

CASE REPORT

Diagnosis and management of accommodative esotropia

Clin Exp Optom 2006; 89: 5: 325–331

DOI:10.1111/j.1444-0938.2006.00059.x

Steffanie L-H Liang* BOptom

PgDipAdvClinOptom

Timothy R Fricke^{†#} MScOptom

*Victorian College of Optometry,

The University of Melbourne, Carlton,
Australia

[†]Clinical Vision Research Australia,

Victorian College of Optometry, Carlton,
Australia

[#]Department of Optometry and Vision
Sciences, The University of Melbourne,
Carlton, Australia

E-mail: tfricke@unimelb.edu.au

Background: Accommodative esotropia is the most common form of childhood strabismus presenting to optometric practice. Functional and cosmetic outcomes are often excellent but depend on accurate diagnosis, urgent and correct initial management and careful follow-up.

Case reports: We present several cases that highlight important aspects of the clinical care of accommodative esotropia. The first patient was mismanaged by undercorrection of hypermetropia, but was later accurately diagnosed to have accommodative esotropia and was subsequently managed successfully with full hypermetropic correction alone. The second patient had an accommodative esotropia with amblyopia. The third patient used a near addition to correct a residual near esotropia.

Conclusions: The published evidence and these cases make several points regarding assessment, diagnosis and management of esotropia. Assessment must aim to reach a diagnosis based on aetiology, as the aetiology of esotropia has a significant impact on management decisions and prognosis.

Submitted: 18 July 2005

Revised: 3 March 2006

Accepted for publication: 18 March 2006

Key words: accommodation, amblyopia, diagnosis, esotropia, management, strabismus

Accommodative esotropia is the most common form of all childhood strabismus.^{1,2} As with any strabismus, it occurs due to a mismatch of factors increasing the demand on fusion compared to factors controlling the quality of fusion.³ In the case of accommodative esotropia, excess convergence results either from a physiological response (accommodative convergence) to high hypermetropia or an abnormal response (high accommodative convergence to accommodation ratio) to moderate hypermetropia.⁴ The

excess convergence is beyond the person's fusional divergence amplitude, either because the deviation is too large or because amblyopia is decreasing fusion ability.

The average presenting age of accommodative esotropia is 2.5 years but there is a wide range from three months to seven years.^{3,5–8} Accommodative esotropia may be fully refractive (no strabismus remains when the hypermetropia is corrected) or partially refractive (the esotropia is reduced by refractive correction but is still

present). Other complicating factors, such as vertical deviations (most commonly inferior oblique over-action with superior oblique under-action) and amblyopia, can exist as part of the cause, effect or association of the esotropia.

Accurate differential diagnosis of esotropia plays a key role in successful management of the deviation. The aetiology and management of accommodative esotropia are different from those of infantile, sixth nerve palsy and Duane's syndrome esotropias. The aetiology of

acquired non-accommodative esotropia is debatable: some authors have suggested that it is a long-term adaptation to no treatment or poor treatment of accommodative esotropia,^{9,10} some have suggested that there is a primary extraocular muscle cause,¹¹⁻¹⁴ while others have suggested a complex interaction between accommodative and non-accommodative aetiologies.¹⁵

Accommodative esotropia has a very favourable prognosis, if the appropriate treatment is initiated promptly.^{8,16} Conventional treatments include spectacles, therapy for amblyopia, other vision therapy and prisms. On rare occasions, topical miotics may be chosen over spectacles as the treatment of choice (for example, for children with extremely poor compliance with spectacle wear or who repeatedly break glasses). Despite the accumulated evidence approving the efficacy of non-invasive treatments of accommodative esotropia, a few authors still advocate early surgical intervention. Authors such as Gobin¹⁷ view the hypermetropia as an association or effect of the esotropia rather than the underlying cause. Patients should be informed about potential complications of surgery compared to anti-accommodative therapy (spectacle correction or miotic drops). The essentially non-invasive and reversible nature of anti-accommodative therapy makes it difficult to argue against at least a trial before surgery.

CASE REPORTS

Case 1. Mismanagement of esotropia by significant undercorrection of hypermetropia

Miss B, a five-year-old girl, presented to our clinic with symptoms of a turned eye and poor performance at school. She was wearing glasses with a prescription of +0.50 R and L. Her corrected vision was R 6/9.5 and L 6/7.5 (logMAR Lea symbols). A constant right esotropia was present with and without her spectacles, measuring 40^Δ at near and 30^Δ at distance. The esotropia appeared concomitant to excursions, with no globe retraction in any direction. No

torticollis, latent nystagmus (LN), dissociated vertical deviation (DVD) or smooth pursuit asymmetry (SPA) were apparent. No CNS abnormalities were evident from history (headaches, nausea, vomiting, clumsiness, general malaise, trauma, recent weight changes, hormonal changes, growth defects) or by ocular examination (including pupil function and eyelid position). Raab's Plus 3 test was positive (that is, her esotropia reduced when she wore +3.00 DS lenses on both eyes). She showed constant right suppression with the Worth 4 Dot test at all distances. Cycloplegic retinoscopy found that her actual refractive error was R and L +4.00/-0.50 × 180. Ocular funduscopy through dilated pupils found no abnormalities; slitlamp biomicroscopy was also normal and no exophthalmia was observed.

In the absence of incomitancy, globe retraction, LN, DVD, SPA, apparent CNS abnormality and ocular/orbital pathology and the presence of significant hypermetropia and significant reduction of the esotropia with correction of the hypermetropia, the diagnosis was, at least partially, accommodative esotropia. Full refraction was prescribed for constant wear and arrangements were made to review.

Five weeks later, vision with the spectacles was R and L 6/7.5 and the previously large constant esotropia had reduced to a small esophoria at near. Stereopsis was 100 seconds of arc measured with the Animals Subtest of the Randot Stereotest (Stereo Optical Co), with correction. Fusional reserves at near were BO greater than 40, BI 10/8. Without spectacles, Miss B had a constant alternating 40^Δ esotropia at distance and near. Diagnosis was confirmed as fully-accommodative esotropia. Miss B was advised to continue to wear her spectacles continually.

When Miss B returned three months later, her corrected vision remained at 6/7.5 R and L. Cover test revealed orthophoria at distance and 5^Δ esophoria at near. Stereopsis had improved to 25 seconds of arc on the modified Wirt circles of the Randot Stereotest. Fusional reserves at near had improved to BO greater than 40, BI 14/12.

One year after initial presentation, Miss B was able to achieve 6/6 R and L with her spectacles. No eso-deviation was noted with spectacle correction. Significant improvement in academic performance was also reported by her teachers and mother, after she started wearing her full hypermetropic correction.

While the appropriate correction of this child's hypermetropia appeared to directly enhance her learning ability, it is not possible to draw cause-effect conclusions about the relationship between correction of hypermetropia and academic performance based on one case. It seems logical that clear, comfortable vision should facilitate fluent and enjoyable reading, however there is no compelling evidence to prove this. Experience and interpretation of the evidence,¹⁸⁻²¹ suggest that correcting ocular and visual problems may or may not lead to improvements in academic performance depending on other factors.

Case 2. Accommodative esotropia with amblyopia

Miss C initially presented to our Children's Clinic, when she was three years of age. Her parents had noticed a constant 'inward turn' of the right eye since she was two years old. Vision measured with single Lea symbols was R 6/60, L 6/9.5; we were unable to test logMAR acuity. Cover test found a constant, comitant 30^Δ right esotropia at distance, which increased to 50^Δ at near. No binocularity was demonstrated. Raab's Plus 3 test was positive. The esotropia appeared comitant to excursions, with no globe retraction in any direction. No LN, DVD or SPA were apparent. No CNS abnormalities were evident from history or ocular examination. Cycloplegic retinoscopy revealed R +5.00/-1.00 × 180, L +4.00/-0.50 × 180. VA with this prescription was R 6/60 and L 6/12. Ocular health assessed by slitlamp and stereoscopic funduscopy through dilated pupils was normal.

In the absence of incomitancy, globe retraction, LN, DVD, SPA, apparent CNS abnormality or ocular/orbital pathology and in the presence of significant hypermetropia and significant reduction of the

esotropia with correction of the hypermetropia, the diagnosis was, at least partially, accommodative esotropia with amblyopia. The full cycloplegic refraction was prescribed and review was set for three weeks.

Miss C returned two months later. Refraction remained the same, while VA improved to R 6/60, L 6/7.5. There was a small residual esotropia of 5^{Δ} at distance and 15^{Δ} at near. The diagnosis was partially accommodative esotropia with amblyopia. Full-time spectacle wear (aiming for all waking hours) with full-time patching (aiming for waking until evening meal-time) of the left eye was recommended, with review in three weeks.

Miss C returned four weeks later for review. Spectacle compliance was 100 per cent and patching compliance was estimated as 75 per cent. Her parents had not noticed the eye turn as much, except when she was tired. VA measured with single Lea symbols had improved to R 6/30, L 6/7.5, while the first measure of logMAR Lea symbols was achieved and was R 6/60, L 6/9.5. There was no change in refraction or the residual esotropia. Miss C was instructed to continue full-time spectacle wear with full-time patching of the left eye. Review was set for one month.

Four weeks later, spectacle compliance remained at 100 per cent, while patching compliance reportedly improved to about 90 per cent. VA was further improved to R 6/19 (single Lea symbols), 6/30 (logMAR Lea symbols), L 6/7.5. Cover test found orthophoria at distance with her glasses, while a less than 10^{Δ} residual right esotropia remained at near. Her parents felt that her eyes looked straight when she was wearing her spectacles. Miss C was instructed to continue full-time spectacle wear with full-time patching of the left eye.

Over five more monthly review cycles, Miss C continued to wear essentially the same spectacle correction. Her therapy for amblyopia was modified twice. First, to two hours per day patching of the non-amblyopic eye with one hour of concentrated near work (as per PEDIG 2003 protocols)²² then later to atropine penalisation of the non-amblyopic eye (as per PEDIG 2002 protocols).²³ We modified

therapy because our clinical experience suggests that periodically changing therapy is a useful aid to compliance: there is real and perceived reward in moving from full-time to part-time patching to some form of penalisation. At last review, compliance for spectacle and amblyopic therapy reportedly remained high. Visual acuity was measured as R 6/7.5 (single Lea symbols), 6/9.5 (logMAR Lea symbols), L 6/7.5. Cover test suggested less than 10^{Δ} esophoria only. There was gross stereopsis (Titmus Fly only). The diagnosis was changed to fully-accommodative esotropia. Changes in Miss C's visual acuity are plotted in Figure 1.

Case 3. Use of a near addition to correct a residual deviation at near

Master W, a three-year-old boy, presented with 'crossed-eyes' that seemed to swap from right eye to left and were first noticed 12 months previously. Vision was R and L 6/12 (single Lea symbols). He had a constant, concomitant 40^{Δ} alternating esotropia at distance, which increased

to 60^{Δ} at near. Raab's Plus 3 test found less than 5^{Δ} esophoria at distance but 25^{Δ} esotropia at near. The esotropia appeared concomitant to excursions, with no globe retraction in any direction. No LN, DVD or SPA was apparent. No CNS abnormalities were evident. Cycloplegic retinoscopy found R +2.50 DS and L +2.50 DS. Slitlamp and stereoscopic fundal examinations were normal. Visual acuities were R and L 6/9.5.

In the absence of directional incomitancy, globe retraction, LN, DVD, SPA, apparent CNS abnormality or ocular/orbital pathology and in the presence of significant hypermetropia, significant reduction of the esotropia with correction of the hypermetropia, and significant far-near incomitancy, the diagnosis was high AC/A ratio accommodative esotropia without amblyopia. A spectacle correction of +2.50 DS OU was prescribed for full-time wear.

Master W returned two months later. His parents felt that the 'eye turn' had disappeared with the spectacles but was

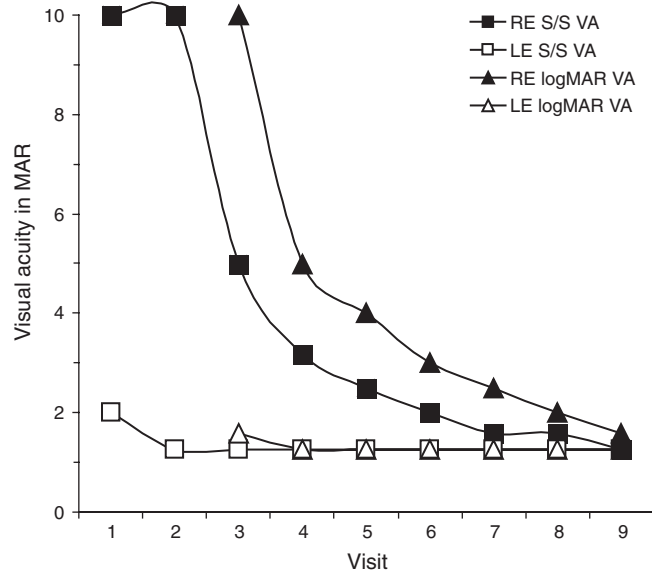


Figure 1. Visual acuity change over clinic visits for Miss C. Full-time patching was performed between Visit 2 and Visit 5. Patching for two hours per day with one hour of concentrated near work was performed between Visit 5 and Visit 7. Atropine penalisation was performed between Visit 7 and Visit 9.

unchanged without them. Vision was R and L 6/6 (single LH symbols), R and L 6/7.5 (logMAR LH symbols). There were no refractive changes. With spectacles, Master W was orthophoric at distance but still had a constant 20^A alternating esotropia at near. An additional +1.00 DS OU over the distance correction decreased the near esotropia to 10^A, while a +2.00 DS OU addition decreased the near esotropia to less than 5^A. He had constant alternating suppression to Worth 4 Dot testing at near but fusion at distance. The diagnosis was unchanged. It was felt that a +2.00 DS OU near addition would be useful in promoting near fusion: there is no good evidence for this decision but choosing the lowest addition that reduces the near esotropia to an almost undetectable size seems most reasonable. Lenses were changed to +2.50 DS OU with a +2.00 DS near addition in a 35 mm D-segment bifocal. Wide bifocals set high (mid-pupil) are considered most likely to provide a successful outcome, although there appear to be no published data.

Master W returned two months later. His parents were happy with the outcome. They felt his eyes were never turned with the spectacles. Vision was R and L 6/6 (logMAR LH symbols). He was orthotropic at distance and near with his spectacles on (that is, using the near addition for near cover test). Without spectacles, he had a 40^A alternating esotropia at distance, increasing to 60^A at near. With spectacles, he passed the random dot shapes of the Randot stereotest and had a contour stereoacuity (measured with the Randot animals) of 100 seconds. Fusional reserves at near were BO 40/35, BI 12/4. He was advised to continue with the same spectacles with six-monthly reviews.

DISCUSSION

Aetiology and differential diagnosis

In a tertiary care ophthalmology clinic in rural North America, the most common forms of childhood esotropia were accommodative esotropia, esotropia associated with CNS abnormalities, acquired

non-accommodative esotropia, esotropia resulting from an ocular sensory defect, infantile esotropia, sixth cranial nerve palsy and Duane's syndrome.¹ The relative prevalences are listed in Table 1. Our impression is that accommodative esotropia is the most prevalent and esotropia due to CNS abnormalities the least prevalent in primary eye care in Australia. Regardless of the exact prevalence in any particular population, the importance of differentiating between the aetiologies cannot be over-estimated. First, the aetiology helps clinicians to decide whether they are dealing with primary benign esotropia or esotropia secondary to a potentially serious systemic problem. Second, it determines the management for most esotropia.

The clinical characteristics of the common esotropias are listed in Table 1 but the following additional points are worth noting.

Intuitively, quantification of the strabismus is important to diagnosis. The magnitude, constancy, laterality, concomitancy, fusion state/capacity and presence/depth of amblyopia are all inherently important. Some measurement of AC/A ratio is also vital, even a crude measure such as Raab's Plus 3 test provides an opportunity to gauge the effect of plus lenses on an esotropia before the cycloplegic refraction is known. The central role of hypermetropia in so much esotropia (over half are accommodative) means that cycloplegic retinoscopy is mandatory. Without cycloplegia, mistakes such as the mismanagement of Case 1 prior to attending our clinic can occur too easily.

The prevalence of esotropia associated with CNS defects (17 per cent), visual loss (seven per cent) and paralysis (three per cent) makes it critical for the primary eye-care professional to have sophisticated protocols for determining the possibility of serious neurological and ocular disease in any patient presenting with esotropia. This should include seeking unusual symptoms (headaches, nausea and/or vomiting, clumsiness, general malaise, trauma, recent weight changes, hormonal changes, growth defects), consciously searching for unusual signs (nystagmus

other than latent, torticollis, ptosis, incomitancy, exophthalmia, pupil abnormalities) and performing a best-practice ocular health examination.

Infantile esotropia and early onset accommodative esotropia can be confused. The clinician must conscientiously search for signs suggestive of infantile esotropia: latent nystagmus, smooth pursuit asymmetry and dissociated vertical deviation. The clinician must seek any accommodative component: measure the response to plus lenses (Raab's Plus 3 test allows you to do this prior to knowing the exact refractive error) and do a cycloplegic refraction.

Acquired non-accommodative esotropia is difficult to distinguish from accommodative esotropia with poor or no treatment.²⁴ The clinician should seek any accommodative component and consider a trial correction of any hypermetropia found before seeking a surgical opinion. If there is evidence of response to the hypermetropic correction in reasonable time, continue managing as an accommodative case until no further improvement can be achieved.

Duane's Syndrome may be associated with other ocular lesions (for example, iris stromal dysplasia, pupillary anomalies, cataracts, heterochromia, persistent hyaloid arteries, choroidal colobomata and microphthalmos) and systemic malformations (for example, facial anomalies, hearing deficits and anomalies of the limbs, feet and hands). The potential for ocular lesions means that a best-practice ocular health examination is essential, while the potential for systemic malformations means that referral for paediatrician examination via a general medical practitioner is necessary.

Sixth cranial nerve palsies can be benign or a harbinger of serious neurological disease. Benign childhood sixth cranial nerve palsies frequently occur following upper respiratory tract infections or other forms of mild viral illness. It is usually self-resolving. Practitioners should carefully seek associated neurological symptoms and signs, for example, headaches, nausea, vomiting, general malaise, and if there is any doubt, refer for

Form of esotropia	Prevalence in tertiary care clinic	Typical age of onset	Common clinical signs/associations	Common initial management
Accommodative	53%	3 months to 7 years	Small to large deviation, significant hyperopia, high AC/A, refractive correction significantly decreases deviation	Glasses with maximum plus
Associated with CNS abnormalities	17%	Most commonly essentially congenital but can be acquired at any age	Cerebral palsy, developmental delay, autism, behaviour, spasmus nutans, Down syndrome, infantile spasms, hydrocephalus, cerebral haemorrhage, motor vehicle accident, meningitis	Referral to hospital emergency room or paediatrician via GP, if CNS condition not previously diagnosed
Acquired non-accommodative	10%	1–5 years of age	Small to large deviation, little or no hyperopia, normal AC/A, no neurological or systemic signs or symptoms	Seek surgical opinion if convinced there is no accommodative component
Associated with visual loss	7%	Acquired at any age	Monocular or binocular blindness	Manage cause of visual loss, do nothing, or seek cosmetic alignment via surgery
Infantile	5%	Within first 6 months of life	Large deviation, latent nystagmus common, MNTSPA common, DVD frequent, poor motor and sensory fusion potential	Seek surgical opinion early
Sixth cranial nerve palsy	2%	Acquired at any age	Esotropia worse at distance than near, limitation of abduction on the affected side, esotropia worsens on gaze ipsilateral to the affected nerve	Requires scans and/or blood work-up for aetiology (urgently if recent onset)
Duane's retraction syndrome	1%	Usually congenital	Small or no esotropia in primary gaze, limitation of abduction towards the affected side producing increasing esotropia on ipsilateral gaze, globe retraction and/or ptosis on contralateral gaze	Children should have paediatric medical assessment due to chances of related defects

Table 1. Common forms of esotropia and their clinical characteristics. Prevalences from Mohny (2001).¹

diagnostic opinion to someone with ability to scan and do blood work-ups.

Management

Epidemiological studies show that accommodative esotropia is a common presentation.¹ There is a considerable body of evidence suggesting that correction of hypermetropia should take a central role in the management of accommodative esotropia.^{8,16} The cases presented here demonstrate successful management with plus lenses. Some finer points of this management deserve closer attention.

Management of accommodative esotropia can be broken into stages.

1. Prevent further motor adaptations. Prescribe glasses that get the eyes as straight as possible as soon as possible, using either minimum plus that achieves constant binocular alignment or full cycloplegic correction.
2. Treat monocular sensory adaptations. Treat amblyopia to achieve best possible visual acuity in each eye alone (as in Case 2).
3. Treat motor adaptations and binocular sensory adaptations. Restore binocular alignment (may require increased hypermetropic correction, bifocals as in Case 3, corrective prisms, vision therapy or surgery) and achieve best possi-

ble binocularity (usually requires vision therapy).

4. Promote emmetropisation; wean patients off plus lenses in the appropriate way at the appropriate time.^{16,25}

Stage 1 is demonstrated by all three cases presented and a significant body of established evidence.^{3,4,8,9}

Stage 2 is demonstrated by Case 2 and a significant body of established evidence.^{22,23} There are still debateable points. While the PEDIG trials suggest that full-time patching, part-time patching and atropine penalisation have roughly the same average effect over a six-month period, it is unknown whether any

of these treatments may be more successful for particular children. In addition, the effect of changing therapies is unknown. In Case 2, we elected to modify therapy between these three proven options to maintain compliance. Our experience is that compliance decreases over time (the time-scale is patient and family dependent) but that changes in therapy can provide the sense of progress and success that families need to persist. In addition, we feel that it is preferable to pre-empt any compliance decrease by changing therapy before motivation declines. There is no solid evidence for this but Case 2 provides an example of successful treatment.

Treating binocular sensory adaptations in Stage 3 is more difficult to predict. It has been established that the age of onset of the esotropia and the duration of constant esotropia pose the most significant risk for adverse binocular visual outcomes.^{4,10,26} Early detection and prompt, appropriate management of accommodative esotropia are important for the maintenance of binocular visual function. If this has not occurred, such as in Case 2, the long-term prognosis may be improved by treatment to improve fusion and preferably achieve some level of stereopsis. Vision therapy has been proposed to achieve these goals.

The longer-term natural history of accommodative esotropia is still uncertain, probably because it is variable. Some authors have suggested that accommodative esotropia resolves in adolescence and that most patients no longer need to use any optical correction to maintain ocular alignment.^{5,16,25} According to Lambert's study, children with lower baseline hypermetropic refractive errors (less than +3.00 DS OU) are more likely to be able to discontinue spectacle wear¹⁶ but the weaning process requires gradual reductions (0.50 D) in prescription. Others believe that accommodative esotropia does not resolve in adolescence and may indeed continue well beyond this age.²⁷⁻³⁰ It is important for parents to realise that their children will need to wear spectacles for as long as they are required to maintain good VA, binocular alignment and

high-grade stereopsis. In most cases, this means they will need to maintain spectacle wear at least into their adolescence or early adulthood. In the cases presented, the aim will be to achieve Stage 4 at the appropriate time in the future by weaning them off spectacles using the method recommended by Lambert and associates.¹⁶

CONCLUSION

Clinical assessment of patients presenting with esotropia must be adequate to enable an aetiological diagnosis. The cases presented provide three examples of clinical assessments reaching aetiological diagnoses. Accommodative esotropia is the most common form of childhood strabismus and has a favourable prognosis, if appropriate treatment is initiated promptly. Once a diagnosis of accommodative esotropia has been reached, management should aim to prevent further motor adaptations, to treat amblyopia, motor adaptation and binocular sensory adaptations, and to promote emmetropisation. The cases presented demonstrate the management options.

REFERENCES

- Mohney BG. Common forms of childhood esotropia. *Ophthalmology* 2001; 108: 805-809.
- Mohney BG, Huffaker RK. Common forms of childhood esotropia. *Ophthalmology* 2003; 110: 2093-2096.
- von Noorden GK. Binocular Vision and Ocular Motility: Theory and Management of Strabismus, 5th ed. St Louis: Mosby, 1996.
- Birch EE. Marshall Parks Lecture. Binocular sensory outcomes in accommodative ET. *JAAPOS* 2003; 7: 369-373.
- Baker JD, Parks MM. Early-onset accommodative esotropia. *Am J Ophthalmol* 1980; 90: 11-18.
- American Academy of Ophthalmology. Basic and Clinical Science Course Section 6: Pediatric Ophthalmology and Strabismus. San Francisco: LEO, 2001-2002.
- Pollard ZF, Greenberg MF. 20 unusual presentations of accommodative esotropia. *JAAPOS* 2002; 6: 33-39.
- Berk T, Koçak N, Ellidokuz H. Treatment outcomes in refractive accommodative esotropia. *JAAPOS* 2004; 8: 384-388.
- Parks MM. Management of acquired esotropia. *Br J Ophthalmol* 1974; 58: 240-247.
- Fawcett SL, Birch EE. Risk factors for abnormal binocular vision after successful alignment of accommodative esotropia. *JAAPOS* 2003; 7: 256-262.
- Hiles DA, Watson BA, Biglan AW. Characteristics of infantile esotropia following early bimedial rectus recession. *Arch Ophthalmol* 1980; 98: 697-703.
- Baker JD, DeYoung-Smith M. Accommodative esotropia following surgical correction of congenital esotropia, frequency and characteristics. *Graefes Arch Clin Exp Ophthalmol* 1988; 226: 175-177.
- Molarte AB, Rosenbaum AL. Clinical characteristics and surgical treatment of intermittent esotropia. *J Pediatr Ophthalmol Strabismus* 1991; 28: 137-141.
- Gobin MH. Surgery for fully accommodative esotropia. *Binocul Vis Strabismus Q* 2001; 16: 81-82.
- Raab EL. Etiologic factors in accommodative esodeviation. *Trans Am Ophthalmol Soc* 1982; 80: 657-694.
- Lambert SR, Lynn M, Sramek J, Hutcheson KA. Clinical features predictive of successfully weaning from spectacles those children with accommodative esotropia. *JAAPOS* 2003; 7: 7-13.
- Gobin MH. La vision binoculaire après correction chirurgicale du trabisme accommodatif. *Bull Mem Soc Fr Ophthalmol* 1985; 96: 95 (cited by von Noorden 1996).³
- Eames TH. The influence of hypermetropia and myopia on reading achievement. *Am J Ophthalmol* 1955; 39: 375-377.
- Kulp MT, Schmidt PP. Visual predictors of reading performance in kindergarten and first grade children. *Optom Vis Sci* 1996; 73: 255-262.
- Rosner J, Rosner J. Some observations of the relationship between the visual perceptual skills development of young hyperopes and age of first lens correction. *Clin Exp Optom* 1986; 69: 166-168.
- Rosner J, Rosner J. The relationship between moderate hyperopia and academic achievement: how much plus is enough? *J Am Optom Assoc* 1997; 68: 648-650.
- Pediatric Eye Disease Investigator Group. A randomised trial of patching regimens for treatment of moderate amblyopia in children. *Arch Ophthalmol* 2003; 121: 603-611.
- Pediatric Eye Disease Investigator Group. A randomized trial of atropine vs patching for treatment of moderate amblyopia in children. *Arch Ophthalmol* 2002; 120: 268-278.
- Mohney BG. Acquired nonaccommodative esotropia in childhood. *JAAPOS* 2001; 5: 85-89.
- Lambert SR, Hutcheson KA, Elish NJ. Weaning children with accommodative esotropia out of spectacles: a pilot study. *Br J Ophthalmol* 2003; 87: 4-7.

26. Mulvihill A, MacCann A, Flitcroft I, O'Keefe M. Outcome in retractive esotropia. *Br J Ophthalmol* 2000; 84: 746-749.
27. Raab EL, Spierer A. Persisting accommodative esotropia. *Arch Ophthalmol* 1986; 104: 1777-1779.
28. Swan KC. Accommodative esotropia long range follow-up. *Ophthalmology* 1983, 90: 1141-1145.
29. Taylor RH, Armitage M, Burke JP. Fully accommodative esotropia in adolescence. *Br Orthopt J* 1995; 52: 25-28.
30. Rustein RP, March-Tootle W. Clinical course of accommodative esotropia. *Optom Vis Sci* 1998; 75: 97-102.

Corresponding author:

Timothy Fricke

Victorian College of Optometry

374 Cardigan Street

Carlton VIC 3053

AUSTRALIA

E-mail: tfricke@unimelb.edu.au