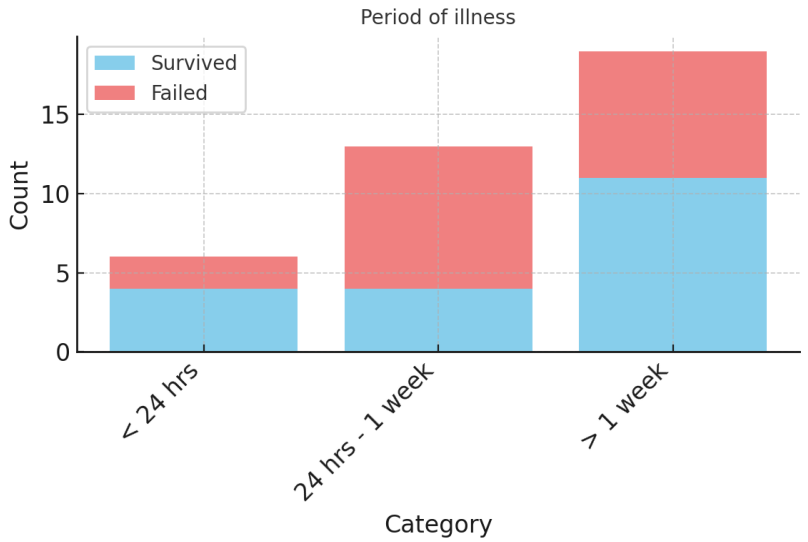
Death to enucleation time

Time	Total	Survived	Failed	Survival %
< 4 hrs	16	9	6	56.25
4-12 hrs	21	11	9	52.38
12-24 hrs	1	1	0	100.0
> 24 hrs	2	1	1	50.0



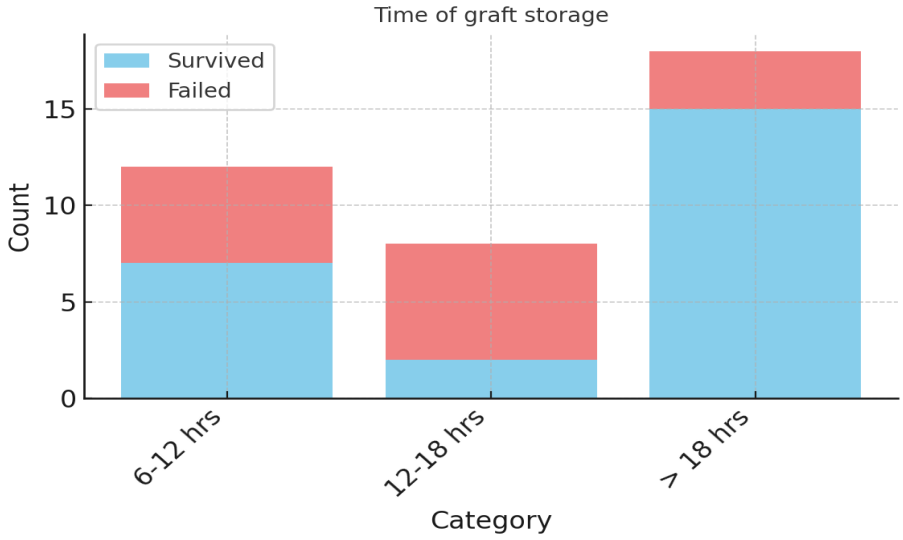
Period of illness

Duration	Total Grafts	Survived	Failed	Survival %
< 24 hrs	6	4	2	66.67
24 hrs-1 week	13	4	9	30.76
> 1 week	21	11	8	52.38



Time of graft storage

Time	Total Grafts	Survived	Failed	Survival %
6-12 hrs	14	7	5	50.0
12-18 hrs	8	2	6	25.0
> 18 hrs	18	15	3	83.3

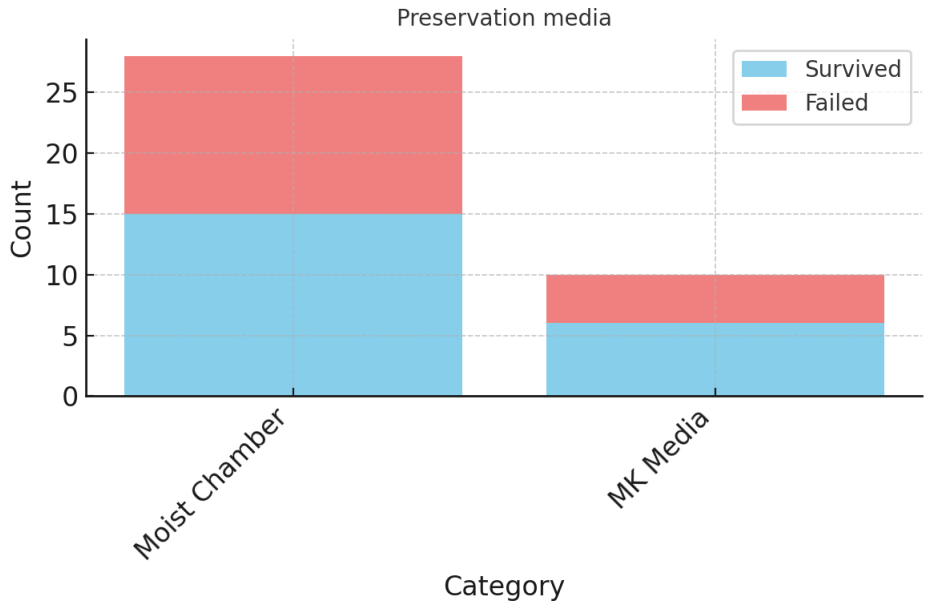


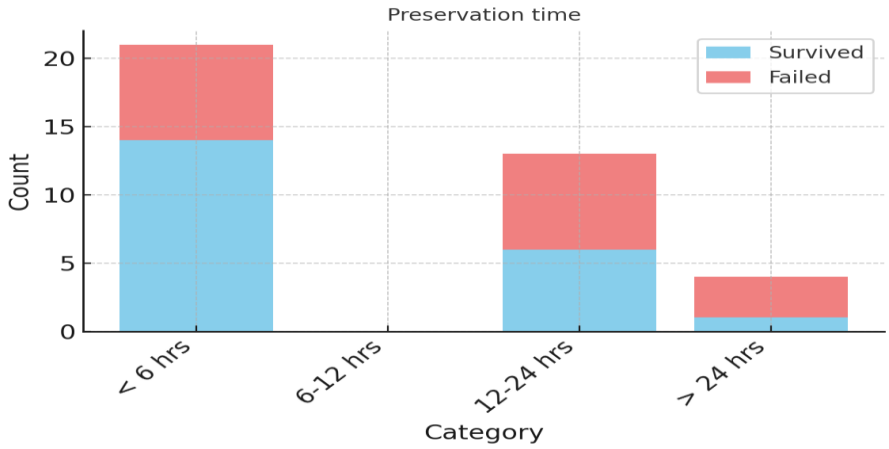
Seasonal effect

Season	Total	Survival	Failed	Survival %
Rainy	6	4	2	66.66
Winter	17	10	7	58.82
Summer	17	7	8	41.17

Preservation media

Preservation Media	Total Grafts	Survived	Failed	Survival %
Moist Chamber	30	15	13	50.0
MK Media	10	6	4	60.0





Preservation time

Time	Total	Survived	Failed	Survival %
< 6 hrs	23	14	7	60.86
6-12 hrs	0	0	0	-
12-24 hrs	13	6	7	46.15
> 24 hrs	4	1	3	25.0

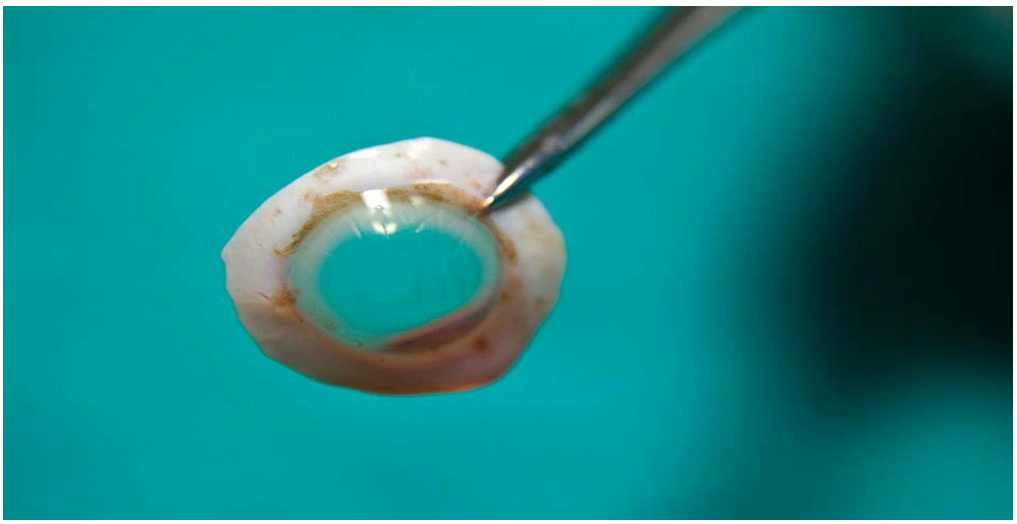


Figure 1: Donor Cornea

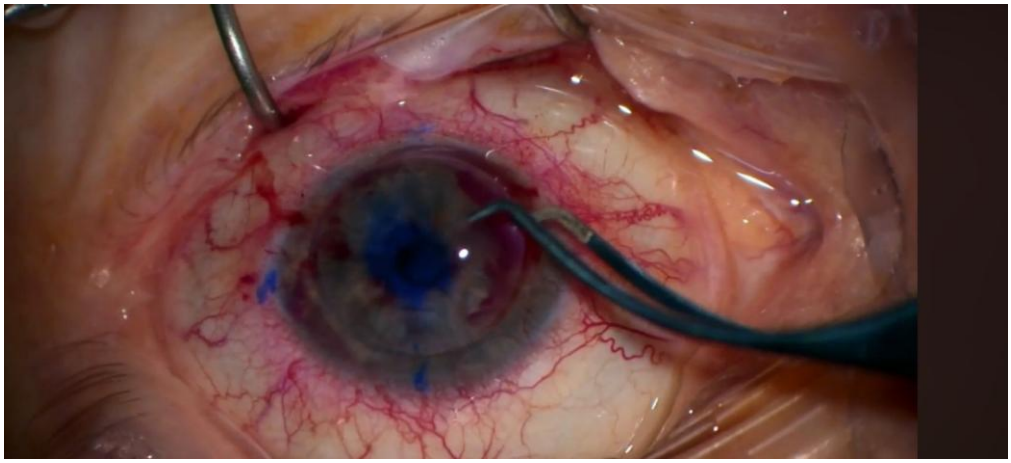


Figure 2: PLACEMENT OF DONOR CORNEAL BUTTON OVER THE RECIPIENT BED

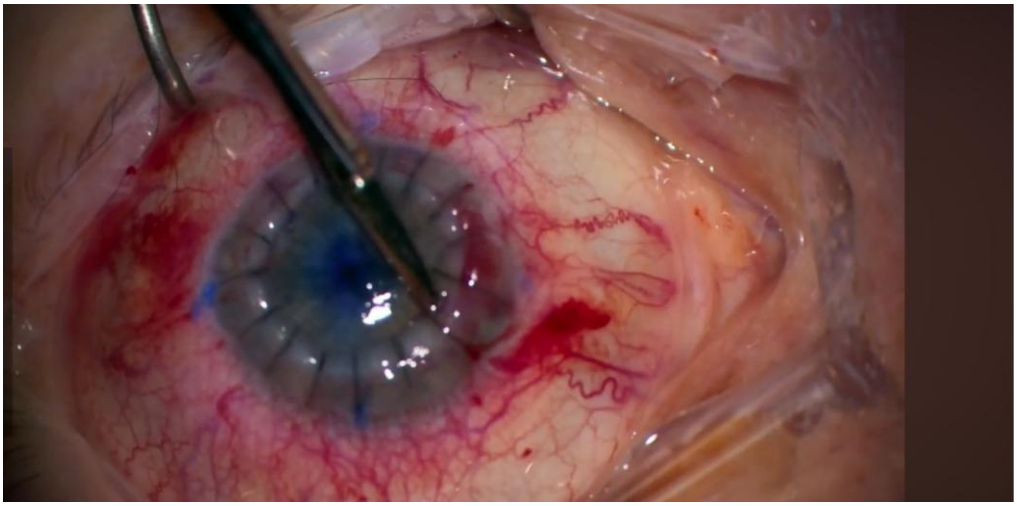


Figure 3: GRAFT SUTURED TO RECIPIENT BED

4.Discussion and Conclusion

Our findings suggest that donor age and sex did not significantly influence graft survival, consistent with previous studies. Graft size >8 mm was associated with increased risk of failure, while preservation method had no significant effect. Shorter death-to-enucleation intervals showed better outcomes, though not statistically significant. Corneas procured from hospitals had better survival due to optimal handling, whereas those procured from home were prone to infection-related failures.

At 24 months, 52.5% of grafts remained clear. Donor cornea size >8 mm was confirmed as a risk factor. Preservation method (Moist chamber vs MK media) showed no significant difference. Infection prevention through asepsis and surface sterilization remains crucial. Postoperative compliance was also identified as an important factor influencing graft outcome.

In conclusion, donor age, sex, and short death-to-enucleation times do not significantly affect graft clarity. Graft size >8 mm is a significant risk factor for failure. Strengthening eye banking systems, ensuring asepsis, and improving postoperative compliance are essential to optimize corneal graft outcomes in India.

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