Frontal lobotomies and Darwinism—an example of harm to life and health

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The history of the surgical practice called lobotomy today was reviewed. The theory concluded certain undesirable aggressive behaviours were due to the influence of our primitive reptile brain we inherited from our reptile evolutionary ancestors. The solution was an attempt to separate the more primitive brain from the more advanced part of the brain to reduce its influence. The procedure was popular not only in America, Great Britain, and Europe, but also Japan. Although some attempts were successful, in many cases it did more harm than good. Furthermore, the treatment's longevity was disappointing and it had to be replicated, sometimes four or five times. The development of various psychotropic drugs, plus an unacceptable number of failures, forced its abandonment.

The frontal lobotomy procedure was a form of brain surgery based on the evolutionary belief that, as the brain had evolved in primates, the new parts evolved on top of the older brain parts, later called the 'reptile brain'.[1] The term lobotomy is from the Greek *lobos*, meaning lobe (in this case of the brain), and *tomos*, meaning to cut. A frontal lobotomy is thus an attempt to surgically 'cut off' the frontal lobes, especially the very front parts, from the underlying ('less evolved') portions of the brain. It also became known as frontal leukotomy (or leucotomy) from the Greek for 'white', because what was being cut were the connecting fibres between the two, which run in the so-called 'white matter'. (The 'grey matter' in the cortex contains the actual nerve cell nuclei.) The theory was that separating the reptile brain, which was supposedly responsible for 'more primitive' behaviours such as aggression and general emotional behaviour, from the newer brain, the frontal lobes, could reduce such 'reptile' behaviour.[2]

Thus was born the era of surgical lobotomy, which ended only in the late 1960s.[3] In its heyday, "many of the era's most important medical figures—neurosurgeons, neurologists, psychiatrists, physiologists, and others—lent their support" to the procedure.[4] This history illustrates that medicine sometimes drew as much on cultural ideas, such as evolution, as it did on such things as clinical experience, clinical trials, and (animal or laboratory) experimentation.

The history

On 13 September 1848, a 25-year-old railroad worker named Phineas Gage was struck in the head with a 43-inch-long iron tamping bar used to break up rock. The pointed 3 cm (1.25 in) diameter bar was driven completely through his head, destroying much of his brain's left frontal lobe. Specifically, the iron bar entered the left side of his face, continuing upward behind the left eye, through the left side of the brain, and out of the top of the skull through the frontal skull bone. Considering the damage the bar caused, it was amazing Mr Gage survived the accident. The injury's reported effects on his personality and behaviour were dramatic. Overall, he became less aggressive, and far more placid and introverted.[5] In short, he was emotionally flat; both positive and negative emotions had been lost.[6]

A few years later, French surgeon and committed Darwinist Paul Broca (figure 1) concluded, partly on the basis of the famous Gage case, that the prefrontal lobes (the portion at the very front of the frontal lobes) must be the part of the brain that separated humans from lower animals during evolution.[7] Broca was fascinated by evolution and its implications for brain study, and he once remarked: "I would rather be a transformed ape than a degenerate son of Adam."[8,9]

The result of Broca's insight was that researchers on mental illness attempted to surgically separate the parts of the brain that they believed had evolved recently from the parts we had supposedly retained from our ancient reptile ancestors. If Broca and others involved in this history had believed in the creation account that the human brain was created perfect, it is unlikely that they would have concluded that separating sections of it would result in a helpful treatment for the various (post-Fall) problems which they attempted to ameliorate by way of a lobotomy.

The reptilian brain complex

The structures derived from the floor of the human forebrain during early foetal development were labelled as the reptilian brain complex. The term derives from the

Figure 1. Paul Broca (1824–1880) was a major anatomist who specialized in brain research. He discovered the function of what is now called Broca's area, a brain region in the frontal lobe of the dominant hemisphere, usually the left, with functions linked to language.

idea that comparative neuroanatomists once believed that reptile forebrains were dominated by these structures. It was proposed that this 'reptilian brain' was responsible for the instinctual behaviours involved in physical aggression, emotional outbursts, agitation, dominance, territoriality, and, in short, reptile-like personality traits.[10]

One of the first persons to attempt to apply some limited research on the reptilian brain to humans was Professor Gottlieb Burchardt. He did this by attempting to replicate Phineas Gage's accident in six schizophrenia patients confined at the Neuchâtel asylum in Switzerland. Of the six, all whose condition was deemed to be incurable, Burchardt declared the four survivors greatly improved or even cured.[11] He reported the results at a Berlin medical conference in 1889, which influenced others to attempt to replicate his results. Professor Burchardt is now considered the founder of psychosurgery, the use of surgery to treat psychiatric problems.

One person who replicated Burchardt's work was Portuguese surgeon Egas Moniz (1874–1955; figure 2). Moniz attended a talk at the Neurological Congress in London by Yale physiologist John Farquhar Fulton and his psychologist colleague, Carlyle Jacobsen, both professors very familiar with the Gage case. In their talk, they reported on the frontal lobotomies of chimps involving surgically isolating all of the connections between the prefrontal brain lobes and the rest of the brain.[12] Fulton, it seems, was primarily interested not in the treatment of mental illness, but in brain evolution based on the belief that evolution had added newer brain structures to older, more primitive ones later called the reptile brain.[13]

The researchers claimed the surgery made the monkeys calmer, more cooperative, and even passive. Previously they had resisted being restrained, and had exhibited 'frustrational behaviour' if not rewarded due to failing to perform appropriately in various experiments they were forced to endure. But no longer, it seemed, though remaining friendly and alert.[14]

In 1936, from what he learned by reading the work of the Yale professors, including Fulton, Egas Moniz introduced a surgical operation he called prefrontal leucotomy (i.e. cutting of the brain's 'white matter', which represents its connecting fibres), which after his initial experimentations he used in the treatment of schizophrenia and other mental conditions. At this time, no treatment existed that could ameliorate the major symptoms of this baffling disease. The operation, later called prefrontal lobotomy, consisted of incisions that destroyed connections between the prefrontal region and other brain parts. Moniz first tried out the technique on a female patient. He drilled holes in her head, then injected alcohol into the holes to destroy the white fibres connecting the frontal lobes to the rest of the brain.

Moniz concluded the operation was a success, but eventually abandoned the injection technique and instead used a knife to sever the connection between what evolutionists declared was the more evolved frontal cortex and the allegedly primitive brain parts behind it. In 1936, Moniz published his findings in several leading medical journals, and also travelled to London to present his results to the general medical community.

In the words of Donald, Moniz was skilled at "presenting the unpalatable in such a way as to make it attractive" by referring to his "butchery as psychosurgery".[15] Moniz then proceeded to use his crude hacking on a variety of mental patients, all of whom he declared to be improved.[16] As he never did a proper follow-up study on his patients, his claims were at best irresponsible. Today, we realize his patients replaced one set of symptoms for another set. They replaced their aggression and irritability with sluggish, disoriented, even moribund inhibition. Some were reduced to vegetative states, and some died of cerebral haemorrhaging.[17]

Soon, Dr Walter Freeman (figure 3), a physician at St Elizabeth's Hospital in Washington D.C., learned of Moniz's allegedly wonderful results and began his aggressive

campaign to lobotomize in the name of science what turned out to be several thousand Americans. His first victim was Alice Hammatt, who was treated in 1936 after being given the choice of being locked in an asylum for the rest of her life or being lobotomized.

Freeman soon experimented with a faster method to lobotomize, namely to insert an (actual!) ice pick via a few mallet taps through the top of the eye socket, move it around, and thereby sever the connection between part of the frontal cortex and the rest of the brain. This method, called a transorbital lobotomy, was used on thousands of persons by Freeman. Among its advantages was that he did not have to bore a hole through the thick skull bone, but only had to puncture a small hole behind the eyeball where the skull was very thin. All of the previous methods described thus far were not only somewhat crude, but often affected very different parts of the brain. Freeman hoped the transorbital method would lend some consistency to the often very imprecise procedure. Best of all for its enthusiasts,

> "… ice-pick lobotomy could be done by anyone with a strong stomach, and, even better, it could be done anywhere. Freeman carried his ice pick in his pocket, using it on one occasion to perform a lobotomy in a motel room. A cheap outpatient procedure, the ice-pick lobotomy became a common psychosurgical choice in state hospitals across the country."[18]

Freeman's most famous case was 23-year-old Rosemary Kennedy, the oldest sister of former US president John F. Kennedy. She underwent a prefrontal lobotomy in an attempt to control her sometimes extreme emotional outbursts, which may have resulted partly from the family's attempt to control her behaviour. To help her have a more peaceful and productive life, the experts recommended the procedure to her father Joseph. After the surgery, Rosemary was left with the mental capacity of a toddler, unable to walk, form a sentence, or follow simple directions. She was able to relearn some basic skills, but never fully recovered. Instead, the surgery left her mentally and physically incapacitated for the rest of her life.

Lobotomy was used to treat not only the mentally ill, but also the criminally insane, and some claim was even used to 'cure' political dissidents.[19] The use of lobotomies began to decline only in the mid to late 1950s. Although critics of the technique always existed, opposition eventually became fierce because of the many failures and mixed results. Some patients did fairly well, many others did not. Most importantly, phenothiazine-based neuroleptic (anti-psychotic) drugs, such as chlorpromazine, became widely available. These were much more effective than psychosurgery, thus the surgical treatment method was soon superseded by chemical treatment.

Freeman was finally banned from operating only in 1967, after one of his long-term patients died from a brain hemorrhage following her third Freeman lobotomy, and no true lobotomy has been performed in the United States since then. The total number of persons lobotomized by Freeman alone was close to 3,500.[20] During the 1940s and 1950s, lobotomies were performed on close to 50,000 patients in the United States, and around 17,000 in Western Europe, including 4,500 in Sweden.[21,22] Most were women and some were children as young as four.[23] How many of these died prematurely from the operation is unknown, but the number is significant, estimated at 1.5–6 %.[24] Common serious problems included severe hemorrhaging, brain seizures, loss of motor control, partial paralysis, huge weight gains, and intellectual and emotional malfunction.[24] Almost all were seriously affected mentally in some way, some very adversely as was Rosemary Kennedy.

Figure 2. Professor Egas Moniz (1874–1955), a Portuguese neurologist and founder of the psychosurgery field. He invented the technique now called frontal lobotomy, for which he received the Nobel Prize in 1949 for his work in this area.

Amazingly, the 1949 Nobel Prize in Physiology or Medicine was given to Egas Moniz "for his discovery of the therapeutic value of leucotomy in certain psychoses"—a treatment that was considered then as "one of the most important discoveries ever made in psychiatric therapy".[16]

The sometimes-severe adverse effects of the procedure were known from the beginning of the technique's use. Even the early research by the Yale professors reported that their

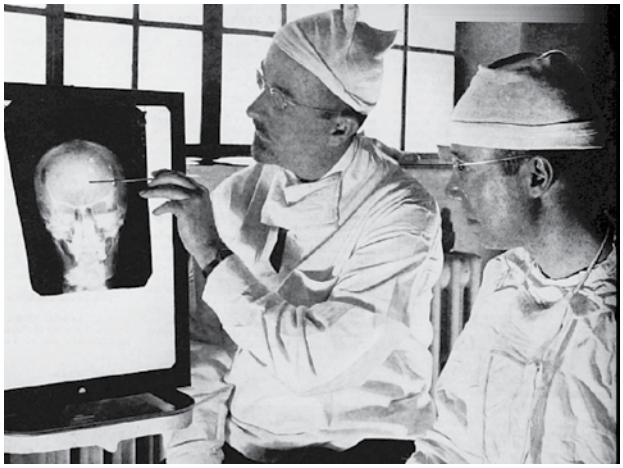

Figure 3. Dr Walter Freeman (1895–1972), left, examining an X-ray before psychosurgery—the cutting of the brain in an attempt to remove 'undesirable aggressive behaviours'.

monkey subjects often lost both ambition and their drive to succeed in the various tasks in which they were involved.

A major reason for eventual growing opposition to the technique, besides the high failure rate and the fact that better chemical treatment techniques became available, was that it did not seem to matter much specifically where or how the cuts in the brain were made. The results were often fairly similar. If there was a reptile brain area that could be separated from the more evolved brain, and if this was the basis for the therapeutic results claimed, the cuts would need to have been made specifically in the area connecting the two. Since it did not seem to matter much where the cuts in the cerebrum were made, this was evidence that was clearly inconsistent with the whole evolution-based concept justifying lobotomy in the first place.

The researchers also found that the positive effects of treatment were often only temporary, and most of the patients relapsed in time, indicating that the damage caused by the treatment was either being repaired or other parts of the brain were taking over those functions lost by the treatment.[25]

Another problem was that the same protocol helped some patients and hurt others. Brain researchers also increasingly concluded that the separate parts of the cerebral cortex are like a symphonic orchestra; each part contributes to the whole, but the music can still sound great even when some parts are missing.[26] In the case of a hemispherectomy (removal of half of the brain, which can sometimes be the only option for severe epileptic seizures), if completed when the patient is young, the remaining hemisphere can largely compensate for the half removed, often with only minor issues with walking.[27,28] Furthermore, children born with only a half or less of the cerebral cortex can almost totally compensate for the loss. This has been documented by twin studies, in which one has a normal brain, and the other has a large percent of the cerebral hemisphere missing.[29]

These observations do not deny that some specific brain parts are critical for certain functions, such as Broca's area being responsible for controlling motor functions involved with speech production. Many patients who have damage to this brain area can generally understand words, but struggle to assemble and express them so as to be able to effectively communicate.

The triune brain

The idea of the 'triune brain' was popular for some time. It proposed that three brain levels existed, the innermost being the reptilian brain, next the palaeo-mammalian complex (the limbic system), and the outer layer was the neo-mammalian complex (the higher-level brain, or neocortex).[30] According to this theory, these structures were sequentially added to the forebrain during the course of evolution.

The brain research noted above on hemispherectomy was critical in demolishing both the triune brain theory and reptile brain theories, as well as the core idea behind the lobotomy procedure. Removal of specific structures, such as by the use of stereotactic surgery with gamma radiation to ablate a cancerous pituitary, is done with a high level of precision to treat a very specific condition. But damage to the cerebrum as done by a lobotomy was often worse than a failure to help improve the patient—the patient was worse off than before the treatment for the reasons noted above.[31]

Other practitioners proposed surgical treatments based on the opposite theory—that the frontal lobes *are* the problem, not the so-called primitive less-evolved brain beneath. Evolutionists contend that humans have the most evolved frontal lobes in the entire animal kingdom, and they reasoned that aggression and other mental problems emanated from these, and so could be ameliorated by separating the frontal lobes from the rest of the brain. This would reduce the influence of the most evolved part of the brain.[32] After all, hadn't Darwin reasoned that humans were one of the most aggressive of all animals?

Outcome

The triune and reptile brain theories lost favour with most comparative neuroscientists in the post-2000 era.[33] The reasons include the fact that efforts to localize the reptile brain failed, and that the hoped-for results of psychosurgery never materialized.[34] Even though the evolutionary assumption was generally retained, it was not surprising that the focus of treatment became success, i.e. health improvements in the sufferers of mental illnesses.[35] Meanwhile, the damage done to countless patients before the procedure was finally abandoned was profound.

Conclusions

The leading scientists involved in the lobotomy procedure accepted evolution, and experimental evidence seemed to show that a part of the brain was important in expressing so-called primitive emotions.

Consequently, their evolution lens on reality predisposed them to conclude that severing certain connections would produce a large reduction in these primitive emotions, and so would in their minds confirm their evolutionary conclusions.

Lobotomy is now only a very embarrassing part of medical history that we can look back on, wondering how and why it was ever largely accepted by both scientists and physicians.[36] Part of the reason was incorrect assumptions about brain evolution. As a result: "Aside from the Nazi doctor Josef Mengele, Walter Freeman ranks as the most scorned physician of the twentieth century."[37]

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