THE TREATMENT OF SPASTIC PARAPLEgia
BY SELECTIVE SPINAL CORDECTOMY

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Any method of surgery that can be utilized to improve the physical state of a spastic paraplegic person is worthy of description. It is the purpose of this communication to describe a technic that can be used on certain paraplegics and has certain definite physiologic and technical advantages over the more commonly used methods of producing flaccidity. In order to illustrate this surgical approach to the problem, 4 cases will be reported in detail.

If spasticity in flexion or extension exists in the extremities and body distal to the level of injury to the spinal cord, the problem of rehabilitation and general care is markedly enhanced. The spasticity frequently induces such overwhelming situations (for example, urologic complications or bedsores) that death may result. When such situations develop, it then becomes necessary to produce flaccidity in the lower extremities and bladder so that these structures can be adequately cared for. During recent years, the classic methods of producing flaccidity have been by anterior rhizotomy,13,14 subarachnoid injection of alcohol14,16 or, more rarely, posterior-column tractotomy.15 Each method, although it presents its own inherent difficulties, serves a worth-while purpose and each remains a part of the surgeons’ armamentarium. An additional procedure, which seems suited to certain conditions, is selective spinal cordectomy. This procedure can be accurately accomplished and, in most instances, expeditiously performed.

The concept of removal of a malfunctioning organ is not new to medicine but in fact is fundamental to the science of surgery. Thus, the gangrenous leg must be removed to save the life of the patient. More recently it has become apparent to neurologic surgeons that patients who suffer from infantile hemiplegias and epilepsy are improved by hemispherectomy.1,10,17 Physiologically, the “spastic” terminal portion of the spinal cord can be compared to the “spastic epileptogenic hemisphere.” In each instance, there are occasions when all or part of the disorganized neurologic structure is best removed from the body.

The idea of removing large segments of the spinal cord first occurred to the author in February, 1948, and on Aug. 31, 1948, a thoracic, lumbar and sacral spinal cordectomy was accomplished in an effort to eradicate a highly

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malignant glioma of the spinal cord. The details and effects of this procedure have been described previously.\textsuperscript{11} It became apparent that removal of extensive portions of the spinal cord is compatible with life, but that certain alterations in physiology occur.\textsuperscript{12} The most striking effect of spinal-cord removal or extensive injury is catabolic in nature, with manifestations of gynecomastia, hypoproteineemia, decreased metabolic rate, and evidence of demasculinization. Details of this have been recorded previously, and efforts to combat these changes have also been outlined.\textsuperscript{5-9} From a practical point of view, it is apparent from this work that the bladder can contract after large segments of the spinal cord have been removed. The evidence indicates, therefore, that spinal cordectomy below the cervical segments is compatible with life, will relieve spasticity, and will produce a flaccid bladder that can contract. Also, intestinal function is little altered when a transected spinal cord is converted to a resected spinal cord.

The effect of spinal cordectomy on sexual function in either men or women is not known. One would suspect, however, that the effect would be no different from what is seen with a cauda-equina type of lesion or after either extensive anterior rhizotomy or subarachnoid injection of alcohol. For a review of this subject the reader is referred to the work of Bors and co-workers.\textsuperscript{1,2}

**REPORT OF CASES**

*Case 1.* A white woman aged 48 years sustained an injury to the thoracic part of the spinal cord on June 23, 1951, in an automobile accident. Laminctomy on June 26, 1951, revealed trauma of the cord from the 3rd to the 5th thoracic segments inclusive. Spasticity in flexion and the usual mass reflex phenomena gradually developed. An automatic bladder did not develop and a retention catheter was necessary. Bedsores, thrombophlebitis and debilitation became an almost overwhelming problem. Rehabilitation was impossible.

On July 23, 1952, a lower spinal cordectomy was performed (Fig. 1). The spinal cord was removed from the 11th thoracic segment through the conus and upper part of the cauda equina. This resulted in flaccidity of the lower part of the abdominal wall and the lower extremities. Rehabilitation was rapid and well managed. Bedsores were healed by numerous plastic procedures.

The patient has subsequently lived at home. She has continued to require the use of a catheter. This has been employed for convenience, and no attempts have been made to remove it because of the patient's reluctance and inability to become sufficiently mobile to establish satisfactory control of the bladder either with or without transurethral resection. She has become too obese.

The portion of spinal cord from the site of injury (3rd, 4th and 6th thoracic segments) to and including the 10th thoracic segment was left intact to maintain reflex spasticity of this portion of the body, particularly the upper part of the abdominal wall. It was hoped that the intra-abdominal pressure could be reflexly increased to aid in evacuation of the bladder. In this instance, however, it has not been possible to attain satisfactory management of the bladder.

*Case 2.* A 13-year-old girl fell from her bicycle on Aug. 27, 1952, sustaining immediate paralysis of the lower portion of her body and legs. On Sept. 3, 1952, a