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The introduction of leucotomy: a British case history

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For upwards of 20 years a surgical treatment for mental illness (leucotomy) was in vogue in the United Kingdom that by 1954 had been performed on upwards of 12, 000 people, although the final figure may never be known.[1] It is fashionable to look back in horror or at least with some professional discomfort at a mutilating and irreversible surgical procedure that was never subject to a controlled clinical trial, carried, on average, a 4% mortality rate and risked permanent damage to a patient's personality. Interestingly, both leucotomy and ECT developed in Britain at around the same time in the early 1940s and both became orthodox and popular treatments in psychiatric hospitals. Yet, whereas ECT has retained its clinical status, leucotomy has become something of a historical embarrassment.

This paper aims to discuss the coming of psychosurgery to Britain in the context of its arrival and development in a specific psychiatric institution: The North Wales Hospital, Denbigh. Data have been collected about the first cohort of patients operated on ($n = 24$) by the surgeon who initiated the leucotomy programme prior to his transfer to a different hospital in 1945. The selection, treatment and care of these patients has been examined, largely by using their medical notes, but other information has been gained from Clwyd Country Records Office and the interviewing of retired medical and nursing personnel.

The North Wales Hospital was founded, on a charitable basis, in 1848 and became the central institutional provision for mental illness for the five counties of North Wales. Although psychosurgery came to fruition in the 1940s, there was a smattering of operations for the relief of mental illness done in Britain in the 1890s.[2] The North Wales Hospital Annual Report for 1919 shows that one patient had an operation on the brain 'for the relief of epilepsy' but also with a view to improving his mental state. The result is

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recorded as being 'disappointing'.[3] Frontal lobe surgery for the relief of mental distress developed in the mid 1930s – first performed by Egas Moniz in 1935 but popularized with an almost evangelical zeal by an American neurologist Walter Freeman in collaboration with a neurosurgeon, James Watts. Freeman and Watts described an operation (the standard leucotomy) for dividing the white matter in both frontal lobes (the fronto-thalamic tracts). The procedure is essentially a blind one requiring two burr holes to be drilled through the coronal sutures of the skull. Full details of operative technique and pre- and post-operative care were outlined in the 1942 edition of Freeman and Watts book *Psychosurgery*.[4] There had been comparatively little academic discussion of psychosurgery in the British medical press prior to the arrival of this book and the book had a significant impact on the subsequent development of British psychosurgery.[5] By 1942 Freeman and Watts had operated on 80 cases, but the only published cases in Britain prior to 1942 were 8 patients, the first of whom had a leucotomy performed in Bristol in December 1940. The results of this small series were published in *The Lancet* in July 1941 and were said to be 'encouraging'. The author subsequently claimed that 'improvement could be hoped for in every type of case'.[6] Although only a handful of cases had been reported in the British medical press by the time leucotomy was introduced at Denbigh in April 1942, the next Annual Report claimed that 'sufficient cases have been observed in the country' for it to be introduced on sound clinical grounds.[7] By the time leucotomy was discontinued in the early 1960s around 300 patients had been operated on in North Wales. The introduction of leucotomy was not discussed by the official Hospital Management Committee.

Why did leucotomy make sense in the early 1940s? Since nobody could be certain why leucotomy had therapeutic benefits there was obviously some debate about its theoretical basis. What was taken to be axiomatic was that mental function could, to some extent, be anatomically localized.[8] There had been considerable research interest in frontal lobe function and on this was built, somewhat precariously, theories to support the practice of leucotomy (it remains in dispute whether Moniz was justified in taking the risk of operating when he did on what was known at the time). Moniz supported the notion that abnormal mental processes were structured in a correspondingly abnormal neuronal constellation which could be surgically and therefore therapeutically disrupted. Freeman considered the basis of their technique to dissociate the emotional from the intellectual components of the morbid thought process, removing the 'sting' of any psychosis since 'without the frontal lobes there could be no functional psychosis'.[9] This argument was widely quoted by British psychiatrists. At an important symposium on leucotomy held in London in March 1943 by The Royal Medico-Psychological Association (RMPA), Percy Rees reported its results and discussion with reference to psychoanalytic theory: 'without the frontal lobes

there can be no super ego, without the super ego no conflict and without conflict no functional mental disorder'.[10] Dr Roberts, the Medical Superintendent at the North Wales Hospital attended this symposium and made a formal report of its findings which, he said, were 'interesting and informative'.[11]

Given adequate conceptual grounds, leucotomy developed rapidly. Early reports in the British medical press suggested that leucotomy could offer relief from anxiety, apprehension, obsessional symptoms, 'tension states' and also control distressing behaviour. A key claim was that it could resocialize a subgroup of people otherwise doomed to institutional care. A common view was that the operation was indicated more by symptoms and behaviour rather than by diagnosis *per se*.[10, 12] In the early British published series a variety of different diagnostic categories were reported on – indeed, over 100 diagnostic categories were returned in the Ministry of Health Leucotomy Survey by 1954.[13] Early on it became evident that the best results were in depressed and obsessional patients. Even so the editor of *The Journal of Mental Science* suggested in 1944 that any mental illness of long standing duration, apart from chronic mania, epilepsy and general paralysis, could be considered for leucotomy.[14] There are no documentary records in any detail recording any internal debate about diagnostic case selection in the North Wales Hospital. The first 24 patients included 11 cases of depression, 9 schizophrenics, 1 paraphrenia, 1 of paraphrenia mixed with depression, 1 case of post-encephalitis with schizoid features and a further post encephalitic case with depression.

If diagnosis did not of itself provide an operative indication, what did? Three other factors were important in case selection in the early days: treatment failures in patients with poor prognoses, behavioural problems and the presence of a distressing level of inwardly experienced emotional tension.

The Annual Reports for The North Wales Hospital state that leucotomy was reserved for 'hopeless cases – as a last resort after the demonstrated failure of all other forms of treatment'.[15] In the initial series of 24 patients there is evidence of this policy: of the 17 patients whose full psychiatric notes could be found, all had had previous failed treatments – usually ECT but also insulin coma therapy, prolonged narcosis or cardiazol injections. This selection policy was broadly in line with other contemporary British psychiatric institutions, but by 1943 Fleming was selecting patients for operation who had better prognoses and had not had previous treatment of any sort.[16] In so doing their selection policy was closer to the only large series published before 1943 – that by Freeman and Watts – who largely operated on patients with affective, obsessional or other neuroses (almost 90%) of whom only a handful were in a psychiatric institution pre-operatively.

Selection of patients for operation at Denbigh was also influenced by the degree of behavioural disturbance and therefore the extent of nursing supervision required. In at least half of the original 24 patients nursing difficulties were explicitly stated, and in about a quarter was the management

of self-harm or attempted suicide an issue. In one patient's case the supervising psychiatrist made this plain: 'leucotomy [has been] carried out largely with an eye on easing nursing care [in a patient who is] a low grade imbecile, destructive, unclean and cannot apply himself to anything.' This selection criterion was publicly acknowledged in contemporary psychiatric reviews. Leucotomy may be indicated for patients 'who require a great deal of nursing supervision, who (are) a constant source of trouble'.[17] This is also corroborated by nurses' accounts at the North Wales Hospital.[18] There is no documentary evidence to suggest, however, that leucotomy was ever carried out for punitive reasons or entirely to control difficult behaviour.

Case selection was also a function of symptomatology. Even if psychotic phenomena could not be reliably removed by operation their emotional strength ('the sting' in Freeman's words) could be weakened. Berliner, based in Dumfries, identified 'mental tension' as a key target symptom for leucotomy which, when removed, would allow the patients to be disengaged from if not unaware of their previous emotional concerns.[19] In the North Wales Hospital series prominent affective or anxiety-related symptoms featured in most cases and the phrase 'marked mental tension' occurs in some of the pre-operative notes. In general, however, there is a noticeable absence of clinical discussion recorded in the notes when patients were considered for leucotomy – sometimes a month or two elapsing between the entry prior to operation and the operation note itself. In the majority of cases there is no evidence of specific consent being gathered (although some of the notes are incomplete).

When Lt-Col. Duff FRCS operated on the first case at the North Wales Hospital he had been the hospital's consulting general surgeon for 17 years. He worked as a local GP in Denbigh. His successors were trained neurosurgeons from Liverpool. Mr Duff never selected patients himself but left this decision for the psychiatrist. By the time Mr Duff began to operate he probably did not have Freeman and Watts's book describing, in detail, their leucotomy technique. Much to Walter Freeman's chagrin the first shipment of *Psychosurgery* was the victim of the German U-boat campaign. Since the operation required new instruments, innovation was in order. Initially Mr Duff used a curved pointed bistoury to cut the brain, but he subsequently developed a 'cannulo-leucotome' (with the help of the craftsmanship of two of the institutional psychiatrists and a Birmingham tool manufacturer). This leucotome had a parallel arm external to the head so that the surgeon could gauge the intracranial position of the leucotome without relying on the judgement of the nurses to help align it. The leucotomy technique Mr Duff adopted was originally akin to Moniz's but subsequently became something of his own and was published in *The Lancet* in 1946.[20] Other British surgeons were also developing their own instruments: McKissock (probably the most prolific leucotomy surgeon) used a blunt brain needle; Willway used a narrow paper knife and Crombie was developing his own design of leucotome with a rotating blade.[21]

The operating theatre at The North Wales Hospital was a 15 ft sq room off one of the female wards. It is now a utility room. The operating theatre staff were all male and trained 'in house'. Indeed, the majority of the patients were men in contrast to the national pattern in which there was a consistent bias towards performing leucotomies on women. The strict male:female segregation in the hospital was not relaxed post-operatively. Male patients left the operating theatre on a trolley and were pushed (sheltered by a macintosh if necessary) 50 yards down the hospital drive to male territory. Mr Duff preferred to use local anaesthesia, which had the advantage of decreasing overall anaesthetic risk and enabled the surgeon to monitor the immediate effects of leucotomy by engaging the patient in what must have been a rather tense conversation. Some of these conversations were later noted down in the Denbigh notes. Part of the anecdotal charm of Freeman and Watts's book consists in the recording of these chats, some of which were quite macabre:

> Surgeon: 'what is going through your mind now?'
> Patient: 'a knife'.[22]

Although Mr Duff found that trephining a burr hole through the patients' skull often had a soporific effect on them, this was not a universal surgical experience. Fleming and McKissock abandoned local anaesthesia when their patients found it 'an experience terrifying in the extreme' to be conscious of the drilling.[23] The therapeutic effects of the operation itself may have tended to allay anxiety, especially in the second half of the procedure. 'It is a thrill' wrote Mr Duff, 'to see the lines of anxiety disappear and the patient suddenly become extrovert ... just as the second hemisphere is cut'.[24]

Patients were allowed to convalesce for usually 5–10 days before returning to their wards. The most serious immediate risk of the operation was haemorrhage (this is what spurred Mr Duff to develop a safer leucotome). Marked bleeding was reported in almost a third of the early cases (sometimes requiring carotid compression). Leakage of CSF also occurred (3 cases – due to puncture of the lateral ventricle) and wound infection (one case). Transient fevers and urinary incontinence were common post-operative complications.

For the weeks following leucotomy patients might enter a surgically-induced childhood in which intensive behavioural and psychological retraining could place. This rehabilitation was considered to be almost important as the operation itself.[25] Surprisingly little documentary evidence exists about the rehabilitation phase of the treatment at Denbigh although reference to 'attendance at occupational therapy' is often cited in the notes.

Overall, early outcome results were encouraging. Discharge rates were high, particularly in the depressed patients (9/11) compared to the schizophrenic group (2/9) when the first cohort of patients were reviewed in 1945 (follow up period: 3 months – 30 months). Half the patients were

Leucotomy outcome data 1942-1961 North Wales Hospital (cumulative figures)

Year	1942		1943		1944		1945		1950		1961[†]	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Discharged, recovered or partially recovered*	0	0	3	2	9	5	15	9	48	30	105	92
Improved in hospital	1	0	4	0	6	0	8	1	23	12	47	37
Unchanged in hospital	0	0	2	0	2	1	3	1	17	10	32	22
Worse	0	0	0	0	0	0	0	0	0	1	No data	
Died	0	0	1	0	1	0	1	1	3	7	5	7
Relapsed and re-admitted	0	0	0	0	0	0	0	0	13	11	31	21
TOTAL	1	0	10	2	18	6	27	12	91	60	161	138

* 'by recovered is meant that the patient has either left or will shortly leave hospital sufficiently well to return to his work or in the case of a woman to resume care of the home'

Annual Report 1945, 20–21.

[†] Figures as recorded in Annual Report, 1961.

considered to have 'recovered' (which meant discharged or about to be with adequate social functioning) at this juncture. A further 6 patients had 'improved', 3 had not improved, and 1 had died due to the operation. Nobody was worse. Ten of the recovered cases were in paid employment when reviewed in 1945. These results compare well with other British series published at the time.[14]

Monitoring outcome was a significant concern for the hospital. Figures were collated annually and published in the Annual Report. After 1946 concern developed over relapse rates (at around 1 in 9 in 1946 and 1 in 6 by 1960). By 1950 the Hospital Board decided to try and contact its leucotomy patients using the Psychiatric Social Work service 'to estimate [the patients'] capacity to fit into society'.[26] An elaborate pro-forma was devised to gain information about the patient's mood, interests, energy, conduct, social efficiency (employment and domestic) and self-care. In the 1940s it was sometimes held that outcome was 'incomparably better' if the patient came from an educated background and had a private rather than a rate-aided status within the hospitals. Rees surmised that this may have to do with pre-morbid personality patterns.[27] In fact almost none of the North Wales Hospital patients were private and the outcome results were similar to Rees's.

A trained psychologist was appointed at Denbigh in 1944 and she began to carry out pre- and post-operative psychometric testing using a battery of tests, including the RMPA's own psychometric testing pack for leucotomy patients which was available from the summer of 1942 onwards. It was generally conceded that the psychometric tests showed little evidence of post-operative intellectual deterioration. Indeed a 1944 review by the editor of *The Journal of Mental Science* states: 'There appears to be no indication that any part of the mental mechanism is lost with the removal of the frontal tissues.'[28] By and large the Denbigh psychologist's evidence tended to agree but significant numbers of patients (especially schizophrenics) were unable to co-operate with psychometric testing.

Two deaths occurred during the review period out of the original 24 patients. One was obviously related to the operation (a brain abscess) although no coroner's inquest took place. The other was a depressed patient, classified as recovered, who died of an aspirin overdose a few months after leaving Denbigh. An open verdict was recorded as he habitually over-medicated himself, but the exact circumstances remained obscure. On hearing of this patient's death the Medical Superintendent at Denbigh wrote to the pathologist to ask for the brain to be returned to the hospital so that he could examine the line of the leucotomy scar.

It remains to be discussed why leucotomy was so enthusiastically embraced as a therapeutic option in Britain in the 1940s. Several reasons might be offered. One possibility is that there was a consensus view that patients were not made any worse by the procedure (providing they didn't die). Duff states as much in his *Lancet* article in 1946, but he is reiterating

reports made by Berliner in 1945, Rees in 1943 and Hutton in 1941.[29] Of course, the physical risks of the operation were known about in these years – for example, the risk of epilepsy being considered to be 6.4% in 1944,[30] and three of Duff's patients eventually developed seizures (one in 1946, one in 1953 and one in 1954). Of greater interest in the Denbigh group was that the personality changes brought about post-operatively were not necessarily considered to be adverse effects even when known about, when global judgements about recovery were being made at follow-up. Two patients developed forensic records within a few years of leucotomy (and were re-admitted with diagnoses of hypomania). The wife of one of these patients certainly considered the operation to be responsible. 'The operation had very bad results... he turned out to be a sex maniac, using filthy language to everybody.' A further 5 patients were recognized as being either mildly euphoric or aggressive following the operation even prior to 1945. A further patient was admitted in 1948 with hypomania. It may, of course, be possible that Mr Duff had unwittingly operated on patients with bipolar disorders. Neither was the psychologist's overall impression always sanguine. After reviewing one patient she wrote: 'Following the operation she looked very aged and broken. I could hardly recognize her.' Although this was written after only 3 months follow-up, this patient, who had been 'talkative, willing and co-operative', became a long stay patient with a mental age of 7. Almost no patients were officially recognized as being worse off post-operatively in subsequent Annual Reports but by 1961 the Ministry of Health review of leucotomies in England and Wales estimated that 3.1% of all patients (5.8% of the over 65s) were acknowledged to have been harmed by the operation to the point where it prevented subsequent discharge.[31] In the early days, however, the belief that there were not likely to be deleterious effects encouraged the development of leucotomy: consent for the very first patient operated on at Denbigh was gained by making the claim that he would be 'no worse' (psychologically) post-operatively.

The reasons why psychosurgery developed in America have been reviewed by Valenstein in his book on the subject.[32] It is of interest to compare the US experience (as understood by Valenstein) with the British development and specifically at The North Wales Hospital.

In the first instance Valenstein suggests that overcrowding in American state asylums contributed to the need to find treatments that could effect discharge. There was something of a population explosion at The North Wales Hospital from the mid 1930s onwards and the consequent overcrowding was dwelt upon at length in successive Annual Reports. By 1946 there was a 120% increase in the admission rate into the hospital compared to the average annual rate 1935–9. The population of the hospital peaked in 1949, which coincided with the peak number of leucotomies performed at The North Wales Hospital and in the UK overall. The original aims for the leucotomy programme as stated in the 1943 Annual Report were that it

would 'hasten recovery' and help the 'hospital stay to be curtailed'. There is no direct linkage made between the introduction of leucotomy and the overcrowding issue but the emphasis on achieving discharge and easing nursing management for other 'hopeless' patients obviously relates well to the aim to reduce the hospital population.

Valenstein notes that the development of leucotomy helped to promote the careers of a number of doctors who, at least in the US, were in a degree of ideological and economic competition with one another. This claim is difficult to quantify and, on the face of it, British institutional psychiatry in the 1940s was not the most sought-after professional niche. Nevertheless, some professional kudos was gleaned by the Denbigh doctors for their innovatory commitment to leucotomy. Mr Duff not only achieved the article in *The Lancet* but his technique was also discussed in Freeman and Watts's second edition of *Psychosurgery* published in 1950.[33] One of the other psychiatrists also got a publication out of the experience by writing up a novel indication for leucotomy for *The Journal of Mental Science*.[34] Publicity for the leucotomies was developed locally and at least one man who was considered to be an operative success was asked to attend local BMA meetings to demonstrate the benefits of the operation. The fact that he was mildly euphoric as a result of the operation probably helped his stage fright. His social worker reported that he 'was delighted at being a show piece and (was) full of his demonstration trips'.

Valenstein also claims that leucotomy was given popular appeal through the uncritical acclamation of magazines such as *Life*, *Time*. Interestingly, Mr Duff in his *Lancet* article referred tangentially to pressure being put upon surgeons by keen relatives, and the brother of the very first patient that he operated on wrote to the Medical Superintendent in such terms: 'Recent reports in the press have encouraged us to hope that at last a treatment has been found giving a fair chance of recovery in schizophrenia. Naturally we are anxious to learn your opinion with regard to the case of my brother'. Some psychiatrists were very wary of lay publicity and took an insular attitude towards it. 'It seems a pity that such a technical matter as leucotomy should be discussed in the lay press and we can only deprecate very strongly the action of medical men who have encouraged this.'[35]

The final point Valenstein makes is that there was a desperate need for any treatment that worked at all. The Medical Superintendent never considered leucotomy to be a trivial procedure but one which was 'severe and involves definite risk'.[36] Even so there were – even as early as 1943 – calls for leucotomy to be considered for any patient who had been in hospital for a year or more.[37] Certainly such therapies that were in use then, such as prolonged narcosis, malaria fever treatment, insulin coma therapy and colonic washouts, are now comfortably confined to (the not so distant) past. The exception is ECT. In fact, the majority of leucotomized patients were given ECT before leucotomy was considered but usually only one course.

Almost always there was some positive response to ECT recorded in the notes but with subsequent relapse. The fact that ECT could bring about transient change was sometimes taken to be a good omen for leucotomy. Freeman himself noted that ECT had influenced the development of leucotomy by slowing its progress down and Rees (at the 1943 symposium) suggested that ECT was depriving leucotomy of one of its most favourable indications – depression. 'The number of chronic melancholics in mental hospitals that practise shock therapy has been reduced today almost to vanishing point.'[38]

It would be easy to review the history of the development of leucotomy with a social conscience schooled by the anti-psychiatry movement and a conceited confidence in modern therapeutics. In the 1940s leucotomy appeared to be an effective way of relieving distress and getting people out of the institution. Indeed, almost 50% of patients operated on in the first 3 years were discharged and, on average they had been in hospital for almost 4 years. On average in the UK two thirds of the people with affective disorders and a third of those who had schizophrenic disorders were subsequently discharged after leucotomy performed before 1954.[39] Surgery's contribution to this outcome is obviously debatable and the North Wales Hospital Annual Reports acknowledge this. The historical issue must be whether this form of psychiatric treatment was embraced with an unjustified enthusiasm or whether appropriate clinical caution was exercised. The lack of controlled trials was recognized as something of an embarrassment and their absence was sometimes explained away in terms of the patient population being dealt with: '[these patients] were doomed to chronic invalidism and thus could constitute their own controls.'[40] Nevertheless, the Denbigh psychiatrists took great care to gather outcome data which were initially very encouraging and in line with the plethora of published case series that appeared from 1943 onwards in the British medical press.

The explanation for the decline of leucotomies is more problematic than might be supposed. Certainly the introduction of neuroleptics may have contributed – chlorpromazine arriving in Britain in the early part of 1954 – but leucotomy numbers were already slowing down then both in Denbigh and nationally. Leucotomy operations may have been a function of asylum population (which was declining at the North Wales Hospital from the early 1950s) but even so, the Ministry of Health was at something of a loss to explain the decline in operations but suspected that the adverse effects of the operation were becoming more of a problem. The relief of suffering was bought at the price of accepting a level of existence qualitatively different from and usually below that which the patient had enjoyed before the onset of the illness. After all, 25% of patients received no benefit at all, 3% were made worse and a further 3% – 4% were killed by it.[41] Professional attitudes towards leucotomy subsequently changed and there is evidence of this amongst the Denbigh staff even in the early 1950s. Psychosurgery lives on, of

course, but not in peripheral rural asylums, and is performed within much tighter social and legislative controls.

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