Title
Grey Matters: How controversial and drastic neurosurgeries have contributed to our knowledge of the brain

Permalink
https://escholarship.org/uc/item/0mt2w8m0

Journal
Berkeley Scientific Journal, 16(2)

ISSN
1097-0967

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Publication Date
2012

Undergraduate
Transcripts of the ancient philosophers tell us that early man often wondered if the human mind was not more complex than the physical brain. It was thought that there existed a soul component to the human body that separated man from animal. Thousands of years later, mankind is still grappling with the same questions. Moreover, what we have learned about the physiology and development of the brain since ancient times has only increased the depth and breadth of the questions we ask. Surprisingly, the destruction of the brain has played quite a role in our understanding of human life. It wasn’t until we started destroying brains to save people that our rigorous attempts to answer questions started bearing tangible fruit.

Trepanned skulls, or skulls with holes drilled through to the outermost layer of the brain, the dura mater, have been found at a number of ancient sites spanning multiple continents including modern day Europe, and South America. These findings date back to as early as 2000 B.C. The trepanations themselves span from centimeters in diameter to the size of half of the skull. Scientists and anthropologists alike hypothesize that ancient peoples performed such surgeries as medical cures for headaches, seizures and the like. Some also propose that trepanation might have been seen as a method for removing evil spirits from the body. (“An illustrated,” 2008). Both theories have valid supporting arguments, and we will never know for sure what the reasons for trepanation were.

“destruction of brain structures can result in newer and stronger brain”

Fast forwarding to more recent history however, in 1848, Phineas Gage, a railroad worker, had a work-related accident that resulted in metal rod going through the frontal lobe of his brain. Doctors removed the rod to the best of their ability, and Gage, surprisingly, survived. But the damage done to the frontal lobe of his brain caused him to have significant behavioral changes. Friends who previously described him as being organized and dependent did not recognize the man that came out of the accident. The post-accident Gage was described as lacking the ability to formulate and carry out complex plans, and as being unreasonably belligerent and profane. Some accounts even claim that Gage began molesting children post-accident (Costandi, 2010). Scientists of the era were able to hypothesize the functions of the frontal lobe, based on the type of changes that Gage underwent. These behavioral changes caused scientists of the era to realize that the mind and brain may be one and together, and that behavior may be encoded in the physical brain. This realization took society one significant step further to solving the mind-brain problem, and was the basis for the neurosurgical experimentation of the 1900s. For example, in 1934, Antonio Egas Moniz, a Portuguese neurosurgeon performed 27 lobotomies and in 1949, he shared a Nobel Prize for developing the procedure. (“Moniz,” 1998) A lobotomy cuts connections to the anterior part of the frontal lobe. It was thought to cure people of tension, depression, schizophrenia, and the like.
His associate, an American named Walter Freeman, was performing up to 25 lobotomies a day by the year 1952. Freeman performed surgeries on patients as young as 12 years old with varying success. One of his many patients, H. M., an Unforgettable Amnesiac, Dies at 82 (2008). Instead, Molaion's memory was severely affected. He lost all memory previous to shortly before the surgery. In addition, he lost the ability to form new memories. In essence, he lost his living from moment. The interesting aspect of Molasion's resulting state was that while he could not formulate new memories and only had limited access to memories about his young adult life, he was able to learn how to perform motor actions, such as making coffee— even though he could not remember learning those actions. In other words, his procedural memory mechanisms were intact (Anderson, 2010). From Molasion's case, scientists and doctors were able to hypothesize that different types of memory were encoded in different parts of the brain and that the hippocampus isn't the center of all types of memory.

Thus, human history has seen the human brain sliced in an impressive variety of ways under the pretense of saving lives. Procedures that may, in retrospect, seem haphazard have laid the groundwork for the life-saving, highly effective techniques used today. Additionally, modern neurosurgeries have continued to constantly contribute to our understanding of the nature of the elucidating the mind. Neurosurgical procedures to cure epilepsy have become quite common-place and have been instrumental in this process.

Epilepsy is a relatively common neurological disorder. 50 million people worldwide, and 200,000 people in the US have epilepsy. Some people live with the symptoms for up to 20 years before being clinically diagnosed and treated (Bardi, 2011). Genetic predisposition and head trauma are just a couple of the numerous causes underlying the condition, and some patients may have distinct environmental triggers such as flashing lights, and loud noises. The symptoms of epilepsy are numerous, but the symptom that is typically considered to be the most hindering is the seizures. Many people take anti-convulsant drugs to prevent seizures, but when this is ineffective, surgery may be required to remove the critical portions of the brain where the abnormal neuronal firings that cause the seizures and other symptoms are occurring. (Weiner, 2004)

An often referred studied epileptic is Henry Molaion, more commonly known as H.M. At age 9, Molaion suffered from a falsely innocuous brain injury caused by running into a car while riding his bicycle. However, as a result of this injury, Molaion began to experience severe seizures, and his general intelligence hindered. When he was 27 years old, in order to give him a normal life (Carrey, 2008), instead, Molaion's memory was severely affected. He lost all memory previous to shortly before the surgery. In addition, he lost the ability to form new memories. In essence, he lost his living from moment. The interesting aspect of Molasion's resulting state was that while he could not formulate new memories and only had limited access to memories about his young adult life, he was able to learn how to perform motor actions, such as making coffee— even though he could not remember learning those actions. In other words, his procedural memory mechanisms were intact (Anderson, 2010). From Molasion's case, scientists and doctors were able to hypothesize that different types of memory were encoded in different parts of the brain and that the hippocampus isn't the center of all types of memory.

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