Eye Banking Factors in the The Australian Corneal Graft Registry

Presented by Miriam Keane, PhD
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At the Eye Bank Association of Australia and New Zealand Meeting
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Registered Graft Numbers

*As received by 15th February 2019
Have Donor Profiles Changed?

- Donor sex
  - Consistently more males: 40% to 60% split

- Multi organ donors
  - 12 to 16% per year: No clear pattern of increase or decrease
Changes is Donor Profiles?

- Donor age groups
  - Mean and medians had dipped but increasing again
  - 1/5 under 50 years
  - Majority of donors (approximately 1/3) aged 60 to 69
Changes in Donor Profiles?

- **Cause of donor death**
  - Most common malignancy (just above 1/3)
  - Proportions have remained fairly consistent
  - Intracranial/cerebral haemorrhages/cardiac vying for 2nd spot
Endothelial Cell Counts

- 4 to 7% in the under 2500 cells/mm² category
- Increase in counts 2500 to 3000
- Mean/median cell count around 3000
Changes in Eye Bank Procedures?

- Time from death to enucleation
  - Higher percentages in longer time groups
  - Mean and median both raised from 9/10 to 13/14 hours
Changes is Eye Bank Procedures?

- **Storage media**
  - Shift to organ culture stabilised – future?
  - Still small numbers of moist pot

![Chart showing percentage of storage media from 2009 to 2018]

Legend:
- Optisol
- Organ culture
- Moist pot
- Other
Changes in Eye Bank Procedures?

- **Length of corneal storage**
  - A lot fewer unadvised now
  - Optisol: Mean and median 3/4 days increased to 5/6 days
  - Organ culture: Mean and median 13/14 days increased to 16/17 days
But what does this mean for the outcomes of corneal grafts?

- Results from the 2018 report
- New DMEK analyses
Effect on survival

- 2018 ACGR report
  - Endothelial cell count <2500 cells/mm² had significantly poorer survival for PK & DS(A)EK
    - Included in DS(A)EK multivariate, excluded from PK due to missing data
    - Still not significant for DMEK in latest analyses (p=0.815)
  - Time from death to enucleation not retained in any multivariate models
    - Still non significant for DMEK in latest analyses (p=0.906)
  - Donor age group
Donor Age group

- PK results in 2018 report:
  - Under 50 years superior survival to each other 10 year age group (all p<0.001)
  - 50 to 59 years superior survival to 80 years and older (p=0.001)

- DS(A)EK results in 2018 report:
  - Under 40 years superior survival to 40 to 69 years (p=0.014)
  - Under 40 years superior survival to 70 years and older (p=0.001)

- New DMEK analysis reaffirms results of 2018 report:
  - Under 50 years poorer survival than 60 to 69 years (p=0.001)
  - Under 50 years poorer survival 70 to 79 years (p=0.001)
  - New: Under 50 years poorer survival 50 to 59 years (p=0.039)
Storage Media and Length of Storage

2018 Report

- Storage type
  - Not retained in multivariate model for PK
  - Not significant after clustering by patient for DS(A)EK
  - Not significant for DMEK

- Storage time in hypothermic media
  - Not retained in multivariate model for PK
  - Not significant for DS(A)EK or DMEK

- Storage time for organ culture media
  - Not significant for PK, DS(A)EK or DMEK

- New DMEK analyses find differences
DMEK - Storage Media

![Graph showing graft survival probability over time with two storage methods: Hypothermic storage (n=1106) and Organ culture storage (n=942). The p-value for the difference is 0.025.](image)
DMEK - Length of Storage

- Hypothermic storage: ≤5 days, 6/7 days, 8+ days, p=0.623

![Graph showing survival probability over time with different organ culture time points.](image)

- Organ culture, ≤2 weeks (n=229)
- Organ culture, >2 to 3 weeks (n=394)
- Organ culture, >3 weeks (n=122)
- Organ culture, time not advised (n=197)

\[ p = 0.005 \]
DMEK - Storage Media and Length of Storage

- Included in multivariate model, \( p=0.004 \)
  - Once other factors were controlled for, Optisol (yellow line) had superior survival:
    - OC \( \leq 2 \) weeks (blue line)
    - OC >2 to 3 weeks (red line)
    - OC time not advised (orange line)
  - No difference between Optisol (yellow line) and OC >3 weeks (green line)
  - OC >3 weeks (green line) had superior survival to OC >2 to 3 weeks (red line)

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**Graph Details:**
- Hypothermic storage (n=1106)
- Organ culture, \( \leq 2 \) weeks (n=229)
- Organ culture, >2 to 3 weeks (n=394)
- Organ culture, >3 weeks (n=122)
- Organ culture, time not advised (n=197)

**Significance:**
\( p<0.001 \)
DMEK results update

- Included in multivariate model
  - Storage media and length of storage, p=0.004
  - Donor age group, p=0.006
  - Donor/recipient sex match/mismatch, p=0.009
  - Australian State where graft was performed, p<0.001
  - Recipient age group, p=0.002
  - Graft year, p=0.002
  - Graft size, p<0.001
  - Surgeon volume and level of follow-up, p<0.001
DMEK - Donor/Recipient Sex Match

- If H-Y antigen linked, you would expect poorer outcomes in male donor to female recipient (green line), particularly compared to female donor in female recipient (blue line).
- In multivariate model, p=0.009
  - Female donor in male recipient (red line) had poorer survival than male donor in female recipient (green line), and male donor in male recipient (orange line).
  - No other comparisons were significant.
Summary

- There have been some changes in donor profiles and eye bank procedures over the past 10 years, specifically:
  - An increase in time from death to enucleation
  - A shift to storage in organ culture
  - An increase in the time corneas are stored
- For the most part these factors do not appear to affect graft survival, except:
  - Storage time in organ culture for DMEK
  - Donor recipient sex match also in DMEK multivariate model
    - Not related to H-Y antigen mismatch
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