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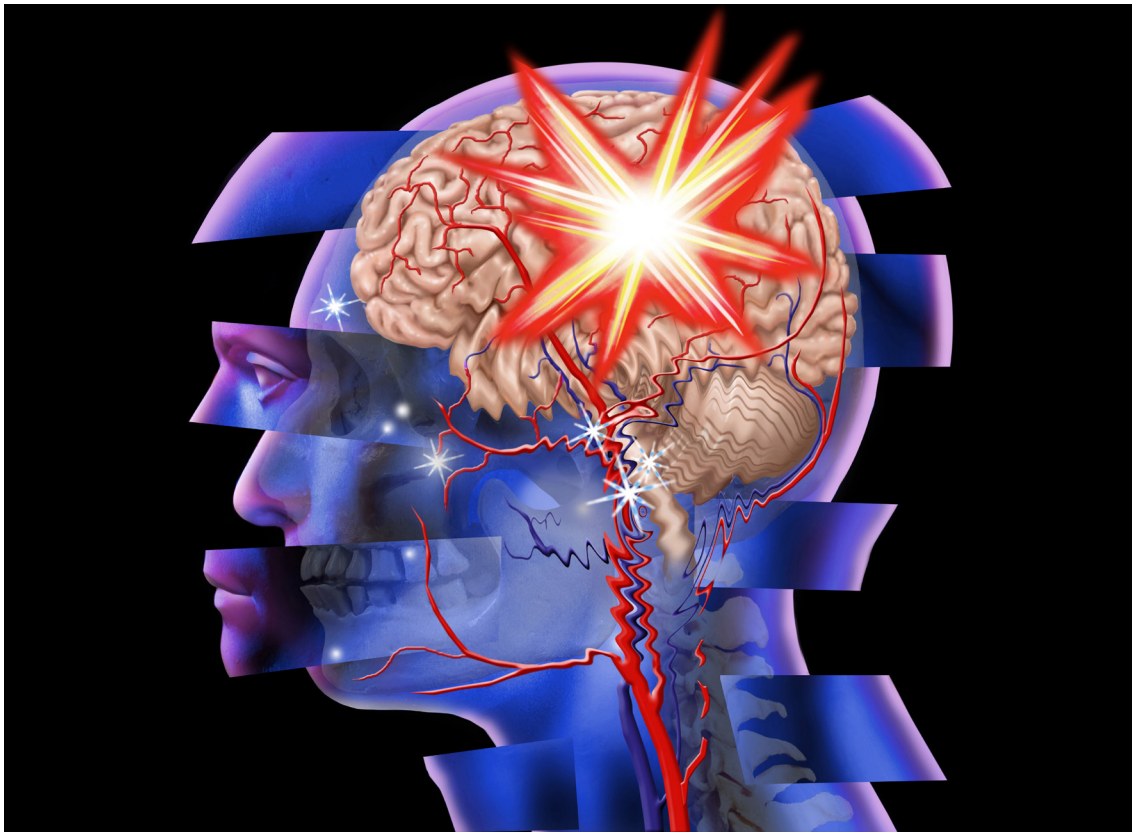
PERSPECTIVE

Neuroendocrine dysfunction: a path to demonstrating traumatic

By Molly M. McKibben



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Lawyers involved with clients who sustain traumatic brain injuries often feel that a lack of imaging studies showing damage to the brain means it's impossible to corroborate their client's injury. But there are ample other methods available to demonstrate the existence of such an injury.

A traumatic brain injury can be caused by a blow to the head or a sudden movement of the body that causes the head and brain to move quickly back and forth. According to the CDC, the movement can cause the brain to bounce around or twist in the skull, or cause chemical changes in the brain, or cause stretching or damage to brain cells.

Medical providers often define traumatic brain injuries as mild, moderate, and severe, descriptors used to help them triage an injury. Defining a brain injury as "mild" can be misleading – it essentially means that a brain injury is not immediately life-threatening. But the effects of a mild traumatic brain injury can be persistent, life-altering, and permanent. Millions of Americans sustain mild traumatic brain injuries (also known as mTBIs) every year.

It is not uncommon for someone who has suffered an mTBI to have a "normal" CT scan or even MRI after their injury. The precise details of soft tissue like the brain are unlikely to show up on a CT scan, and even a microscopic injury to the brain may not be revealed in an MRI. But a lack of a positive image showing damage to the brain doesn't mean it didn't occur.

One of the ways a traumatic brain injury can reveal itself is through disruption of endocrine function in the person's body. The endocrine system is a network of glands which release hormones into the bloodstream – hormones that control mood, growth, metabolism and reproduction. The endocrine system's "master gland" is the pituitary gland. It uses information it gets from the brain to tell the other glands in the body what to do. Damage to the pituitary gland resulting from a traumatic brain injury can disrupt the production and distribution of hormones in the body – this is called neuroendocrine dysfunction.

It's important to understand how damage to the pituitary gland is caused. The mechanism most likely to occur due to a mild traumatic brain injury is vascular damage to the pituitary gland. This happens due to the structure and location of the gland. It's found at the base of the brain, behind the bridge of the nose, and hangs off the brain into a bony compartment at the base of the skull called the sella turcica. During an event that causes rapid movement of the brain, the pituitary gland can stay in place as the brain moves backward and forward or side to side, which can cause stretching and micro-tearing of the blood vessels and nerves on the gland and connecting it to the brain. This damage to the gland

Molly M. McKibben *is a partner at Greene Broillet & Wheeler, LLP.*

can interfere with the production of hormones and can result in hypopituitarism, where the gland fails to produce at all or not enough of certain hormones.

This damage to the pituitary gland will almost certainly not show up on imaging. But it will reveal itself in hormonal deficiencies that can occur immediately or develop over time. Pituitary deficiencies are seen at a high rate in persons who have sustained a traumatic brain injury. It's such a significant consequence of a traumatic brain injury that the Department of Defense has developed a training for doctors to use to screen for and identify neuroendocrine dysfunction in active-duty and veteran military members. It's important that mTBI sufferers be evaluated for it because untreated neuroendocrine dysfunction is associated with increased mortality.

The most common pituitary hormone deficiency that is seen in long-term survivors of mTBI is growth hormone. Human growth hormone is a single-chain polypeptide that is involved in a variety of biological functions including growth, development, and immunity. Symptoms of growth hormone deficiency include decreased strength, irritability, low bone density, a loss of interest in socialization, memory issues, fatigue, weight gain, and problems concentrating.

A person who is experiencing these symptoms can be evaluated for low growth hormone via a stimulation test (because growth hormone is released in the body in pulses, a random blood measurement of growth hormone is not a reliable indicator of growth hormone status). There are a few different tests that can be used which take around two hours and are performed on an outpatient basis.

If a person's stimulation test reveals their mild traumatic brain injury has caused damage to their pituitary gland that has resulted in low growth hormone, they can be treated with recombinant human growth hormone (rhGH). This is a synthetic medication administered via daily subcutaneous injections. Growth hormone therapy has been shown to improve body mass, bone density, exercise tolerance, personal productivity, and quality of life. The research that has been done on the effect of hormone-replacement demonstrates that such treatment does improve some mtBI symptoms – meaning that while some symptoms may be permanent, others may be treatable. People who have used rhGH have found an improvement in their fatigue after three months, and an improvement in cognition after five months. It is a treatment that someone suffering from low growth hormone will have to endure for the rest of their life in order to minimize the treatable symptoms of their traumatic brain injury.

Having a person who has sustained head trauma evaluated for an endocrine deficiency is one of many ways to demonstrate that they suffered a mild traumatic brain injury, and can help guide them to the medical treatment they need to improve their quality of life.