Traumatic brain injury (TBI) is a leading cause of death and disability among children and adolescents in the United States. An estimated 90% of head-injury-related emergency department visits result in a diagnosis of mild TBI (mTBI) also known as concussion. Historically ignored as a major public health concern, concussion can cause lasting neurocognitive changes that can persist for years or even decades; well beyond the typical 2-week clinical recovery period. Post-concussive syndrome (PCS) encompasses a constellation of cognitive and physiological symptoms that continue to occur weeks, months, or years after a concussion. In children and teenagers, these impairments can disrupt an individual’s developmental trajectory, leading to underperformance in academics, poor integration into the workforce, and diminished quality of life in adulthood. Preclinical neuroscience has greatly improved our understanding of the consequences of head injury; however, vast architectural differences between rodent and human brains has resulted in dismal translation of therapeutic strategies from the bench to the bedside. In recent decades, the domestic pig (sus scrofa) has attracted considerable attention as a highly promising model animal for studying age-specific responses to mechanical trauma due to striking similarities between pig and human brain anatomy, development, and neuroinflammatory response. To add to the growing body of work utilizing pigs for the study of brain injury, we have developed a model of pediatric concussion in juvenile Yucatan miniature pigs. We conduct an extensive battery of cognitive and behavioral assessments designed to reveal post-concussive complication in pigs. We also conduct clinically relevant live imaging procedures to better understand the effects concussion can have on brain connectivity and function. The utilization of an animal model whose neuroanatomy closely resembles the human brain is critical to the development of therapeutic protocols that are effective and safe.