

A Step by Step Guide to Understanding and Managing Traumatic Brain Injury Cases for Attorneys and Risk Managers

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Part I: Introduction

A. Overview of the Brain

The human brain represents the product of an ongoing, six billion year construction project. In its physical form and function the human brain represents millions upon millions of trial and error adaptive adjustments comprised of an estimated 100 billion neurons and many more glial or support cells. It is organized into thousands of regions. The human brain in a seamlessly integrated manner governs body functions and movement but, more importantly, regulates thinking or cognition. Not surprisingly, although the brains of different animals may not look exactly alike, they all work according to the same principles and mechanisms. These neurons and glial cells communicate using a nearly infinite number of synaptic connections yet the entire organ and in humans weighs only about three pounds. Billions of years of evolution have resulted in a very complex human brain yet one that is a humbled, far from efficient, crowded organ. Neuronal pathways of the human brain have been described as equivalent to the New York City subway system or to the streets of London with layers upon layers of routes, each constructed at a different time in a different way. Yet this amazing system, for the most part, develops and works exceptionally well until injured.

The adult human brain at between 1,300 and 1,400 centimeters is by far not the largest brain among animals. Consider that a sperm whale's brain is approximately 7,800 centimeters and an elephant's brain is 4,700 centimeters. Thus, bigger brains alone do not necessarily mean smarter or more developed organisms. Although larger brains are associated with higher intelligence to some extent, smaller brains can be advantageous from

an evolutionary point of view, particularly if they are equal in intelligence to larger brains. Many additional factors beyond brain size impact intelligence and human function. Brain size in vertebrates such as humans may relate more to social rather than mechanical skills. Lower ratios of brain to body mass may increase the amount of brain mass available for more complex cognitive tasks. For reptiles brain mass is 1:1500, for birds 1:220, for most mammals 1:180 and for humans 1:150. MRI studies of humans have demonstrated that to some extent brain size has modest correlation with intelligence. Consider that an infant is born with a brain of 300 to 400 cm, tripling in size by the adult years. Yet between birth and the conclusion of the first two decades of life, a nearly infinite acquisition of knowledge and behaviors characterized as human development. Gram for gram the human brain delivers an almost dazzling array of motoric, behavioral, cognitive and emotional capacities nearly impossible to fathom in light of its size. The brain is a metabolically high cost organ consuming about 20% of the body's metabolic energy providing further evidence of its complex operations. Further, most energy use is devoted to being ready to think and respond rather than thinking per se. It is this readiness that is often so adversely impacted when individuals suffer from a traumatic brain injury.

Despite rapid, fascinating advances in our understanding of brain structure, function and complex human behavior it still remains the case that there is much more that we don't know about how the brain grows, functions and ages than we actually understand. Neuroimaging techniques have allowed scientists to appreciate the relationship between the anatomy and physiology of the brain and motor functions for example. The basic cognitive operations of the brain for that matter, the mind the physical brain creates, remain elusive.

Beyond anatomical structure and physiology the brain, unlike any other organ in the body, creates an alter ego, the conscious mind. The idea that

the brain can create consciousness seems like a science fiction phenomena. No other organ in the body is capable of doing this. Our liver, heart or kidneys do not think. For thousands of years philosophers and scientists have debated and wax poetic about the nature of the human mind. The mind appears to be composed of a set of processes driven by language, organized by memory and individualized by each person's unique perception and interpretation of their lives and yet the human brain does not appear to possess a localized center of conscious control. The mind is not localized to one spot in the brain. Though highly dependent upon the frontal lobes, consciousness and self-awareness is also dependent upon sensory, processing and interpretive abilities distributed throughout the brain. A description of the biological basis of the brain or of human consciousness continues to elude the best efforts of current researchers. We understand how people lose a sense of consciousness. We also understand how certain conditions are created by alterations in the brain subsequent to traumatic brain injury and also by conscious life experience. Yet as we come to appreciate and understand the relationship between certain conscious activities and structures within the brain, it still remains the case that our consciousness extends well beyond the structures and physiology of the brain. As the center of our consciousness and being, it is fitting that we devote an increasing scientific literature to understanding and facilitating the operation of the brain, in particular developing an appreciation of conditions, both traumatic and developmental, that alter the brain's function.

Cerebral hemispheres of the brain are mirror like and situated above most other brain structures. They are covered with a cortical layer. Beneath the cerebrum lies the brain stem, resembling a stalk on which the cerebrum is attached. At the rear of the brain beneath the cerebrum and behind the brain stem at the cerebellum, a structure with a horizontally furrowed surface that makes it look different from any other brain area. The dominant feature

of the brain is corticalization. The cerebral cortex in humans is so large that it overshadows every other part of the brain. The cerebral cortex is essentially a sheet of neurotissue folded in a way that allows a large surface area to fit within the confines of the skull. Each cerebral hemisphere has a total surface area of about 1.3 square feet. Outwardly the cerebral cortex is nearly symmetrical with left and right hemispheres. Each hemisphere is divided into four lobes:

Frontal lobes: Associated with reasoning, planning, parts of speech, movement, emotion and problem solving.

Parietal lobes: Associated with movement, orientation, recognition, perception of stimuli from the environment.

Occipital lobes: Associated with visual processing.

Temporal lobes: Associated with perception and recognition of auditory stimuli, memory and speech.

B. What is a Traumatic Brain Injury?

A traumatic brain injury (or TBI) is also referred to as an intracranial injury. This occurs when either an external force traumatically injures the brain or the brain is injured through the rotational forces experienced as the result of acceleration, deceleration injuries. TBI can be classified based on severity (mild, moderate, severe), mechanism (closed or penetrating head injury) or other features. A head injury usually refers to TBI but is a broader category because it can involve damage to structures other than the brain such as the scalp and the skull.

The severity of a traumatic brain injury as mild, moderate or severe, can be related to three measures: 1) a Glasgow Coma Score (an assessment made at the scene of the accident or soon after); 2) a period of post traumatic amnesia; or 3) a period of loss of consciousness. Mild brain injury reflects a GCS of 13-15, post traumatic amnesia of less than a day and loss of consciousness of less than 30 minutes. A moderate brain injury reflects a Glasgow Coma Score of 9-12, post traumatic amnesia of less than seven days, a loss of consciousness of greater than thirty minutes but less than twenty-four hours. Finally, a severe brain injury, from which many individuals do not recover, reflects a Glasgow Coma Score of 3-8, post traumatic amnesia over seven days and loss of consciousness over twenty-four hours.

Brain injuries can also be focal or diffuse. Focal injuries are confined to a specific area. A diffuse injury typically reflects edema (swelling) and line shift throughout the brain. A diffuse axonal injury, which is wide spread damage to axons, including white matter tracks and projections to the cortex. Injuries to the orbital frontal cortex, for example (lower surface of the frontal lobes), and the anterior temporal lobes typically involve social behavior, emotional regulation, olfaction and decision making.

C. What Forces Are Involved in a Traumatic Brain Injury?

Most traumatic brain injuries are either the result of force striking the skull during which some energy is absorbed by the skull often leading to skull fractures and then damaging the brain. Such injuries can also result in penetration through the skull causing direct injury to the brain. More commonly today most traumatic brain injuries result from an acceleration/

deceleration, typically an automobile accident or fall in which the brain is exposed to gravitational, rotational and acceleration/deceleration forces.

D. What Happens to the Brain When It Is Injured?

Damage to the brain may occur immediately as the result of a blow from the outside or acceleration/ deceleration. However, damage may also develop as the result of swelling or bleeding following an injury. Changes can occur after a brain injury during which the brain tissue may swell causing it to take up more room inside the skull. This is referred to as edema. When this occurs the swollen brain tissue will push the other contents of the skull to the side. The brain may also bruise. This is referred to as a contusion. A collection of blood is called a hematoma or a clot. This may also push the contents of the brain from one side to the other. The flow of cerebral spinal fluid may also become blocked. This will cause the ventricles or open spaces within the brain to become enlarged. This is referred to as hydrocephalus. Any of these changes can cause increased intracranial pressure which then can damage all parts of the brain if the pressure is not relieved.

When the skull is fractured, the bones actually strike the brain as well and can add additional pressure. Even if the skull is not fractured the brain can be bruised at the point of impact given that the brain sits loosely inside the skull, the inside of which is a rather bony and uneven structure.

When the brain is sufficiently traumatized by any or a combination of these forces, disruption in consciousness and/or electrical activity in the brain can occur. The latter will lead to post traumatic seizures .

E. Understanding the Difference Between the Brain and the Mind

As described, the brain is a physical structure. The first concern is to the level of physical injury. In many mild brain injury cases, physical tests such as MRI or CT scan do not reveal any physical damage to the brain, yet in many of these cases the mind is affected. Conscious awareness is adversely impacted involving memory, concentration and daily cognitive functioning.

F. Understanding the Difference Between Symptoms and Impairments

It is important to understand the difference between symptoms and impairments. Symptoms are those direct consequences of a brain/mind injury (these might include fatigue, poor memory, irritability, etc.). Impairments as defined by neuropsychologists as reflecting the impact of these symptoms on every day living. For some individuals even mild symptoms can have significant impairments. It is important to keep in mind that impairment is not consistently nor similarly defined across all specialties (for further review see *Assessment of Impairment* by Goldstein

and Naglieri, 2009, Springer). It is now recognized that symptoms and symptom severity, while contributing to daily impairments, do not contribute much more than 20% of observed behavior. The majority of behavior in everyday life appears to be contributed to by multiple other factors, many of which have yet to be understood.

G. Understanding the Difference Between Children and Adults

1. Compared with the brain of a child, representation of function in the adult brain is likely to be more focal to make greater use of inhibitory processes and to implicate non-cortical regions associated with the automatization of skills.
2. Increased metabolic activity peaking at 150% of normal by two years of age and lasting for at least three years.
3. Focal and localized brain functions in adults are carried out by diffuse regions in children.
4. Adults utilize inhibitory processes, children do not as routinely.
5. Less automatization of the brain mediated functions in children.

H. Why Does It Take So Long for Brain Injuries to Heal?

Brain injuries typically take up to eighteen months to heal. Unlike other organs of the body, or your arm or leg for instance, the brain must continue its basic operation and functions during recovery as well as recover simultaneously. Consider the impact of an injury upon an athlete when they continue to use that particular limb despite the injury. Thus, the brain in order to heal must work even harder than prior to injury. It is

also important to keep in mind the difference between recovery and accommodation. Long after the brain has stabilized following a TBI it is still possible for individuals through the use of medications, strategies or other technical or electronic devices, to improve their daily functioning and reduce impairment.

Part II: Critical Issues for Risk Managers in Working with Attorneys

A. Professional and Personal Experience

Many attorneys are not well-versed in the intricacies of traumatic brain injury cases. As with any other specialty area, it is important to choose a counsel with experience litigating traumatic brain injury cases.

B. Philosophy of Working with TBI Cases

Despite the available science, some attorneys continue to believe that the majority of traumatic brain injured individuals could easily function better if they chose to do so. It is important for the risk manager to understand the attorney's philosophy because it is often through this philosophy that true worth and value of the case will be explained.

Part III: Critical Issues and Data Concerning the Plaintiff

A. The Importance of Pre-Existing Data

Collect as much pre-existing data as possible in regards to early childhood, schooling, work, relationships, psychiatric and/or substance problems.

B. Critical Post-accident Signs Likely to Reflect a Drawn Out Recovery

1. Chronic unremitting headache.
2. Pre-accident history of psychiatric problems.
3. Pre-accident history of headache and related pain problems.
4. The presence of Post Traumatic Stress Disorder following an accident.
5. Symptoms appearing excessive relative to severity of injury.
6. Impairment appearing excessive relative to severity of injury.

C. Educational issues

It is critical to obtain as much and as many educational records as possible concerning an individual's schooling, behavior, general performance, grades, entrance exams as well as high stakes testing records. These provide an excellent foundation upon which to understand an individual's current post-TBI functioning.

D. Vocational Issues

It is important to obtain as much vocational data as available. In particular to understand the type, nature and quality of work patient completed prior to a TBI.

E. Family Issues

It is the case that dysfunctional families are not good places for individuals with TBI's to recover. An understanding of how a family functions, psychiatric issues, related behaviors, family members, etc. is critical in understanding the environment in which the post TBI plaintiff resides.

Part IV: Working with Physicians, Neurologists versus Psychiatrists versus General Care Practitioners

A. Experience

It is important to obtain an understanding of the extent to which a physician has worked with TBI patients.

B. Knowledge and Opinion About TBI

It is critical to understand the physician's past training as well as their opinions about recovery, treatment options (including medications such as stimulants for patients with concentration and memory problems).

C. The Basis for Opinions Offered

It is critical to make a distinction between a treating provider and forensic expert. The former individual may offer an opinion simply based on clinical experience versus the forensic expert offering a forensic opinion which should find its basis primarily in science and research not experience and clinical practice.

Part V: Critical Issues in Working with a Neuropsychologist

A. Know their Credentials

Neuropsychologists can be credentialed in a number of areas. There are two organizations that currently certify neuropsychologists. These credentials are essential for neuropsychologists entering the field. However, credentialing in neuropsychology is a fairly new phenomena. Experienced neuropsychologists with long vocational histories and backgrounds may or may not hold these certifications. There was no grandfathering of either of these certifications and thus many practicing neuropsychologists did not see the need nor take the time to complete this training. These credentials,

however, should not be used to determine that one neuropsychologist is smarter, better or more experienced than another.

B. Neuropsychological Assessment

Neuropsychological assessment begins with the collection and measurement of brain based skills responsible for thinking, learning, feeling and behaving. It then involves developing and understanding the complex interaction of these skills with each other and with environmental factors. Finally, neuropsychological assessment concludes with opinions concerning etiology and prescriptive interventions.

C. Neuropsychological Assessment Follows a Logical Course

1. Knowledge of the brain and body.
2. Educational history.
3. Vocational history.
4. Personal and psychiatric history.
5. Nature of the trauma.
6. Immediate and subsequent symptom course.
7. Integration of historical, qualitative and quantitative data as a means of testing hypotheses offering opinions and prescribing interventions. There are no short cuts.

D. Neuropsychological Philosophy

Understanding the neuropsychologist's philosophy concerning traumatic brain injury. A belief is a valuable ally for many individuals. Unfortunately even in the face of fact many individuals representing themselves as experts continue to rely on belief rather than fact to offer opinions. For example, some neuropsychologists will take an individual's highest score, determine that is how they functioned prior to a TBI and evaluate all lower scores as

indicative of loss secondary to brain injury. There is no strong scientific evidence to support this position. Other neuropsychologists may fail to appreciate the difference between a patient's level of knowledge and their current level of abilities. Knowledge and ability are two very different phenomena. The first represents acquired information. The second represents more hard wired skills such as memory, planning and the ability to think complexly. Some neuropsychologists, for example, believe that unless a brain scan or MRI shows deficits, any deficit found in neuropsychological testing must have pre-dated the injury or accident.

E. Norm Versus Brain Injury Testing

Today most neuropsychologists provide norm referenced testing. That is the patient is being compared to the general population of individuals with similar vocational, educational and related background. It is still the case, however, that some neuropsychologists use tests that are standardized on brain injured patients in an effort to prove brain injury. This is unnecessary. Brain injury is best demonstrated by the findings of physicians and medical tests at the time of an accident. It is further the case that individuals absent history of traumatic brain injury with developmental and other kinds of neurologic problems will test poorly on such brain injury normed tests but in and of themselves have not had an acute injury.

F. Component Skills Measured in a Thorough Neuropsychological Assessment

1. Attention.
2. Language.
3. Intelligence
4. Sensory motor functions.

5. Visual spatial functions.
6. Memory and learning.
7. Executive functions.
8. Achievement.
9. Pain, emotional and personality style.

G. Pseudoscience

Understanding the neuropsychologist's appreciation of pseudoscience and the use of pseudoscience in offering opinions. An understanding of these issues is critical. There are a number of principal differences between science and pseudoscience. Pseudoscience typically reflects the following:

1. *An overuse of ad hoc hypotheses designed to immunize claims from falsification.* This is a means of explaining away negative findings. These opinions and principals can never be falsified.
2. *Absence of self-correction.* This represents a failure to modify or change opinions with available changing science.
3. *Evasion of peer review.* The opinions offered are based on belief rather than scientific study.
4. *Emphasis on confirmation rather than refutation.* Here efforts are made to only seek confirming evidence for particular opinion or claim.
5. *Absence of connectivity.* Pseudoscientists purport to create entirely new paradigms rather than build on existing science.

6. *Overuse of anecdotal or testimonial evidence.* Pseudoscientists equate belief and hearsay with fact.

H. How to Help Your Experts

1. *Records.* It is critical to provide a complete and thorough set of vocational, academic and medical records whenever possible. Records should be offered to the expert in an organized manner, preferably bates stamped with a Table of Contents and dividers. Increasingly, neuropsychologists prefer records electronically allowing them to access these records easily.
2. *Making the referral.* It is critical when making the referral to first question the neuropsychologist as to their interest in the case, asking them to review an initial set of records and offer verbal opinion as to whether or not this is a patient they are willing to evaluate. Then when the formal evaluation is made it should be accompanied by a referral letter with specific questions to address relative to the patient to be evaluated. Questions can include their pre-existing history, injuries, level of current functioning, prognosis, needed treatment and relationship of the accident to any deficits found during testing.
3. *Availability.* Once a referral is made it is essential to be available to experts when and if they call with questions. A check for conflict of interest should also be made.
4. *Follow-up.* Typically there is a span of time between when the evaluation is completed and a deposition is taken. It is critical that the expert be provided with the opportunity to obtain updated information about the

patient such that the deposition will reflect not just the evaluation that may have been completed a year prior but also the patient's current functioning. This can typically be accomplished by most neuropsychologists with a one out follow-up visit. Additionally, should the case go to trial it is critical for the neuropsychologist to have the opportunity to either re-evaluate or briefly interview the patient prior to trial. This will allow them to provide a more thorough presentation to the jury.

I. Why a Neuropsychologist Should Be Your Quarterback in TBI Cases

Neuropsychologists understand the science and practice of all experts involved in the evaluation and treatment of traumatic brain injured patients. They are trained to integrate data, evaluate past, current and potential future functioning and thoroughly assess impairment.

About the author

Sam Goldstein, Ph.D. is a Licensed Psychologist in the State of Utah. He holds multiple Fellow and Diplomate awards. He has worked clinically as a developmental neuropsychologist, evaluating children and adults over the past thirty years. Dr. Goldstein edits the Journal of Attention Disorders, sits on six Editorial Boards, including those for a number of neuropsychological, peer reviewed publications. He is the author of thirty-five books and three tests. He has a number of additional test instruments and books in development. Dr. Goldstein has written extensively about issues related to child development, impairment, neuropsychological testing, pain, traumatic brain injury and Post Traumatic Stress Disorder. Research summaries about these issues are available on his website, www.samgoldstein.com under the section titled Legal Updates. Dr. Goldstein can be reached at info@samgoldstein.com or (801) 532-1484.