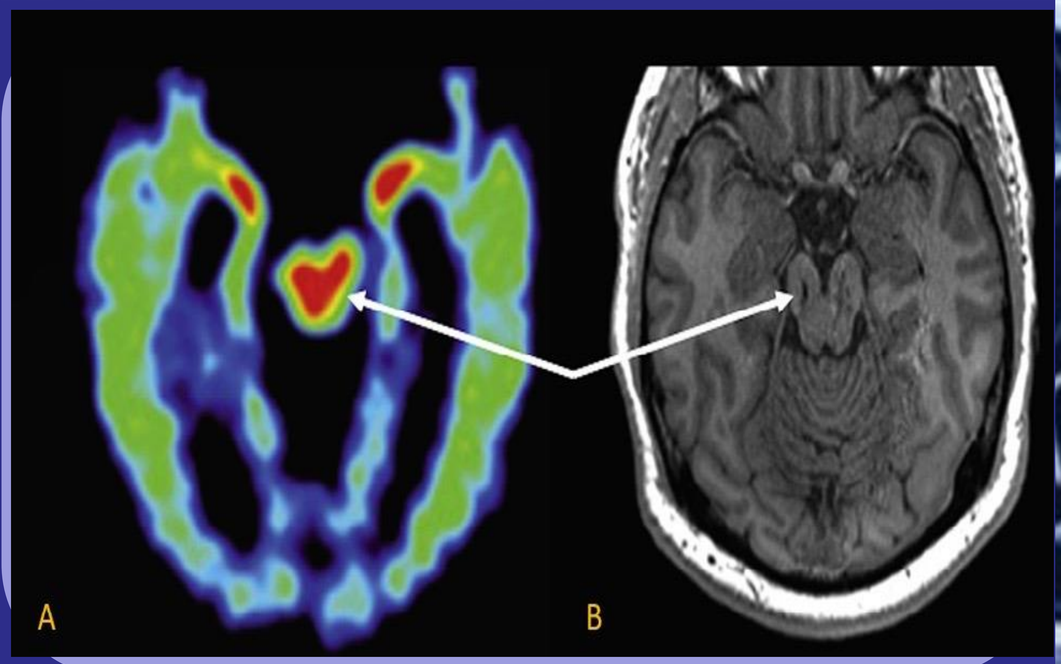
The Effects of CTE On The Brain

34

Introduction

Chronic traumatic encephalopathy is caused by repeated hits to the head. The disease mostly forms in football players and boxers. “Each year there are approximately 1.6 million to 3.8 million concussions in the United States (Cantu et al. 2015 p.312). Research has discovered ways to possibly diagnose chronic traumatic encephalopathy before death. Some of these ways are functional magnetic resonance imaging, diffusion tensor imaging, positron emission tomography, volumetric MRI, and fluid biomarkers.



Conclusion

In conclusion, CTE is a serious disease and a serious threat to people that have it or could easily get it playing contact sports. Thankfully with the improvement of technology there will be a way in the near future that doctors can diagnose CTE before the person dies from it. Also, with the advancement in technology, the doctors may not be able to cure it right away but hopefully they will be able to find a way to slow the progression of the disease.

Functional Imaging

Functionalmagnetic resonance imaging(fMRI) uses a blood-oxygen-level dependent to measure the amount of neural activity in the parts of the brain that are affected by CTE (Cantu et al., 2015). It does this by measuring the contrast between oxygenated and deoxygenated blood, which indirectly measures the neural activity in different areas of the brain. When running these tests on different patients, they had some patients who have never had a head injury and former and current athletes with a history of head trauma (Cantu et al., 2015). Functional connectivity analysis is the study of multiple parts of the brain at the same time. Doctors do this to check the connectivity of the different portions of the brain that should be sending signals to each other.

Diffusion Tensor Imaging

Diffusion tensor imaging (DTI) is another way for doctors to run tests on a patient’s brain to test for CTE, even though DTI reads fluid biomarkers in the brain it is a noninvasive procedure. DTI is a noninvasive technique that uses MRI to measure the amount of fluid diffused through the brain (Cantu et al., 2015). They do this to measure the water that is diffused across the axons to see if there is a disruption or to see if any axons are demyelinated. The demyelination of an axon can either increase the rate of diffusion or it can change the direction of diffusion. By changing the direction of diffusion, the DTI test will show this change to the doctors and they will get a general understanding of what is going on in the brain. With CTE, doctors have found that within the white matter of the brain, there has been an increase in mean diffusion and a decreased fractional anisotropy.

PET Scan

Positron emission tomography (PET) uses nuclear imaging and it detects radiolabeled tracers (Cantu et al., 2015). PET also measures the differences in metabolism by using, “2-deoxy-2-(18F)-fluoro-D-glucose” (Cantu et al., 2015 p. 322). The biggest advantage is by imaging the brain after injecting the tracer, there has been clues to where CTE may be present. The most effective p-tau tracer that they have made is called [18F]-T807 (Cantu et al., 2015). This has been the most effective one so far because it has a high selectivity rate and a high affinity rate for p-tau (Cantu et al., 2015). Before the [18F]-T807 tracer was made it was difficult to use different tracers because they would bind to a lot of other proteins besides the ones being targeted.

References

1. Cantu, Robert C., Corp, Daniel T., Montenigro, Philip H., Stein, Thor D., Stern, Robert A. (2015). Chronic traumatic encephalopathy: historical origins and current perspective. *Annual review of clinical psychology*. Retrieved from http://library.clarksoncollege.edu:2417/ehost/detail/detail?vid=3&sid=85ace7d9-086b-49a1-81ea-e75b8b2a5f26%40sessionmgr4008&hid=4114&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=109716286&db=ccm

2. Blennow, Kaj, Dekosky, Steven T., Ikonomovic, Milos D., Gandy, Sam. (2016). Acute and chronic traumatic encephalopathies: pathogenesis and biomarkers. *Nature reviews neurology*. *9*. 192-200. Retrieved from http://library.clarksoncollege.edu:2417/ehost/detail/detail?vid=20&sid=2f1f25b5-2f254262-8e5798d081e0021e%40sessionmgr4010&hid=4114&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=108002286&db=ccm

3. DeKosky, S.T., Dickstein, D. L., Gandy, S., & Pullman, M. Y. (2017, May). Antemortem biomarker support for a diagnosis of clinically probable chronic traumatic encephalopathy. Retrieved September 24, 2017, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5415635/

4. Goldberg, Jamie. (2017). Study finds cases of CTE and Alzheimer’s in former pro soccer players. 4. Retrieved from http://library.clarksoncollege.edu:2417/chc/detail?sid=8b704398-6748-461f-911e00e868f8ae3f%40sessionmgr4010&vid=15&hid=4114&bdata=JnNpdGU9Y2hjLWxpdmU%3d#AN=2W61680474713&db=cmh