

# NEUROGENIC BLADDER ASSOCIATED WITH BRAIN TUMORS

*With Presentation of a Case Study*

W. JAMES GARDNER, M.D.

Until fairly recently, the top level for the control of the autonomic functions of the body has been assumed to be the basal ganglia of the brain. The work of experimental physiologists, particularly Sherrington, Denney-Brown, and Robertson in England, Fulton, Bucy, Langworthy, and Kolb in America has proved conclusively the existence of autonomic representation in the cerebral cortex. These highest autonomic centers are located in the cortex of the frontal lobes and they exert a governing effect on the centers in the hypothalamus and medulla which regulate visceral activity. Blood vessel tone, glandular secretions, sweating, and gastro-intestinal motility are a few of the visceral functions which have been proved to be definitely under the control of the frontal lobes of the brain.

In a study on the physiology of micturition in man, Denney-Brown and Graeme Robertson observed the variations in intravesical pressure which occur with increasing distention of the bladder. They concluded that apart from a faint background of maintained tonic activity, spontaneous vesical activity takes the form of waves of contraction appearing in rhythmical progression. An effort to void evokes powerful contractions of the bladder, whereas a voluntary effort of restraint completely inhibits the nervous discharges responsible for spontaneous vesical activity.

In pursuing the center for micturition cephalad, Longworthy and Kolb studied intravesical pressures in normal animals and in animals with sections through the brain stem at various levels. They first established the volume of contents necessary to induce reflex micturition in the intact animal. They found this to be 155 cc. in the cat. After removal of the motor cortex on one side, this volume was reduced to 30 cc. After removal of the other motor cortex, the volume was further reduced to 20 cc. After a section at the upper border of the pons, it was 11 cc. When the section was at the middle of the pons or below, reflex micturition was very weak and incomplete. That is, there was retention with overflow. The conclusions to be drawn from these findings are that tone in the musculature of the bladder is similar to tone in striated muscles, that it is under the control of the motor cortex which exerts an inhibiting action on the reflex centers in the cephalic portion of the hind brain.

The bladder symptoms of patients with cerebral lesions have not received very serious consideration in medical literature. The reason for this is probably that the incontinence has been dismissed under the assumption that it was a mental symptom. Although this is true perhaps in the majority of cases, it certainly is not true in all instances.

## NEUROGENIC BLADDER ASSOCIATED WITH BRAIN TUMORS

Every neurological surgeon has observed retention of urine in certain patients with cerebellar tumors. This is the result of pressure on the medulla with interruption of the reflex arc to the centers in the upper portion of the pons. With this arc interrupted, the tone of the bladder musculature is lost. This was demonstrated experimentally by Langworthy and Kolb by their sections through the middle of the pons.

It is well recognized now that true vesicle incontinence can occur as a result of lesions of the frontal lobes. Our experience seems to indicate that the lesion must affect both frontal lobes, although exactly what portion must be damaged is not entirely clear. We have seen it in unilateral frontal lobe tumors which were of sufficient size to markedly compress the opposite frontal lobe. It has always cleared up with removal of the tumor even though this involved amputation of one frontal lobe or even removal of an entire cerebral hemisphere.

The patient who has elicited our greatest interest in this problem is one in whom it was necessary to amputate both frontal lobes for an infiltrating tumor.

This patient was a woman of 52 years who presented a typical picture of brain tumor and who in addition was incontinent of urine. The significance of this symptom was not realized at the time of her original study and it was ascribed to intellectual deficit. Ventriculography indicated the presence of a bilateral frontal lobe tumor. At operation on August 28, 1933, an infiltrating tumor of the right frontal lobe was found and an amputation of this lobe was performed at a point anterior to the motor area. The patient immediately became continent but lapsed again into incontinence seven days later. As the first operation showed the tumor extending into the left frontal lobe, this lobe was amputated at a second operation 12 days later. The patient made a satisfactory recovery from these operations but has remained absolutely incontinent to date. The patient is rational. She shows some memory defect and complicated mental processes are impossible. She, however, is tidy about her appearance and in her habits. She is never conscious of a feeling of fullness in the bladder and even when it is full, voluntary urination is impossible. The urine does not dribble. It discharges involuntarily after several hours of filling. She has never been catheterized to determine whether or not there is retention.

Cystoscopic study was performed by Dr. Higgins. His notes are as follows: Cystoscope passed with ease. There is no loss of sensation in the urethra. Hot water was allowed to run into the bladder which the patient could differentiate from cold solution. The bladder is quite atonic but there is no fine trabeculation present. Upon irritating the wall of the bladder with a catheter there was but very little response. The internal sphincter shows a marked degree of loss of tone.

Here, then, we have the picture of a patient who cannot tell when her bladder is full and cannot voluntarily empty it. This, in spite of the fact that there is no paralysis and no loss of cutaneous sensibility. These findings are in agreement with the experimental evidence that the centers for voluntary control of micturition are located bilaterally in the frontal lobes.