

UNDERSTANDING TRAUMATIC BRAIN INJURY

UNDERSTANDING MILD-TO-MODERATE TRAUMATIC BRAIN INJURY (TBI) AFTER AN ACCIDENT: *PATIENT INFORMATION ON SYMPTOMS, DIAGNOSIS, AND COORDINATED CARE*

This patient resource was created to help you understand traumatic brain injury (TBI), why it can be difficult to diagnose, and how advanced medical tools – such as **blood-based biomarkers** and personalized care coordination – **can support both your health and your legal case after an injury.**

If you have been involved in a motor vehicle accident, or other traumatic event, this information is especially important – even if you feel “mostly fine” today. Symptoms of mild to moderate TBI do not always appear immediately and may develop or change over time. In some individuals, symptoms can persist or worsen, affecting physical, cognitive, or emotional functioning.

While many people recover well from TBI, others may experience longer-term effects such as headaches, visual disturbances, dizziness, cognitive difficulties, or seizure-related conditions that require ongoing medical evaluation and management. Early diagnosis and tailored follow-up care can play an important role in supporting recovery and optimizing long-term outcomes.

WHAT IS TRAUMATIC BRAIN INJURY (TBI)?

Traumatic Brain Injury (TBI) occurs when a sudden force disrupts normal brain function.

This can happen due to:

- A direct blow to the head
- Rapid acceleration or deceleration (such as whiplash)
- Blast or impact forces transmitted to the brain

TBI exists on a spectrum:

- Mild TBI (often called a concussion)
- Moderate TBI
- Severe TBI

While severe TBIs are often obvious and immediately treated, **mild-to-moderate TBIs are frequently overlooked or under-diagnosed**, even though they can have lasting effects.

Each year, approximately **2.8 million people in the U.S. are diagnosed with TBI**, but many individuals with mild-to-moderate injuries are never formally diagnosed or treated.

WHY MILD-TO-MODERATE TBI IS OFTEN MISSED

Historically, mild-to-moderate TBI has been diagnosed using **subjective tools**, such as symptom questionnaires and patient self-reporting.

While helpful, these tools have important limitations:

- Symptoms may fluctuate day-to-day
- Some symptoms appear weeks or months after injury
- Patients may minimize or misattribute symptoms
- Stress and adrenaline can temporarily mask problems

There is also a **knowledge gap** among healthcare providers when it comes to diagnosing and treating mild-to-moderate TBI, which can lead to delays in care and poorer long-term outcomes.

WHY IMAGING (CT OR MRI) IS NOT ALWAYS ENOUGH

Many patients assume that a “normal” CT scan or MRI means there is no brain injury.

However:

- **CT scans** are designed to detect bleeding or skull fractures
- **Standard MRIs** often do not detect microscopic or cellular-level brain injury

In mild-to-moderate TBI, damage often occurs at the **cellular and molecular level**, involving inflammation, axonal injury, and disruption of normal brain signaling – changes that may not appear on conventional imaging.

This means a patient can have **real brain injury despite normal imaging results**.

SYMPTOMS OF MILD-TO-MODERATE TBI

Symptoms can be physical, cognitive, emotional, or sleep-related. They may begin immediately after your accident – or much later.

Common symptoms include:

- Headache or pressure in the head
- Dizziness or balance problems
- Sensitivity to light or noise
- Fatigue
- Memory or concentration difficulties
- Brain fog or slowed thinking
- Mood changes (irritability, anxiety, depression)
- Sleep disturbances

Importantly, **symptoms may emerge weeks or months after the injury**, which is why early, objective evaluation matters.

THE RISK OF LATE-ONSET AND LONG-TERM EFFECTS

Some individuals experience:

- Persistent post-concussive symptoms
- Delayed neurological decline
- Difficulty healing or incomplete recovery
- Increased long-term risk of neurodegenerative disease



These risks are not the same for everyone. Genetics, injury mechanism, and biological response all play a role.

HOW BIOMARKER TESTING CHANGES TBI DIAGNOSIS

After an injury, the brain's support and repair cells – called **glial cells** – release measurable proteins into the bloodstream. These proteins, known as **biomarkers**, allow doctors to detect brain injury objectively.

Blood-based biomarker testing can help determine:

- Whether a brain injury occurred
- The biological severity of injury
- Whether the injury is resolving or ongoing
- How your body is responding to treatment

This represents a major advancement in TBI care – moving from subjective symptoms to **objective, personalized medicine**.

GENETIC MARKERS AND LONG-TERM RISK ASSESSMENT

When clinically appropriate, testing may also include genetic markers such as:

- **MTHFR** – associated with how efficiently your body repairs and recovers
- **APOE** – associated with long-term neurological resilience and degeneration risk

These markers do **not** diagnose TBI, but they can provide insight into:

- Why some people may heal more slowly
- Who may benefit from closer monitoring or early intervention

YOUR CHOICE AND YOUR CARE

Even if biomarker or genetic testing is recommended by your physician:

- **Testing is always your choice**
- You may decline testing at any time
- Your care will continue regardless

Your doctor – typically a neurologist – determines what testing is clinically appropriate based on your unique presentation.

HOW BIOCONNETIX SUPPORTS YOU

BioConnetiX is not a medical provider. We are a care coordination and administrative services company focused on connecting patients to the *right specialists* – efficiently and intelligently.

We help by:

- Connecting you with **TBI-specialized neurologists and other clinicians licensed in your state**
- Reducing long wait times for time-sensitive care
- Coordinating comprehensive neurological evaluations focused on mild-to-moderate TBI assessment



BioConnetiX Patient Education Resource

- Assisting your local care team in identifying and consulting with appropriate specialty experts when clinical questions arise
- Connecting your physician with laboratories that perform the specialized diagnostic testing required for TBI evaluation
- Coordinating your blood draw at a convenient location and ensuring the phlebotomist has the correct instructions to properly collect and handle your sample
- Connecting your local care team with **molecular pathologists and neuro-intensivists** who are experts in interpreting TBI biomarker results and using that information to guide a personalized plan of care based on your unique results
- Coordinating the collection of relevant medical records and test results from participating providers and laboratories, and ensuring that your attorney receives copies of your diagnostic results, medical records, and supporting documentation needed to effectively and efficiently manage this aspect of your case

This coordinated approach allows patients to access **advanced, precision-medicine-based care** that could otherwise be difficult, time-consuming, and costly to obtain.

WHY THIS MATTERS IN YOUR LEGAL CASE

In personal injury cases, documentation matters.

Biomarker testing can provide:

- **Objective medical evidence** of brain injury
- Clear documentation supporting diagnosis and treatment
- Insight into injury severity and recovery trajectory
- Data that helps attorneys accurately present the medical facts of your case

Biomarkers can also be used over time to demonstrate **healing, persistence, or response to treatment**.

ADDRESSING THE CARE GAP AFTER INJURY

National guidelines – including those from the **American College of Surgeons** – recognize that many patients experience a **care gap** after initial injury treatment.

Even patients with moderate or severe TBI often receive limited rehabilitation and follow-up. For mild-to-moderate TBI, this gap is even larger.

BioConnetiX exists to help close that gap – by ensuring patients receive:

- Appropriate specialty evaluation
- Objective diagnostic tools
- Coordinated follow-up care

OUR COMMITMENT TO PATIENTS

BioConnetiX is committed to becoming a national leader in:

- Patient education
- Objective TBI diagnosis
- Ethical, patient-first use of advanced diagnostics



BioConnetiX Patient Education Resource

- Improving access to personalized, data-driven medicine by reducing unnecessary cost, delay, and complexity through efficient coordination and clinical alignment

Our goal is to empower you with knowledge, access, and clarity – so you can focus on healing, while your care team and attorney have the information they need to advocate for you effectively.

QUESTIONS?

Your attorney or BioConnetiX care coordinator can help answer questions about next steps, evaluations, or testing options.

You are not alone – and early, informed action matters.



ADDITIONAL RESOURCES

If you would like to learn more about traumatic brain injury (TBI), current best practices in TBI management, and the emerging role of biomarkers and genetics in guiding personalized, objective care, the following resources may be helpful:

American College of Surgeons: 2024 Best Practices Guidelines: The Management of Traumatic Brain Injury

This nationally recognized guideline outlines current standards and recommendations for the evaluation, diagnosis, and management of traumatic brain injury across the full spectrum of severity.

<https://www.facs.org/media/vgfgjpfk/best-practices-guidelines-traumatic-brain-injury.pdf>

Blood Biomarkers for Traumatic Brain Injury: A Narrative Review of Current Evidence

This peer-reviewed scientific review summarizes current research on blood-based biomarkers used in TBI assessment, including **GFAP**, **UCH-L1**, **S100B**, and Neurofilament Light (**NF-L**), and explains how these markers support objective diagnosis and monitoring of brain injury.

<https://www.sciencedirect.com/science/article/pii/S2772529423010238>

These materials are provided for educational purposes only and are not intended to replace medical advice from your treating physicians. Your care team can help interpret how this information applies to your individual situation.

