SENSORY CHANGES WITH HERNIATED NUCLEUS PULPOSUS
LOYAL DAVIS, M.D., JOHN MARTIN, M.D., AND STANTON L. GOLDSTEIN, M.D.
Department of Surgery, Northwestern University Medical School, Chicago, Illinois
(Received for publication September 14, 1951)

In recent years it has become common to perform surgery for herniations of the nucleus pulposus without myelographic verification, and many\textsuperscript{1,2,4–10} believe that an accurate diagnosis can be made on clinical findings alone. In fact, Keegan\textsuperscript{4–9} has devised a new dermatome chart based almost entirely on sensory changes in patients with herniated nucleus pulposus. In doing this he must assume that the majority of herniations involve only one nerve and are complete lesions, although he does note that in some instances there may be a lesser degree of compression, in which case, the localization may be misjudged. He states also that more than one nerve may be involved in a single herniation and that a more lateral, or more medial herniation than usual may be misleading.

On the basis of light pin scratch sensibility, Keegan has outlined dermatome areas for each of the posterior spinal nerve roots and states that the outlining of this so-called dermatome hypalgesia is diagnostic of single nerve involvement. Spurling and Grantham,\textsuperscript{10} on the other hand, state that touch and temperature tests reveal sensory changes better than pin prick. They
also believe that myelography is not necessary in the majority of cases and that the level of the herniation can be diagnosed by sensory changes, but their sensory charts are different from those of Keegan. Falconer, Glasgow and Cole\textsuperscript{3} describe sensory changes extending up the leg into the buttock, similar to, but not exactly like, Keegan's findings. However, they state that when the pain is severe, sensory impairment may become more extensive than can be explained on a segmental basis alone. They found extensive overlap, which Keegan did not find, and in several cases found a sensory loss confined to the foot and leg alone.

We have made a study of the sensory changes in 500 consecutive patients with surgically verified herniated nucleus pulposus. In all but 38, myelography was performed and the lesion verified. Eighteen of the herniations were in the cervical region, 201 at the L4-5 interspace, 234 at the L5-S1 interspace, and the remainder scattered at various levels throughout the spinal column or in multiple locations. Of the 500 patients, 327 had demonstrable sensory changes, which were extremely variable. Herniations at the L4-5 interspace alone produced 38 different patterns of sensory involvement varying from a small area of diminished sensation on the lateral aspect of the calf to hypalgesia of the entire thigh, leg, and foot (Fig. 1). Herniations at the L5-S1 interspace produced 29 different sensory patterns (Fig. 2).

It was interesting and significant to note the variability of the sensory findings with each particular examiner. These examinations were done by the authors and 6 other neurosurgical fellows and comparisons made. Pin prick and light pin scratch stimuli were used. The results also depend to some extent upon the patient's intelligence, suggestibility and psychic makeup.