

What are the phases of brain injury?

Brain injury has three injury phases that make each traumatic brain injury unique. It is not always possible to predict how a victim will respond to the phases of traumatic brain injury. Each injury phase may cause further insult to the initial injury. These injury phases rapidly occur in sequence with phase two and three persisting and manifesting concurrently.

The first injury phase is the primary injury sustained from the accident or assault. This phase involves the actual traumatic event, followed by the initial neural damage, damage to adjacent glial tissue and the initial inflammatory response that immediately follows the event.

The second injury phase is the when the swelling may contribute to the deterioration of the victim's neurological status. This phase may increase intracranial pressure (> 15mmHg or 180 cm H₂O) and may impair blood flow to key areas of the brain, including the injury site(s) and adjacent structures. This is the phase where infection may arise or complications associated with increased intracranial pressure may unfold for the victim. Increased intracranial pressure may cause impaired blood flow to the brain; with higher intracranial pressure leading to worsening neurological impairment. Impaired blood flow may create various complications like brain swelling that causes a brain shift and cellular changes due to a lack of oxygen. This phase requires careful medical/surgical management or permanent injury and even death may result.

The third injury phase of brain injury may arise from the second injury phase because of pressure on the brain stem and inflammatory mediators that are released from injured brain cells and the immune system. This phase has a profound effect on the respiratory center of the brain. It also negatively impacts the vascular motor stability throughout the body. So the victim may have problems with breathing, blood pressure and heart rhythm which may result in low perfusion states. Low perfusion states interfere with the delivery of oxygen to cells and will adversely affect recovery from traumatic injuries.