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### The History of Lobotomies: Examining its Impacts on Marginalized Groups and the Development of Psychosurgery

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Psychosurgery is commonly seen as the last choice for the treatment of mental disorders such as depression, schizophrenia, and even anxiety (Balon, 2004; Rück et al., 2003), typically occurring only when therapy and pharmacological interventions have repeatedly failed.

Unfortunately, and in part due to the stigmatization of psychosurgery, there is a significant lack of neurosurgeons, particularly in the United States. According to the Kenning (2016), there are less than 3,700 licensed neurosurgeons in the United States, which has over 5,700 hospitals, equating to approximately 0.65 neurosurgeons for each hospital in the United States.

Despite this disparity, psychosurgery is an essential medical facet of the mental health field. In contrast, past centuries have seen an abundance of psychosurgical practices from trephination, which took place thousands of years before the common era, to stereotactic surgery, which takes place presently (Faria, 2013a; Faria, 2013b; Kucharski, 1984). More than any other procedure, however, the lobotomy impacted the medical community and society as a whole. In the early days of psychosurgery (i.e., the mid-20th century), lobotomies significantly marginalized certain populations and ultimately ruined countless lives given unethical patient treatment by today's standards and the lack of informed consent from vulnerable individuals.

However, contrary to other psychosurgical procedures, lobotomies gained much attention outside the medical community and became very popular from the 1930s to the 1960s (Kucharski, 1984). Furthermore, unlike other psychosurgical techniques, lobotomies indirectly influenced the development of various new procedures and guided psychosurgery toward an ethically appropriate practice to avoid past mistakes resulting from lobotomies (Faria, 2013b; Faria, 2013c; Mashour, Walker, & Martuza, 2005). This review article will address (1.) the history of lobotomies in terms of four different major eras, (2.) the marginalization and stigmatization of disadvantaged populations that lobotomies contributed to, and (3.) the medical and ethic-based developments that lobotomies may have indirectly contributed to, despite having led to numerous deaths and countless negatively impacted lives.

### **The History of Lobotomies The Burckhardt Era (1888 -1907)**

Contrary to popular belief, lobotomies were not first performed by Walter Freeman, who was dubbed *the Lobotomist* and attracted much media attention around the world between the 1930s and the 1960s due to his eccentricity and charisma (Caruso & Sheehan, 2017). Freeman may have popularized lobotomies more than any other scientist; however, many others conducted lobotomy-like procedures before Freeman. The first known lobotomy-like procedures on humans took place in 1888 and were performed in Switzerland by Swiss psychiatrist Gottlieb Burckhardt on six schizophrenic patients (Kucharski, 1984;

Stone, 2001). At the time of his original experiment, Burckhardt was the superintendent of the Préfargier Asylum, a small psychiatric clinic in Neuchâtel, Switzerland. This asylum housed many violent and disruptive schizophrenic patients, who Burckhardt selected for his surgeries in hopes of alleviating their symptoms. Burckhardt's results displayed specific improvements; however, one patient died during the surgery, and the others faced post-operative aphasia and seizures. As this was the first time anyone had purposefully damaged a human brain in hopes of alleviating mental illness, Burckhardt's work was not accepted readily by the public and the medical community, who thought of Burckhardt's work as careless and irrational. Eventually, his research and Burckhardt himself were shunned from the medical community, which even went as far as ridiculing and disrespecting Burckhardt's research, even after his untimely death in 1907 (Stone, 2001). At the time, Burckhardt's research was so shocking that it scared other researchers and the general public, which subsequently led to their dismissal of his work.

### **The Moniz Era (1935 – 1949)**

Given the negative results and perceptions of Burckhardt's research, psychosurgery as a whole was relatively unexamined for nearly four decades. However, interest in psychosurgery grew dramatically in the early 1930s (Boettcher & Menacho, 2017; Wind & Anderson, 2008). In 1935, American psychologists John Fulton and Carlyle Jacobsen presented a study at the Second International Neurological Congress in London. Fulton and Jacobsen's study examined the behavior of two chimpanzees who had become calmer and more cooperative following the removal of their frontal lobes. Attending this conference was Portuguese neurologist Egas Moniz, who desired recognition in the medical community and saw an opportunity to make medical history when he witnessed Fulton and Jacobsen's presentation. Moniz immediately began thinking about applying these methods to human subjects (Boettcher & Menacho, 2017; Faria, 2013a; Mashour et al., 2005; Stone, 2001; White & McGee-Collett, 2016; Wind & Anderson, 2008).

Moniz's ideology was that mental illness was due to *faulty wiring* and that mentally ill individuals could not get better by themselves. Therefore, he thought it was important to disconnect the prefrontal cortex from the rest of the brain in an attempt to *re-wire* these connections (Wind & Anderson, 2008). Following the conference in London, Moniz returned to Portugal and quickly partnered with Portuguese neurosurgeon Almeida Lima to begin planning the application of Fulton and Jacobsen's psychosurgery to human subjects. A few months later,

in Lisbon, Portugal, Moniz and Lima performed their first attempt at lesioning the prefrontal cortex from the rest of the brain by injecting pure ethanol into the prefrontal cortex's white matter, which led to neuronal death and subsequently left the prefrontal cortex disconnected. Moniz and Lima claimed that their patients were calmer after this procedure; however, perhaps confounded with these claims, patients' emotional affect was unnecessarily weakened. Moniz and Lima did not use this method extensively as they found it to be unpredictable, unreliable, and difficult to control.

Following these unsuccessful early trials involving ethanol injection, Moniz designed what he named the *leukotome* (i.e., a metal rod with a loop at one end). This tool allowed him to use a completely different approach, characterized by the drilling of holes in patients' skulls and the physical cutting of axons in the brain, which was found to be much more precise than the ethanol injections. Moniz and Lima coined this procedure the *leukotomy* (Boettcher & Menacho, 2017; Faria, 2013a; Kucharski, 1984; Mashour et al., 2005; Wind & Anderson, 2008).

Six months after the 1935 conference in London, Moniz and Lima published their first study reporting on the results of twenty leukotomies performed on mentally ill individuals. Their results suggested that seven individuals completely recovered from their illnesses, seven individuals displayed improvements, and that six individuals remained unchanged (Mashour et al., 2005; Wind & Anderson, 2008). Although this study featured a relatively small sample, the results fascinated the medical community as no patients regressed or died, which was normal for mental illness treatments during this era and had happened decades ago when Burckhardt first attempted human psychosurgery (Wind & Anderson, 2008). Moniz went on to win the 1949 Nobel Prize for Physiology and Medicine for these medical discoveries (Caruso & Sheehan, 2017; Faria, 2013a; Wind & Anderson, 2008). However, it is believed that Moniz's highly respected stature as an acclaimed neurophysiologist, rather than his medical work and research may have influenced his peers to nominate him for the prize (Caruso & Sheehan, 2017; Ögren & Sandlund, 2007; Valenstein, 1986; Wind & Anderson, 2008).

### **The Freeman Era (1936 – 1971)**

Shortly after Moniz and Lima's initial study, Walter Freeman became interested in psychosurgery. Unlike Moniz and Lima, Freeman was not a licensed neurosurgeon, but as a physician. The majority of Freeman's training had been in neurology with a particular interest in neurosurgery; therefore, he was fairly familiar with psychosurgery and neuroanatomy.

Throughout his career, Freeman held various faculty positions in the United States. In 1935, Freeman recruited American neurosurgeon James W.

Watts to his practice at George Washington University, where Watts later became Freeman's partner for the earlier portion of his lobotomy career (Boettcher & Menacho, 2017; Caruso & Sheehan, 2017; Faria, 2013a; Mashour et al., 2005; Valenstein, 1986; Wind & Anderson, 2008).

Even before performing lobotomies, Freeman was eccentric and enjoyed acting against authority and social norms. For example, Freeman submitted photos of a secret Yale University society to the New York Times during his undergraduate tenure at Yale. Further, he once had a patient with a ring stuck around his penis, which Freeman easily removed but refused to return, citing its value as medical evidence (but yet in actuality, he engraved his family crest into the ring and wore it on a gold chain around his neck for years). Later on, it became known that Freeman kept physical objects as memorabilia from all of his lobotomy patients, which happened to be thousands of individuals (Caruso & Sheehan, 2017).

Like Moniz, Freeman initially used pure ethanol to elicit neuronal death and eventual lesioning of the prefrontal lobe, but quickly stopped when he realized it led to undesirable results. Thus, he began experimenting with Moniz's leukotomy method by removing corings from patients' frontal lobes; however, he ended up losing his surgical license when one of his patients died during an operation (Caruso & Sheehan, 2017; Faria, 2013a).

Following their non-successful early trials, Freeman and Watts eventually developed a method called the *prefrontal lobotomy* in which they ceased the removal of prefrontal tissue and instead severed the connections between the prefrontal lobe and the thalamus. Freeman and Watts performed their first prefrontal lobotomy on a depressed woman in 1936 in Topeka, Kansas, despite her attempts to withdraw consent for the surgery (Boettcher & Menacho, 2017; Caruso & Sheehan, 2017; Wind & Anderson, 2008). Upon waking up, the woman was in good spirits, but began to experience language difficulties, disorientation, and agitation less than a week after the surgery (Caruso & Sheehan, 2017).

After a few years of performing prefrontal lobotomies with questionable levels of consent, Freeman learned of a method called the *transorbital lobotomy* from Italian psychiatrist Amaro Fiamberti. This method ultimately allowed Fiamberti to enter the skull through a patient's eye socket using an *orbitoclast* (i.e., a modified icepick). This was of major interest to Freeman as it would allow him to perform his surgeries without drilling holes through his patients' skulls (Boettcher & Menacho, 2017; Caruso & Sheehan, 2017; Faria, 2013a).

Freeman copied Fiamberti's method, allowing him to perform lobotomies without the presence of a surgeon (Boettcher & Menacho, 2017; Caruso & Sheehan, 2017; Mashour et al., 2005). Furthermore, Freeman believed that this new method also increased the precision of his lesioning, which he thought was

important, believing that different mental illnesses required different and precise lesions. For example, Freeman claimed that he lesioned the anterior portions of the prefrontal cortex of individuals with affective disorders and the posterior portion of the prefrontal cortex of individuals with schizophrenia (Faria, 2013a).

In 1942, Freeman and Watts published their first study reporting on the lobotomies of 200 individuals. The results displayed that 63% of the patients experienced improvements, 23% remained unchanged, and that 14% deteriorated or died in the process of the lobotomy (Caruso & Sheehan, 2017; Faria, 2013). Even though many did not improve, Freeman's lobotomies were seen as a good option for overcrowded hospitals and the general public, who had grown frustrated with the number of mentally ill individuals in their communities (Caruso & Sheehan, 2008; Faria, 2013; Kucharski, 1984).

Freeman eventually developed his techniques further, which were ultimately seen as forceful and unsterile, subsequently leading to a split with Watts (Caruso & Sheehan, 2017; Mashour et al., 2005). However, Freeman was still successful and became extremely popular on his own, going on to perform an estimated 4,000 lobotomies throughout his career. This excessive number was possible due to the fact that Freeman had become a "relentless crusader" and believed strongly in his technique. Further, even though the medical community resisted Freeman's gruesome and unsterile methods, his lobotomies were still viewed as a viable option and a last resort for patients who resisted initial treatment (Caruso & Sheehan, 2017; Faria, 2013a). There is no doubt that Freeman's number is excessive; however, the popularity of lobotomies is better grasped when considering the total number of lobotomies to have taken place in the United States and Europe between the 1930s and 1950s, estimated at approximately 60,000 (Faria, 2013a).

### **The Pharmacological Era (1952 – Present)**

In the 1950s, lobotomies became less and less prominent, and Freeman slowly lost his legacy (Caruso & Sheehan, 2017). In 1952, John Fulton, who had performed the prefrontal lobe removal on chimpanzees in 1935, announced the end of the lobotomy era (Faria, 2013a). In the following years, pharmacological treatments became more common and were seen as safer and easier options. Most notably, chlorpromazine and haloperidol, two antipsychotics, debuted in the United States in 1955 and 1967 respectively (Boettcher & Menacho, 2017; Caruso & Sheehan, 2017; Faria, 2013a; et al., 2005; Stone, 2001; Wind & Anderson, 2008), immediately affecting the frequency of lobotomies, concluding with Freeman's final and failed lobotomy in 1967, which led to the patient's death.

Concurrent with this, the media played a role in stigmatizing lobotomies and psychosurgeries, with movies such as *One Flew Over the Cuckoo's Nest*

(Caruso & Sheehan, 2017). The social environment of the time was rapidly losing support for the lobotomy, but despite this, Freeman went on to publish another study in 1971 featuring lobotomies on 707 schizophrenic individuals—for whom the experimental conditions were improved, yet 73% still had to be hospitalized or remained in a state of dependency following their surgery. This was the final end for Freeman's procedure, demonstrating its inherent lack of reliability (Caruso & Sheehan, 2017; Faria, 2013a) and increasing evidence of the maltreatment of primarily marginalized patients.

### **The Marginalization and Stigmatization of Lobotomies**

In order to truly understand why lobotomies persisted for nearly three decades as a primary form of treatment for mental illness, one must consider the context and the era in which lobotomies took place (i.e., the zeitgeist). Presently, it is difficult to imagine why lobotomies persisted for so long despite there being evidence of adverse side effects such as worsened conditions and even death. However, considering the zeitgeist allows for a greater understanding of this occurrence.

It has become fairly evident that lobotomies were performed on disadvantaged populations such as women, older adults, and especially the mentally ill, which undoubtedly further marginalized these groups of people. Additional evidence of this marginalization is demonstrated by the sheer number of women who underwent lobotomies—older women comprised the most common demographic to receive this treatment (Breggin, 1973; Mazure, Druss, & Cellar, 1992). As the people who received lobotomies were not in positions of power (i.e., financially stable, mentally healthy, and youthful men), they rarely had a voice in determining whether or not lobotomies would be performed. Contrarily, the individuals who *were* in positions of power were not affected personally; therefore, they often had no incentive to make a case against lobotomies.

Informed consent was not a concern for most lobotomists, especially Freeman (Caruso & Sheehan, 2017), parallel to the coercive use of other psychiatric treatments in history (e.g., shock therapy, psychotropic drugs) (Breeding, 2016). In fact, some lobotomy patients later publicly stated that they never provided consent prior to their operation and in many cases repeatedly expressed the fact that they tried to decline the lobotomy (Mazure et al., 1992). This exemplifies that disadvantaged people (i.e., women, older adults, and mentally ill individuals) were stigmatized members of society and were perceived to be in need of a cure by any means necessary, their consent subsequently not even sought by surgeons. This adds to the dehumanization that these populations faced, perceived as passive entities unable to make their own decisions. These factors may ultimately have contributed to the historical

persistence of lobotomy-based treatment.

Freeman's claim that different types of lobotomies treated different mental disorders was false, evidenced by the fact that individuals suffering from a wide range of mental illnesses (e.g., neurosis, anxiety, psychotic disorders) were all treated very similarly (Breggin, 1973). In essence, lobotomies were performed to cure anyone who displayed any symptoms that went against social norms of the era or were not appreciated by their communities—yet another reason as to why this form of treatment persisted for so long; it was perceived as a *cure-all*. Further, the general population had grown frustrated with the presence of mentally ill individuals in their communities and nearby asylums, leading to psychosurgeons' decision to simply treat mass amounts of mentally ill individuals in a desperate attempt to minimize mental illness in communities (Ögren & Sandlund, 2007). Lobotomies became an attractive option to both the general public and psychosurgeons as they were perceived as an immediate cure and an efficient way to eliminate mental illness (Faria, 2013a).

These factors, in conjunction with the lack of other treatment options, provides an explanation for the persistence and prominence of lobotomies between the 1930s and 1960s. In the end, it is evident that unethical and nonconsensual psychosurgery was problematic; however, considering the zeitgeist allows a better understanding of why this form of treatment persisted for so long. Furthermore, although lobotomies had many adverse impacts, it is necessary to discuss how they indirectly led to the development of many modern procedures by facilitating public outcry against their practice, spurring more accurate scientific research, and motivating firm ethical guidelines to be developed regarding the use of psychosurgery.

### **The Impact of Lobotomies on the Development of Psychosurgery**

Without a doubt, lobotomies had atrocious effects on disadvantaged individuals, casting a stigma on psychosurgery, psychology, and science as a whole. However, psychologists and neurosurgeons have since adapted their practices to ensure consensual, ethical treatment for the mentally ill, and some valuable medical knowledge was gained following the psychosurgical techniques described in this review, despite their horrific procedures (Mashour et al., 2005).

The lobotomy's core assumption that psychological functioning was related to specific areas of the brain, or localization of brain functioning, contributed to the way in which mental disorders are now treated. Evidence of this influence can be found by examining the methods of treatment used in different subdisciplines of the field today such as Cognitive Behavioral Therapy (CBT), arguably the most effective treatment of a variety of mental disorders today (e.g., depression and anxiety). Common modern therapies have been influenced by such controversial treatments as electroshock therapy and



lobotomies since these earlier forms of treatment demonstrated that behavior could be modified and that mental illnesses could be treated successfully in some cases. This does not mean that CBT was developed because of lobotomies, but that lobotomies provided an example of behavior modification, which may have influenced much more prominent forms of treatment such as CBT. Though lobotomies should be viewed as a dark era in the history of psychology and psychosurgery, the knowledge gained from the practice of lobotomies nonetheless played an important role in the development of psychological, psychosurgical, and neuroanatomical information, which ultimately led to the development of prominent biological and behavioral theories (Kurcharski, 1984).

The scientific knowledge gained from lobotomies also contributed to various other psychosurgical procedures (White & McGee-Collett, 2016). Furthermore, as psychosurgery's influence has expanded to a variety of subdisciplines in recent years, its medical basis can be historically linked to the performance of lobotomies, particularly in American psychosurgery (Wickham & Raz, 2014).

Unlike psychosurgery during the lobotomy era, psychosurgery now adheres to stricter rules in terms of informed consent, harm reduction, and careful planning. Furthermore, once a surgery begins, everything is now very closely monitored to make sure things are being done ethically. Perhaps most importantly, psychosurgery now requires informed consent from the patient, as opposed to the way that many lobotomies between the 1930s and 1960s were conducted. Lastly, all new and promising psychosurgical techniques are examined and considered to a greater extent now with the help of exploratory methods such as animal modelling (Mashour et al., 2005), in contrast to how Moniz immediately started performing surgeries on humans in 1935 after Fulton and Jacobesen's research on chimpanzees cued his interest (Boettcher & Menacho, 2017; Stone, 2001; Wind & Anderson, 2008).

In terms of present-day psychosurgery, neurosurgeons still use brain lesioning techniques similar to leukotomies and lobotomies. However, thanks to the development of stereotactic neurosurgical devices in the late 1940s, neurosurgeons are now able to be much more precise in their lesioning, which results in far fewer side effects. Further, unlike lobotomies, which were predominantly used as techniques to alleviate cognitive disorders (e.g., schizophrenia), psychosurgery is now a more common line of treatment for anxiety disorders (e.g., social anxiety disorder) (Faria, 2013b; Faria 2013c; Mashour et al., 2005). Specifically, some examples of current psychosurgical techniques are the *anterior cingulotomy*, which lesions the anterior cingulate and subsequently alleviates obsessive-compulsive disorder (OCD) symptoms (Faria, 2013c; Mashour et al., 2005). Similarly, the *subcaudate tractotomy* interrupts

connections between the frontal lobe and subcortical structures, and has been effective in treatment of OCD, anxiety, and depression (Faria, 2013b; Mashour et al., 2005). The anterior cingulotomy and the subcaudate tractotomy can also be combined for what is known as the *limbic leukotomy*, which is used to treat patients with more severe depressive disorders and OCD symptoms. Lastly, the *anterior capsulotomy* is another option for OCD patients in which the anterior limb of the internal capsule is lesioned. The anterior capsulotomy is often compared to the anterior cingulotomy and typically found to be more effective in terms of treatment; however, the anterior cingulotomy is associated with less side-effects and risk. Despite this, potential side-effects for the anterior capsulotomy are confusion, weight gain, depression, and sleep disturbances; thus, incomparably milder to side effects associated with earlier psychosurgical techniques such as the leukotomy and the lobotomy (Mashour et al., 2005). Thus, despite the atrocities that stemmed from the lobotomy era, current developments and practices demonstrate that valuable information was gained due to neurosurgeons' persistence and adaptation. Further, these techniques are not only more precise and empirically supported, but they are also highly scrutinized, psychosurgical techniques during the lobotomy era.

## Conclusion

Between the 1930s and 1960s, lobotomies were popularized by many individuals throughout the world using various methods. A historical organization of major lobotomy-related events demonstrates the negative impact on typically marginalized patients of the lobotomy movement. Women, older adults, and especially mentally ill persons were mistreated and were subject to non-consensual psychosurgery, which often led to worsening symptoms and death.

During the peak of the lobotomy era, it was presumed that mentally ill individuals could not get better on their own and that psychosurgery was the only option and cure. Thus, lobotomies became extremely popular even if they were highly unethical by today's standards. Although lobotomies directly marginalized individuals and ruined lives, their occurrence indirectly helped the development of new forms of clinical treatment, new areas of research, and the development of stronger moral and ethical standards. This highlights a certain dissonance between the major negative impacts that lobotomies had (e.g., marginalization of mentally ill persons and the stigmatization of psychosurgery as a whole) and the indirect positive outcomes that arose thanks to public outcry and gained knowledge (e.g., implementation of more ethical medical practices and more effective psychosurgical techniques). Although lobotomies had a major negative impact on psychosurgery, scientists have adapted from previous generations' mistakes and

now perform psychosurgery with knowledge, care, and ethical concern. Ultimately, lobotomies should always be considered as one of the most problematic and destructive eras in the history of psychosurgery and psychology. However, an emphasis on modern psychosurgery's adaptation from these past mistakes is also important.

The major shortage of neurosurgeons in the United States provides evidence for the continued stigmatization associated with psychosurgery, though psychosurgery is unrecognizable from those conducted in the lobotomy era. Unlike the lobotomy era, neurosurgery is now seen as a last-resort form of treatment when other practices repeatedly fail (e.g., clinical therapy and pharmacological interventions). Lobotomies were unethical, excessive, and certainly marginalized and mistreated certain populations, ultimately leading, paradoxically, to both worsened conditions and death, and to creating a negative basis upon which modern, ethical forms of psychosurgical treatment were built.

## References

- Balon, R. (2004). Developments in treatment of anxiety disorders: Psychotherapy, pharmacotherapy, and psychosurgery. *Depression and Anxiety, 19*(2), 63–76. doi: 10.1002/da.10149
- Boettcher, L. B. & Menacho, S. T. (2017). The early argument for prefrontal leucotomy: The collision of frontal lobe theory and psychosurgery at the 1935 International Neurological Congress in London. *Neurosurgery Focus, 43*(3), E4. doi: 10.3171/2017.6.FOCUS17249
- Breeding, J. (2016). Electroshock: On how and why it lingers on long after insulin coma shock and lobotomy are gone. *Ethical Human Psychology and Psychiatry, 18*(1), 58-73. doi: 10.1891/1559-4343.18.1.58
- Breggin, P. R. (1973). The second wave. *Mental Health, 57*(1), 10-13. Retrieved from <https://breggin.com>
- Caruso, J. P. & Sheehan, J. P. (2017). Psychosurgery, ethics, and media: A history of Walter Freeman and the lobotomy. *Neurosurgery Focus, 43*(3), E6. doi: 10.3171/2017.6.FOCUS17257
- Faria, M. A. (2013a). Violence, mental illness, and the brain - A brief history of psychosurgery: Part 1 - From trephination to lobotomy. *Surgical Neurology International, 4*(1), 49. doi: 10.4103/2152-7806.110146
- Faria, M. A. (2013b). Violence, mental illness, and the brain - A brief history of psychosurgery: Part 2 - From the limbic system and cingulotomy to deep brain stimulation. *Surgical Neurology International, 4*(1), 75. doi: 10.4103/2152-7806.112825
- Faria, M. A. (2013c). Violence, mental illness, and the brain – A brief history of psychosurgery: Part 3 – From deep brain stimulation to amygdalotomy for violent behavior, seizures, and pathological aggression in humans. *Surgical Neurology International, 4*(91), 1-12. doi: 10.4103/2152-7806.115162
- Kenning, T. J. (2016). *Neurosurgical workforce shortage: The effect of subspecialization and the case for shortening residency training*. Retrieved from <https://www.aans.org>
- Kucharski, A. (1984). History of frontal lobotomy in the United States, 1935-1955. *Neurosurgery, 14*(6), 765-772. doi: 10.1227/00006123-198406000-00022

- Mashour, G. A., Walker, E., & Martuza, R. L. (2005). Psychosurgery: Past, present, and future. *Brain Research Reviews*, 48(3), 409-419. doi: 10.1016/j.brainresrev.2004.09.002
- Mazure, C. M., Druss, B. G., & Cellar, J. S. (1992). Valproate treatment of older psychotic patients with organic mental syndromes and behavioral dyscontrol. *Journal of the American Geriatrics Society*, 40(9), 914-916. doi: 10.1111/j.1532-5415.1992.tb01990.x
- Ögren, K. & Sandlund, M. (2007). Lobotomy at a state mental hospital in Sweden. A survey of patients operated on during the period 1947-1958. *Nordic Journal of Psychiatry*, 61(5), 355-362. doi: 10.1080/08039480701643498
- Rück, C., Andréewitch, S., Flyckt, K., Edman, G., Nyman, H., Meyerson, B. A., ... & Åsberg, M. (2003). Capsulotomy for refractory anxiety disorders: Long-term follow-up of 26 patients. *American Journal of Psychiatry*, 160(3), 513–521. doi: 10.1176/appi.ajp.160.3.513
- Stone, J. L. (2001). Dr. Gottlieb Burckhardt - The pioneer of psychosurgery. *Journal of the History of the Neurosciences*, 10(1), 79–92. doi: 10.1076/jhin.10.1.79.5634
- Valenstein, E. S. (1986). Great and desperate cures: The rise and decline of psychosurgery and other radical treatments for mental illness. New York: Basic Books.
- White, R. T. & McGee-Collett, M. (2016). A portrait of prefrontal lobotomy performed at the Royal Prince Alfred Hospital in Sydney by Dr. Rex Money. *Australasian Psychiatry*, 24(5), 428-430. doi: 10.1177/1039856216635906
- Wickham, B. & Raz, M. (2014). Review of “The lobotomy letters: The making of American psychosurgery”. *History of Psychiatry*, 25(1), 128-130. Retrieved from <https://journals.sagepub.com/home/hpy>
- Wind, J. J. & Anderson D. E. (2008). From prefrontal leukotomy to deep brain stimulation: The historical transformation of psychosurgery and the emergence of neuroethics. *Journal of Neurosurgery*, 25(1), 1-5. doi: 10.3171/FOC/2008/25/7/E10