THE DYNAMIC FACTOR IN SPINAL CORD COMPRESSION
A STUDY ON DOGS WITH SPECIAL REFERENCE TO CERVICAL DISC PROTRUSIONS

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(Received for publication June 18, 1937)

It is a well established fact that certain chondrodystrophic breeds of dogs have a greater tendency towards degeneration and protrusion of intervertebral discs than other breeds.\(^3\)

Degeneration of discs in the chondrodystrophies is characterized by a dystrophic calcification of the nucleus pulposus. Very often there is a complete rupture of the annulus fibrosus, with a varying degree of displacement of the nucleus pulposus into the vertebral canal. Because of the calcification the displacement can, in many cases, easily be demonstrated and the allied spatial changes followed on routine roentgenograms. Almost all disc protrusions in the dog, except a few lateral ones, compress the spinal cord. (The spinal cord extends to the last lumbar vertebrae. There are 7 lumbar vertebrae.) This combination of circumstances provides ideal material for the study of the varying factors influencing the symptoms of compression of the spinal cord.

Olsson\(^4\) and Hansen,\(^5\) on the basis of clinical, roentgenological and patho-anatomical material, discussed thoracolumbar protrusions in the dog. Observations pertinent to this paper may be summarized as follows:

In cases of complete rupture of the annulus fibrosus the protrusion may cause symptoms of varying severity: from complete paraplegia to only slight pain. The onset of pain or paresis may be sudden or insidious and the duration of symptoms variable. Some dogs with paraplegia never recover while others recover within 3 weeks or up to 6 months. In many cases pain will cease in a few days, while in other cases pain may persist for months. Olsson explains the variability in degree and duration of symptoms as follows. A complete irreversible paraplegia is more the result of how the disc protrusion occurs than the size of the protrusion. A slow-growing, large protrusion may give rise to only slight symptoms, while a sudden protrusion will act as a severe trauma to the cord sometimes with severe hemorrhage, spinal shock and even death. This is in accordance with the results obtained later by Tarlov et al.\(^8\)–\(^10\) in their experimental study on compression of the spinal cord in the dog.

Healing results from the disappearance of the inflammatory reactions, bleedings and edema rather than from the disappearance or diminishing
of the protrusion itself. If now and then a small amount of disc tissue is pressed out through a rupture in the annulus fibrosus by active or passive movements of the spine, the inflammatory reaction and subsequent irritation of the cord will persist together with clinical symptoms. Even very large protrusions may not cause symptoms if they are firm and do not continue to enlarge. Considering the natural mode of healing through stabilization of the protrusion, Olsson\(^6\) introduced a surgical method to prevent further protrusion of a ruptured disc. This fenestration operation consists of the removal of the remaining part of the nucleus pulposus through an incision in the annulus fibrosus outside the vertebral canal.

Laminectomy and removal of the protrusion proved to be of little value in these cases largely because of the damaged cord’s low tolerance to the surgical trauma.

The above concepts were based upon studies of thoracolumbar disc protrusions. However, great muscular forces affect the thoracolumbar area. This may be the explanation why sudden and powerful protrusions followed by paraplegia are very common in this area. These cases thus are less suitable for continuous study of delicate changes in symptoms and the effects of therapeutic measures.

Cervical disc protrusions in the dog, reported for the first time by Olsson\(^6\) in 1951 and described more completely by Olsson and Hansen\(^7\) in 1952, are, in this respect, of greater interest. Pain in the neck and forelegs is the predominant symptom. Paraplegia or quadriplegia is seen only exceptionally. These differences in symptoms in the cervical and thoracolumbar regions may be explained by the different muscular forces exerted on the cervical and lumbar spine during locomotion, as well as by the somewhat wider cervical part of the vertebral canal which provides more room for the spinal cord.

The aim of this paper, based mainly on a study of cervical disc protrusions, is to throw new light upon the problems concerned in compression of the spinal cord.

**CLINICAL STUDIES**

**MATERIAL AND METHODS**

During the eight-year period from 1949–1956 about 1300 clinical cases of disc protrusions in the dog have been studied. In 40 of these cases there were symptoms associated with protrusions of the cervical discs. The cases of protrusion of the thoracolumbar discs have been discussed in previous papers and are not included in this study except a few cases of special interest. Treatment in the latter cases has been routine in the clinic, according to the regime given by Hansen and Olsson\(^4\) in 1953.

All dogs with cervical disc protrusions were subjected to detailed neurological and roentgenological examinations during the period of clinical observation. They were reexamined several times after recovery. In all 40 cases the site of the protrusion was demonstrated on routine roentgenograms.