

Letters to the Editor

Convergence accommodation and distance exotropia

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Summary: Convergence accommodation (that is the accommodation produced when the eyes converge) is a probable mechanism for the reduced binocular visual acuity seen in patients who control distance exotropia. Minus lens therapy may be advantageous to these patients and is a therapy that may benefit patients who do not demonstrate a high AC/A ratio.

The following argument is presented to explain how minus lens therapy may help some patients with distance exotropia. Blur is not the only stimulus to accommodation, and the possibility of convergence accommodation being allowed to occur when minus lenses are worn is considered, that is the lenses are acting as a correction rather than a stimulus.

The use of minus lens therapy for distance exotropia is thought to stimulate accommodation and aid control of the deviation by the resultant accommodative convergence.^{1,2} The angle is expected to reduce the most in those with a high accommodative convergence/accommodation (AC/A) ratio.³ Indeed reports of minus lens therapy in pre-selected patients with high AC/A ratios support this.⁴

But does minus lens therapy work only in patients with a high AC/A ratio? Some authors have suggested that the angle of deviation is the more important factor.⁵ Many texts reference Caltrider and Jampolsky⁶ when discussing minus lens therapy. However, those authors reported the treatment to be equally effective in patients with either a normal AC/A ratio (defined as 3:1 to 6:1) or a high AC/A ratio (above 6:1) and only fail to draw a conclusion about patients with a low AC/A ratio because they had only two patients in that group. Watts *et al.*⁷, in evaluating the Newcastle scoring system in minus lens therapy, reported that only one of their patients had a high AC/A ratio, suggesting therefore that the treatment was successful in those without a high ratio; and Rowe *et al.*⁸ did not find AC/A ratio to be different in those who required further treatment and those who did not. Thus, other mechanisms can be examined.

The reduced binocular visual acuity which may occur in distance exotropia has been attributed to accommodative convergence.⁹ However, when convergence occurs convergence accommodation is produced. In a closed loop condition (where the feedback loop for blur is allowed) this accommodation is normally inhibited, but it may be demonstrated in open loop conditions (where the feedback loop is broken, e.g. by using pinholes or a Gaussian target). In the patient controlling a distance exotropia, convergence is used to maintain binocular single vision, and convergence accommodation has to be

negated unless blurring is to occur. Hasebe *et al.*¹⁰ found that in intermittent distance exotropes and decompensating exophorias a larger lag of accommodation occurred in the monocular state compared with when binocular, supporting an enhanced accommodative response during the use of convergence to control via the convergence and convergence accommodation synkinesis.

A ratio of the accommodation induced per prism dioptre of convergence may be measured: the convergence accommodation/convergence (CA/C) ratio. The mean CA/C ratio in patients with intermittent exotropia and exophoria (all of whom achieved binocular single vision at near with stereo-acuity better than 240 seconds of arc) has been reported as $0.081 \pm 0.043D:1^\Delta$, which was comparable with normals ($0.091 \pm 0.036:1$).¹¹ No inverse or reciprocal relationship was found between either stimulus or response AC/A and CA/C ratios. The authors comment that 'Probably a lower CA/C ratio is beneficial, enabling the vergence control system to compensate for large strabismic deviation with minimum degradation of accommodation accuracy'.

To maintain binocular single vision, when there is some 'awareness' of the eyes deviating or just the desire to maintain straight eyes, it could be considered that it is more likely that the patient would use convergence than accommodation, and that any resultant blur is secondary to the resultant convergence accommodation. In the person with normal binocular single vision, trying to maintain binocular single vision during forced convergence, Semmlow and Heerema¹² designed an experiment which examined this question and concluded that the blur experienced was due to convergence accommodation. Perhaps we can therefore consider that a second mechanism may be used in some patients undergoing minus lens therapy. In the presence of minus lenses convergence accommodation is allowed and a clear image maintained. For the mean CA/C ratio found by Nonaka *et al.*¹¹ (0.08 D for each prism dioptre of convergence) in exo-deviations, a calculation shows that 37^Δ of convergence could occur and the uninhibited 3.00 D of accommodation be permitted by use of -3.00 DS lenses. We therefore appear to have a good reason for minus lens therapy to work in those patients who do not have a high AC/A ratio but who are allowed, with the minus lenses in place, to converge without needing to inhibit convergence accommodation.

Gnanaraj and Richardson¹³ state that there is a 'Lack of clear evidence to guide clinicians in determining the most effective form of treatment'. Indications of which form of treatment is best suited to the patient needs further investigation, but examination of the literature helps us to better understand some responses to different forms of treatment that are seen clinically.

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Orthoptists providing a cost-effective alternative glaucoma service

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Summary: With a short period of in-house training and a small increase in staffing levels, the orthoptists at the Princess of Wales Hospital, Bridgend have established a glaucoma service, which has brought about a reduction in the waiting times of new referrals to under 12 weeks and care of review cases. This service has significant benefits to the patients and is cost-effective. As experienced decision-making clinicians within the hospital eye care team, orthoptists are well placed to participate in glaucoma care at a high level.

The problem

The prevalence of primary open angle glaucoma (POAG) in Britain is estimated at 1230 cases per 100 000 population.¹ In recent years the number of referrals to hospital glaucoma units has been increasing due to an ageing population, greater patient expectation, better technology and disease awareness. As a result, hospital eye clinics have become overwhelmed with new referrals and the subsequent follow-up required. As a

reaction to this, community-based services led principally by optometrists have developed across the country^{2,3} with varying success and cost implications. Hospital eye units are also looking at how better to address these issues.

In Bridgend all patients were assessed through general clinics, and although referrals were prioritised, even urgent glaucoma referrals waited over a year for their first appointment. The other problem facing all ophthalmic services is that of follow-up capacity. It is considered that one-third of all ophthalmic review cases are due to glaucoma and ocular hypertension.

A solution

Orthoptists had historically run the visual field clinics. In 2001 we persuaded management and ophthalmologists that the orthoptists could extend their role to the provision of a glaucoma service. The initial appointment was for a 0.6 WTE orthoptist. Equipment start-up costs were a new slit lamp and Humphrey visual field analyser. Training was in-house with the ophthalmic consultant and initially involved the acquisition of tonometry skills and the development of a shared care glaucoma pathway.

The beginning of the orthoptic glaucoma service

To address the new waiting list, the orthoptist triaged the new patients on the basis of intra-ocular pressure (IOP) measurement and field defect. The orthoptist spent 4 sessions per week assessing patients, 1 session per week on training and 1 session in a joint clinic where the consultant examined the patients triaged by the orthoptist. Within 6 months the waiting list for new referrals had reduced to less than 12 weeks from receipt of the referral to initial assessment.

Once the new waiting list was under control, attention was directed at taking the review patients into the orthoptic glaucoma service thereby reducing pressure on the ophthalmic service.

Training

After the initial 6-month period, the training session ceased. All further training has been integrated into continuing professional development or clinic time with no cost expenditure to the Trust. Skills gained include anterior chamber examination, HRT image acquisition and analysis, gonioscopy and stereo disc assessment. This has allowed refinement of the triage system. The orthoptists are now competent to assess and diagnose all referred patients attending the glaucoma clinic. Any pathology detected during the orthoptist glaucoma examination which is outside their competency is passed to the general ophthalmology clinic for advice. The joint clinic with the consultant has continued as it proved to be invaluable for verification of clinical decisions, development of knowledge and skills and for integration into the ophthalmic team.

The benefits

Audit of the orthoptic glaucoma service has proved that it has been successful in maintaining the new patient