

A DELICATE OPERATION

Roy C. Selby, Jr.

Roy C. Selby, Jr., (b. 1930) graduated from Louisiana State University and the University of Arkansas Medical School, where he specialized in neurology and neurosurgery. He now practices in the Chicago area and is the author of numerous professional articles on neurosurgery. "A Delicate Operation," which first appeared in Harper's magazine in 1975, reports for a more general audience the details of a difficult brain operation.

In the autumn of 1973 a woman in her early fifties noticed, upon closing one eye while reading, that she was unable to see clearly. Her eyesight grew slowly worse. Changing her eyeglasses did not help. She saw an ophthalmologist, who found that her vision was seriously impaired in both eyes. She then saw a neurologist, who confirmed the finding and obtained X rays of the skull and an EMI scan—a photograph of the patient's head. The latter revealed a tumor growing between the optic nerves at the base of the brain. The woman was admitted to the hospital by a neurosurgeon.

Further diagnosis, based on angiography, a detailed X-ray study of the circulatory system, showed the tumor to be about two inches in diameter and supplied by many small blood vessels. It rested beneath the brain, just above the pituitary gland, stretching the optic nerves to either side and intimately close to the major blood vessels supplying the brain. Removing it would pose many technical problems. Probably benign and slow-growing, it may have been present for several years. If left alone it would continue to grow and produce blindness and might become impossible to remove completely. Removing it, however, might not improve the patient's vision and could make it worse. A major blood vessel could be damaged, causing a stroke. Damage to the undersurface of the brain could cause impairment of memory and changes in mood and personality. The hypothalamus, a most important structure of the brain, could be injured, causing coma, high fever, bleeding from the stomach, and death.

The neurosurgeon met with the patient and her husband and discussed the various possibilities. The common decision was to operate.

The patient's hair was shampooed for two nights before surgery. She was given a cortisone-like drug to reduce the risk of damage to the brain during surgery. Five units of blood were cross-matched, as a contingency against hemorrhage. At 1:00 P.M. the operation began. After the patient was anesthetized

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her hair was completely clipped and shaved from the scalp. Her head was prepped with an organic iodine solution for ten minutes. Drapes were placed over her, leaving exposed only the forehead and crown of the skull. All the routine instruments were brought up—the electrocautery used to coagulate areas of bleeding, bipolar coagulation forceps to arrest bleeding from individual blood vessels without damaging adjacent tissues, and small suction tubes to remove blood and cerebrospinal fluid from the head, thus giving the surgeon a better view of the tumor and surrounding areas.

A curved incision was made behind the hairline so it would be concealed when the hair grew back. It extended almost from ear to ear. Plastic clips were applied to the cut edges of the scalp to arrest bleeding. The scalp was folded back to the level of the eyebrows. Incisions were made in the muscle of the right temple, and three sets of holes were drilled near the temple and the top of the head because the tumor had to be approached from directly in front. The drill, powered by nitrogen, was replaced with a fluted steel blade, and the holes were connected. The incised piece of skull was pried loose and held out of the way by a large sponge.

Beneath the bone is a yellowish leatherlike membrane, the dura, that surrounds the brain. Down the middle of the head the dura carries a large vein, but in the area near the nose the vein is small. At that point the vein and dura were cut, and clips made of tantalum, a hard metal, were applied to arrest and prevent bleeding. Sutures were put into the dura and tied to the scalp to keep the dura open and retracted. A malleable silver retractor, resembling the blade of a butter knife, was inserted between the brain and skull. The anesthesiologist began to administer a drug to relax the brain by removing some of its water, making it easier for the surgeon to manipulate the retractor, hold the brain back, and see the tumor. The nerve tracts for smell were cut on both sides to provide additional room. The tumor was seen approximately two-and-one-half inches behind the base of the nose. It was pink in color. On touching it, it proved to be very fibrous and tough. A special retractor was attached to the skull, enabling the other retractor blades to be held automatically and freeing the surgeon's hands. With further displacement of the frontal lobes of the brain, the tumor could be seen better, but no normal structures—the carotid arteries, their branches, and the optic nerves—were visible. The tumor obscured them.

A surgical microscope was placed above the wound. The surgeon had selected the lenses and focal length prior to the operation. Looking through the microscope, he could see some of the small vessels supplying the tumor and he coagulated them. He incised the tumor to attempt to remove its core and thus collapse it, but the substance of the tumor was too firm to be removed in this fashion. He then began to slowly dissect the tumor from the adjacent brain tissue and from where he believed the normal structures to be.

Using small squares of cotton, he began to separate the tumor from very loose fibrous bands connecting it to the brain and to the right side of the part of the skull where the pituitary gland lies. The right optic nerve and carotid

artery came into view, both displaced considerably to the right. The optic nerve had a normal appearance. He protected these structures with cotton compresses placed between them and the tumor. He began to raise the tumor from the skull and slowly to reach the point of its origin and attachment—just in front of the pituitary gland and medial to the left optic nerve, which still could not be seen. The small blood vessels entering the tumor were cauterized. The upper portion of the tumor was gradually separated from the brain, and the branches of the carotid arteries and the branches to the tumor were coagulated. The tumor was slowly and gently lifted from its bed, and for the first time the left carotid artery and optic nerve could be seen. Part of the tumor adhered to this nerve. The bulk of the tumor was amputated, leaving a small bit attached to the nerve. Very slowly and carefully the tumor fragment was resected.

The tumor now removed, a most impressive sight came into view—the pituitary gland and its stalk of attachment to the hypothalamus, the hypothalamus itself, and the brainstem, which conveys nerve impulses between the body and the brain. As far as could be determined, no damage had been done to these structures or other vital centers, but the left optic nerve, from chronic pressure of the tumor, appeared gray and thin. Probably it would not completely recover its function.

After making certain there was no bleeding, the surgeon closed the wounds and placed wire mesh over the holes in the skull to prevent dimpling of the scalp over the points that had been drilled. A gauze dressing was applied to the patient's head. She was awakened and sent to the recovery room.

Even with the microscope, damage might still have occurred to the cerebral cortex and hypothalamus. It would require at least a day to be reasonably certain there was none, and about seventy-two hours to monitor for the major post-operative dangers—swelling of the brain and blood clots forming over the surface of the brain. The surgeon explained this to the patient's husband, and both of them waited anxiously. The operation had required seven hours. A glass of orange juice had given the surgeon some additional energy during the closure of the wound. Though exhausted, he could not fall asleep until after two in the morning, momentarily expecting a call from the nurse in the intensive care unit announcing deterioration of the patient's condition.

At 8:00 A.M. the surgeon saw the patient in the intensive care unit. She was alert, oriented, and showed no sign of additional damage to the optic nerves or the brain. She appeared to be in better shape than the surgeon or her husband.