EXPERIENCES WITH HIGH CERVICAL CORDOTOMY

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The development of anterior-lateral cordotomy has been covered by many excellent reviews.1,2,5,8 The results of cordotomies performed in the high thoracic region have given relatively satisfactory results for the relief of intractable pain in the trunk, pelvis, and lower extremities. However, two disadvantages of cordotomy at this level have existed: the level of analgesia obtained by this method has not always remained sufficiently high to provide continued relief of pain, and the retention of "islands" of intact sensation distal to the cordotomy have in many instances negated an otherwise satisfactory result. In order to overcome these disadvantages, other surgical procedures have been employed. Among these are prefrontal lobotomy, mesencephalic tractotomy and medullary spinothalamic tractotomy. These procedures have not gained widespread utilization because of technical difficulties inherent with the operation, relatively high mortality rates and inconstancy of results. At the present time, the indications for these operations are considered to be rather sharply limited, and in general they are not considered to be the operation of choice for the relief of intractable pain below the face. The most notable exception to this is in the instances of intractable pain associated with severe narcotic addiction and pre-existing mental changes. For these patients prefrontal lobotomy has been of considerable value.3

As a result of the frequent unsatisfactory results obtained with high thoracic cordotomies and the disadvantages encountered with other neurosurgical procedures for relief of pain, cordotomy done in the high cervical region has enjoyed increasing popularity.4,6,7 High cervical cordotomy offers the advantages of relatively few technical difficulties, sustained high levels of analgesia without "islands" of hypalgesia or sparing distal to the site of the cord incision and a relatively low operative mortality rate. The purpose of this paper is to present and discuss our experience with 81 consecutive cases of high cervical cordotomy performed by the members of the neurosurgical service of the University of Minnesota Hospitals during the years 1948 through 1954.

When the program of performing high cervical cordotomies was first

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instituted in this clinic, only those patients with intractable pain in the upper thorax, brachial plexus, and upper extremity were subjected to this procedure. However, over a period of years it has been felt more and more strongly that high cervical cordotomy was the operation of choice for patients with intractable pain in the trunk, pelvis, and lower extremities and because of this, many patients with pain in these locations have been subjected to high cervical cordotomy and are included in this study.

Initially, the selection of these cases for surgery was not based on a rigid set of criteria and some of the patients were desperately ill and debilitated when first seen as possible candidates for surgical relief of pain. Experiences with patients in this category have been most disappointing and it must be stressed that the optimum time for cordotomy is prior to the extreme general physical decline and severe narcotic addiction, for these attend a much slower postoperative convalescence and a higher operative mortality rate.

In this series of 81 cases there were 11 operative deaths, an operative mortality rate of 13.5 per cent. Two of these patients, obviously extremely poor surgical candidates, suffered cardiac arrest prior to making the incision in the cord. They are included in the mortality statistics but for obvious reasons are not included in the other statistics presented here. The remaining 9 patients were terminally ill and debilitated and were considered poor surgical risks.

Included in this series of 81 patients with high cervical cordotomy are 33 patients upon whom bilateral incisions were made to relieve either midline or bilateral pain. In 14 patients the bilateral incisions were done in the higher cervical levels and in 19 the high cervical incision was combined with a high thoracic incision. Thus, a total of 112 cordotomies were performed in this series of 81 cases (Table 1).

<table>
<thead>
<tr>
<th>Level of incision</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
<th>C6</th>
<th>C7</th>
<th>C8</th>
<th>T1</th>
<th>T2</th>
<th>Total 112</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cordotomies</td>
<td>6</td>
<td>71</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>9</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

The etiology of the pain varied but predominantly it was caused by neuritis or radiculitis secondary to local or regional extension of malignancy. Among the other diseases encountered in this study were tabes dorsalis, phantom limb pain, leukemia and osteoarthritis of the spine (Table 2).

**SURGICAL TECHNIQUE**

The upright or sitting position was used for all patients in reasonably good physical condition upon whom unilateral high cervical cordotomies were done. At first, this position was used for bilateral procedures but because of the associated drop in blood pressure and ensuing complications it became obvious that a horizontal or a prone position must be used whenever doing bilateral cordotomies. Three of the deaths in this series perhaps can