Developing Global Conversations in Eye Banking

Corneal Transplantation and Eye Banking:
(The Good, the Bad, and the Worst...)

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(and... Heather Machin)
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– Carl Zeiss Meditec
– Santen, Inc.
– Eye-Lens Pte Ltd
– Network Medical Products
The “Good”…

Corneal transplantation or keratoplasty has developed procedure consisting of full-thickness replacement of the half a century, and successfully caters to most causes of newer forms of lamellar transplantation surgery, which see a fundamental change in recent years. Deep anterior lamellar keratoplasty, which selectively replaces the corneal endothelium, has led to more rapid and predictable visual outcomes. Other emerging procedures like DALK, DSEK, DMEK, and PKD, have become more widely available because of rapid advances in these techniques. Collectively, these advances have resulted in improved outcomes, and have expanded the number of cases of corneal blindness, which can now be treated successfully. Femtosecond-laser-assisted surgery, bioengineered corneas, and medical treatment for endothelial disease are also likely to play a part in the future.
Shifting the Paradigm to Selective Lamellar Keratoplasty

- Much less rejection
- Stronger eye
- Donor advantage
- Better graft survival
- Good visual results
- Poor visual results
- Difficult surgery
- Longer surgical time

General trend globally to adopt these lamellar procedures wherever possible, but clearly major differences and trends occurring around the world, with variable adoption rates and approaches
Deep Anterior Lamellar Keratoplasty (DALK)

21 yr old with Keratoconus
Bilateral DALKs performed
Advantage of EK over PK: Fuchs’ Dystrophy

Bilateral blunt ocular trauma

RE
DMEK

LE
PK

20/20
CF
The Singapore Corneal Transplant Study (SCTS)

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2014: PK: 14%
DALK: 30%
DSEK: 51%
DMEK: 4%

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Who’s Doing What?
Corneal Transplantation Around the World

Methodology
- Peer Reviewed Literature Search
- Major Eye Banking Associations (EBAA, EEBA, etc)
- Data from Transplant Registries (ACGR, NHSBT etc)
- Corneal Societies/members (SITraC, ACS, etc)
- Individual (National) Eye Banks
- Individual Ophthalmology Institutions

Challenges
- Lack of data in many continents, countries (e.g. Eastern Europe, Africa, Asia)
- Cornea transplant/eye bank registries: variable response rates from surgeons
- Published studies: data sets differ in time periods, many institution-specific studies
- Lack of uniformity in definitions for disease Indications (e.g."keratitis"; “infections”: scar or active keratitis?)
National Registries/Associations

Eye Bank Association of America (EBAA)
Association of Eye Banks of Asia (AEBA)
European Eye Banks Association (EEBA)
UK NHS Blood and Transplant (NHSBT)
Australian Corneal Graft Registry (ACGR)
Eye Bank Association Australia New Zealand
Latin American Transplantation Report (ABTO)
Society Italiana Trapianto di Cornea (SITraC)
German Ophthalmological Society
Eye Bank Association of India (EBAI)
Hospital Authority Lions Eye Bank, Hong Kong
Korean Network for Organ Sharing (KONOS)
Singapore Cornea Transplant Study (SCTS)

Eye Banks/Ophthalmic Institutions

Beijing Tongren Eye Bank, China
Shandong Eye Institute, China
Ramayamma International Eye Bank of LVPEI, India
Cornea Centre and Eye Bank, Tokyo Dental College, Japan
Kyoto Prefectural University of Medicine, Japan
Seoul St Mary’s Eye Hospital, South Korea
Santa Lucia International Eye Bank of the Philippines
King Khaled Eye Hospital, Saudi Arabia
Singapore Eye Bank, Singapore
Pretoria Eye Institute, South Africa
National Eye Bank of Sri Lanka, Sri Lanka
National Taiwan University Hospital, Taiwan
Thai Red Cross Eye Bank, Thailand
Jakarta Eye Center, Indonesia
SightLife, USA

Individuals

Keryn Williams, Australia
Graeme Pollock, Australia
Jose Alvero Pereira Gomes, Brazil
Zhiqiang Pan, China
Lixin Xie, China
Iva Dekaris, Croatia
Usha Gopinathan, India
Johan Hutauruk, Indonesia
Made Susiyanti, Indonesia
Aldo Caparossi, Italy
Choun-Ki Joo, South Korea
Shigeru Kinoshita, Japan
Naoshi Shinozaki, Japan
Veera Ramani, Malaysia
Tin Win, Myanmar
Ma Dominga Padilla, Philippines
Ali Alrajhi, Saudi Arabia
Ed Sevenster, South Africa
Yu-Chih Hou, Taiwan
Lalida Pariyakanok, Thailand
Pham Ngoc Dong, Vietnam

John Armitage, UK
Mark Jones, UK
Kevin Corcoran, USA
David Korroch, USA
Jeremy Shuman, USA
Berthold Seitz, Germany
David Touboul, France
Marcus Ang, Singapore
Howard Cajucom-Uy, Singapore
Chia-Li Pang, Singapore
Adoption of Endothelial Keratoplasty by Country (2011-12)

Transplant registries, national or regional Eye Bank statistics

- Sweden: 52% (SCTR 2012)
- USA: 50.7% (EBAA 2012)
- Singapore: 44.38% (SCTS 2012)
- UK: 45.27% (NHSBT 2011)
- Australia: 36% (ACGR 2011)
- Germany: 24.8% (German Ophth Soc 2011)
- Italy: 23% (SITraC 2011)
- Hong Kong: 21.3% (Hong Kong Lions Eye Bank 2012)
- Sri Lanka: 11% (NEBSL 2012)
- Brazil: 7.19% (ABTOI 2012)
- India: 2.8% (EBAI 2012)
- Philippines: 1.02% (SLIEB 2011)
- Thailand: 0.76% (Thai Red Cross Eye Bank 2012)
Adoption of new innovations depends on:

• Confidence in superiority ✓
• Ease in adoption ✓
  • Short learning curve ✓
  • Access to new technology ✓
• Economics ✓

5 Stages in the Adoption of Medical Innovations

Domestic Surgery Use of U.S. Supplied Intermediate-Term Preserved Tissue

- EK: 56.1% in 2014

Wilson CB. BMJ 2006;332:112-4
Adoption of DSAEK in Developing Countries

Adoption of new innovations depends on:

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- Economics

5 Stages in the Adoption of Medical Innovations

S-curve showing the five stages in adoption of innovations

Wilson CB. BMJ 2006;332:112-4
Adoption of Anterior Lamellar Keratoplasty by Country (2011-12)

- Singapore: 28.2% SCTS 2012
- Brazil: 27.2% ABTO 2012
- Italy: 26.1% SITraC 2011
- Sri Lanka: 20% NEBSL 2012
- UK: 13.36% NHSBT 2011
- Australia: 13.04% ACGR 2011
- Hong Kong: 12.5% Hong Kong Lions Eye Bank
- India: 7.5% EBAI 2012
- Germany: 5.93% German Ophth Soc 2011
- Thailand: 4.77% Thai Red Cross Eye Bank 2012
- USA: 1.95% EBAA 2012
- Philippines: 1.02% SLIEB 2011

Transplant registries, national or regional Eye Bank statistics

ALK: 1.98% in 2014
Adoption of Innovations in Medicine (Deep Anterior Lamellar Keratoplasty)

Adoption of new innovations depends on:

- Confidence in superiority ✓
- Ease in adoption ✗
  - Short learning curve ✗
  - Access to new technology ✗
- Economics ✗

5 Stages in the Adoption of Medical Innovations

S-curve showing the five stages in adoption of innovations

Wilson CB. BMJ 2006;332:112-4
In the “real world”, there may be a very significant learning curve effect when adopting new surgical procedures…
Singapore Cornea Transplant Study (SCTS): 12 year comparison of PK v ALK v EK (2000-2011)

- 2,330 corneal transplants between 2000 to 2011
- First grafts analyzed only: 1,242 grafts
- 8 corneal surgeons (+ 17 corneal fellows in training)
- Same clinical training/protocols for PK, DALK and EK

<table>
<thead>
<tr>
<th>SCTS Data</th>
<th>PK</th>
<th>DALK</th>
<th>DSAEK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of cases</td>
<td>Survival Rate</td>
<td>No. of cases</td>
</tr>
<tr>
<td>1st year</td>
<td>596</td>
<td>94.3%</td>
<td>296</td>
</tr>
<tr>
<td>2nd year</td>
<td>466</td>
<td>84.8%</td>
<td>200</td>
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<tr>
<td>3rd year</td>
<td>315</td>
<td>79.1%</td>
<td>114</td>
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<tr>
<td>4th year</td>
<td>236</td>
<td>75.4%</td>
<td>76</td>
</tr>
<tr>
<td>5th year</td>
<td>185</td>
<td>70.7%</td>
<td>36</td>
</tr>
</tbody>
</table>

*Note: p<0.001 for PK vs DALK and DSAEK.*
**DALK is much better than PK.... in the Singapore Corneal Transplant Study at least ...**

**Singapor Corneal Transplant Study**

**DALK: Stromal Rejection**

- Fully recovery with steroids

**Major Advantage of DALK in Developing Countries:**

- Better graft survival in adverse follow-up conditions, and high risk vascularized corneas
- Manual surgery – low cost
- Lamellar grade tissue – better utilization
Singapore National Eye Centre
Advanced Corneal Transplantation Courses

>100 surgeons trained from 19 countries