




MEDICAL AND
HEALTH SCIENCES



National Eye Bank Trust



nz national eye centre




THE UNIVERSITY
OF AUCKLAND
FACULTY OF MEDICAL
AND HEALTH SCIENCES

CHANGING TRENDS IN CORNEAL
TRANSPLANTATION IN AOTEAROA /
NEW ZEALAND 1991-2020


Professor Charles NJ McGhee
ONZM, FRSNZ, MBChB PhD DSc FRCS FRCophth FRANZCO
Professor & Chair of Ophthalmology,
Director, New Zealand National Eye Centre
Past-President, Asia Pacific Academy of Ophthalmology



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Dr Eduard Zirm PK 1905




DSAEK @ 3 months 2007

EVOLUTION of TRANSPLANTATION
over the last 250 years



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1750-1900: 150 year of experimentation


1905: First successful PKP by Zirm

1905-1950 PKP more widely established

1950-2000 The Golden age of PKP

1995-2020: Renaissance of DALK & DSEK

2020's: Cell based transplantation?



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Corneal endothelial transplantation:
a very brief history DSEK, DSAEK, DMEK

1965 Pollack & Barraquer – hinged flap PLK


1993 Ko et al – PLK via scleral tunnel in rabbits

1998 Gerrit Melles – first EK in humans

2000 Mark Terry – first human DLEK in USA

2005 Price reports DSEK results (N=50)

2008 Melles reports DMEK results (N=10)



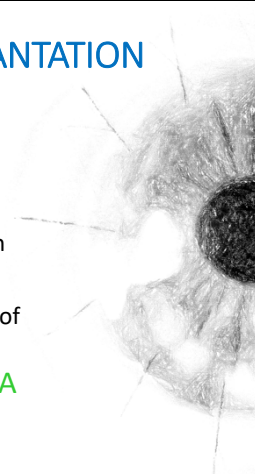
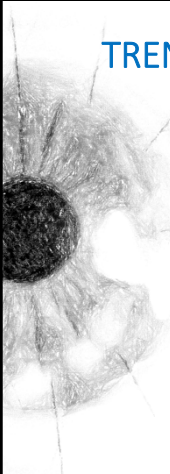
DSAEK

DMEK

Early DSEK 2007 © McGhee

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TRENDS IN CORNEAL TRANSPLANTATION



• Increased number of procedures

• Changing indications

• Lamellar now > penetrating



• Eye Bank lamellar tissue preparation

• Increasing popularity of DMEK

• Reporting of longer term outcomes of lamellar procedures



• Sources: [NZNEB](#), [ACGR](#), [EBAA](#)

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Factors influencing keratoplasty trends?


- Evolving surgical techniques
 - Descemet's Stripping Endothelial Keratoplasty (DS(A)EK)
 - Descemet Membrane Endothelial Keratoplasty (DMEK)
- Corneal crosslinking for keratoconus (CXL)
- Significant population growth¹
- Rising number of cataract surgeries per 100,000 population¹



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NZNEB a 30-year analysis: Methods
(Dr Corina Chilbeck *et al* Cornea 2021)



Electronic NZNEB database analysed (January 1991 to January 2020)

- Recipient demographics and pre-operative diagnoses
- Type of transplant and location surgery performed


A priority scheme² was applied to identify the **PRIMARY INDICATION** for transplantation e.g.

Corneal hydrops → microbial keratitis → perforation... primary indication = keratoconus

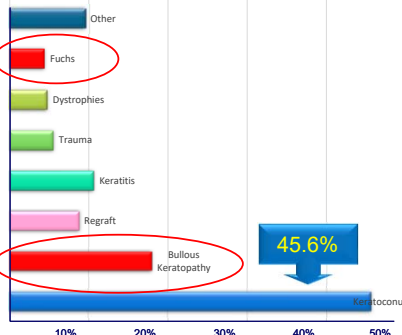
Penetrating injury → cataract surgery → bullous keratopathy... primary indication = trauma

However, diagnosis of re-graft (repeat keratoplasty) was given priority over all others

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New Zealand National Eye Bank (NZNEB):
Transplant Indications 1991-1999





Indication	Percentage
Bullous Keratopathy	45.6%
Keratoconus	~10%
Regraft	~10%
Keratitis	~10%
Trauma	~10%
Dystrophies	~10%
Fuchs	~10%
Other	~10%

N=1370




Indications for Corneal Transplantation in New Zealand: 1991-1999.
M.Edwards, GM.Clover,N Brookes, D.Pendergrast, J.Chaulk, CNJ.McGhee. CORNEA 2002

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Overview of keratoplasty in NZ



Results:

6840 cornea transplanted

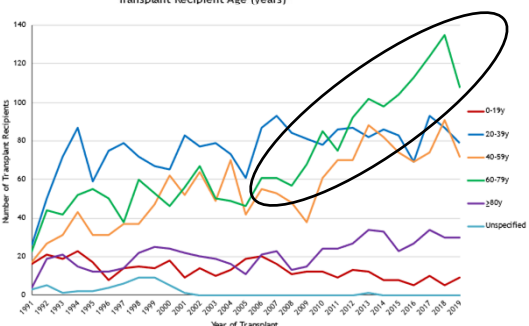
54.3% male

Mean age 50.1 +/- 21.6 years

72.1% performed in public (range 60.8-85.4%)

By region (2010-2019):

- Auckland 54.6%
- Wellington 17.5%
- Christchurch 13.2%



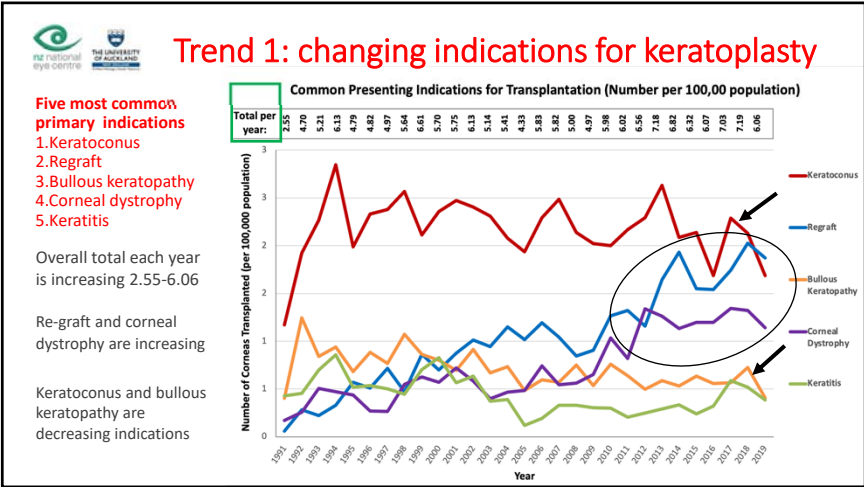
Transplant Recipient Age (years)

Number of Transplant Recipients

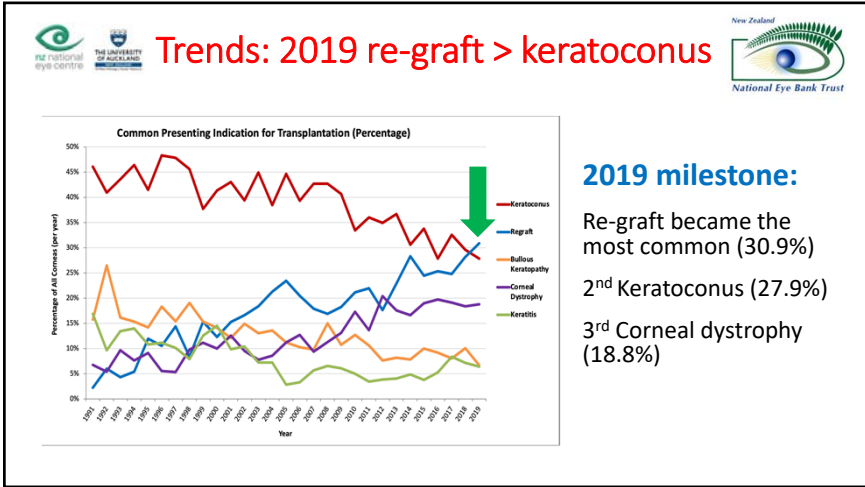
Year of Transplant



Rapid increase in age 60-79 years correlates with endothelial keratoplasty

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The Era of repeat keratoplasty in NZ?



Background & Participants

In New Zealand, repeat keratoplasty has become the second leading indication for corneal transplantation.

Study design: Retrospective study (1991-2017) in a public corneal service: 219 patients undergoing 279 repeat keratoplasty procedures.

Lu LM, Boyle AB, Niederer RL, Brookes NH, McGhee CNJ, Patel DV. Repeat corneal transplantation in Auckland, New Zealand: indications, visual outcomes and risk factors for repeat keratoplasty failure. Clin Exp Ophthalmol **2019** Nov; 47(8): 987-994

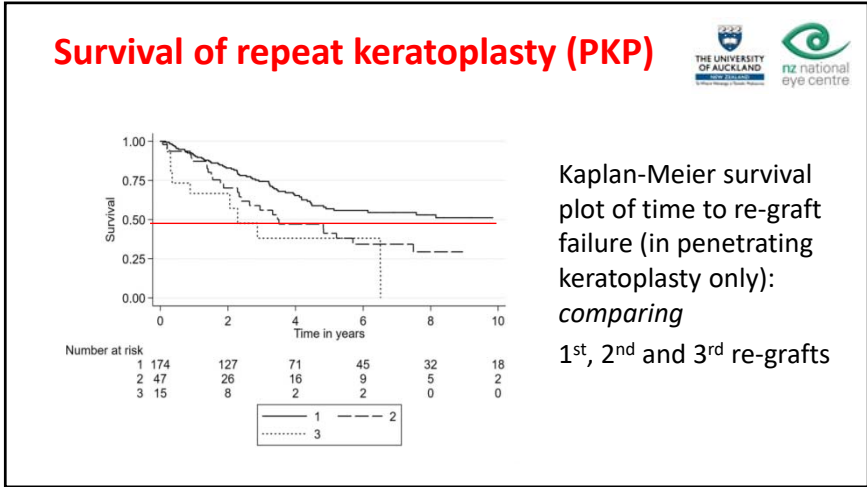
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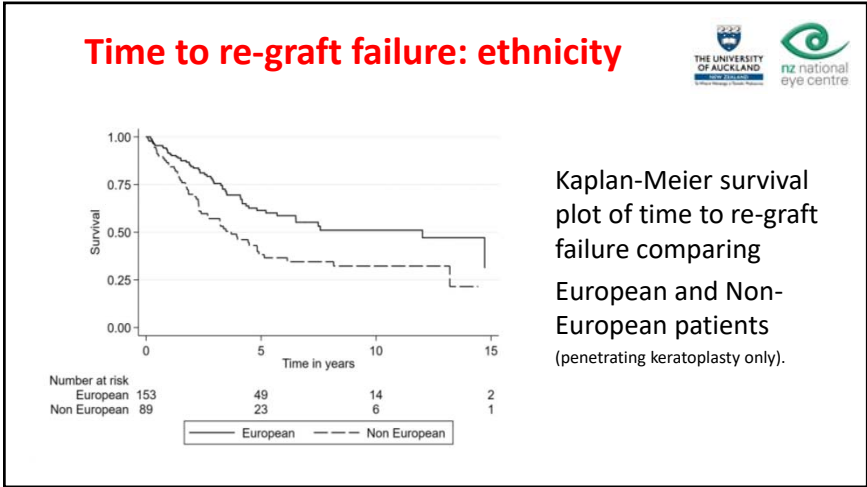
Indications for repeat keratoplasty

Repeat keratoplasty Indication	N=279	Percent
Endothelial decompensation without history of rejection	105	37.6%
Endothelial decompensation with history of rejection	88	31.5%
Recurrent ectasia or high astigmatism in keratoplasty	44	15.8%
Acute infection	11	3.9%
Acute trauma	10	3.6%
Corneal scar	10	3.6%
Primary graft failure	6	2.2%
Other	5	1.8%

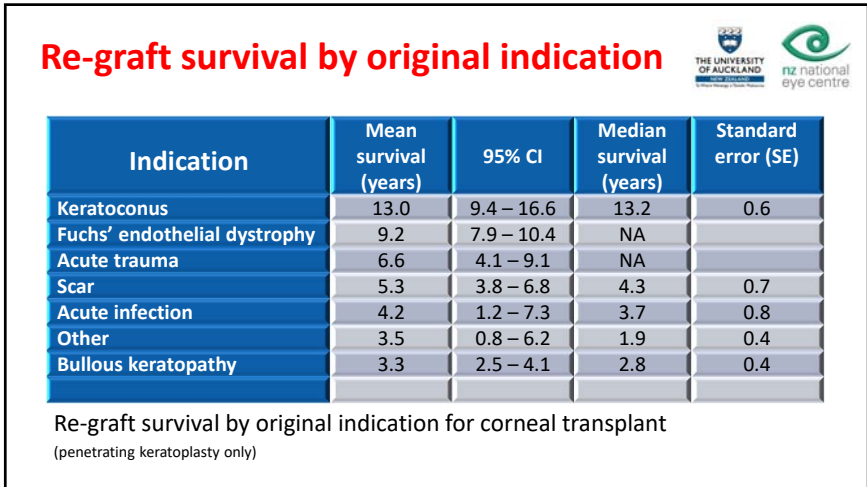
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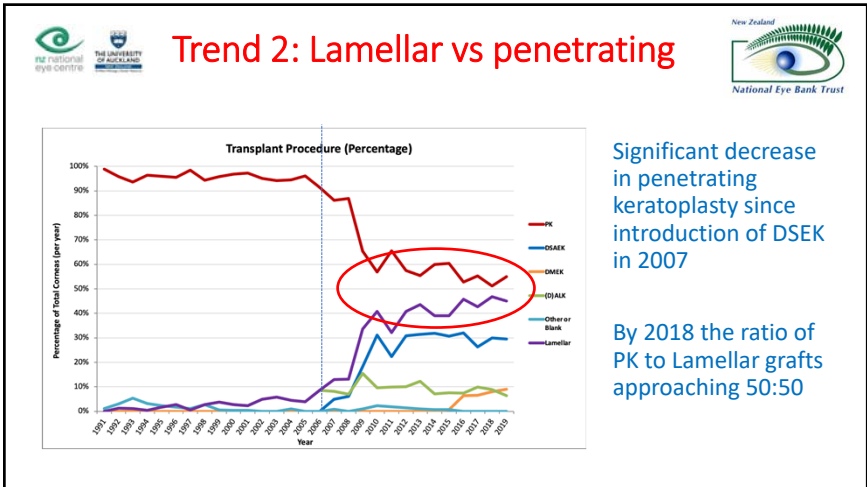
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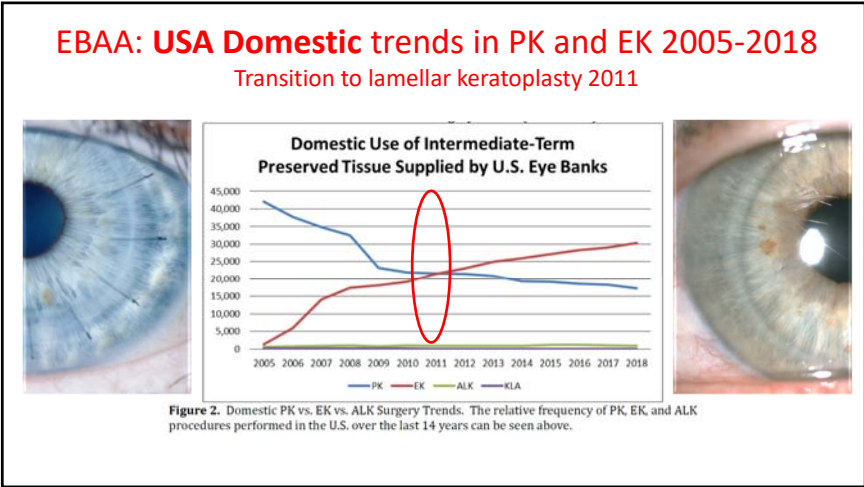
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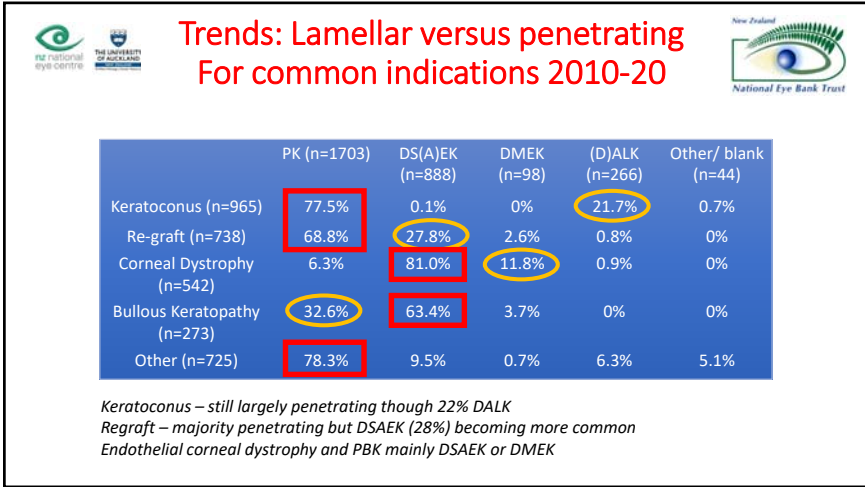
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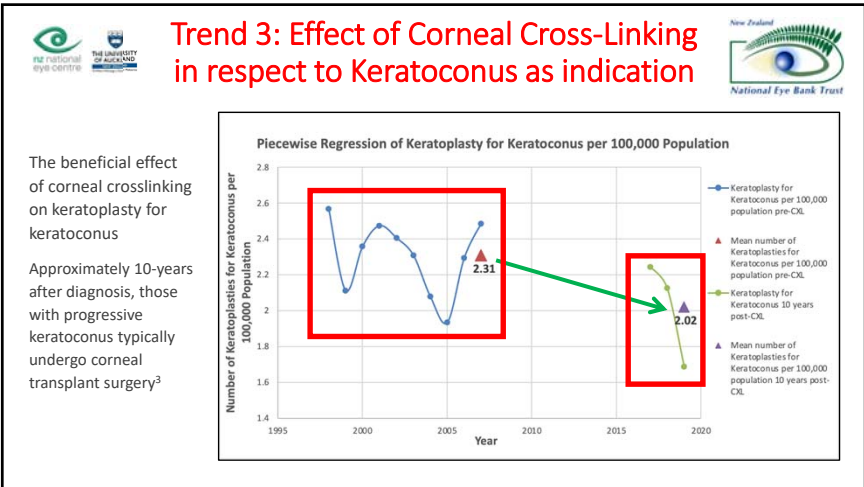
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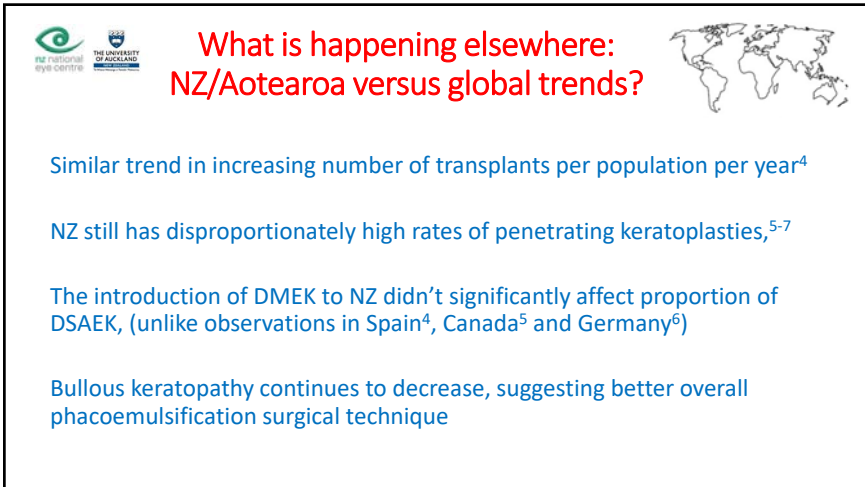
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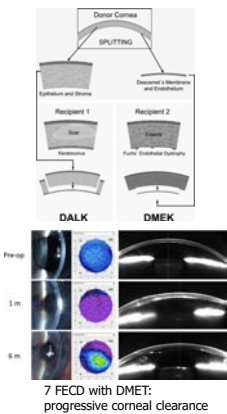
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Future modifications and alternatives to endothelial keratoplasty

- Small diameter Descemet’s stripping
- Use of ROCK inhibitors
- 1 donor → split cornea, multiple DMEK
- Descemet’s membrane endothelial transfer
- Tissue engineered grafts
- Endothelial Cell therapy
- Stem cells



Dirisamer M, Yeh RY, van Dijk K, et al. Recipient endothelium may relate to corneal clearance in Descemet membrane endothelial transfer. *Am J Ophthalmol* 2012; 154:290–296.

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Acknowledgements



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CLINICAL SCIENCE

Changing Trends in Corneal Transplantation in Aotearoa/ New Zealand, 1991 to 2020: Effects of Population Growth, Cataract Surgery, Endothelial Keratoplasty, and Corneal Cross-Linking for Keratoconus

Corina M. Chilibeck, BSH, MBChB,* Nigel H. Brookes, MSc,† Akilesh Gokul, BOptom(Hons), PhD,*
Bia Z. Kim, MBChB, MD,* Helen C. Twohill, BA,† S. Louise Moffatt, BSc,†
David G. Pendergrast, MBChB, FRANCO,*† and Charles N. J. McGhee, DSc, FRCOphth*†

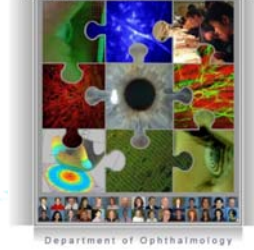
Purpose: The purpose of this study was to identify trends in the primary indication for keratoplasty in New Zealand/Aotearoa (NZ) after significant population growth, increase in the number of cataract surgeries per population, widespread adoption of endothelial keratoplasty, and introduction of corneal cross-linking for keratoconus.

Conclusions: Keratoplasty trends in Aotearoa/NZ have changed considerably because of the evolution of phacoemulsification and keratoplasty techniques. Unlike proportions observed overseas, NZ still performs penetrating keratoplasties in over half of all transplants. Corneal cross-linking may be having an early effect of reducing keratoplasty rates for keratoconus.

- Assoc Prof Gillian Clover, PhD, FRACO, founder and first Scientific Director of the NZNEB
- Trustees, Managers, and Transplant Coordinators of the NZNE
- Ophthalmologists and Optometrists of New Zealand for support and participation
- Donors and their families for their generous gift to the recipients

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Translational Vision Research



Thank you



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