

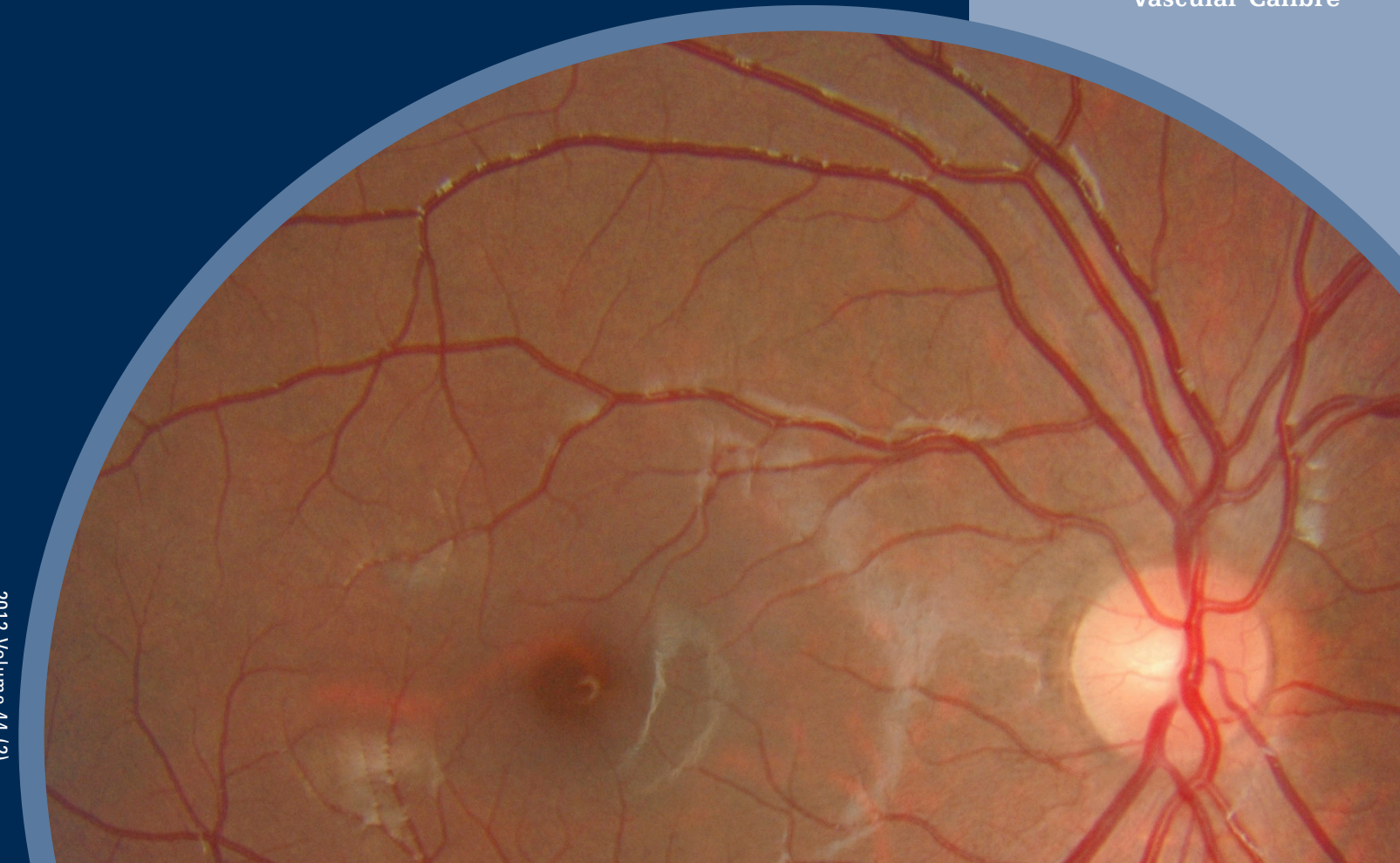
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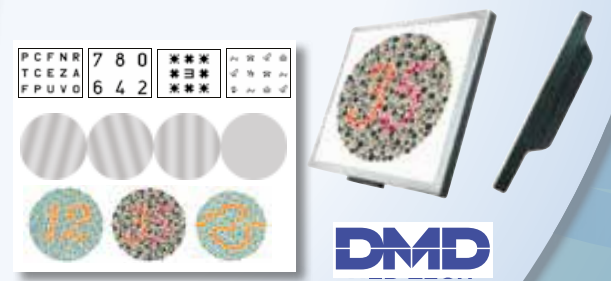
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Improved Visual Acuity in Patients with Congenital Nystagmus Following Anderson-Kestenbaum Procedures

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ABSTRACT

This retrospective study conducted within a large paediatric clinical practice identified eleven patients who were operated on during the period of 1996-2011, using the Anderson-Kestenbaum procedure. These patients, aged 4 to 17 years, were operated on by the same surgeon. Visual acuity was measured using age-appropriate linear or single optotypes and results were compared pre- and post-operatively. Observations of head posture by ophthalmologist, orthoptist

and parent were recorded pre- and post-operatively. Results showed the Anderson-Kestenbaum procedure reduced the compensatory head posture and improved visual acuity in 75% of patients, with a mean improvement in visual acuity of 3.75 letters. Patients showed minimal residual head posture. This study is limited by its retrospective nature and small subject numbers.

Keywords: nystagmus, compensatory head posture, visual acuity

INTRODUCTION

Anderson and Kestenbaum were the first ophthalmic surgeons to describe the use of bilateral extraocular muscle procedures to reduce the size of the compensatory head posture and improve function in patients with congenital nystagmus.^{1,2,3,4} While their procedures had a common aim, Anderson operated on only two muscles whereas Kestenbaum operated on all four horizontal extraocular muscles.^{1,4,5} The aim of the procedure is to displace an eccentric null zone towards the primary position using recession and resection of the horizontal recti muscles so that the patient is able to achieve a zone of minimal nystagmus without having to adopt a large compensatory head posture.^{1,2,3,4} The procedure involves recessing the pair of extraocular muscles opposite to the direction of intended gaze and resecting the pair of agonists contracting in the intended direction of gaze.^{1,2,4} Taylor and Jesse supported Anderson's proposal that through the dampening of the nystagmus, patients' visual acuities would also increase.^{1,2} This is consistent with the rationale that the lower the intensity of the nystagmus, the greater the improvement in visual acuity.^{1,5,6} The Anderson-Kestenbaum procedure is not widely used as there are a limited number of patients for which the procedure is suitable. Previous

studies have been limited by these constraints. The majority of patients who have congenital nystagmus have a null point, a direction of gaze in which the amplitude and/or frequency of the nystagmus is reduced thereby allowing best potential visual acuity to be realised.^{1,4,6} Patients, who adopt a compensatory head posture to utilise their null point, can often encounter many problems. These include changes in musculo-skeletal neck and spinal structures in the developing child, poor use of optics in corrective lenses, social/psychological aspects of a large face turn and in older patients, include the acquisition of driving skills, sporting and other physical abilities. It is for these reasons that nystagmus surgery for a compensatory head posture is often proposed.^{4,6} The question has been posed as to whether visual acuity is also significantly improved. The aim of this retrospective study is to compare the pre- and post-operative visual acuity results of patients with congenital nystagmus who had the Anderson-Kestenbaum procedure performed by the one surgeon, with the purpose of reducing the size of the compensatory head posture.

METHODS

The Anderson-Kestenbaum (AK) procedure had been performed on a total of eleven patients who were identified by researching the clinical records of the largest private paediatric ophthalmology clinic in Victoria, Australia. The years 1996-2011 were chosen, this being the period in

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which the surgeon had been operating continuously. No AK procedures have been performed since 2011. The patients suitable for analysis had been listed in the surgical records and data was manually collected. Of the eleven patients six wore no refractive correction, four wore full-time hypermetropic correction and one patient had a low amount of hypermetropic correction used only for near work (therefore not worn in the measurements used in this study). Although only the one surgeon operated in this study, several orthoptists provided clinical measurements pre- and post-operatively as part of normal clinical practice.

The visual acuity (VA) of the eleven patients, aged 4 to 17 years, had been measured both pre- and post-operatively as part of a full clinical assessment. The age-appropriate VA optotypes used were the 3 metre LogMAR illuminated chart and the 3 metre Kay picture recognition test. VA was analysed to determine whether there had been an improvement in visual acuity with the reduction of the CHP postoperatively. The VA measurements that have been analysed are those taken with both eyes open using the CHP, as this was the measurement integrating visual acuity and compensatory head posture. Subjective observations of the CHP were recorded pre- and post-operatively by ophthalmologist,

orthoptist and parent. Geometric measures of the CHP were not routinely employed in the clinical setting. The ophthalmologist based his surgical decision on a combination of both Anderson and Kestenbaum procedures as well as the Parks method, basing the amount of recession and resection on all four extraocular muscles on the type and severity of head posture and any accompanying strabismus.

RESULTS

Results can be viewed in Tables 1 - 6 and Figure 1. Tables 1 and 2 show the direction of the CHP including face turn, head tilt and chin elevation or depression, the presence of strabismus and the AK surgery. Table 1 describes patients in the linear optotype group (patients 1 to 8) and Table 2 shows the single optotype group (patients 9 to 11). Seven patients had CHP comprising face turns to the left, three patients had CHP of face turns to the right and one patient had an alternating head turn. Five patients had strabismus preoperatively with three showing reduced horizontal angles postoperatively. Due to age, VA measurements were not obtained by using the same optotype on all patients. Best recorded VA preoperatively and the best recorded

Table 1. Characteristics of patients in the linear optotypes group

Patient	Age at surgery (years)	CHP pre-op	CHP tilt pre-op	CHP post-op	Strabismus pre-op	Strabismus post-op	Procedure
1	10.1	Left	No	No	No	No	RLR and LMR recess RMR and LLR resect
2	17.1	Right	Right tilt	Right tilt Chin-up	RET +10pd	Flick RET	RMR and LLR recess RLR and LMR resect
3	6.7	Left	No	No	No	No	RLR and LMR recess RMR and LLR resect
4	8.9	Left	No	No	No	No	RLR and LMR recess RMR and LLR resect
5	11.6	Right	No	No	No	No	RMR and LLR recess RLR and LMR resect
6	10.4	Left	No	No	No	No	RLR and LMR recess RMR and LLR resect
7	6.2	Left 20°	No	No	LET +10 pd	LET +10 pd	RLR and LMR recess RMR and LLR resect
8	6.9	Alternating	No	Small alternating	LET +10 pd, R/L 14 pd	Exophoria -6 pd, R/L 2 pd	RMR and LLR recess RLR and LMR resect

Table 2. Characteristics of patients in the single optotypes group

Patient	Age at surgery (years)	CHP turn pre-op	CHP tilt pre-op	CHP post-op	Strabismus pre-op	Strabismus post-op	Procedure
9	5.4	Right turn	No	Small right turn	RET +18 pd	RET +6 pd	RMR and LLR recess RLR and LMR resect
10	4.0	Left turn	Left tilt	No turn Small left tilt	LET +35 pd, L/R 12	L/R 12 pd	RLR and LMR recess RMR and LLR resect
11	5.7	Left turn	No	Small left turn	No	No	RLR and LMR recess RMR and LLR resect

VA postoperatively are described in Table 3, using the total number of letters seen, for patients in the linear optotype group. The VA improved in six patients, remained unchanged in one patient and was reduced by five letters in one patient.

Table 3. Linear optotypes group, visual acuity pre- and post-operatively (number of letters identified on LogMAR chart)

Patient	VA BEO pre-op (using CHP)	VA BEO one month post-op	Best recorded VA BEO post-op	Change
1	50	50	55	10%
2	55	50	50	-10%
3	38	35	45	16%
4	45	42	55	18%
5	40	40	40	0%
6	35	35	38	8%
7	30	35	35	14%
8	45	45	50	10%

Figure 1 shows the improvement in VA in the linear group. This is based on the number of letters gained/lost following surgery. The range of letters seen by patients preoperatively was between 30 and 55 letters and postoperatively between 35 and 55, indicating that none of the patients had VA less than 3/9. Postoperatively, 75% of the linear optotype group had some level of VA improvement. The most significant improvement was noted in patient 4 with an 18% (a gain of 10 letters) improvement in VA recorded postoperatively. Mean VA increase postoperatively was 3.75 letters. Figure 1 demonstrates a decrease of 5 letters recorded by patient 2. Further investigation found that this patient preferred not to wear his refractive correction, thereby reducing the VA from 3/3 (55 letters) to 3/3.8 (50 letters) postoperatively. The mean VA improvement in the linear group was 6.81% (3.75 letters) when patient 2 was included or 9.09% (5 letters) when patient 2 was excluded.

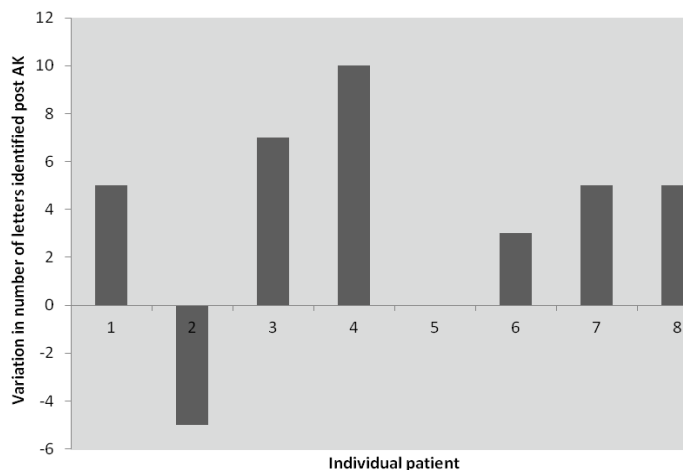


Figure 1. Visual acuity change post Anderson-Kestenbaum procedure (linear optotypes group).

Table 4 shows the VA of patients in the single optotype group. VA improved postoperatively in two patients (66.7%) and remained unchanged in one patient. This VA cannot be described by the number of letters but only by the Snellen's equivalent value of size of picture recognition.

Table 4. Single optotypes group, visual acuity pre- and post-operatively

Patient	VA BEO pre-op	VA BEO at one month post-op	Best recorded VA BEO post-op
9	3/6	3/6	3/4.8 (45 letters)
10	3/6	3/6	3/6
11	3/9	3/6	3/6

Table 5 shows the amount of muscle recession or resection in each case. It can be seen that the amount of recession/resection in all patients was between 5 and 11 mm, with the largest amount involving the lateral rectus. Patients 2, 7, 8, 9 and 10 had strabismus recorded pre- and post-operatively. The amounts of extraocular muscle recession and resection included the consideration of the correction of the strabismus. The emphasis was on greater amounts of recession/resection of the lateral rectus in these cases. Four of the five patients with strabismus had a reduction in the size of their esotropia. The prism cover test results are listed in Tables 1 and 2. There were no instances of limited adduction or abduction on horizontal gaze as recorded on ocular movement testing. No cases of iatrogenic strabismus were induced and no consecutive exotropia occurred.

Table 5. Amount of extraocular muscle recession/resection (mm)

Patient	RLR	LMR	RMR	LLR
1	unknown	unknown	unknown	unknown
2	unknown	unknown	unknown	unknown
3	10 recess	7 recess	7 resect	9 resect
4	9 recess	6.5 recess	8 resect	10 resect
5	9 resect	7 resect	6.5 recess	9 recess
6	9 recess	6.5 recess	8 resect	10 resect
7	7 recess	5 recess	5 resect	7 resect
8	9 resect	6 resect	6.5 recess	8 recess
9	11 resect	7 resect	7 recess	10 recess
10	10 recess	8 recess	7.5 resect	10 resect
11	7 recess	8 recess	6 resect	5 resect

Table 6 lists the stereopsis results for all patients. As can be seen, no procedure resulted in compromised binocular functions. In patients 1, 3, 4, and 5 the level of stereopsis on the Lang II test either remained stable or improved, patient 6 was never tested, and patients 2, 7, 8, 9, 10, and 11 did not show the presence of stereoacuity pre- or post-operatively.

Table 6. Lang II stereopsis (seconds of arc)

Patient	Stereopsis pre-op	Stereopsis post-op
1	200	200
2	No SV	No SV
3	400	200
4	1200	600
5	1200	1200
6	Test not completed	Test not completed
7	No SV	No SV
8	No SV	No SV
9	No SV	No SV
10	No SV	No SV
11	No SV	No SV

Patients in both single and linear optotype groups were described as having an improvement in VA, but with minimal residual CHP remaining following the procedure. Qualitative description was required as no numerical value was provided for pre- and post-operative CHP and was based on observation of the ophthalmologist, orthoptist and parent. Patient 4 CHP pre- and post-operatively can be seen in Figures 2A and 2B. Head postures were not reversed in any instance. Analyses of all results in relation to statistical significance are not given due to the limited subject numbers.



Figure 2A. Patient 4 preoperative CHP.



Figure 2B. Patient 4 postoperative CHP.

DISCUSSION

The first premise that this study supports is that the VA measured with both eyes open for patients with congenital nystagmus and a CHP improves with a reduction in the eccentricity of the null zone. The closer the null zone approximates the primary position, the better the ability of the patient to maximally utilise their VA. Refractive corrections can be optimally used, and increased retinal image stabilisation probably occurs with a reduction in the nystagmus amplitude and frequency.⁶

In this retrospective study, eight out of the eleven patients had improved VA following AK surgical correction of their CHP associated with their congenital nystagmus. It must be noted that the pre- and post-operative measurements were performed by several orthoptists over time at this large paediatric clinic.

Previous studies have quantified the CHP pre- and post-operatively. Wang et al⁷ propose that the measurement in degrees of the patient's CHP is the deciding factor in the required amount of surgery. In patients with CHPs less than 15 degrees, the surgeon used Anderson's two muscle approach. If the CHP was 15 to 25 degrees the surgical decision was based upon Kestenbaum's four muscle approach and in patients with CHP that was greater than 25 degrees, the surgery followed the Parks method.⁴ Wang et al's results were positive, showing that 72.27% of patients had less than 8 degrees of CHP postoperatively. While they described the surgical decisions based primarily on the size of the CHP, their retrospective study showed that the main deciding factor was the direction rather than the size of CHP. This raises the question as to the importance of categorising patients into degrees of CHP or not. Wang et al also reported that 79.55% (35 out of 44) of their patients had an increase in VA of 10 letters postoperatively. Our retrospective study compares well, with 75% of patients demonstrating an increase in VA, however the magnitude of the change (3.75 letters) was less than that reported by Wang et al.

Based on previous findings,⁸ the surgeon in this study chose to surgically adjust the horizontal component alone of the CHP and not actively intervene in the vertical or torsional components. Similar studies with patients who had both head tilts as well as head turns, showed that surgery exclusively on the horizontal muscles was able to provide significant improvement to the VA and CHP post operatively.⁸

The benefit of limiting the recession of the medial rectus is a common discussion among surgeons. In many studies it is suggested that this muscle should be recessed no more than 5 mm in order to avoid reduced adduction.⁹⁻¹¹ In our study, the surgeon chose to recess the appropriate rectus muscle between 5 and 10 mm depending on the combined CHP and strabismus. While specific adduction measurements were

not made postoperatively due to the retrospective nature of the study, there was no symptomatic loss of function. A small amount of symmetrical duction restriction may in fact be desirable postoperatively in the direction of gaze induced by the original CHP. It can be argued that the benefits of the reduction in the patient's CHP outweigh the risk of over-recessing the medial rectus muscle. Sternberg¹² completed a similar evaluation of ten patients who received operations based on Anderson-Kestenbaum procedures. He recessed the medial recti muscles only up to 3 mm, with the rationale of preventing convergence insufficiency. Results however, showed that VA remained the same in eight of the ten patients, and improved in only two. It seems therefore that a greater recession of the medial rectus aids significantly in the reduction of the CHP without adduction deficit risk and therefore allowing improved VA.³

Von Noorden⁴ discusses the use of the Parks method, which is similar to the method employed in this study. Parks recommended 5 mm recession of medial recti, 6 mm resection of medial recti, 7 mm recession of lateral recti, and 8 mm resection of lateral recti. These contrast with the measurements in the current study which are larger, the greatest being those with strabismus. Parks further recommended adding 1 - 2 mm to the recession/resection in patients with larger head turns.⁴ Results in 18 patients whose surgery followed the Parks method, show the elimination or reduction of the CHP to less than 5 degrees in 77% of patients, indicating the success of this method.⁴

The level of data collected for this retrospective study was limited; the main reason being that the Kestenbaum operation is not a common surgical procedure. Similar prospective studies were able to compare larger numbers, with surgery on 43 patients over a period of 15 years.¹ Statistical analyses of those results could therefore be conducted. In our study, the patients were divided into the single and linear optotype groups, required due to the age-related VA testing performed at the time of surgery. Three patients in the single optotype group were unable to complete all or any of their testing with a linear VA chart due to age and maturity level. In a prospective study completed by El Kamshoushy et al,¹³ a protocol was completed prior to testing, ensuring that all patients were aged over 5 years. Testing was conducted with one common method and the results were repeated on separate days to establish consistency. The retrospective nature of our study meant there were limitations to these VA protocol settings. El Kamshoushy et al aimed to demonstrate that improving the CHP also improved the recognition time, not just the VA level. The results were unable to be statistically analysed due to the small size of the population. It is useful to note that our study compared favourably with El Kamshoushy et al's, in that there was no evidence of unc cosmetic CHP or poor muscle function following the AK procedure.

Surgical results in all patients were successful, including those with strabismus preoperatively. Von Noorden discusses the risk of operating using the Anderson-Kestenbaum procedure on patients with strabismus, as results are often found to be less predictable than strabismus surgery uncomplicated by nystagmus null zones.⁴ The four strabismus cases in our study all had unilateral esotropia. In three of the four, the angle of esotropia significantly reduced following the AK procedure, one was unchanged and there were no overcorrections or reversals.

Binocular functions are often useful to include within studies on extraocular muscle surgical treatments. Von Noorden states that in using Parks' version of the Anderson-Kestenbaum procedure, binocular function should not be compromised. The exception is possible diplopia postoperatively which should subside quickly.⁴ As shown in the patients within our study, none of the 11 cases who were able to demonstrate stereopsis preoperatively had their stereopsis compromised postoperatively. This supports von Noorden's proposal for the preservation of binocularity when following the Parks method of the AK procedure.

CONCLUSION

This study concludes that using the Anderson-Kestenbaum surgical procedure to improve CHP and VA is successful for the majority of patients with congenital nystagmus. These results support the findings of similar studies. Although the numbers in this data collection were limited, the number of patients gaining improvement in their linear VA is similar, at 75%, to the work of previous authors.

The ideal prospective study would be designed where the patients presented with congenital nystagmus, an established CHP, no refractive error, and were able to reliably perform a linear optotype visual acuity test. VA would be tested both eyes open with and without the CHP preoperatively to establish that the CHP was indeed being utilised to maximise VA. Electronystagmography measures pre- and post-operatively, would provide evidence for changes in amplitude, frequency and latencies of the nystagmus and provide clues for mechanism changes. Clinical data would be collected periodically by the same orthoptist and the operations performed by the same ophthalmologist. The CHP would be quantitatively recorded and qualitative assessment would also be made. The project would be ongoing until sufficient numbers were obtained so that statistical significance could be determined.

This study confirms that the Anderson-Kestenbaum procedure continues to be a useful and successful tool in the management of patients with congenital nystagmus and a compensatory head posture. This procedure reduces the head posture and improves the visual acuity in the majority of patients.

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'Culture in the clinic': A Review of the Public Health Challenge of Preventing Age-Related Low Vision or Blindness in African Americans: With Implications for Eye Health Care in Australia

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ABSTRACT

There is a body of evidence indicating African Americans are at a higher risk of developing blindness or low vision from ageing-related eye conditions, largely due to lack of attendance at eye screenings or non-compliance with treatment. Three eye conditions which will be discussed in this context are cataract, glaucoma and diabetic retinopathy. The aim of this literature review is to demonstrate that, when planning programs such as eye screenings, it is important to consider the cultural needs of the client group under study. This paper attempts to demonstrate how addressing cultural needs and culturally-determined barriers to eye screening attendance could greatly enhance program success. Australia's cultural mix indicates there is a need to consider all races when planning programs. Using this holistic approach in a similar manner but applied to more local populations, such as indigenous Australians could also enhance eye screening attendance rates for these

subjects.

The literature suggests the health issue of low vision or blindness in African Americans is largely attributable to geographic and culturally-determined behavioural factors posing a barrier to seeking professional eye screening and treatment. Also, culturally determined barriers to modifying diet and lifestyle habits influence control of sight-threatening diabetes resulting in poorer vision, which generally deteriorates with age.

It has been reported that African Americans would benefit from public health intervention to help prevent or minimise low vision. If this health issue is successfully addressed, there could be significant reductions in the economic health care burden in regions where this population resides, and patients could enjoy a better quality of life.

Keywords: eye health, cultural attitudes, risk factors, barriers, enablers

INTRODUCTION

According to public health professionals, health care delivery systems need to address the cultural needs of the targeted population in order to increase the likelihood of success.^{1,2} This literature review aims to highlight the impact a well-planned, culturally appropriate eye health program can have on attendance rates and therapy adherence. Whilst this is an African American study, the results suggest that using the general approach of engaging with the target group in a culturally-sensitive manner could enhance program success in other populations. The holistic approach to health care can therefore be applied anywhere, if each culture is taken into account. Australia is a very appropriate example of a multicultural society which could take a similar approach to health care delivery.

Approximately 1 in 28 Americans over the age of 40 years are suffering with partial vision loss or complete blindness.³ This rate is expected to double by the year 2020, as the population ages.⁴ In African Americans, the problem is more prevalent and the challenge for orthoptists, ophthalmologists, optometrists and public health professionals working with these groups lies in addressing this gap.³

Low vision or blindness is costly to society as it affects independence, increases the risk of falls and comes with an expensive health burden to the community with the necessary incorporation of rehabilitative services. Vision loss also decreases living standards and quality of life. With vision-impaired individuals more likely to stay at home, the picture is further complicated as their connection with health professionals can potentially become more difficult to maintain.⁴

Various types of 'non-compliance' to medical intervention have been noted, a better understanding of which can

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assist in managing patients (Table 1).⁵ Cataract, glaucoma and diabetic retinopathy are the three most common eye disorders. Visual outcomes related to these conditions can be improved if patients are educated about self-management and compliance with treatment. Eye health screenings planned in a culturally sensitive manner have been shown to improve compliance with suggested treatments when a diagnosis has been made.^{6,7}

Table 1. Types of non-compliance with medical services in a US study of African Americans¹⁶

Receiving a prescription but not filling it
Taking an incorrect dose
Taking medication at the wrong times
Increasing or decreasing the frequency of doses
Stopping the treatment too soon
Delaying seeking healthcare or non-participation in clinic visits
Failure to follow doctor's instructions
'Drug holidays', the patient stops the therapy for a while and then restarts the therapy
'White-coat compliance', patients are compliant to the medication regimen around the time of clinic appointments

PREVALENCE OF OCULAR CONDITIONS AMONGST AFRICAN AMERICANS

Cataract

Cataracts are the cause of approximately 50% of cases of vision loss in white, African American, and Hispanic individuals, however the more severe forms of cataract-related vision loss are four times more prevalent in African Americans.⁸ African Americans therefore have a greater burden of uncorrected cataract-related vision loss when compared with white Americans.⁸

Glaucoma

A recent study identified that glaucoma was present in 1.9% of people in the United States and three times more prevalent in African Americans.^{9,10} There is therefore, an increased risk of vision loss in this population. Peek et al¹¹ also reported that African Americans are 45% less likely to undergo glaucoma surgery, which may be contributing to the higher blindness rates in this population.

Diabetic retinopathy

Diabetic retinopathy is present in 4.1 million American adults aged 40 years and over, with one in twelve having sight-threatening retinopathy. With future projections, the age-related prevalence of diabetes poses a serious public health challenge as the population ages.¹² Indeed, a 3.4 % increase in diabetes has been reported with age in a study of people over the age of 40 years.⁷ Looking specifically at African Americans, it was noted that not only is diabetes more prevalent in this group, so is the most sight-threatening form of retinopathy where central vision is affected. This is

linked to having untreated diabetic retinopathy for a longer period of time.¹³

RISK FACTORS

Biological factors

The biological risk factors for glaucoma include a positive family history, or genetic predisposition, African American ancestry, and diabetes. Diabetes increases the risk of glaucoma, particularly when the diabetes is poorly managed and longstanding.^{9,10,11} Diabetes is reported by Walker et al¹⁴ to be more prevalent in African Americans, partly due to genetics, but also largely influenced by cultural factors.

Cultural factors

Cultural risk factors help to explain the attitudes, beliefs and consequent reactions to medical intervention. In a series of interviews with African Americans regarding cultural beliefs about the seriousness of vision loss; preferred health habits and a sense of spiritualism or 'fatalism' (that fate is in God's hands), were found to be possible influences on why medical compliance is poor.¹⁴

Furthermore, significant misunderstandings associated with the natural diet still consumed by many African Americans were noted. For instance, there was a lack of knowledge about a balanced diet. Many African Americans were reported to rely heavily on foods with high amounts of sugar, such as yams and bananas for nutrition, ignoring the other important food groups required in a diet.

Environmental factors

Environmental risk factors include geographical isolation, a low supply of eye health professionals or screening services in rural regions, or difficulty with transport to clinics for financial reasons. All these factors have been noted to be related to the increased prevalence of eye disease amongst African Americans.⁸

BARRIERS TO HEALTHY BEHAVIOUR

Behavioural attributes

The Eye Disease Prevalence Research Group^{12,15} reported that African American men are more likely to be blind from cataracts than white men. In the East Baltimore region, untreated cataract and the resulting blindness was four times more prevalent in African Americans compared with whites. In addition, the types of cataracts found most frequently in African Americans are different from those found in whites.^{4, 15} The cataracts are often diagnosed later in this population, due to poor attendance rates at eye screenings and are therefore of the more dense and central type, causing more severe vision impairment.

African American men are also more likely to have cataracts

resulting in total blindness even though more women are diagnosed with cataracts.⁸ This is likely to be due to African American men being more likely to delay or completely avoid seeking surgical correction of the cataract.⁴ Variations in access to surgical treatment may also account for some of these disparities.⁸

Looking at glaucoma, there was a higher reported incidence of vision impairment in African American versus white adults. Half of the blindness found in these populations could have been prevented or reversed with proper care, highlighting the need for attendance at screenings for early detection and compliance with treatment upon diagnosis. Studies of rural-based community populations showed that, as distance from the cities increased, the rates of vision loss from glaucoma were higher. This was reported to be partly due to lack of access to appropriate eye care.⁴

Attitudes towards health, the health system and empowerment

As noted previously, African Americans do not attend medical appointments as frequently as white Americans. A more in-depth analysis of reluctance to attend appointments was conducted by Brown¹⁶ who undertook a series of individual interviews with African Americans. He reported that there was a level of mistrust in the advice and treatment offered by health professionals and that there was a preference for natural treatments to address poor vision.

Although this was a United Kingdom-based study, similar studies by Anderson et al¹⁷ showed responders have feelings of powerlessness, ambivalence and even a fear of their illness. Both Brown and Anderson et al have shown an inability for African Americans to connect behaviour to outcomes and a lack of social support and education related to their health.^{16,17} Other researchers however, have noted a lack of confidence in the health system, although this group still requested assistance from the same professionals they lacked faith in, to better understand their condition.^{18,19} Overall, African Americans did not have a thorough understanding of the seriousness of the disease, lacked trust in the health system and did not possess the types of behaviours required to control an ocular and/or medical condition.

Religious views

Brown¹⁶ reported that religious faith and the concept of leaving one's fate in the hands of a higher being (views embedded within the African American culture) are barriers to healthy behaviours. For instance, Peek et al¹¹ reported that African Americans are 45% less likely to undergo glaucoma surgery and suggested that this lack of co-operation with medical intervention may be due to religious views amongst other issues. Once again, issues of mistrust in the medical system, lack of understanding, fear and reluctance to change were also reported as reasons why African Americans underwent less surgery.¹¹

Language and lack of understanding of medical information

Language can be a barrier when planning programs, as it hinders communication and understanding of the information provided regarding diagnosis and treatment.²⁰ African Americans speak in a range of unique ways. Included in the language is a variation on English, described as 'African American English', 'bad', 'simple' or 'Pidgin English'.²¹ Whilst the language may not immediately appear to be much of a variation on English, the use of this type of language creates a sense of identity amongst group members.²¹ It is this latter point which health professionals could take note of when planning programs. An interpreter may not be required, but placing participants together in groups with members they can relate to, has significantly enhanced program success rates.¹¹

When researchers looked at perceived barriers to diabetic eye care, they found that whilst participants felt they had a good knowledge of the condition, there was a gap in the levels of information relayed about retinopathy and in subsequent patient understanding.^{14,22} All suggested that addressing language barriers may help to bridge this knowledge gap.^{14,18,19,22} Walker¹⁴ also reported that in the case of diabetes, complications of the general disease can overshadow the eye disease, further complicating understanding and compliance.

ENABLERS TO IMPROVING ATTENDANCE AT VISION SCREENING AND CHECK-UP SERVICES

In the interviews conducted by Brown,¹⁶ group discussion proved to be an effective method in increasing participants' understanding of their condition. African Americans felt most comfortable in a setting with their peers and this has proven an enabler to public health education.^{11,23} Also encouraged is a more personal approach, with individual phone-calls to patients to follow up on any educational programs implemented.

Useful strategies to enable effective delivery of health messages to target audiences include the use of the mass media, interpersonal communication and shared decision-making. In general, it has been found that individuals are willing to learn more about their eyes and the potential for sight loss, which is driven by a sense of fear and stress about losing vision¹¹ and as such, there is significant opportunity for clinicians to enable increased understanding.

Given that it is well known that early detection is a key to preventing vision loss, it is questioned whether adequate numbers of eye care professionals exist in rural areas where African Americans reside. Increasing the access to eye screenings in rural areas is therefore also a necessary step in public health intervention, in addition to better educating African Americans about their eye condition and working on modifying behaviours and attitudes.

PUTTING THE EVIDENCE INTO THE AUSTRALIAN CONTEXT

The Australian Bureau of Statistics (ABS) reports national census data however lengthy demographic census reports are not published on a yearly basis, but rather five-yearly.

A general trend of immigration of all races is increasing. The National Migrant Statistics Unit (NMSU) was developed in 2006 by the ABS.²⁴ Not all ancestry is reported accurately, however in 2011 the reported immigration of those with African American ancestry was at least 1,141. Migration is increasing, and as not all ancestries are reported, or some people report only one of two ancestries, this figure is likely to be significantly higher.²⁵

In 2013, the ABS census data showed that in the last ten years, immigration to Australia in general, has grown from 23.1% to 27%, or to approximately 6 million people. This is a significant change, so it stands to reason that health care professionals must take the culture of the patient into account, to enhance effectiveness in service delivery.²⁵

CONCLUSION

The evidence presented here, points to a significant gap in eye health between white and African Americans. The literature suggests that this is explained by behavioural and environmental risk factors, cementing an already existing lack of compliance with and understanding of medical services.

The picture is not completely negative, as efforts to improve knowledge gaps to date have shown possible enablers to change, such as a concern about health and a willingness to learn more. The challenge for the future now lies in matching public health programs to the needs of target groups. Australian health professionals should be alert to the fact that they may come across members of this demographic in their daily working lives. Principles outlined in this review could be applied to enhance program success. Similarly, clinicians are encouraged to take a more holistic approach when planning any eye health program, by ensuring it matches the overall needs of the particular target group from the outset.

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Predictors of Retinal Vascular Calibre: A Review

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ABSTRACT

Retinal vascular calibre assessment offers a unique, non-invasive research tool to better understand the pathophysiology of the body's microvasculature and aid in the prediction of cardiovascular, cerebrovascular and metabolic related diseases. However, to fully understand the relationship between the microvascular alterations that occur in the retina and the role they play in human disease it is important to recognise the impact of genes, ethnicity, prenatal, perinatal and postnatal factors on

retinal vascular calibre. This review highlights a range of genetic, ocular, systemic and birth parameters, most notably that of ethnicity and birth size, that appear to have a profound effect on retinal vascular calibre and therefore must be taken into account as a source of variation when determining the clinical significance systemic factors have on retinal vasculature.

Keywords: retinal vascular calibre, arteriolar calibre, venular calibre

WHAT IS RETINAL VASCULAR CALIBRE?

Retinal blood vessels are readily accessible via non-invasive retinal photography. Previous methods of measuring retinal vascular characteristics involved subjective clinical ophthalmoscopic examinations that proved to be variable and imprecise.¹ Objective measurement of retinal vascular changes can now be accurately assessed using computer-based imaging programs.¹ They provide a means to study the early structural changes that provide important information regarding the state of ocular microcirculation.² Retinal vascular calibre assessment involves measuring the diameter of retinal arterioles and venules and an overall value for each calculated via a specialised formula (normal range = 100-300 microns).³ It has proven to be an effective tool in determining the clinical significance that systemic, environmental and genetic factors have on retinal vasculature. Furthermore, researchers have established that retinal vascular calibre assessment offers a unique, non-invasive research tool to better understand the pathophysiology of the body's microvasculature and aid in the prediction of cardiovascular, cerebrovascular and metabolic related diseases.² To fully understand the relationship between the microvascular alterations that

occur in the retina and the role they play in human disease, it is important to recognise the impact that genes, ethnicity and pre-, peri- and post-natal factors have on retinal vascular calibre.

ETHNICITY

Increasing evidence suggests retinal vascular calibre varies significantly between different ethnic groups.^{2,4-6} The Singapore Cohort Study of the Risk Factors for Myopia (SCORM) examined retinal vascular calibre in 768 children from Chinese, Indian and Malaysian backgrounds.² Findings were such that retinal venules and arterioles were narrower in Chinese children compared to Malay and Indian children.² Wong et al further highlighted the presence of ethnic variations in retinal microvasculature when they found that both retinal arteriolar and venular calibre were significantly larger in Black and Hispanic participants compared to Chinese and Caucasian participants.⁶ A later Australian study by Rochtchina et al found that retinal vascular calibre was wider in children of East Asian appearance compared to Caucasians. This difference however, could be principally explained by darker iris colour which approximated to darker retinal pigmentation.⁴ They suggested that a higher level of pigmentation in those darker races reduces the contrast between background and retinal vessels, making the vessel's edge harder to detect by the specialised semi-automated computer program, leading to the erroneous

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overestimation of retinal vascular calibre.⁴ This implies that retinal pigmentation may affect comparisons of retinal vascular calibre between subjects with different ethnic backgrounds. Despite these findings the precise reasons for these differences still remain largely unclear. Ethnic differences in calibre may reflect the susceptibility to vascular risk factors, ocular biometry measures, variations in retinal background colour and/or genetic factors.^{2,4-6}

GENETIC DETERMINANTS

The Beaver Dam Eye Study was the first to investigate the genetic basis of retinal vascular calibre, focussing on familial aggregation initially and then building on this research using genome-wide linkage in a subsequent study.⁷⁻⁸ When investigating correlations among family members they found that retinal vascular calibre measurements were more strongly correlated between relatives compared to unrelated individuals and these correlations were likely the result of shared genes. This novel finding provided the first evidence for a genetic influence on retinal vascular calibre.⁷ A later study by Xing et al utilised data from the Beaver Dam Eye Study to assess genome wide linkage. Findings were such that retinal arteriolar and venular calibre were linked to multiple genetic loci, some unique to only arterioles and some unique to only venules.⁸ This finding further highlighted that structural changes in retinal microcirculation may have genetic determinants as some distinct genes are likely to play a part in determining the size of arteriolar and venular calibre.⁸ Taarnhoj et al went on to examine the heritability of retinal vascular calibre, recruiting 55 monozygotic and 50 dizygotic twins to assess the relative influence of genetic and environmental factors on vascular calibre.⁹ Retinal vascular calibre was found to be significantly influenced by genetic factors as it accounted for 70% of variance in arteriole diameters and 83% variance in venule diameters.⁹ The results from these three studies suggest that retinal vascular calibres and the associated variations in risk of systemic disease may be a primary genetic characteristic. Despite this, further research is required to aid in the understanding of genetic associations on vascular calibre in various systemic diseases.¹⁰

BIRTH PARAMETERS

The impact of early life factors on retinal vascular calibre still remains largely unclear. Children have been a popular choice as participants in these studies as they are generally free of potentially confounding systemic and environmental factors and therefore provide an ideal study population.¹¹⁻¹² Several studies have examined the relationship between birth weight and retinal vascular calibre and have shown a possible association between the two.^{3,10,13-15} It has been suggested that low birth weight and shorter birth length may impact the body's microcirculatory structure possibly

leading to the development of various cardiovascular and systemic disorders.³ Cheung et al was one of the first studies to assess the relationship between birth factors and retinal vascular calibre in children.² They found that there was no association between vascular calibre and the birth factors of gestational age and birth weight. These results do not support the growing body of evidence that suggests a person's risk of hypertension, diabetes and coronary heart disease begins in early life.^{10,14} Cheung et al must be commended for their large sample size (n = 768), however the school-based design may not have been truly representative of the entire community.²

Conversely, later studies by Sun et al and Mitchell et al, who also assessed the relationship between birth parameters and retinal vascular calibre, found a consistent association between smaller birth size and narrower retinal arterioles.^{10,14} Mitchell et al also added that children with a smaller birth length and head circumference also displayed significantly narrower retinal arterioles.¹⁴ These findings support the concept that poor in utero growth may have an adverse influence on microvascular structure.^{10,14} Mitchell et al utilised a large population-based sample (n = 1369), however they did not account for genetic or socioeconomic factors that could confound associations between retinal vascular calibre and birth weight.¹⁴ On the other hand, despite a small sample size (n = 266), Sun et al's twin study accounted for any vascular determinants that would be constant across twin pairs (maternal nutrition, environmental factors, gestational diabetes, socioeconomic factors) suggesting that arteriolar changes are likely related to individual specific factors such as different foetal nutrient supplies.¹⁰ These findings are consistent with those in adult populations.³ Liew et al examined the association between birth weight and retinal arteriolar calibre in 3,800 persons aged between 51 and 72 years.³ Similarly, they found that lower birth weight was associated with narrower retinal arteriolar calibre. Findings from Liew, Mitchell and Sun imply that intrauterine influences of low birth weight may result in structural circulatory changes.^{3,10,14}

OCULAR PREDICTORS

Myopia

There is still much debate surrounding the relationship between retinal vascular calibre and an individual's refractive state. Wong et al was one of the first studies to assess this relationship and found that smaller retinal arteriolar and venular calibres were associated with a myopic refraction and the opposite was noted in hyperopic participants.¹ It remained uncertain however, whether the variations noted were related to biological or pathological processes in eyes of different refraction or whether the variation in ocular magnification between myopic and hyperopic eyes was the source of this variation.¹ The effect of ocular magnification

is such that as the ocular dimensions of the eye increase the retinal blood vessel diameters as measured from fundus photographs decrease.¹⁶⁻¹⁷ A later study conducted by Wong et al went on to examine this relationship further.¹⁸ Similarly to their previous study, they found that participants with myopic refractive errors displayed significantly narrower retinal arteriolar and venular calibres compared to their hyperopic counterparts.¹⁸ Despite this, they noted that refraction had no effect on the association between blood pressure and retinal vascular diameter. This suggests that correcting for ocular magnification in myopia may only be necessary when quantifying and comparing precise retinal vascular measurements between participants but not so important when looking at associations within participants, for example in research surrounding retinal microvasculature parameters and systemic conditions such as hypertension.¹⁸ Assuming that these differences between hyperopic and myopic participants are a direct result of ocular magnification, various formulae have been developed to counter this issue.¹⁸ These assume however, that myopia is only associated with longer axial length and do not account for the effect that other ocular dimensions such as corneal curvature have on refractive errors. Findings from Shimada et al and Nemeth et al support the theory that biological processes are responsible for these retinal vascular alterations. They found that myopes displayed narrower retinal vessel diameter with associated decreased retinal blood flow.¹⁹⁻²¹ Shimada et al further suggested that these findings may be related to the development of chorioretinopathy in high myopia.¹⁹ These results highlight that there is still conjecture surrounding the mechanisms responsible for the variations in retinal vascular calibre in myopia and hyperopia. Furthermore, additional research is required to evaluate whether these variations are significant enough to consider in future calibre studies.

Axial Length

Like myopia, there are currently varying opinions in the literature as to the relationship between retinal vascular calibre and axial length. Patton et al was one of the first studies to assess this relationship and found a significant association between narrow retinal vessels and longer axial length in pseudophakic eyes of older adults.²² However, as this study was conducted in an older adult population the results may be biased by the presence of concurrent systemic disease.^{11,23} Furthermore, there was no correction for ocular magnification. The effect of ocular refraction and ocular dimension on the image size of retinal photographs has been postulated previously.¹⁶⁻¹⁷ A later study by Cheung et al sought to rectify previous limitations examining this relationship in children aged seven to nine years old.²⁴ They found that there was no association between axial length and retinal vascular calibre after correcting for ocular magnification. This highlights the possibility that previously reported associations between axial length and vascular calibre could be related to differences in ocular

magnification.²⁴ Despite this, more research needs to be conducted to determine the clinical significance of these findings.

Intraocular Pressure and Optic Disc Diameter

To develop an understanding of the physiological and anatomical determinants of retinal vascular calibre, several researchers have assessed the affect that intraocular pressure (IOP) and optic disc diameter have on the retinal microvasculature.²⁵⁻²⁸ Previous studies in adult populations have reported conflicting associations between IOP and retinal vascular calibre. Results from Klein et al and Shin et al suggested that IOP was related to retinal vascular calibre changes in adults with glaucoma and diabetes.^{29,30} Mitchell et al and Ikram et al on the other hand, found that no relationship existed between the two variables in adult participants with glaucoma.^{11,28} As stated previously, this inconsistency may be related to ocular and systemic diseases that are common in adult populations which could bias the results. Cheung et al was the first study to examine the relationship between IOP and retinal vascular calibre in children.²⁵ They found that both arteriolar and venular calibre were similar across the distribution of IOP, suggesting that IOP does not influence retinal vascular calibre. Based on these findings it may not be crucial to control for an association between IOP and retinal vascular calibre in future studies conducted on children. However, evidence surrounding this association in adults is inconclusive and further research is warranted.²⁵

Very few studies have examined the relationship between retinal vascular calibre and optic disc parameters. Findings in adult populations have been inconsistent in describing the association between retinal vascular calibre and optic disc size. Klein et al and Ikram et al reported no relationship between retinal vessel diameters and cup to disc ratio or incident optic disc changes, suggesting that retinal vascular calibre plays an insignificant role in the pathogenesis of glaucoma.^{27,28} Cheung et al were the first researchers to explicitly examine this relationship in children.²⁵ They found a statistically significant association between smaller vertical optic disc diameter and narrower retinal arteriolar and venular calibres. Despite the fact that the detected differences in vascular calibre were quite small, similar associations have also been found in adult populations¹¹ suggesting that a possible anatomic relationship may exist between optic disc dimensions and retinal vascular calibre.^{11,25} However, as limited research concerning this relationship has been conducted in the child population, further research is required before any significant conclusions can be drawn.

BODY MASS INDEX (BMI) AND BLOOD PRESSURE

Childhood obesity is a significant public health issue in today's society with 10% of children worldwide being

classed as obese.³¹⁻³³ The relationship between obesity and microvascular disease remains largely unknown. Cheung et al examined the association of BMI and weight with retinal vascular calibre in children.³⁴ They found that greater BMI and weight were associated with larger retinal venular calibre. These findings are consistent with those in adult populations that also found that larger venular calibre was associated with higher BMI, increased waist circumference, and higher waist to hip ratios.³⁵⁻³⁷ Mechanisms surrounding retinal venular dilation have been related to metabolic risk factors and inflammation.³⁸ Retinal arteriolar alterations on the other hand, have been more strongly associated with blood pressure.³⁹ Evidence suggests that retinal arteriolar narrowing is a result of prolonged hypertension and is associated with cardiovascular related deaths in adult populations.⁴⁰ Mitchell et al set out to determine the effect of blood pressure on retinal arteriolar calibre in children.³⁹ Similarly to those studies on adult populations,^{23,41-45} they too found that blood pressure was associated with retinal arteriolar narrowing suggesting that the effects of raised blood pressure may manifest earlier in life. These novel findings in child populations may shed light on the microvascular alterations that result from a high BMI and blood pressure. Further research in this area is required to replicate these findings and investigate mechanisms by which these microvascular alterations occur.

CONCLUSION

Due to the limited research into the effects of ocular parameters, BMI and blood pressure on retinal vascular calibre measurements, it remains relatively contentious whether these factors influence retinal microvascular particularly in children. However, this review highlights that a range of genetic and birth parameters, most notably that of ethnicity and birth size, appear to have a considerable effect on retinal arteriolar and venular calibre. This emerging evidence suggests that the well-established systemic factors that influence retinal microvasculature, such as blood pressure and blood glucose levels, may not be solely responsible for the variations noted in retinal vascular calibre and that birth factors may also contribute to the variation. Further research is required to determine the clinical importance of the specific predictors of retinal vascular calibre and how they relate to the pathogenesis of cardiovascular, cerebrovascular and metabolic related diseases.

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Selected Abstracts from the Orthoptics Australia 69th Annual Scientific Conference held in Melbourne 25 to 28 November 2012

PATRICIA LANCE LECTURE

A SNAPSHOT OF ORTHOPTICS FROM THE 1960s TO 2000

Shayne Brown

The paper was a snapshot of the trends in orthoptics from the mid 1960s till early in the 2000s. It covered changes in education, clinical practice, the profession and research. From the 1960s till the early 2000s, the orthoptic course progressed from a 90-week course run by the Orthoptic Board of Australia, under the auspices of the Ophthalmological Society of Australia (now RANZCO), to a degree course at universities in Sydney and Melbourne. In the 1960s and 1970s ocular motility was the major aspect of clinical work. This has gradually changed and now orthoptists also work as ophthalmic assistants, with patients with disabilities, in education and research. Clinical research kept pace with these changes and has underpinned the effectiveness of orthoptic procedures and treatment programs. The professional association, one of the oldest in the orthoptic world, continues to support its members and is held in high regard by its counterparts internationally.

ZEISS LISA 839MP TRIFOCAL IOL, A NEW STANDARD IN HYPERMETROPIC/PRESBYOPIC MANAGEMENT

Dedei Armah, Ilan Sebban, Alana Parker

Aim: To evaluate the visual outcomes, spectacle independence and patient satisfaction with the Zeiss AT LISA 839MP Trifocal compared with Zeiss LISA 809MP bifocal intraocular lens.

Method: The study enrolled 50 eyes (24 patients) with astigmatism of less than 0.70 DC. All patients received bilateral trifocal IOLs (AT LISA tri 839MP, Carl Zeiss Meditech). Surgical technique involved topical anaesthesia, 2.2 mm clear corneal incision and sutureless phacoemulsification. Visual acuity for near (33cm Niden Chart), intermediate (66 cm LogMAR chart), and distance (6m), and subjective refraction was assessed at 1 day, 1 week and 4-6 weeks post operation. Patient satisfaction was assessed at 4 to 6 weeks postoperatively including photophobia symptoms. These results were compared with the Zeiss LISA 809MP bifocal. Biometry was performed using the IOLMaster and Haigis formula was optimised.

Results: A high level of patient satisfaction was achieved with the Zeiss trifocal when compared with the bifocal IOL. Biometry and IOL power outcomes were extremely accurate. One week and 4 to 6 week postoperative results compared favourably to the Zeiss LISA 809MP bifocal for near N5 (Niden Chart) and distance 6/6 (LogMAR chart), but showed significantly better visual acuity at intermediate vision (N8 - N10).

Conclusion: The Zeiss AT LISA tri 839MP lens provides patients with excellent visual acuity at all distances, spectacle independence and a higher level of patient satisfaction when compared with bifocal IOLs.

PERIMETRIC ANALYSIS OF FLICKER-DEFINED FORM IN COMPARISON TO STANDARD AUTOMATED PERIMETRY

Mitchell Bagley

Purpose: To compare visual field outcomes between standard automated perimetry on the Humphrey Visual Field (HVF) and flicker-defined form using the Heidelberg Edge Perimeter (HEP).

Method: Seventy-four subjects performed both HVF and HEP on the same day. Visual field (VF) tests must have been performed reliably on both machines to be included in analysis. To evaluate the association between VF tests, mean deviation (MD), pattern standard deviation (PSD), test time and glaucoma hemifield test (GHT) data were collated from one eye per subject.

Results: There was an obvious learning effect with left eyes performing better than right eyes. The level of agreement for the GHT was 43%, with 66% of cases within normal limits on the HVF as opposed to 26% on the HEP. Both MD and PSD gave significant but not strong correlations ($r = 0.451$, $p < 0.001$; $r = 0.553$, $p < 0.001$). Paired samples t-test revealed that the mean test time on HVF was significantly shorter than on the HEP by 49.27 seconds ($t = -4.791$, $p < 0.001$).

Conclusion: The HEP demonstrates good consistency with the HVF in reference to MD and PSD and detects defects with greater sensitivity. The GHT analysis suggests the HEP may be hypersensitive with a high false positive rate on initial testing. Research is continuing, investigating the effects of repeated testing and learning curve on the HEP in addition to evaluating the accuracy with which the HEP can map known visual field defects.

2RT LEADING THE WAY

Kate Brassington

The Macular Research Unit within the Centre for Eye Research Australia has been conducting a pilot study on the effects of a novel nanosecond laser and the development of late stage age-related macular degeneration. Fifty patients were lasered with the 2rt laser in one eye and monitored with imaging and psychophysics over a two-year period. To date no patient has experienced choroidal neovascularisation with results suggesting improvement in function of lasered eyes as well as the contralateral eye. The methodology and preliminary results of this pilot study will be discussed.

THE BIG MOVE

Emily Caruso

There are many areas in the field of ophthalmology in which orthoptists work. However these fields can present very different working environments and roles for orthoptists. The personal experience of changing from a private practice orthoptist, to a clinical trial coordinator in the Macular Research Unit at the Centre for Eye Research Australia will be discussed. Also the different roles each job entails, what it is like to work in a multidisciplinary team and the challenges that arise from changing fields will be explained.

NOT SO SIMPLE!

Donna Corcoran

A child presented and was treated with simple convergence, however the patient returns with an unexpected result. Everyone need be aware that, at times the unexpected can occur.

THE VALUE OF EYE MOVEMENTS IN THE DIAGNOSIS OF BALANCE PROBLEMS

Elaine Cornell, Ann Burgess, Hamish MacDougall, Ian Curthoys

Vibration applied to the mastoid bone just behind the earlobe elicits eye movements that can assist in the diagnosis of balance problems, particularly those of the otolithic system (static posture as opposed to head rotation that activates the semicircular canals).

We have previously shown that bone-conducted vibration to each mastoid in humans results in small horizontal and vertical eye movements, suggesting that the ipsilateral superior oblique and the contralateral inferior rectus are also activated. The present study tested that hypothesis further by measuring the torsional component as well as horizontal and vertical responses during different directions of gaze. Additional information was obtained from one subject with a unilateral superior oblique palsy.

We concluded that conducted vibration to the mastoid bone in humans reproduces the dynamics of normal ocular compensation to a head tilt and could be a useful diagnostic tool for balance problems.

THE ORTHOPTIST'S ROLE IN MANAGING OPTIC NERVE GLIOMAS

Stephanie Crofts

Optic pathway gliomas account for 5% of all intracranial tumours in children and are strongly associated with neurofibromatosis type 1. If left untreated, these tumours can result in significant visual impairment and restrictive ocular motility problems. The path of treatment is varied and highly dependent on the visual status of patients.

The orthoptist plays a vital role in monitoring vision in patients with optic pathway gliomas to ensure timely treatment is initiated.

THE CORRELATION BETWEEN THE CLINICAL ASSESSMENT, HISTOLOGY REPORT AND THE POSITIVE DIAGNOSIS OF GIANT CELL ARTERITIS

Natalie Duffy

Purpose: The purpose of this study was to examine the correlation between the clinical assessment, histology report and the positive diagnosis of giant cell arteritis.

Method: In 2011, a retrospective study was conducted at a single-site ophthalmic practice in Sydney. Clinical staff reviewed records to identify temporal artery biopsy patients between 2005 and 2011. All patients were previously consulted by the same neuro-ophthalmologist prior to the biopsy. Relevant data was extracted and entered into a database for statistical analysis. A scoring system was developed for each sign and symptom to facilitate analysis. Descriptive and correlation statistics were applied to the collected data.

Results: A total of 40 patients were included in the study. The average age of participants was 78 years. At initial presentation common signs included headache, jaw claudication and a change in vision. Blood testing revealed that 55% of patients had an erythrocyte sedimentation rate (ESR), and 90% of patients had a c-reactive protein (CRP) level above normal at presentation. A positive final diagnosis of temporal arteritis was made in 72.5% of all patients, however only 52.5% of cases returned a positive temporal artery biopsy result.

Conclusion: This study has affirmed the importance of a temporal artery biopsy in the diagnosis of giant cell arteritis. However, with poor sensitivity it is critical for the clinician to take a detailed history of signs and symptoms to reveal possible indicators for the condition. Close clinical evaluation by a qualified orthoptist combined with the biopsy procedure will ensure that giant cell arteritis is promptly detected in patients.

NEW TREATMENT IN UVEITIS: HUMIRA

Carly D'Sylva, Robert McKay

Patients with uveitis can represent some of the most difficult ophthalmology patients to treat. The large files of these patients represent huge amounts of human effort, hours spent in hospital, patience and compassion. Prednisolone in conjunction with an immunosuppressive drug is the current standard treatment for patients with chronic, severe uveitis. However, this treatment is not ideal given the numerous side-effects.

Humira is a fully humanised monoclonal antibody and represents hope for patients suffering with uveitis and potentially an alternative to high doses of oral prednisolone. Humira works by blocking the inflammatory process and is known as an anti-tumour necrosis factor (TNF) drug. TNF inhibition is targeted therapy, whereas steroids and immunosuppressants dampen the whole immune system. A number of patients are now receiving Humira through a compassionate assistance scheme from the Royal Victorian Eye & Ear Hospital and through participation in clinical trials, with pronounced improvements being observed in their disease and quality of life.

THE RETINAL STRUCTURE OF AMBLYOPES RESISTANT TO OCCLUSION THERAPY: A LITERATURE REVIEW

Adrienne Farrow, Connie Koklanis

Debate persists in the literature as to whether there are retinal changes in amblyopic eyes. Despite varying opinions, there is consensus that further evaluation is required. Optical coherence tomography is a popular method of assessing retinal structures with numerous studies conducted on children with normal eyes and other ocular conditions, including amblyopia.

It appears that of the studies investigating amblyopia, strabismic, anisometropic and mixed types are most commonly considered. There does not however, appear to be any research investigating retinal changes using OCT with amblyopes resistant to occlusion therapy; children compliant with treatment but showing no improvement in visual acuity. This group would be worthy of exploration to ascertain if the retina differs from children with amblyopia who respond to occlusion. Early identification of any structural deficits of the retina in amblyopia could potentially allow for better prognosis and management for patients and their parents.

A CASE OF TRIPLOPIA? A CASE OF CONVERSION DISORDER?

Julie Fitzpatrick

The low vision rehabilitation orthoptist is involved in assisting clients to maximise independence despite functional vision loss, which may come in the form of reduced vision, field loss, reduced contrast sensitivity or loss of binocular functions.

This is a case study of an elderly female who presented with monocular triplopia. The symptoms in relation to conversion disorder will be discussed. The role of the orthoptist in a multidisciplinary team will be summarised. Management of the patient's symptoms with the goal of maintaining binocularity is emphasised, as this is an important dimension that the rehabilitation orthoptist brings to the low vision therapy team.

'CULTURE IN THE CLINIC': THE PUBLIC HEALTH CHALLENGE OF ADDRESSING AGE-RELATED LOW VISION OR BLINDNESS IN AFRICAN AMERICANS

Julie Fitzpatrick

There is a body of evidence which supports the notion that African Americans are at a higher risk of developing blindness or low vision from aging-related eye conditions due to lack of attendance at eye screenings or non-compliance with treatment.

The eye conditions discussed in this public health context will include cataract, glaucoma and diabetic retinopathy, the latter resulting from type 2 diabetes. Studies also support the notion that African Americans would benefit from public health intervention to help prevent or minimise low vision due to these conditions.

The author suggests this health issue of African Americans suffering more significantly with low vision, is largely attributable to geographic and culturally-determined behavioural factors posing a barrier to seeking professional eye screening and treatment for any of these eye conditions. Also, these risk factors may be more likely to prevent the target group from modifying eating and lifestyle habits and taking control of any sight-threatening diabetes which may also exist.

The result from the above is poorer vision in this aging demographic, which research suggests will only worsen in the near future as more people in general in the United States are aging. If addressed, this health issue could save the nation millions of dollars in health care costs and provide participants with a better quality of life which is shown to be associated with having good vision. The relevance of considering cultural risk factors in planning any eye screening worldwide is emphasised.

RISK FACTORS FOR THE DEVELOPMENT OF MYOPIA IN AUSTRALIAN SCHOOLCHILDREN

Amanda French, Kathryn Rose

Aim: To establish risk factors for incident myopia from the longitudinal Sydney Adolescent Vascular and Eye Study.

Methods: Sydney Myopia Study participants aged 6 and 12 years were re-examined 5 to 6 years later. Cycloplegic autorefraction (cyclopentolate 1%; Canon RK-F1) was measured at baseline and follow-up. Incident myopia was defined as no myopia at baseline but myopic (≤ -0.50 dioptres) in either eye at follow-up. Risk factors were measured by questionnaire, including time spent outdoors and near work.

Results: Children who became myopic spent less time outdoors compared to those who did not (younger cohort, 16.3 and 21.0 hours $p < 0.0001$, older cohort, 17.2 and 19.6 hours, $p = 0.001$) and in the younger cohort only, performed more near work (19.4 and 17.6 hours, $p = 0.02$). Children with myopic parents were more likely to become myopic in the younger ($P_{trend} < 0.0001$), but not the older cohort. Children of East Asian ethnicity had a higher incidence of myopia than European Caucasian children (both $p < 0.0001$) and, spent less time outdoors (both $p < 0.0001$). Predictive modelling showed that a less hypermetropic refraction at baseline was the most significant predictor of incident myopia. Addition of time outdoors, near work, parental myopia and ethnicity to the model improved the area under the ROC curve to 0.89 ($p < 0.0001$) in the younger, but not the older cohort.

Conclusions: Time outdoors was related with incident myopia in both age cohorts but most strongly in the younger children. Near work and parental myopia were additional significant risk factors for myopia only in the younger cohort.

ORTHOPTIST-LED ASSESSMENTS FOR DIABETIC RETINOPATHY AND CATARACTS

Jana Gazarek, Rebecca Jessup, Robyn Wallace, Zeina Dayoub

Aims: To pilot an advanced practice orthoptic role (within existing legislative scope). To improve access to ophthalmology services by better utilising the skills of orthoptists, without compromising the quality of patient care. To increase capacity and more timely access to care through

task reallocation.

Methodology: Competency packages were developed in partnership with La Trobe University and delivered to all orthoptists who would be undertaking cataract and diabetes assessments. A trial cataract assessment service was established and data collected over a 6-week period. Quantitative and qualitative data collected included waitlist and waiting times, patient and staff satisfaction, and management destination of patients attending the service.

Results: Results have shown that the service has enabled improved access and more time-efficient care, improved flow through the ophthalmology service, early identification of patients most in need of surgery, a reduction in waiting time from referral to assessment, a reduction in the 'waiting room' time for patients, redirection of almost one-third of cataracts to be managed conservatively by orthoptists or community optometrists, greater job satisfaction for orthoptists and better learning/development opportunities for orthoptic students attending placements at Northern Hospital.

Conclusion: This project achieved a number of positive outcomes: increasing capacity, improving access to eye services and increasing patient/staff satisfaction. Key learnings and practicalities of establishing and evaluating services such as this one, along with long term sustainability and application across Victorian health services, will be presented to Department of Health and the wider healthcare community.

A NEW GOLD STANDARD FOR TREATING DIABETIC MACULAR OEDEMA? LOOKING TO THE FUTURE FOR DME

Elizabeth Glatz

Diabetic macular oedema (DME) is the principal cause of visual loss in people with diabetes. While until recently considered the gold standard for treatment of DME, laser is rapidly losing traction and may not necessarily be the first treatment option for many ophthalmologists today. As laser by its very nature is destructive, new novel therapies are emerging to take its place. This presentation will explore the direction that DME treatment is taking by presenting other options diabetics may have in the future and will present some recent research findings which support moving away from laser as the first line of defence against DME.

THE GLAUCOMA MONITORING CLINIC - RVEEH

Debra Gleeson

Over the last 30 years the role of the orthoptist has certainly expanded. Orthoptists are now engaging in new models of care. The Glaucoma Monitoring Clinic is one such clinic at the Royal Victorian Eye & Ear Hospital. It is a multidisciplinary clinic set up to monitor chronic glaucoma patients. Currently there are two glaucoma consultants, four orthoptists, two optometrists and three nurses working in the clinic.

Through the weekly teaching session prior to the clinic and clinical support, team members have increased their knowledge and learnt new skills to enable them to assess these patients. New skills include gonioscopy and optic disc/fundus assessment with an indirect lens at the slit lamp.

Orthoptists are well placed to take the step forward to increase our knowledge and skill base to aid in the provision of services to the increasing number of those with chronic eye disease.

CYCLODEVIATION ASSESSMENT: A NEW METHOD

Kamil Gorski, Fiona Gorski

This presentation introduces a new innovative objective method in the measurement of cyclodeviations, using a common tool found in general

ophthalmic and hospital departments. The method to be presented for measuring torsion provides a quick, accurate and efficient alternative to existing methods. It may provide invaluable data in the detection and measurement of torsion in complex strabismus. This method is particularly appropriate for use in the paediatric population and for those with developmental delay.

THE CHALLENGE AND THE PROMISE OF THE BIONIC EYE: THE BIONIC VISION AUSTRALIA PROJECT

Robyn Guymer

Purpose: Bionic Vision Australia (BVA) is a multidisciplinary partnership of Australian researchers aiming to develop a retinal prosthesis to restore vision and improve the quality of life for people with degenerative vision conditions.

Methods: In 2009 the Australian Research Council awarded BVA \$42 million in a Special Research Initiative to develop this project. 157 researchers from various disciplines ranging from electrical engineers to clinicians from eight Australian organisations are currently involved in this project.

Results: Two device streams have been developed, a wide-view device which aims to deliver mobility and independence and a high-acuity device which is aimed at restoring acuity to allow for the possibility of reading. Currently the wide view device is placed in the supra-choroidal space and the high acuity device has an epiretinal approach. Both are currently undergoing preclinical studies. Current numbers of electrodes planned for the wide view device are around 100 and we aim to reach a level of 1,000 electrodes for the higher acuity device.

Conclusion: Our current devices are aimed at restoring vision to people with retinitis pigmentosa and similar retinal conditions. The multidisciplinary team at BVA brings world leading technologies to this challenge and is on track to meet all its major milestones of the ARC grant which concludes at the end of 2013.

FIGHT RETINAL BLINDNESS! PROJECT

Amparo Herrera-Bond

Purpose: The Fight Retinal Blindness! project aims to identify optimal treatment patterns using the new treatments for macular disease, and to provide national benchmarks of treatment outcomes with which practitioners can compare their own results.

Method: An innovative web-based data entry tool has been developed to track treatments given, visual acuity and adverse events over time. Bearing in mind the dynamics of a busy clinic, patients can be entered into the system in less than 30 seconds, data from subsequent visits in less than 15 seconds. A graph of letters read versus time is generated 'on the fly' for each patient, providing a single page summary of the patients response over the entire course of treatment.

Results: Sixteen centres (5 academic) from Sydney, Perth, Melbourne, Adelaide, Canberra and Brisbane, New Zealand and Switzerland are currently contributing to the project. Data on over 2,000 patients receiving treatment for wet age-related macular degeneration have been entered with follow-up ranging from 4 months to 5 years. Release 5 of the data collection software, will be made available to all fellows treating AMD and will meet RANZCO CPD requirements. The graphical representation of treatment response facilitates patient flow and improves compliance.

Conclusion: The Fight Retinal Blindness! project is a unique Australian enterprise that provides a range of benefits to both patients and clinicians. It is anticipated that modules will be added to track treatment of diabetic retinopathy and other retinal and ophthalmic conditions.

STROKE AND THE EYES: DECREASED VISUAL ACUITY AND ITS IMPACT

Neryla Jolly, Ann Macfarlane, Rob Heard

Background: The incidence of stroke and vision defects increase as age increases. Central vision or visual acuity can be a particular issue because when it is affected there is a decrease in ability to undertake high definition tasks (reading) and differentiation of low contrasted images such as facial recognition and step identification. Affected patients can respond poorly to the environment which impacts on their recovery and rehabilitation.

Aim: To investigate the incidence, cause and management of visual acuity defects in stroke patients.

Methods: Vision results from 150 randomly selected patients admitted to hospital with a diagnosis of stroke were collected. The results for visual acuity were analysed for the incidence of decreased acuity, the cause of the reduction and management strategies.

Results: Eighty-nine participants (37%) had good visual acuity; 6 (4%) were unable to perform any test; 55 (37%) were classified as having visual impairment (acuity less than 6/12 and N8). A major cause for the decreased acuity was glasses left at home, 22 participants (15%); with other reasons including ocular diseases, 14 participants (9%) and nystagmus. Management strategies included retrieval of glasses, referral for ophthalmic management and referral for agency support (Vision Australia or Guide Dogs). Twenty-three results were recorded prior to the research assessment and were mostly descriptive, with 8 correct and 15 incorrect results.

Conclusion: Visual acuity defects in stroke patients are present in high numbers. Accurate detection will assist stroke practitioners to be aware of vision impairment and manage affected patients appropriately.

TOWARDS GAINING THE BEST INFORMATION ABOUT VISION TO ASSIST THE RECOVERY OF A PATIENT WITH STROKE

Neryla Jolly, Ann Macfarlane, Rob Heard

Aim: To report on the development and evaluation of a tool to be used by any health care practitioner, to screen for the presence of eye problems in patients who have been diagnosed to have had a stroke. Practitioners caring for stroke patients often detect stroke-related vision defects but miss pre-existing eye diseases, the need for glasses and reduced acuity. In stroke units where orthoptists are employed the detection is high (83%). The availability of orthoptists is limited, so affected patients are likely to have undetected vision-based problems, which may decrease the responsiveness to rehabilitation.

Methodology: This is a retrospective study using patient data collected from 100 patient case histories. The tool is a single page, tick box. It has three sections, each with actions to be implemented as required. The sections are: (a) questions about ocular history and symptoms, (b) observation of ocular conditions (red eye, ptosis), (c) responses affected by vision defects (ability to fix and follow). The tool was tested against 100 case histories of patients admitted to hospital following a stroke, noting information recorded by any health care practitioner and also information from the orthoptic assessment.

Results: Of the 499 ocular conditions found by the orthoptic assessment, the tool identified 307 (62%). Non-orthoptic health care practitioners identified 88 (18%) ocular conditions.

Conclusion: In the absence of orthoptic services the tool has the capacity to enable improved detection of vision conditions, enabling improved management as well as enhancing the response for rehabilitation.

RETINAL VASCULAR CALIBRE AND DIABETIC RETINOPATHY: A REVIEW

Stuart Keel, Laima Brazionis, Catherine Itsiopoulos, Connie Koklanis, Meri Vukicevic

Diabetes is a major cause of morbidity/mortality worldwide. Type 1 (juvenile onset) diabetes accounts for about 13% of all diabetes in Australia but more than 90% of diabetes in children aged 0 - 14 years. Diabetes-related blindness is reaching alarming proportions in developing countries. Despite children/adolescents with type 1 diabetes having significant lifetime risk of blindness from retinopathy, clinically useful predictors remain limited. There is evidence that measurement of retinal vascular calibre may provide prognostic information about the risk of microvascular complications thereby offering some clinical predictors.

The effect of retinal arteriolar and venular calibre on incidence/progression of retinopathy in type 1 and type 2 diabetics has been researched. Variations in retinal arterioles may be present in early stages of retinopathy in type 1 diabetics suggesting that this may be a factor in recognising individuals who are at high risk of developing incident retinopathy. Conversely, retinal venular dilation appears to represent a later sign of severe retinopathy associated with microvascular complications in adults with type 2 diabetes. Findings imply that variations in retinal arteriolar/venular calibre may reflect different pathophysiological processes.

INTERMITTENT EXOTROPIA: DOES CONTROL INFLUENCE QUALITY OF LIFE?

Samantha King, Connie Koklanis, Zoran Georgievski

Aim: To investigate the quality of life of children with intermittent exotropia as it relates to the control of the deviation.

Methods: Eighteen children diagnosed with intermittent exotropia were recruited from the Royal Children's Hospital (RCH) and Peninsula Eye Centre (PEC). Each underwent a general orthoptic examination. Control of the exotropia was determined with the measurement of BVA and the use of the Newcastle Control Score (NCS). The Intermittent Exotropia Questionnaire (IXTQ) and the Children's Visual Function Questionnaire (CVFQ) were completed by the participant and the parent respectively to quantify quality of life.

Results: Quality of life was significantly worse in children with poorer control of their deviation as measured by BVA on both the IXTQ ($t(16)=2.22$; $p=0.020$) and CVFQ ($t(16)=3.00$; $p=0.008$). However when utilising the NCS a significant difference was only noted with the CVFQ ($t(16)=2.77$; $p=0.014$) but not with the IXTQ ($t(16)=2.00$; $p=0.063$).

Conclusion: Children who have poorer control of their exotropia may have a reduced level of quality of life as compared to those with better control.

PAEDIATRIC EYE INJURIES: A STUDY OF CHILDREN WHO PRESENTED TO THE CHILDREN'S HOSPITAL AT WESTMEAD

Suzy King

Eye injuries in children are one of the leading causes of non-congenital unilateral blindness. A number of children present each year to the Children's Hospital at Westmead, with a variety of eye injuries caused by various means.

A study was carried out focussing on children with eye injuries that presented as new patients to the Eye Clinic at the Children's Hospital at Westmead, between January 2011 and June 2012. The study aimed to investigate the age at presentation, gender, causation of injury and visual outcomes of these children.

Methods and results will be discussed in detail along with a few interesting case studies.

CONGENITAL CATARACTS, AMBLYOPIA AND QUALITY OF LIFE

Connie Koklanis, Monique Rose, Zoran Georgievski

Aim: To investigate the quality of life in children undergoing treatment for stimulus deprivation amblyopia secondary to a unilateral congenital cataract as compared to strabismic and/or anisometropic amblyopia.

Method: Children aged 3 to 8 years underwent an orthoptic investigation including a visual acuity assessment, cover test, assessment of ocular movements and stereoacuity. Parents completed the Amblyopia Treatment Index (ATI) and Children's Visual Function Questionnaire (CVFQ).

Results: Preliminary data includes 27 children with amblyopia (19 strabismic/anisometropic and 8 stimulus deprivation). The overall score for the ATI was worse in the stimulus deprivation group ($p=0.0396$). A significant difference was also noted for the 'treatment compliance' subscale ($p=0.0002$). The scores for all other ATI subscales were poorer in the stimulus deprivation group but did not reach significance (adverse effects $p=0.1811$; social stigma $p=0.5952$). The overall score for the CVFQ was significantly worse in the stimulus deprivation group ($p=0.0421$). All CVFQ subscale scores were poorer in the stimulus deprivation group, but only reached significance for the 'competence' subscale (competence $p=0.0407$; personality $p=0.5167$; family impact $p=0.1057$; treatment difficulty $p=0.1684$).

Conclusion: Children with stimulus deprivation amblyopia secondary to a unilateral congenital cataract may have significantly reduced quality of life as compared to children with strabismic and/or anisometropic amblyopia.

THE 'OCULAR MOTILITY SIMULATOR'

Connie Koklanis

Changes in health care delivery and clinical education in Australia have presented tertiary institutions with considerable challenges in providing students with suitable clinical experiences. Increases in student numbers alongside increases in demand for services and improved productivity, has led to a general reduction in students' access to patients. In this context, simulated learning can contribute to and expand students' opportunities for gaining clinical skills and experience. By providing opportunities for deliberate practice of new skills through simulation and by integrating this mode of teaching and learning into the curriculum, the transfer of skills into clinical practice can be better promoted. As part of ocular motility training at La Trobe University we are exploring the use of an 'Ocular Motility Simulator' to simulate various concomitant and incommittant deviations with the aim of assisting students to better acquire competencies in relation to the investigation, diagnosis and subsequent management of patients with ocular motility disorders. This paper will present the prototype being developed for discussion.

TREATMENT OUTCOMES OF CHILDREN WITH VISION IMPAIRMENT DETECTED THROUGH THE StEPS PROGRAM

Melanie Lai, Kim Marchant, Gillian May

Background: The Statewide Eyesight Preschooler Screening Program (StEPS) is a free vision screening program offered to four-year old children in NSW, with the aim of early detection of childhood vision problems, prior to school entry so as to maximise treatment outcomes. Children who fail to pass the vision screening test at preschool, are referred on to tertiary paediatric outpatient ophthalmology clinics which are conducted at Sydney Hospital and Sydney Eye Hospital, Sydney Children's Hospital Randwick and St George Hospital. Children who attend these clinics and are confirmed as having vision impairment are managed with the treatment appropriate to their diagnosis.

Method: A retrospective study was conducted at each of the above hospital sites to review the outcomes of children who underwent treatment through the StEPS Paediatric Outpatient clinics. Children who received an initial screening and proceeded to treatment between May

2011 and July 2011 (inclusive) were included in the study.

Results: A total of 66 children were assessed at diagnostic clinics across the three study sites. A total of 43 children received treatment for visual impairment following their initial appointment. The two main causes of reduced vision were revealed to be uncorrected refractive error and strabismus. Spectacle correction and occlusion therapy were the two forms of treatment for vision impairment prescribed across sites. The outcomes of treatment of children in the StEPS program will be discussed.

EXAMINING A CHILD WITH INTERMITTENT EXOTROPIA: TREATMENTS AND CONSIDERATIONS

Wendy Liang

Intermittent exotropia is found in 1% of the population and is the most common form of exodeviation. Once diagnosed, the indication, timing and type of treatment is subject to much discussion as patient response to the different treatments can be varied and unpredictable.

A review of the different types of treatment and their success rates including orthoptic exercises, prisms and overcorrecting minus lenses will be presented. Reasons why some treatments may work better for some patients than others will also be discussed.

Finally, some of these children may eventually require surgery and so the effects of these treatments on postoperative results will be looked at as well as any considerations prior to surgery for example: true divergence vs high AC/A ratio – how to diagnose and measure.

EYE INVOLVEMENT IN DYSLEXIA AND THE ROLE OF VISION THERAPY

Wendy Liang

Teachers are rightly concerned when their students seem to have difficulties in reading at the level that is to be expected of their environmental factors and age, and often send them to have a thorough eye examination. We will be examining the part that the eyes play in dyslexia and review the different treatments often prescribed and their effectiveness.

USE OF ELECTROPHYSIOLOGY TO CONFIRM INTACT VISUAL PATHWAYS IN A CASE OF CONVERSION DISORDER

Jo Lynch, Heather Mack

A 20-year old male presented with a history of sudden onset of blindness, during medically supervised withdrawal from opiate use over a nine-day period. The patient wished to avoid the possible long-term side-effects of opiate use such as liver damage. At the age of 8 years he had been diagnosed with Perthe's Disease, requiring numerous surgical procedures. His chronic pain was managed with various medications over the years. Extensive testing was undertaken in the clinic involving investigation of ocular structure and function, and a detailed history. The tests included electrophysiological investigations, confirming a diagnosis of Conversion Disorder.

OREV: 4 YEARS ON, WHERE TO NEXT?

Catherine Mancuso, Stephanie Tsonis

The Orthoptic Review Clinic (OREV Clinic) was the brainchild of Zoran Georgievski, and was first set up in 2008. The idea was to review patients who were on a waiting list to see a doctor for their review appointment but were overdue for this and were unlikely to get an appointment due

to the demand on services in the public health system. These patients were reviewed by an orthoptist who would then determine the patient's need to be seen by an ophthalmologist or be discharged to the care of a community eye care professional. The OREV clinic has undergone a number of changes since its inception.

Four years of outcome data will be presented on this clinic and a discussion around its future direction will be conducted.

EARLY EXPERIENCE WITH FEMTO-SECOND LASER CATARACT SURGERY IN VICTORIA

Nhung Nguyen, Grant Snibson

Introduction: Laser Assisted Cataract Surgery (LACS) with the LenSx first arrived in Victoria in 2011 at Manningham Day Procedure Centre (MDPC). This new technology may in time prove to revolutionise the way we perform cataract surgery with claims to have advantages in delivering precise and self-sealing corneal incision, make repeatable circular and accurate capsulorhexis, and require less technical difficulty in phacofragmentation and phacoemulsification. The presentation will outline the clinical and surgical adaptation process of integrating LACS into the theatre system with tips on selection criteria. It will report on the visual and refractive outcome and complications of the first 500 cases.

Conclusion: LACS appears safe in the first 500 cases. As the number of treatments are analysed the data may prove to have key benefits over conventional cataract surgery, however more data is required to support this claim fully.

IMPROVED VISUAL ACUITY IN PATIENTS WITH CONGENITAL NYSTAGMUS FOLLOWING ANDERSON-KESTENBAUM PROCEDURE

Stephanie Norman, Julie Green, James Elder

Purpose: To assess the effectiveness of Anderson-Kestenbaum procedure on patients with congenital nystagmus, in improving both the size of the compensatory head posture and the level of visual acuity.

Method: This retrospective study conducted within a large paediatric clinical practice identified ten patients who were operated on during the period of 1996 - 2011, using the Anderson-Kestenbaum procedure. These patients, aged 4 to 17 years were operated on by the same surgeon. Visual acuity was measured using age-dependent linear or single optotypes and results were compared pre- and post-operatively. Observation of head posture by ophthalmologist, orthoptist and parent was recorded pre- and post-operatively.

Results: Visual acuities improved by at least three letters in 7 of the 10 patients postoperatively. Visual acuity in two patients remained the same whilst another decreased by five letters. It should be noted that all patients had a visual acuity of 3/9 or better and therefore no patients had poor visual acuity pre- or post-operatively. All patients had some amount of residual head posture, but all were observed to have significant improvement cosmetically. Head postures were not reversed in any instance.

Conclusions: Anderson-Kestenbaum procedure reduced the compensatory head posture and improved visual acuity in 70% of patients, with an average improvement in visual acuity of 3.5 letters. Patients showed minimal residual head posture. This study was limited by its retrospective nature and small subject numbers.

GRADUATE ENTRY MASTERS: BRIDGING KNOWLEDGE

Jean Pollock, Connie Koklanis

The two-year Master of Orthoptics was introduced at La Trobe University in 2011. This incorporates a bridging program which aims to support the Graduate Entry Masters (GEM) students by providing them an introduction to fundamental concepts. The short course runs for one month prior to joining the existing undergraduate students and utilises a blended approach combining elements of online and face-to-face learning. The first evaluation of the bridging program was undertaken upon completion of the short course, the results of which were presented at this conference last year. A final evaluation of the student's perception of the worth of the bridging program was undertaken in 2012, when these same students were nearing the end of the degree and preparing for entry into the world of a new graduate. Student's perceptions were investigated using a questionnaire and focus group interview. This presentation will report the findings of this final evaluation.

COLOURED LENSES REVISITED: USE OF FILTERS FOR ACHROMATOPSIA

Marion Rivers

The use of coloured filters in retinal disease has been controversial with various investigators unable to measure improvement in vision functioning on standard tests. People with retinal disease often report significant improvement in vision functioning with particular filters. Red filters for rod monochromatism is reviewed. The outcomes for children wearing 550 polaroid Eschenbach lenses will be presented.

DO GOVERNMENT FUNDING PROGRAMS SUCH AS BETTER START, NATIONAL DISABILITY INSURANCE SCHEME, PERSON CENTRED FUNDING AND SUPPORTED LIVING FUND AFFECT THE PRACTICE OF ORTHOPTISTS?

Marion Rivers

What do these mean for orthoptists? 'Better Start' funding is here, supported living funds are here, National Disability Insurance Scheme (NDIS) is on the way to a location near you.

Government funding initiatives are changing the face of services for people with disability and the organisations that traditionally provide services. Orthoptists need to understand these changes to guide and help patients navigate the new world of access to funding. Support agencies face the challenge of continuing to deliver services in a competitive fee for service environment. The implications of these changes and services will be discussed.

PATIENT COMPLAINTS: TRUE UNTIL PROVEN OTHERWISE

Laura Rizza, Heather Mack

A case report is presented showing the importance of an orthoptist's clinical testing in making a diagnosis.

A 39-year-old Asian male presented for a second opinion regarding visual loss. He underwent bilateral LASIK the year before for low degree myopia. The surgery was routine with no complications other than mild postoperative dryness which settled rapidly with topical lubricants. He complained of disturbance of vision in his left eye which became worse over time. His uncorrected visual acuity was 6/4 RE and 6/5 LE. Well-healed corneal flaps were noted; the remaining examination was normal including optical coherence tomography (OCT) macular scanning.

This case presentation outlined possible differential diagnoses and discussed the expectations of patients post refractive surgery. The patient's diagnosis indicates that even when a patient's vision is 'excellent', the role of the orthoptist is to exhaust all avenues to find the

problem when the patient is saying there is something wrong.

RETINAL OXYGEN SATURATION AND FUNCTION IN EARLY AGE-RELATED MACULAR DEGENERATION

Emilie Rohan, Meri Vukicevic, Lauren Ayton, Chi Luu

Purpose: Ischemia and hypoxia have been implicated in the pathophysiology of age-related macular degeneration (AMD). Many studies have examined the choroidal perfusion in AMD eyes, however the retinal oxygen metabolism level has not been investigated. The purpose was to determine the retinal oxygen saturation level in patients with early AMD and to correlate the oxygen saturation level with retinal function, which is known to be altered in an early stage of the disease.

Methods: Participants were divided into two groups. Group 1 comprised 9 subjects with early AMD, aged between 60 and 76 years. Group 2 consisted of 30 healthy controls aged between 22 and 73 years. Only one eye of each subject was selected for the study. Retinal oxygen saturation level was measured using an oximeter. Retinal function was determined using multifocal electroretinography (mfERG) which records local electrophysiological responses from different areas of the retina. The stimulus for the mfERG recording consists of a hexagonal array made up of 61 hexagons. The oxygen saturation level of the control and AMD groups were compared. The relationship between oxygen saturation levels and the mfERG response amplitude and implicit time were also analysed.

Results and Conclusion: Data collection for this project is still in process. Final results and conclusion will be presented.

THE EFFECT OF CENTRAL CORNEAL THICKNESS IN ASSESSING IOP WITH GOLDMANN APPLANATION AND DYNAMIC CONTOUR TONOMETRY: A COMPARATIVE CLINICAL STUDY

Alina Sayer, Matthew Jacob, Angelique Antoniou, Peter Jefferies

Aim: To validate the effectiveness of Goldmann applanation tonometry (GAT) in measuring intraocular pressure (IOP) at varying central corneal thicknesses (CCT) when compared to Pascal dynamic contour tonometry (PDCT).

Method: A total of 57 participants (65% female, mean age 67.91 ± 15.3 years) including 103 eyes were recruited over a 2 month study. Central corneal thickness was calculated with OCT (Zeiss Cirrus HD-OCT) and IOP determined by PDCT (Pascal Swiss Microtechnology AG) and GAT (Haag Streit Bern). Exclusion criteria included eyes with previous irido-corneal conditions or kerato-refractive procedures.

Results: Intraocular pressure measured with PDCT was significantly greater than IOP measured with GAT in the total sample ($p < 0.001$), in $\leq 500 \mu\text{m}$ ($p < 0.001$) and $\geq 600 \mu\text{m}$ corneas ($p < 0.01$). The Bland-Altman plot demonstrated poor agreement between the two methods in the total sample (bias = 2.9 mmHg, 95% limits of agreement -1.4 to 7.2), $\leq 500 \mu\text{m}$ (bias = 3.3 mmHg, 95% limits of agreement -1.6 to 8.2) and $\geq 600 \mu\text{m}$ corneas (bias = 2.1 mmHg, 95% limits of agreement -3.2 to 7.4). There was poor correlation between CCT and PDCT ($r = 0.104$), whereas CCT and GAT demonstrated a statistically significant correlation ($r = 0.240$). There was strong correlation between GAT and PDCT ($r = 0.87$), this correlation was weaker when nomogram-adjusted GAT IOP was compared to PDCT ($r = 0.68$).

Conclusion: While GAT is a reproducible method in measuring IOP, it may be misleading in determining true IOP independent of CCT. Pascal DCT is a statistically less corneal-dependent method of determining IOP and should be considered the primary method of assessing IOP in the management and diagnosis of glaucoma and ophthalmic conditions.

THE EYES HOLD THE KEY

Katie Scanlon

Quite often a systemic condition can be diagnosed during an eye examination. This talk explores the features of systemic disease that may be seen on an eye examination, and what may indicate that the patient requires further investigation.

ACCURACY OF ORTHOPTISTS IN THE DIAGNOSIS AND MANAGEMENT OF TRIAGED PAEDIATRIC PATIENTS

Jane Scheetz, Connie Koklanis

Approximately four years ago the Royal Children's Hospital in Melbourne implemented an orthoptic triage clinic for non-urgent referrals related to ocular motility or vision disorders. This was implemented in response to increased demand for paediatric eye services. The intention was to safely expedite patient care and to discharge patients to the community where appropriate. Providing a high-quality eye service that is efficient and effective and which improves the patient journey has been central to developing this sustainable service.

The purpose of the current clinical audit has been to evaluate the agreement between the orthoptist and medical practitioners (ophthalmology consultant, fellow and/or registrar). Included in this audit are patients who were initially reviewed and managed by the orthoptist within the triage clinic and later reviewed by a member of the medical team. Patients who were discharged have not been included in this audit. This paper will present an outline of the model of service delivery and the outcomes of the latest audit.

REFRACTIVE OUTCOMES OF TRANS-PRK ON HYPERMETROPES USING SCHWIND AMARIS

Kathleen Suarez, Ilan Sebban

Purpose: To evaluate the visual outcomes, spectacle independence and patient satisfaction with hypermetropic TransPRK and discuss how to manage patient expectations.

Method: The study involved 50 eyes of 25 patients. It was a prospective consecutive clinical study. All patients received TransPRK ablations using the ORK-CAM software module and aberration free protocol. All refractions and surgery were performed by a single surgeon.

Results: Average age of 51 years with 64% female and 46% male. The mean spherical equivalent was +2.58 D, mean sphere was +2.87 D and mean cylinder was -0.59 DC. The scattergram shows overcorrection, a trend towards overcorrection at 2 weeks, an almost perfect slope at 3 months, and a trend towards undercorrection at 6 months.

Conclusion: Laser vision correction for hypermetropic and presbyopic patients remains the poor second cousin to lens-based surgical procedures (PRELEX). It takes three months to achieve a stable desired result due to overcorrection outcome. Latent hypermetropia and presbyopic regression is unpredictable. Higher refractions tend to have greater regression.

ORTHOPTIC-LED GLAUCOMA MONITORING CLINIC AT ALFRED HEALTH

Danielle Thorburn, Connie Koklanis

A significant number of specialist outpatient attendances are related to glaucoma follow-up. This most likely relates to the demography of an aging population and improved technology in detecting and monitoring optic neuropathy. With constant new referrals and fewer discharges due to the chronic nature of glaucoma, there is invariably an increased demand on outpatient services.

In response to this increased demand, Alfred Health has recently implemented a Glaucoma Monitoring Clinic. This model of care utilises specifically trained orthoptists to monitor and co-manage patients diagnosed with stable glaucoma or who are glaucoma suspects. Whilst the concept of shared care for glaucoma with allied health staff is not novel, no research to date has investigated the role of the orthoptist in integrated glaucoma patient eye care. Orthoptists are suitable to be involved in such models of service delivery as they have the underpinning knowledge and skills to carry out clinical investigations applicable to the diagnosis and monitoring of ocular pathology. Furthermore, given that orthoptists deliver outpatient eye care services within a collaborative hospital team, they are well positioned to offer further support to ophthalmology glaucoma services.

An outline of the new orthoptic-led Glaucoma Monitoring Clinic at Alfred Health will be presented and discussion invited.

REFERRAL TRIAGE AND PRE-REFERRAL GUIDELINES

Stephanie Tsonis, Catherine Mancuso

The Royal Victorian Eye & Ear Hospital receives around 10,000 new referrals for ophthalmological services every year. The Orthoptic Department is responsible for the triage of these referrals to determine clinical urgency and priority.

A high demand on RVEEH services and limited access in a timely manner led to the development of pre-referral guidelines for general practitioners as part of the Outpatient Access Reform Project. The aim of the guidelines is to bridge community services and address the current and future growing demand on referrals.

USING ON-LINE LEARNING IN THE TEACHING OF VERTOMETRY TO ORTHOPTIC STUDENTS: AN UPDATE

Suzane Vassallo

The purpose of this presentation is to provide an update about the ongoing development of an on-line simulation tool, 'Understanding Vertometry'. This resource was developed in response to student feedback which sought more efficient use of teacher time in vertometry workshops. This 'update' will highlight the changes this resource has undergone in the last 12 months, since it was first introduced at this conference in 2011. Using data collected over a 3-year period, this presentation will also detail the multiple benefits, both cognitive and affective to both student and teacher, which the implementation of this resource has afforded.

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 performance
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

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
1962	Adrienne Rona	A survey of patients at the Far West Children's Health Scheme, Manly
1963	Madeleine McNess	Case history: Right convergent strabismus
1965	Margaret Doyle	Diagnostic pleoptic methods and problems encountered
1966	Gwen Wood	Miotics in practice
1967	Sandra Hudson Shaw	Orthoptics in Genoa
1968	Leslie Stock	Divergent squints with abnormal retinal correspondence
1969	Sandra Kelly	The prognosis in the treatment of eccentric fixation
1970	Barbara Denison	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
1995-7	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

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

THE MARY WESSON AWARD

1983	Diana Craig (Inaugural)
1986	Neryla Jolly
1989	Not awarded
1991	Kerry Fitzmaurice
1994	Margaret Doyle
1997	Not Awarded
2000	Heather Pettigrew
2004	Ann Macfarlane
2008	Julie Barbour
2010	Elaine Cornell
2011	Zoran Georgievski

ZORAN GEORGIEVSKI MEDAL

2012	Neryla Jolly (Inaugural)
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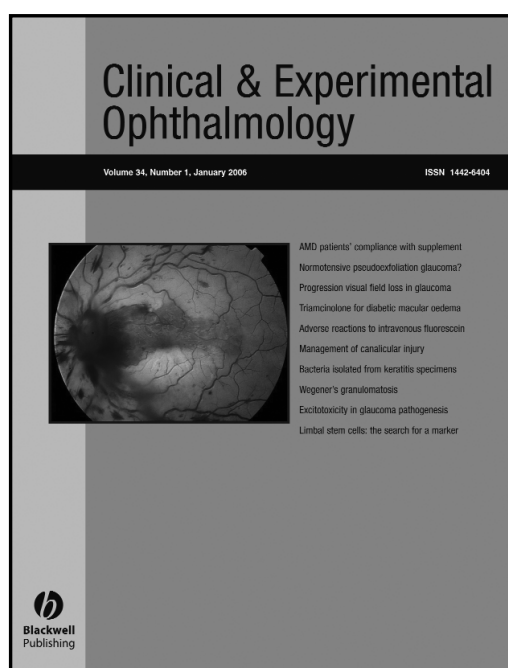
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