

## Optometry

## Optometry's role increases in identifying, treating concussion

Primary Care Optometry News, April 2014

Visual pathways alone account for more than 50% of the brain's pathways and, therefore, are commonly affected in concussion, according to **Steve Devick, OD**, cofounder and CEO of King-Devick test.

A SECO panel presentation on head injury with facilitator **Richard Laudon, OD; Carl Hillier, OD, FCOVD; Neal McGrath, PhD**, and Devick also addressed how the expanding coverage of sports-related concussion together with the availability of vision-based concussion screening tools and treatments have highlighted optometry's presence in this area.

"A new awareness of the role of vision in the mild traumatic brain injury (mTBI) patient has created a significant increase in office visits and referrals to our optometric practices," the doctors said in their presentation. "MTBI is associated with numerous deleterious changes affecting the visual system. Dysfunctions of the oculomotor and binocular vision systems are some of the most widely reported visual problems in individuals with mTBI."



Robert Fox, OD, FCOVD, performs a cover test to evaluate the binocular status of according to the CDC. concussion patient.

Images: Fox R

these are mTBIs that are not treated in a hospital or emergency department."



"These are injuries that can be caused by either direct or indirect forces," McGrath, a clinical neuropsychologist, said in the SECO presentation. "A person doesn't even have to be hit directly in the head. If you're hit hard in enough in the body, causing whiplash – and we know about that from not only auto accidents, but sports as well –

### Brain injury basics

The U.S. Centers for Disease Control and Prevention defines a mild traumatic brain injury as "a complex pathophysiologic process affecting the brain, induced by traumatic biomechanical forces secondary to direct or indirect forces to the head. MTBI is caused by a blow or jolt to the head that disrupts the function of the brain. The term mTBI is used interchangeably with the term concussion.

"An estimated 75% to 90% of the 1.4 million traumatic brain injury (TBI)-related emergency department visits, hospitalizations and deaths that occur each year are concussions or other forms of mTBI,"

"Approximately 1.6 to 3.8 million sports- and recreation-related TBIs occur in the U.S. each year," the organization reported. "Most of



that can cause concussion.”

#### Neal McGrath **Increased awareness**

Awareness regarding mTBI and its long-term effects have been increasing largely due to media reporting on blast-exposed war veterans, superstar professional athletes and even youth athletes, according to the SECO presentation.

Since 2007, athletes from different disciplines and of different ages have had their brains examined after their deaths, according to the Boston University Chronic Traumatic Encephalopathy Center. The list includes 50-year-old Dave Duerson and 28-year-old Derek Boogaard, from the National Football League and the National Hockey League, respectively. However, the list also includes 36-year-old Ryan Freel of Major League Baseball, and 17-year-old Nathan Stiles, a football player in his senior year of high school.

All of these athletes were diagnosed postmortem with chronic traumatic encephalopathy (CTE), “a progressive degenerative disease of the brain found in athletes (and others) with a history of repetitive brain trauma, including symptomatic concussions as well as asymptomatic subconcussive hits to the head,” according to the center. All of these athletes received a significant amount of press, through outlets such as ESPN and the *New York Times*.

#### **Visual signs, symptoms, impairments**

As detailed in a number of studies, mTBI patients can experience a wide range of symptoms, both short- and long-term, following the concussive event. Some of the impairments include: blurred vision, eye strain, reading issues, diplopia, peripheral vision restrictions, color deficits, increased sensitivity to light, loss of balance, dizziness, headaches, lessened coordination, confusion, memory issues and trouble concentrating.





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"Patients that have an acquired brain injury often suffer from oculomotor dysfunction," *Primary Care Optometry News* Editorial Board member **Scott Edmonds, OD, FAAO**, said in an interview. "Three basic eye movement systems can be impaired by these injuries. The most common system to be impaired is accommodation. The second system is vergence, often manifesting as convergence insufficiency. As objects get close to people with brain injury, they start to experience double vision.

"The third system that is impaired is the version system, including both saccadic eye movements and smooth pursuits," he continued. "Saccadic eye movements are affected in a broad range of traumas. More profound injury may cause damage to critical smooth pursuit eye movements. Patients can have varying levels of impairment of any of those eye movement systems, as well as diplopia, field defects, contrast and acuity."

Edmonds is co-director of the Low Vision/Contact Lens Service at Wills Eye Institute and in a joint venture with Salus University as one of the staff optometrists at Magee Rehabilitation Hospital, both in Philadelphia. His clinical experience involves treating a broad spectrum of head injuries.

These visual impairments translate into difficulties in patients' activities of daily living and quality of life.

"Day to day, these patients have problems with their daily activities, such as getting dressed, reading and even driving, because they have problems in terms of navigation," **Carl Garbus, OD, FAAO**, president of the Neuro Optometric Rehabilitation Association, explained in an interview. "Oftentimes, they'll bump into things, as they're not seeing things on one side or the other. Many patients can't go to work or, they're in school, but they can't concentrate or get their work done."

### Identification, evaluation, management

Despite evidence otherwise, studies have shown that ocular impairments are sometimes overlooked in brain injury treatment in favor of physical and cognitive deficits.



"When the patient's eyes look straight and they are not complaining that something is wrong with their eyes, it's not obvious," **Ida Chung, OD, FCOVD**, president of the College of Optometrists in Vision Development, told PCON.

"And when there are no obvious signs, a condition can be underdiagnosed."

The guidelines on how optometrists deal with the management of brain injury do not include a timetable, and some doctors disagree on when to intervene.

Ida Chung

"It's really nice to see them sooner, so that we can start delivering care quicker and help speed up the recovery process," **Robert Fox, OD, FCOVD**, told PCON.

"What I have learned is that you have to give patients at least 3 weeks before you're going to do anything," Laudon said. "But it's going to be on a case-by-case basis."

"Rest, from a physical to cognitive perspective, is a standard recommendation and an important step in the recovery process," he continued. "The question is: How much rest?"

According to Devick, after 3 weeks of cognitive and physical rest, vestibular and oculomotor therapy should begin to kick-start neuroplasticity and improve recovery.

Optometrists who are affiliated with hospitals or rehabilitation centers, like Edmonds or Garbus, can see patients just weeks after their injury. However, optometrists often will not see injured patients for months or years – and, in some cases, patients have been living with vision dysfunctions since they were injured and have resorted to optometry only after they grew frustrated with other therapies.

"It can vary quite a bit," Garbus said. "If we're seeing them in a hospital setting, we're seeing them within weeks or within days, but that's not the majority. The majority of optometrists are seeing patients in their private practice, probably 3 to 6 months out. Sometimes it's 2 years out because the patient never got to see an optometrist, and no one knew to refer that patient to an optometrist in time, and the problems lingered on."

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The doctors are in greater agreement regarding the type of evaluation necessary.

"Because of the high prevalence of subjective visual complaints and oculomotor dysfunctions in TBI patients in various studies, a comprehensive vision evaluation should be conducted after brain injury, regardless of injury type or severity," Laudon said in the SECO presentation.

According to Laudon, the eye exam should include more than acuity and eye health and probe areas of binocularity, accommodation and ocular motilities.

"Evaluation is done with traditional, old-fashioned equipment," Edmonds told PCON. "The doctor has to learn how the patient's eyes are moving in response to certain tests."

Laudon uses clinical probes such as a penlight or red glass technique to determine a near point of convergence, stereopsis, accommodative facility as well as eye movement tests such as the King-Devick Test and the Developmental Eye Movement Test. Although the latter two eye movement tests are similar, according to Laudon, only the King-Devick has been validated in the assessment of an mTBI.



Richard Laudon

Medical imaging techniques such as CT and MRI scans are not necessarily helpful in diagnosing or tracking the recovery of brain injuries, according to several sources.

"This disturbance of brain function is typically associated with normal structural neuroimaging findings (i.e., CT scan, MRI)," the CDC reported in an education resource for physicians. "Mild TBI results in a constellation of physical, cognitive, emotional and/or sleep-related symptoms and may or may not involve a loss of consciousness."

"People rush to have their kids scanned, and most of those scans are not showing anything," Laudon told PCON. "Putting people through scans is not always beneficial and sometimes has negative consequences, as you could be scrambling brains instead of providing information. It doesn't mean you rule it out, but there's a natural tendency to want a scan."

### Treating brain injuries

In treating brain injuries, optometrists are working with other doctors and therapists to make up a multifaceted and comprehensive approach.

"This is what's unique about optometry rehabilitation – we're a member of a multidisciplinary approach, so we're involved in the total care of the patient," Garbus explained. "We coordinate care with other professionals, such as occupational therapists, speech therapists, physical therapists and neurologists."

While rest is typically initially prescribed, various therapies using specific technologies exist to address prolonged ocular dysfunctions including everything from prisms to touch screens to Nintendo's Wii video game console.



"One of the big areas in terms of therapy is prisms," Garbus said. "Different types of prisms are used for measuring eye deviation and evaluating posture and head position. When you put a prism in front of a patient, it can affect how they see the world – the way the floor or the walls are oriented, as well as balance, posture and eye alignment."

In his practice, Hillier, clinical director at the San Diego Center for Vision Care, uses simple treatments such as sunglasses and hats as well as compensatory prisms, vision therapies, walking boards, referencing mirrors and other environment modifications.

"There is a piece of equipment in visual integration therapy that uses a computer and the Wii system," Chung said. "It monitors a patient's balance while they engage in a visual task, which is part of therapy for someone who may have vestibular balance issues."

Difficulties exist, Laudon cautioned, on both sides of treatment. According to a study in *Neurosurgery*, discussed by McGrath at SECO (Collins et al.), while 80% of patients were recovered by 3 weeks, the other 20% experienced a slower recovery lasting 2 additional weeks or even longer.

Such persisting symptoms can be challenging and even disabling in school, work or everyday life activities, McGrath said. He emphasized the importance of further evaluations and interventions if symptoms do not clear with rest alone.



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This patient is wearing prisms to create a mismatch between her visual and tactile inputs while performing a complex eye-hand vision therapy activity.

"Many patients have been seen by a number of doctors or clinicians and have been frustrated by their persistent visual difficulties," Laudon said. "Many have other medical problems beyond their eye problems and are overwhelmed by their problems and their therapies."

Patients who go without treatment, either by ignoring their diagnosis or going without one altogether, face additional injuries. According to Garbus, patients who suffer a brain injury are more likely to suffer another.

In general, Devick said, brain injured people are "very vulnerable." According to a statistic from the journal *Neurosurgery*, already-concussed athletes are four times more likely to sustain subsequent concussions within 7 to 10 days.

"I'm seeing more and more children and young adults who have had two or three concussions over the course of a year or 2," Fox said. "Patients seem to bounce back slower from each successive injury. After the first one, they may have just been out a week or 2, maybe missed sports for a few weeks, but after a second or a third concussion they may still be suffering from symptoms a year out."

Patients can sometimes suffer from post-concussion syndrome and experience prolonged symptoms that last for weeks, months and sometimes years, according to the Mayo Clinic.

### Optometry's future in brain injuries

Aside from the increasing role that optometrists may see in the evaluation, treatment and management of brain injuries, there is also the task of prevention.

"Optometrists' role with the brain-injured population is growing," Chung said. "As the demand for optometric vision rehabilitation of brain-injured patients increases, the need for trained optometrists to meet this demand rises. I anticipate we will see more research in the area of prevention of brain injury secondary to trauma or other causes, including the role optometrists play in prevention of falls, one of the largest contributors to traumatic brain injury in seniors."

"It's something we should do more," Fox admitted. "We should be talking to our patients about the use of helmets and protective gear in contact sports or other physical activities such as skiing or skateboarding."



Reducing exposure and hits can help reduce the amount of concussions, according to Devick, who reported that 75% of head trauma occurs during practice. Devick also acknowledged that athletes, coaches, teachers, medical personnel and parents all need to be educated and involved in prevention as well as management.

As mTBIs and concussions receive continued attention in general and within the scope of optometry, Garbus is confident that schools will offer additional training.

Robert Fox

"It is probably already starting," he told PCON. "The actual training programs that optometry schools offer at this time is limited. Evaluation of mild traumatic brain injuries requires knowledge in neurology, binocular vision and functional vision."

"The role of optometrists in the area of concussions and brain trauma is changing as we speak," Fox said. "More and more rehabilitation centers are already utilizing our services. Hopefully in the near future, calling in an optometrist to evaluate a concussion patient's functional vision needs will become as routine as having an occupational or physical therapist be part of the evaluation process." – *by Chelsea Frajerman*

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#### For more information:

**Ida Chung, OD, FCOVD**, can be reached at [ichungcovid@gmail.com](mailto:ichungcovid@gmail.com).

**Steve Devick, OD**, can be reached at (630) 501-0288; [sdevick@kingdevicktest.com](mailto:sdevick@kingdevicktest.com).

**Scott Edmonds, OD, FFAO**, can be reached at (484) 326-9017; [scottaed@aol.com](mailto:scottaed@aol.com).

**Robert Fox, OD, FCOVD**, can be reached at [rfoxod@juno.com](mailto:rfoxod@juno.com).

**Carl Garbus, OD, FFAO**, can be reached at (661) 775-1860; [cgarbusod@gmail.com](mailto:cgarbusod@gmail.com).

**Carl Hillier, OD, FCOVD**, can be reached at (619) 464-7713; [vtherapy@pacbell.net](mailto:vtherapy@pacbell.net).

**Richard Laudon, OD**, can be reached at [laudonr@neco.edu](mailto:laudonr@neco.edu).

**Neal McGrath, PhD**, can be reached at (617) 959-1010; [dr.neal@NeuropsychNewEngland.com](mailto:dr.neal@NeuropsychNewEngland.com).



**Disclosures:** Devick is the cofounder and CEO of King-Devick Test, LLC. McGrath is a consultant for ImPACT Applications Inc., a company that developed a computerized concussion evaluation system. Chung, Edmonds, Fox, Garbus, Hillier and Laudon have no relevant financial interests.

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