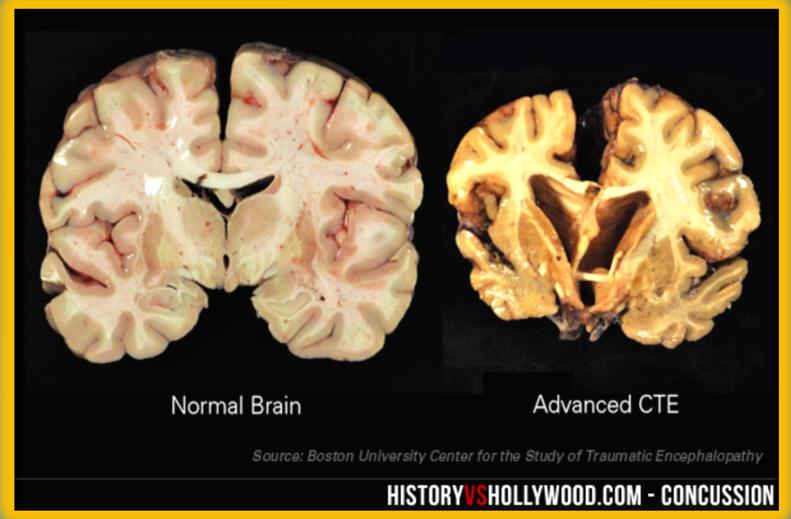
Concussions and Chronic Traumatic Encephalopathy

Introduction

Sports related concussions are an epidemic in this country and more than three million concussions happen every year [5]. A concussion is caused by a blow to the head and is categorized as a brain injury. Computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET) are all imaging modalities that are used to aid in the diagnosis of concussions. A repeated amount of concussions over a period of time can cause a person to develop chronic traumatic encephalopathy (CTE)[5]. CTE is an incurable neurodegenerative disease that causes progressive brain damage and is mostly found in NFL players[1]. CTE has yet to be diagnosed before a person is deceased and researchers are currently working on finding the best imaging modality to use. PET scan, susceptibility-weighted imaging (SWI), and diffusion kurtosis imaging (DKI) are among the few modalities that may be able to diagnose this disease.



Imaging CTE

Positron Emission Tomography (PET)

- Used to look for deposits of tau trapped in the brain.
- Researchers are trying to develop PET markers that can detect tau abnormalities[3].

Susceptibility-weighted imaging (SWI)

- Can detect microbleeds
- Microbleeds should not be present in people under 60.

Diffusion kurtosis imaging (DKI)

- DKI detects changes and normal development in neural tissues [6].
- It measures water inside the brain cells and allows researchers to measure abnormalities in white matter[6].

Imaging Concussions

Computed Tomography (CT)

- CT is the standard test to image the brain after an injury.
- Takes pictures in slices and shows if there is bleeding or a fracture.

Magnetic Resonance Imaging (MRI)

- MRI is used to identify changes in the brain and evaluate any further injuries[4].
- MRI uses powerful magnets and radio waves that help to produce a detailed image of the brain[4].

Positron Emission Tomography (PET)

- PET scan is an imaging technique used to diagnose a subtle brain injury[2].
- Functional imaging test
- A special dye is put into a vein that helps to visualize organs in the body.

Case Study

A study was performed on 200 deceased football players to see how many of them died because of having CTE. This study consisted of high school, college, and NFL football players. CTE was detected in 90 percent of the college, players, 20 percent of high school players, and 110 out of 111 NFL players[7].

Conclusion

Extensive research is currently being done to detect CTE before death and to detect concussions as soon as they happen in sports. CTE has proved to be fatal and is continuing to take lives. These lives are usually those of previous NFL players. Scientists are developing ways to prevent concussions in hopes that this will lead to fewer people developing CTE.

References

1. Boodman, E. (2016). Concussion researchers spark hope with new tool to diagnose brain damage. *Stat News.* Retrieved from https://www.statnews.com/2016/09/27/cte-diagnosis-concussion/
2. Johnson, G (2017). *PET Scan after Concussion* – The most sensitive for subtle brain injury. Retrieved from http://subtlebraininjury.com/pet-scan-after-concussion/
3. Mayo Clinic Staff. (2016). *Chronic traumatic encephalopathy.* Retrieved from http://www.mayoclinic.org/diseases-conditions/chronic-traumatic-encephalopathy/basics/tests-diagnosis/con-20113581
4. Mayo Clinic Staff. (2017). *Concussion*. Retrieved from http://www.mayoclinic.org/diseases-conditions/concussion/diagnosis-treatment/diagnosis/dxc-20273161
5. Medicalnews.net (2012). *Common misconceptions about brain and severity of head injuries.* Retrieved from http://www.news-medical.net/news/20120218/Common-misconceptions-about-brain-and-severity-of-head-injuries.aspx
6. Tanner, L. (2017). *CTE FAQ: How repeated head blows affect the brain.* Retrieved from http://www.nbcdfw.com/news/sports/How-Repeated-Head-Blows-Affect-Brain--442984703.html
7. Laskas, Jeanne. (2016). *Normal brain vs. brain with CTE* [Photograph]. Retrieved from http://www.historyvshollywood.com /reelfaces / concussion/