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Australian Orthoptic Journal

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2016 Volume 48

Paediatric strabismus care in Australia

Cataract surgical outcomes audit

Orthoptist-led diabetic retinopathy screening

Acute macular neuroretinopathy

Deviations from standard postoperative instructions

50 years of the Australian Orthoptic Journal

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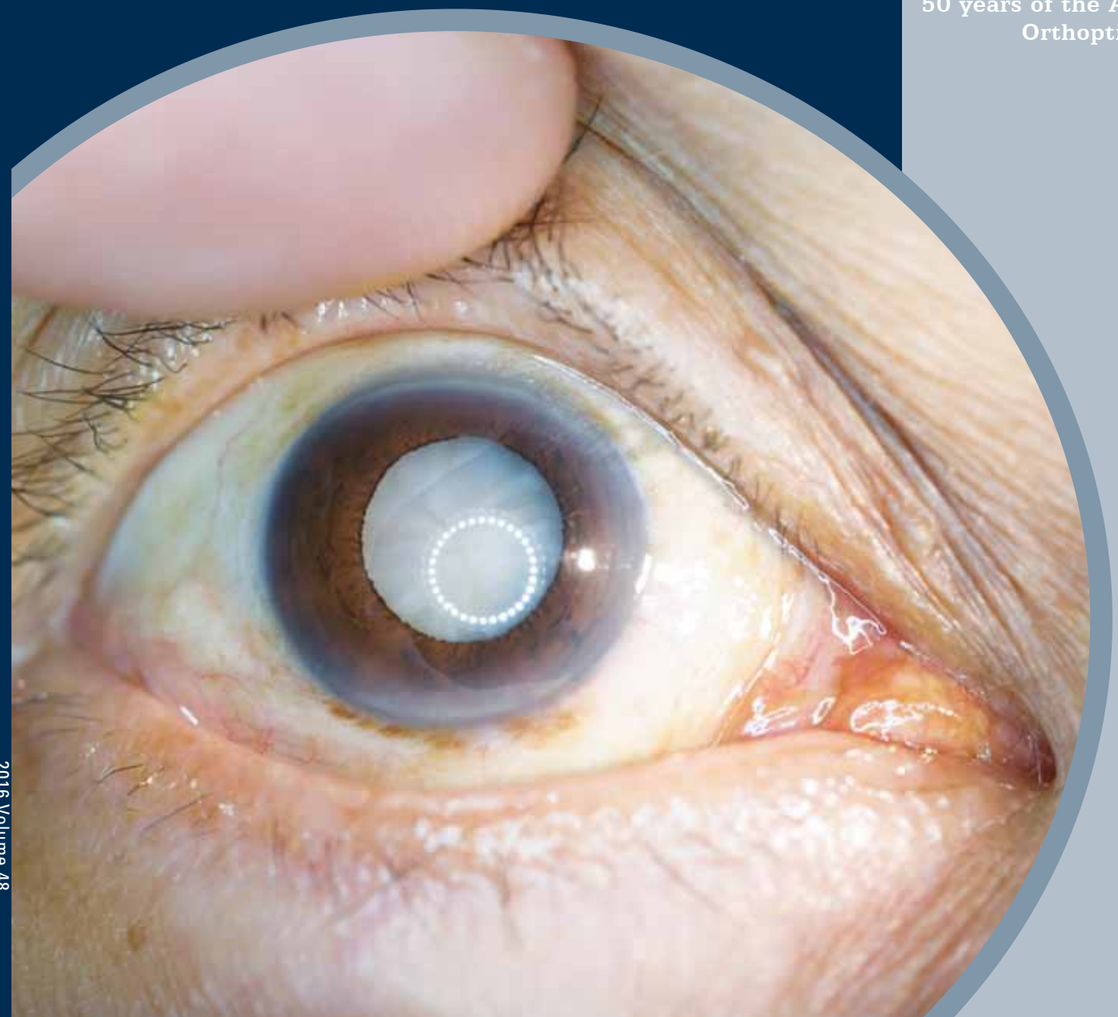

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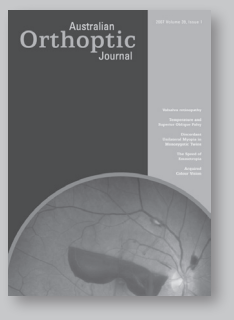

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The types of manuscripts accepted are as follows:

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Book Chapter: Murphee AL, Christensen LE. Retinoblastoma and malignant tumors. In: Wright KW, Spiegel PH, editors. Pediatric Ophthalmology and Strabismus. 2nd Ed. New York: Springer; 2003. p. 584-589.

Web Page: Cancer Council Australia. Position statement: eye protection; 2006 [Updated Aug 2008, cited 2010 31st Jul] Available from: http://www.cancer.org.au//policy/positionstatements/sunsmart/eyeprotection.htm.

Tables and Figures: Tables and figures must be accompanied by a suitable title and numbered consecutively as mentioned in the text. It is preferable if images are supplied as high resolution jpeg, tiff or EPS files.

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Editorial

The Current Relevance of Paediatric Strabismus Care in Australia

Caring for patients with strabismus is an area covered by all orthoptists in their university training, however not all orthoptists currently work in the area of strabismus, and some will only come across the condition on the rare occasion. In Australia, over the past 85 years since its inception as a profession, orthoptics has continued to change, adapt and evolve into what it is today. Orthoptists work in a variety of settings and utilise an ever-expanding skill set driven by technology advances making their way into clinical practice.

The first orthoptic hospital clinic in Australia was established at The Alfred Hospital in Melbourne in 1931, with The Royal Alexandra Hospital for Children in Sydney following in 1933. Since that time, orthoptists have continued to work in both public, private and research settings all over this vast country, from remote rural areas to large cities. The profession has seen the role of the orthoptist expand and extend into many different areas of expertise including ophthalmic care, clinical research and orthoptic-led clinics. Orthoptic-led clinics have demonstrated success by utilising the orthoptist's skill set and knowledge to facilitate new clinics, streamline care and reduce waiting times. From personal experience working in a tertiary referral centre, we are actively involved in orthoptist-led strabismus screening clinics which are solely managed by the orthoptist. These clinics receive referrals from primary or secondary screeners within the community such as general practitioners, community nurses or community orthoptists. As orthoptists, our knowledge of strabismus enables us to run these orthoptic-led clinics to diagnose strabismus and refer on to our ophthalmology clinic for a thorough eye examination if required. We are also able to monitor the patient within the orthoptic clinic, or if no abnormality is found, discharge the patient from our care. Strabismus was the core role of the orthoptist in the past. Looking at today's paediatric clinics, strabismus remains a condition that is central to orthoptics. Not only do we see primary strabismus of varying intermittent, constant, neurological or mechanical types, but we also see secondary strabismus that has occurred as a result of stimulus deprivation, trauma or ocular pathology. There are many experienced and passionate clinicians who find their role as a paediatric orthoptist an interesting and fulfilling one. There are many reasons for this and strabismus is one key factor.

Knowledge of the diagnosis and management of strabismus enables the orthoptist to have a unique role not only in direct patient care, but also in teaching and training of orthoptic students, medical students, nurses and ophthalmology and neurology registrars. On a daily basis, we will treat intermittent exotropia divergence excess type, assess fully accommodative esotropia and diagnose a microtropia. We will use our skills to undertake a patch test, perform a prism bar cover test, measure fusion ranges, utilise the synoptophore and prescribe occlusion therapy to treat amblyopia. All the 'traditional' orthoptic skills and techniques are performed alongside recent clinical skills and tests such as iCare tonometry, optical coherence tomography (OCT), autorefraction, fundus photography and visual electrophysiology.

Many cases of strabismus are amblyogenic. The orthoptist plays a vital role in the management and treatment of amblyopia. Methods for treating amblyopia are essentially the same practices that were used by the early orthoptists in the 1930s, however research and technology continues to evolve and challenge our current practice. The benefit of orthoptic-led clinics in amblyopia management is to allow frequent reviews and monitoring of vision and utilise the orthoptist's knowledge and skills to counsel the patient on techniques and strategies to improve compliance.

In today's day and age, patient expectation and satisfaction is very high. This possibly has occurred even more so in recent years with the 'Dr Google' phenomenon, social media and reality television. Families attend the clinic with high expectations of looking not just cosmetically acceptable, but are striving for perfection. The orthoptist's role with these patients also extends into counselling and aiding patients to make informed decisions regarding strabismus surgery and treatment options.

Technology and advances in medical science have not by any means replaced the skills that we have, but rather have added to and enhanced our patient assessment to become more comprehensive. This has enabled orthoptists to provide a better level of patient care and we are better clinicians for it. As clinicians, our role will continue to evolve and more and more we are seeing ourselves not just managing conditions, disorders and disease but also involved in health promotion and advocacy. Looking into the future of the orthoptist's role in strabismus, we can only expect further advances and changes in technology and patient care. We are sure there will be many exciting developments to come.

Louise Brennan, Stephanie Crofts

Orthoptic Department, The Children's Hospital at Westmead, Sydney

Cataract Surgical Outcomes: A Five-Year Audit

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ABSTRACT

Aim: Cataract extraction with intraocular lens implantation is the most common elective procedure in Australia. In order to ensure best clinical practice, outcome results must be compared with nationally or internationally accepted benchmarks. The aim of this paper was to present the clinical outcomes audit for a five-year period from 2008 to 2012 and compare to these benchmarks.

Method: A random sample of 1,734 patients was selected over a five-year period. Preoperative, surgical and postoperative data was recorded, including best-corrected visual acuity (BCVA), refraction and the VF-14 visual function questionnaire.

Results: In 2012, the mean final BCVA was 6/7 (0.87 decimal, 95%CI 0.84 0.90) significantly increased from 6/15 preoperatively (0.41 decimal, 95%CI 0.39 0.43, $p<0.001$), with 97% achieving 6/12 (0.50 decimal) or better and 52% achieving 6/6 (1.0 decimal) or better, with no significant differences over the five-year period. The mean refractive prediction error varied from -0.03 to -0.13 dioptres (DS), with 89 to 94% achieving a refractive prediction error within ±1.00 DS and 64 to 75% within ±0.50 DS. The VF-14 visual function postoperative mean for 2012 was 84.90 (95%CI 82.25 87.54) significantly increased from 70.34 preoperatively (95%CI 67.89 72.79, $p<0.001$), similar over the five-year period.

Conclusions: The Monash Health clinical outcomes of both visual acuity and refraction were within recommended benchmarks. With increasing pressure on the public health system an efficient and cost-effective service with the highest level of care is essential. A continual auditing process assesses this care and ensures the maintenance of quality outcomes.

Keywords: cataract outcomes, cataract audit, refractive outcomes

INTRODUCTION

Cataract surgery with intraocular lens (IOL) insertion is the most common elective surgical procedure in Australia, with 229,693 hospitalisations for cataract extraction in 2013-2014 (8.9 per 1,000 population).[1] In the public hospital system there were 51,465 cataract admissions in 2008-2009, rising to 64,770 in 2012-2013, an average increase of 5.9% per year.[2] In the context of an increasing demand for this service, it is essential that public health institutions provide an effective and cost-efficient service. Though cataract surgery is now essentially a day-case procedure with minimal complications, blindness may still occur as a result of this procedure, which means that the benefits of this common procedure must still always be balanced against the risks.[3]

In order to ensure that quality of care is achieved and maintained, regular audits of surgical and clinical outcomes are required. Audits serve to ensure the achievement of surgical and clinical goals and the maintenance of quality outcomes, and are particularly useful in a public health system with major registrar training and so frequently changing staff. Complication rates, including endophthalmitis, posterior capsule rupture, anterior and posterior vitrectomy are generally measured and reported as quality indicators;[4-9] however it is the clinical outcomes that are of more interest and importance to the patient. Clinical outcomes that may be measured following cataract surgery include visual acuity (VA) and refraction; or more subjectively, patient-reported visual function outcomes such as the VF-14 Index questionnaire. The VF-14 scale is an index of functional impairment in patients with cataract and has been shown to correlate better with patients' perceived trouble with vision and satisfaction following surgery than the measurement of VA.[10]

In order to ensure best clinical practice, to judge the quality of service provided and to promote learning and quality improvement, outcome results must be compared with nationally or internationally accepted gold-standard benchmarks. These benchmarks are established by the comparison of large sample audit reports. However, in

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order for meaningful comparison, they must be seen in the context of the population assessed. Many of the published reports are sourced from National Health Service (NHS) data or from the European Registry of Quality Outcomes for Cataract and Refractive Surgery (EUREQUO) and do not have restriction criteria on the reported samples.[5,7,9,11,12] These samples include patients with ocular comorbidities, complex cases, surgical complications, surgery performed by both experienced surgeons and those in training. A smaller number of reports present data from restricted samples, excluding those with comorbidity, complications; or include only those operated by consultants, or from independent hospitals.[8,13]

The aim of this paper was to present the audit results for a five-year period from 2008 to 2012 in comparison to established international benchmarks.

METHOD

Participants and Procedure

Patients treated at the Monash Health Cranbourne Day Surgery are referred either directly to the surgery list by Monash Health consultants, or to the preadmission clinic by community ophthalmologists and optometrists. The preadmission clinic provides a 'one-stop' visit, with visual acuity and biometry measurements performed by orthoptists, followed by ophthalmic assessment and consent, then nurse-led pre-anaesthetic triage. Surgery is performed as a day-case procedure by either a consultant or registrar. The postoperative clinical pathway consists of a one-week postoperative visit, where those requiring second eye surgery are consented and returned to the waiting list; and the majority are discharged to their referring clinician for their final four-week assessment. A small number who may have some complication are booked to return for further review.

Subjective visual function is measured using the VF-14 index of functional visual impairment, which consists of 12 questions designed to identify a broad spectrum of vision-dependent everyday activities, and two further questions on driving, graded by level of difficulty. An average score is calculated for the 12 questions, with the highest possible score of 100.[10] Preoperative best corrected visual acuity (BCVA) is measured in the clinic for all those patients referred from the community, or by the consultant for those referred direct to the list.

Random samples of all cataract surgery patients were selected from the date-ordered theatre list each year from 2008 to 2012, using the random ordering function in Microsoft Excel 2010. The total number of cataract operations in this time period was 8,989, with a total sample size of 1,734 (19%). The project was approved as a Quality Improvement activity by the Monash Health HREC (Project No. RES-16-00000443Q).

All preoperative, surgical and one-week postoperative clinical data was retrieved via the Scanned Medical Record (SMR) system. Final postoperative VF-14 visual function information was obtained from the sample patients. Visual acuity and refractive outcomes were obtained from their referring clinicians, ophthalmologists and optometrists, which meant that there was no standardised measure of VA, so all were converted to decimal notation for comparison.

Data analysis

The data was entered into a Microsoft Excel spreadsheet, and analysis performed using Microsoft Excel 2010 and the statistical program IBM SPSS Statistics Version 20.0. For analysis of differences in age, BCVA, VF-14, spherical equivalent refraction, refractive prediction error and absolute prediction error between the groups over the five-year period, one-way analysis of variance (ANOVA) was used, after homogeneity of variance was tested with Levene's test. Post hoc analysis was performed using Tukey HSD test. The Wilcoxon Signed Ranks test was used for paired comparisons between preoperative and postoperative scores. A p value of <0.05 was considered to be statistically significant. As can be seen in Table 1, postoperative data was not available for every patient, as either the clinician or the patient did not return the request for information.

RESULTS

Of the 1,734 patients in the sample, 1,040 (60%) were female and 58% presented for first eye surgery. Of the total sample, 1,236 (71%) attended the preadmission clinic, with the remaining 29% referred direct to the surgery list by hospital consultants.

The preoperative and postoperative measurements of BCVA and VF-14, and the age range of those in the sample are presented in Table 1. The proportion of patients in the different age groups combined across the five-year period is presented in Figure 1. No significant difference was found over the five-year period for mean age or VF-14. Analysis

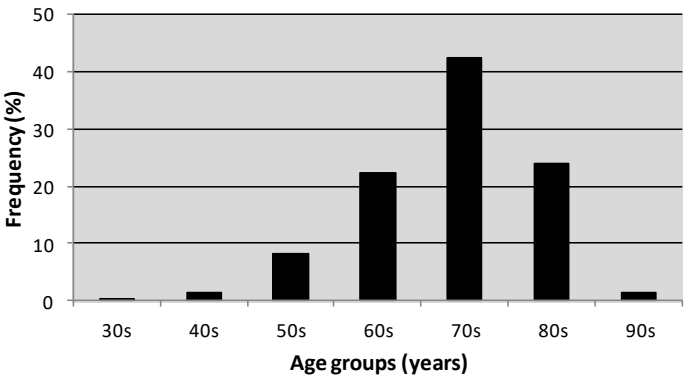

Figure 1. Age groups of the total sample.

Table 1. Preoperative and postoperative patient characteristics, five-year comparison							
		2008	**2009**	**2010**	**2011**	**2012**	**P**
Age (years)	N	343	334	353	349	355	
	Mean	73.5	73.0	72.6	72.5	72.4	0.510
	(95% CI)	(72.6, 74.5)	(72.0, 74.0)	(71.5, 73.6)	(71.5, 73.5)	(71.4, 73.5)	
	Range	41 - 94	35 - 90	36 - 96	33 - 98	42 - 97	
Preoperative BCVA operated eye (decimal)	N	333	328	342	343	353	
	Mean	0.36	0.38	0.39	0.40	0.41	0.016*
	(95% CI)	(0.34, 0.38)	(0.36, 0.40)	(0.37, 0.41)	(0.38, 0.42)	(0.39, 0.43)	
	Range	0.001 - 1.00	0.001 - 1.00	0.001 - 1.00	0.001 - 1.00	0.001 - 1.00	
Final BCVA operated eye (decimal)	N	265	274	250	239	248	
	Mean	0.88	0.86	0.83	0.90	0.87	0.019*
	(95% CI)	(0.85, 0.90)	(0.83, 0.89)	(0.80, 0.86)	(0.87, 0.93)	(0.84, 0.90)	
	Range	0.05 - 1.50	0.05 - 1.33	0.001 - 1.50	0.01 - 1.50	0.17 - 1.50	
Preoperative VF-14	N	294	280	269	285	312	
	Mean	74.19	72.57	70.25	69.56	70.34	0.061
	(95% CI)	(71.75, 76.62)	(70.03, 75.11)	(67.71, 72.79)	(66.81, 72.31)	(67.89, 72.79)	
	Range	16.67 - 100	5.00 - 100	9.09 - 100	0.00 - 100	4.17 - 100	
Preoperative VF-14	N	220	207	173	187	190	
	Mean	89.02	87.51	86.16	86.11	84.90	0.19
	(95% CI)	(86.81, 91.22)	(85.00, 90.02)	(83.47, 88.86)	(83.29, 88.93)	(82.25, 87.54)	
	Range	18.75 - 100	20.00 - 100	25.00 - 100	9.09 - 100	25.00 - 100	

ANOVA *Significance at <0.05
Post-hoc: Preop BCVA operated eye *Significance between 2008 and 2012 (Tukey HSD, Mean Difference = -0.466, p <0.05)
Post-hoc: Final BCVA *Significance between 2010 and 2011 (Tukey HSD, Mean Difference = -0.707, p <0.02)

Table 2a. Preoperative BCVA levels, five-year comparison					
Percentage achieved	**2008 N = 333**	**2009 N = 328**	**2010 N = 342**	**2011 N = 343**	**2012 N = 353**
VA 0.50 decimal (6/12) or better	28.8	33.2	26.3	41.5	42.5

Table 2b. Final postoperative BCVA outcomes levels, five-year comparison					
Percentage achieved	**2008 N = 265 (77% of sample)**	**2009 N = 274 (82% of sample)**	**2010 N = 250 (71% of sample)**	**2011 N = 239 (69% of sample)**	**2012 N = 248 (70% of sample)**
VA 0.50 decimal (6/12) or better	95.8	93.8	93.6	96.6	96.8
VA 0.67 decimal (6/9) or better	86.0	85.0	86.8	89.5	88.7
VA 1.0 decimal (6/6) or better	54.3	52.2	44.4	56.5	52.4

showed a statistically significant increase in preoperative BCVA between 2008 and 2012, representing an increase from Snellen equivalent 6/16.7 to 6/14.6; and a similar significant difference in postoperative BCVA from 6/7.2 in 2010 to 6/6.7 in 2011 (see Table 1 for statistical analysis).

In 2012, the mean preoperative BCVA of the designated surgical eye was Snellen equivalent 6/14.6 (0.41 decimal, 95%CI 0.39 0.43) which showed a significant improvement to a mean postoperative BCVA of 6/6.9 (0.87 decimal, 95%CI 0.84 0.90, p<0.001), with a similar result in previous years (Table 1). The proportion of patients achieving each line of the Snellen chart preoperatively and postoperatively over the five-year period is presented in Figures 2 and 3, illustrating the mean BCVA shift after surgery. Tables 2a and 2b present the proportion of eyes achieving a BCVA of 6/12, 6/9 and 6/6 over the five-year period, preoperatively and postoperatively respectively. The preoperative BCVA was 6/12 or better in only 29% in 2008, with an increase over the five-year period to 43% in 2012. The final BCVA was 6/12 or better in 94 to 97%, and 6/6 or better in 44 to 57% (Table 2b).

Figure 4 presents the final BCVA achieved in relation to the age of the patient, showing a decline in final BCVA with increasing age. Table 3 presents the proportion of those

Table 3. Final BCVA outcome compared to preoperative, five-year comparison					
Percentage achieved	**2008**	**2009**	**2010**	**2011**	**2012**
Both pre-and post-operative best VA known	75	81	69	67	70
VA improved	94.2	94.4	93.9	94.8	93.1
VA remained the same	3.9	4.1	2.0	3.0	4.4
VA decreased	1.9	1.5	4.1	2.2	2.4

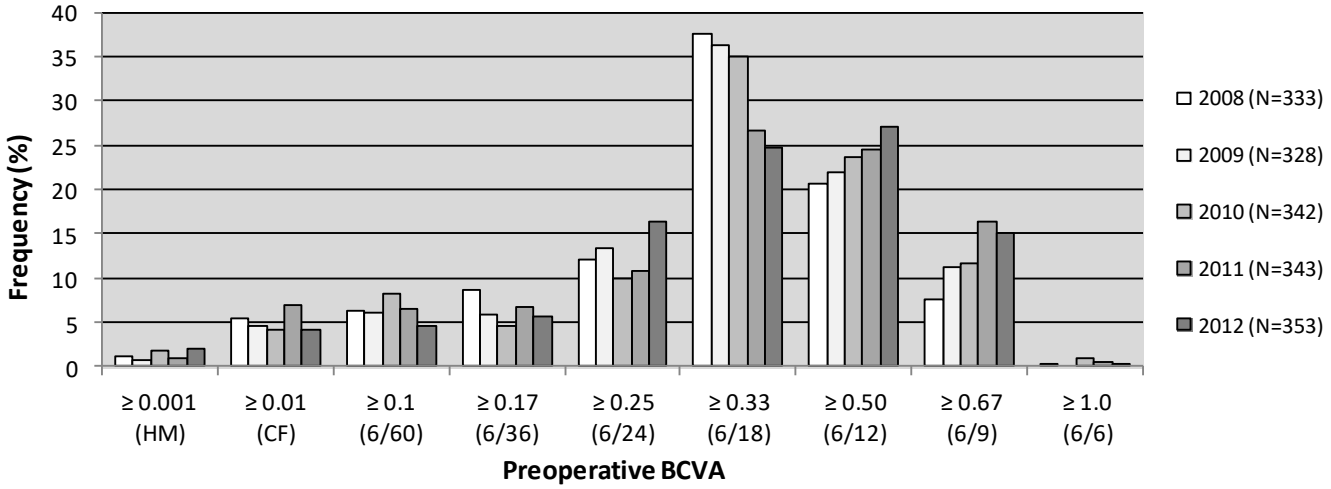

Figure 2. Preoperative BCVA in designated surgical eye, five-year comparison.

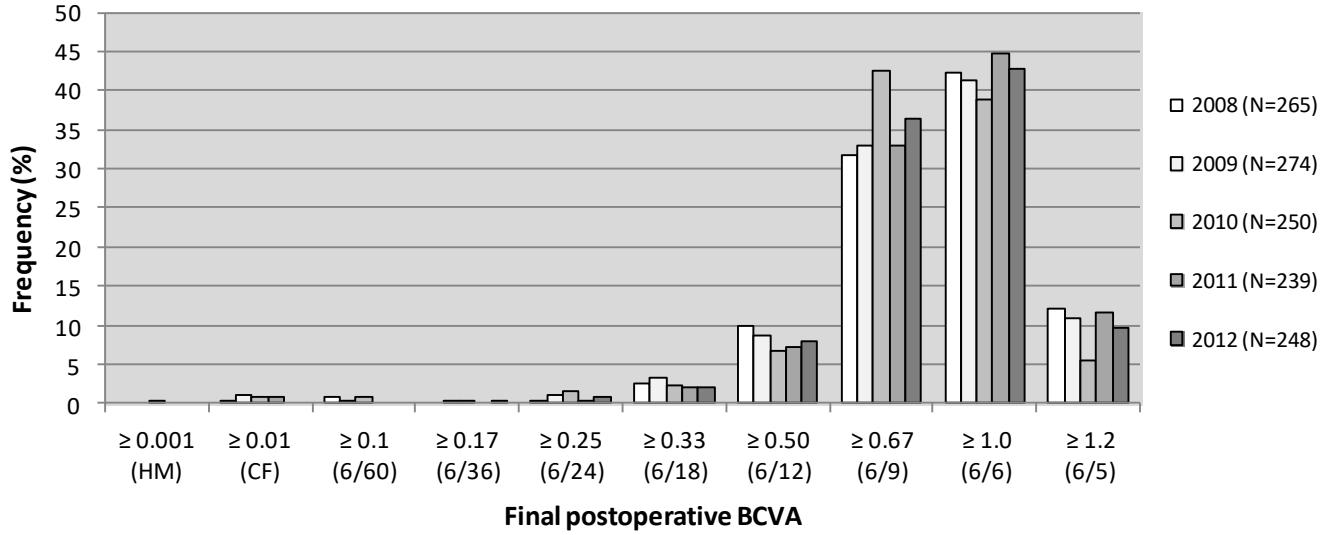

Figure 3. Final postoperative BCVA, five-year comparison.

Table 4. Refractive outcomes, five-year comparison							
		2008	**2009**	**2010**	**2011**	**2012**	**P**
Spherical equivalent refractive outcome (DS)	N Mean (95% CI) Range within ±0.50DS within ±1.0DS	263 -0.27 (-0.34, -0.20) -2.00 - +1.75 71.5% 88.2%	252 -0.24 (-0.31, -0.16) +3.50 - +1.13 76.6% 93.3%	244 -0.26 (-0.34, -0.18) -2.50 - +2.00 65.6% 90.6%	240 -0.28 (-0.36, -0.21) -3.50 - +1.00 68.8% 91.7%	244 -0.27 (-0.33, -0.20) -2.50 - +1.50 73.4% 91.9%	0.936
Refractive prediction error (DS)	N Mean (95% CI) Range	255 -0.08 (-0.16, -0.01) -2.07 - +1.82	251 -0.03 (-0.10, +0.04) -3.08 - +1.53	242 -0.08 (-0.15, -0.00) -2.47 - +2.20	240 -0.12 (-0.18, -0.05) -1.79 - +1.18	244 -0.13 (-0.19, -0.06) -2.09 - +1.70	0.357
Absolute prediction error (DS)	N Mean (95% CI) Range	255 0.46 (0.41, 0.51) 0.01 - 2.07	251 0.40 (0.35, 0.45) 0.00 - 3.08	242 0.46 (0.40, 0.51) 0.00 - 2.47	240 0.41 (0.37, 0.45) 0.00 - 1.79	244 0.38 (0.34, 0.43) 0.00 - 2.09	0.079

ANOVA

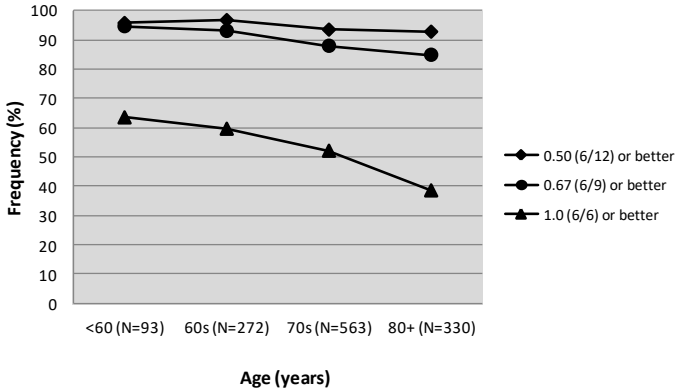

Figure 4. Final BCVA by age group, 2008 to 2012 (N = 1,258).

who did not show an improvement in BCVA postoperatively.

The final refraction information was known for 1,243 eyes, 72% of the original sample. The mean spherical equivalent outcome refraction in 2012 was -0.27 dioptres (DS), ranging from -2.50 to +1.50DS, similar each year over the five-year period (Table 4). Mean refractive prediction error varied from -0.03 to -0.13DS, and mean absolute prediction error from 0.38 to 0.46DS (Table 4). Figure 5 presents the range of refractive prediction error, known for 1,232 patients, over the five-year period, with no statistically significant change over this time (Table 4). The cumulative percentage of refraction prediction error within ±0.5 to ±3.5DS over the five-year period is presented in Table 5.

In 2012, the mean preoperative VF-14 of the designated surgical eye was 70.34 (95%CI 67.89 72.79), improving to a mean of 84.90 postoperatively (95%CI 82.25 87.54, $p<0.001$), with no significant difference across the five-year period (Table 1). The ranges of preoperative and postoperative VF-14 scores are presented in Figure 6. The preoperative and postoperative responses to the individual VF-14 questions are presented in Table 6. Table 7 presents the comparison of preoperative and postoperative scores, demonstrating the proportion of those who did not show an improvement in VF-14 postoperatively.

DISCUSSION

The female predominance of 60% was similar to other studies which ranged from 53 to 68%.[5,7-9,12-19] The mean age of 72.4 to 73.5 years was also similar to other studies,

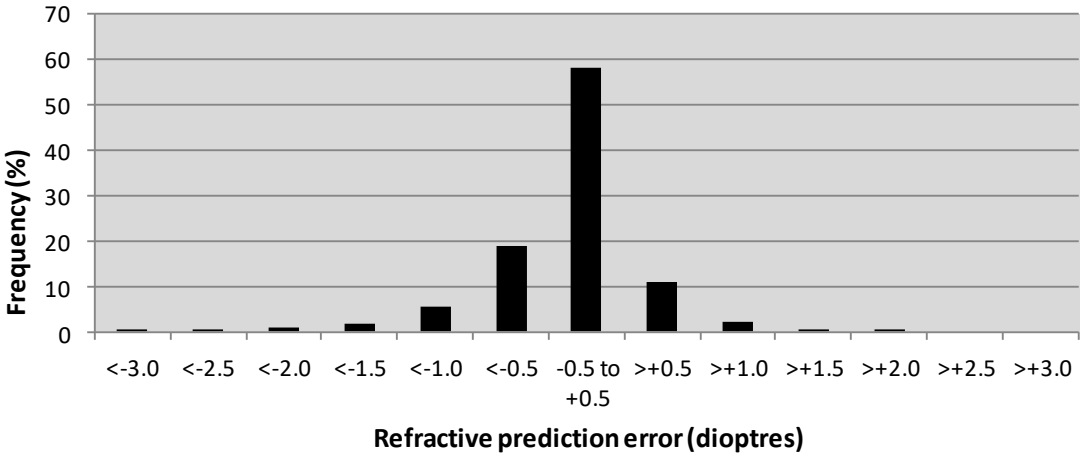

Figure 5. Five-year refractive prediction error (N = 1,232).

Table 5. Cumulative percentage of prediction error outcomes, five-year comparison

Percentage achieved	2008 N = 255 (74% of sample)	2009 N = 251 (75% of sample)	2010 N = 242 (69% of sample)	2011 N = 240 (69% of sample)	2012 N = 244 (69% of sample)
Within ±0.50DS	68.2	71.7	64.1	71.3	74.6
Within ±1.0DS	89.4	92.8	92.2	91.7	93.5
Within ±1.5DS	96.4	97.2	96.8	99.6	98.0
Within ±2.0DS	99.6	99.6	98.4	100	99.6
Within ±2.5DS	100	99.6	100		100
Within ±3.0DS		99.6			
Within ±3.5DS		100			

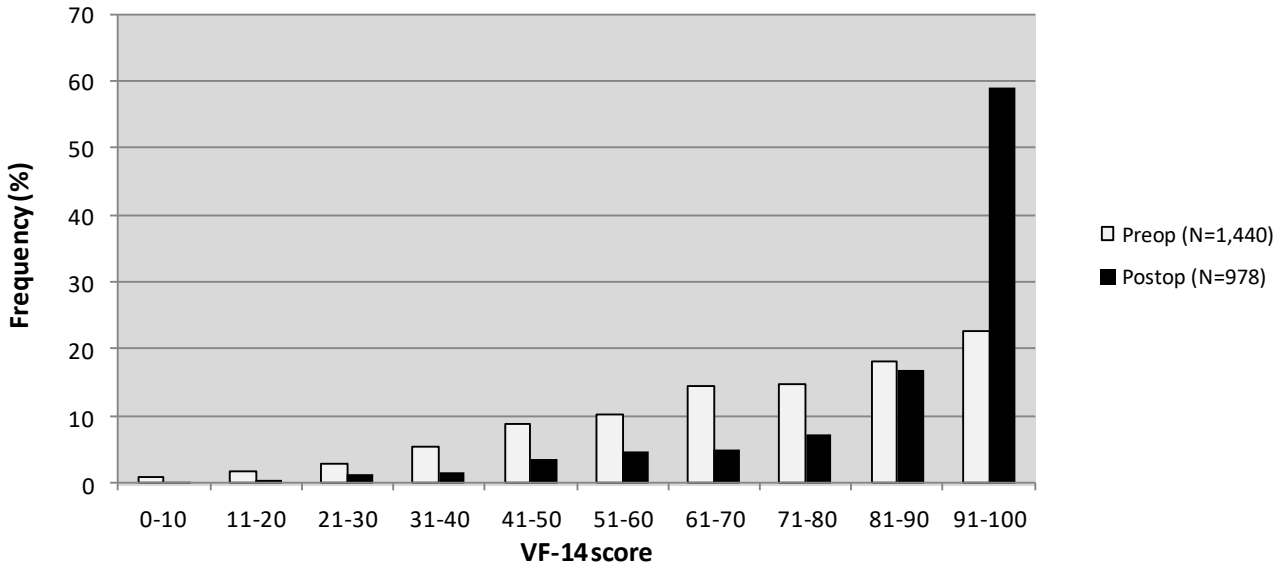

Figure 6. Five-year comparison of preoperative and postoperative VF-14 scores.

Table 6. VF-14 visual function, five-year comparison of preoperative and postoperative scores

VF-14 question	Preoperative 'At least mod difficulty' N = 1,447 (%)	Postoperative 'At least mod difficulty' N = 999 (%)
1. Reading small print such as labels …	59	28
2. Reading newspaper or book	53	24
3. Reading large print …	28	12
4. Recognising people …	16	8
5. Seeing steps, curbs …	23	11
6. Reading traffic, street and shop signs	31	12
7. Doing fine handiwork …	51	22
8. Writing cheques, filling forms …	37	15
9. Playing games …	29	14
10. Sports …	35	13
11. Cooking, self-care	18	11
12. Watching television	30	12

Table 7. Final VF-14 outcome compared to preoperative VF-14, five-year comparison

Percentage achieved	2008	2009	2010	2011	2012
Both pre- and post-operative VF-14 known	57	52	39	44	48
VF-14 improved	76	77	75	73	73
VF-14 remained the same	10	4	6	9	5
VF-14 decreased	14	19	19	18	22

which ranged from 72 to 76 years,[5,8,12,14,16-20] with 43% of patients in their 70s. The 58% of first-eye operations was similar to the 58 and 59% reported elsewhere.[5,7]

Visual acuity

The mean BCVA showed a small significant change over the five-year period and demonstrated a trend towards operations performed at milder levels of visual impairment, as the VA of the operated eye was 6/12 or better in 29% in 2008, with a steady increase over the five-year period to 43% in 2012 (Figure 2 and Table 2a). Such a trend to earlier surgery was also reported in the UK National Cataract Survey, with 45% of operated eyes having VA of 6/12 or better in 2003, compared with only 27 to 31% in 1997.[5,12] In other studies preoperative levels of vision have reported a very wide range, with the proportion having VA 6/12 or better varying from 17 to 47%.[5,7,9,12,15,17,18,21] Historically, less than 9% had VA of 6/12 or better in 1990,[5] prior to the now common procedures of phacoemulsification, foldable IOLs and small-incision surgery. It must be noted that there was no standardised method of measuring VA as these results were obtained from clinical records and converted to decimal notation from a Snellen fraction. This results in an imperfect statistical analysis in comparison to LogMAR VA which with logarithmic scaling allows equal steps between

lines and standardisation of results.[22]

Over five years, the mean BCVA increased from between 6/14.6 and 6/16.7 initially, to between 6/6.7 and 6/7.2 after cataract surgery. The final BCVA was 6/12 or better in 94 to 97%, 6/9 or better in 85 to 90%, and 6/6 or better in 44 to 57% of patients. These outcomes are similar to previous reports where final BCVA of at least 6/12 was reported in 83% to 98%.[5,7,9,13,18-21,23,24] The proportion of patients with BCVA of at least 6/9 compared favourably with previous reports of 73 to 90%;[23-26] and those with BCVA of 6/6 or better also compared well to 46% reported by Jaycock et al.[5]

When comparing visual acuity outcomes, it is important to consider the reported inclusion or exclusion criteria. It is interesting to note that the proportion of eyes with ocular comorbidity achieving VA of 6/12 or better has been reported as 75 to 80%,[5,20,23] in comparison to those without pre-existing ocular comorbidity and/or surgical complications, where 92 to 97% achieved 6/12.[5,7,18,20,21,23] The sample from our study included all patients receiving surgery; those with pre-existing ocular pathology such as age-related macular degeneration, diabetic retinopathy, glaucoma and previous trauma; those with surgical complications including posterior capsule rupture, anterior vitrectomy, zonular dehiscence and extracapsular cataract extraction; and postoperative complications such as cystoid macular oedema.

Lundstrom et al recommended a benchmark of 97% gaining VA 6/12 or better, including all patients in their study, in comparison to Hahn et al who suggested 98.5% but had a very restricted sample of only uncomplicated surgery from experienced surgeons and those with no comorbidity.[7,13] In our study, of the patients who were known not to achieve 6/12, the vast majority had significant pre-existing retinal or corneal pathology.

In an analysis of final BCVA in relation to patient age, Jaycock et al reported a rapid decline in the proportion of eyes achieving 6/6 from the age of 65 years, whereas a similar decline was not evident with BCVA of 6/12 until 80 years.[5] Our patients show a similar pattern, with the drop in VA only minimal at the 6/12 level, reducing from 97% of those less than 60 years to 93% of those in their 80s; but markedly different for those achieving 6/6, reducing from 63% of those less than 60 years to only 38% of those 80 years and older. Clinically, these results are important as this makes the prognosis for VA outcome quite different for those over 80 years of age and may be reflected in the mean value if the sample reported is from an older demographic.

It is interesting to note that there are a small number of patients who do not improve after surgery, being either worse (1.5 to 4%) or unchanged (2 to 4%) This is within the levels reported by others of 1.7 to 4.8% worse postoperatively,[5,15,18,21] and 5 to 11% unchanged,[5,15] usually due to pre-existing disease.

Refraction

Over the five-year period the spherical equivalent refractive outcome was within ±1.00DS for 88 to 93%, and within ±0.50DS for 66 to 77% of patients. Final refractive outcome has been reported within ±1.00DS in 74[27] and 82%[16] and within ±0.50DS in 44%.[27]

Calculation of the prediction error, the difference between the predicted and the actual outcome refraction showed a mean error of -0.03 to -0.13DS, ranging from -3.08 to +2.20DS. This wide range is similar to other studies, with the 99% range previously reported as -3.98 to +2.92DS[21] or within ±4.00DS.[9] The prediction error of our sample was within ±1.00DS for 89 to 94%, and within ±0.50DS for 64 to 75%. Other studies have reported between 79 and 97% within ±1.00DS[7-9,11,13,20,24] and between 49 and 80% within ±0.50DS.[8,9,11,13,24]

Absolute Error is the amount of refractive prediction error irrespective of the direction. Mean absolute error (MAE) reduced from 0.48 to 0.36DS over the five years, however this was not a statistically significant change. Improvements in MAE over time have been reported from 0.77DS in 1995 to 0.67DS in 2000,[20] and from 0.63DS in 2003 to 0.55DS in 2006,[11] with the European Registry reporting MAE of 0.55DS for 2009 to 2011.[7]

The refractive outcomes at Monash Health from 2008 to 2012, measured by both absolute refractive prediction error and proportion of patients within ±0.50DS and ±1.00DS, demonstrate stable outcomes. This may reflect the procedural changes made in 2006 to improve reliability and consistency of measurements; including the introduction of partial coherence laser interferometry biometry and the performance of all biometry scans by the one orthoptist. Previously biometry had been performed by a varying number of consultants and registrars. The introduction of a more consistent methodology, including measurement of both eyes and the measurement of the glasses, also improves the reliability of the results, assisting with confirmation of results and the detection of outliers.

Benchmark standards are recommended by various studies, however the inclusion criteria and outcome measures vary between studies. On review of the literature, looking at refractive outcomes over the time period from 2001 to 2009, it can be seen that prediction error has improved, with one study reporting three cycles from 2003 to 2006, with those within ±1.00DS increasing from 80 to 87% and within ±0.50DS from 49 to 60%.[11] Gale et al (2009) recommend setting the benchmarks of refractive prediction error at 85% within ±1.00DS and 55% within ±0.50DS, though it must be noted that their sample included only uncomplicated surgery, with 'in the bag' lenses and final BCVA of 6/12 or better. Hahn et al in 2011 recommend a higher benchmark of 80% within ±0.50DS; though do suggest that this is derived from a sample excluding any

ocular comorbidity, using experienced consultant surgeons and only including those with uncomplicated surgery and a postoperative BCVA of 6/7.5 or better; and propose these figures as a contribution to the discussion of how valid benchmarks should be derived.[13] Lundstrom et al (2012) are more in line with Gale et al, recommending an outcome refraction of 87% within ±1.00DS, including all postoperative results.[7] One further measure, mean absolute error of 0.6DS, is recommended as a benchmark outcome.[7]

There are several sources of error which may affect the refractive outcome, including the preoperative measurements, surgical procedures and resultant lens position. The major sources have been reported as: prediction of the effective lens position (35% contribution to error), postoperative refraction measurement (27%), axial length measurement (17%), and pupil size and its effect on spherical aberration (8%).[28] Effective lens position can be affected by customisation of the A-constant, IOL haptic design, the surgical incision, capsulotomy size and many other unmeasurable variables. Other variables may include astigmatism, optical aberrations, alignment of the visual axis, and surgically-induced corneal changes. One study suggested that cataract density affected refractive outcome by errors in axial length measurement due to changes in the refractive index of the lens.[29] With our model of care, the patients are returned to their referring clinician for the four-week assessment, which means the results are obtained from a large number of clinicians, with no standardisation of outcome measures. Of interest in this context is the added factor described by Norrby that the refractive outcome measure itself has such variability that it contributes significantly to the total error,[28] which would further complicate the outcome result in our series.

Visual function, VF-14

Over the five-year period the mean preoperative VF-14 visual function score varied from 69.56 to 74.19, slightly less than the mean values reported by others of 75.1 to 79.4.[10,14,16,30,31] Of the entire sample, 41% had a preoperative VF-14 score greater than 80, including 23% with a score greater than 90. A trend towards a lower VF-14 threshold has been reported with visual function scores of greater than 90 in more than 30% of patients.[14,31]

The mean postoperative VF-14 visual function score over the five-year period varied from 84.90 to 89.02, slightly less than the mean values reported by others which ranged from 88 to 93.[14,16,31-33] There was a statistically significant improvement from the mean preoperative score, with 76% reporting a postoperative score greater than 80, an increase from 41% preoperatively. Similar to the BCVA outcomes, 73 to 77% reported an increase in their VF-14 score, with others either decreased or remaining the same. These results are similar to other studies which reported between 23 and 28% of patients with no change or a decreased score,[14,16,31] or 16% who reported no improvement with Catquest, another visual function questionnaire.[20]

It can be seen in Table 6 that the tasks presenting most difficulty for the patients were 'reading small print such as labels …', 'reading the newspaper or book' and 'doing fine handiwork …', with 59%, 53% and 51% reporting at least 'moderate difficulty', respectively. Postoperatively these were reduced to only 28%, 24% and 22% respectively. The tasks associated with fine near vision have been reported as the most troublesome preoperatively, with the highest correlation postoperatively between the change in these abilities and satisfaction after surgery.[14,16,30]

CONCLUSION

The outcomes achieved of BCVA of 94 to 97% 6/12 or better, 44 to 57% 6/6 or better and refractive prediction error of 89 to 94% within ±1.00DS and 64 to 75% within ±0.50DS are within the recommended benchmarks. The Monash Health cohort of patients included all those who received surgery; those with systemic and ocular comorbidities, complicated surgery and both trainee registrar and consultant surgeons.

Though the mean of each measurement improved and the majority gained a good level of function, it must be noted that there was still a small number of patients who decreased on either of these measurements, as has been reported by others, with the most frequent reason being the existence of ocular comorbidity in the operated eye.[5,7,14-16,18,20,31,33] This emphasises the importance of a patient's understanding of a guarded prognosis when making the decision to have cataract surgery.

Best clinical practice involves a comparison of outcomes to established benchmark standards. Continual monitoring of clinical, administrative and surgical processes is required to maintain the highest level of patient care and efficiency. The more recent introduction of electronic medical records will assist in the easier collection of data, making ongoing evaluation, learning and quality improvement a much easier and more time-responsive process. As the population ages, there will be an ever-increasing need for cataract surgery, and so an efficient provision of this service will become increasingly important. The Monash Health model of care, promoting cataract management as day-case surgery integrated with community-based referral and follow-up management, continues to provide a resource-efficient model.

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Investigating the Effectiveness of an Orthoptist-Led Diabetic Retinopathy Screening Clinic

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ABSTRACT

Aim: To determine the effectiveness of the orthoptist-led diabetic retinopathy screening clinic at Northern Health by investigating the diagnostic agreement between orthoptists and ophthalmologists.

Method: This study was a retrospective audit of 1,097 patients booked at the Northern Health orthoptist-led screening clinic. The demographic data and clinical assessment findings were recorded for the 101 included patients (192 eyes). The orthoptists' diabetic retinopathy diagnoses were compared with those made by the ophthalmologists using a kappa analysis.

Results: Substantial agreement was observed between the orthoptists and ophthalmologists in relation to the diagnosis and detection of diabetic retinopathy ($k = 0.660$, $p < 0.001$).

Conclusions: Strong agreement was found between the orthoptists and ophthalmologists when detecting and diagnosing diabetic retinopathy for patients attending the Northern Health orthoptist-led clinic. This suggests that orthoptists are able to effectively detect and diagnose patients with diabetic retinopathy in a hospital outpatient setting and provide a high level of care.

Keywords: diabetic retinopathy, screening, orthoptist

INTRODUCTION

Diabetic retinopathy (DR) occurs as a complication of diabetes. It is characterised by the presence and development of retinal vascular lesions that can leak fluid and cause clinically significant macular oedema (CSMO), which is the leading cause of vision loss in those with diabetes.[1-4] Diabetic retinopathy is currently the leading cause of blindness in working-age adults with a strong association between the severity of retinopathy and the duration of diabetes.[1,2,4-6] Duration of diabetes is the strongest risk factor in those with non-insulin-dependent diabetes. They are also at a slightly higher risk of developing diabetic retinopathy than insulin-dependent patients due to recent improvements in metabolic control.[4] Ophthalmic screening, with the appropriate treatment and management, has shown to prevent vision loss in up to 95% of cases.[7,8] According to the National Health and Medical Research Council,[4] all people with diabetes should have a dilated fundus examination at the time of diagnosis and then at least every two years thereon. Indigenous Australians, people from non-English speaking backgrounds and those living in rural and remote areas should undergo annual screening. More frequent screening is indicated in these populations due to a higher prevalence and earlier onset of non-insulin-dependent diabetes as well as poor access and low utilisation of services.[4,9] Unfortunately, patient compliance is poor, with up to 50% of Australians not undergoing screening within the recommended time frame.[1,6,8]

In order to meet the increasing demand placed on the current healthcare system, we need to look towards workforce reform and to develop allied health professionals to extend their practice. This is particularly evident in the eye healthcare system and more recently for orthoptists.[10,11] Extending orthoptists' scope of practice has many advantages and has the potential to inspire a variety of innovative models of care. In Australia, orthoptists are well placed within the public health system to address the increased demand for eye care services. An extension of orthoptic roles to monitor and manage stable ophthalmic disease has the potential to improve service delivery whereby patients are seen in a more timely manner with a reduction in waiting times and ophthalmologists are able to concentrate their higher level skills on more complex and surgical cases.

Northern Health has been active in expanding orthoptic services in response to increasing demand and has specifically introduced orthoptist-led clinics targeting diabetic retinopathy. This clinic was designed as a screening and assessment clinic whereby the orthoptists would independently examine each patient and determine the appropriate review and management in accordance

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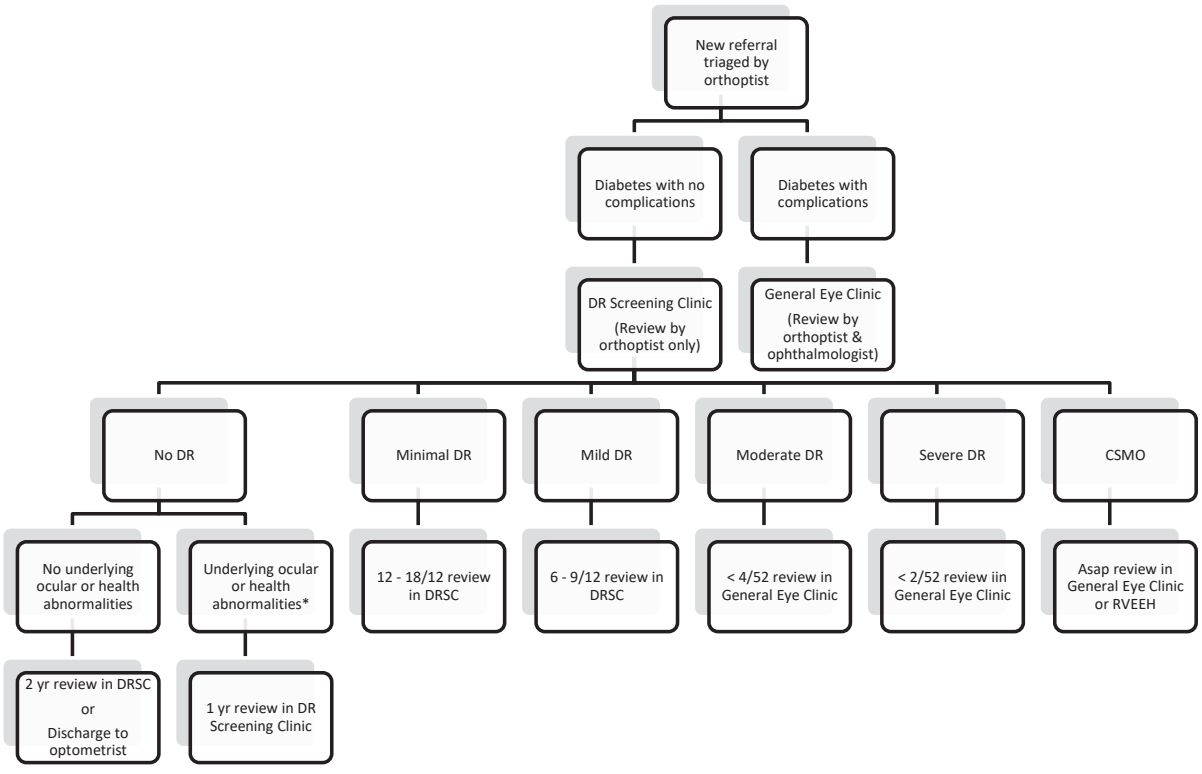
with the National Health and Medical Research Council (NHMRC) guidelines for the management of diabetic retinopathy.[4] The DR screening clinic has been running for approximately 12 years at Northern Health consisting of three orthoptists, three ophthalmologists and one registrar. The driving force to commence this clinic was the demand for services, with an increasing number of people diagnosed and living with diabetes.

Figure 1 illustrates the clinical pathway for patients referred for a diabetic eye check. In the initial triage process, patients are classified as either having 'diabetes with complications' such as increased blood sugar levels, high blood pressure or cholesterol, or any known retinopathy; or as having 'diabetes with no underlying complications'. Patients with complications are to be seen in the general eye clinic by both an orthoptist and ophthalmologist. Patients with no underlying complications are seen in the orthoptist-led DR screening clinic. In this screening clinic, the patient's condition is diagnosed and assigned a classification according to the NHMRC guidelines. A patient with no retinopathy is either reviewed in two years, or discharged to their local optometrist if they have no underlying ocular or health conditions. A patient is considered for earlier review (within 12 months) if they are Indigenous Australians; from non-English speaking backgrounds; have a long duration of diabetes, poor glycaemic control, hypertension or blood lipid control; or have renal disease. If the patient is diagnosed with minimal DR they are reviewed in 12 to 18 months in the screening clinic. If mild retinopathy is detected the patient is reviewed in 6 to 9 months in the screening clinic. When moderate DR is detected, the patient is then reviewed in the general eye clinic within four weeks. If severe retinopathy is diagnosed the patient is seen in the eye clinic as soon as possible or within two weeks. If CSMO is identified and confirmed on ocular coherence tomography (OCT) in any patient, they are seen in the eye clinic or referred to the Royal Victorian Eye and Ear Hospital, depending on the day and time, as soon as possible for appropriate treatment and management.

METHODOLOGY

Participants

From January 2012 to July 2013, a total of 1,097 patients were booked into the DR screening clinic. From these, 996 patients were excluded from this analysis. Four-hundred-and-sixteen patients (41.7%) failed to attend their appointment with either health professional, 84 patients (8.7%) were discharged from the clinic to their general practitioner or optometrist and 316 patients (31.7%) were



*Indigenous Australians, those of non-English speaking backgrounds, those with longer duration of diabetes, poor glycaemic control, hypertension, poor blood lipid control or renal disease

Figure 1. Patient pathways for diabetic retinopathy screening at Northern Health.

to have a review appointment with the orthoptists only. For 103 patients (10.3%), there was no DR diagnosis data available from one or both health professionals and 77 patients (7.7%) did not meet the clinic criteria. This resulted in a total of 101 patients (192 eyes) included in the study.

Procedures

Data was retrospectively collected from the medical histories and referrals of patients who had attended the DR screening clinic. A list of the unit record numbers of patients was obtained and used to de-identify the patient for their confidentiality. The project was approved by the Northern Health Low Risk Ethics Committee and the La Trobe University Faculty of Health Sciences Human Ethics Committee (Project No. FHEC12/103). The medical histories of these patients were reviewed in date order and data was recorded including demographic details of age and gender; and clinical information of visual acuity and diagnosis by the orthoptist and ophthalmologist.

A standard clinical assessment was performed by the orthoptists for each patient in the orthoptist-led DR screening clinic. The assessment included taking a clinical history (including HbA1c, blood sugar level and type of diabetes), visual acuity, subjective refraction, and anterior and posterior segment examination. Non-mydriatic and mydriatic fundus photos and an OCT were also performed on each patient.

For the diagnosis of diabetic retinopathy, the NHMRC modified Airlie House classification (Wisconsin system) was used.[4] Diabetic retinopathy is categorised as non-proliferate (NPDR) or proliferative (PDR). Non-proliferative disease is further classified into: none, minimal, mild, moderate and severe retinopathy, which can further develop into PDR (Table 1). CSMO can occur in either type of retinopathy.

Table 1. Classifications for the diagnosis of non-proliferative diabetic retinopathy[4]
None
No signs of diabetic retinopathy
Minimal
Microaneurysms only
Mild
Microaneurysms and one or more of; retinal haemorrhages, hard exudates or cotton wool spots
Moderate
Microaneurysms in at least one retinal quadrant and one or more of; cotton wool spots, venous beading or intraretinal microaneurysms
Severe
Any of; microaneurysms in all four quadrants, intraretinal microaneurysms in one or more quadrants, or venous beading in two or more quadrants
Clinically significant macular oedema
Retinal thickening of the macular centre or hard exutdates near the centre of the macula with adjacent thickening

The classification system grades the severity of retinopathy based on the presence or absence of specific retinal lesions such as haemorrhages, microaneurysms, hard exudates, venous beading, intraretinal microvascular abnormalities, soft exudes or cotton wool spots, neovascularisation involving the optic disc or elsewhere in the retina. The severity scale is indicated for use at every assessment in order to determine the need for follow up, referral or treatment.[4] Only NPDR and CSMO were assessed and classified in this study. Patients with proliferative PDR were reviewed, treated and managed in the general clinic by the ophthalmologists.

Data Analysis

All data was recorded on data collection forms, entered into an excel spreadsheet for statistical analysis using IBM Statistical Package for Social Sciences (SPSS) software, Version 21.0. Statistical significance was set at $p \leq 0.05$. Descriptive statistics were utilised to present the characteristics of the study population. A kappa analysis was used to review agreement between the orthoptists and ophthalmologists. To evaluate the agreement between these professionals, the orthoptists' clinical outcomes and decisions were compared to that of the ophthalmologists.

RESULTS

Of the 101 participants, 55 (54.5%) were females and 46 (46.5%) were males. At the initial appointment with the orthoptist, the mean age of participants was 66.4 years (SD ± 14.7), ranging from 26.7 to 91.1 years. Visual acuity of the participants ranged from Snellen acuity 6/5 to counting fingers at 1 metre. Table 2 presents the classification agreement data for the orthoptists and ophthalmologists. The kappa analysis for the agreement between the orthoptists and ophthalmologists when detecting and diagnosing diabetic retinopathy revealed substantial agreement between the two professionals ($k = 0.660$, $p < 0.001$). In addition to diabetic retinopathy, two eyes were found to have an epiretinal membrane and one eye to have drusen, each of which was diagnosed by both professionals.

DISCUSSION

When looking at the agreement between the orthoptists and ophthalmologists for the diagnosis of diabetic retinopathy, this study showed statistically significant substantial agreement with only 42 disagreements out of a total of 192. Thirty of these differences were due to the orthoptists under-diagnosing the severity of retinopathy, and 12 were due to over-diagnosis compared with the ophthalmologists. This rate of under-diagnosis could have been affected by the time delay between the patients' appointments. It is known that the duration of diabetes strongly predicts the

Table 2. Classification and agreement by orthoptists and ophthalmologists for non-proliferative diabetic retinopathy

		Ophthalmologist classification						
Orthoptist classification		No DR	Minimal	Mild	Moderate	Severe	CSMO	**Total**
	No DR	**87**	6	6	0	0	0	**99**
	Minimal	3	**10**	7	1	0	0	**21**
	Mild	3	4	**19**	8	0	0	**34**
	Moderate	0	0	1	**27**	2	0	**30**
	Severe	0	0	0	1	**2**	0	**3**
	CSMO	0	0	0	0	0	**5**	**5**
	Total	**93**	**20**	**33**	**37**	**4**	**5**	**192**

severity of retinopathy,[1,4,5,12] and therefore it would be of benefit to record and analyse this when conducting future research.

The factor of inter-rater reliability and experience requires consideration, as there were three orthoptists in the DR screening clinic and three ophthalmologists, including one registrar, in the general clinic. This has the potential to increase disagreements between graders due to varying competencies and experience with screening. Inter-rater reliability should be taken into consideration when conducting further research, including factors such as workplace experience, duration of employment, skill level and any training or education received.

The accuracy and agreement for classifying moderate and severe retinopathy and CSMO are the most clinically important diagnoses in this study. When looking at the diagnosis of moderate retinopathy, there were 10 discrepancies in a total of 37 participants. Orthoptists under-diagnosed eight eyes as having mild, and one eye as having minimal retinopathy, which meant that nine eyes (7 patients) were not referred for ophthalmic assessment by the ophthalmologist, but were booked for review in six to nine months time with the orthoptists. Overall, the orthoptists' results concurred with the ophthalmologists when diagnosing moderate retinopathy. In a study by Klein et al,[13] patients who had moderate retinopathy at their baseline exam were found to progress to proliferative retinopathy in at least one eye within six years. In a later study, Henricsson et al[12] reported that patients with moderate retinopathy showed a 50% risk of vision loss resulting from progression to proliferative retinopathy or CSMO within three years. The earlier detection of moderate retinopathy by orthoptists may help with timely treatment and to slow progression if detected early and monitored frequently.

The diagnosis of severe retinopathy proved to be the most difficult, with an equal number of agreements and disagreements between the professionals. There were however, only four eyes diagnosed with severe retinopathy, with the orthoptists under-diagnosing two eyes as having moderate rather than severe retinopathy. The outcome for under-diagnosis in these cases however, was not of clinical concern as the patients were still referred and reviewed in the general eye clinic by an ophthalmologist within four weeks of screening. Henricsson et al[12] reported that 50% of those with severe retinopathy progressed within one year to the proliferative stage and/or CSMO, which highlights the need for accurate and timely diagnosis of severe retinopathy. Further research with a larger sample of patients with severe retinopathy would clarify the accuracy of orthoptists with this classification level.

There was complete concordance between orthoptists and ophthalmologists in this study for the detection of CSMO, with a 100% agreement rate. CSMO is the most common cause of vision loss in diabetic retinopathy, which makes its clinical detection particularly important.[1,4] Prompt diagnosis of CSMO is imperative as urgent treatment is indicated in these patients to prevent any further retinal damage and vision loss.[1,4] One-third of untreated patients with CSMO will have a significant loss of central vision within three years.[1]

A number of studies have investigated the use of trained non-physicians, including retinal photographers, ophthalmic nurses, primary graders, general practitioners, optometrists and orthoptists as graders for diabetic retinopathy screening.[3,7,14-20] It is however, difficult to directly compare these studies to this one as various grading and classification systems were used as well as different screening and assessment tools. A number of health professionals in these studies appeared to under-diagnose

diabetic retinopathy more often than over-diagnose, which is similar to the orthoptists' trends in this study.[14,15,17]

In this study, the orthoptists appear to have the required skill-set necessary to accurately diagnose the majority of diabetic retinopathy classifications. Additional training and guidance in detecting cases of minimal and severe retinopathy would further strengthen the orthoptists' skills in DR screening. As Georgievski et al[16] stated, minimal training for orthoptists has the potential to uniformly prepare them to participate and run DR screening clinics. This has been demonstrated in various other studies where general practitioners, optometrists and non-physicians received specific training to meet screening standards.[7,15,20,21]

CONCLUSION

This study suggested that orthoptists at Northern Health have the necessary skill-set to effectively diagnose and detect diabetic retinopathy in a diabetic retinopathy screening clinic. There was significant agreement between orthoptists and ophthalmologists when diagnosing absent, mild and moderate diabetic retinopathy as well as clinically significant macular oedema. Further training in the diagnosis of minimal and severe retinopathy is recommended to increase the effectiveness of the screening clinic. Future research needs to be conducted surrounding the role of orthoptists in leading DR screening clinics in order to support and lead healthcare reform in the development of new and improved models of eye service delivery. The demand for effective and efficient diabetic retinopathy screening clinics is constantly increasing and orthoptists are the ideal healthcare professional to be used in these screening models to help combat this growing public health issue.

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A Missed Case of Acute Macular Neuroretinopathy

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ABSTRACT

Acute macular neuroretinopathy (AMN) is a rare disease of the outer retina, most commonly presenting with a central or paracentral scotoma, wedge-shaped foveal lesions and hyper-reflective lesions, followed by thinning at the inner segment-outer segment junction. Patients report central/paracentral scotomas which correlate with visual field defects as detected by Amsler grid and automated static visual field testing. The case presented in this paper demonstrates the diagnosis of AMN in the absence of the full range of disease markers and highlights the importance of high density optical coherence tomography scanning in aiding the diagnoses of previously missed clinical conditions.

Keywords: Acute macular neuroretinopathy, spectral domain optical coherence tomography, paracentral lesion, scotoma

INTRODUCTION

Acute macular neuroretinopathy (AMN) is a rare condition which results in temporary or permanent visual loss.[1] It was first described in 1975 and at that time it was believed to be a condition which primarily affected the inner retina,[1] however further research and development in imaging techniques has shown that AMN is in fact a disease of the outer retina.[2-4] AMN is usually characterised by paracentral or central scotomas[1-4] and has been reported with the macula either unilaterally or bilaterally affected and visual acuity either normal or slightly decreased.[4] Wedge-shaped foveal/parafoveal retinal lesions of a reddish brown nature are commonly seen on retinal examination[4,5] with retinal haemorrhages occasionally seen.[6] It has been suggested that the aetiology is likely to be viral, with preceding flu-like symptoms commonly described.[1-5]

One case of suspected AMN in a young woman, who presented with paracentral scotomas, and remained undiagnosed for six years, is discussed.

CASE REPORT

A 21-year-old female presented to clinic initially in 2009, complaining of a small scotoma in the upper temporal visual field of the left eye for approximately eight days. She reported that the onset coincided with the end of a severe bout of flu. Visual acuity was 6/4 bilaterally, with fundus examination showing no defect or visible signs of maculopathy. A small superior temporal scotoma in the left visual field could be mapped on an Amsler grid, however Humphrey Visual Field Analyser (HVF) 30-2 demonstrated no abnormality in either eye. No signs of retinal lesions or haemorrhages were noted, with optical coherence tomography (OCT) and fluorescein angiography (FA) showing no apparent defect. The OCT was performed on the Zeiss Cirrus HD-OCT (Carl Zeiss Meditec, Jena, Germany), with a high definition 5-line raster completed, and FA was performed on the Topcon IMAGEnet 2000 (Topcon Medical Systems Inc, Oakland, USA). At this time no diagnosis or conclusions were able to be made by the ophthalmologists involved and the patient was not required to return for follow-up and was discharged.

Six years later the patient was re-scanned using the Heidelberg Spectralis OCT (Heidelberg Engineering, Heidelberg, Germany). The scan showed the absence of hyper-reflectivity with a residual paracentral lesion and disruption at the location of the inner and outer segment junction (ISOS), as shown in Figure 1. Amsler grid demonstrated a small superior temporal lesion in the left visual field as shown in Figure 2, however HVF 10-2 testing showed no defect. The patient reported the ongoing presence of the superior temporal scotoma, however over time a reduction in size occurred and it is no longer as pronounced.

DISCUSSION

Acute macular neuroretinopathy usually presents in young women of reproductive age,[5] as was the case with this patient. Disease markers for this condition include the presence of scotomas, foveal retinal lesions apparent on the fundus, retinal haemorrhages, and early presenting hyper-reflective retinal lesions followed by disruption or thinning of the outer nuclear layer demonstrated on OCT.[1,4,5,7] It is a condition which has been reported considerably in the literature, with the full range of disease markers aiding in diagnosis in the known cases.[1,3-12] The presenting symptom of a central or paracentral scotoma occurs in patients

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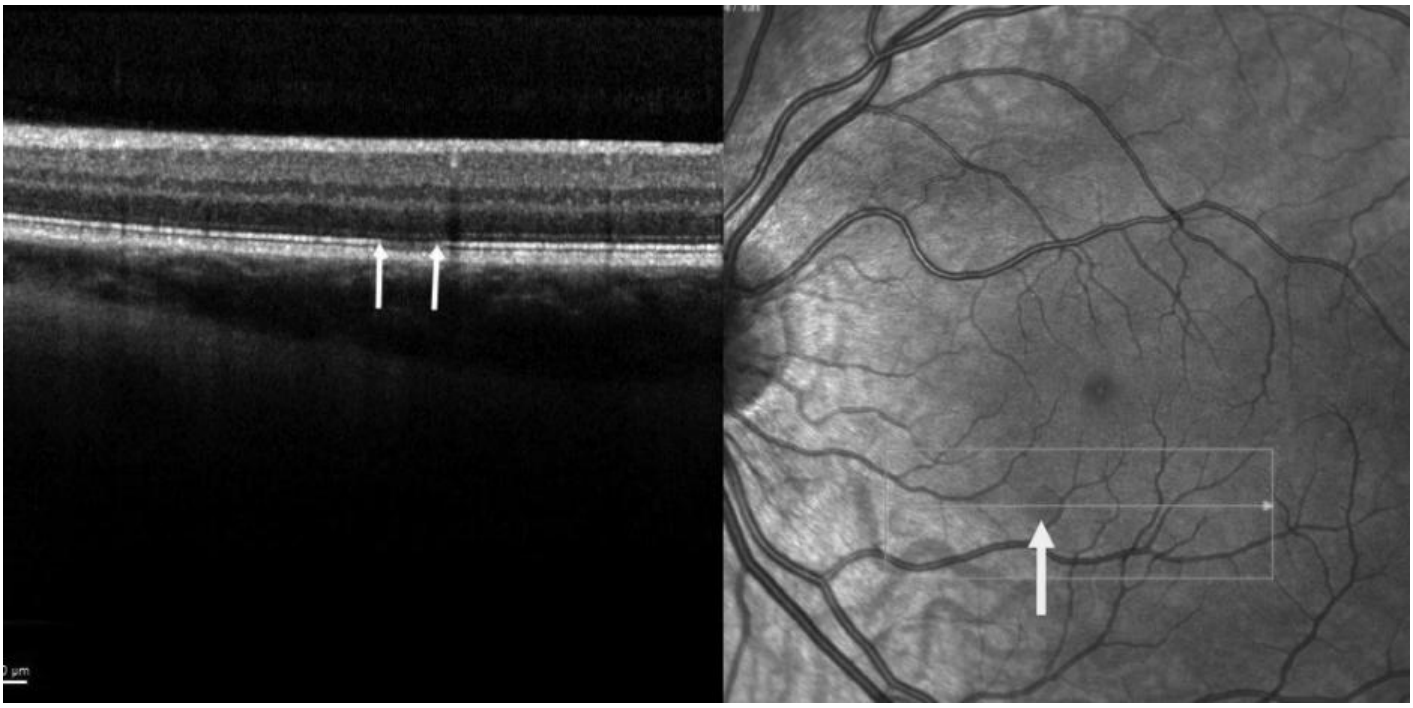

Figure 1. Residual paracentral lesion and disruption at the inner segment-outer segment junction (shown between the two arrows).

with AMN, prompting a thorough clinical examination to allow differential diagnosis.[4,12-14] Visual acuity is most commonly reported as normal, although cases have been reported where reduced vision is present.[7,12,14] Upon fundus examination reddish brown foveal or parafoveal lesions are reported in all but two of the published AMN cases,[4,5] with retinal haemorrhages also accompanying these lesions in rare circumstances.[6] In the case presented, foveal lesions as a distinct disease marker were not demonstrated, therefore the diagnosis of AMN in this case, as well as two others discussed in literature, was based purely on the presence of a scotoma and location of a lesion and disruption at the ISOS junction. The location of the discoloured foveal lesion will generally correlate with the scotoma location subjectively described and may be found on HVF 10-2.[4,13,15] The diagnosis of this rare condition can often be difficult with the signs appearing over a slow time course.[4,15] Aziz et al[5] reviewed 44 cases between 2002 and 2012, comparing them alongside 41 cases previously reviewed by Turberville et al.[4] The mean age at presentation was 30 years, 86% were female and 46% reported a preceding flu-like illness, just as in the case presented in this report.[5] Throughout the literature, pathogenesis of the lesion is described as uncertain, with immune-based aetiology agreed upon as the most likely cause.[1,5,9,16] The commonly used investigative techniques include OCT, Amsler grid, HVF 10-2, and colour and red-free retinal photographs. OCT is described as the most useful of the diagnostic tests, with its ability to show the initial hyper-reflective lesions in the outer nuclear layer which occur due to the disruption of the photoreceptor cell bodies, followed by the thinning of the outer retinal layers and the outer plexiform layer

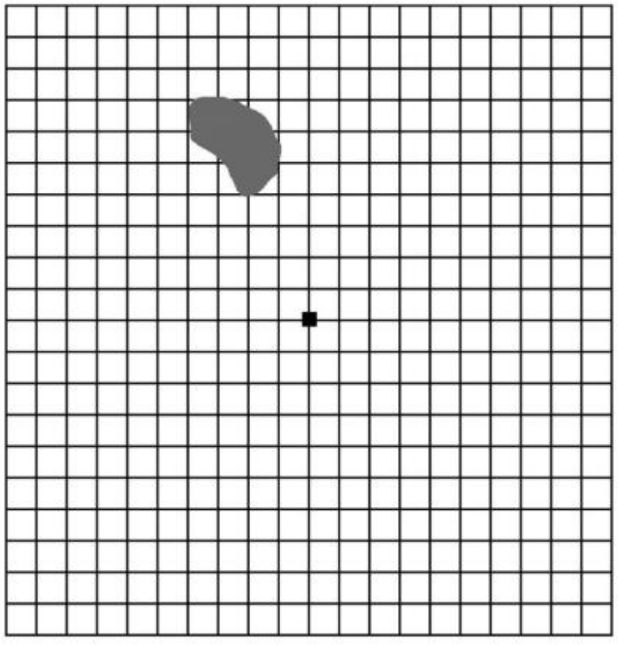

Figure 2. Small superior temporal scotoma in the left visual field.

which reveals absence of hyper-reflectivity.[2,13,16-21] Patients demonstrate retinal disease at the boundary or junction of the inner and outer segments,[5,13,19] which is able to be seen clearly on the OCT images. The case presented in this paper showed a residual lesion due to thinning and disruption of the inner and outer segment junction, however this lesion was less pronounced at the time of diagnosis due to long-term scarring, with subsequent absence of

hyper-reflectivity and a likely degree of resolution. This associated abnormality on OCT and HVF may persist for an indefinite period.[9] Electrophysiology is not routinely performed on those with AMN and typically elicits normal responses.[20,22,23] A limited number of cases in literature have shown both normal and subnormal implicit times on multifocal electroretinogram, demonstrating depressed cone photoreceptor amplitudes which would correlate to the location of the hyper-reflective lesion and abnormal photoreceptor function.[20,24] Fluorescein angiography and indocyanine green angiography (ICG) findings in AMN are reported as normal in the majority of cases where they have been performed as part of investigation, however hypofluorescence on FA corresponding to the lesion location is noted in a small number of cases.[5,13] In contrast, Sanjari et al present one case of bilateral AMN with correlating ICG changes, showing a delay in the filling of choroidal arteries and choroidal hyperpermeability.[14] This raises the question of whether more cases would show ICG changes if this level of testing was available or chosen to be performed at the time, including the case presented in this paper, where ICG testing was not performed. FA was performed in the case presented, and it was the finding of a normal result that enabled the ophthalmologist to rule out any pathological cause, and subsequently discharge the patient with no clear diagnosis.

The use of FA and ICG in patients with suspected AMN allows the differential diagnosis between other conditions which have similar presenting signs.[5,13] Common differential diagnoses include acute posterior multifocal placoid pigment epitheliopathy (APMPPE), acute retinal pigment epitheliitis, central serous chorioretinopathy (CSC), acute zonular occult outer retinopathy and idiopathic blind spot enlargement syndrome, which may also be referred to as white dot syndromes.[4,13] The similar nature of these conditions, associated subtle lesions and temporary visual loss in young to middle-aged adults presents them as important conditions to consider during investigation.[4] The lesions in AMN are distinguishable from these conditions by location and appearance, with those in AMN identified as depressed central macular lesions located in the outer retina. In comparison, CSC is identified by its serous detachment of the retina shown on OCT, and APMPPE is characterised by yellow coloured lesions located in the retinal pigment epithelium. APMPPE will also present with non-fluorescent lesions in early stages of the FA, whereas AMN commonly exhibits no abnormality in FA results.[4] Due to the rarity of AMN as an ophthalmic diagnosis, differential diagnosis is vital to avoid misdiagnosis and therefore to ensure the correct management.

Management of AMN is a debated topic within the literature. The prescription of corticosteroids as a method of treatment has been described, with Hashimoto et al reporting decreased scotoma size after four months of corticosteroid treatment.[25] Interestingly, this line of treatment does not appear to be discussed elsewhere and it is widely agreed that no treatment demonstrates benefits in assisting the resolution of AMN.[8] Scotomas which are present as a result of AMN may resolve over time,[6,9] however in many cases they remain, with approximately half of the reported cases showing no improvement.[4,5,9] Sixty-six of the 85 cases discussed by Aziz et al included follow-up results, and of these, improvement was reported in thirty-two.[5] This ongoing gradual improvement indicates that the disease process involves cell dysfunction over an extended period, rather than cell death, in which case no improvement would be expected.[9] The cause of the remaining long-term scotomas, documented present for up to nine years, is likely due to the thinning of the outer nuclear layer resulting in an irreversible attenuation of the photoreceptor body.[9,16,26] The case reported in this paper is an example of this with the scotoma remaining long-term, with only minimal improvement revealed since onset.

The technology of optical coherence tomography has improved significantly with development from the time domain Stratus, to the spectral domain Zeiss Cirrus and Heidelberg Spectralis now routinely used. The quality of scan produced and detail presented in spectral domain OCTs are superior to their predecessor the time domain, and disruption to the inner and outer segment retinal layers may only be demonstrated on spectral domain technology.[27-29] Currently there is no published literature which demonstrates superiority of the Heidelberg Spectralis to that of the Zeiss Cirrus in retinal layer examination. Given that spectral domain OCT imaging was used on the patient in both investigations, the failure to locate an initial hyper-reflective retinal lesion or subsequent residual lesion was not due to the technology used. Analysis of the two OCTs performed on the patient show the main difference being the spacing between scans. The Cirrus performed in 2009 was completed with scan spacing of 250 microns, whereas the spacing for the Spectralis scan was 11 microns. This increase in high density scans in a compact location is the most probable cause of the discovery of the lesion and disruption at the inner segment-outer segment junction which was previously missed six years prior.

CONCLUSION

The diagnosis of AMN in the presented case demonstrates the ease by which ophthalmic diagnoses can be missed. The absence of multiple disease markers, along with insufficient scan density, may have resulted in the failure to locate the lesion and the inability to provide a clear diagnosis in 2009. It is shown throughout the literature that the reddish brown foveal lesions consistently occur as a presenting sign, however it is interesting to see that along with the one presented in this paper only two other cases have been reported with scotoma and hyper-reflective lesions or

retinal layer disruption as the sole disease markers. This highlights the importance of considering the diagnosis of AMN in all patients presenting with central or paracentral scotomas. Failure of in-depth investigation using spectral domain OCT, particularly in the case of the absence of foveal lesions, may lead to a missed diagnosis. Performing a greater level of high density scans on the Cirrus OCT in the location of the scotoma, and considering the possibility of AMN as a diagnosis at the time of presentation, may have led to an earlier diagnosis of the condition for this patient. Although diagnosis of acute macular neuroretinopathy is uncommon and requires no treatment, it is an important ophthalmic condition which should not be overlooked as a possibility in the presentation of a sudden onset scotoma.

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Unusual Deviations from Standard Postoperative Instructions and Subsequent Review of Protocol

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ABSTRACT

The orthoptist plays an essential role in patient education and practice management. We present three unusual episodes of patient medication misuse, including two patients who mistakenly placed alternative liquids into their eye following surgery and a further patient who continued to use their medication after the family dog had used the bottle as a chewing device. Vision and safety outcomes varied considerably between cases. An orthoptist-driven review of postoperative standing orders was undertaken to reduce the risk of future occurrences. Supplementary graphics of the medications were added to the information forms. Patients were further requested to return accompanied to postoperative information visits to aid recall and emphasise proper protocol. Anecdotally there has been a reduction in medication-related enquiries following the intervention and no additional cases of ocular injury.

Keywords: cornea, correction fluid, cyanoacrylate glue

INTRODUCTION

Postoperative medication is essential in aiding successful surgery outcomes. Despite the clinic's best efforts, poor compliance and the misuse of medication remains a well referenced issue.[1-4] The outcomes can be significant. This paper reports three unusual excursions from the standard postoperative regimen and their outcomes. Combined, these cases led to a revision of the centre's postoperative instruction material and methodology.

CASE REPORT

Case 1:

A 58-year-old male truck driver attended the clinic investigating refractive surgery for a moderate hypermetropic astigmatic correction. He then proceeded to bilateral LASIK surgery. Surgery was uncomplicated and at day one uncorrected visual acuity was 6/9 in both eyes. Two weeks following surgery he returned complaining of reduced vision in the left eye. Uncorrected distance visual acuity (UDVA) was 6/120 improving to 6/21 with a small correction. On further questioning the patient admitted to placing correction fluid in his eye several days previously. This occurred as he mistook the bottle of correction fluid for his standard postoperative medication, both of which had been placed above the fridge (Figure 1). He attempted

Figure 1. Comparison between standard correction fluid and eye drop bottles.

to wash out the fluid but did not seek immediate medical attention. Despite prolonged treatment with corticosteroids (Maxidex, Alcon, Fort Worth, USA) and artificial tears (Systane, Alcon, Fort Worth, USA), corrected vision improved only to 6/15 with significant photophobia resulting from a central linear scar (Figure 2). Corneal topographical examination further indicated secondary irregular astigmatism (Figure 3). Options for visual rehabilitation were discussed including gas-permeable contact lenses and lamellar corneal transplantation. Due to the visual requirements for a commercial driver's licence, the patient

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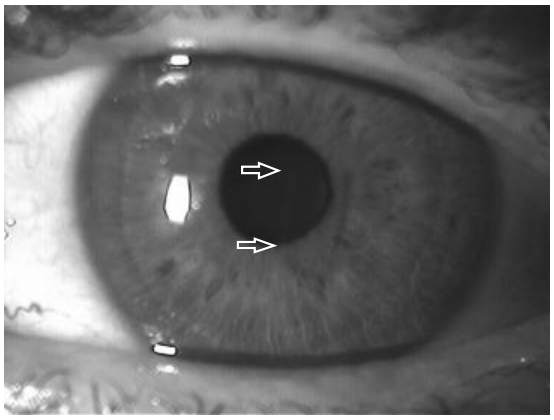

Figure 2. Central linear scar secondary to corneal insult (arrows indicate scar).

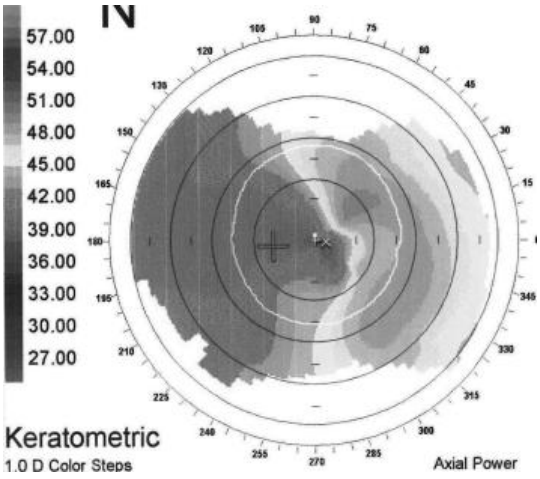

Figure 3. Topography showing irregular corneal astigmatism following liquid paper insertion.

proceeded to deep anterior lamellar keratoplasty. Following final suture removal two years post-surgery, he achieved UDVA of 6/7.5. The graft appeared clear and the patient comfortable.

Case 2:

Approximately three weeks following LASIK surgery, a 34-year-old man mistakenly placed cyanoacrylate (superglue) in his right eye in place of the provided artificial gel lubricant. Upon realising his eyelids were bound together he attempted to flush the lids with water albeit without effect. Upon presentation the patient was prepped for immediate surgery which necessitated the removal of several eyelashes and manually separating the lids. Fortunately minimal glue had contacted the corneal surface. The eye was irrigated and the patient commenced on antibiotics. UDVA remained variable before improving to 6/6 at one month post intervention.

Case 3:

A 63-year-old man successfully underwent cataract removal and intraocular lens replacement. At day one UDVA was 6/6 part. The patient was provided with postoperative instructions and booked for further review in two weeks. At the subsequent visit, he raised concern that during the interval his dog had managed to remove the antibiotic drops from the bedside table and subsequently chewed the bottle. Without thought for possible consequences, he had continued to use the drops. Fortunately slit lamp examination revealed no sign of infection. The bottle was removed from the patient and a replacement provided.

DISCUSSION

Although we have reported relatively unusual presentations, this series emphasises several issues of relevance to the standard postoperative population.

Since first being described by Margo and Trobe in 1982,[2] there have been repeated accounts of patients inadvertently placing superglue and other potentially dangerous substances into their eye.[3-8] Most commonly this is cyanoacrylate glue which is packaged similarly to many ocular ointments[9] (Figure 4). Tabatabaei et al[10] describe a large case series of patients attending a local hospital,

Figure 4. Examples of available superglue bottles.

where 105 patients presented across a three-month period to emergency for treatment of superglue related injuries. Seventy-two percent of injuries occurred at home, highlighting a general lack of awareness of the potential danger for ocular injuries. As expected, the cause attributed to the majority of cases was patient carelessness (78%). In their study, poor vision was found to contribute to only 3% of cases; however others have reported a higher incidence than this. O'Hare and co-authors previously showed that up to 12% of patients may misidentify standard pharmacy labels.[11] Smith et al suggested up to 40% of patients may

have significant issues identifying labels thereby placing themselves at risk of inadvertent instillation.[12] This may be exacerbated in the immediate period following ocular surgery where it is likely that a patient's near vision is impaired. Of note, Gavin et al related a case of repeated instillation of flea drops postoperatively by the patient's carer who did not wear her reading glasses, thereby proving vigilance is essential from all concerned parties.[8]

Our patients demonstrated a range of outcomes from minimal ocular discomfort to corneal scarring and irregularity requiring additional surgery. The effects of inadvertent instillation of toxic substances into the eye or surrounding region appears dependent on the properties of the fluid instilled, the time in the eye and the immediate treatment. Cyanoacrylate glue will bond almost immediately however as the glue commonly only bonds to surfaces that are dry, instillation typically will only involve eyelashes or the lid margins.[13] Contact dermatitis, loss of eyelashes and fusion of the lids are thereby routinely noted in superglue injuries. Drops that enter the eye may lead to symptoms, including conjunctival injection, corneal epithelial defects and punctate epithelial erosions. More severe cases, due to repeated instillation or delayed treatment, may lead to corneal oedema, Descemet's folds and eventual scarring.[8] Correction fluid includes a combination of titanium dioxide, mineral spirits, resins and solvents making it toxic to the ocular surface.[14]

Copious eye irrigation to remove the toxic substance is the essential initial treatment. In the case of superglue-related injuries, removal of patient eyelashes and manual separation of the lids may be required. Although it has been suggested that the eyelids may separate spontaneously within a week, amblyopia represents a possible sequela in young patients and is a consideration in early treatment.[13] There are no reports of significant amblyopia related directly to superglue injuries and subsequent tarsorrhaphy therefore this remains a theoretical issue.

The greatest concern for ophthalmology is the increasing pool of reports suggesting that previous strategies have not been effective. Industry regulation for pharmaceutical packaging has been explored without success.[3,6,15] The use of uniform cap sizing and colours for non-ophthalmic preparations, child-proof bottles, braille warnings, vertical ribs on bottles as warning and different odours are some of the various suggestions offered previously.[6,7] As this would likely require significant change to design and manufacturing processes, it remains unlikely these changes will be driven by industry. Morgan et al highlight this issue noting that the same company often creates packaging for both the general and pharmaceutical industries and therefore will have little, if no incentive, to introduce these changes.[3] The responsibility will fall to healthcare professionals to continue to report these incidents to regulatory authorities and further to provide adequate patient education and information.[16]

Hennessy et al reported that drop administration was a particular concern for the visually impaired patient.[17,18] One-third of patients missed initially when applying drops

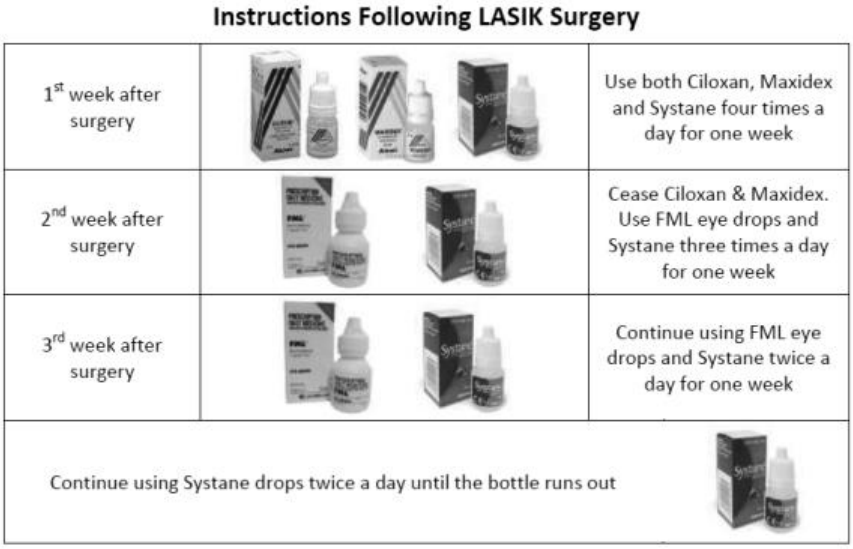

Figure 5. Postoperative instruction sheet with supplementary graphics.

to their own eye. A further one-third of patients touched the eye with the bottle during instillation increasing the risk of contamination. Perhaps of greatest concern however, was that almost half of all patients had an inaccurate perception of their own ability to instil eye drops correctly. Patient education and instruction is therefore essential to effective practice and harm minimisation. In response to our cases, the orthoptic team led a revision of current standing orders at our practice. To assist patient recall and minimise potential errors, supplementary graphics containing the prescribed medication were added to the respective information sheets (Figure 5). In keeping with literature recommendations, specific instructions, such as to keep the medication in a consistent location were emphasised during the consultation.[8,19] Furthermore, patients were encouraged to bring family or friends to the postoperative consultation as an additional tool to help accurately implement the instructions. The usefulness of education programs has been described previously. Shah et al, in their meta-analysis suggested that education interventions are not effective in the prevention of eye injuries albeit this review explored a broader narrative of potential injuries.[20] Kendrick et al, in their analysis of child and family interventions, propose some evidence in reducing injury rates albeit they also state that widely conflicting literature exists.[19] As our cases represent sporadic incidents, it is impossible to evaluate the success of the intervention however the absence of further events, including an anecdotal reduction in patient medication enquiries, suggests that the revision and education program has provisionally been successful.

CONCLUSION

The orthoptist plays an important role in patient education and practice management. Revision of standard postoperative protocols may represent a simple yet effective tool to help patients avoid unnecessary treatment-related errors.

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The 2016 Patricia Lance Lecture

50 years: The Development of Research and Publication in the Australian Orthoptic Journal

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ABSTRACT

This lecture was presented in honour and memory of Patricia Mary Lance in recognition of her contribution to orthoptics in the fields of research, education and the association, both in Australia and internationally.

After seven years of publishing the transactions of the annual scientific meetings, the first titled edition of the Australian Orthoptic Journal was published in 1966 as Volume 8, which means that 2016 marked 50 years of our journal with its current name. This anniversary provided an opportune time to look back over the journal and its development over the decades, from the very first orthoptic paper in the transactions of the 1959 meeting, which was by Patricia Lance, to the latest research publications in 2015.

Over this time the changes in society, culture, education and technology have all affected the development of research and this has been reflected in our journal.

Keywords: orthoptic history, education, research, professional development

INTRODUCTION

In 2016 we are celebrating 50 years of the Australian Orthoptic Journal with its current name. Upon being invited to present the 2016 Patricia Lance Lecture, it seemed fitting to look at the fifty year history of the journal to offer some insight into the development of our profession. Fourteen orthoptists were present at the inauguration of the Orthoptic Association of Australia in 1944 after which they met annually. From 1959, the Transactions of the Annual Scientific Meetings were typed and distributed to members. The first volume labelled as the Australian Orthoptic Journal was issued in 1966 as Volume 8, with the 1959 transactions labelled retrospectively as Volume 1.

1959 TO THE 1960s

In 1959 the very first paper published was by Patricia Lance on the A-Syndrome and as one of the founding members, she enabled so many phases of our development. In this era the majority of papers were on squint and sensory adaptations, with a treatise by Diana Mann in 1959 on perceptual and motor phenomenon of fusion and binocular reflexes, theories that still hold today.

The orthoptic training was hospital-based and in 1962 the first common final examinations for Sydney and Melbourne were held, with an interesting comment by Diana Mann in her report on the student examinations '… a certain set of minor faults and virtues characterised all Sydney answers, and another set the Melbourne ones … the lecturers appear to unwittingly have over or under emphasised certain topics'. It was suggested that the Association should give thought to questions of terminology. Coincidentally, the booklet *Orthoptic Terminology* was published by the British Orthoptic Society in 1962 and became the handbook for all students. The Association also discussed the need to determine the minimum body of knowledge required to fulfil the requirements of any clinical post in Australia – the beginning of workforce surveys.

During the 1960s we were beginning to forge a more formal relationship with ophthalmologists and the control of our own profession, with orthoptists first appointed to the Orthoptic Board of Australia in 1964. At this time, orthoptics was defined by squint and sensory disorders. Publications in the journal presented the 60s as the era of 'counting and cataloguing', with many papers describing the characteristics of squint such as type, gender, age of onset, laterality, size … One particular area of interest was the comparison of the proportion of divergent to convergent squints, with Australia showing a much higher proportion of divergent squints than the United Kingdom. Active orthoptic treatments and their outcomes were described, including anti-suppression, occlusion, bifocals and miotics. Eccentric fixation was the topic of the 60s; children given intensive pleoptic sessions (Haidinger's

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brushes, after-image stimulation, red-filer exercises and inverse occlusion), with rural and non-compliant children hospitalised for daily treatment. The numbers presented in some papers were very large: 70 cases of eccentric fixation, 127 cases of post-traumatic convergence insufficiency and Patricia Lance managed to amass 569 cases of diplopia for one paper.

Patricia Lance reported on a 1960 goodwill tour of Asia '… orthoptics is of very little interest in any of these countries … because squint plays such an exceedingly small part in their work.' There were '… too many cases of blindness … a large proportion of myopia among Asiatic people, which means that convergent squint, especially accommodative type is seen less often …' Fifty years later we are looking at progressive myopia as a population concern, with orthoptists playing a major role in this research.

Of interest was the beginning of orthoptists moving into the wider field of ophthalmic testing, with the Royal Victorian Eye & Ear Hospital employing two orthoptists as 'ophthalmic technicians' in 1964. There were papers on contact lenses and monocular aphakia, noting that 'ocular implants are considered dangerous and are proving unsuccessful overseas'; on the electro-oculogram and research into chloroquine retinopathy and retinal dystrophies; a case of fundus flavimaculatus with fluorescein angiography, which prompted Beverley Balfour to ask for ideas on how to produce eccentric fixation in a 13-year-old. Up until 1966, the transactions included the discussion following each presentation. These topics were all the flag-bearers for our current practice.

During this decade most papers were descriptive, with the first publication to report a two-group comparison of 'early surgery' (prior to five years of age) by Anne Walker in 1962, but no statistics. In 1969 Sandra Kelly published the first paper with statistical analysis, including the manual calculation of chi-square and significance, reporting that anisometropia presented a serious obstacle to the correction of eccentric fixation.

1970s

The last of the Diploma of Orthoptic Board of Australia (DOBA) hospital-based graduates in 1974 started work with Schiotz tonometers, Bjerrum and Goldmann fields. We moved into the colleges of advanced education with an Associate Diploma of Applied Science, transferring control of the curriculum from ophthalmologists to orthoptists; Cumberland College of Health Sciences in 1974 and Lincoln Institute of Health Sciences in 1975. Moving from the hospital service system to academic institutions meant that there was a more overt recognition of the need to ensure professional competence. We now had access to libraries, technical facilities and academic staff in biological, behavioural and physical sciences, providing a much broader support for research. The first male students were enrolled in the 1970s.

The 1970s saw the growing trend for orthoptists to work as 'ophthalmic assistants/technicians', so a redefinition was required to represent our profession to the government and within the medical and allied health world. Vivienne Gordon, in her 1977 President's address suggested 'Orthoptics is a specialised branch of medical sciences in the area of applied ocular physiology. The orthoptist is a responsible and clinically trained professional, working as part of the ophthalmic team within the scope and ethics of ancillary medical practice'.

The 'critical period' for amblyopia and binocular single vision became paramount with the research of Hubel and Wiesel in the 1970s. Our journal contained papers on what we still understood as 'traditional orthoptics', with the near reflex, AC/A ratio and intermittent divergent squint a perennial Australian problem. Publications on eccentric fixation, ARC and pleoptics were decreasing with the advent of earlier treatment, an effect of the earlier introduction of school medical services which aimed to promote better health and vision outcomes. Of note was Diana (Mann) Craig's 1976 paper on alternating sursumduction, later to be known as DVD, suggesting '… the clues when carefully collected and collated, the aetiology of ASD may ultimately be unravelled' – 40 years later, we are still not completely there. American terminology was now influencing our British heritage, with the change from 'squint' to 'strabismus' first appearing in the 1977 volume of the journal.

The entire 1972 volume was dedicated to dyslexia. Patricia Dunlop, in this volume and later, published several papers on her reference eye test and lateral dominance; and on the ocular characteristics and orthoptic treatment. The need for multidisciplinary basic research was stressed by all authors, along with the importance of the outcomes being assessed by remedial teachers and psychologists to assess the true value of any treatments. The initial 1971 joint statement by the American Academy of Ophthalmology and Otolaryngology, the American Association of Ophthalmology, and the American Academy of Pediatrics on dyslexia and learning disorders was issued in the context of the many claims by alternative therapists to cure dyslexia without scientific evidence, and has been reaffirmed in 2014; that dyslexia is not a disease of the peripheral visual system, that vision training is not supported by scientific evidence, and remedial education is required.

Several large scale vision screening projects were published for kindergarten and school-aged children, helping to establish age-related norms and the criteria for 'failure'. The 1970s saw us moving into the wider community, reporting the higher incidence of visual problems and the multidisciplinary care required for those with major systemic disorders, such as stroke, thyroid eye disease, cerebral palsy, and intellectual, hearing or visual impairment.

The 1970s saw the introduction of many tests that changed our practice – particularly gratings. The Catford drum showed that infants had better visual acuity than we previously thought. The Cam Stimulator for the treatment of amblyopia appeared, however follow-up tests failed to confirm its success. Contrast sensitivity brought us frequencies, square-waves and sine-waves. The journal at this time demonstrated the initial developments of software and technology, with some papers still producing bar charts with biro and a ruler, and those later in the decade presenting graphs such as 'curve of best fit', with complex statistical analysis becoming the norm. The journal was no longer just the transactions of the annual scientific meeting as papers were now submitted for peer review and publication.

1980s

Personal computers first appeared on desks in 1983; we could enter and analyse our own research data with the introduction of statistical software programs in the mid-1980s.

In 1982 Diana (Mann) Craig was still urging us to develop and change, to take on the challenge of the future; 'The more it changes, the more it stays the same. We still have severe critics to keep us on our toes. We still have new ideas to report, new goals appearing. In other words, our profession continues to be a developing and challenging one.'

The recurrent themes of the journal included sensory anomalies, fixation, microtropia, accommodation, convergence, AC/A ratio and orthoptic, surgical and pharmaceutical treatments. The 1983 Australian contribution to an International Orthoptic Association survey was 2,620 cases written by Patricia Lance and Reginald Mitchell, with a relative incidence of 70% esotropia and 30% exotropia. The perennial question of whether latitude or hours of sunlight were statistically significant was unable to be determined due to the uneven and localised population distribution along our east coast.

In 1983 British orthoptist Joyce Mein presented a clinical study that showed abnormal naso-temporal OKN in patients with the ET/LN/DVD triad. Anne Fitzgerald and Sandra Tait demonstrated abnormal decussation of temporal fibres at the chiasm in those with DVD.

Publications supported the expanding role of orthoptists in the community, with papers on head injuries, craniosynostosis, the newborn follow-up clinic, the spectrum of congenital rubella, alcohol and the visual system. A paper on ocular signs and aging was the first mention of senile macular degeneration, something which now takes up a significant portion of orthoptic practice.

Scotopic sensitivity syndrome presented another battle to fight. Tinted lenses were introduced to Australia claiming to cure reading difficulties, however there were no trials, no controls, no data or statistical analysis to back up their claims of success. In 1989 Anne Fitzgerald presented a vast review of the learning disability literature and then went on to design several trials to test these hypotheses. The issues of outcome measures, such as letter or word recognition, and visual preference vs actual reading improvement were raised; with suggestions of motivational, placebo, attention and self-esteem factors. Looking at 2016 online sites, the argument is still going on.

Papers were appearing on our role in visual rehabilitation of the partially sighted, in 1984 Kerry Fitzmaurice first published her studies of eccentric viewing training initially with tertiary students.

Technology which resulted in work practice changes included ultrasonography, both A and B Scan, reported by Anne McIndoe when IOLs were introduced at the Royal Victorian Eye & Ear Hospital in 1980. In 1987 Susan Bull reported refractive outcomes of 51% within 1 DS, now this is expected to be greater than 90% as reported in the current volume. Anne Fitzgerald presented the use of VERs in various projects, including OKN, DVD and visual field anomalies.

The 1980s was a period of establishing norms including the normal ranges published with new contrast sensitivity tests validated for different age groups; of validating tests to assess sensitivity and effectiveness, such as the Lang Stereotest for microtropia, the City University Colour Vision Test found to be limited for optic nerve defects; or validating clinical variations of testing such as using the Goldmann for static perimetry, measuring accommodation towards or away, or assessing the efficacy of single versus multiple pinhole.

Literature reviews and case reports published in the journal showed an increasing interest and knowledge of neuro-ophthalmology. This was the time of international neuro-ophthalmologists John Leigh and David Zee's book '*The neurology of eye movements*' and attending any neuro-ophthalmology conference meant arriving home with yet another new eye movement pathway. New colour vision tests stimulated a resurgence of interest in its testing and interpretation.

1990s

Moving into the 1990s major developments were occurring in the education of orthoptists, with the first graduates from the Bachelor degree courses in the early 1990s. In 1991 Elaine Cornell was the first Associate Professor of Orthoptics appointed in Australia, followed by Alison Pitt in 1992. In 1994, Julie Green was the first orthoptist in Australia to receive a PhD.

A few papers are mentioned which demonstrated some themes of the 1990s. In 1991, I investigated the VA and oculomotor development of infants to establish normal

responses in a clinical environment in comparison to those published in the research environment. British orthoptist Carolyn Calcutt, in 1993, challenged all our conceptions of the natural history of strabismus and amblyopia with her report on untreated early onset esotropia, where only 7% of adults had visual acuity less than 6/12 in their non-fixing eye when conventional theory would have predicted far worse levels of reduced visual acuity. Zoran Georgievski in 1994 studied the effects of central and peripheral binocular field masking on fusional-disparity vergence, reporting that peripheral fusion plays a major role; a fitting follow-on from Diana Mann's treatise on 'perceptual and motor phenomenon of fusion and binocular reflexes' published in Volume 1. Robin Wilkinson presented her work with the Strabismus Inheritance Study Tasmania in the 1997 Patricia Lance Lecture.

The 1990s saw the beginning of orthoptists' involvement in sports science, with Pierre Elmur leading this research. Neryla Jolly established the role of orthoptists in driver assessment and rehabilitation. We demonstrated our ever-widening role within the community with such papers as visual screening in diabetes; VF-14 test of visual function, satisfaction scores and cataract outcome measures; cortical blindness in multi-handicapped children; accommodation in young offenders; and cluster seating in the classroom.

In the 1990s new instruments abounded – photorefractors, retinal photography, automated perimetry, excimer laser, infrared eye movement recording, contrast sensitivity – it was time again to establish norms. No review of research and development would be complete without a mention of Zoran Georgievski's Torsionometer, 1996. Complex statistical analysis was now the norm, and the importance of interpreting statistical significance within the clinical context was regularly noted.

Through the 1990s, there was a wide range of topics presented in the form of literature reviews and case reports, providing detailed summaries to update and educate the reader. These range from strabismus to neuro-ophthalmology and glaucoma. It was the time to stress the importance of case reports in adding to our knowledge and understanding by building case-law and applying our understanding of pathology to individual variations. Alison Pitt in 1992 noted 'The importance of reporting on relatively rare clinical problems is stressed to build up a case-law of conditions which will gradually add to our knowledge …' Similarly, Julie Green in 1995 commented 'Individual patient descriptions with specific lesions or disorders contribute along with experimental animal studies to our understanding of ocular pathology'.

2000s

In the new century, we are still protecting our role in the eye health field and wider community, with alternative therapies made all the more available to the public via the internet, with no scientific evidence required of their validity. The discussion revolves around the questions of how the public makes an informed choice and how they know whether there is any science behind what they read. Through Informit, Australian Orthoptic Journal publications now appear in a Google or Google Scholar search.

One of the major professional developments was the legislative changes for glasses prescribing rites in 2007. The formation of the Australian Orthoptic Board, also in 2007, placed registration and continuing professional development completely in the control of orthoptists. This decade saw the introduction of graduate Masters programs at University of Technology Sydney and La Trobe University. One consequence of the increased numbers of orthoptists in academic institutions and their requirement for publications in high-impact factor journals is that there are fewer research publications submitted to our journal.

Orthoptists continued to move further into the role of ophthalmic diagnosis and management; including glaucoma, corneal thickness, biometry, contact lenses, myopia and monovision. It was satisfying to see that there were still significant publications on strabismus, sensory and motor processes – aetiology, diagnosis and treatment; including esotropia, exotropia, diplopia, surgical and non-surgical management.

This decade orthoptists became involved in corporate screening and the effects of computer-based equipment, the occupational and health issue of the times. Dyslexia has been replaced with attention deficit disorder as the issue for school children. Visual rehabilitation is now emphasising the functional aspects of vision loss, reconciling clinical measures with those activities of daily living.

In the 1999 Patricia Lance Lecture published in 2000, Kerry Fitzmaurice commented 'Search widely, if you have had a good idea someone may have had it before you', or as I have found reading through 50 years of journals, that there is often an oblique reference maybe in another context, that fits beautifully into whatever you were thinking. In a 2007 editorial, British orthoptist Fiona Rowe promoted the virtues of literature reviews. These are becoming more frequent in our journal, allowing comparison and contrast, revising knowledge and compiling it into a particular context, which often gives a whole new outlook with which to view your patients.

2010s

Moving into the 2010s, one of the most significant changes in health funding was the introduction of the National Disability Insurance Scheme, which has designated orthoptists as funded clinicians for the management of those with vision impairment. We can only hope that this will live up to its promise. Sue Silveira has published on the need to develop a new methodology to determine functional impact and the process of implementing this within the

government frameworks.

Jane Scheetz in a 2013 editorial discussed the need to build the evidence for innovation within eye health care to safely address future workforce challenges, with higher patient expectations and increased need for services within a resource-limited health system. Three examples of new models of care have been published, our journal being an ideal platform to publish this pilot data to promote these innovative models for conditions that are appearing in ever increasing numbers – glaucoma, AMD and diabetes.

Strabismus is now being presented more often in the form of case reports and literature reviews. One of my case reports brought us full circle from the very first edition, with two cases of eccentric fixation, revealing minimal mention of this topic since the 1970s. We noted that every treatment modality reported some success, but all had a number of patients failing to improve. Eccentric fixation remains a condition about which we could say that relatively little may be known. Another case of coexisting DVD and DHD, reminded me of the 1970s with Diana (Mann) Craig wondering if the puzzle of DVD would be solved; and the 1980s with the long list of acronyms and the developments of OKN and neurological pathways. The last paper published in 2015 returned us to the initial core role of an orthoptist – strabismus and sensory disorders, again causing us to question our common beliefs of the critical period and amblyopia treatment in the older patient.

A 2015 paper presented the microperimeter in routine retinal practice. This paper provides a perfect example of the developments over the years from Bjerrum perimetry and exemplifies our scientific development with a mind-boggling array of statistics.

CONCLUSION

Looking at the Australian Orthoptic Journal: Where have we come from? Where to from here? Zoran Georgievski's comment in 2007, 'It is possible we persevere because we consider a journal to be a diary, an ongoing measure or gauge … a permanent record that chronicles our growth year after year' sums up how we look at our journal. In the context of the current external factors it means that the highest level of scientific evidence-based projects; those prospective, randomised control studies are now less likely to be submitted to our journal. We need to continue to publish the highest quality case reports, literature reviews, clinical projects, models of care, and evaluation projects; all of which contribute to its success.

The journal is now 50 years old. After all those years of amazing developments, we cannot let it whither, we must continue to watch it thrive in a new context and this relies upon you all to 'chronicle our growth year after year' and champion the future of our journal. Bill Gillies, in his Patron's address of 1977 stated 'Although it is fascinating to look back at how far orthoptics has come, it is far more important to look at the way ahead and how you may more effectively get there.' Almost 40 years on, these words are more relevant than ever.

ACKNOWLEDGEMENTS

May I acknowledge those hundreds of orthoptists who have published in the journal over the years, contributing to our ever-increasing body of knowledge and apologise that I have not named everyone.

Letter to the Editor: The National Disability Insurance Scheme: Positive Implications for Current and Future Orthoptic Practice

Julie Fitzpatrick MPH BOrth BSc PGDipHlthResMeth PGDipHlthProm

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Southern Low Vision, Geelong, Australia

The National Disability Insurance Scheme (NDIS) is expected to provide about 460,000 Australians under the age of 65 years, who have a permanent and significant disability, reasonable and necessary supports to meet client-determined ordinary life goals, as the scheme rolls out nationally over the next few years.[1] The NDIS was launched in July 2013 in some parts of Australia, namely the Barwon Region and Hunter Valley, NSW. The projected annual cost to the government is reported to be an estimated $22 billion, as clients utilise funds for equipment and services supporting their set goals.[1]

NDIS planners and health professionals are responsible in educating the client in accessing mainstream services and supports, plus gaining services available in the health, rehabilitative and education systems. The goals set by each client aim to allow all participants access to 'reasonable and necessary' funded supports. It is noteworthy that assistance from the NDIS is not means tested, so accessed funding, whilst limited, will have no impact on income support such as the Disability Support Pension and Carers Allowance.[1]

According to the World Health Organization, 'health' is defined as '... a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.'[2] Considering the use of the term 'health' or rehabilitative, versus 'medical' services, orthoptists are well positioned as the key eye care practitioners under the NDIS, as optometrists and ophthalmologists currently fall into the medical (unfunded) category.

Silveira, (2015) discussed the current criteria by which vision impaired clients are generally classified under the NDIS.[3] Visual acuity and field loss are the main two factors assessed when planners evaluate the reported needs of the client, as documented in a functional orthoptic vision report. This report aims to explain vision findings in 'everyday' language and traditionally has proven useful in environments such as the workplace or schools. Whilst the NDIS does not cover funding for school-based equipment, the functional vision report is the platform by which a client's planner gains insight into their visual status, so consequently decides whether or not the included equipment recommendations should be honoured.

Orthoptists working within low vision agencies will be happy to hear there is an array of support in place to guide you through the process of report-writing. Orthoptists acting as sole providers can obtain assistance over the phone from the NDIS support staff. Setting up is as simple as first obtaining an Australian Business Number, then registering with the NDIS online. An orthoptist must be registered with the Australian Orthoptic Board, have a Certificate of Currency and be a member of Orthoptics Australia to be eligible to receive a Medicare number, which makes registering for NDIS and other agencies a relatively smoother process.

As reported by Silveira, clients with needs relating to eye movement disorders, lack of contrast sensitivity or extreme visual fatigue, may also qualify for services, so NDIS planners will hopefully become more educated over time, about the array of potential functional vision problems a client may have, as orthoptists verify this in each functional vision report.[3]

Support 'clusters' may include 'improving daily living skills', 'communication' and 'adaptive technology', to name just a few. Registering oneself as a provider involves selecting the support clusters which match these types of services, so future clients searching for a service, may find the relevant provider with relative ease.[1]

I, amongst others, have been fortunate to have experienced utilising the NDIS, as Geelong and the Barwon Region functioned as the 'launch site' and location of head office for the NDIS in 2013. Decisions regarding funding of equipment

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or orthoptic hours, occur on a 'case-by-case' basis, so just as each patient is unique, so too, will be the equipment needs and number of hours required with the orthoptist. We currently are listed amongst 'allied health' and are paid a little above $172 per hour. This may be per hour spent with the client or per hour spent on report writing.

The following case study illustrates my involvement, whereby this deserving client managed to engage in several hours of eccentric viewing training as well as later receive funded equipment. The client now enjoys learning English and, as a refugee, looks forward to obtaining long-term employment and bringing his family from overseas.

A 37-year-old refugee from Pakistan was diagnosed by a local ophthalmologist, with posterior uveitis, glaucoma and central scarring from a bomb blast several years ago, with severe chorioretinal atrophy. Due to prior involvement with the client at a low vision agency, I received this private referral.

Visual acuity was found to be Right: Hand Movements, Left: Light Perception (directional). Central vision loss was extensive, as shown by the Humphrey visual fields and OCT (Figures 1a and b, 2a and b). A combination of Bjerrum fields and 'clock-face method' allowed me to determine the ideal eccentric viewing position. Until eccentric viewing had commenced, the client was unable to use simple optical magnification aids, due to extensive central vision loss. I was fortunate enough to be granted an initial 8 hours, then a subsequent 8 hours of rehabilitation time with this client, in addition to 2 hours of report-writing time. Following 16 funded hours of eccentric viewing, the patient's results are as shown.

Near acuity improved from N80 to N12 with improved reading speed and skills in writing.

NDIS is also considering funding a closed-circuit television electronic magnifier to allow the client to see notes on a Smart Board whilst studying English at a local TAFE facility. In addition, funding is being sought for a vertical reading stand. The client has also received orientation and mobility training and an iPhone with built-in assistance for navigation.

As the NDIS rolls out nationally, a wider range of orthoptic case studies will hopefully be presented by orthoptists utilising this valuable service Australia-wide. For the latest updates and timing on the roll-out of the NDIS near you, look for 'Every Australian Counts' or 'myplace.ndis.gov.au' online.

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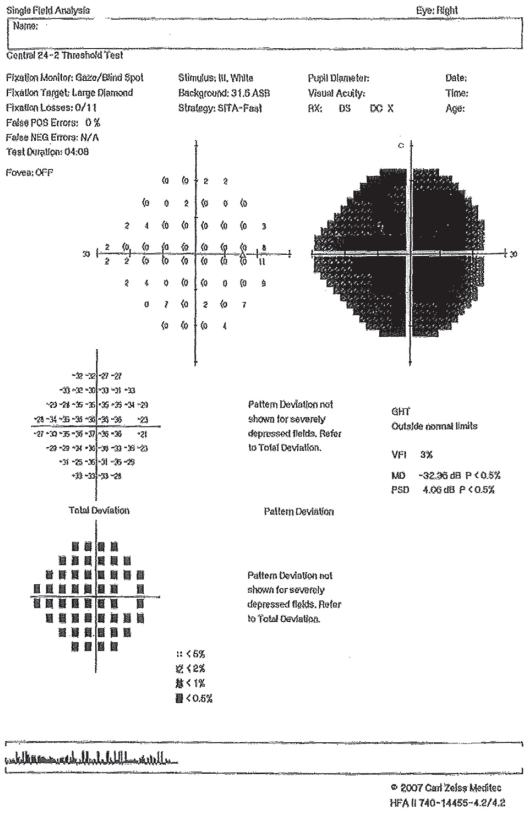

Figure 1a. Humphrey visual field right eye.

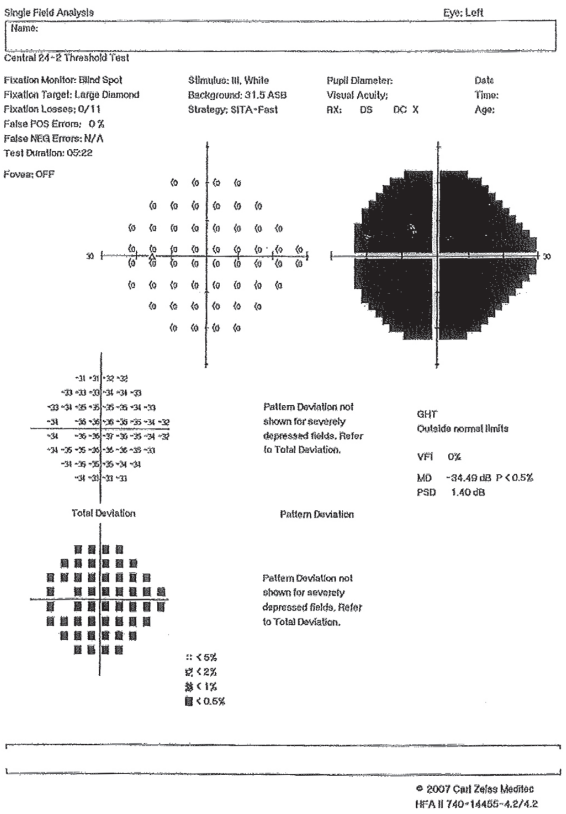

Figure 1b. Humphrey visual field left eye.

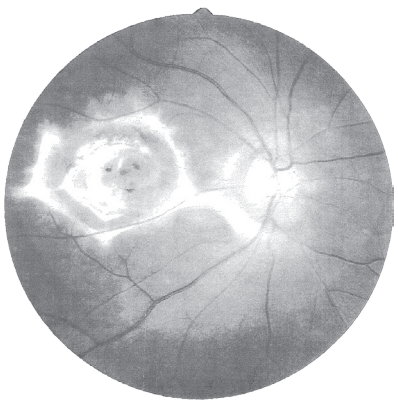

Figure 2a. OCT right eye.

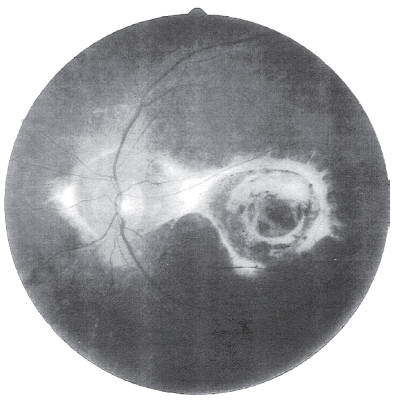

Figure 2b. OCT left eye.

Selected Abstracts from the Orthoptics Australia 73rd Annual Scientific Conference held in Melbourne 20th to 22nd November 2016

PATRICIA LANCE LECTURE
50 YEARS: THE DEVELOPMENT OF RESEARCH AND PUBLICATION IN THE AUSTRALIAN ORTHOPTIC JOURNAL

Linda Santamaria

This lecture is presented in honour and memory of Patricia Mary Lance in recognition of her contribution to orthoptics in the fields of research, education, and the Association both in Australia and internationally. After seven years of publishing the transactions of the annual scientific meetings, the first titled edition of the Australian Orthoptic Journal was published in 1966 as Volume 8, which means that this year marks 50 years of our journal with its current name. This anniversary provided an opportune time to look back over the journal and its development over the decades, from the very first orthoptic paper in the transactions of the 1959 meeting, which was actually by Patricia Lance, to the latest research publications in 2015. Over this time the changes in society, culture, education and technology have all affected the development of research and this has been reflected in our journal.

REVIEW OF THE PREVALENCE OF STRABISMUS AND FACTORS CONTRIBUTING TO VARIATION

Felicia Adinanto, Amanda French, Kathryn Rose

Strabismus presents in 2-5% of the population and is highly associated with amblyopia. It is known that those with poor vision in one eye are more likely to have pathology in the better eye later in life, contributing to the proportion of those with vision impairment with age. Literature has established that the contribution of genetics to strabismus is approximately 30% with associations between strabismus and various craniofacial and global syndromes. Environmental risk factors such as low economic status, maternal exposure to smoking, low birth weight, prematurity and admission to neonatal intensive care units have been identified as modifiable risk factors. This raises the question of whether the prevalence of strabismus has varied over decades. In order to determine this and whether the contribution of demographic characteristics of the population, such as age and ethnicity and methods of sampling and testing across populations has caused variation in the recorded prevalence of strabismus, this has been assessed by systematic analysis of the available literature.

Papers presenting the prevalence of strabismus within various population samples have been identified through database searches of PubMED and MEDLINE. Search terms included prevalence, strabismus, risk factors, school-based and population. Papers were selected for analysis if the samples were either population-based or school-based and the method of detection was by cover test by a qualified practitioner.

RISK FACTORS FOR ESOTROPIA AND EXOTROPIA

Felicia Adinanto, Amanda French, Kathryn Rose

Purpose: To identify risk factors associated with the development of esotropia and exotropia, which may have contributed to trends observed in the prevalence over the past few decades.

Methods: A systematic literature review was performed to provide insight into the relative contribution of genetics and modifiable risk factors in the development of esotropia and exotropia in children.

Results: Genetic studies of strabismus have established that the risk of developing esotropia is 3 to 5 times greater if a first degree relative had strabismus. The overall prevalence of strabismus was not significantly different between ethnicities (p=0.81). However, in European Caucasian populations 62.6% had esotropia while 74.3% of those in East Asian populations had exotropia. Modifiable risk factors such as low socio-economic status, maternal exposure to smoking, low birth weight, prematurity and admission to neonatal intensive care units have been previously identified. Esotropia is associated with antenatal factors, such as admission to NICU and low birth weight, whereas exotropia is related to modifiable risk factors such as low socio-economic status.

Conclusions: While the prevalence of strabismus is consistent across different locations, there is variation in the prevalence of esotropia and exotropia based on ethnicity. A family history of strabismus increases the risk of developing strabismus, but in itself is unable to account for the majority of strabismus cases. The contributions of modifiable risk factors appear to play a major role in the development of esotropia and exotropia in children. However ethnic differences in esotropia and exotropia are unexplained by any of these risk factors.

UNDERSTANDING THE RELATIONSHIP BETWEEN INCOMITANT STRABISMUS AND THE RADIOLOGICAL FINDINGS

Natalie Ainscough, Gulsah Bakar, Nermina Mustafic, Jessica Collins

Using case studies seen in ophthalmology departments run by South Australia Health, the interpretation of a range of radiological assessments was presented, including MRI and CT scans, and their relationship to eye movement deficits identified in the outpatient clinic.

THE SAFETY AND EFFICACY OF CORNEAL COLLAGEN CROSS LINKING COMBINED WITH ORTHOKERATOLOGY LENSES FOR KERATOCONUS

Mitchell Bagley, Tess Huynh

Purpose: To evaluate the results of corneal collagen cross linking (CXL) alone compared to when CXL is performed in combination with corneal moulding orthokeratology (OK) lenses for progressive keratoconus.

Method: A pilot study was conducted involving patients who presented with progressive keratoconus and proceeded with treatment of either CXL alone or CXL with OK wear. Patients who were treated using OK lenses wore these for a minimum of one month prior to CXL and resumed OK wear one month postoperatively, continuing until vision had stabilised. The same accelerated CXL protocol was followed for all cases. Vision, autorefraction, keratometry and pachymetry were obtained throughout the study.

Results: There were 10 eyes in each group. In both groups VA improved by seven letters and there was no progression across all keratometric indicators between the preoperative appointment and the most recent appointment post CXL. Mean best corrected visual acuity indicated a slightly greater improvement in the OK group of three letters compared to one. The mean minimum pachymetry revealed greater thickening in the OK group (+23.22um) compared to the control group (+12.13um). Two patients in each group appreciated an improvement in their vision, however three patients who wore OKs reported ocular discomfort. There were no adverse advents in either group.

Conclusion: Given the similarity in results between CXL alone and combining this procedure with OK wear it is difficult to ascertain what place this treatment option has in the current clinical context. It is likely that a higher-powered study may reveal more significant findings.

THE EVALUATION OF PATIENT EDUCATION AND THE PROVISION OF INFORMATION REGARDING PATIENT SUPPORT GROUPS AND LOW VISION SERVICES TO PATIENTS RECEIVING TREATMENT FOR NEOVASCULAR AMD

Jessica Boyle, Meri Vukicevic, Konstandina Koklanis, Catherine Itsiopoulos, Gwyneth Rees

Background: Central to the patient experience of ophthalmic treatment is patient education. Despite the chronic and invasive nature of anti-vascular endothelial growth factor (VEGF) treatment for neovascular age-related macular degeneration (AMD), the perceptions of patients around patient education have not been widely investigated in this clinical population. Of the handful of studies to have explored this to date, all have been limited by small sample size. These studies have reported that patients receive inadequate information pertaining to the injection procedure and its outcomes. Improving patient education standards may help minimise known pre-procedural anxiety often experienced in those undergoing anti-VEGF treatment for neovascular AMD. In addition, no study to date has investigated issues surrounding the provision of information to patients in relation to patient support groups/low vision services from the perspective of ophthalmologists and orthoptists involved in patient care. The aim of this study was to investigate the experiences and perceptions of patients undergoing repeated intravitreal anti-VEGF injections for neovascular AMD in relation to patient education. A secondary aim was to identify issues surrounding patient education and the provision of information relating to low vision services and patient support groups from the perspective of ophthalmologists and orthoptists.

Methods: Forty patients (16 males, 24 females) with neovascular AMD undergoing anti-VEGF treatment were recruited from a private ophthalmology practice and public hospital in Melbourne. Patients underwent semi-structured, one-on-one interviews. Interview topics included: treatment burden and satisfaction; tolerability; barriers to adherence; treatment motivation; and patient education. Interviews were audio recorded and thematic analysis performed using NVivo 10 (QSR International, Doncaster, Australia). Eighteen orthoptists and one ophthalmologist with experience in managing patients with neovascular AMD were recruited from the same private ophthalmology clinic and public eye hospital. Eye health care professionals completed a self-administered electronic questionnaire designed by the study investigators exploring their perceptions around patient education and the provision of information to patients about support groups/services.

Results: Patient satisfaction in relation to the provision of educational information was low, especially among public patients. Many patients reported receiving inadequate information about AMD and its treatment. Visual feedback in the form of optical coherence tomography (OCT) imaging was perceived by patients to represent a useful adjunct to verbal information conveyed by their specialist and facilitated their understanding of treatment. However, not all patients reported having been shown their OCT scan in the past. A lack of patient awareness was found concerning low vision services and support groups, irrespective of public versus private status. Not surprisingly, service uptake was also low with only one patient enrolled in a patient support group and few patients aware of low vision services available to them. Factors influencing the uptake of low vision rehabilitation services and patient support groups (as identified by patients) included: timing of referral, financial outlay, perceived benefit/s, and accessibility. Referral rates were low amongst orthoptists. Barriers to the referral of patients to low vision services and patient support groups (as identified by orthoptists) included: practical factors, knowledge-based factors, patient factors and clinical protocol.

Conclusion: Despite treatment adherence typically being high in patients undergoing anti-VEGF injections for neovascular AMD, patient satisfaction with the level of educational information provided was low, especially in public patients. Many patients felt uninformed about the treatment process and reported limited knowledge of support services available to them. Improving the standards of patient education may help lessen pre-procedural anxiety and assist patients to better manage the challenges of AMD treatment.

CHALLENGING OUR THINKING ON AMBLYOPIA: A PARADIGM SHIFT

Louise Brennan, Jane Lock

Amblyopia is fundamentally a neurological disorder resulting in subnormal vision that arises from disruption of visual development during early childhood. Amblyopia, which is more commonly referred to as 'lazy eye' affects about 2% of the Australian population. The current mainstay of treatment is occlusion therapy, which involves patching or penalisation of the non-amblyopic eye. Some scientists and clinicians purport that whilst patching improves monocular vision, it neglects binocular visual development. The latter is important for depth perception, and appreciation of form and motion. Recent experimental evidence supports the role of binocular methods of treating amblyopia, referred to as dichoptic therapy. This treatment method forces both eyes to function together by presenting different images to each eye, either in a movie or as an interactive game. The amblyopic eye sees images of higher contrast, while the fellow eye sees images of lower contrast. For the game to be played successfully both images must be seen. Multiple small studies have already demonstrated the efficacy of dichoptic tablet games for visual improvement in amblyopes. Our current thinking on amblyopia and how this is being challenged will be discussed along with an outline of a prospective study being conducted at The Children's Hospital at Westmead.

INVESTIGATING A FEAR OF THE DARK - ERG FINDINGS IN CHILDREN WITH NYCTALOPIA

Nick Brislane

Objective: To report on the clinical phenotypes in a series of children who presented with complaints of night blindness.

Discussion: During the commissioning of the visual electrophysiology testing service at The Royal Children's Hospital, 10 patients underwent standard and extended electroretinogram (ERG) testing to investigate their common complaints of night blindness. Under scotopic test conditions, six patients' ERGs showed an absence of rod-derived b-waves, a negative response to a bright white stimulus. The use of photopic, cone-derived ERG to short and long duration flash stimuli assisted in differentiating between genetically distinct conditions which are indistinguishable based on a negative ERG alone. ERG testing beyond the standard ISCEV protocols was informative in making distinctions between complete and incomplete congenital stationary night blindness (4 cases), retinitis pigmentosa (3 cases), x-linked retinoschisis (1 case), enhanced s-cone syndrome (1 case) and rod dysfunction secondary to isotretinoin use (1 case).

Conclusion: ERG studies beyond the ISCEV standard protocols are useful in diagnosing various causes of nyctalopia in children.

ORTHOPTISTS AND ORTHOPTICS IN THE WAR YEARS, 1939-1945

Shayne Brown

When war broke out in September 1939 the exact number of trained orthoptists in Australia was unknown. At least six were in Sydney, at least four in Melbourne, one in Adelaide and one in Hobart. The profession was in its infancy. The Orthoptic Association of Australia (OAA) was yet to be formed and the Orthoptic Board of Australia (OBA) was barely a year old. Research by Canadian born, British ophthalmologist, Air Commodore Sir Philip Livingston developed visual standards required for trainee aircrew in the Royal Air Force (RAF) and these standards were mainly adopted by the Royal Australian Air Force (RAAF). Livingston had found that some trainee pilots with poorly controlled heterophorias displayed inaccuracies in depth perception which affected their ability to land their aircraft safely. He was a strong advocate for orthoptic treatment. This was a controversial matter both in England and in Australia. However Australian ophthalmologist, Joseph Ringland Anderson, argued for the inclusion of orthoptic investigation and treatment for aircrew trainees under the

Empire Air-Training Scheme. Consequently, Australian orthoptists, Beatrice Barnes, Ethel D'Ombrain, Diana (Mann) Craig, Emmie Russell and Lucy (Willoughby) Retalic assessed and treated RAAF aircrew with ocular motor imbalances from 1940-45. Little has been written about this period in Australian orthoptic history. To my knowledge there are no personal records written by these orthoptists. Much of what we know is through scientific papers and some accounts by ophthalmologists and RAAF personnel. Nevertheless, there is sufficient evidence to show that these women played an important part in aviation medicine.

BEFORE I WAS BORN

Kirsten Campbell

Prior to the development of computerised perimetry, monitoring glaucoma involved measuring IOP, often by Schiotz tonometry and performing fields with a Bjerrum screen or arc perimeter. Pilocarpine was the standard treatment for glaucoma with the resulting miosis reducing the field. Refracting patients after cataract surgery meant waiting for 6 to 8 weeks for the large wound to heal and refraction to stabilise. Aphakic correction required patience and continued explanation to gain an accurate refraction. The artist Monet exemplified difficulties following cataract surgery and his rejection of what was then a satisfactory result.

NOT YOUR AVERAGE SQUINT...

Nicole Carter

In a paediatric setting doing initial examinations on patients with a possible strabismus becomes as routine as brushing your teeth. From the information on the referral and the parent's description of eye signs, the orthoptist usually has a good idea of one or two differential diagnoses as soon as they enter the room. But every now and then a case presents that is not your average squint! This presentation showcased a selection of interesting squint cases. The details of each case were followed from referral to orthoptic and ophthalmic examination, diagnosis and follow-up.

THE USE OF A TOOL TO DETECT THE PRESENCE OF VISION DEFECTS IN PATIENTS DIAGNOSED WITH STROKE – VISION SCREENING TOOL VALIDATION RESULTS

Michelle Courtney-Harris, Neryla Jolly, Kathryn Rose

Aim: To validate a vision screening tool for use by hospital-based health practitioners in stroke-affected patients to identify pre-existing and stroke-related ocular conditions.

Methods: A vision screening tool was devised in consultation with multidisciplinary vision care experts to be part of routine stroke assessment. Stroke units in two metropolitan Sydney public hospitals with no access to on-site eye care professionals, participated in the study. Patients admitted to these units for a minimum of three days were eligible for recruitment. Participants were allocated randomly to one of two groups. In Group 1, a detailed visual assessment by an experienced eye care practitioner (orthoptist) was compared to information elicited by the tool when administered by a non-eye practitioner. In Group 2, the vision screening tool was administered by both the orthoptist and practitioner for comparison. This study had institutional ethical approval.

Results: 100 participants were recruited; analysis showed the tool was highly successful in ascertaining pre-existing eye conditions. While the tool is able to detect obvious newly acquired visual problems, subtle conditions are more likely to be missed.

Conclusion: The vision screening tool is suitable and a valid instrument for achieving its designated purpose of identifying pre-existing and newly acquired visual problems in patients with a diagnosis of stroke. It is suggested that minor modifications to the vision screening tool along with an education package will enhance its overall functionality.

EXPLORING THE PATIENT PERSPECTIVE OF CATARACT SURGICAL OUTCOMES

Vu Quang Do, Lisa Keay, Anna Palagyi, Jan Steen, Andrew White, Peter McCluskey

Background: Success of cataract surgery has traditionally been assessed by visual acuity and vision function measures. However, little is known about the relationship between these clinical outcomes and patient satisfaction following cataract extraction.

Purpose: This study aims to identify the main predictors of patient satisfaction following cataract surgery and to explore how satisfaction and quality of life is related to key visual outcomes such as visual acuity and vision-related quality of life.

Methods: The aim is to recruit 400 bilateral cataract patients aged 50 years and above currently on the cataract surgery waiting list at four public hospitals and one private clinic in Sydney. Participants will undergo comprehensive assessment of vision, self-reported visual function, quality of life and mood prior to first eye surgery, three months after first-eye surgery and three months after second-eye surgery. Satisfaction with surgery will be rated by the participant, and target post-surgical refractive status and surgical complications assessed by surgical record review.

Results: 330 participants have undergone baseline assessment as of July 2015, with 27% (n=90) having completed follow-up assessment post first-eye surgery. One-third (n=28) of participants were dissatisfied with their self-reported wait-time from initial hospital appointment to surgery date (median 6 months, range 1-18 months); median preferred waiting time was 4.5 months (range 0.5-12 months). Most participants (91%, n=82) were satisfied with their first-eye cataract surgery.

Conclusion: Eliciting the personal perspective of cataract surgery may allow eye professionals to better determine the suitability of a patient for cataract surgery, manage expectations and appropriately time surgery.

A CASE OF FOVEAL HYPOPLASIA

Allanah Crameri

A four-year-old boy was referred to the clinic for poor visual acuity which the optometrist was unable to improve. On further investigations by the orthoptist and ophthalmologist, foveal hypoplasia was suspected. Foveal hypoplasia is the underdevelopment of the fovea and macula which includes an absent or abnormal maculofoveal reflex, unclear definition of the area and capillaries running abnormally close to the foveal region. Isolated foveal hypoplasia is often subtle and difficult to detect however, other accompanying signs may include nystagmus, poor visual acuity, aniridia, albinism, microphthalmia and achromatopsia. This case looked at the initial presentation, investigations and suspected diagnosis of foveal hypoplasia.

HOW DO WE COMMUNICATE WITH OUR PATIENTS?

Catherine Devereux

Increasingly, health providers are expected to partner with their patients in the delivery of health care services. Person-centred practice puts the consumer (patients, family and their carers) at the centre of their care by including them in decision making and focusing on their unique and individual needs. Patients tell us that they want timely care, respect, positive communication and to feel supported. Based on a series of consumer-led projects this presentation addressed communication as the integral component in building effective relationships with patients and their

families. How we talk with consumers and consider their understanding of health information is pivotal to empowerment and maximising health outcomes. The Teach Back technique will be outlined and encouraged as a useful method to 'confirm that you have explained to the patient what they need to know in a manner that the patient understands'.

ORTHOPTISTS DRIVING CLINICAL IMPROVEMENTS VIA THE SAVE SIGHT REGISTRIES (SSR)

Amanda Dinh, Amparo Herrera-Bond, Phuc Nguyen, Mark Gillies, Stephanie Watson

Background: The SSR is a sophisticated web-based data system used worldwide to collect data on the outcomes of therapy for eye disease, including patient reported treatment outcomes. Modules are currently available for macular degeneration (nAMD), diabetic retinopathy and keratoconus. Outcomes data collected via the registry is driving improvements in patient care and providing a clear picture of the patient journey. Orthoptists play a key role facilitating the use and growth of this significant registry and providing patient education on the outcomes of their eye disease and treatment course.

Method: A review of the current procedures for implementation of the SSR was conducted utilising the keratoconus module. Key roles for the orthoptist were identified. Data collected from the keratoconus module was used to illustrate the role of the orthoptist for the Save Sight Registries.

Results: 116 key roles for the orthoptist were identified. Orthoptists identified as being actively involved with data input from patients in real-life clinical settings, facilitating the collection of patient reported outcomes via survey, reviewing treatment outcomes with the ophthalmologist and patient education. Interests in the SSR have been encouraging with increasing implementation across various centres nationally and internationally. The database for nAMD has grown from 293 patients in 2009, to 5,500 patients, 7,109 eyes in 2016 with a total of 146,159 treatments. Likewise, there are already 261 treatments captured and 851 eyes in the Keratoconus Module.

Conclusion: SSR is a unique system empowering orthoptists with clinical knowledge. It is driving improvements in ophthalmology by tracking outcomes of treatment in real life clinical settings with a patient focused approach. Orthoptists registered in the system are self-educating and becoming more actively involved in patient care and the patient's treatment journey and in turn, professional development.

THE AUSTRALIAN ORTHOPTIC BOARD AND YOU

Kerry Fitzmaurice

Historically the orthoptic profession in Australia was regulated by the Orthoptic Board of Australia, a sub-committee of the Royal Australian and New Zealand College of Ophthalmologists (RANZCO). The Board members included ophthalmologists and orthoptists and the functions included conferring the entry to practice qualification – Diploma of the Orthoptic Board of Australia, and to ensure professional standards. As the orthoptic profession developed, having professional standards regulated by another professional body became inappropriate. The preferred position was regulation under government legislation however as this was not possible the agreed option was to form an independent body that would be recognised nationally in a court of law. The Australian Orthoptists Registration Body Pty Ltd was formed with a sub-committee – the Australian Orthoptic Board (AOB). The current AOB provides independent oversight of the quality of orthoptic practice by: accrediting the university training programs for orthoptists in Australia; assessing the equivalence of non-Australian qualifications; regulating professional development and providing disciplinary procedures and actions in the case of professional misconduct. The role of the AOB in professional regulation was discussed.

RISK FACTORS FOR LONGITUDINAL BIOMETRIC AND REFRACTIVE CHANGE IN AUSTRALIAN SCHOOLCHILDREN

Amanda French, Kathryn Rose

Purpose: To investigate longitudinal change in biometry and refraction and examine the impact of risk factors in Australian schoolchildren.

Methods: The Sydney Adolescent Vascular and Eye Study followed up participants (6 years; N=1,765 and 12 years; N=2,353) from the Sydney Myopia Study, 5 to 6 years after initial examination. Children underwent a comprehensive ocular examination including cycloplegic autorefraction (Cyclopentolate 1%, Canon RK-F1). Change in spherical equivalent refraction (SER) and biometry for the right eye were analysed and the impact of risk factors examined.

Results: There was a significant negative shift in mean refraction between baseline and follow-up (both cohorts $p<0.0001$) associated with increases in axial length (AL), anterior chamber depth (ACD) and axial length/corneal radius ratio (AL/CR). Children of East Asian ethnicity and those with myopic parents had greater changes in refraction and biometry (all $p<0.0001$). Children who spent more time in near work also had larger increases in AL and AL/CR, although this was significant only in the older cohort (AL, $p=0.02$ and AL/CR, $p=0.03$). Conversely, spending greater time outdoors reduced AL growth in the younger (high=0.71 mm, moderate= 0.77 mm and low=0.86 mm, $p<0.0001$) and older cohort (high=0.22 mm, moderate=0.26 mm and low=0.28 mm, $p=0.008$), as well as AL/CR (both $p<0.0001$).

Conclusion: Greater time spent in near work increased refractive and biometric change but, this was significant for the older cohort only. More time spent outdoors slowed AL/CR change and AL elongation in both cohorts, although the impact appeared greater at a younger age.

THE USE OF BLENDED LEARNING TO INCREASE ORTHOPTIC STUDENTS' ACCEPTANCE AND SUCCESS IN EVIDENCE-BASED PRACTICE LEARNING

Amanda French, Kathryn Rose

Purpose: This study aimed to assess the impact of blended learning on student acceptance and success in learning evidence-based practice (EBP).

Method: Blended-learning was introduced to increase student engagement in EBP subjects in the Master of Orthoptics course in Sydney. Student acceptance was assessed quantitatively through formal subject evaluation scores and qualitatively through thematic analysis of student survey comments. The contribution of blended learning to student success was investigated by analysis of grades.

Results: In 2010, student acceptance of learning EBP was low with only 37% satisfied with the research subject. With the introduction of a preparatory subject incorporating blended learning in 2011, student satisfaction with the semester 2 subject increased to 56%, although student comments suggested that the relevance was not well understood: 'I do not at all see the relevance to my degree and how this knowledge will be used in my career as an orthoptist' (student, 2011). With further refinement of the curriculum, student satisfaction increased to 87%, 100% and 81% in 2012, 2013 and 2014 and comments indicated a greater understanding of the relevance. Student grades for the final research subject also increased, with the failure rate dropping and an upward shift in the mean grade.

Conclusion: The use of blended learning strategies to encourage orthoptic students' engagement has significantly increased student acceptance and success in their learning of EBP. This is likely to translate into greater engagement in EBP and research as orthoptic graduates.

TAKE TWO APPS AND TWEET ME IN THE MORNING: HEALTHCARE IN A DIGITAL WORLD

Michelle Gallaher

Social media and the internet of things is playing an increasing role in healthcare delivery, and practitioners and providers can no longer afford to ignore its value. Initially seen as a detrimental distraction and a source of misinformation by many healthcare providers, social media is fast becoming a primary tool for many clinical researchers, medical technology developers, healthcare providers and patients. Digital health and the opportunity these platforms offer to orthoptics and ophthalmology is being transformed, literally before our eyes. Vision technologies and patient engagement opportunities are emerging in the market, built upon smartphone platforms. Social media platforms, particularly Facebook and Twitter, are seeking to serve clinical researchers and patients who are vision impaired and clinical researchers looking for engagement and data. The rise of digital health is transforming the sector with technologies that are disrupting the major players in the medtech market with cheaper, easier and more sympathetic approaches improving compliance, access and outcomes. Examples were introduced of high value social media and IofT technologies such as Research Kit and IBM Watson, and ways in which regulation, legislation, quality clinical evidence, market access and reimbursement need to keep pace with the way patients and practitioners are engaging online, specifically in vision sciences, were discussed.

GOLDMANN APPLANATION TONOMETRY AUDITS (RVEEH)

Debra Gleeson

Raised intraocular pressure (IOP) has been shown to be a significant risk factor for glaucomatous damage and progression. The goal for treating patients with glaucoma is to lower the IOP to a targeted pressure to reduce the risk of further damage. Goldmann applanation tonometry (GAT) is the gold standard for measuring IOP and accuracy performing this test is of high importance. It had been noted on the RVEEH EGTH glaucoma clinic that there was some disparity between the IOP measurements taken by the orthoptists and those measured later by the glaucoma consultants. An audit was undertaken over a three-week period to note the number and range of disparity in the IOP measurements. A professional development opportunity was provided on several occasions for the orthoptic staff to outline the many factors affecting measurement and how to improve technique. An audit of IOP readings was conducted in 2016 after two of these teaching sessions.

THE TED TALK: AN OVERVIEW AND CASE PRESENTATIONS

Lindsay Horan

Thyroid eye disease is autoimmune disorder that can lead to dysfunction of multiple organ systems. Its effect on the eye can be mild to very severe. The eye muscles are often involved, leading to eyelid retraction, dry eye, and restrictive strabismus. In this presentation, an overview of thyroid eye disease, including its ocular manifestations and natural history, was provided. In addition, case presentations illustrated the disease course and management.

PREVALENCE AND RISK FACTORS FOR DIABETIC RETINOPATHY IN A HOSPITAL-BASED POPULATION OF AUSTRALIAN CHILDREN AND ADOLESCENTS WITH TYPE 1 DIABETES

Stuart Keel, Catherine Itsiopoulos, Konstandina Koklanis, Meri Vukicevic, BOrth, Fergus Cameron, Laima Brazionis

Aim: To investigate the prevalence, and traditional and emerging risk factors associated with retinopathy in a hospital-based population of Australian children and adolescents with type 1 diabetes.

Methods: This was a cross-sectional study of 483 children and adolescents with type 1 diabetes. The medical files of participants who had retinal images taken were audited to collect all relevant clinical data. Diabetic retinopathy was assessed from colour retinal images by an ophthalmologist according to the Modified Airlie House classification system.

Results: Diabetic retinopathy was observed in 11 (2.3%) participants. Univariate analysis revealed a higher mean HbA1c (M=9.2±1.6 vs 8.3±1.3; p=0.008) and BMI (M=27.4±5.2 vs 23.1±4.6; p=0.009), and lower serum HDL cholesterol (M=1.2±0.3 vs 11.5±0.3; p=0.006) in participants with diabetic retinopathy. Logistic regression revealed that the principal components analysis derived risk profile of: higher serum creatinine, older age, higher SBP, higher BMI, abnormal eGFR (<59 ml/min), lower HDL cholesterol, higher serum sodium, longer duration of diabetes and narrower retinal arteriolar calibre was associated with diabetic retinopathy (ExpB=2.60, 95% CI 1.36-4.96, p=0.004).

Conclusions: These results support the concept that the pathogenesis of diabetic retinopathy is likely due to the combined influence of various risk factors, many already identified. Furthermore, the results of univariate and multivariate analysis provide novel evidence for the possible benefit of more intense management of diabetic retinopathy for persons with a low HDL level.

CHILDREN REFERRED FOR TERTIARY CARE AT THE CHILDREN'S HOSPITAL AT WESTMEAD FROM COMMUNITY-BASED SURVEILLANCE WITH COMPLEX NEURODEVELOPMENT AND ADDITIONAL NEEDS

Lindley Leonard, Louise Brennan

With the initiation of a pilot clinic in 2010 there has been an evolution in the management of children seen within a busy outpatient combined orthoptic/ophthalmology service. Changes have been evident in referral patterns including a noticeable increase in referral of children with complex neurodevelopment and additional needs being assessed within the community, requiring appropriate ophthalmology assessment. This has required us, as orthoptists, to consider a model of service delivery to accommodate children that previously have not been reviewed within this particular clinic. Discussion highlighted modifications within the service and a number of cases that confirmed the necessity of a thorough assessment whilst considering adaptations for children with additional needs.

EARLY LIFE RISK FACTORS OF AMBLYOPIA, STRABISMUS AND ANISOMETROPIA IN A YOUNG ADULT POPULATION

Gareth Lingham, Seyhan Yazar, Paul Sanfilippo, Jenny Mountain, Alex Hewitt, John Newnham, David Mackey

Aim: Amblyopia, strabismus and anisometropia are childhood diseases that frequently co-occur. We investigated the underlying possible early life risk factors associated with these three conditions in 20-year-old individuals.

Methods: The Western Australian Pregnancy Cohort (Raine) Study is a cohort study of individuals born between 1989 and 1991. During prenatal period, parents of these individuals completed comprehensive questionnaires on medical history, life style and environmental exposures. At the 20-year follow-up, 1,344 participants underwent an extensive eye exam including a complete orthoptic assessment. Risk factors were explored for each condition by comparing with a disease-free control group. Identified differences were further investigated using univariate and multivariate regression models.

Results: Of 1,128 participants of Northern European ancestry, 14 (1.2%) had amblyopia, 47 (4.2%) had clinically significant strabismus and 34 (3.0%) were anisometropic. The frequency of individuals born via normal delivery was consistently lower in amblyopia (42.9%), esotropia (40.7%), exotropia (50%) and anisometropia (58.8%) groups compared to control

(78.3%) (all p<0.001). Birth by caesarean section was associated with increased likelihood of having amblyopia after adjusting for sex (OR: 2.28, 95% CI: 2.08-2.49, p<0.001). Occipitofrontal diameter, median gestational age and duration of first stage of labour and delivery mode were all associated with strabismus in univariate analyses (all p<0.05).

Conclusion: Among the long list of risk factors we investigated, non-vaginal delivery was associated with amblyopia, strabismus and anisometropia in our Western Australian cohort. This study supports the hypothesis that abnormal delivery methods may be related to common childhood eye diseases.

PAPILLOEDEMA: TRUE SWELLING, DRUSEN IN DISGUISE ... OR BOTH?

Melanie Lloyd

Children are often urgently referred to the ophthalmology department with 'papilloedema'. This presentation took a closer look at the literature regarding the prevalence, diagnosis and management of idiopathic intracranial hypertension and drusen, as well as the necessary investigations required to differentiate between them.

THE ROLE OF OCULAR ELECTROPHYSIOLOGY IN AUTOIMMUNE RETINOPATHIES

Jo Lynch

Autoimmune retinopathies such as MAR (melanoma associated retinopathy) and CAR (cancer associated retinopathy) are rare conditions but need to be considered in patients who present with rapidly progressive, bilateral, painless vision loss, particularly if they have a history of cancer. Symptoms may include visual field defects, nyctalopia, photopsias and defective colour vision. Extensive testing is required to exclude other causes such as genetic conditions and electrophysiology has an important role to play.

ROYAL VICTORIAN EYE AND EAR HOSPITAL AND ACO COLLABORATIVE CLINIC - A NEW MODEL OF CARE FOR LOW RISK GLAUCOMA PATIENTS

Linda Malesic, Catherine Green, Caroline Clarke, Tracy Siggins, Sharon Bentley, Maureen O'Keefe

To develop a sustainable clinical model of care for the management of glaucoma suspects involving a collaboration between the Royal Victorian Eye and Ear Hospital (RVEEH) and the Australian College of Optometry (ACO). The Glaucoma Collaborative Clinic (GCC) was established in April 2016, at the ACO's main clinic in Carlton, Melbourne. The clinic utilises the full scope of eye care professionals, ophthalmologists, optometrists and orthoptists, to provide eye care the numerous public patients suspected of having glaucoma. The service has been developed with a focus on providing the most appropriate care at the most appropriate time in the patient journey. This presentation outlined how this new clinic has involved new collaborative models and pathways to eye care, building on and bringing together the skills and experience of both the RVEEH and ACO to deliver the best outcomes for patients. In addition, the ways in which the new GCC has provided scope for the clinical training of orthoptists and optometrists in a unique collaborative environment will be presented.

SPECIALIST CLINIC REDESIGN AT THE ROYAL VICTORIAN EYE AND EAR HOSPITAL

Catherine Mancuso, Tracy Siggins

The Royal Victorian Eye and Ear Hospital (RVEEH) is changing. Anyone who works there or has visited in the past four years can see that. There are workmen walking through the hospital in their hard hats and high-vis vests, there is a large gantry erected off the side of the hospital and there is dust and noise and vibration. This is all because we are undergoing a major redevelopment which will bring our facilities into the 21st century. Although these changes are significant they are not the only changes taking place. Significant clinic redesign activities have also taken place. In order to achieve this, we have had to look at: i. how The Royal Victorian Eye and Ear Hospital transitioned from an undifferentiated general eye clinical service to the Surgical Ophthalmology and Acute Ophthalmology specialist eye services; ii. the use of data to support well informed service decisions, and iii. defining clinic role and patient pathways – a compelling narrative for change.

A REVIEW OF StEPS OUTCOMES

Danielle Morgan

The Statewide Eyesight Preschool Screening program (StEPS) provides free vision screening for all 4-year-old children in NSW. The program targets children before starting school to maximise the potential for visual improvement during the critical period of visual development. This presentation explored outcomes from the Sydney Children's/Prince of Wales Hospital StEPS clinics over the last few years and focused on the importance of encouraging patient attendance and the need for orthoptic screening in the StEPS program.

DIABETIC RETINOPATHY IN PREGNANCY: A REVIEW

Julie Morrison, Lauren Hodgson, Lyndell L Lim, Salmaan Al-Qureshi

The prevalence of diabetes in Australia has more than doubled in 20 years. The prevalence of diabetes in pregnancy is increasing even more rapidly due to increasing gestational age and the increasing prevalence, and younger age of onset of type 2 diabetes in the population. Pre-existing diabetes is present in 1 in 167 pregnancies in Australia, divided equally between type 1 and type 2 diabetes. Diabetic retinopathy is a leading cause of blindness in women during their childbearing years and pregnancy increases the short-term risk of diabetic retinopathy progression. We examined the risk factors for progression of diabetic retinopathy during pregnancy including; duration of diabetes, baseline level of retinopathy, level of glycaemic control and hypertension. We also examined current screening and management guidelines and their levels of evidence, current treatment options for diabetic retinopathy and avenues for further research.

THE ORTHOPTIC-LED DIABETIC SCREENING CLINIC AT THE ALFRED HOSPITAL

Mercy Nguyen

In 2014, the ophthalmology department at the Alfred Hospital introduced an orthoptic-led diabetic screening clinic. This clinic was developed in response to the increasing demand required to care and monitor the ocular health of those with diabetes. It allows the orthoptist to be more actively involved in patient care and management, as well as provide a more efficient and effective way of dealing with the ever-growing diabetic health concern. Through this diabetic screening clinic, results have shown that patients receive a more thorough and comprehensive assessment than previously, as well as more appropriate regular eye appointments. This presentation outlined the protocols and procedures that have been implemented through this screening clinic and the benefits it has provided both to the patients and to the productivity of clinics.

A NOVEL METHOD FOR MEASURING NYSTAGMUS

Cem Oztan

Nystagmus is the involuntary repetitive rhythmic oscillation of the eyes. The movements of the eyes are commonly from side to side, but sometimes can be up and down, clockwise and counter clockwise rotation or any combination of these. Additional characteristics of nystagmus include type, whether pendular or jerk, amplitude, frequency, intensity, foveation, conjugate/disconjugate and presence of a null point. Nystagmus in infancy and childhood can be idiopathic or associated with ocular or systemic conditions. It is a common cause of vision impairment, resulting in variable classifications from near normal vision to profound low vision. The clinician is faced with a unique challenge of examining and treating patients with nystagmus. The aim of this presentation was to briefly review current eye movement recording techniques used in nystagmus such as electrooculography, electronystagmography and video eye/gaze tracking devices, and evaluate a novel method for measuring nystagmus which can be used in clinic and applied to the assessment phase and treatment success of nystagmus patients.

ORTHOPTICS IN AN OPHTHALMIC CLINIC

Becc Page, Shandell Wishart

It is nearing the middle of a busy, four doctor clinic and a new patient has presented to a retinal specialist with a 6th nerve palsy – they turn to you for your expert opinion on how to manage this patient. What do you do!? Working within a busy ophthalmic practice, we saw a need to follow in the footsteps of several public hospitals and set up orthoptic-only clinics to provide one-on-one care to patients who require an in-depth orthoptic assessment that cannot be provided within the confines of an ophthalmic clinic. These sub-contracted clinics allow ocular motility patients to be seen at a more suitable time and managed by their orthoptist on an ongoing basis. This presentation aimed to explain how we got our clinics up and running, what challenges we faced along the way and why this model could be useful to many other clinicians working in an ophthalmic setting.

FINGOLIMOD (GILENYA) SCREENING AT THE ALFRED HOSPITAL

Alannah Price

In 2013 at the Alfred Hospital an Orthoptic Drug Screening Clinic was established to screen and monitor ocular changes associated with the use of plaquenil, ethambutol and fingolimod (Gilenya) medications. Gilenya 0.5mg was approved for use in Australia by the Therapeutic Goods Administration (TGA) in February 2011 and placed on the Pharmaceutical Benefits Scheme (PBS) in September 2011 for the treatment of relapsing forms of multiple sclerosis (MS). Collective data from clinical trials found the incidence of macula oedema associated with the use of 0.5mg of Gilenya to be 0.4% of participants. It is therefore recommended that patients who commence Gilenya have an eye exam to assess macula oedema within the first 3 to 4 months of commencing the drug. An overview of the protocols and procedures for Gilenya screening in the Orthoptic Drug Screening Clinic was discussed.

BULA! ORTHOPTISTS IN FIJI 2015

Maria Pritchard, Tony Wu

Last November a group of volunteer medical and allied health professionals visited the Coral Coast in Fiji to provide a range of health based services and education to the local community. The two orthoptists provided vision screening, education and glasses. The experience of these orthoptists was presented.

A RETROSPECTIVE STUDY TO IDENTIFY FACTORS THAT INFLUENCE CLINICAL ADHERENCE RATES IN PATIENTS WITH DIABETIC MACULAR OEDEMA UNDERGOING INTRAVITREAL INJECTION TREATMENT

Monique Rose, Catherine Itsiopoulos, Meri Vukicevic, Konstandina Koklanis, Gwyneth Rees, Suki Sandhu

Diabetic macular oedema (DME) is due to leakage of fluid from damaged blood vessels. Vascular endothelial growth factor (VEGF) is elevated in eyes with DME, and drives vascular leakage. Centre-involving sight-affecting DME is currently treated with intravitreal anti-VEGF injections. It is a commonly performed procedure, which involves multiple injections every four to six weeks until the fluid is resolved and may be continued indefinitely to maintain vision. To date no studies have identified clinical attendance rates and explored personal and clinical factors that influence attendance and non-attendance in patients with DME receiving intravitreal injection treatment. Studies have primarily focused on the barriers and incentives to attend diabetic retinopathy screening. A retrospective study utilising data from medical records of DME patients who attended (patients who attended all appointments) and did not attend (patients who missed one or more appointments in the previous 12 months) the eye clinic between 1st January 2014 to 31st December 2014 was identified from The Royal Victorian Eye and Ear Hospital medical retina injection clinic and retinal clinics at the Cheltenham Eye Centre. A telephone survey was conducted to gain patients' perspectives on attendance and non-attendance. The attendees were asked one open-ended question and non-attendees two open-ended questions. Data analysis has commenced and results will be presented. This person-centred approach will inform strategies for patient education and support to minimise non-attendance in patients with diabetes-related eye complications.

GEOGRAPHIC ATROPHY IN THE CLINICAL TRIAL WORLD

Sutha Sanmugasundram

Age-related macular degeneration (AMD) is a progressive eye disease, which is the leading cause of irreversible blindness in people aged 50 years and older in the developed world. There are two clinical forms of AMD: a non-exudative or dry form, geographic atrophy (GA), and an exudative or wet form. GA affects roughly five-million people worldwide and its occurrence increases exponentially with age. Although the cause of GA is not well understood, studies have shown that specific genetic characteristics and environmental factors may contribute to its development and progression. In the early stages of GA, patients typically show minimal changes in their central visual acuity. Patients can also experience symptoms from visual dysfunction including dense parafoveal scotomas, delayed dark adaptation and reduced contrast sensitivity. In the later stages, as the GA lesion expands into the fovea, a significant decrease in central VA occurs. Currently there are no approved medical treatments for GA, however there are several clinical studies investigating treatment to reduce the rate of GA progression and vision loss. At CERA, we are currently partaking in five different sponsored clinical studies for GA, with three trialling three different investigational drugs and two studying the natural history of these patients. This presentation briefly outlined the three different investigational products being trialled and the differences and benefits of participating in both treatment and non-treatment trials.

HOW TO WRITE A CASE REPORT FOR THE AUSTRALIAN ORTHOPTIC JOURNAL

Linda Santamaria

Are you thinking of writing for the Australian Orthoptic Journal, but not sure where to start? For the beginning writer, this could be with a case report, or an outline of a new model of care. This presentation outlined the process of preparing a case report for submission to the journal, with hints on ethics considerations, literature searching, reading and writing.

OCULAR TORSION IN STRABISMIC PATIENTS AND HOW IT AFFECTS THEIR BINOCULAR POTENTIAL

Angela Serna

We prospectively looked at 40 patients who presented to our clinic with binocular diplopia. Using a Clement Clarke synoptophore, we assessed how many of these patients presented with ocular torsion and how this impacted their binocular potential by testing Worth's three grades of binocular vision. Clinically, we have seen that small negligible amounts of torsion can often affect a patient's binocularity, especially their horizontal fusional amplitudes and stereopsis. Often these patients are unable to fuse with prisms, they demonstrate intermittent fusion or report a somewhat 'single' but blurred image when corrected with prisms or post-surgically. These patients often will not complain of torsional diplopia and ocular motility testing does not always indicate the presence of a superior oblique palsy.

NEW OCT SIGNS IN INTERMEDIATE AMD

Pyrawy Sharangan

Age-related macular degeneration (AMD) is the leading cause of vision loss in people aged fifty years and over in Australia. AMD has relatively slow progression from the early to the advanced stage therefore leaving a window of opportunity for early intervention. With the advancement of available technology and introduction of high resolution imaging techniques, we are now able to detect and analyse new characteristics of AMD that may assist with better understanding the disease. Through this we would be able to detect high-risk signs that indicate a subgroup more likely to progress to vision loss. The spectral domain optical coherence tomography (SD-OCT) is one such device with the ability to help identify additional risk features. This presentation focused on three features that have been identified through our longitudinal studies: nascent geographic atrophy, reticular pseudodrusen and non-exudative detachment of the neurosensory retina.

FAMILIAL RETINOBLASTOMA AND GENETIC TESTING: A PARADIGM SHIFT IN CLINICAL CARE

Sandra Staffieri, Lisa Kearns, James Elder, John McKenzie, Lisette Curnow, David Amor, Alex Hewitt, David Mackey

Background: Retinoblastoma (RB) is the most common intraocular malignancy occurring in children. The RB1gene was first identified in 1986 with genetic testing for RB translating to clinical care by the end of the 1990s. This heralded a paradigm shift in the clinical management of affected individuals by informing their clinical care and that of their siblings and offspring.

Aim: To report on the frequency and outcomes of the use of pre- and post-natal genetic testing for familial retinoblastoma using the Victorian Retinoblastoma Database cohort since 1998.

Methods: Retrospective audit of the Victorian Retinoblastoma Database.

Results: Twenty-six infants were born of 13 individuals with a personal or family history of RB. Only four of the 13 parents elected to undergo pre-natal testing for seven pregnancies. Pre- or post-natal genetic testing was completed in 19 pregnancies. Of these, 12 (63%) infants were found to carry the familial RB1 mutation, six of whom remain unaffected carriers. Five of the unaffected carriers are from two known low-penetrant families. The gestational age at which the first lesions developed in all the affected infants ranged from 35 to 43 weeks (mean 40 weeks). One pregnancy was induced due to the identification of lesions prenatally with intrauterine MRI. With treatment, 21 eyes of 12 affected children have been retained.

Conclusion: Timely genetic counselling and testing for individuals with a personal or family history of RB is an integral part of optimal clinical care. This multidisciplinary approach to care and surveillance is vital to ensure the earliest diagnosis and treatment for optimal outcomes.

Named Lectures, Prizes and Awards of Orthoptics Australia

THE PATRICIA LANCE LECTURE

1988	Elaine Cornell	Home exercises in orthoptic treatment
1989	Alison Pitt	Accommodation deficits in a group of young offenders
1990	Anne Fitzgerald	Five years of tinted lenses for reading disability
1992	Carolyn Calcutt	Untreated early onset esotropia in the visual adult
1993	Judy Seaber	The next fifty years in orthoptics and ocular motility
1995	David Mackey	The Glaucoma Inheritance Study in Tasmania (GIST)
1997	Robin Wilkinson	Heredity and strabismus
1998	Pierre Elmurr	The visual system and sports perfomance
1999	Kerry Fitzmaurice	Research: A journey of innovation or rediscovery?
2005	Kathryn Rose	The Sydney Myopia Study: Implications for evidence based practice and public health
2006	Frank Martin	Reading difficulties in children - evidence base in relation to aetiology and management
2008	Stephen Vale	A vision for orthoptics: An outsider's perspective
2009	Michael Coote	An eye on the future
2010	John Crompton	The pupil: More than the aperture of the iris diaphragm
2011	Neryla Jolly	On being an orthoptist
2012	Shayne Brown	A snapshot of orthoptics from the 1960s to 2000
2013	Sue Silveira	Finding the leader within
2014	Patricia Dunlop	A life in orthoptics
2015	Fiona Rowe	The spectrum of post-stroke visual impairment
2016	Linda Santamaria	50 years: The development of research and publication in the Australian Orthoptic Journal

THE EMMIE RUSSELL PRIZE

1957	Margaret Kirkland	Aspects of vertical deviation
1959	Marion Carroll	Monocular stimulation in the treatment of amblyopia exanopsia
1960	Ann Macfarlane	A study of patients at the Children's Hospital
1961	Ann Macfarlane	A case history "V" Syndrome
	Margaret Kirkland	Surgical cases of intermittent divergent strabismus
1962	Adrienne Rona	A survey of patients at the Far West Children's Health Scheme, Manly
1963	Madeleine McNess	A survey of the use of miotics
1965	Margaret Doyle	Diagnostic pleoptic methods and problems encountered
1966	Gwen Wood	Miotics in practice
1967	Sandra Hudson Shaw	Orthoptics in Genoa
1968	Lesley Stock	Divergent squints with abnormal retinal correspondence
1969	Sandra Kelly	The prognosis of the treatment of eccentric fixation
1970	Barbara Dennison	A summary of pleoptic treatment and results
1971	Elaine Cornell	Paradoxical innervation
1972	Neryla Jolly	Reading difficulties
1973	Shayne Brown	Uses of fresnel prisms
1974	Francis Merrick	The use of concave lenses in the management of intermittent divergent squint
1975	Vicki Elliott	Orthoptics and cerebral palsy
1976	Shayne Brown	The challenge of the present
1977	Melinda Binovec	Orthoptic management of the cerebral palsied child
1978	Anne Pettigrew	
1979	Susan Cort	Nystagmus blocking syndrome
1980	Sandra Tait	Foveal abnormalities in ametropic amblyopia
1981	Anne Fitzgerald	Assessment of visual field anomalies using the visually evoked response
1982	Anne Fitzgerald	Evidence of abnormal optic nerve fibre projection in patients with dissociated vertical deviation: A preliminary report
1983	Cathie Searle	Acquired Brown's syndrome: A case report
	Susan Horne	Acquired Brown's syndrome: A case report
1984	Helen Goodacre	Minus overcorrection: Conservative treatment of intermittent exotropia in the young child
1985	Cathie Searle	The newborn follow up clinic: A preliminary report of ocular anomalies
1988	Katrina Bourne	Current concepts in restrictive eye movements: Duane's retraction syndrome and Brown's syndrome
1989	Lee Adams	An update in genetics for the orthoptist: A brief review of gene mapping
1990	Michelle Gallaher	Dynamic visual acuity versus static visual acuity: Compensatory effect of the VOR

1991	Robert Sparkes	Retinal photographic grading: The orthoptic picture
1992	Rosa Cingiloglu	Visual agnosia: An update on disorders of visual recognition
1993	Zoran Georgievski	The effects of central and peripheral binocular visual field masking on fusional disparity vergence
1994	Rebecca Duyshart	Visual acuity: Area of retinal stimulation
1995–97	Not awarded	
1998	Nathan Clunas	Quantitative analysis of the inner nuclear layer in the retina of the common marmoset callithrix jacchus
1999	Anthony Sullivan	The effects of age on saccades made to visual, auditory and tactile stimuli
2001	Monica Wright	The complicated diagnosis of cortical vision impairment in children with multiple disabilities
2005	Lisa Jones	Eye movement control during the visual scanning of objects
2006	Josie Leone	The prognostic value of the cyclo-swap test in the treatment of amblyopia using atropine
2007	Thong Le	What is the difference between the different types of divergence excess intermittent exotropia?
2008	Amanda French	Does the wearing of glasses affect the pattern of activities of children with hyperopic refractive errors?
2009	Amanda French	Wide variation in the prevalence of myopia in schools across Sydney: The Sydney Myopia Study
2010	Alannah Price	Vertical interline spacing and word recognition using the peripheral retina
2011	Amanda French	Comparison of the distribution of refraction and ocular biometry in European Caucasian children living in Northern Ireland and Sydney
2012	Melanie Cortes	Treatment outcomes of children with vision impairment detected through the StEPS program
2013	Jess Boyle	The accuracy of orthoptists in interpreting macular OCT images
2014	Allanah Crameri	Orthoptist-led clinics: investigating the effectiveness and efficiency of orthoptists in diabetic retinopathy screening and cataract assessment
2015	Jess Boyle	The psychological impact of repeated intravitreal injections on patients with neovascular age-related macular degeneration
2016	Gareth Lingham	Early life risk factors of amblyopia, strabismus and anisometropia in a young adult population

PAEDIATRIC ORTHOPTIC AWARD

1999	Valerie Tosswill	Vision impairment in children
2000	Melinda Syminiuk	Microtropia – a challenge to conventional treatment strategies
2001	Monica Wright	The complicated diagnosis of cortical vision impairment in children with multiple disabilities
2005	Kate Brassington	Amblyopia and reading difficulties
2006	Lindley Leonard	Intermittent exotropia in children and the role of non-surgical therapies
2007	Jody Leone	Prevalence of heterophoria in Australian school children
2008	Jody Leone	Can visual acuity screen for clinically significant refractive errors in teenagers?
2009	Jody Leone	Visual acuity testability with the electronic visual acuity-tester compared with LogMAR in Australian pre-school children
2010	Fiona Gorski	Neurofibromatosis and associated ocular manifestations
2011	Suzy King	Understanding Sturge-Weber syndrome and the related ocular complications
2012	Jane Scheetz	Accuracy of orthoptists in the diagnosis and management of triaged paediatric patients
2013	Louise Brennan	Visual outcomes of children seen in the StEPS High Priority Clinic at The Children's Hospital at Westmead
2014	Nicole Carter	Understanding ocular motor apraxia
2015	Lindley Leonard	Long-term follow-up of a high priority referral clinic at The Children's Hospital at Westmead – beyond the clinic
2016	Cem Oztan	A novel method for measuring nystgamus

THE MARY WESSON AWARD

1983	Diana Craig (Inaugural)	1995	Margaret Doyle	2008	Julie Barbour
1986	Neryla Jolly	1998	Not Awarded	2010	Elaine Cornell
1989	Not awarded	2001	Heather Pettigrew	2011	Zoran Georgievski
1992	Kerry Fitzmaurice	2004	Ann Macfarlane	2014	Mara Giribaldi

ZORAN GEORGIEVSKI MEDAL

2012	Neryla Jolly (Inaugural)	2014	Linda Santamaria	2016	Julie Barbour
2013	Connie Koklanis	2015	Sue Silveira		

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