What are the Latest Advancements in Imaging Techniques for Traumatic Brain Injury?

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Dr. Deborah Little: Magnetic resonance spectroscopy is a very old technique. It's actually the first type of technique that was used in MR imaging. It's not in itself an imaging technique so you don't get a picture. You're not seeing an image of the brain. Instead what you get is a measure of biochemistry of the tissue that's in the brain. So we can look at whether neurons are dying or whether axons have been damaged, whether there's inflammation.

It's not reimbursable so it's rarely used in clinical practice. It's virtually all being used in research but it's still one of these techniques that really gets at what's happening to the tissue without us having to do a biopsy. Now biopsies are necessary in most points of time and MR spectroscopy is only useful in certain areas of the brain but it's one of the more exciting. But beyond magnetic resonance imaging there are new techniques in what we consider the imaging world including optical coherence tomography.

So this is a relatively new technique that allows us to look at blood flow, both you know relatively close to the edge of the brain and looks at both blood that's been oxygenated and also deoxygenated blood. So as neurons fire they take up blood, they use the oxygen so you get this rush of both oxygenated and deoxygenated blood. The advantage of this is we get a really fast time course of looking at how the brain functions. The downside is it only goes about 2 inches into the cortex so it limits what we can do.

Functional magnetic resonance imaging is another technique that's being widely used in research, especially in, well in brain injury among pretty much every other disease you can think of. Functional imaging uses the same MRI systems that are standard, structural, clinical imaging is using or are using and looks at the time course of blood flow to certain areas of the brain. So for example, if you open and close your right hand, within about 5 seconds you see an increase in blood flow to areas in the left motor cortex. We can measure this because it actually changes the amount of iron saturation in the brain so we can localize this. Right now for clinical purposes, it's being used predominately for pre-surgical planning but there have been widespread differences shown between TBI and controls.

At this point it's really used to differentiate between groups of patients so it's not as useful on the single patient level but it's one of the applications that's really being pushed forward to look at function.