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BILATERAL FRONTAL LOBE LEUCOTOMY
Its Place as a Therapeutic Agent
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As the title of this presentation implies, we are dealing with a surgical procedure and if nothing else has been accomplished, this procedure has brought together the psychiatrist and the neuro-surgeon in a common field that most certainly has made for better understanding between these two branches of medicine. Throughout the discussion of this subject, we are dealing primarily with the therapeutic value of one of the many types of leucotomy so-called, namely the section of the frontal thalamic and hypothalamic association fibres which are severed to the extent of approximately 3/5 of their number, in the posterior 1/3 of each frontal lobe.

In the human there is no obvious intellectual defect following the removal of either frontal lobe. When both lobes are removed, the individual shows a marked change. This change can be compared to the inebriate state without ataxia. The individual becomes boastful, careless and lacks judgment. He lacks initiative and is incapable of planning and cannot grasp complicated problems. Such an individual could operate a simple boat. He would require his frontal lobes, however, to be taught anything more than the rudiments of sailing. He would require his frontal lobes to appreciate the danger of a storm and plan appropriate action. Such complicated thinking, where one idea follows another logically, has been termed by the psychiatrist, synthesis. The reaction following such thinking is governed by judgment. Synthesis and judgment are both conditioned by knowledge gained in the past (experience), and further conditioned by emotional tone (mood). We are aware that all behaviour is conditioned by emotional tone. It has been shown that there are basal centres (hypothalamus) which, in the animal deprived of his frontal lobes, can produce on stimulation a state of fear to the point of protective combat. However, such emotional tone is a primitive survival mechanism and does not allow the fine judgment that is required in our complex social life. This primitive reaction is conditioned by centres in the frontal lobes, and if we consider the reflex-like arcs involving association tracts from the sensory cortical areas to the thalamus and hypothalamus, and from the frontal cortex to the thalamus and hypothalamus we are able to postulate the dynamics of the production of emotional tone. If the hypothalamus is over-active to impulses received from the frontal cortex and thalamus, so as to be stimulated and produce a state of fear, we would expect to find an emotionally unstable, fearful individual whose complex delicate mental processes are distorted by this abnormal emotional tone. On this basis, the breaking of these so-called reflex arcs should bring about at least a partial reduction of the stimulation that was affecting the hypothalamic centres and the patient's fear should be reduced.

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Given before the Detroit Academy of Medicine, January 13, 1953.
If a complete break occurs, euphoria may result. We know that removal of both frontal lobes abolishes fear. Inasmuch as the neuro-surgical procedure involves a very small incision in the cortex, little impairment would be expected in the other complex functions in this part of the brain ( intellect, judgment, synthesis, etc.) and as the incision involves approximately 3/5 of the association tracts between the frontal cortex, thalamus and hypothalamus, there still remains a limited connection to permit the conditioning of our emotional tone and thus our behaviour, by the frontal cortical areas and thalamus.

Dr. C. B. Farrar, Dr. K. G. McKenzie (1) and my interest in bilateral frontal lobe leucotomy was stimulated by Freeman and Watts, and in 1939 we visited Washington and were shown a number of their cases. In 1941 the Rockefeller Research Unit of the Toronto Psychiatric Hospital embarked upon the psychosurgical treatment of hopelessly mentally ill patients. The first patient chosen was a mentally defective female, aged 58, suffering from an involutional agitated depressive state with paranoid features. She had been ill for 2 years previous to the operation, having had a remission of five years duration from a prior mental illness. At the time of operation, she continually described “little men” who were hammering at her brain and slowly killing her and because of this she felt she would be better dead. There were bouts of weeping and an undercurrent of anxiety which resulted in her pacing about the ward constantly, obviously fearful of what was going to happen. She found it progressively difficult to attend to her toilet habits and she was agitated to the point where she had no appetite. She had lost weight over the period of her illness and at the time of operation her weight was 92 lbs. Following the bilateral frontal lobe leucotomy there was an immediate disappearance of anxiety. At the end of two months she had gained approximately 15 lbs. in weight. She now was able to help in the care of other convalescent patients in a boarding-out home, being limited only by her mental deficiency. In view of this remarkable improvement, 47 patients were subjected to this treatment during the next 11 years.

Since 1939, as a conservative estimate 15,000 or more cases have been subjected to a bilateral frontal leucotomy of one kind or another and although there still is a difference of opinion as to its value in the schizophrenic group, most investigators agree that it is useful in reducing the acute nursing problem in the very agitated schizophrenic. In the affective disorders, particularly the involutional melancholias, better than 50% of cases in most series reported have shown a marked improvement, in most cases allowing the patient to return home and often return to remunerative employment. In the selection of cases from a psychiatric standpoint, the criterion employed required at least pathological fear in the clinical picture. This fear was manifested by anxiety, agitation or impulsive behaviour and it is my feeling that in spite of the many and varied suggestions that have been made as to the criterion for the selection of patients, this one at least is the most reliable. Since 1948 this operation has been used in the treatment of intractable pain, Walter Freeman again pioneering this therapy in America. He

concludes that it is a valuable adjunct in the treatment of unbearable pain, affecting not the sensation but the psychic component, namely emotional reaction to this phenomena. The patient feels the pain but does not suffer in the same degree because of this sensation. In 1951 Felix Mandl instituted the technique in which a temporary so-called leucotomy or lobotomy was performed by injection of 1% procaine into each frontal lobe and if this procedure brought about a marked diminution in the patient’s discomfort and was not permanent, then the leucotomy procedure could be performed. Dr. K. G. McKenzie and Dr. W. S. Keith and I have had a small series of cases of intractable pain and have had an opportunity of trying unilateral as against bilateral frontal leucotomy. In approximately 6 cases treated, unilateral leucotomy was of no significant benefit but a bilateral procedure brought about an improvement in 5 of these 6 patients. This group has been followed for approximately 5 years without relapse.

In a number of the patients, insulin shock therapy, as the treatment for schizophrenia, with electroshock as the treatment in depressed mental states, had failed to bring about a maintained improvement. All patients had been ill for more than 2 years with little hope for any significant improvement at any time in the future.

Results—Between 1941 and 1952, 47 patients were subjected to the surgical procedure described, of which

20 were affective disorders, 15 recovered, 3 improved, 2 unchanged
23 were schizophrenics, 4 recovered, 11 improved, 8 unchanged
4 were anxiety states, 4 recovered.

These patients have been followed not less than 8 months and most of them from 2 to 11 years. These results show a recovery or improved mental state of 90% in the affective disorders and 64% in the schizophrenic and schizo-affective states. The anxiety states show a 100% recovery rate.

Complications—The most serious complication following bilateral frontal lobe leucotomy is cerebral hemorrhage, but fortunately this complication has not occurred in this group. There have been no obvious neurological abnormalities as a result of the procedure, and the only complication has been hypersexuality noticed in 25% of our cases. This difficulty is often seen in neoplasms or other lesions involving the frontal lobes. The complication has not presented a serious feature as it has been manifested by either unusual demands upon the marital partner, or increased masturbation. No anti-social sexual behaviour has been reported, referable to the complication, in our series of patients. Usually the increased libido persists for 9 to 18 months, gradually returning to normal. Patients gain from 15 to 50 pounds during the six months following the operation. In our group, about 1/3 of the patients had transitory urinary incontinence, but this never lasted beyond three to four weeks post-operatively. There were no cases of convulsions in our series and we suggest this excellent result is probably because of the slight cortical damage done by the instrument used. Most series show 3–5% or greater incidence of this complication.

Summary and Conclusions—We have now available a neuro-surgical procedure which provides a means of improving suitably selected cases previously categorized
as hopelessly mentally ill. At least they are much less uncomfortable and, in better than 50% of cases, are able to be rehabilitated socially and vocationally, rather than requiring extensive institutional care. In cases of continuous acute pain, the affective component of this pain can be reduced and thus a reduction made in the suffering of the patient. We appreciate that it is a mutilating operation but it is not an empirical therapy, there being adequate basis for this procedure in our understanding of the neuro-anatomy and neurophysiology of the brain. Bilateral frontal leucotomy has opened a new field in our psychiatric concepts, inasmuch as we bring about at least a reduction in the degree of mental illness by reducing the function of a part of the complex cerebral mechanism.

Nissl remarked to one of his students while they were observing Paris from the Eiffel Tower one evening, that the spectacle brought to mind the multitude of cortical cells flashing on and off in our complex brains. After some thought he added that Paris probably could get along very well with a good number of these lights not functioning, and no doubt he felt this applied to the human brain as well.

The leucotomy has definitely established that we do fairly well in spite of more than half of the connections being severed between the frontal lobes and the lower centres and this would add credence to Nissl’s philosophical comment. There is something to be said for moderation, even in cortical activity.