TRAUMATIC BRAIN INJURY: PROOF OF THE INVISIBLE*

Douglas K. SheffThe Sheff Law Offices
Daniel Webster Suite
10 Tremont St., 7th Floor
Boston, MA 02108
(617) 227-7000
dsheff@shefflaw.com

One out of every 500 Americans suffers from traumatic brain injury (TBI) every year. Any attorney evaluating this type of case is regularly faced with a major problem of proof. Unlike a broken bone or a herniated disc, most brain damage is invisible. The following is intended to address the invisible nature of TBI injuries.

Not long ago TBI cases were considered either difficult or impossible to prove and, therefore, inactionable. Along with the advent of objective technological testing, such as CT scan and MRI, came the ability of trial lawyers to demonstrate damages in brain injury cases, often resulting in large verdicts or settlements.

But only 10 to 15 percent of traumatic brain injury is detectable through traditional CT scan and MRI, providing a huge obstacle in more than 85 percent of these cases. Furthermore, most visible TBI is associated with congenital or organic conditions, such as brain tumors or leaking aneurysms.

Those who would attempt to "prove the invisible" must begin by understanding the etiology of TBI and the means by which it can be illustrated in a manner that is both admissible and persuasive.

The problem is that most TBI occurs on a microscopic level. During trauma, the brain, ordinarily bathed and protected in cerebral spinal fluid, undergoes a "shearing" phenomenon when caused to impact with rough portions of the skull, damaging or destroying millions of brain cells in an instant.

As depicted in attachment 1, these cells are particularly fragile as they are long and thin, they tend to stretch or even snap at the "axon" structure of the cell, thereby causing the brain to suffer "diffuse axonal shearing": The victim is said to suffer "mild to moderate TBI."

The terms "mild" or "moderate" refer to the degree and length of loss of consciousness reported, and not the severity of damage to function. It is critical that a trial expert explain this terminology to the jury at trial, or counsel risks the jury believing that his or her expert feels that the plaintiff's injuries were "mild" in nature. Mild TBI can have severe consequences, and may result in permanent and total disability.

Any violent movement of the skull may produce this shearing effect. Direct impact to the head is not necessary, as in the case of an automobile accident where one's head is thrown forward or backward with great force, without making direct contact with any object. This type of injury is often referred to as an "acceleration/deceleration" injury.

This may be one reason why 60 percent of TBI occurs during motor vehicle accidents. These

sorts of cases are extremely difficult. With no evidence of impact with a window or windshield, no evidence of loss of consciousness, not even a bruise or bump on the head, neither the medical nor the legal community is traditionally equipped to demonstrate traumatic brain injury.

In some cases, negative traditional CT or MRI results can be used to *support* the plaintiff's case, especially where causation is in issue. As these tests identify congenital defects, tumors and other abnormalities that are not commonly associated with a traumatic incident, the defense expert will have to concede that negative CT or MRI results demonstrate that no such unrelated problems affected the plaintiff prior to the subject trauma.

TBI is sometimes not an obvious injury. Often it is family or even counsel who first initiates a diagnosis for a TBI victim. Where counsel is the first to suspect TBI, he or she has a unique responsibility. His or her first job is to look for signs and symptoms in the medical records such as loss of consciousness, nausea or headaches.

Next, the attorney must look for behavioral changes, sometimes subtle, in the client's daily life. The attorney must be prepared to spend significant time with family, friends, teachers, co-workers, etc. These changes may correspond to particular areas of the brain in a pattern or proportion that may lend significant support to your case.

Attachment 2 shows the various "lobes" of the brain, and the following describes how impaired function can be traced to each specific lobe:

Frontal Lobe/Observed Problems

- Loss of simple movement of various body parts (paralysis);
- Inability to plan a sequence of complex movements needed to complete multi-stepped tasks, such as making coffee (sequencing);
- Loss of spontaneity in interacting with others;
- Loss of flexibility in thinking;
- Persistence of a single thought (preservation);
- Inability to focus on task (attending);
- Mood changes (emotionally labile);
- Changes in social behavior;
- Changes in personality;
- Difficulty with problem solving;
- Inability to express language (Broca's Aphasia).

Parietal Lobe/Observed Problems

- Inability to attend to more than one object at a time;

- Inability to name an object (anomia);
- Inability to locate the words for writing (agraphia);
- Problems with reading (alexia);
- Difficulty with drawing objects;
- Difficulty in distinguishing left from right;
- Difficulty with doing mathematics (dyscalculia);
- Lack of awareness of certain body parts and/or surroundings space (apraxia);
- Inability to focus visual attention;
- Difficulty with eye and hand coordination.

Occipital Lobe:/Observed Problems

- Defects in vision (visual field cuts);
- Difficulty with locating objects in environment;
- Difficulty with identifying colors (color agnosia);
- Production of hallucinations;
- Visual illusions—inaccurately seeing objects;
- Word blindness—inability to recognize words;
- Difficulty in recognizing drawn objects;
- Inability to recognize the movement of an object (movement agnosia);
- Difficulty with reading and writing.

Temporal Lobe/Observed Problems

- Difficulty in recognizing faces (prosopagnosia);
- Difficulty in understanding spoken words (Wernicke's aphasia);
- Disturbance with selective attention to what we see and hear;
- Difficulty with identification of, and verbalization about objects;
- Short-term memory loss;
- Interference with long-term memory;
- Increased or decreased interest in sexual behavior;
- Inability to categorize objects (categorization);
- Right lobe damage can cause persistent talking;
- Increased aggressive behavior.

Brain Stem/Observed Problems

- Decreased vital capacity in breathing, important for speech;
- Swallowing food and water (dysphagia);
- Difficulty with organization/perception of the environment;
- Problems with balance and movement;
- Dizziness and nausea (vertigo);
- Sleeping difficulties (insomnia, sleep apnea).

Cerebellum/Observed Problems

- Loss of ability to coordinate fine movements;
- Loss of ability to walk;
- Inability to reach out and grab objects;
- Tremors;
- Dizziness (vertigo);
- Slurred speech (scanning speech);
- Inability to make rapid movements.

Recently "PET Scans" have made their way into the courtroom. A PET Scan is a film of the brain as it absorbs glucose. The subject must fast before this test. Just before filming, glucose is introduced into the blood system. As the brain cells absorb the glucose, normal uptake is measured by a change in color seen on the film.

PET Scans were originally used to locate tumors in the brain, but have more recently been found helpful in the detection of traumatic brain injury. Irregular uptake levels in a particular lobe or location of the brain, which correspond to impaired function controlled by same, can provide powerful evidence as the basis for opinions held by an expert neurologist or neuropsychologist. The area of damage is reflected in attachment 3 by a darkened circle on the left side of the film. Recently, doctors and scientists have utilized a test known as "Functional" MRI (FMRI). This special MRI records dynamic changes in blood flow to the brain. Areas in the brain with the most activity show up as bright spots and allow us to see whether brain activity occurs in different brain regions as a patient thinks, feels, smells or reacts to external stimuli.
The 3T MRI is perhaps the most promising technology yet. Doctors now have the ability to conduct Magnetic Residence Imaging with a magnet three times as powerful as those used in traditional MRIs. As a result, this new filming procedure yields exceptional anatomic detail. It's depicted in attachment 4, we can now visualize increased and decreased neuronal function. (Red areas show brain activity during ocular movements). This new technology allows us to see not only anatomy within the body, but also the metabolic function of those structures. For the first time, doctors can detect signals from sodium, phosphorus, carbon, nitrogen and oxygen—the metabolic building blocks of brain function and human thought. We are now able to see and film diffuse axonal injury in a manner never before possible with living brain tissue. When preparing a case for your expert, it is necessary to gather as much "premorbid" information as possible, such as school grades, standardized test scores and employment information. Consider speaking to family, friends, employers and teachers in order to compare behavior before and after the injury, your treating and/or expert neurologist will need all of this in order to do a proper evaluation.
In a mild to moderate TBI case, the expert neuropsychologist is a key witness. A neuropsychologist is a key witness. This is a psychologist with specialized pre- or post-doctoral training and experience in assessing brain dysfunction. This assessment is made through the administration of tests, techniques and interviews with the objective of identifying brain dysfunction, the location or origin of dysfunction, prognosis for recovery, measuring functional strengths and weaknesses, the capacity to engage in independent daily life functions and/or the need for supervision. The tests utilized vary according to individual circumstances, and often

require days to administer.

While an expert neuropsychologist will often work in conjunction with a neurologist, the training and experience of these disciplines differs greatly. Neurology is the medical science dealing with the nervous system, including the brain. A neurologist is a medical doctor who specializes in the diagnosis and treatment of diseases of the nervous system, whereas a neuropsychologist is a psychologist trained to *diagnose behavioral disturbance caused by brain injury or other factors.*

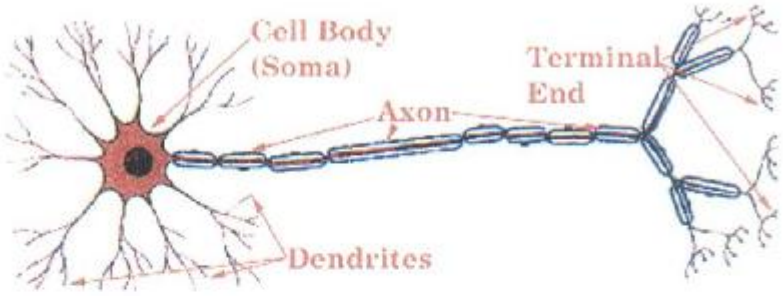
As stated above, the cause or origin of these behavioral disturbances is often not confirmed with the traditional diagnostic measures utilized by a neurologist, e.g., X-ray, MRI and/or CT scan. Rather, brain dysfunction, as evidenced by behavioral disturbance, is confirmed through the use of neuropsychological tests.

It's important to know how to interpret the results of neurological testing. One thing to remember is that the numeric scores themselves are not important in a vacuum. Only when compared to premorbid information and reviewed for disparity (e.g., subject scores in 79th percentile on 18 out of 20 tests, but only 66th in remaining two) and pattern (deficits occurring in the location of the brain where expected) can you and your experts properly understand and communicate your client's injuries.

Exhaustive investigation and development of the TBI case can be a costly endeavor. Neuropsychological assessment, often requiring days to complete, can result in substantial costs. Further, expert neuropsychologists should work in conjunction with other experts, such as neurologists, physical, vocational and cognitive rehabilitation experts, and economists. Problems in TBI cases range from expert qualifications to *Daubert* motions regarding new technologist. A good advocate will anticipate these challenges, and should accumulate evidence, such as that described above, from the very outset of the case. Only then can counsel achieve the best result possible.

Attachment 1

Double-click on icon below to view Adobe Acrobat document (must have Adobe Acrobat Reader installed).


Cell Body
(Soma)
Terminal
End
Axon
Dendrites

Attachment 2

Double-click on icon below to view Adobe Acrobat document (must have Adobe Acrobat Reader installed).

Acrobat Document

Attachment 3

Double-click on icon below to view Adobe Acrobat document (must have Adobe Acrobat Reader installed).

Acrobat Document

Attachment 4

Double-click on icon below to view Adobe Acrobat document (must have Adobe Acrobat Reader installed).

Endnotes