Abstracts book of Vision 2008

the 9th International Conference on Low vision
Research and Rehabilitation partnerships -
Proceedings of the 9th International Conference on Low vision

P3 - Cortical vision loss and acquired brain injury

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128.3 - Assessing functional vision impairment in a population of people with acquired brain injury: Outcome measures for research that relate to community living

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This presentation will focus on the range of outcome measures most suited to assess visual function in the population with Cortical Vision Impairment including:Ophthalmological, ADL tasks, reading, mobility skills and Quality of Life measures.
Preliminary results of the use of selected outcome measures will be presented from an ongoing research study into the effectiveness of visual scanning training on the function of people with Cortical Vision Impairment.
The trend to have Low Vision Specialists involved in the assessment and therapy interventions for people with Acquired Brain Injury (ABI) appears to be gaining momentum, yet the tools available to assess visual disabilities associated with Cortical vision impairment are not always routinely included in clinical practice. This is surprising given that Cortical Visual Impairment, including eye movement disorders, visual field deficits, low vision, perceptual and cognitive difficulties, can affect approximately one third of all people with ABI.
More subtle visual perceptual deficits, such as visual inattention, become harder to assess using a static assessment task, as they may only be apparent when people are required to attend to multiple stimuli in a dynamic environment.
Given the important functional implications of these visual disabilities appropriate and meaningful outcome measures that relate to community living should form part of standard clinical intervention for all patients with stroke or traumatic brain injury. Reliable and valid outcome measures are also needed in order to evaluate the effectiveness of therapy interventions aimed at reducing the impact of these visual difficulties.
The aim of the presentation will be to:
* Promote the use of standard clinical and functional outcome measures
* Highlight the contribution that Low Vision Specialists can make to an interdisciplinary rehabilitation team.
* Facilitate the development of multi-centred research.

Vision 2008
Montréal, Canada

Proceedings of the 9th International Conference on Low Vision,
Vision 2008, Montreal, Quebec, Canada
July 7 – 11, 2008

Assessing functional vision impairment in a population of people with acquired brain injury: Outcome measures for research that relate to community living

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Abstract. The trend to have Low Vision Specialists involved in the assessment and therapy interventions for people with Acquired Brain Injury (ABI) appears to be gaining momentum, yet the tools available to assess visual disabilities associated with Cortical vision impairment are not always routinely included in clinical practice. This is surprising given that Cortical Visual Impairment, including eye movement disorders, visual field deficits, low vision, perceptual and cognitive difficulties, can affect approximately one third of all people with ABI. More subtle visual perceptual deficits, such as visual inattention, become harder to assess using a static assessment task, as they may only be apparent when people are required to attend to multiple stimuli in a dynamic environment. Given the important functional implications of these visual disabilities appropriate and meaningful outcome measures that relate to community living should form part of standard clinical intervention for all patients with stroke or traumatic brain injury. Reliable and valid outcome measures are also needed in order to evaluate the effectiveness of therapy interventions aimed at reducing the impact of these visual difficulties. This paper will focus on the range of outcome measures most suited to assess visual function in the population with Cortical Vision Impairment including Ophthalmological, ADL tasks, reading, mobility skills and Quality of Life measures.

Keywords: Cortical Vision Impairment; Acquired Brain Injury; Outcome measure; Visual Perceptual Deficit; Quality of Life;

1. Introduction

Incidence of Neurological Vision Impairments (NVI) is often under reported in the population of people with ABI due to a lack of standard screening measures that form part of standard rehabilitation assessment protocols. A recent study by Rowe[1] estimate that up to 88% of people screened had various vision deficits noted in ocular motor, visual field or visual perceptual processes.

In order to adequately determine the presence of the variety of neurological vision impairments that can occur it is considered necessary to use of a combination of clinical assessments, functional measures and questionnaires relating to outcome of therapy intervention. Whilst many of the measures currently available continue to have limitations with regard to their relevance to one's ability to carry out many of the activities required for independent community living, they should form the basis of standard outcome measures.

2. Clinical Ophthalmological Assessment

2.1 Visual Fields

Computerised visual field analysis using devices such as a Medmont, Humphreys or Goldman Automated Perimetry are now widely accepted as part of a standard clinical review. Perimetry may be static or kinetic, qualitative or quantitative, threshold or suprathreshold. Static perimetry uses stimuli of varying luminance in the same position to produce vertical boundary of the visual field. This method is preferred in quantitative perimetry. The kinetic perimetry uses moving stimulus of known luminance or intensity from the non-seeing area to a seeing area until the patient is able to perceive the stimulus. The assessment of kinetic perimetry relates more closely to the vision skills required for mobility in dynamic environments.

An alternative to standard visual fields, in the form of a modified attentional visual field test, has been reported in a study by Cunningham.[2] A Humphrey Visual Field Analyser was modified by the addition of external lasers which introduced a task additional to standard threshold field task by presenting central red targets at fixation.

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Standard and modified visual fields were assessed with results indicating that stroke survivors had depressed visual field sensitivity compared to controls. Sensitivity was further reduced when the stroke survivor were exposed to modified field test. Manual response times to central targets increased in both groups when combined with field test; stroke survivors had longer response times. It was concluded that subjects considered to have recovered from CVA and who have returned to independent living may still have visual problems which are manifest only when they have to divide their attention. These problems may therefore not be detected using standard clinical tests.

The Visual Scanning Analyser (VSA) is a tool developed to address the need for assessment of divided attention between multiple stimuli and to also assess the degree of visual scanning required for safe mobility. The VSA has been previously validated against conventional measures of unilateral visual neglect.[3] This tool is currently used as a key outcome measure in a study to evaluate the effects of static scanning training and mobility training in a group stroke survivors.

2.2 Visual acuity

Static Visual Acuity is measured using stationary optotypes and a sitting observer. However, in everyday life the identification of moving vehicles or persons is often required as we, as well as our surroundings, are continually moving. Dynamic Visual Acuity is rarely tested and often impaired by deficits in smooth pursuit eye movements, or nystagmoid fixation instability. Even in healthy, aged adults, dynamic visual acuity is more impaired than static acuity. Where possible, the assessment of dynamic visual acuity should also form part of the clinical measures conducted.

2.3 Contrast sensitivity

Abnormalities in contrast sensitivity occur after post-chiasmal lesions, where the patients complain about blurring of vision and deficits in reading, when recognising objects and faces especially under poor lighting conditions. Patients with impaired contrast sensitivity often have normal or close to normal visual acuity as tested with high contrast stimuli so that their contrast sensitivity deficit may go undetected.[4]
In post chasmal lesions:

- 12% have decreased acuity
- 82% have decreased spatial contrast sensitivity, at least in patients with acute lesions.

Wherever possible all patients should have a review of their refractive corrections (at an appropriate time post injury). The measurement of contrast sensitivity can be performed in a non-clinical, functional assessment using the Mars Perceptrix[5] hand held contrast sensitivity test allows for more functional assessment in the home or community setting. Contrast should be improved with adequate task lighting.

3. Functional outcome measures

3.1 Visual Attention

Measurement of Unilateral Visual Neglect (UVN) using conventional measures such as the Rivermead Behavioural Inattention Test[6] is widely accepted. Whilst this test is sensitive to significant deficits of UVN they rely on static tests where the person and test material is stationary. They do not relate to tasks that have a dynamic component.

In dynamic tasks visual attention must be divided between focal and ambient attention. There being hemispheric differences in the bias towards these functions, damage to one hemisphere can disrupt specific forms of attention and give precedent to the intact hemisphere.

Visual attention is a crucial lower level skill. A person may be unable to utilise selective visual attention to meet the demands of complex visual tasks. Therefore, the environment in which a person is operating has a large impact on visual skills. The complexity of the task or the environment can lead to apparent inconsistencies in perception and functioning. Complex environments require more mental energy to selectively filter visual information, and lead to more rapid fatigue. Hence, visual perception in relation to daily activities such as mobility tasks needs to be assessed in a variety of environments.

Mild Brain Injury has common sequelae of reduced selective visual attention, especially as the demands of the task increase. This is evidenced by decreased awareness of details/relevant features, an inability to superimpose structure on a seemingly random array and disorientation.

3.2 Mobility Assessment Course

The Mobility Assessment Course (MAC) was developed as an assessment tool that addressed the need for a structured, reproducible outcome measures that involve mobility in a relatively dynamic setting. The MAC has been previously validated against conventional measures of UVN[3] and is currently being used as a primary outcome measure in study into the effects of static scanning training and mobility training on the function of people with Hemianopia and/or unilateral visual neglect resulting from acquired brain injury.

4. Questionnaires on QOL and Rehabilitation outcomes

Assessment of quality of life (QOL) in stroke is becoming a key outcome measure in evaluating treatment intervention. In an evaluation of measures used to assess QOL[6] it was determined that most of the studies about quality of life after strokes have employed generic measures. These scales allow comparisons to be made between patients with different diseases, but are less sensitive when it comes to exploring the specific effects of a particular disease, such as stroke, on the patient's QOL or assessing the response to a certain treatment.

The new disease-specific instruments allow for a qualitative change in the measurement of stroke outcomes and should be considered for use in stroke units. The review conducted by Buck et al outlines some of the more noteworthy specific scales which go some way towards addressing the need for a patient centred, psycho-metrically robust, stroke specific QOL measure.[7]

Some of these scales seem to be more valid and sensitive to changes than the traditional generic instruments. However, very few of these tools specific to stroke outcomes contain components that adequately cover visual perceptual deficits. The lack of awareness of the nature and functional implications of Neurological Vision Impairment often make self reported questionnaires less sensitive to changes following therapy intervention.

Most questionnaires relating to vision focus on ocular intervention for traditional Low Vision programmes, such as the use of optical aids for reading and other ADL’s. These do not adequately reflect changes in functional use of vision following rehabilitation programs directed towards compensatory scanning strategies, where decreased acuity was not the primary issue of concern. To adequately cover the changes associated with vision therapy a combination of QOL measures is required. Suggestions as to a suitable combination of tools that provide content relating to the impact of visual deficits following stroke are outlined below.

The Mayo-Portland Adaptability Inventory (MPAI) was primarily designed to assist in the clinical evaluation of people during the post acute period following acquired brain injury, and to assist in the evaluation of rehabilitation programs designed to serve these people.[8]

Evaluation and rating of each of the areas designated by MPAI-4 items assures that the most frequent sequelae of ABI are considered for rehabilitation planning or other clinical interventions. MPAI-4 items represent the range of physical, cognitive, emotional, behavioural, and social problems that people may encounter after ABI. MPAI-4 items also provide an assessment of major obstacles to community integration which may result directly from ABI as well as features of the social and physical environment.

The National Eye Institute Visual Functioning Questionnaire - 25 (VFQ-25)[9] is recommended as a means of evaluating the change in visual abilities after vision scanning therapy.[8] The use of a patient rated functional vision measure is considered to be a worthwhile adjunct to the MPAI-4 as questions related to the impact of vision deficits are under represented in all measures relating to quality of life relating to ABI, including the MPAI-4.

The VA Low Vision Visual Functioning Questionnaire (VA LV VFQ-48) consists of a list of 48 activities to which participants will assign a difficulty rating. It has demonstrated validity and the ability to be sensitive to change as a result of vision rehabilitation.[10]

5. Other considerations for assessment

Issues of fatigue are unavoidable in the early stages of recovery and lead to significant fluctuations in performance, depending on length of test and fatigue levels on the day. The benefits of obtaining an optimum test result verses the need to determine the person’s ability to functionally carry out activities, often in the presence of significant fatigue, should be considered.

Another consideration in the timing of assessments relates to the impact of spontaneous recovery. The practice of taking measures at six months post incident, in an attempt to negate the influence of spontaneous recovery, may compromise the evaluation of rehabilitation programs, considering that most rehabilitation intervention is completed within this six month period.

Finally, there is a need when using any evaluation tool to ensure that the results are not affected by repeat exposure to the tool as assessments should be repeated at certain points after the intervention has ceased to ensure that any gains made immediately following treatment are maintained.

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