

Guest editorial

The great majority of optometric clinical encounters primarily involve the external and internal eye, and the pathway from the retina to the occipital lobes. Indeed, these structures are the most thoroughly covered in the optometric curriculum, and it is appropriate. However, this emphasis can do a disservice to an appreciation of the total visual process, because in the journey from cornea to occipital there is relatively little processing of information. Rather, the major accomplishment is a separation of information so that data from the left world is transported to the right brain, and vice-versa. Higher level processing truly begins within the occipital areas, and increases in what has been termed 'the extended visual pathway' [1]. In general, the parvocellular channel (which specializes in high spatial frequency information) is conducted from the occipital to the inferior temporal region, where visual recognition occurs. The magnocellular channel (which specializes in low and middle spatial frequency information) proceeds from the occipital to receive data on motion and orientation of environmental objects from the more superior temporal areas. It then flows to the posterior parietal cortex, which is sensitive to the spatial relations of objects within the visual field. This area has connections to the frontal eye fields, which are involved in the initiation of voluntary pursuit and saccadic eye movement [2].

Admittedly, the above is a very abbreviated outline of a single aspect of a complex process. Nevertheless, it shows that all of the cerebrum is involved in even the simplest of visual tasks. The articles on the brain in this issue, when taken together, superbly emphasize this concept. It also explains the vulnerability of the physical and functional aspects of vision when a person sustains trauma to the head.

The term 'acquired brain injury' (ABI) has come to encompass those conditions that appear suddenly and result in a neurological deficit or deficits [3]. There are two major precipitating conditions for ABI. The first results from an external insult to the brain, such as caused by auto accidents, gun shot wounds and industrial accidents, and these constitute Traumatic Brain Injury (TBI). The second category includes conditions resulting from an internal insult to the brain.

Here, the most common scenario is a vascular incident, such as ischemic or hemorrhagic stroke, but arterio-venous malformations, and sequelae of brain surgery are also included. And whatever the etiology, clinical experience and an increasing literature give evidence that some type of ocular and/or visual dysfunction results [4-6]. These sequelae are most often not fully addressed during the acute medical care phase of treatment, where the goal is to keep the patient alive. However, as the patient enters either the in- or out-patient rehabilitation phase, failure to fully diagnose and treat the ocular and visual problems can severely hamper the treatment regimens particularly of the physiatrist, occupational, physical and speech therapists, and psychologists. Indeed, it is these rehabilitation professionals who are increasingly calling on optometrists to provide care for ABI patients.

It is not surprising that this has occurred. Optometry has always been concerned with rehabilitation, as evidenced by a long history in providing leadership, research and care in the areas of low vision and vision therapy. But our expertise, sensitivity and willingness to offer other services is particularly important to the ABI population. Providing the refractive correction in the particular frame, lens type and design that takes into account all of the sequelae of ABI can often dramatically affect the patient's general functioning. For example, substituting separate distance and near glasses for progressive addition lenses can significantly minimize vertigo in the patient who has suffered damage to the vestibular system. Fully correcting the hyperopia in a pre-presbyopic patient who has incurred damage to cranial nerve III, and proactively treating the resulting flawed near point relationship of accommodation and convergence can often contribute to success in the patient's rehabilitation program which includes computer and paper and pencil tasks. Being aware that hypersensitivity to light has been shown to be a characteristic of some ABI individuals [7], providing absorptive lenses can reduce a variety of complaints and increase contrast sensitivity and near point efficiency in these patients [8].

The documentation that impaired fixation, pursuit

and saccades are sequelae of ABI has been previously summarized [9]. These can impede the individual's reading ability and have devastating effects on many activities of daily living; for example, the inability to accurately follow an approaching vehicle when crossing a street can result in further injury. There is objective evidence that these functions can be improved by vision therapy in post-trauma periods that are beyond the normal healing process [9,10]. And patients with ABI are prone to an interruption of binocular vision, resulting in constant or intermittent diplopia [4-6]. Clinical experience, along with a growing literature, indicates that amelioration is possible with vision therapy and/or the use of compensatory prism [3,9,11-13].

It has been well established that visual field defects are a consequence of ABI [14,15]. While virtually any category of compromise can occur, the most common are homonymous hemianopias or quadrantanopias. Failure to fully diagnose and manage these defects can have severe consequences for the patient, not only in terms of the rehabilitation program, but also in the patient's inability to safely navigate any environment. However, the determination of these defects is complicated because of the existence of visual neglect (also known as visual spatial hemi-imperception) which occurs in some ABI patients. In this condition, the individual is unaware of the field loss, and usual static or kinetic perimetric testing may or may not document the impairment. The clinical entity of 'extinction' accounts for this situation [3,15]. Consequently, the precise determination of these visual field defects is not simple, and specialized testing via paper and pencil tasks [16] or computer based programs [3,15] is necessary. Whether the patient is aware or unaware of the field loss, there are a number of strategies available. These range from behavioral methods [17-19] to the use of partial or ground-in yoked prism that move a portion of the affected field into the patient's intact field of vision [3,15,20].

Clinical experience has shown that this population is vulnerable to ocular pathologies. This can be accounted for because those who sustain stroke are more apt to have diabetes, hypertension and glaucoma. Furthermore, many ABI patients suffer from the dry eye syndrome with accompanying blepharitis. This can be caused by generally poor health, or be side effects of medications that are commonly prescribed to these patients, such as antidepressants, tranquilizers, and antihypertensive agents. When left undiagnosed and untreated the individual will often complain of blurred and/or double vision which can seriously impede all aspects of the rehabilitation process.

Supplying optimal ocular and visual care to these patients is quite demanding. The provider must ap-

preciate the social, economic and psychological effects that occurred suddenly to the patient. Not only has the patient been thrust into new and different roles as worker, parent, friend and spouse, but he or she is forced to contend with being a stranger to one's self [21]. And the optometrist must be prepared to use all the knowledge and skill that her education offered. As is evident from above, more than a superficial understanding and application of the anatomy, neurology and physiology of the ocular and visual systems, optics, visual therapy and pharmacology are required. The optometrist must be prepared to develop and maintain expertise in the language, culture, economics and politics of rehabilitation, to become a member of a vital team.

While the challenge is great, a major reward is that this area of care is a carve-out that is ours for the taking because of our uniqueness as the only health care professionals who can provide the wide range of ocular and visual care that the survivors of ABI need and deserve. It is truly primary optometric care at its finest.

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