INTERVERTEBRAL FORAMEN STUDIES

I. FORAMEN ENCOREACHMENT ASSOCIATED WITH DISC HERNIATION*

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These studies are the outgrowth of observations coordinating the radiographic and morphologic studies of cadaver spines. The specimens were supplied by the Anatomy Department at Syracuse University Medical College. Following radiographic examination the nerve roots were removed, embedded in paraffin and the section stained with hematoxylin eosin.

An examination of the normal lumbar foramen section (Fig. 1) shows the nerve root (N) or its ganglion occupying only about 1/6 to 1/4 of the opening. Surrounding the nerve is a generous reserve cushion space containing blood vessels, lymphatics,

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Fig. 1
fat and areolar tissue. These compressible structures constitute a safety factor during the normal foramen constriction incidental to spinal movement. In each of the four sections here shown the disc (D) is on the left side. The ligamentum flavum (F) is somewhat hypertrophied in one of these sections.

Permanent constriction of the foramen, from any cause, reduces the reserve cushion space. This predisposes to root pressure in the event of edema, hemorrhage, perineural inflammation or additional foramen encroachment.

The most common cause of foramen constriction is disc degeneration and its secondary changes. These include: herniation of disc substance into the foramen, thinning of the disc with approximation of the pedicles, subluxation of the upper vertebra forward or backward upon the one beneath, hyperplasia of the ligamentum flavum, bony spur formation projecting backward from the disc or forward from the posterior joint, and lastly, subluxation of the articular process from below upward and forward into the foramen. Some of these are illustrated in Fig. 2. A and B are blocks taken from constricted 5th lumbar foramina. In both, the disc is thinned and herniates backward (2) into the foramen. In these the distorted nerve (1) has been outlined. The superior articular process (3) from the sacrum has subluxated upward and forward into the foramen, constricting that opening. This has impinged against the under surface of the 5th pedicle at (4). Fig. 2C is the section (×1.7) from an encroached 5th lumbar foramen. The triangular-shaped nerve root (1) has become compressed between the pedicle above and the disc substance (2) herniating backward into the foramen.

Fig. 3 is the right lumbosacral spine of a male 83 years old. He had complained of low back pain for many years but no history of sciatica was obtained. A shows herniation of the 4th lumbar disc backward into the spinal canal (arrow) displacing the distal nerve roots. The