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Ethics and Effectiveness of Psychosurgery

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Please give me an inhuman operation to take away the scaredness.—A schizophrenic adolescent. Philadelphia. 1976.

This poignant request is a striking expression of the ambivalence with which psychosurgery* is universally regarded. It is a cry of suffering uttered in the cultural expectation that relief can be provided by brief, impersonal intervention—the way hunger is relieved at a fast food counter. Yet it recognizes that there is something wrong—inhuman—about the operation. This essay describes my own ambivalence toward psychosurgery, and how it was resolved.

In 1972, charges made by Dr. Peter Breggin, a Washington, D.C., psychiatrist, that a “new wave” of psychosurgery was under way impelled me to make my own investigation. I found that brain surgery was indeed being performed on adults and children for a wide range of psychiatric and behavioral disorders, including schizophrenia and schizoaffective disorders, neurotic depression, fear and anxiety, obsessive-compulsive neurosis, psychopathic behavior, anorexia nervosa, abnormal sexual behavior, hyperactive or aggressive behavior, drug addiction, alcoholism, obesity, and chronic pain for which no organic basis can be found. The regions of the brain invaded or disconnected by such surgery include parts of the frontal lobe, cingulate gyrus, substantia innominata, thalamus, hypothalamus, and amygdala (Breggin, 1972; Valenstein, 1973, 1976†).

*The term “psychosurgery” is not pejorative, but a vivid and accurate description, coined by Watts and Freeman, who introduced frontal lobotomy to the United States in 1936. Psychosurgery does not include surgery for movement disorders such as Parkinsonism, for epilepsy, or for chronic pain with a clear organic basis. The ethics and effectiveness of these procedures are also in need of critical review, but for the most part they do not involve psychiatry nor are they presently subjects of major controversy.

†The most detailed and even-handed treatments of the history of psychosurgery, the scientific issues, and the contemporary psychosurgical literature are to be found in these two publications by Valenstein.
It also appeared to be true, as Breggin had claimed, that psychosurgery had potential as a tool of the State for controlling social deviance. Amygdalotomy had already been performed on several "hard core" prisoners in the California penal system. A similar project was vetoed by a Michigan court. Research in the "pathology of violence" was under way in Boston with financial support from the Federal Departments of Justice and Health, Education and Welfare. The principal investigators on this project, a psychiatrist and psychosurgeon, had publicly stated, following the Detroit riots in 1967, that although poverty was certainly a factor, it should not blind us to "other possible factors, including brain dysfunction in the rioters who engaged in arson, sniping and physical assault." They went on to note that while jobs, education, and housing are needed, "to believe that these factors are solely responsible for the present riots is to overlook some of the newer medical evidence about the personal aspects of violent behavior" (Mark et al., 1967).

In their book, Violence and the Brain, Mark and Ervin called for development of "an early warning test of limbic brain function to detect those humans who have a low threshold for impulsive violence... and better and more effective methods of treating them once we have found out who they are."

That spring there were reports of psychosurgery performed at Philadelphia's Hahnemann Hospital for drug addiction and alcoholism (Fields, 1972) and of similar treatment for a large series of alcoholics in Texas. When I asked at a Hahnemann-sponsored symposium (Matthews, 1972) what was to stand in the way of treating all of the 10 million American alcoholics this way, no one had a precise answer.

A few months later Dr. M. Hunter Brown, a neurosurgeon who probably accounts for over 40 cent of psychosurgery in the United States today, was quoted thus:

The person convicted of a violent crime should have the chance for a corrective operation... Each violent young criminal incarcerated from 20 years to life costs the taxpayers perhaps $100,000. For roughly $8,000, society can provide medical treatment which will transform him into a responsible, well-adjusted citizen. (National Enquirer, July 9, 1972)

Dr. Brown terms his own "multitarget" procedure for this purpose, the "C.I.A." operation (Cingulum Innominata Amygdala)!

Dr. Orlando Andy described surgery to treat, not psychotic disorders, but "abnormal behavior" including anxiety, aggressiveness, destructiveness, agitation, distractibility, attack, suicidal tendencies, nervousness, mood oscillations, stealing, rage, negativism, combativeness, and explosive emotions. He had performed thalamotomy for such symptoms on children as young as nine years old (Andy, 1966, 1970).

Britain's leading psychosurgeon, Geoffrey Knight, had long advocated surgery for geriatric depression which, he notes, is an increasingly serious public health problem (Knight, 1969).

In short, psychosurgery seemed indeed to be "an inhuman operation"
and there appeared to be nothing to keep it from becoming a panacea for socially burdensome aberrance, except the informed dissent of the scientific community. Accordingly, I presented the facts and their apparently ominous implications to a meeting of my neurobiological colleagues.

In rebuttal, a neurosurgeon made the following argument: The mentally ill went essentially untreated for hundreds of years—until the introduction of frontal lobotomy in 1935. The necessity for lobotomy declined after 1955 with the introduction of psychotropic drugs. Nevertheless, there has remained a small group of intensely suffering patients who do not respond to psychotherapy, drugs, or shock treatment. These intractable patients are candidates for psychosurgery. The modern surgery, in contrast to the “old” lobotomy, is safe and effective, since only small lesions are made in regions that can now be located with precision. There is little evidence of untoward effects on personality. Further, the surgery tends to be supported by modern concepts of the limbic system. The surgeon pointed out that many important therapeutic advances—antibiotics, for example—were made before their scientific basis was thoroughly understood. He concluded that his medical responsibility would make it immoral for him to deny psychosurgery to a chronically suffering patient.

If his argument was correct, I was standing uncomfortably in the way of medical progress. And, if I were a physician, how would I meet my moral obligation to anguished patients? To answer his challenge it was necessary to examine each part of the argument—the history of the treatment of mental illness, the true chronology of psychosurgery, the state of surgical technology, current concepts of the limbic system, and the best independent estimates of the efficacy and side effects of modern psychosurgery. The findings summarized in this essay will indicate how little relation there is between the development of psychosurgery and truly useful therapies such as antibiotics.

**Historical Cycles in Somatic and “Moral” Treatment of the Mentally Ill**

It is not true that effective treatment of the mentally ill awaited lobotomy. In fact, there have been several long cycles in the treatment of mental illness over the last two centuries. In some periods, successful treatment was almost exclusively psychological, without use of physical restraint or bodily interventions. Whenever application of these methods declined, belief in a medical model invariably rose, accompanied by a renewed focus on somatic treatment. From the perspective of two centuries, psychosurgery is not an act of daring or genius but a predictable technological continuation of this historical cycle.*

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*The following historical material is a synthesis relying heavily on the works of Bockoven, 1956; Grob, 1966; Rees, 1957; Rothman, 1971; Scull, 1974; Tuke, 1813.*
Late eighteenth century: somatic treatments

In the eighteenth century, the mentally ill in rural England were not differentiated from indigents of other sorts, but were cared for within the community—supported by their families and the parish. With the rise of a market economy and the accelerating transition from rural to urban life, the insane began to accumulate as a distinct subclass in the population. As such, they were increasingly separated from the community in madhouses, where they were treated by administration of bleedings, purges, and emetics. One suspects that these treatments were not entirely without effect. Placebo responses are as powerful in psychiatric as in general medical practice (Frank, 1973). Furthermore, it is hard to imagine that after being bled, purged, and vomited, a patient would retain much capacity for agitated behavior. Such exhaustion could be interpreted as a cure, and it is probable that many patients who survived accepted this interpretation.

The madhouse system deteriorated toward the end of the eighteenth century. The insane were often chained, ill-clothed, ill-fed, and shockingly abused, as in the case of recent American “after-care” rooming houses, to achieve maximum profits from minimum effort (Scull, 1977). A reform movement developed a new approach, the asylum. The first of these, the Quaker-supported York Retreat, was opened in 1796 by William Tuke. Initially it had a staff of 7 and a patient population of 15. The number of patients grew to 33 by 1799 and to 62 by 1813. Tuke’s reforms became the paradigm of “moral therapy” for the next 50 years.

1796 to 1850: Moral treatment

The restraint of agitated mental patients by chains, straitjackets, and solitary confinement was largely abandoned by Tuke and, later, completely so by another English reformer, John Conolly. Somatic treatments were also discarded, not on principle but because careful observation failed to support their efficacy. Here are the comments of Samuel Tuke (1813) on the attitude of the York physician toward somatic treatment:

... Bleedings, blisters, seatons, evacuants, and many other prescriptions received an ample trial, but they appeared to the physician too inefficacious... a very strong argument against them arose, from the difficulty with which they were frequently administered; as well as from the impossibility of employing powerful medicines in long continuance without doing some injury to the constitution. The physician plainly perceived how much was to be done by moral, and how little by any known medical means.

For calming agitated patients the Retreat relied on an atmosphere of tranquility generated by gentle supervision, warm baths, ample food, and porter, a malt liquor. Liquor was used not as an intoxicant, but to help the patients recapture their sense of well-being. The physical design of the Retreat confirmed its concept of psychotherapy—private rooms, lit by unbarred windows.
Most critical of all to moral treatment was the establishment of high expectations for the patients. They were encouraged to dress well, to work, to pray, to enlighten themselves, and to be esteemed. Their desire for esteem was positively reinforced at every opportunity, 100 years before the birth of "behavior modification" techniques. *

All of the early American asylums, including the Institute of Pennsylvania Hospital, the Hartford Retreat, and Worcester State Hospital, were modeled both physically and in therapeutic practice after the York Retreat (Rothman, 1971). Here is an extract of Charles Dickens' account of his visit to the asylum at South Boston in 1842:

Every patient in this asylum sits down to dinner every day with a knife and fork and in the midst of them sits... (the superintendent). At every meal moral influence alone restrains the more violent among them. ...

In the labor department every patient is... trusted with the tools of his trade... In the garden and on the farm they work with spades, rakes, and hoes. For amusement they walk, run, fish, paint, read, and ride out to take the air in carriages provided for the purpose. They have amongst themselves a sewing society to make clothes for the poor which holds meetings, passes resolutions, never comes to fisticuffs or Bowie knives, as sane societies have been known to do elsewhere; and conduct all its proceedings with the greatest decorum.

The irritability which otherwise would be expanded on their own flesh, clothes, and furniture is dissipated in these pursuits. They are cheerful, tranquil, and healthy.

Moral treatment in this period was incredibly effective. Between 1796 and 1861 the York Retreat discharged 71 per cent of its patients who had been admitted within three months of illness onset (Rees, 1957). The results at Worcester State Hospital, Massachusetts, were similar. Seventy per cent of those admitted within a year of illness onset were discharged during the years 1833 to 1846. These figures are the more impressive since 10 to 20 per cent of admissions were for the general paralysis of syphilis. A monumental follow-up study completed in 1893 showed that half of the original number had experienced no recurrences; less than half of those that did relapse were permanently rehospitalized (Bockoven, 1956).

1850 to 1930: Decline of moral treatment and rise of custodial care

The success of moral treatment depended on the shared values of staff and patients and on a high staff/patient ratio. The long-range effectiveness of the treatment must have depended on having an intact, supportive community network to which the patient could return. The possibility of meeting any of these requirements was seriously eroded by the altered social circumstances of the Industrial Revolution. The success of moral therapy declined; so did belief in the curability of mental illness (Bockoven, 1956; Grob, 1966; Scull, 1974).

Worcester State Hospital illustrates the point. Between 1834 and 1853 the

proportion of patients to doctors rose almost three-fold, to a ratio of 1:140 (Grob, 1966). Attendants were added, of course, but they were disinterested, wage-earning custodians. The patient population changed rapidly from predominantly Yankee craftsmen, farmers, and seamen to immigrant Irish proletariat.

The increase in the number of foreigners is an evil the more to be regretted, because there is reason to fear that it may be, still further, an increase of incurables... their misery, their ignorance, and their jealousy stand in the way of their improvement at the Hospital.*

It is obvious that in such an atmosphere of low expectations moral therapy could not work. The "cure" rate, that is, the per cent released without readmission, fell from more than 51 per cent in the 1830s to 23 per cent by the 1880s, and far lower for the Irish. Discouragement about the possibility of cures had a feedback effect—the fewer the cures, the less vigorous the attempts at moral therapy, the fewer the cures. The numbers of patients employed in useful work decreased, the use of restraints and opiates increased, and so did the hospital death rate.

In this period there were prophetic flirtations with somatic treatment for "behavioral disorders," focused particularly on women. Beginning in 1872, ovariectomy was performed for attempted suicide, persecution mania, erotic tendencies, simple "cussedness," masturbation, dysmenorrhea, "troublesomeness," and "eating like a plowman." It was estimated that by 1906 150,000 ovariectomies had been performed, a figure which seems particularly shocking when it is recalled that the population of the United States was only 15 per cent of what it is today and that only half of the population was eligible. The proponents of ovariectomy were absolutely convinced that the ovaries were the source of feminine behavioral disorders and that no other treatment was comparably effective (Barker-Benfield, 1972).

As the cure rates fell toward zero in the late nineteenth century, hospital physicians became convinced of the "incurability" of insanity and even sought to prove (unsuccessfully) that the earlier statistics on cures were false. Insanity in some cases was now defined as incurable; for example, dementia praecox, Kraepelin's term for schizophrenia (circa 1890), translates as "precocious mental deterioration," though there is ample evidence that many patients recover from schizophrenic "breaks" (Vaillant, 1964). This trend was reinforced by the demonstration in 1913 that at least one form of insanity, general paralysis, had a microbial origin.

Mental hospital admissions continued to rise during the first part of the century and particularly during the Great Depression, for it has been shown that mental hospital admissions peak in economic depression (Brenner, 1973). By the mid-1930s mental hospitals had become swollen—huge institutions, with populations in some cases as high as 10,000—more like small cities than refuges for recovery (Deutsch, 1949). Cure rates had in many cases fallen below the hospital death rates and not even remnants of moral treatment remained.

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In the 1930s and early 1940s it was common admissions practice to strip a patient of all objects that might maintain his orientation toward the outside world—jewelry, watches, and street clothes. Following a shower, he was forced to "wear hospital pajamas, or torn, bedraggled dressing gowns, the purpose of which was to prevent escape." Patients were strictly segregated by sex and had no opportunity for work or play. Straitjackets, solitary confinement, long periods in cold, wet sheets were common. Acutely disturbed patients subjected to such disorienting experiences frequently deteriorated into chronic illness (Greenblatt et al., 1955).

1930 to 1940: Return of somatic treatments

By 1930 the number and condition of the mentally ill had become unmanageable. Any treatment that promised a result was considered eagerly, and without scepticism. This decade produced a rich harvest of somatic treatments: metrazol therapy was introduced in 1935; insulin coma in 1933; electroconvulsive therapy in 1938; frontal lobotomy in 1935 (Kalinowsky, 1961).

Psychosurgeons describe the introduction of lobotomy as a daring step. Moniz, a Portuguese physician, heard at a meeting Fulton's report of Jacobsen's finding that a single agitated chimpanzee had been calmed following destruction of the prefrontal areas and immediately began to operate on humans. He ignored crucial negative data: detailed reports of the terrible deficits following frontal lobe removal in humans, Jacobsen's description of similar deficits in the chimpanzee, and the fact that Jacobsen had not at that time even verified the size or location of the animal's lesion.

Everyone blinked these issues and seized on lobotomy and shock therapies with as much critical judgment as the eighteenth-century physicians had exercised in their acceptance of bleeding and purges. Following its introduction to the United States in September of 1936, the practice of lobotomy spread widely and rapidly—not merely in urban, academic medical centers, but also into obscure state hospitals. By 1942, for example, Schrader had already operated on 73 patients at State Hospital No. 4 in Farmington, Missouri (Freeman and Watts, 1942). By 1943, the U.S. Veterans Administration was officially encouraging its neurosurgeons to obtain special training in prefrontal lobotomy (Valenstein, 1973). Following World War II, psychosurgical procedures were widely performed in VA Hospitals; for example, 83 were performed at Salem, Virginia, VA Hospital before 1948 (Dynes, 1968). Figures on the total number of VA operations have never been released.

Uncritical enthusiasm for lobotomy was not restricted to surgeons. D. O. Hebb, then a leading experimental psychologist, called lobotomy in 1945 "a landmark in psychiatric practice." By 1948 Dr. John Fulton, a leading neurophysiologist and co-author of the chimp experiments on which

*Perhaps the most careful and interesting account is that of Brickner (1936), whose co-worker lived with a patient whose frontal lobes had been removed for a tumor and who devotes a whole book to describing this patient's childish, inappropriate behavior—incapacity for work, sex, or adult relationships.
lobotomy was "based," had dropped his earlier reservations. He noted that if only 25 per cent of the patients in mental hospitals could be released, the taxpayers would save one million dollars per day, and called lobotomy "not only a highly important therapeutic weapon, but... one of vast economic significance" (Fulton, 1949). At the time Fulton was serving on the Connecticut Lobotomy Committee, which had approved over 200 operations. He does not reveal how he or the "review" committee managed to balance their appreciation for the taxpayer's interests against those of the patient. This period of enthusiasm for lobotomy culminated in the awarding of the Nobel Prize to Moniz in 1949.

1945 to 1955: Decline of lobotomy

The last lines of Freeman and Watts' 1942 book, Psychosurgery, read:

To the normal individual the frontal lobes are indispensable; to the sick individual they may be destructive. Without the frontal lobes there could be no functional psychoses.

The dream had been that lobotomy would cure psychosis, permit the release of many hospitalized patients, and facilitate the care of those that remained. It was a fantasy which faded rather quickly.

In the first place, Freeman and Watts recognized quite early that chronic patients did not respond very well to lobotomy, and they avoided such patients as a consequence. More than half of the patients they reported on in 1942 had been ill for less than a year and 76 per cent for less than two years; only 4 per cent had been ill for five or more years. When Freeman introduced the "transorbital" lobotomy in the late 1940s (Freeman and Watts, 1950), he began to operate on outpatients who, by definition, could not be considered deteriorated.

Freeman and Watts, despite their fantasy, reported quite frankly that lobotomy did not remove psychosis, but rather reduced the capacity of patients to focus on their emotional turmoil. They describe their postlobotomized patients as docile and "child-like," and emphasized that most required aftercare by their families. Roughly 75 per cent of their patients were women, undoubtedly because docility and equanimity are less incapacitating to housewives than to men who are expected to function in the world at large. Female-to-male ratios of 2:1 or 3:1 are common, both in large geographical surveys and in the reports of individual surgeons.*

It is clear from reading Freeman and Watts, for they are among the field's most guileless authors, that psychosurgery contains a "Catch-22." The catch is that while surgery provides the greatest symptomatic relief for the acutely ill, it is also most costly to these patients in loss of affect and creativity, loss of ability to focus and shift attention, and loss of ability to sustain goal orientation (see also Valenstein, 1978). Chronically ill, deteriorated patients are less

*For example, Vosberg (1963) found in a survey of lobotomy in Western Pennsylvania that 74 per cent of the patients were women. My examination of records at the Hospital of the University of Pennsylvania showed a similar preponderance for the years 1947 to 1967.
damaged by the surgery because they have already lost these qualities beforehand. On the other hand, it is the acute patients who are most likely to benefit from moral therapy—which, as we have noted, was largely unavailable in this period.

Many practitioners learned for themselves the effects of lobotomy on chronic patients. Dr. John Dynes (1968) summarized the discouraging results of lobotomy on 83 chronically ill VA patients:

There was immediate evidence of mild to moderate lessening of symptoms and restlessness and violence...this improvement was not well sustained... The most important feature was that the schizophrenic disorder was not appreciably altered by the operation except possibly to hasten the process of emotional flattening and deterioration...the diagnosis of chronic brain syndrome has had to be added to the prior diagnosis of schizophrenia...

Twenty years later, all 83 patients remained hospitalized. Similar observations were made by Dr. R. Vosberg (1963) in a 10-year follow-up study of lobotomy in western Pennsylvania. His findings were particularly significant, since the lobotomies were not the "old" Freeman and Watts type, but the more modern "bimedial" type which have been held to be less damaging to the personality. Similarly, in a Canadian study, McKenzie and Kaczanowski (1964) reported that probability of release of 183 lobotomized patients was no greater over a five-year period than for an unoperated group of matched controls. In a similar British study with blind ratings of patients with "bimedial" (restricted) lobotomy versus matched controls, there was little difference after five years in anxiety, obsession, or work adjustment (Tan et al., 1971).

Although these long-term follow-up studies were not published until the 1960s, by the late 1940s the early fantasies had faded for some. For example,

![Figure 1](image)

Dr. Harry Solomon, director of Boston Psychopathic Hospital and author of numerous studies of lobotomy, wrote that in chronically ill patients “spectacular improvement has occurred enabling the patients to return to a position of usefulness in society, and to be, at times, self-sustaining” (my italics). He estimated this number “in the neighborhood of 10 percent.” Although he concluded that 80 percent were “more contented,” he said nothing about their release (V.A. Tech. Bull., 1948).

Lobotomy seems to have peaked in the United States around 1949, and to have fallen off rapidly thereafter. Figure 1A illustrates this pattern for western Pennsylvania. Lobotomy at the University of Pennsylvania followed a similar pattern (Fig. 1B), as apparently did the practice in Connecticut (Hollingshead and Redlich, 1958). Although its decline may have continued into the early 1950s in other parts of the country, there is no evidence to support the oft-quoted dogma that lobotomy declined only after the introduction of major tranquilizers. Thorazine was not marketed until 1954 and had little impact until 1955 (Scull, 1977). It appears, therefore, that lobotomy died largely of its own weight.

1945: Renewal of moral therapy*

Another factor that must have hastened the decline of lobotomy before the advent of modern drugs was the revival of moral therapy. Following World War II there was tremendous public pressure for “mental health” reforms. Newspaper exposés and pressure from veterans and other groups forced attention to the purely custodial nature of the system. A National Mental Health Act was passed in 1946, and the V.A. poured new funds into their system of mental hospitals. The impact was great; for example, the staff at the VA Hospital in Bedford, Massachusetts, doubled between 1945 and 1952. Even more important, however, was a growing recognition that much of the patients’ regressive behavior reflected inhuman institutional practice rather than the natural course of mental illness. Greenblatt et al. have described the change from custodial to therapeutic care in three Boston area hospitals between 1945 and 1953: the depersonalizing admissions procedure was exchanged for a more reassuring induction rite; the practices of prolonged “hydrotherapy” and restraint in cold, wet sheets were dropped. In 1945, for example, patients spent an aggregate of 11,665 hours in restraints at the Bedford Veterans Administration Hospital, but no time in restraints by mid-1950. Voluntary activity such as sports was encouraged. Forced feeding was stopped, patients who had been heavily sedated were withdrawn from barbiturates, and the practice of “chemical restraint” was curbed. Effecting these changes required re-education of the staff and mobilization of its enthusiasm to new levels of tolerance and understanding.

In short, a renewal of moral therapy was instituted quite independently of any new somatic treatment — and the results were dramatic. Greenblatt notes, for example, that catatonic behavior faded from the wards at Boston Psychopathic Hospital. This hospital was a statewide center for lobotomy in this period, and Greenblatt notes:

*The following discussion is documented in Greenblatt et al. (1955).
Table 1. *Status at End of Five Successive Years of the First 100 Patients Committed to Boston Psychopathic Hospital After June 30, 1946*

<table>
<thead>
<tr>
<th>Status of Patient</th>
<th>1 Year</th>
<th>2 Years</th>
<th>3 Years</th>
<th>4 Years</th>
<th>5 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out of state</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Dead</td>
<td>4</td>
<td>7</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Living and in Massachusetts</td>
<td>92</td>
<td>89</td>
<td>88</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Of those living and in Massachusetts:

- In hospital:
  - Not discharged: 7 5 3 3 2
  - Discharged and readmitted: 13 8 9 8 10
  - In community:
    - Discharged and not readmitted: 54 51 49 46 45
    - Discharged after readmission: 18 25 27 31 31
  - Total: 72 76 76 77 76

- Per cent in community: 78 85 86 88 86


As the “worst” patients from other institutions arrived to await determination concerning the surgery, it was discovered that their destructive and assaultive behavior, which had kept many of them in seclusion for long periods, changed dramatically. For the first time personnel had partial evidence that such outrageous behavior could be the result of resistance to and retaliation against a fearful, rigid, and nontherapeutic ward atmosphere. Prior to this, the staff had always questioned whether Boston Psychopathic Hospital was not skimming off the cream of the “better” patients, and that only those better patients would respond to the freedoms of the “Psych” community. Now they learned that their attitudes toward patient care had perhaps universal applicability.

When such changes prevailed in 1952 in a “chronic” ward at Metropolitan State Hospital, outside Boston, all the patients showed improvement in objective measures of socialization. Almost half were discharged from the ward; 28 per cent of those originally on the ward were able to work in the hospital and 17 per cent were discharged to their homes. Table 1 from Greenblatt et al. indicates that the “recovery” rates by 1951 at Boston Psychopathic Hospital were about the same as those achieved by the early nineteenth-century moral therapists.

The mental hospital population has diminished massively over the last 20 years. Although this phenomenon is conventionally attributed to the mass introduction of neuroleptic drugs in 1955, there is clear evidence that the trend toward release began in both England and the United States as early as 1948, a full seven years before the widespread use of modern drugs. Furthermore, much of the decline in hospital population is accounted for by release of chronic patients, those for whom drugs are least effective (Scull,
1977). This is not to say that drugs are without effect, but that their effects have not been clearly distinguished from the effects of moral therapy and that the strong interaction between the two approaches has not been appreciated.

Even so, certain new forms of moral therapy have achieved successes for conditions that are still being treated by psychosurgery. At the Child Guidance Clinic in Philadelphia, anorexia nervosa is treated, not as an illness within an adolescent, but as part of a power struggle within the family. In a fairly large series of cases, it has proved possible to resolve the individual feeding problem by resolving the family struggle (Minuchin et al., 1975). Cingulotomy is, however, still performed for anorexia (Ballantine, 1972). Similarly, obsessive-compulsive neurosis is still treated by frontal leucotomy or cingulotomy despite remarkable success in treating the syndrome with behavior modification techniques (Hodgson et al., 1972; Radman and Hodgson, 1974; Marks et al., 1975).

**Contemporary Psychosurgery**

Psychosurgery was no longer "needed" to deal with patients in public facilities and beyond the early 1950s was no longer widely used for this purpose. A few surgeons, however, remained active, operating primarily on private patients referred through long-established channels. A recent survey showed, for example, that by 1973, 64 per cent of the operations performed each year were accounted for by 10 per cent of neurosurgeons, and 41 per cent by one individual surgeon (Valenstein, 1976). The surgeons' focus in this period was on developing new surgical techniques and on attempting operations on regions of the brain previously untouched in humans.

**New techniques**

In 1948 Spiegel and Wycis adapted for humans a stereotactic approach developed for animals by Horsley and Clarke in 1908. In this technique, the head is rigidly fixed in a three-dimensional coordinate system and the coordinates of the site to be destroyed are selected from a three-dimensional map of the brain. This permits destruction of subcortical areas such as thalamus, hypothalamus, and amygdala with minimal damage to overlying structures. The means of destruction are almost as varied as the neurosurgeon: coagulation by means of D.C. or radio frequency current, ultrasound, freezing, implantation of radioactive "seeds," and toxic chemicals. Neurosurgeons claim that these new lesions are safe, small, and accurate.

The claim of "safety" seems true. Deaths as a consequence of the surgery are rare. Furthermore, the incidence of seizures following surgery has been substantially reduced, probably because there is less nonspecific brain trauma during surgery. It is also true that the lesions tend to be physically smaller and somewhat more cautiously made than the early lobotomies. However, since neural pathways have a very precise organization, a "small" lesion in one
region can have more dramatic effects than a large lesion in another. The machinery of the frontal cortex is spread over a wide expanse, but funnels part of its output into the hypothalamus which contains, in a relatively tiny volume, neural mechanisms involving virtually every aspect of visceral, endocrine, and emotional responsiveness. A "small" lesion of the hypothalamus makes the same kind of sense as a "small" hydrogen bomb; their smallness is vastly disproportionate to the damage they can do.

Claims regarding the accuracy of the lesion placement are wholly unsubstantiated. Even though stereotactic technique in cats is usually accurate to within a few millimeters, it leaves enough uncertainty to make histologic confirmation of lesion placement an almost invariable requirement before experimental results can be published. In humans, wide variation in configuration of both skull and brain make simple stereotaxy so uncertain that it is usually supplemented by x-rays of internal landmarks. Since few patients die following the surgery, there is rarely independent evidence to substantiate the claim of accuracy.

In stereotactic thalamotomy for the motor disorders of Parkinson's disease, surgeons estimate that no more than 80 per cent of the lesions fall somewhere within their large target, the ventrolateral "complex." This estimate is based not on direct anatomical verification of the lesion site but wholly on calculating from x-rays where this part of the thalamus is supposed to be (Caracalos et al., 1963). Of 3000 cases done by one neurosurgical group by 1960, only four had come to postmortem examination (Cooper et al., 1963). These cases showed damage not only in the ventrolateral complex, but also in the ventroposteromedial and reticular thalamic nuclei, the subthalamic nucleus, zona incerta, fields H₁, H₂, internal capsule, and capsule of the red nucleus. These surgeons, despite their vast experience, frequently must make a second lesion, "overlapping the optimum locus" to achieve the desired clinical affect. Here are their comments about accuracy.

The investigator placing lesions... should not be deluded into the conclusion that identical lesions can... be placed in each patient. The diversity in each brain due to anatomic differences, various degrees of aging... and variability of blood supply requires a flexibility within even the most scientific approach to this particular problem.

In short, there is little evidence that stereotactic surgery is as accurate as the surgeons claim and adequate reason to believe that it is not. In a case with which I am personally familiar, an intended cingulotomy was found by a neuropathologist to be quite wide of the mark.

Psychosurgeons have tried to use patients' responses to electrical stimulation of brain structures to supplement stereotactic electrode placement. Some appear to claim, for example, that the electrode is in the amygdala if electrical stimulation evokes aggressive behavior (Mark and Ervin, 1970). This tactic is flawed in several respects. First, it is logically circular. Since there is no way to verify in humans the anatomical site of subcortical stimulation, it is impossible to tell whether the response is evoked from the intended target or from other structures. Valenstein (1970) has shown in
animal experiments that identical behaviors can be evoked from electrodes implanted in different regions of the hypothalamus, and Penfield has shown in humans that the same "experiential response" can be elicited by stimulating widely separated regions on the cortical surface (Penfield and Perot, 1963).

Second, the responses to stimulating a particular brain structure in animals and humans are highly variable and context-dependent. For example, in rats hypothalamic stimulation through a single electrode can elicit either feeding, drinking, gnawing, food shuffling, digging, or sexual behavior. Findings of this kind have led Valenstein (1970) to the conviction that "no specific relation exists between a given hypothalamic site and a particular response. In humans, cingulate stimulation may evoke specific sensory and motor responses, pain, generalized seizure, nausea, amnesia, fear, or pleasure (Meyer, 1972). Similarly, Chapman (1958) found stimulation "in the region of the amygdala" could evoke "feelings of fear and fright, visual hallucinations, depersonalization, and behavior suggestive of being startled." In no instance was he able to evoke "any subjective or behavioral response that remotely resembled aggressiveness. This was disconcerting, as the major reason for selecting these (7) patients . . . was intractable assaultiveness."

By similarly circular reasoning, surgeons frequently judge the "accuracy" of the lesion placement by clinical outcome. If the behavior is favorably affected, the lesion is assumed to be on target. If not, it is concluded that the target was missed and that a second operation is indicated. Thus, more than 26 per cent of the patients in the recent study of Teuber et al. (1976) had multiple operations: four had two bilateral cingulotomies, four had three cingulotomies, and one had two cingulotomies plus a "C.I.A." (see p. 3). Similarly in the Mirsky-Orzech study (1976), 37 per cent had an unspecified number of previous psychosurgical operations. Since there is no way of verifying the size or sites of any of the lesions, there is logically no way to decide whether positive or negative results are obtained by destruction of specific areas. The results that follow multiple operations are as likely as not to be the effect of cumulative destruction. By the same token, even with a single operation it is impossible to tell whether a "positive" result stems from destruction of the intended target or from nonspecific destruction. In Parkinson's surgery the results of lesions outside the intended target seem as effective as those within it (Caracalos et al., 1962).

**New targets**

As the realization grew that the old lobotomies did not eliminate psychosis but did cause gross personality defects, attempts were made to discover operations with greater specificity. Some of the experiments in the late 1940s were performed directly on humans. The Columbia-Greystone Project (Columbia-Greystone Associates, 1949), for example, attempted, by making different lesions in different patients, to determine which regions of frontal cortex would produce the most favorable clinical results. There is wide agreement that no useful conclusions emerged from this study, but it did become generally agreed in this period that in frontal lobe surgery destruction
of the medial parts were sufficient for clinical effect and produced less blunting than the full Freeman-Watts operation (see Greenblatt and Solomon, 1958). Knight and Scoville were among the prominent surgeons who continued to operate on the medial frontal lobe.

Most of the new targets were chosen on the basis of extremely selective interpretations of animal experiments. Klüver and Bucy in 1939 reported reduced fear and aggression in monkeys following removal of the temporal lobe. The animals also became “psychically blind,” “hyper-oral,” and hyper-sexual. Scoville, attending only to the observation of placidity, removed the temporal lobe bilaterally in 10 patients (Scoville and Milner, 1957). The surgery did not ameliorate their mental illness, but with the larger lesions, it severely and permanently impaired their ability to incorporate new memories. A patient could recall his childhood, but not “the locations of the rooms in which he lives, the names of his close associates, or even the way to the toilet or urinal” (Scoville, 1954). That 10 operations were performed before this was appreciated raises some question about the thoroughness with which such patients are studied postoperatively.

Cingulotomy was also developed by selective attention to animal experiments. In 1948 Ward removed the anterior cingulate gyrus in monkeys, following which such an animal

... shows no grooming behavior or acts of affection toward its companions. In fact, it treats them as it treats inanimate objects and will walk on them, bump into them... Such an animal never shows actual hostility to its fellows. It neither fights nor tries to escape when removed from a cage. It acts under all circumstances as though it had lost its "social conscience" (Ward, 1948; my italics).

Encouraged by this evidence of surgically induced placidity, Ward performed the operation on a 25-year-old schizophrenic woman who remained ill but "more manageable." Other American surgeons adopted the operation and continued to perform it during the 1950s and 1960s for essentially the same range of symptoms formerly treated by lobotomy.

In the early 1950s Schreiner and Kling reproduced many features of the Klüver-Bucy syndrome in animals by destroying the amygdala and overlying temporal cortex (Schreiner and Kling, 1953). The lesion produced hyper- and indiscriminate sexuality — and again a "taming" effect, especially striking in fierce species such as lynx, agouti, and rhesus monkey. Again, as with cingulotomy, there was evidence of emotional blunting and decrease in the animal's capacity for social interactions. Amygdalotomized monkeys released to their original troops under free-ranging conditions

... responded very inappropriately and acted as though they did not comprehend the significance of gestures from other monkeys... these operated animals appeared confused and more fearful when returned to their natural group... they all became social isolates... (and eventually)... died of starvation or were killed by predators (Valenstein, 1973).

Kling (1972) has also observed amygdalotomized female monkeys mishandle their young and behave "as though the infant was a strange object
to be mouthed, bitten, and tossed around as though it were a rubber ball.” It was also reported as early as 1955 that the amygdala is intimately involved in endocrine control. Amygdalotomy in young animals produces partial atrophy of the thyroid, pituitary, and adrenal glands, and also may retard growth. Psychosurgeons, however, focused only on the taming effect of amygdalotomy, and began to operate in the 1950s and early 1960s in cases marked by aggressive or destructive behavior, whether the diagnosis was personality disorder, schizophrenia, mental retardation, or temporal lobe epilepsy (Heimberger et al., 1966; Mark and Ervin, 1970; Vaermet and Madsen, 1970). Evidence that amygdalectomy produces deficits in humans similar to those in monkeys is summarized by Valenstein (1973).

One can begin to appreciate the reasons for such selective interpretations of animal experiments on realizing that the whole orientation of the surgeons is based on concepts of brain, emotion, and behavior that have been outmoded for, to put it charitably, 20 to 30 years.

Changing Concepts of the Brain and Behavior

Between 1935 and 1955, it was imagined that the brain is a machine built of simple elements linked in linear, causal sequences, similar in principle to such familiar machines as the gasoline engine. It was thought that there are “lower” and “higher” “centers.” Figure 2 illustrates this concept, which is still found in many textbooks. “Centers” were supposed to be anatomically discrete structures that perform particular perceptual or behavioral “functions,” such as “perceiving pain,” “seeing,” feeding, or sexuality. It was believed that “the amount of motivated behavior is a function of the amount of activity in these excitatory centers.”

In this conceptual framework, loss of a particular function following destruction of a specific nucleus or tract was reason enough to assign that function to the destroyed region. Alternatively, functions could be assigned by evoking a behavior from a structure by electrical stimulation. For example, the visual cortex was considered a higher visual center, since “blindness” resulted from its removal. The amygdala was a “rage center,” since in animals placidity followed its destruction and angry behavior followed its stimulation.

The “emotions” were thought to “circulate” via a simple circuit described by Papez in 1937:
Figure 2. Two pathways for "pain" information entering the nervous system, one for "automatic" or "reflex" control, and the other for "higher" centers. (From Sterling, P.: Principles of central nervous system organization. In Fraser, A., and Winokur, A. (eds.): Biological Basis of Psychiatric Disorders. New York, Spectrum Publications, 1977.)

MacLean enlarged on this concept in the 1950s, added the amygdala and septum to the circuitry, and called it the "limbic system." It was considered a "primitive" part of the brain because it exists in simple form in lower animals. It is, of course, no more primitive than our eyes or hearts, primitive versions of which also exist in lower animals.

Discoveries in neurobiology since 1955 have utterly transformed these conceptions and produced a much richer view. This new view begins with revised concepts of the neurons themselves. Previously a neuron had been
Figure 3. Some types of neural connections discovered with the electron microscope. A, Axoaxonic contact from cell C to cell A. What A "relays" to B depends on what cell C has to say. B, Reciprocal dendrodendritic contacts between cells A and B. Dendrite of cell A turned on by dendrite of cell B, but also turns off dendrite of B. A is modifying its own input, telling its informant what it is willing to hear. C, "Dyadic" contact from A to B and C. Reciprocal contact from B to A also influences cell C. Here B not only tells A what it wants to hear, but also modifies message transmitted from A to C. Arrows indicate functionally significant directions of current flow in the cells. (From Sterling, P.: Principles of central nervous system organization. In Fraser, A., and Winokur, A. (eds.): Biological Basis of Psychiatric Disorders. New York, Spectrum Publications, 1977.)

considered to be a simple "relay" element (Fig. 2) with input only on the dendrites and output only at the axon. It is now realized that in most parts of the brain single neurons form extremely complex local circuits in which both dendrites and axons receive and transmit. Figure 3 indicates a few of the known arrangements.

At the level of regional interconnections as well, new techniques show that the "telegraph model" of Figure 2 is obsolete. Different regions are interconnected, not by a single pathway, but by "cascades" of connections. Figure 4 shows this for the visual system. This diagram implies that each structure has multiple functions, since each "listens" and "speaks" to so many other structures. Obviously, too, with each structure at the end and at the beginning of so many processes, the notion of "lower" and "higher" centers becomes absurd. These new findings have recently enriched our thinking about the nature of vision itself.

Neurologists, having a "linear" conception of the brain, believed that a patient with a lesion of primary visual cortex was "blind." After all, the patient denied "seeing" a figure shown on a screen. Recently, however, some neuropsychologists, informed by this new "network" conception of the visual
system, insisted that their "cortically blind" patient point to the part of the screen where he thought the figure might be. They urged him to "guess" whether the figure was an "X" or an "O." The patient pointed accurately and guessed correctly on this and other tests. Thus, although he has abnormal vision because part of the network has been destroyed, there is a sense in which he does "see" (Weiscrantz et al., 1974).

Similar changes have occurred in our conception of the "limbic" system. The number of recognized interconnections has grown until Papez' circuit no longer stands out (Fig. 5). It has become clear, as would be anticipated from the anatomy, that each structure has multiple functions. The amygdala, for example, has demonstrated influences on feeding, drinking, aggression, sexual behavior, learning, blood pressure, and secretion of cortisol, growth hormone, oxytocin, and sex hormones (Elefetheriou, 1972).

It is also recognized, as may be appreciated from Figure 5, that the limbic system is not sharply demarcated from the rest of the brain. Many "motivated" behavioral responses and autonomic and endocrine responses can be affected
from areas previously thought to be purely "motor" areas. For example, stimulation of certain cerebellar areas can elicit grooming, feeding, or attack, accompanied by appropriate changes in heart rate and blood pressure (Reis et al., 1973). Similarly, destruction of a nigrostriatal pathway, also thought to be purely "motor," produces aphagia and adipsia, syndromes formerly thought to be purely hypothalamic (Ungerstedt, 1971).

The "new neuroanatomy" allows us to appreciate why there were arguments about whether the primary function of the frontal lobe was in intellectual or emotional processes. Figure 5 indicates that the frontal lobe has a pivotal position between the "limbic" and "nonlimbic" structures. It receives a cascade of inputs from neocortical regions concerned with complex perceptual and ideational processes (Fig. 6A) and a cascade from a host of limbic structures representing internal states of the body and emotions (Fig. 6B). The frontal lobe projects back to both sets of structures, again in "cascade" fashion (Figs. 6C and D).

This anatomy implies, as Nauta (1971) has pointed out, a dual role for the frontal lobe. It can inform the emotional sphere by its access to perceptual and intellectual processes, and it can focus and reinforce the perceptual and intellectual processes through its access to the emotional sphere. This interpretation could explain the two major features of the frontal lobe syndrome. First, affect is "flattened"; that is, emotional expression is no
Figure 6. Some connections of the frontal cortex. A. Cascades arrive in the frontal lobe from neocortical systems which analyze the "outer" world. B. Cascades to frontal lobe from limbic system which analyze the "inner" world. The results are transmitted back both to neocortex.

Illustration continued on opposite page.
Figure 6 Continued. C and to limbic structures D, again by means of cascades. Many connections have been omitted for the sake of clarity. (From Sterling, P.: Principles of central nervous system organization. In Fraser, A., and Winokur, A. (eds.): Biological Basis of Psychiatric Disorders. New York, Spectrum Publications, 1977.)
longer responsive to changes in environmental context. This would be anticipated because the mechanisms for emotional expression are no longer thoroughly informed by perceptual mechanisms of environmental changes. Second, there is "instability of intent"; that is, a program of action once initiated tends to fade out or be easily deflected before its ultimate goal is reached. Alternatively, the patient may persevere on one component of the program, as though the larger goal did not really matter. This, too, would be anticipated because thought processes are less thoroughly reinforced by emotions.

Lesions of the cingulate gyrus, amygdala, and frontal lobe are similar in that they all reduce emotional drive and the responsiveness of emotion to environmental context. At present not even the most sophisticated neuropsychologists can distinguish between patients with frontal, cingulate, amygdalar, or other limbic lesions. This is probably in part because, as Figures 5 and 6 indicate, the structures are so thoroughly interconnected.

The earlier concepts of the brain in which particular structures were assigned particular behavioral or emotional functions such as "aggression," "sex," "hunger," or "pleasure" required a relatively rigid classification of the functions themselves. Psychosurgeons continue to classify emotions and behavior in this way and also judge certain categories, namely strong or negative affect, as "bad," and other categories, such as mild or positive affect, as "good." Knight (1969), for example, says, "...primitive emotions are damaging emotions in psychiatry...." He describes a patient following surgery as "warm and normal in emotion" with a developing "normal maternal love" for her young son.

Similarly, Hunter Brown (1972) describes "a composite of the postoperative cingulotomy patient" as "generally one of a poised and self-assured individual who functions competently in his tasks, is usually cheerful, and has a good disposition and sense of humor." Brown sees a parallel between the "increased frustration tolerance of cingulectomized primates" and postcingulotomy behavior of humans in which there is a "notable equanimity in coping with the usual tensions of living. Often this seems superior to that of their fellow humans."

Newer concepts of the brain which appreciate the multiple functions and interconnectedness of each of its parts have been accompanied by a parallel appreciation in the study of behavior: that the meaning of any single piece of behavior depends on the context in which it is performed. There are no "good" or "bad" categories of emotions or behavior; rather, each is essential in particular situations. Furthermore, emotion can be effectively expressed in a variety of ways, depending on the context. For example, most psychiatrists would agree today that "normal maternal love" must at times be expressed as warm, positive affect and at others as concerned outrage or indignation. Furthermore, some mothers express outrage effectively by raising an eyebrow, while others raise a hand. Knight recognizes none of these possibilities and mentions no such variation in expression in his patients.

Similarly, "frustration tolerance" and "equanimity" are not, a priori, "good" behavioral capacities to be maximized in all situations. Rather, they
are elements that must be closely regulated to permit an individual to negotiate the world without engaging in constant conflict and without, at the same time, being taken advantage of. Again, there is no description by Hunter Brown of his patients' behavior in contexts where frustration tolerance and equanimity are inappropriate. Nor are such descriptions to be found in any of the psychosurgical literature.

By contrast to this significant growth in our understanding of both the brain and behavior, the psychosurgeons' theoretical accounts are either so simple-minded or so incoherent as to be bizarre. Here, for example, is America's most active psychosurgeon (Brown, 1972) describing the theoretical basis of his multiple target ("C.I.A.") surgery:

Since 1965 our major thrust has been directed to control or cure hard core schizophrenia and sociopathic aggression... Before proceeding... it was necessary to conceptualize a theoretical model that might have a reasonable prospect of success. Distortions of input-throughput-output were honed down more finely in the sequence of perception-cognition-affect with due respect for those areas needed for memory and information storage. Clearly a solution to the problem would involve the temporal as well as the frontal lobe... Let us take... (the) case of a violent sociopath; whether his homicide is carefully premeditated or an impulsive crime of passion, consummation often is followed by intense emotional satisfaction. Incongruous on the surface, the chain is in truth idiosyncratic suggesting disturbance in both the cingulum and amygdala.

1965 to 1978: Contemporary motivations for psychosurgery

The decade between 1955 and 1965 was a quiet one for psychosurgery, in which experience was gained with the new techniques and operations. In the second half of the 1960s, the psychosurgeons began to summarize their work for the medical public in a more systematic and aggressive way. Papers on cingulotomy appeared by Ballantine (1967) and Brown and Lighthill (1968); Andy published his work on thalamotomy (1966); papers appeared on amygdalotomy by Heimberger (1966) and Vaermet and Madsen (1970); Knight published regularly on orbital leucotomy between 1965 and 1969. Mark and Ervin wrote their "riot" letter to JAMA in 1967 (see p. 2), and their book Violence and the Brain appeared in 1970. Finally, the International Congress of Psychosurgery was revived and convened in 1970, for the first time in several decades.

The focus of interest in psychosurgery was no longer, as it had been in the 1930s and 1940s, on release or control of institutionalized patients, for this was no longer a pressing issue. Instead, the focus was on control of social deviance, violence, and addiction. The social context was one of rising political agitation around the demands of urban blacks, the Vietnam War, the women's movement, and epidemic heroin addiction.

It is also relevant that in this period neurosurgeons began to be underemployed, having lost portions of their practice to neurologists, neuroradiologists, orthopedists, and plastic surgeons, and to drug treatment of conditions such as Parkinsonism, which had been treated surgically in the
1950s and 1960s. It is estimated that in 1970, the average neurosurgeon performed only five or six operations per month (Bergland, 1973; Odom, 1972). The pressure on these specialists to find adequate employment for their skills must be taken seriously, since it is known that the number of operations performed tends to be proportional, not to the demonstrated need for surgery, but rather to the number of surgeons available (Bunker, 1970). This pressure may partly account for the rising interest in psychosurgery at urban, academic medical centers which are under particular pressure, having lost many patients to suburban hospitals. The recent recommendation of the National Commission for the Protection of Human Subjects (1976) seems tailored to the needs of such institutions:

"Until the safety and efficacy of any psychosurgical procedure has been demonstrated, such procedure should be performed only at an institution with an institutional review board. . . . The review board will determine the competence of the surgeon to perform the procedure and see that adequate pre- and post-operative evaluations are performed.

Thus, the National Commission, while implicitly recognizing that safety and efficacy have not been established, endorses the continuation of psychosurgery under the auspices of research institutions. This recommendation makes it likely that psychosurgery will continue for some time as a subspecialty in academic medical centers.

Effectiveness and side effects of contemporary psychosurgery

It is common in medicine for forms of therapy to spread rapidly and, for a while, to be used indiscriminately. Gradually their use becomes more differentiated; clear indications and contraindications become recognized, and side effects and the potential for iatrogenesis become appreciated. Finally, controlled studies give a more realistic appraisal of the true advantage of the treatment over placebo or other "active" therapies. Thus, we no longer give antibiotics to treat viral infections; we recognize the difference between broad- and narrow-spectrum antibiotics, and the difference between relatively dangerous ones such as chloramphenicol, and relatively benign ones such as penicillin. Similarly, the therapeutic limitations of neuroleptic drugs and their serious potential for iatrogenesis has gradually been established, though it has taken 20 years (Crane, 1973). One must ask, therefore, whether psychosurgery has, after 40 years and 50,000 or more operations, developed any evaluative criteria. Are the claims of success supported by real evidence? Have the surgeons identified the contraindications and side effects that must accompany any therapy, let alone one that destroys part of the core of our beings?

Psych surgeons, as noted in the introduction, recommend surgery for essentially all forms of "intractable" psychiatric illness. There are no generally recognized contraindications. Since it is an irreversible procedure, some surgeons consider it a "last resort" after all other therapeutic alternatives
have been exhausted. Yet some of the most prominent surgeons emphasize that it should be performed before “intellect is burned out by excessive electrotherapy, chemotherapy, and especially by the unique nature of the disease process itself” (Brown, 1972; see also Sweet, 1973). Psychosurgery is still performed for conditions which can often be effectively treated by specific forms of psychotherapy. For example, anorexia nervosa is often treated successfully by family therapy, obsessive-compulsive neurosis by behavioral modification techniques, obsession and intractable pain by hypnosis (Erickson, 1967), and so on. Reports of psychosurgery for these conditions never indicate that these therapies have been tried, nor do they ever present evidence that competent psychotherapy has been tried. Valenstein, in a report to the National Commission, notes that most patients arrive at psychosurgery through

“regular channels of referral” between particular psychiatrists and neurosurgeons….[The diagnostic criteria for indicating surgery] are rarely made explicit by psychiatrists and neurosurgeons in the published literature. Consequently, the statement that “all therapeutic alternatives have been exhausted,” which commonly appears in the psychosurgical literature, must be accepted or rejected as a matter of faith.

Reports of success and denial of iatrogenic effects also must be taken on faith, since Valenstein’s massive and systematic evaluation of the world literature shows 90 per cent of it to be virtually devoid of the necessary objectivity (Valenstein, 1976). In most of this literature there are no controls, no objective tests of function, no evaluation of the size or quality of the placebo effect, or the effect of the surgeon’s expectations. The evaluations are usually carried out either by the surgeons or their subordinates. There is not even a pretense in this literature of identifying contraindications, nor of determining which psychiatric problem is appropriate for a particular type of operation. Valenstein concludes:

...The great majority of the psychosurgical literature has no scientific value and little validity. The possibility that a significant part of improvement seen after surgery can be attributed to biased selection of patients and “placebo” effects cannot be ruled out.

Despite his criticisms, Valenstein cannot bring himself to believe that a surgeon could deceive himself “to assign a rating of excellent to a patient who spends his days sitting passively and unresponsively at home.” Yet, such surgeons and such patients do exist. At my own institution a patient who had received three lobotomies, which ultimately resulted in a hemiparesis, hydrocephalus, and severe epilepsy, was considered to have been “helped” by the treatment. The patient, not institutionalized before the surgery, and then considered “bright,” now has an I.Q. of 61, no social life, no work, and does sit at home, passively, unresponsively. Human capacity for self-deception is almost boundless, which is, in part, why prospective, controlled studies are indispensable.

Perhaps the best evaluations of modern psychosurgery are the two
performed recently for the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research by Teuber et al. (1976) and by Mirsky and Orzack (1976). These were valuable in that they employed some controls and were done independently of the surgeons by skilled psychologists who employed objective tests. The studies were flawed, however, in respects that are known to enhance artificially the apparent effectiveness of any treatment. They were largely retrospective; that is, most patients were seen by the psychologist only after the surgery. Under these conditions, recognition of losses from preoperative status will be minimized. The cases were selected by the surgeons, at least in the Mirsky-Orzack report, providing opportunity for sample bias, and the evaluations were not "blind," leaving the opportunity for examiner bias. There was no systematic control for the placebo effects, which, in surgery for angina, can account for about 35 percent of the relief (Beecher, 1961). Finally, many of the follow-ups were brief (only a few months) because of the Commission’s deadline. Since initially positive results following psychosurgery are often followed by relapse and reoperation, the brief follow-ups also tend, artificially, to favor the apparent effectiveness of the surgery. Even so, the results of these studies do not support the major claims of psychosurgery.

In the Teuber study, 34 patients received cingulotomy: 4 for "obsessive-compulsive" neurosis, 7 for "depression," 12 for a mixture of diagnoses ranging from anxiety neurosis to schizophrenia, and 11 for chronic pain with a psychogenic component. Twenty-two patients were women; 11 were men. One patient was studied only from the records and the gender was not given, certainly a comment on the quality of the records. Four male patients refused to participate and their outcomes are unknown. In the Mirsky-Orzack study 27 patients received either restricted frontal lobotomies of two contemporary varieties or multitarget ("C.I.A.") operations for a wide range of diagnoses that included depression, manic-depression, anxiety reaction, intractable headache, obsessive-compulsive personality, chronic schizophrenia, and alcoholism. Sixteen patients were women and 11 were men. The preponderance of women over men in the Mirsky-Orzack study tends to support the critics’ claim that at least some psychosurgeons operate more frequently on women.

If contemporary psychosurgery were truly a treatment of "last resort," one might anticipate that it would be restricted to older patients with ample evidence that they had received skilled psychotherapy. In the Teuber report, however, five of the seven depressed patients received their first operation between the ages of 21 and 33. Little mention is made of psychotherapy for these patients, but six of the seven had received massive ECT (50 to 200 treatments); one patient had received 100 ECT by age 20! In Teuber’s "mixed" diagnostic category, 7 of 12 patients were first operated on between the ages of 21 and 30. They, too, had received massive trials of ECT and drugs. In these patients the "last resort" might more accurately be characterized as the "final assault." Indeed, one of the major themes of the Teuber report is that substantial brain damage in the 34 patients evident on the objective tests was highly correlated with the amounts of ECT they had received.
The surgeons' claims of therapeutic effectiveness go largely unsubstantiated in the Teuber and Mirsky-Orzack reports. Though cingulotomy has been supposed to be particularly effective for obsessive-compulsive neurosis, none of the four such patients in the Teuber study were helped, though one had two operations and another, three. Of the seven patients operated on for depression, four had either no relief at all or partial relief followed by cyclic relapses and reoperation. Two of these patients had two operations, another had three. The three other patients were reported to be substantially relieved, though one "hit an alcoholic low" following surgery. These three patients, however, were followed for only 9 to 18 months after surgery and may still be subject to relapse, since relapse cycles for the others were approximately one to five years.

Seven of 12 patients in Teuber's "mixed" diagnostic category, including five with multiple operations, were clearly unimproved. Of the remaining five, one had an "undetermined outcome," but was taking Dilantin (for postoperative seizure), Librium, Valium, Elavil, Thorazine, and Halidol (sic). Another showed moderate improvement at three-month follow-up, but given the relapse rate of the others, this result is also undetermined. A third patient showed moderate relief of pain and depression, but the family attributes this improvement to his postoperative divorce. Obviously there is no way to separate the effects. A fourth patient was operated on at age 21, having already had 30 ECT. She showed dramatic improvement, but was followed for less than nine months. The last patient, followed for only 14 months, showed some improvement (quit drinking) but had not been able to return to his previous work as a school janitor.

Of 11 patients cingulotomized for pain, five were substantially relieved; six others received partial or no relief and are still taking drugs. One of these had 12 ECT within two months following his operation. Teuber found the "pain" patients to be more effectively relieved than those in the other diagnostic categories. This observation raises the question of the placebo effect which is known to be powerful in relieving pain. In some cultures, for example, trepanation, scraping the outside of the skull, is extremely effective for chronic pain (McNutt, 1968). One of the Teuber patients relieved by cingulotomy had previously been relieved for three years by a back operation, and following relapse, had been relieved again by injection of placebo into the intervertebral space, followed again by relapse. Since she was followed for only 15 months after cingulotomy, it is obviously impossible to determine whether her cure is permanent and should be attributed to psychosurgery, or a placebo response that will be followed again by relapse.

One patient in the Teuber report was a true placebo control. a woman for whom a cingulotomy was planned to treat her pain accompanied by anxiety and suspicion. The surgeon, unable to find secure landmarks at operation, terminated the procedure, telling the patient that she had received a "modified" operation. She had, by her own estimate, 75 per cent relief, as much as many of the cingulotomy patients, and expressed deep gratitude toward the surgeon. Many other patients in this study expressed similar reverence toward the surgeon, who not only had treated them but had helped them with practical matters such as finding a place to live. This close re-
lationship between the surgeon and his patients may have contributed as much toward the relief as the destruction of brain tissue. Certainly there is no evidence to the contrary.

That drugs and ECT do not achieve as large or as sustained placebo effects in these patients may merely reflect the utterly routine use of these treatments. Psychosurgery, by contrast, must be seen by patients and family as an extraordinary measure. To the extent that this is true, it may be appropriate to develop dramatic treatments with less iatrogenic potential. Perhaps a return to trepanation, which does not cause brain damage, would be in order.

The Teuber study hardly provides evidence of the effectiveness of modern psychosurgery. The specific claims for relief of obsessive-compulsive behavior were wholly unsupported. Relief in other diagnostic categories was extremely circumscribed; in many cases temporary relief was followed by cyclic relapse that continued even after multiple operations. One would be hard pressed to distinguish "operative" successes from placebo responses, or, in one case, from a response to a change in marital status.

The data in the Mirsky-Orzack study regarding successful outcome are not particularly encouraging either. Forty-eight per cent of these patients were classified as "less favorable outcome" ("LFO"), indicating either moderate improvement, no change, or deterioration. Fifty-two per cent were rated as "very favorable outcome" ("VFO"). However, one surgeon accounted for fully half of the VFO's with a "success" rate of 88 per cent, compared to a 40 per cent and 29 per cent rate for the other surgeons in the study. One might attribute this either to the surgeon's superior skill and his choice of operation (the "C.I.A.") or to his fortunate selection of cases for the Mirsky-Orzack team. Eighty-five per cent of the VFO's in this study were women. The success rate for women was 75 per cent, versus only 15 per cent for men. Most of the women in the study "occupied a housewife-homemaker role," suggesting that, as for the classical lobotomies, the surgery is better tolerated by those in a protected role.

It is universally conceded that the "old" lobotomies worked by decreasing the capacity to sustain emotional focus and drive. Patients retained their original sources of pain, obsession, depression, and so on, but were no longer dominated by them. As would be anticipated from our current concepts of the frontal lobe and limbic system (see pp. 141 to 145), this therapeutic effect was naturally accompanied by the "side" effects of general lessening in affective intensity, and a loosening of the relation between cognition and affect, so that affect was not only flattened but also often inappropriate. The side effects were greatest for the brightest and most intact patients and were considered less incapacitating for patients who remained protected within the family, which is why women in housewife roles were considered the best surgical candidates.

Contemporary psychosurgeons have been at pains to distinguish their results from the old lobotomies, claiming that their patients achieve not only relief of symptoms, but also new levels of cheerfulness, equanimity, maternal love, and so on, without other costs to the personality. In the Teuber and
Mirsky-Orzack reports, neither the patients' comments nor their behavior on objective tests substantiates this claim. Instead they suggest that both the therapeutic and the side effects resemble those of the old lobotomy, the only difference being that contemporary surgery, since it tends to be more conservative, produces somewhat less florid blunting.

One of Teuber's patients, for example, a paranoid, depressed schizophrenic, explains that following surgery, he still mistrusts and dislikes his neighbor, "but does not dwell so much on it—is not driven by it." The patient recognizes as the source of his relief that he "cannot focus as much on anything...." The report notes that he "cannot concentrate and that helps against the 'monomania' as he calls it." The patient had shown some improvement 14 months following surgery, but had been unable to return to his previous work as a school janitor. One of Teuber's "pain" patients says, "I still get the pains, but they don't worry me so much." Another, tested both pre- and postoperatively, had partial relief of her pain, but clear psychological losses on tests of hidden figures, sorting, fluency, and delayed alternation. She is "less able to concentrate, 'hypnotized' by rhythmic noises, has trouble arranging housework—but is optimistic that it's getting better." Optimism, of course, is one by-product of the surgery (see p. 148) and may have no bearing on whether her ability to concentrate is actually improving.

In the Mirsky-Orzack study, objective tests showed clear evidence of "cognitive" loss of the sort that usually accompanies frontal lobe damage. These losses were particularly great for the VFO group, which tended to make the most perseverative errors on a card-sorting test, "despite the fact that they appear somewhat brighter and appear to have a somewhat better memory." These patients also showed the greatest losses in responsiveness of cerebral electrical activity to response-contingent stimulus events. These substantial losses led the investigators to speculate that "recovery from the severe and crippling psychiatric illnesses from which these patients suffer may in some cases be made at a price—the loss of certain cognitive capacities.... It also follows that recovery is less likely to occur if some cognitive loss is not sustained." The detailed description of the test performance of their sample VFO case illustrates these losses and also suggests that "blunting" is indeed the source of therapeutic effect.

On the basis of this subject's test performance and behavior I would conclude that she is a woman of superior intelligence, with particular skills in areas involving verbal ability and abstract thinking and striking deficits in her capacity to organize and to retain visual information and in her ability to integrate visual and motor activity. Her difficulty in organizing visual material and numerical information makes it hard for her to grasp sequences and to think ahead as she goes along. She appears to deal with this incapacity by using, instead, trial and error approaches, in a somewhat hit or miss fashion. Her test results alone would not be incompatible with depression, perhaps of an involutorial type, and this is further indicated by the frequent comments about her inadequate performance made during the testing sessions, and what appears to be a rather poor self-image. However, what is most striking is the lack of depressive affect or distress or anxiety which would normally be expected to accompany the recognition of such cognitive deficits as she manifests (italics mine).
This test behavior and lack of affective display resemble strikingly Jacobsen's original (1935) observations on lobotomized chimpanzees and the observation of Freeman and Watts and many others in the 1940s on lobotomized humans. Overall, therefore, the Teuber and Mirsky-Orzack reports fail to support any of the major claims of contemporary psychosurgery. It appears to be neither highly efficacious, nor without cost to the patient, nor to differ fundamentally from "classical lobotomy."

Conclusion: Ethics of Psychosurgery

The problem I raised at the outset, whether it is not immoral to refuse psychosurgery to a suffering individual, now seems to me simple. The surgery seems to offer sustained relief only rarely. The part of the relief that depends on the placebo effect could undoubtedly be achieved in some more imaginative and less organically destructive way. The part that depends on partial disconnection of the brain's affective and cognitive mechanisms does not seem large enough or sustained enough to pay for its serious costs documented in the Teuber and Mirsky-Orzack reports. In short, while one must sympathize with suffering, there is no evidence that it is much relieved by such surgery.

The issue of ethics is also simple. There are two definitions of "ethical." It can mean "conforming to professional standards of conduct." By this definition, psychosurgery must now be considered ethical, just as bleeding, vomiting, and purging were in the eighteenth century, and just as solitary confinement, straitjackets, custodial care, and lobotomy were in the 1930s to 1950s. "Ethical" also means "right and proper." Since the surgery does not usually bring sustained relief, and since such relief as does occur is often accompanied by blunting of psychological capacities, it cannot be considered in any way right or proper. In short, it is highly unethical.

The issue of "informed consent" has also been simplified, for it depends entirely on who does the informing. Truly informed consent cannot be obtained by psychsurgeons because their perceptions of the issue are demonstrably biased, to say the least. If "informed consent" included a thorough presentation of the discouraging data in the Teuber and Mirsky-Orzack reports and in Valenstein's analyses, it is unlikely that many patients would agree to surgery. Short of such a presentation, no consent is, in my opinion, informed.

My initial concern with the rise of the "new" psychosurgery was its potential for control of social deviance. I now think it has little such potential. First, it is still an extremely crude disruption of a fantastically delicate mechanism. It simply will not work. Psychsurgeons are correct in pointing out that schools, television, and other features of our culture are far more

*The conclusions in the Teuber and Mirsky-Orzack reports are somewhat less pessimistic than my own. I have felt compelled, given limited space, not to debate their conclusions, but to focus instead on what seemed important in their data.
subtle and effective. Second, psychosurgery has been and will continue to be resisted. Although people know they are controlled in various ways through the culture, they are also aware of their power to resist unjust control—even in “total institutions,” such as a concentration camp or a “cuckoo’s nest.” They are aware that this power resides in their brains and they will not give it up in the long run. That is why psychosurgery on only 300 to 400 patients per year has caused a greater stir than the 12,000 annual deaths from more familiar kinds of unnecessary surgery (Cost and Quality of Health Care. 1976).

We have described how the rise of lobotomy and more recent forms of psychosurgery bear only a loose relation to advances in scientific understanding and demonstrable therapeutic efficacy. Their rise was more strongly correlated with social demand, in the 1930s for a solution to the problems of custodial care, in the 1960s for a solution to rising social disruption: violence, alcoholism, addiction, old age depression—and neurosurgical underemployment. The disuse of these practices, on the other hand, usually follows not improved treatments, but disenchantment with poor therapeutic results, and also social resistance. Psychosurgery will probably go the way of purging and bleeding, since it is practically worthless as an individual therapy or for control of social deviance. In the short run, however, the practice can do both individual and social damage.

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