Australian Orthoptic Journal, 1979-80, Vol. 17

VISUAL ASSESSMENT OF CEREBRO-VASCULAR ACCIDENT PATIENTS IN REHABILITATION PROGRAMMES

Ann Macfarlane, D.O.B.A. and E. C. Longhurst, D.O.B.A.

Abstract
The orthoptist's contribution is important in the therapy team's assessment of cerebro-vascular accident patients in rehabilitation programmes.
Visual findings in a series of 316 C.V.A. patients, are discussed.
Therapists show how these findings influence the interpretation of their tests and choice of treatment.

Key words
Cerebro-vascular accident, visual acuity, visual fields, rehabilitation.

The aim in assessing the visual functions in cerebro-vacular accident (C.V.A.) patients is not just to provide a visual acuity reading but also to evaluate the following:–

1) detection of visual field loss,
2) full assessment of ocular movements and muscle balance,
3) assessment of abnormal head posture which may be in the interests of binocular single vision,
4) assessment of stereoscopic vision, and
5) assessment of colour vision.

Knowledge of the state of the patient's visual capacity and resultant feedback is necessary before there can be accurate evaluation and subsequent treatment of sensory and motor disorders.

Ayres states the "execution of an adaptive response is dependent upon continual sensory feedback and adequate integration and interpretation of those sensations."[1] There is convergence of multi-sensory stimuli; these can be visual, auditory, olfactory, somesthetic and vestibular.

Birren states that "visual perception refers to these processes required to sense, interpret and respond to visual information"[2].

Studies with human beings demonstrate the dependence on feedback to perform accurate skilled motor functions. In a study by Smith, Ansell, Sherman and Smith, it was stated that "delaying the visual feedback in neurologically normal individuals resulted in severe disruption of learning and motor performance"[3].

The following are the trends that emerged from the examination of 316 C.V.A. patients at Lidcombe Hospital.

These C.V.A. patients are not a random sample. Patients with very mild C.V.A.'s who recovered spontaneously and those with extremely severe C.V.A.'s who were transferred to nursing homes were not often referred for assessment. Therefore the severity of the C.V.A. in this sample of patients varied between these two limits.

The sample was almost equally divided between males and females. (159 were males and 157 were females).

65% were tested within three months of the C.V.A. Because of this, the site of lesion was frequently unknown as CAT scans or brain scans had not been performed. Where the site of lesion was known, 59% were middle cerebral, 5% were posterior cerebral, 3% were from carotid insufficiency, 12% were vertebro-basilar and 21% were from other lesions.

Five of the basic motor and sensory problems found with C.V.A. patients were:– 1) Hemiplegia, 2) Neglect, 3) Apraxia, 4) Dysarthria and 5) Aphasia.

1) HEMIPLEGIA: "Is a weakness or paralysis affecting one side of the body, most commonly

caused by vascular lesion, tumour or trauma of the contra-lateral hemisphere".

2. NEGLECT: "Disorder ranging from a passive to an active neglect of personal or extra-personal space on the affected side due to the mal-function in the central processing system of the non-dominant parietal lobe.
3) APRAXIA: "The inability to motor plan although the means to execute motion is intact.
   a) Ideomotor Apraxia; May be able to execute the motion automatically, yet not in command.
   b) Ideational Apraxia; Limits the patient further and is unable to execute the act even automatically.
   c) Constructional Apraxia; Is in the inability to copy, draw or construct designs in either 2 or 3 dimensions and thus limits the patient's ability to manipulate his environment effectively.
4) DYSARTHRIA; "Term for a collection of motor speech disorders due to impairment originating in the central or peripheral nervous system. It affects respiration, articulation, ability to use voice and ability to maintain rhythm of speech.
5) APHASIA: "Communication disorder caused by brain damage and characterised by complete or partial impairment of language comprehension, formulation and use; It excludes disorders associated with primary sensory defects, genral mental deterioration, or psychiatric disorders. Partial impairment is often referred to as dysphasia"[4].

49% of patients had communication problems i.e. aphasia, dysarthria, deafness or dementia etc.

The average age of the patients was 67.0 years and as stated in a study by Dr. S. Sarks[5], this would put most patients into an age group having a higher incidence of cataracts, glaucoma, senile macular degeneration and refractive error. Any of these conditions may have the effect of reducing visual acuity.

The Anderson and Palmore survey[6] (1974) found that the proportion of people having V.A"s of 6/6 or better was 56% at age 60; and 14% at age 80. This shows a marked reduction in visual acuity in this age group.

In a survey of a random sample of people over 65 and using a standard of 6/12 (English driving licence standard) and N8, (the smallest print likely to be read) as a base, McWilliam found that only 14% of people did not reach this standard. He states that "with hindsight it would have been better to have chosen stricter standards"[7]. Using the same standards, (6/12 and N8) in the present study it was found that 14% of the patients had 6/18 or worse and 10% had N10 or worse. 4% were common to both groups i.e. had reduced vision for both near and distance. Therefore this is a total of 20% with acuity problems.

The number of patients with glasses totalled 91%, 42% had bifocals, 29% had readers, 4% had distance glasses only, 12% had both readers and distance glasses, 3% had some other form of glasses (e.g. frosted lens or prisms) and in 1% the intended usage of the glasses was unknown.

With aphakic correction the patient copes better when the object of regard is placed directly in front of him, i.e. helping to eliminate the "jack in the box effect". With bifocals, the focal range of the lenses is limited and therefore not practical in all therapy situations.

The method of testing visual acuity in the majority of patients was with the linear Snellens chart. Those unable to use this method were assessed using the following techniques:—

1. Sheridan Gardiner Single Letters	37%
2. Sheridan Gardiner Linear	20%
3. Catford Oliver Drum	24%
4. Snellen's single letters	11%
5. With Numerals	4%
6. Total unassessable	4%

Catford and Oliver[8] state that their test is to be performed at 60 centimetres; however, with the presbyopic patient, the test must be performed within the approximate focal range of the patient's near correction. By a simple mathematical process, the approximate visual acuity can be calculated. Using Snellen's principle, a 6/12 target seen at 3 metres is equivalent to a 6/24 target seen at 6 metres. Therefore with Catford a reduced 6/6 equivalent target is equal to a reduced 6/12 if the test is performed at 30 centimetres instead of 60 centimetres, i.e. at half the recommended distance.

The group with unassessable acuity was surprisingly small considering that many patients fatigued extremely easily or were so affected by receptive aphasia that even simple commands were not understood.

Quite a few patients complained that their glasses were unsatisfactory or that they were unable to read yet they had N5 vision, normal ocular muscle balance, Titmus better than 4/9 circles, convergence closer than 5 centimetres and no field loss. Thus the therapist, aware of no obvious ocular abnormality, could devise treatment appropriately.

The incidence of manifest strabismus in this study was 17% with 60% having latent deviations. The incidence of manifest strabismus in the normal population would be much less than this, however, the higher incidence of strabismus in this study may be related to the incidence of patients with markedly impaired acuity in one eye.

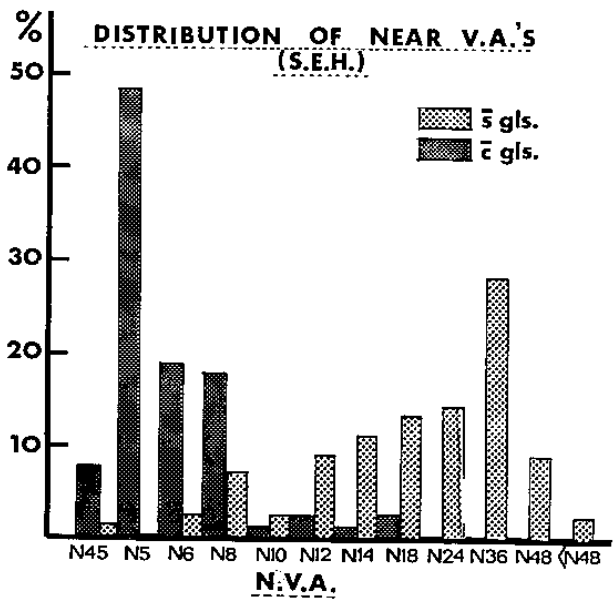
A sample of patients of the same age presenting at Sydney Eye Hospital Casualty Department was studied. The aims were:—

a) To compare the near visual acuity (N.V.A.) with glasses to that without glasses.

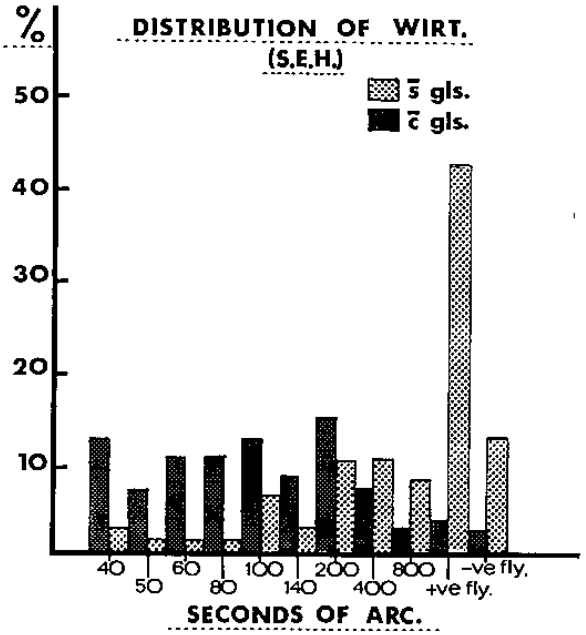
b) To compare the performance of Titmus Stereo-acuity test with glasses to the performance of the same test without glasses.

In 97% of cases, near visual acuity with glasses was better than without (see Graph I). In 87% of cases stereo-acuity was better with glasses than without (see Graph II). The maximal near visual acuity reduction was N5 to less than N48 and the maximal reduction of stereo-acuity was from 60 seconds of arc to zero appreciation. Whereas 92% could read N10 or better with glasses, only 15% could do so without glasses.

GRAPH I



GRAPH II



It is essential to understand this relationship as it stresses the importance of the correct use of glasses by the patient for fine motor tasks, remembering that 84% of patients have near correction.

21% of the total group or 29% of those accurately assessable have noticeable visual field defects. It should be noted that in many patients with dramatic aphasic and apraxic problems the site of the lesion is in an area involving the optic radiations. Hence one would expect that if the visual fields of every patient could be accurately assessed, the percentage with field loss would probably be higher.

Routine testing often gives indications that a field loss may be present, such as when the patient loses one side of the visual acuity chart, misses the first few words in near visual acuity testing, sees only one number of the two digit number as presented in the Ishihara colour test or seeing only one wing raised in the Wirt Titmus Fly Test.

The patient's subjective responses, (complaining of missing toast or dessert on their trays, etc;) may also give an indication of field loss. Sometimes the patients symptoms are wrongly attributed to other causes.

Case Histories

1. Mr. S.C. a 65 year old male was admitted with a second right C.V.A. with resultant left hemiplegia. His ocular complaints were that his "glasses were useless" and that he "had stopped reading". Because of the left homonymous hemianopia from his initial C.V.A., he had been referred to a low vision clinic where he was assessed as having R6/60 and L6/36 vision and subsequently prescribed a +8.00 dioptre sphere in the right eye and a frosted plano lens for the left eye, the +8.00 D.S. to be used as a magnifying device. Upon accurate assessment his corrected acuity was actually R6/6 and L6/9.

Obviously his hemianopic loss gave the effect of

dramatically reduced visual acuity and he had been treated for such. The assessor did not realise the effect of the hemianopia on acuity assessment and/or it was not understood that hemianopic loss affects both eyes not just the left eye.

2. Mr. A. H. a 58 year old male presented with a left C.V.A. He also had a history of a superior temporal retinal vein occlusion in the left eye. His left visual acuity was counting fingers at one metre. His right visual acuity was 6/6, when tested by the Sheridan Gardiner method of matching letters. He had a marked right temporal field loss with little or no macular sparing. His C.V.A. had caused him to have alexia without agraphia, that is he could write letters or numbers but was unable to interpret them although he had written them himself. As Sorsby[9] states, most of these patients are initially diagnosed as having extremely poor visual acuity due to their inability to interpret what they see on the vision chart. His lesion was in the posterior parietal region separating his visual cortex on the right hemisphere from his speech areas in the left hemisphere in what is known as a posterior disconnection syndrome, so that the conventional methods of acuity testing would have given inaccurate readings.

CONCLUSION

In the future, more attempt must be made to stress the link between the visual needs of therapy and the visual capacity of the patients.

This could be done in part, by encouraging further inter-therapy liaison at a student level.

Therapists, on the whole are not often aware of the effects or management of general ocular conditions, (which may result in reduced acuity or field loss), or the difficulties that the use of aphakic lenses, bifocals or trifocals etc. may present.

The patient, their relatives and the medical personnel involved must be made aware that when dealing with homonymous field losses (i.e. Post chiasmal lesions), the defect is associated with both eyes and not just the eye on the patient's affected side.

Loughhead and Priest[10] related vision to everyday situations by reducing visual acuity by means of filters. Further studies of this type are needed, with tables relating tasks to varying degrees of visual impairment.

Much of that which applies to the assessment of C.V.A. patients, will apply equally well to patients with head injuries or neurological diseases needing assessment for rehabilitation.

Acknowledgement

Many thanks go to Drs. J. & S. Sarks, Dr. Carter, the staff of Lidcombe Hospital and especially the therapists for all their help in this project.

THE CONTRIBUTION OF VISUAL ASSESSMENT TO THE REMEDIAL THERAPIES

PHYSIOTHERAPY

The physiotherapist, concentrates on the physical rehabilitation of the stroke patient. The main aims are to retrain sensation of normal movement, balance reactions in various positions, symmetry, eye/hand co-ordination, normal posture reflexes, selective movement patterns, and concentration etc.

To retrain or treat a patient effectively, the physiotherapist should be aware of the part vision plays. Not only is it important to understand the visual deficits encountered by the hemiplegic patient, but also to note whether, prior to the stroke, the patient had some ocular condition or visual problems.

For example, if a patient has cataracts, it is important to know that he may have some impairment of vision, so that in his rehabilitation, it might be more appropriate to use verbal cues rather than visual ones.

If a patient needed bifocals previously, he may need to wear them during therapy. The therapist should be aware of the exact function of the particular glasses, so that therapy can be carried out effectively.

The hemiplegic patient may be left with several visual deficits resulting from the stroke. The therapists assessment of vision is only very basic and at times, inadequate, so the patient should be referred for full investigation and verification of their ocular deficits where this is possible. Once the problem is known the physiotherapist can plan treatment accordingly.

One of the most common visual disturbances is hemianopia. The patient with homonymous hem-

ianopia can, in theory, be retrained to compensate successfully for his lack of vision by turning his head to the affected side, provided that there are no other intellectual and/or perceptual problems.

The furniture and the patient's position in the ward are so arranged as to facilitate and stimulate attention to the affected side.

The patient who experiences a disruption in binocular vision may have difficulties at certain distances. Therefore, one must try to work within his range or, perhaps on the orthoptist's advice, use some other adaption such as an eye patch so that treatment can be carried out effectively.

The patient who positions his head abnormally, may need to do so in the interest of maintaining binocular single vision or for the compensation of field loss. This means that body symmetry is disrupted. It creates difficulty with balance retraining, gait and normal everyday functions. Realizing that whilst the ocular problem persists the patients abnormal head posture must be maintained, it is necessary to have the visual problem rectified if possible, so that therapy can be more effective.

Therefore, visual information is important to the assessment and treatment of a patient. Only if the physiotherapist is aware of the visual deficits which a C.V.A. patient can face, will the retraining programmes be maximally effective.

R. La Spina B.Sc. (Grad. Dip. Phys.)

OCCUPATIONAL THERAPY

Visual assessment is an essential prerequisite for the O.T. assessment, in order to determine an accurate level of remaining function. The O.T. must be aware not only of visual disturbances associated with C.V.A.'s, but also those related to the ageing process.

This information is relevant to O.T. assessments of perception, function, appropriate retraining and also to apparent behavioural problems.

a) *Assessment of Perception* (The assessment of the patients remaining parietal lobe function, i.e. their ability to manipulate themselves and their environment for normal functioning, including body image, spatial awareness, visual agnosia, apraxia and neglect).

The following are some areas where our tests could be affected by visual disturbances.

1) With neglect it is essential to know if it is associated with hemianopia, as a patient with true neglect will not learn as readily to compensate, as does a patient with only an homonymous hemianopia.

2) Impairment of depth perception will affect results on some constructional apraxia tests, especially when done in three dimensions, e.g. block construction tests.

3) Hemianopia and/or reduced visual acuity will affect the layout and size of test material, e.g. in a formboard test, results could be misleading if material was placed in the area of the patient's field loss.

4) Diminished colour recognition will influence outcome on any test involving colour discrimination.

b) *Assessment of Function* (i.e. The evaluation of the patient's ability to perform selfcare, recreational and vocational tasks.)

Visual disturbances will affect recognition of and handling small items in:

1) Self-care skills e.g. buttons and zippers in dressing.

2) Domestic skills e.g. switches and dials on stoves and household equipment.

3) Work skills e.g. writing, reading and handling equipment.

Distance vision is necessary for some work skills and transport training, e.g. Reading bus numbers and the more advanced skill of driving.

The patient may present without problems in a well lit therapy room, but due to lens changes, may perform badly in poorer lighting. It is important to note this in home visits, as the lighting conditions in some homes can be appalling.

c) *Retraining:* The O.T. must know visual compensatory procedures as suggested by the orthoptist, e.g. Abnormal head postures, as this will influence the posture and positioning of the patient and materials and the distance and angle at which a patient can work at a given task.

d) *Behavioural manifestations:* Some of these can be attributed to a variety of untreated visual disturbances. This is especially relevent with suspected senile dementia and confusion. An obvious example was a patient labelled confused, due to her disorientation on the ward. On visual examination she was found to be partially blind.

Thus, occupational therapy assessment and retraining would be more significant if given specific visual information for each patient presenting with neurological deficit associated with cerebro-vascular accident.

B. Bates B.Sc. (Grad. Dip. O.T.)

SPEECH PATHOLOGY

The speech pathologist working with neurological impairment is involved in the assessment

and management of 'language' impairment due to aphasia or to the disturbance of speech associated with the muscular weakness resulting from impairment to the cranial nerves associated withspeech. The respective terms "aphasia" and "dysarthria" have already been described.

For the purpose of this paper, 'language' is defined as the way we receive information (auditorily and visually), and produce it (by speech, gesture and writing) so that we can organise and interact effectively with our environment.

Both formal and informal test measures are used, which include:

a) Pictures of individual objects, a specific activity or series of activities which a patient may be requested to identify, name or describe.
b) Single words, sentences or paragraphs in varying sizes of print. Patient may be asked to read, re-phrase and/or answer questions about what he/she has read.
c) A set of common objects with which a patient has to carry out simple commands.
d) Figures for simple and complex calculations.

From these and other tests results, the speech pathologist will make decisions as to the patient's level of comprehension of auditory and written material and of his ability to organise and produce speech. It is therefore critical that the speech pathologist be aware of relevent information regarding the patient's visual status.

Similar principles apply to the therapy situation where a patient often has to work with "visually loaded" materials to compensate for his auditory deficits.

Retraining in dysarthria is also often dependent on relatively intact vision, as the patient may need to make use of diagrams, written material, visual display units, or follow a model produced by a therapist to monitor his speech behaviour.

A. Deane B. App. Sc.(Speech Therapy)

REFERENCES

1. AYRES, J. Sensory Intergration and Learning Disorders. Western Psychological Services. Los Angeles. 1973. 2:32
2. BIRREN, J. E. Handbook of The Psychology of Aging. Van Nostrand Reinhold Company. New York. 1977. 2:497-532
3. SMITH, K. U., ANSELL, SHERMAN and SMITH, W. M. "Sensory Feedback Analysis in Medical Research". Am. J. Phys. Med. 42, p.228-262. 1963. 42:228-262
4. From NICOLOSI, L., HARRYMAN, E. and KRESHEK, J. (1978) Terminology of Communication Disorders, Speech, Language and Hearing. Williams and Wilkins. 1978
5. SARKS, S. "Vision in the Elderly". Health Bulletin (EDB) 1978. 2:36
6. ANDERSON, B. and PALMORE, E. "Longitudinal evaluation of ocular function". In E. Palmore (Ed.) Normal Aging, Ed. Palmore E. Durham, North Carolina. 1974. 24-32. Duke Univ. Press
7. McWILLIAM, R. J. "Ophthalmological results of a geriatric assessment survey". Transactions of the Ophthal. Soc. of the U.K. 1975. 95:71-73
8. CAFFORD, G. V. and OLIVER, D. "A method of V.A. detection". Proceedings of the 2nd International Orthoptic Congress, Amsterdam; Excerpta Medica 1972 p. 183
9. SORSBY, A. Modern Ophthalmology. Butterworths. London. 1972. 3:362
10. LOUGHHEAD, J. and PRIEST, L. "An Evaluation of Visual Acuity Levels". 1979. Aust. Orth. J. Vol. 17