Beyond the barriers

Establishing corneal cross-linking in a peripheral centre.

Dr Cam Loveridge-Easther MBChB, Dr Sacha Moore FRANZCO
Ophthalmology, NMDHB
Contact cam.loveridge.easther@gmail.com

NZ Ministry of Health statement of intent " To design services that are more in tuned to the needs of patients, individuals, families and communities"[1].

Aim: To prove that through innovation it is possible to provide a high quality corneal cross-linking service in a peripheral centre that is cost effective and produces results equivalent to the larger studies. This aligns with the Ministry of Health's statement of intent.

BACKGROUND

Providing high quality specialist services in a peripheral centre is challenging.

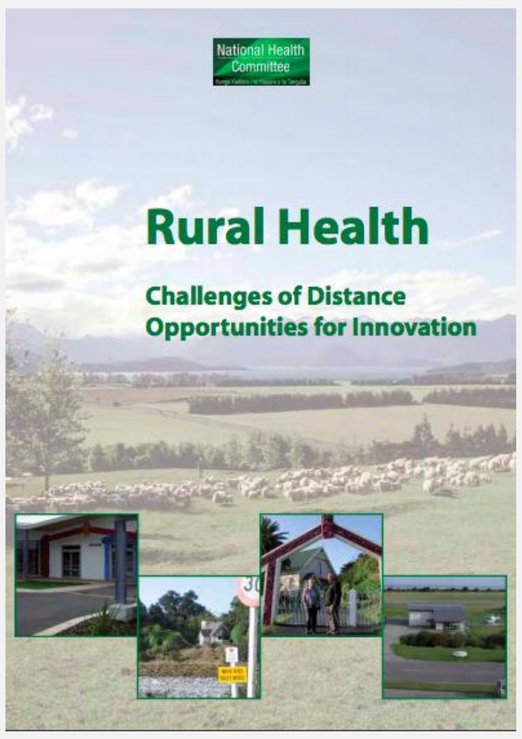
In Nelson, New Zealand, we service a region covering 145,000 people over 227, 000 km2 of largely rural areas.

If we are unable to provide the service locally our patients have to travel to a tertiary centre at a cost and burden to both patient and DHB.

In 2009 The Ministry of Health developed a "Better, sooner and more Convenient" approach that aimed to treat people closer to their homes and in "Rural Health: Challenges of distance, opportunities of innovation" the National Health Committee emphasised **medical technology** as a way of enabling better and more appropriate health service delivery[1-2] .

Transfer options from Nelson

- In 2011 we developed a local corneal cross-linking service - previously a service that required referral to a major centre.
- Corneal cross-linking is a technique that uses UV light and a photosensitiser to strengthen chemical bonds within the cornea. This stabilizes keratoconus (where the clear part of the eye called the cornea bulges forward, distorting vision) from progressing.
- In some cases cross-linking can also reduce the bulge thereby improving vision or ability to fit contact lenses comfortably[3-5].
- Cross-linking also prevents patients from requiring multiple corneal graft surgeries during their lifetime, with its attendant risks and costs (time and money) to both patient and hospital.
- Keratoconus is significant problem in New Zealand occurring more commonly here than elsewhere in the world[6].



Corneal cross-linking in action – image from clspectrum.com

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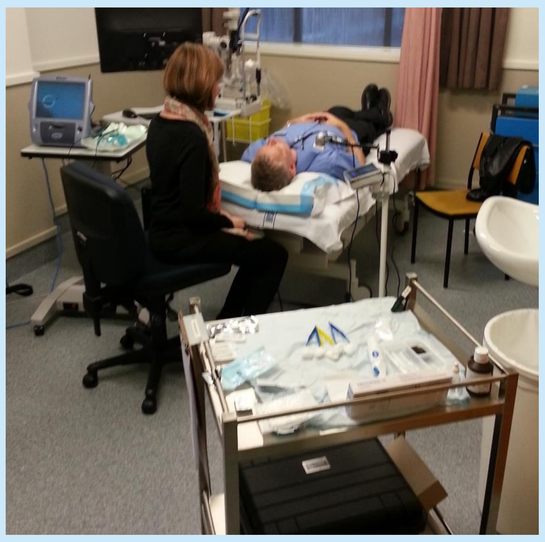
Methods: A UV lamp that can emit the highly accurate light source with calibration equipment required for the Dresden protocol normally costs ~ $45 000 however through NZ biomedical engineers SDZ electronics the required lamp was purchased for only $10 500. Riboflavin is relatively inexpensive and other surgical equipment, rooms, nursing staff and administrative requirements were already established.
Cost of transfer only includes flights ($850) and accommodation ($150 per night) and does not account for time off work for patient or support person. Cost of each procedure was ignored as it was charged to both DHBs as the same coded procedure and was therefore of equal value.

Outcomes: Our current data shows that our results are comparable with large international studies[3-5] - see table 2. As can be seen in Table 2 we have treated 12 individual eyes, have lost 3 to follow up and our results are comparable to larger studies and centres. We have had one episode of keratitis after a patient re-introduced contact lens use which may have been due to decreased corneal sensitivity, this settled with ciprofloxacin drops.

Under review	73
Treated	12
Gender	43 Male
	30 Female
Ethnicity data	49 Caucasian
	24 Maori/PI



eye count	Side	age (last visit)	sex	Caucasian	Maori/ Pacifica	Pretx visit date	BCVA Pre 6/	BCVA post 6/	Follow up Ks Kmin-Kmax	(Kmax-Kmin)-(Kmax-Kmin)	Average K change (Kmax + Kmin/2)-(Kmax + Kmin/2)	CCTI-CCTp	demarcation line depth	FU (months)
1	L	28	F	1		26/03/15	7.5	9.5	-1.53	-2.01	-0.57	-15	328	20
1	R	12	M	1		15/10/15	30	19	-0.77	0.39	-0.58	-7	309	27
1	R	24	M	1		20/03/14	9.5	12						
1	R	12	M	1		04/08/15	9.5	7.6	-0.53	-0.26	-0.4	-23	339	18
1	L	16	M	1		01/05/14	7.5	9.5	-1.26	-3.32	0.47	-10	343	23
1	R	31	M	1		22/09/15	12	12	-7.3	-6.3	4.15	-104	360	22
1	L	17	F	1		08/05/14	9.5	9.5	-1.5	-1.13	-1.25	-16	347	39
1	R	15	M	1		02/04/15	12	9.5	-2.49	-1.3	-1.84	-35	288	7
1	L	13	M	1		13/10/15	12	7.6	-2.52	-1.17	-1.95	-87	350	15
1	R	16	M		1	14/03/17	12	9.5						4
1	L	20	M	1		26/05/17	9.5	9.5	-1.02	-2.55	-0.26	-34	373	6
1	R	20	F		1	06/07/17	12	12						
Average		18.6					11.6	10.6	-2.12	-1.96	-0.24	-37	337.4	18.1

Cost of transfer (per patient)	Cost of equipment
$1 150	$10 500

Conclusion:
Being able to provide a cross-linking service in Nelson has allowed us to treat our patients closer to their homes. While the set up cost is large compared to single treatment costs we have been able to cover that cost over the last 6 years. Despite a relatively low frequency of patients we are also able to provide a service of equal quality to larger tertiary centres.
We would encourage other ophthalmic teams to consider a similar approach and are happy to answer questions about setting up a local cross-linking service.

References:
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