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The Orthoptists' Role in Stroke Management

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Abstract

Background: Visual problems following stroke are multifaceted, cause significant impairment and can be a barrier to rehabilitation. Orthoptists specialize in the management of ocular motility disorders, including strabismus, diplopia and nystagmus, visual perception disorders and visual field defects. Orthoptic assessment and rehabilitation is known to be beneficial along the entire stroke pathway, ranging from the early post-acute phase to long-term care.

Clinical Practice: The incidence of visual problems following stroke has been reported to be greater than 50%, therefore, it would seem appropriate for all stroke services to provide formal vision assessments, yet in many cases this does not happen.

Discussion: The burden of persistent visual impairment following stroke is associated with an increased risk of falls, anxiety and depression with poor functional outcome and poorer quality of life. Early, targeted visual rehabilitation encourages independence, increases patient confidence and improves mobility and balance and should be an essential part of the care and management of all stroke survivors with visual deficit.

Key Points:

- Visual deficits are common following stroke and are related to difficulties with ADL, increased risk of falls
- Visual problems can be subtle so may go undetected and adversely affect rehabilitation
- There is a need for Orthoptists in every stroke service to enable accurate and timely assessments and appropriate interventions
- Early visual rehabilitation promotes independence, confidence and mobility

Keywords: Visual rehabilitation; Diplopia; Hemianopia; Stroke

Introduction

Cerebrovascular accident, or stroke, occurs in approximately 150,000 people each year in the UK [1] and is also the leading cause of adult disability [2]. Over half of all stroke survivors remain dependent on others for activities of daily living (ADL), [3] so any intervention that offers potential advantage to assist independence and/or quality of life should be examined and deployed. Visual defects following stroke are said to occur in approximately 60% of patients [4-9] and include diplopia, blurred vision, reading difficulties, ocular motility imbalance, impaired depth perception, visual field defects and visual perceptual disorders. Such impairments negatively impact on a wide range of activities of daily living including mobility, driving and self-care with subsequent increased dependency and loss of confidence [8,10,11]. Both visual impairment and stroke are associated with depression in the elderly [12].

Many visual problems are easily corrected and can be improved with intervention [11]. Orthoptists have clinical expertise in the diagnosis and management of eye movement abnormality, disorders affecting binocular vision and stereovision, visual neglect and perception and visual field assessment. Accurate information on visual acuity is an essential part of any functional visual assessment, yet many stroke survivors have complex disabilities including lack of speech and understanding [11]. Orthoptists use a variety of methods to enable such assessments that can be undertaken in the first few days following stroke and so play an important role in stroke rehabilitation. There are national guidelines in the UK that recommend that every patient with stroke has a practical assessment of vision and examination of the visual field with appropriate therapy [13,14] yet 45% of stroke services provide no formal vision assessment for stroke [15]. In 2012 a survey revealed that only 26% of patients with visual impairment had their needs met [16]. Current data is lacking on the extent of orthoptic stroke service provision in the UK. Identifying patients who require assessment can be challenging and it has been found that only orthoptic led screening provided qualitative assessments [15], therefore it is recommended that all stroke survivors are assessed by an orthoptist [17]; however funding constraints may prevent any expansion to current service delivery. A delay in identifying visual defects and initiating any subsequent treatment has a negative effect on long term rehabilitation and independence. Links between stroke units and Orthoptists should be established in all stroke services [11].

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There are associations between visual impairment at baseline and a poor modified Rankin Scale (a measure of the degree of disability or dependence in the daily activities of people who have suffered a stroke or other causes of neurological disability) at 3 months post stroke [4]. Hemianopia at presentation is also linked with poor early survival. Although mobility, reading and driving are all impaired, patients also experience difficulty with personal hygiene, feeding, shopping, watching television, socialising and financial management [18]. Non-resolved visual impairment may therefore result in considerable financial burdens for the patient, carer and the community placing a large economic cost on society [16].

The rate of recovery of visual impairment is greatest in the first month following stroke, with up to 42% making a full recovery [4], although opinions differ with some patients recovering in the first few days following stroke. At 3 months post-stroke, 80% of patients presenting with partial gaze palsy had recovered, whereas only 55% of patients with hemianopia had recovered at this stage [4]. Recovery of hemianopia in the first month is seen in 50% of cases, with the likelihood of further spontaneous recovery decreasing with increasing time from onset [19]. It is therefore implied that further recovery of hemianopia after 1 month is possible but unlikely.

Types of Visual Defects Following Stroke

Low vision

Decreased vision is reported in up to 29% of stroke survivors [7,20] and is frequently associated with co-existing ocular pathology, such as cataract, glaucoma and age-related macular degeneration. Hypertensive and diabetic retinopathies are usually co-incidental findings in this group of mainly elderly patients, but visual impairment and severity of retinopathy are related to all-cause stroke mortality [11,21].

Reduced visual acuity is a known risk factor for falls [22]. In a population of stroke survivors with frequent falls 76% of these were associated with visual disorders [23]. Decreased vision needs to be identified early to help prevent falls and the adverse effect that it has on quality of life. In many cases low vision is easily treatable and may be simply related to uncorrected refractive error [20] requiring assessment and advice from an optometrist for appropriate spectacle prescription. Other causes may not be amenable to treatment but still need identifying and explaining to the patient, carer and the multidisciplinary team. Patients may also require referral to Ophthalmologists for treatment or Certification of Vision Impairment and thereby gain access to local sight impairment support services for rehabilitation, support and guidance.

Visual perception disorders

Visual perception defects following stroke are also common. Agnosia is the inability to recognize objects, faces or the relative depth of targets. Alexia is the inability to recognize written words or letters and results in reading difficulties. Charles Bonnet syndrome (visual hallucinations) is often present but frequently under reported and commonly associated with the blind hemi-field [24]. Orthoptists can help differentiate cognitive perceptual problems from true visual difficulties. It is important to liaise effectively with other members of the rehabilitation team such as occupational therapists, physiotherapists and speech and language therapists to discuss the impact of vision problems on mobility, ADL and communication.

Visual inattention or neglect results in a reduction in the ability to look, scan, listen or make movements towards one half of the environment, with a lack of awareness of objects on the affected side. VI is a frequent consequence of right-hemisphere damage [25] but it also found with left hemisphere damage [26,27]. VI is said to occur in up to 85% of patients [27-29]. Recovery is often seen in the early post-acute stage, (usually considered as 2-3 weeks following stroke) but persistent neglect present months or years after stroke is also a common occurrence [30]. Long

Term dependency and poor functional outcome are common sequelae of this condition. Visuo-spatial rehabilitation focuses on increasing the awareness of the neglected side using a range of strategies, specifically focusing on functional tasks such as visual scanning, reading and other near tasks [31]. Interventions include using vertical/horizontal line guides and typo scopes, utilizing visual cues and teaching visual scanning toward the neglected side [32]. Visual scanning, in particular has shown to deliver improvements in visual inattention [33,34]; although this has been documented mainly in small studies [35]. In a recent RCT smooth pursuit training was found to significantly reduce unawareness and accelerate recovery from functional neglect [36]. The authors concluded that bedside neglect treatment using smooth pursuit training is effective and feasible early after stroke. However, more research is needed to better define which treatment techniques are the most beneficial. A recent Cochrane systematic review considers the different interventions for visual inattention and recommends that future studies need to have high quality design to examine persisting effects of treatment [37].

Visual field loss

Visual field loss causes a blind area that may be peripheral or central. Following stroke most visual field loss is peripheral and attributed to cortical strokes causing damage to the visual pathway [38]. Homonymous hemianopia is the most common type of visual field loss following stroke, resulting in loss of half of the visual field in both eyes [38].

The prevalence of visual field loss has been documented as occurring in 10 - 57%in the early post-acute phase [6,9, 39-41] however, this will depend upon the time of assessment post stroke as early, spontaneous recovery is common, especially in the first few weeks [19,42].

Visual field loss can seriously affect quality of life and lead to an increased risk of falls, low mood, impaired reading, increased institutionalisation and may result in poor long term recovery [9,11,43,44]. Hemianopia or blindness has also been found to be incremental risk factors for falls [23]. Patients with visual field loss were found to have lower quality of life scores than stroke patients without visual impairment [38]. There is often a delay between stroke onset and diagnosis of hemianopia, suggesting that such defects are often overlooked; it is recommended that visual field testing should be systematically performed in all stroke survivors with cerebral hemispheric stroke [41].

In a recent prospective multicentre trial half the patients with visual field loss reported no symptoms [38]. Many of these patients are not aware of their visual field defect and continue to drive [38,41],

therefore, early detection and subsequent intervention is important to enhance the patient's ability to engage in functional activities and so promotes risk reduction [45].

There are three main rehabilitation strategies for visual field loss: restitution, adaptation or substitution [38,44,46]. Restitution aims to permanently improve the visual field using flicker stimulation of the blind field with a reported improvement of approximately 5 degrees in visual fields [47,48] and a corresponding improvement in quality of life [49]. This type of training (when tested with dynamic Goldmann perimetry), can lead to a decrease in detection thresholds and subsequent enlargement of the affected area of visual field [50]; however, such improvements have also been postulated as an artefact of testing and eye movements may account for any improvements noted [51,52]. Thus, this treatment remains controversial with outcome data regarding efficacy of VRT conflicting [53]. This treatment can be sourced privately and is not offered in NHS centres.

Adaptation is the most clinically used strategy for hemianopia and involves teaching compensatory eye movements and visual scanning strategies. Visual search training has been shown to have some benefit [46]. Over two thirds of patients with hemianopia show a disorganized visual search strategy that can be markedly improved with systematic approach to training of saccadic eye movements and visual search [54]. This type of treatment has been shown to improve speed and accuracy of visual search into the blind field with a subsequent improvement of functional visual behaviour [38]. Compensatory training using visual scanning and exploration, which encourages more effective eye movements to cope with visual loss, is identified as the most promising rehabilitation technique. Saccadic visual search training improve overall visual function, assessed both objectively and subjectively, representing robust training effects [55]. A recent RCT evaluated the effects of compensatory scanning training in patients with homonymous visual field defects and concluded that training improved mobility related activities, although there was no improvement in reading [56]. Home based training is an effective, inexpensive option that can result in objective benefits in searching, reading and improved quality of life [57]. These strategies can be employed on a long term basis, are an inexpensive and simple option to enhance adaptation and widely available [44]. There are several free web-based therapies offering scanning training and visual search with early promising results (http://www.readright.ucl.ac.uk/; http://www.eyesearch.ucl.ac.uk/) alongside development of Applications for home use.

Visual field 'expanders' are a form of substitution and artificially extend the visual field using sector prisms. Some patients report improvement in functioning and obstacle avoidance [58-60]. There has been a reported 24% success rate at 3 months using temporary Fresnel prisms with some patients electing to have permanent prism glasses [60]. Patients may show adaptation to the field defect following training with prisms but there is little objective alteration of the visual field boundaries [61,62], no extension to the overall visual field seen and no functional improvement in their activities of daily living [63]. Many patients do discontinue their use [38] questioning their long term efficacy.

Typo scopes are reading aids, usually made out of a small sheet of black plastic with a rectangular aperture to reduce the amount of visible print, reduce glare and extraneous light. This enables a line of print to be read more easily and facilitates increased concentration/attention on the area of interest. Typo scopes are often useful in patients with hemianopia but also can also be used with co-existing visual inattention.

Careful visual screening of stroke survivors is recommended to ensure accurate diagnosis of visual field loss and to facilitate prompt treatment and maximize outcome [38]. Information on driving restrictions should also be provided and familiarity with the Driver and Vehicle Licensing Agency regulations must be sought.

Motility defects

The prevalence of eye movement defects following stroke has been estimated as 20-57% [6,9,38,64]. Eye movement defects encompass a wide range of defects including III, IV and VI cranial nerve palsies, reduced convergence, nystagmus, skew deviation, inter- and supra-nuclear disorders and gaze palsies. The presence of manifest strabismus has been reported in up to 52% of patients with cortical stroke [5,64] and is frequently associated with symptoms of diplopia, problems with hand-eye co-ordination and impaired depth perception [11]. Brain-stem stroke also causes strabismus and additionally nystagmus resulting in the distressing symptom of oscillopsia and vertigo. The types of nystagmus reported following stroke include convergence retraction, rebound, pendular, abducting, gaze evoked and jerk nystagmus [65]. Blurred vision, balance problems and diplopia from co-existing motility defects when combined with other co-morbidities following stroke add to the disablement of stroke and have a negative impact on successful early rehabilitation and can result in a prolonged in-patient stay and delayed recovery.

Defects of ocular-motor subsystems, such as saccades and smooth pursuit can be subtle, more difficult to detect and extremely difficult for patients to describe, yet they also cause significant difficulty with ADL, including problems with mobility, reading difficulties and visual search of the environment.

The Orthoptist is able to offer interventions to assist with many of these motility problems by using prisms to join diplopia and restore binocular vision and depth perception, occlusion to eliminate insuperable diplopia or orthoptic exercises to improve control of latent strabismus. Other interventions that may be useful include use of magnification, especially in patients with co-existing reduced vision. Teaching patients to use a compensatory abnormal head posture or null zone of nystagmus, providing appropriate advice on lighting and contrast and provision of scanning strategies can all aid rehabilitation and reduce the impact of stroke on the individual.

Further research

There are few large scale prospective studies for assessment and intervention of visual impairment post stroke. The Vision In Stroke (VIS) study recruited a large cohort of stroke survivors with visual impairment from across the UK using standardized protocols to examine the prevalence, type, rehabilitation options and outcome [7,38]. The evidence relating to eye movement disorders following stroke is also growing. However, currently, there is a lack of evidence specific to the impact of interventions on the functional outcome of patients with stroke and systematic analysis of outcomes of treatment interventions for eye movement disorders are required [66]. Patients

enrolled in randomized controlled trials, especially those eligible for inclusion in intervention trials, may not be representative of the general stroke population. Complete hemianopia and gaze palsy at baseline are associated with poor modified Rankin Scale and patients who present with visual impairment had poorer scores on all domains of quality of life scores compared with patients without visual impairment at baseline [4]; therefore, patients with visual impairments and other associated stroke-related motor defects may be restricted in participating in such trials, limiting the available evidence.

Conclusion

Diplopia, reduced vision, ocular muscle imbalance, strabismus, visual field loss and visual inattention are common deficits that occur following stroke. Such defects can result in decreased quality of life and influence the outcome for stroke survivors. Although the rate of recovery is greatest in the first month, the burden of persistent visual impairment at 3 months is still significant. Visual impairments may exacerbate the effects of other disabilities following stroke, causing increased reliance on others, a change to family and carer relationships and increasing social isolation for both patient and carer, especially if driving is prohibited.

Visual rehabilitation includes providing information on compensatory strategies of advice, suggesting reading aids and utilization of compensatory head postures, using prisms or occlusion for diplopia or visual disturbances such as nystagmus. There are a variety of treatment options for visual field loss and visual perception disorders, although further research is required to best determine the most effective. Visual search training appears to be the most promising adaptation to date and is easy to administer and widely available.

Early visual intervention, especially joining diplopia, facilitates effective rehabilitation, independence and mobility and supports early discharge, return to work and hobbies, thereby increasing self-esteem, confidence, reducing isolation and depression. Establishing links between orthoptic and Stroke services in all units is recommended.

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