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Commentary Open Access

The 'Visible' Injury No One Sees

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Commentary

The diagnosis of concussion/mTBI has become a symptom only diagnosis and symptom only treatment injury over the years. This seems an inappropriate course of therapy for this common and worldwide injury. Concussion/mTBI is underestimated by not only the patients sustaining this injury, but the physicians, therapists, trainers, family members and athletes in the chain of evaluation and those self-reporting symptoms, but also every child athlete, parents of those child athletes and their 'coaches'. The 'coaches' may also be parents and have an inappropriate need to see their child athlete succeed at all costs, even to the detriment of the child's future. This urge to excel at the cost of future health and our young athletes and soldier's future functionality and potential societal contributions needs to be muted and the right thing done for our future as well. It is fact and simple truth that when the symptoms resolve, there may still be an injured brain that has not healed. The injury is simply not visible, and must be made to be visible. Injury visibility is done by common CT and MRI for most other wounds or injuries, but it is also fact that common CT scan and MRI do NOT make concussion/ mTBI visible. CT and MRI however make other skull injuries visible, such as bleeds, fractures, and brain infrastructure injuries. When the patient with concussion/mTBI is sent back to prior to injury activity based on regular CT or MRI with symptom resolution he/she may still have an injured brain, and when back at 'usual' violent or athletic activity may sustain a re-injury of a partially healed prior brain injury, or a new injury on top of the older unhealed injury. This can be devastating to the patient, and doubly so for our children athletes. In concussion/mTBI, normal medical practice and standard of care seems swept aside, and the patient may be sent back to activity before objective proof of brain healing. Those patients with continued symptoms (post-concussive syndrome) are usually kept safely from activity until symptoms are resolved, but again sent to 'action' sans objective proof of brain healing.

How to make an unhealed but symptom free brain injury visible? One answer is to undergo further real in-depth cognitive evaluation by a trained professional, and in many cases those athletes/soldiers reporting no symptoms will be found to still have discoverable symptoms, albeit not reported nor felt by the patient [1]. The second method is to require a special MRI, called Diffusion Tensor Imaging (DTI), performed by a radiologist. This is easily done, and a robust literature supports the use of this technique. DTI must become the standard of care in concussion/ mTBI, and it will only get better as a technique, or change to something more improved. DTI is what we have available now, and is eminently useful [2,3]. Everyone in the chain of evaluation of athletes, adult and children, soldiers, first responders, and others in danger of sustaining head injuries need a DTI scan to prove that the brain injury is healed or healing. Another exciting but experimental method is High Definition Fiber Tracking (HDFT) 'tractography', which uses a more advanced computer program than DTI (ie-over 257 water molecules sampling etc) instead the 6 water molecule samplings done by current DTI [4]. This experimental method shows individual axonal tracts, but in many cases DTI can do so also except not as reliably so.

There are several other exciting new methods that may be useful to 'make 'concussion/mTBI visible in the future. One is the use of ultrasound to find brain abnormalities from mTBI [5]. Several other experimental ideas easily found by googling the subject include fMRI, which measures early cognitive improvement at 72 hours and one week after concussion and compares the results [6]. Other exciting early ideas include tau protein levels, which are elevated in concussion/ mTBI, and measuring eye movements in concussed athletes. These exciting embryonic experimental methods can easily be researched by googling the subjects. These experimental studies are also very early in the chain of useful therapy, but the exciting piece of it is that this work is ongoing, and many scientists are going beyond the currently practiced methods. This research portends better care for concussion/ mTBI and will help immeasurably in making this 'invisible' brain injury visible. The principle guiding the standard of care can be gleaned from Robert Koch, the 19th century microbiologist. His rules were simple- prove the presence of disease, cure/heal it, and then prove its cure or absence. These principles guide the standard of care in most medical practice and are adhered to by physicians and other practitioners, but appears not to be the case in concussion/mTBI. Hence, the standard of care is substandard for concussion/mTBI, and no objective proof of brain healing is accomplished in the majority of cases.

As said, the technology is moving forward, but what is available now is DTI, but is simply not used. This myopic practice is harmful to our concussed/mTBI patients, and to me as a physician, not acceptable. If all involved in the chain of evaluation and care of concussion/mTBI were to use DTI as a beginning return to an acceptable standard of care, and not accept arguments against this technology by some biased against the use of DTI, the technology would be forced to evolve to a more sophisticated one. As it evolves and others are brought online to its use and the standard of care improves, DTI may be replaced for something better. But, it is what we have now and ought to be used. Our concussed/mTBI patients deserve a higher standard of care! The studies by Niogi and Mukherjee and Shenton et al lend support to the pro-DTI utilization [7,8]. The thorough meta-analysis by Elerud et al. [9] compares various brain imaging techniques in view of mTBI as being considered 'non-lethal' but with potential long term sequelae. Elerud looks to use of DTI and 'diffusive' technology as useful for microscopic white matter (axonal) mTBI damage, and differentiates that injury from the more often frontal brain anisotropic damage by using fMRI (functional MRI) for that evaluation. Up to now, while a robust literature for DTI is growing, one of the detractors is that it appears to be 'inconsistent' in results, even while these reports appear overwhelmed by positive results. Perhaps some caution may be valid, but as said above, DTI is what we have available NOW, and as it grows

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in use, it will become more sophisticated from further refinements or simply eventually replaced. Perhaps an increase in the number of diffused water molecules is the future of DTI, as it can give more clear and reliable information [4]. Elerud [9] also points out that the use of DTI is a time related event-early use shows more anisotropy, and later use shows less anisotropy. This may lead to 'inconsistency' in results but is an expected time-related result. To this author and physician, it does work, and is what we have. As a clinician, it is my goal to help my patients in any way I can, and the diagnostic tools do not have to be 'perfect'-they simply have to help make a diagnosis and allow serial treatment follow-up. The future of making the 'invisible' visible is exciting, and promises better care for our concussed patients and our common future.

References

1. Greenwald BD, Ambrose AF, Armstrong GP (2012) Mild Brain Injury. Hindawi Publishing Corporation, USA.
2. Lipton ML, Gulko E, Zimmerman ME, Friedman BW, Kim M, et al. (2009) Diffusion tensor imaging implicates pre-frontal axonal injury in executive function impairment following very mild traumatic brain injury. Radiology 252: 816-824.
3. Kraus MF, Susmaras T, Caughlin BP, Walker CJ, Sweeney JA (2007) White matter integrity and cognition in chronic traumatic brain injury: a diffusion tensor imaging study. Brain 130: 2508-2519.
4. Bijal PT (2015) Broken Cables. Discover 53-59.
5. Sills A, Lee T (2015) Sound Wave technology studied to help diagnosis of concussion. Science Daily.
6. Wylie GR, Freeman K, Thomas K, Shpaner M, Okeefe M, et al. (2015) Cognitive Impairment after mild TBI Measured with Functional Neuro-imaging during the Acute Period . PLoS One 10: e0126110.
7. Niogi SN, Mukherjee F (2010) Diffusion Tensor Imaging of Mild Traumatic Brain Injury. J Head Trauma Rehabil 25: 241-255.
8. Shenton ME, Hamoda HM, Schneiderman JS, Bouix S, Pasternak O, et al. (2012) A review of magnetic resonance imaging and diffusion tensor imaging findings in mild traumatic brain injury.2012, Brain Imaging Behav 6: 137-192.
9. Elerud C, Craddock C, Fletcher S, Aulakh M, King-Casas K, et al. (2014) Neuroimaging after mild traumatic brain injury: Review and meta-analysis. Neurolimage Clin 4: 283-294.