

# Understanding Subconcussive Impacts: A Guide for Parents

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## Introduction

Subconcussive brain trauma is a term increasingly recognized in pediatric neurology, particularly among children involved in sports. Unlike concussions, which are typically characterized by noticeable symptoms following a head injury, subconcussive impacts do not cause immediate, obvious symptoms. However, repeated subconcussive impacts can still have significant, long-term effects on a child's brain health, primarily due to brain inflammation (neuroinflammation). This paper aims to explain what subconcussive brain trauma is, its potential symptoms, the role of neuroinflammation, and the best non-drug treatments available for children.

## What is Subconcussive Brain Trauma?

Subconcussive brain trauma refers to minor head impacts that do not result in the overt symptoms typically associated with concussions. These impacts (hit or hits) can occur frequently in contact sports like football, soccer, hockey, martial arts, and wrestling where the head is subject to repetitive, low-grade blows. Unlike concussions, where symptoms such as headache, dizziness, or confusion are evident, subconcussive impacts often go unnoticed, making them particularly insidious.

## Neuroinflammation and Its Role in Subconcussive Brain Trauma

Neuroinflammation plays a significant role in the symptoms associated with subconcussive brain trauma. While a single subconcussive impact may not cause immediate, noticeable damage, repeated impacts can trigger a cascade of neuroinflammatory responses that contribute to various symptoms and long-term brain health issues. Understanding that these inflammatory responses occurring after trauma are the causation for most of the symptoms, gives us a set of tools to reverse the process and stop the inflammation.

**Microglial Activation:** Microglia are the primary immune cells in the brain. They become activated in response to brain injury, including subconcussive impacts. Chronic activation due to repeated impacts can lead to the release of pro-inflammatory cytokines, which can damage neurons and other brain cells.

**Cytokine Production:** Repeated head impacts stimulate the production of pro-inflammatory cytokines, such as interleukins (e.g., IL-1 $\beta$ , IL-6) and tumor necrosis factor-alpha (TNF- $\alpha$ ). These cytokines can disrupt normal brain function and contribute to symptoms like cognitive decline, mood changes, and sleep disturbances.

**Blood-Brain Barrier (BBB) Disruption:** Subconcussive impacts can compromise the integrity of the BBB, a protective barrier that regulates the passage of substances between the bloodstream and the brain. A disrupted BBB allows inflammatory cells and molecules to enter the brain, exacerbating neuroinflammation and contributing to neurological symptoms.

Oxidative Stress: Neuroinflammation is closely associated with oxidative stress, where an imbalance between the production of reactive oxygen species (ROS) and the brain's ability to detoxify them leads to cellular damage. Oxidative stress further damages neurons and glial cells, compounding the effects of inflammation.

### **Symptoms of Subconcussive Brain Trauma**

While a single subconcussive impact may not produce immediate symptoms, cumulative effects from repeated impacts can lead to significant neurocognitive issues over time. Parents should be vigilant for the following subtle signs, which may indicate ongoing brain stress or injury:

#### **1. Cognitive Symptoms:**

- a. **Memory Problems:** Difficulty retaining new information or recalling previously learned information.
- b. **Attention Deficits:** Problems with concentration, staying focused on tasks, and increased distractibility.
- c. **Executive Dysfunction:** Challenges with planning, organizing, and completing complex tasks.

#### **2. Behavioral and Emotional Symptoms:**

- a. **Irritability and Mood Swings:** Increased irritability, emotional instability, and mood swings.
- b. **Depression and Anxiety:** Persistent low mood, anxiety, and other mood disorders.

#### **3. Physical Symptoms:**

- a. **Headaches:** Recurring headaches or a feeling of pressure in the head.
- b. **Sleep Disturbances:** Difficulty falling asleep, staying asleep, or experiencing restorative sleep.
- c. **Fatigue:** General feelings of tiredness and lack of energy.

### **Laboratory Assessment of Subconcussive Brain Trauma**

The insidious nature of subconcussive brain trauma is compounded by the lack of neuroradiologic findings from such procedures as a CT scan, MRI, PET scan or even a SPECT scan which cannot display the developing neuroinflammation associated with all forms of trauma. The presence of neuroinflammation does cause disruption of the brain's ability to produce a number of hormones and those can be picked up by laboratory testing. Age does have an influence on many of the body's hormones and that is why a very select group of neurosteroids are assessed.

Ideally, and prior to any subconcussive hit, we recommend that a baseline SBT biomarker panel is performed and then repeated every 6 months while the individual is involved in a sport that might predispose them to an SBT. In the event that there is an initial SBT or a subsequent one after the initial screening-baseline biomarker panel, we recommend waiting 3 months before repeating the SBT biomarker panel. If testing is performed prematurely, the effects of the recent hit might be missed.

When an individual's SBT panels are compared, a finding of decreasing levels in the serial testing can be indicative of neuroinflammation that is causing disruption of the brain's ability to regulate hormonal production.

## Non-Drug Treatments for Subconcussive Brain Trauma

To address the neuroinflammatory response associated with subconcussive brain trauma in children, non-drug treatments focus on reducing inflammation and supporting brain health. These approaches include:

1. Education and Prevention:
  - a. Parental and Coach Education: Ensuring that parents, coaches, and children are educated about the risks of subconcussive impacts and the importance of protective measures in sports.
  - b. Proper Technique Training: Teaching children the correct techniques in sports to minimize head impacts.
  - c. Use of Protective Gear: Advocating for the use of helmets and other protective equipment that can reduce the risk of head injuries.
2. Regular Monitoring and Assessments:
  - a. Neurocognitive Testing: Implementing regular cognitive assessments to monitor for any changes in brain function. Baseline testing at the start of the sports season can help identify subtle changes over time.
  - b. Symptom Checklists: Keeping detailed records of any symptoms or behavioral changes observed in the child.
  - c. **Neuroendocrine blood testing for age:** Knowing that subconcussive and concussive brain traumas can affect an adolescent's production of specific hormones, can be used as a screening tool.
3. Rest and Activity Modification:
  - a. Structured Rest: Allowing the brain to recover by reducing cognitive and physical stress. This includes limiting screen time, schoolwork, and physical activities during recovery periods.
  - b. Gradual Return to Activity: Implementing a step-by-step approach to reintroduce physical and cognitive activities, ensuring the child is symptom-free at each stage before progressing.
4. Cognitive and Physical Therapies:
  - a. Cognitive Rehabilitation: Engaging in activities and exercises designed to improve cognitive function, such as memory games, puzzles, and strategic thinking exercises.
  - b. Physical Therapy: Using balance and coordination exercises to improve motor skills and overall physical health.
5. **Nutritional Support:**
  - a. **Healthy Diet:** Providing a diet rich in brain-healthy nutrients, including omega-3 fatty acids, antioxidants, and vitamins.
  - b. Hydration: Ensuring adequate hydration to support overall brain function and health.
  - c. **Nutraceuticals:** Along with a healthy, low-inflammatory diet, the addition of select products developed to mitigate inflammation is suggested.

6. Emotional and Psychological Support:

- a. Counseling: Offering counseling services to address any emotional or psychological issues that may arise due to brain trauma.
- b. Support Groups: Encouraging participation in support groups for children and families dealing with similar issues.

**Conclusion**

Subconcussive brain trauma, while less immediately obvious than concussions, can have significant long-term impacts on a child's brain health. Neuroinflammation plays a central role in the development of these symptoms. Understanding the mechanisms and implementing effective non-drug treatments to manage inflammation can significantly help in mitigating these effects and promoting brain health in children. By focusing on education, prevention, regular monitoring, structured rest, cognitive and physical therapies, nutritional support, and emotional care, parents can help protect their children's brain health and ensure their overall well-being.

Comment: Dr. Gordon has been treating Veterans from the US, UK, Israel, Australia, Ukraine, and Canada over the years with the same initial philosophy that he is bringing to our children who suffer with the existential impact of subconcussive brain trauma. Neuroinflammation is at the core of the process that leads to alterations in cognition and emotional well-being. Correct the inflammation and you can correct the problems generated.

In October 2024, be on the lookout for the book: *A Parental Guide to Subconcussive Head Trauma: What to Know and Where to Go*. It will post on [www.MillenniumHealthStore.com](http://www.MillenniumHealthStore.com)



Information on these products, can be found at [www.TBIHELPNOW.org/the-science](http://www.TBIHELPNOW.org/the-science)