A SURVEY OF THE NEUROLOGICAL RESULTS OF 858 SPINAL CORD INJURIES
A COMPARISON OF PATIENTS TREATED WITH AND WITHOUT LAMINECTOMY
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The literature since World War II contains many articles on the treatment of spinal cord injuries. While most authors agree in general upon proper methods of treating the complications of paraplegia, one apparently unsolved question still remains: "When is laminectomy indicated?"

There seems to be uniform agreement that an exploratory laminectomy is required in patients with penetrating wounds of the spine. A wide difference of opinion exists, however, concerning the indications for laminectomy in cases of recent closed trauma. Most authors consider progressive neurological decline as an absolute indication for intervention, and some feel that most acute spinal cord injuries require laminectomy. In this regard, Tarlov held it reasonable to assume that cord function may recover provided decompressive measures be instituted before irreversible changes occur. Contrastingly, many observers felt that indications for laminectomy are uncommon in the early post-injury period. Characterizing this opinion is a statement of Mayfield who "rarely finds it necessary to perform a laminectomy," feeling the procedure to be indicated only "(1) if it can be shown that bony compression is retarding the recovery of patients with partial cord lesions and (2) if there is demonstrable obstruction of the spinal canal, if x-ray evidence shows sufficient deformity to cause cord compression and if the clinical findings harbor doubt as to whether the lesion is incomplete." Additionally, Munro suggested that "it is outrageously dangerous" to make exploration in recently injured patients with cervical lesions. Yet, Wannamaker reported no fatalities among 42 patients operated upon under such circumstances.

The presence or absence of subarachnoid block, treated lightly in most reports concerning open injury, is considered by many observers to be a critical factor in assessing the need for operative intervention in patients rendered paraplegic by closed trauma. Davis stressed the importance of

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edema of the cord as a contributing factor to paraplegia in the early days following injury and is strongly influenced to operate when spinal subarachnoid block exists. Munro\textsuperscript{8,9} supported Davis' views on edema, but appears to delay surgical exploration until it becomes evident that proper conservative management will be ineffective.

Schneider\textsuperscript{13,14} in a recent series of articles, has described two distinct traumatic cervical cord syndromes and carefully outlined indications for intervention. The first, occurring in hyperextension injuries of the cervical spine, and in the absence of subarachnoid block, is a central cord syndrome, which Schneider stated contraindicates surgery. The second, occurring in flexion injuries, also in the absence of subarachnoid block, is an anterior and lateral cord syndrome, which he feels is remediable in the acute phase by section of the denticulate ligaments in accordance with the theory of Kahn\textsuperscript{7} on the role of these ligaments in anterior cord compression.

The reported indications for late laminectomy are equally controversial. One opinion, characterized in the publications of Rand,\textsuperscript{12} suggests that delayed intervention, particularly after more than 1 year, is seldom followed by significant recovery of function, although the morale of the patient may be improved after exploration. Opposingly Campbell and Meirowsky\textsuperscript{2} have noted satisfactory return of function, particularly that mediated by nerve roots, when operation was performed as long as 5 years after injury, and are prone to consider late intervention in the hope of achieving some such benefit for the patient.

The large number of patients studied in the paraplegia service at this hospital afforded an unusual opportunity to assess these problems in the management of spinal cord injuries. That these people were injured in widely separated areas and in many different ways and treated by many physicians by various methods added to, rather than detracted from, the desirability of the material so supplied for study. Records were available concerning the nature and extent of the traumatic process as well as the treatment applied in 858 such cases. This information, supplemented by neurological evaluation of progress since injuries, permitted comparative analysis of the several therapies employed. This analysis forms the subject matter of this report.

MATERIALS AND METHODS

All 858 patients included in this study were regularly admitted to the paraplegia service of this hospital during the past 9 years. In every instance spinal cord injury, either open or closed, had resulted from acute trauma usually rendering the individual essentially completely paraplegic. The records on all patients so admitted (1020) were reviewed, no case being excluded from the series for reasons other than those described below. The primary requirements for inclusion in the group were as follows:

(1) Of critical importance was the availability of a satisfactory description of the original injury, the condition of the patient during the acute and