

The Role of Imaging in Traumatic Brain Injury

Source: Produced by Victoria Tilney McDonough and Brian King

Video Link: <http://www.brainline.org/content/multimedia.php?id=3206>

Dr. Deborah Little: The role of imaging, especially in pediatric imaging, has been really underutilized, up until the present time. This is largely because the developing brain makes it a challenge for most standard imaging techniques because of this increase in myelination that occurs with development. The increase in myelination actually makes it very difficult to differentiate between different tissue types in the brain and so standard imaging with CT or MRI has done a really poor job at characterizing discreet or even subtle injuries in the brain.

And so within the past 10 years or so, with the advent of a new technology, newer technology called diffusion tensor imaging, we've come a long way into characterizing not only what's normal development but also then what's abnormal development. So the advantage of diffusion tensor imaging, or DTI, is it allows us to look at how water diffuses in the brain so we're made up of, you know, 98 percent water.

Our brain is no different than that and generally speaking. Water is restricted by the same tissues or same structures that you would have in the plumbing in your house. So water is free to run through a pipe but you're not going to see it leaking out of a pipe unless there's damage to that pipe itself. Our brain works the same way but instead of pipes they use white matter fiber tracts, which are coated in myelin, which is an insulation and also with axonal membranes and these two structures keep the water diffusing within the track itself, rather than going across it.

With brain injury and with normal development, you see an increase in myelin, which means the restriction of water increases as development increases, up to a point where it plateaus, somewhere around age 19 or 20, at which point we have a nice developmental curve for looking at myelination. And there's been some wonderful studies run by the national institutes of health that have started to create normative databases for what is, normal age related development, in myelin but it's the latest technology that's really pushed us to see imaging being useful, not just in adults or injury but just even in characterizing normal development.