E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/16.02.478

Research Article

Cornea Donation Calls In a Tertiary Eye Care Centre: an Audit of Donor Characteristics, Retrieval Timelines, and Corneal Grade

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Received: 01.07.26, Revised: 03.08.26, Accepted: 05.09.26

ABSTRACT
Purpose: To characterize cornea donation calls received at a tertiary eye care center and evaluate donor demographics, cause of death, retrieval workflow, and their association with recorded donor corneal grade.
Methods: This retrospective observational audit included 84 consecutive cornea donation calls documented between February and August 2026. Donor age, sex, cause of death, retrieval pathway, timing variables, and recorded corneal grade were extracted. Each donor contributed two recorded corneal grades. Spearman correlation was used for ordinal grade scores; categorical associations were assessed using chi-square or Fisher exact tests, and nonparametric comparisons used the Mann–Whitney U test. Partial rank correlations controlling for age were performed for timing variables.
Results: Mean donor age was 47.8 ±19.2 years; 68 (81.0%) donors were male. Traumatic brain injury was the commonest cause of death (43/84, 51.2%). Sixty-six (78.6%) calls involved all-organ donation and 18 (21.4%) were eye-only calls. Among 168 recorded corneas, 101 (60.1%) were grade A, 38 (22.6%) grade B, and 29 (17.3%) grade C. Forty-two donors (50.0%) had bilateral grade A corneas. Donor age showed a strong inverse correlation with corneal grade score (Spearman $\rho = -0.748$, $P < 0.001$). The association persisted across age groups ($x^2 = 62.42$, $P < 0.001$). Apparent associations between grade and retrieval timing were attenuated after adjustment for age.
Conclusion: Younger donors contributed substantially more grade A tissue. Systematic recording of donation calls, rapid retrieval, and age-stratified monitoring may improve eye-bank procurement and quality assessment.

Keywords: Cornea Donation, Eye Banking, Donor Cornea, Corneal Grade, Hospital Cornea Retrieval Program, Tissue Procurement.

INTRODUCTION

Reliable donor-tissue procurement is essential for corneal transplantation, but donor characteristics and eye-bank workflow influence tissue quality and availability. Indian eye-bank studies have shown that hospital cornea retrieval programs contribute substantially to procurement and that increasing donor age is associated with a greater proportion of non-optical-grade tissue.[1,2] Early retrieval is desirable because prolonged postmortem intervals may adversely affect donor epithelial integrity.[1] Local audits can identify operational delays and donor characteristics associated with better-quality tissue. We analyzed consecutive cornea donation calls to describe donor demographics, retrieval workflow, and the relationship of donor age and timing variables with recorded corneal grade.

METHODOLOGY

This retrospective observational audit was conducted using the eye-bank call and retrieval records of a tertiary eye care center. All consecutive cornea donation calls documented in the available registry between February and August 2026 were eligible. The dataset contained 84 donor records. Variables included age, sex, cause of death, recorded corneal grade for each eye, whether the call involved all-organ donation or eye-only retrieval, place of retrieval, time of death/second declaration, clamping time, time of corneal buttoning or

enucleation, interval between clamping and buttoning, waiting time between arrival and commencement of buttoning, and duration of the procedure.

Corneal grade was analyzed as an ordinal variable, assigning scores of 3, 2, and 1 to grades A, B, and C, respectively; the donor-level grade score was the mean of the two recorded eyes. Descriptive statistics are presented as mean ±standard deviation or median (interquartile range) for continuous variables and frequency (percentage) for categorical variables. Associations between ordinal grade score and continuous variables were assessed using Spearman rank correlation. Age-group differences in eye-level grade were assessed using the chi-square test. Fisher exact testing was used for sparse 2 × 2 comparisons. Continuous variables between donors with bilateral grade A and those without bilateral grade A were compared using the Mann–Whitney U test. Partial Spearman correlations were calculated to examine whether associations between retrieval timing and grade persisted after controlling for donor age. A two-sided $P < 0.05$ was considered statistically significant. Analyses were performed using Python (SciPy) and independently checked using standard statistical procedures.

Data-quality note: the source spreadsheet contained inconsistent capitalization/spacing and several incomplete clock/date fields. Textual duration fields were standardized into minutes when a numerical duration was explicitly recorded. Missing or non-numeric values were not imputed. Because exact dates were incompletely documented for some records, a reliable donor-death-to-retrieval interval could not be calculated for the entire cohort and was therefore not used as a primary endpoint.

RESULTS

Eighty-four cornea donation calls were analyzed. The mean donor age was 47.8 ± 19.2 years (median, 47.5 years; range, 17–98 years). Sixty-eight donors (81.0%) were male and 16 (19.0%) were female. Eighteen donors (21.4%) were aged ≤30 years, 44 (52.4%) were aged 31–60 years, and 22 (26.2%) were aged >60 years. Traumatic brain injury was the leading recorded cause of death (43/84, 51.2%), followed by intracranial bleed (17/84, 20.2%), cardiac/hypoxic causes (12/84, 14.3%), sepsis (7/84, 8.3%), neurologic/brain-death causes (4/84, 4.8%), and other causes (1/84, 1.2%).

Table 1. Donor Demographic and Donation Pathway Characteristics

Variable	n (%) / mean ± SD	Additional detail
Age, years	47.8 ± 19.2	17–98
Male sex	68 (81.0%)	—
Female sex	16 (19.0%)	—
≤30 years	18 (21.4%)	Mean age 22.8 years
31–60 years	44 (52.4%)	Mean age 45.3 years
>60 years	22 (26.2%)	Mean age 73.3 years
All-organ donation	66 (78.6%)	—
Eye-only donation	18 (21.4%)	—

Among the 84 donors, 66 (78.6%) were recorded as involving all-organ donation and 18 (21.4%) as eye-only donation. The recorded place was hospital in 77 (91.7%) calls and home in 7 (8.3%). The corneal grade was available for both eyes in all records, yielding 168 corneas. Overall, 101 (60.1%) corneas were grade A, 38 (22.6%) grade B, and 29 (17.3%) grade C. Forty-two donors (50.0%) had bilateral grade A corneas. Other donor-level grade combinations were AB in six (7.1%), BA in 11 (13.1%), BB in seven (8.3%), BC in two (2.4%), CB in five (6.0%), and CC in 11 (13.1%). [Figure 1]

Table 2. Eye-Level Corneal Grade and Donor-Level Grade Patterns

Corneal grade	Number	Percentage
Grade A	101	60.1
Grade B	38	22.6
Grade C	29	17.3
Bilateral A (AA)	42 donors	50.0
At least one A	59 donors	70.2

Bilateral C (CC)	11 donors	13.1

The mean waiting time between arrival and commencement of buttoning was 57.5 ±64.5 minutes (median, 30 minutes; range, 5–335 minutes). A numeric interval between clamping and corneal buttoning/enucleation was available in 75 records; the mean was 92.4 ± 47.9 minutes (median, 88 minutes; range, 0–300 minutes). The mean recorded procedure duration was 31.7 ±9.8 minutes (median, 30 minutes; range, 10–60 minutes).

Table 3. Recorded Retrieval Workflow Intervals

Timing variable	Mean ± SD (min)	Median (min)	Range (min)	n
Arrival-to-buttoning waiting time	57.5 ± 64.5	30	5–335	84
Clamping-to-buttoning/enucleation interval	92.4 ± 47.9	88	0–300	75
Procedure duration	31.7 ± 9.8	30	10–60	84

Donor age was strongly and inversely correlated with donor-level corneal grade score (Spearman ρ = -0.748, P < 0.001). At the eye level, grade A predominated among donors aged ≤30 years (32/36 eyes, 88.9%) and 31–60 years (64/88, 72.7%), whereas only 5/44 eyes (11.4%) from donors aged >60 years were grade A. Conversely, grade C represented 18/44 eyes (40.9%) in donors aged >60 years compared with 2/36 (5.6%) among those aged ≤30 years. The distribution of grades differed significantly across age groups (χ^2 = 62.42, P < 0.001).

Donors with bilateral grade A corneas were substantially younger than donors without bilateral grade A corneas (mean age 33.6 ± 10.3 vs 62.1 ±15.0 years; Mann–Whitney U, P < 0.001). On unadjusted analysis, waiting time showed a weak positive correlation with grade score (Spearman ρ = 0.298, P = 0.006), while the clamping-to-buttoning interval showed a weak inverse correlation (ρ = -0.295, P = 0.010). However, after controlling for donor age, neither association remained statistically significant (partial ρ = 0.077, P = 0.489 for waiting time; partial ρ = -0.205, P = 0.078 for clamping-to-buttoning interval), suggesting that donor age was a major confounder of the apparent timing-grade relationships.

The proportion of bilateral grade A donors was higher among males than females (39/68 [57.4%] vs 3/16 [18.8%]; Fisher exact P = 0.011). Cause of death was also associated with bilateral grade A status (χ^2 = 27.36, P < 0.001), with bilateral grade A tissue occurring most frequently in traumatic brain injury donors (32/43, 74.4%) and not observed among the 12 cardiac/hypoxic donors in this dataset. These findings should be interpreted as associations within this selected donation cohort and not as causal effects of sex or cause of death on tissue quality.

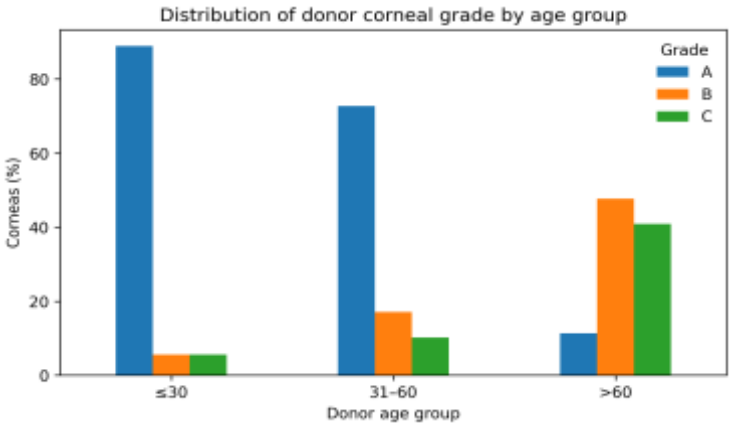

Figure 1. Distribution of Recorded Corneal Grade by Donor Age Group

DISCUSSION

The present audit demonstrates a clear age-related pattern in the recorded quality grade of donor corneas. Half of all donors had bilateral grade A tissue, and 70.2% had at least one grade A cornea. The strongest finding was the

inverse relationship between donor age and grade score: younger donors were substantially more likely to provide grade A tissue, whereas grade B and C tissue predominated among donors older than 60 years. This observation is consistent with previous Indian eye-bank studies showing that increasing donor age is associated with a greater proportion of non-optical-grade tissue.[1,2] In a multicenter Indian analysis, voluntary donation involved older donors and consequently yielded more non-optical-grade corneas, whereas hospital cornea retrieval programs provided an important source of donor tissue.[1]

The predominance of young and middle-aged male donors in the present series was largely related to the high frequency of traumatic brain injury. Although the present study found an association between cause of death and bilateral grade A status, this relationship is likely influenced by the markedly different age distributions and clinical profiles of the underlying donor groups. Therefore, cause of death should not be interpreted as an independent determinant of corneal grade without a larger cohort and multivariable analysis.

Retrieval logistics are another potentially modifiable component of eye-bank performance. In this audit, the median arrival-to-buttoning waiting time was 30 minutes, but the range extended to 335 minutes, indicating substantial variability. Previous Indian eye-bank data have shown that most corneas are retrieved within six hours of death, while delays may occur because of medico-legal procedures and other system-level factors.[1] The present dataset did not permit reliable calculation of death-to-retrieval time for all donors because exact dates and clock times were incompletely recorded. Importantly, the unadjusted relationship between retrieval timing and corneal grade weakened or disappeared after controlling for age. This suggests that operational timing should be monitored, but donor age is a stronger explanatory variable for the grade pattern observed here.

From a quality-improvement perspective, the data support three practical measures: standardized documentation of every eye-donation call; time-stamping of death declaration, departure, arrival, clamping, and commencement of buttoning using a consistent 24-hour format; and routine age-stratified monitoring of tissue grade. Such a registry would permit future analysis of death-to-enucleation interval, tissue utilization, contraindications, microbiological screening, and eventual transplant use. Earlier studies have emphasized that eye banks should individualize procurement strategies according to local donor characteristics and barriers to utilization.[2] The current audit can therefore serve as a baseline for a prospective hospital cornea retrieval program and for evaluating interventions aimed at reducing workflow delays.

This study has several limitations. It was retrospective and based on a relatively small single-center dataset. The source spreadsheet contained inconsistent formatting and incomplete date/time fields, which prevented robust calculation of some conventional eye-bank performance indicators. Corneal grade was treated as the recorded quality classification, but endothelial cell density, slit-lamp findings, serology, microbiological results, storage parameters, and final clinical utilization were not available in the dataset. Consequently, the study evaluates procurement and recorded grade rather than actual transplant utilization. The age-grade association may also reflect selection and cause-of-death differences inherent to the donor population.

CONCLUSION

In this audit of 84 cornea donation calls, donor age showed a strong inverse association with recorded corneal grade, with grade A tissue concentrated among younger donors. Traumatic brain injury was the commonest cause of death, and most calls involved all-organ donation. Retrieval-time variables showed weaker relationships with grade after accounting for age. Standardized, time-stamped eye-bank documentation and continued age-stratified quality monitoring may improve procurement efficiency and help define local predictors of usable donor tissue. Prospective studies incorporating endothelial assessment, tissue utilization, and transplant outcomes are warranted.

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Figure Legends

Figure 1. Distribution of Recorded Corneal Grade by Donor Age Group. Grade a Predominated among Donors Aged ≤30 and 31–60 Years, Whereas Grades B and C Predominated among Donors Aged >60 Years.