Long-Term Results of Surgical Treatment of Myelopathy Due to Cervical Spondylosis

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The treatment of myelopathy due to cervical spondylosis is not always satisfactory. Sometimes good therapeutic results are obtained by simple immobilization of the cervical spine; other times even the most complex surgery cannot arrest the course of the disease. These contradictory results are explained by the inaccurate or incomplete knowledge of the mechanism of spinal cord damage. The complex and debated pathogenesis of this disease is well known. But from the surgical viewpoint, in the light of current knowledge and possibilities of treatment, the etiological factors amenable to treatment are: the basic anatomical factor, spondylosis; another anatomical factor, narrowing of the cervical canal; a dynamic factor, arising out of the mobility of the cervical column.

Etiological Factors

Spondylotic Changes. Depending on their size and site, spondylotic changes can lead to narrowing of the cervical canal. When the lesion is confined to one metamere, the narrowing is limited to the horizontal plane; when several metameres are affected, the narrowing is extensive and longitudinal. Thus, two different conditions can arise: limited spondylosis, and diffuse spondylosis. Each requires different treatment. It is only when the boundaries of the living space of the cord are encroached upon that true compression occurs. That this is uncommon is proved by the wide gap between the very high incidence of spondylotic changes in middle and old age and the relatively low incidence of neurologic complications. Thus, although spondylosis is a common manifestation of aging, it need not always cause a spinal cord lesion. This point is important, because there are grounds for thinking that in spondylosis with myelopathy the neurologic syndrome can be influenced without a direct attack on the vertebral lesion.

Narrowing of the Cervical Canal. Presumably of congenital origin, narrowing of the cervical canal has been found in a large number of patients with spondylosis myelopathy. This may reasonably be explained by the fact that the vertebral lesion is symptomless when the canal is of normal diameter, whereas it may give rise to myelopathy when there is congenital narrowing. The inference would seem to be clear: abolish the constriction by opening the canal by laminectomy. But this may not be sufficient to relieve the myelopathy. The association of these two anatomical conditions makes myelopathy more likely because, if the spondylotic changes are extensive or the narrowing of the canal marked, the boundaries of the cord space are often encroached upon, with consequent mechanical compression of the cord. And yet in many cases this does not seem to occur, for even when the two conditions are associated, immobilization of the cervical vertebrae, surgical or otherwise, may arrest the advance of the myelopathy. Hence, it may be supposed that, if immobilization could be effected before the onset of the symptoms, these symptoms might actually be prevented.

Dynamic Factor. The fact is that there is always a dynamic factor acting on the anatomical substrate, and this, according to its intensity, accentuates or causes the cord distress. This factor results from the mobility of the cervical spine. There is no doubt about the importance of this and it may even be the actual cause of the lesion, as shown by the very high incidence of myelopathy due to cervical as opposed to thoracic spondylosis; although the thoracic portion of the canal is far narrower and almost entirely occupied by the cord, myelopathy is rare, simply because of the relative immobiity of this part of the spinal column.

Received for publication July 8, 1968.
Revision received October 22, 1968.
The importance of the dynamic factor is evident at myelography with an opaque medium, which clearly demonstrates that flexor-extensor movements of the column heighten the filling defect due to spondylosis. This is not because the spondylosis is accentuated but because in flexion the pressure exerted by the dural sac and by the cord on the anterior wall of the canal increases, and in extension the possible retroolisthesis of a vertebral body or the protrusion of the ligamenta flava and of the dura further reduces the space about the cord.

From the surgical angle, it makes little difference whether the mechanical cause acts directly or indirectly via vascular disturbances because if the disturbances are mainly vascular it is always the mechanical cause that interferes with the vascular area and gives rise to the trouble. Surgery can free the anterior spinal artery from mechanical interference, release the radicular arteries from constriction exerted on the conjugate foramina by osteophytic spurs, and relieve pressure on the vertebral artery.

Treatment must take account of the basic anatomical factor, of any narrowing of the canal, and of the pathogenetic factors secondary to flexor-extensor movements of the cervical column. It must attack these causes directly or indirectly by removing the cause of posterior transposition of the cord, or by immobilization of the cervical spine to prevent flexor or extensor movements.

Since these pathogenetic factors vary in importance from one patient to the next, it is a mistake to regard one type of treatment as the best a priori. The choice of operation depends on which pathogenetic factor is of overriding importance in a given case.

Surgical Treatment

Posterior Approach. Of the two surgical approaches to the spinal canal, the posterior one is the older and more familiar. Laminectomy of two to five vertebrae followed by bilateral section of the dentate ligaments used to be the rule, the objective being to decompress the cord posteriorly so as to release it from the action of the spondylosis. The results were not very satisfactory either in our series or in those of other workers. The reasons seem to be: 1) failure to recognize the importance of narrowing of the canal; and 2) reliance on the anterior anchoring function of the dentate ligaments, to which little importance is now attached.

Operation by the posterior route is very different these days and the results are definitely better. It has a specific indication: diffuse spondylosis with marked total constriction of the cervical canal. The operation may involve an extended laminectomy, including all the cervical plates and the first two thoracic plates, or a limited laminectomy, which includes at least five vertebral plates in association. In either case, the procedure includes posterior foraminotomy, specifically, removing the posterior walls of the conjugate foramina and transforming them into open grooves. Laminctomy plus foraminotomy not only frees the dural sac, thus releasing the spinal cord from mechanical strains, but also frees any spinal roots or radiculomedullary arteries that may be compressed. These operations are completed by a special suture of the posterior muscles of the neck, forming a tough inelastic scar-cord along the midline to restrict flexor movement of the column. The objective is to release the cord from the effects of the vertebral lesion without a direct attack on the latter.

An attempt to remove the compressive agent by posterior route is justified when the protrusion is mediolateral and confined to one or two intervertebral spaces, but one must proceed with extreme care. It is usually possible to remove the more or less soft part of the disc protrusion and the lateral calcified part, but insistence on removing the anterior marginal exostoses may result in irreparable damage to the cord and even risk to the patient's life.

Anterior Approach. In spondylosis confined to one or two intervertebral spaces, or even to three, according to some workers the anterior approach is indicated. The advantages of the anterior route over the posterior one are obvious:

1. It permits removal of the degenerated disc material and of the osteophytic spurs and so eliminates the pathogenic action of the causal factor.