Protrusions of Thoracic Disc
The Factor of Herniation Through the Dura Mater*

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Protrusions of the intervertebral disc in the thoracic region are extremely rare—Love and Kiefer\textsuperscript{15} reported 17 cases in 5,500 operative cases at the Mayo Clinic and Arseni and Nash\textsuperscript{2} reported 12 out of a total of 2,544 operations for discal protrusions at a State Hospital in Bucharest. Both authors have reported new totals—Love and Schorn,\textsuperscript{14} 61 cases, and Arseni and Nash,\textsuperscript{2} 28 cases. These lesions have held a sinister reputation ever since the original report of Middleton and Teacher\textsuperscript{17} in 1911. A young man lifted a heavy steel plate, rapidly became paraplegic and died. Autopsy disclosed a massive discal protrusion opposite the 12th thoracic interspace. The neurosurgical world has anticipated disaster from protrusion of thoracic discs—whether this be pre- or postoperative. The personal series reported herein stresses a subject discussed only slightly in the literature, namely dural erosion by the disc. This was so complete in 1 of 2 cases that total intradural sequestration of the disc had occurred.

Early reports\textsuperscript{6,5,11,13,19} indicated that patients with protrusion of thoracic disc had extensive postoperative neurological disability. It was surprising to find that Mixter and Barr\textsuperscript{15} reported 4 cases of thoracic discs in their classical paper—2 of these patients became paraplegic postoperatively. The first extensive series was reported by Love and Kiefer\textsuperscript{15} in 1950. Their paper was entitled interestingly, “Root Pain and Paraplegia Due to Protrusions of Thoracic Intervertebral Disks.” Of 14 patients having motor involvement, 4 were worse, 4 unchanged, and only 1 was improved after operation. A report of Müller\textsuperscript{19} disclosed 3 cases of total paraplegia in 4 patients operated upon at the Serafimer Hospital in Stockholm. Encouraging reports later stemmed from Abbott and Retter,\textsuperscript{3} Epstein,\textsuperscript{7} Horwitz et al.,\textsuperscript{9} and Kite et al.\textsuperscript{12} Most authors realized the technical hazards of surgery; all realized the danger of necrosis of the cord which pre-operatively would be incomplete yet sustain neurological function to a marked degree.

Should any change occur in the relation of the discal protrusion to the cord, serious neurological damage may ensue. This may be precipitated by any degree of trauma or may be secondary to a laminectomy regardless of whether the cord is maneuvered or not. Difficulties are also encountered in establishing the diagnosis of discal protrusion with necrosis of the cord. This may simulate tumors of the cord or infarction. As an aid in the recognition of thoracic discs, Logue\textsuperscript{14} stressed the significance of calcium of the interspace as being significant in localizing the level, yet most agree that a disc may protrude at an interspace when no calcium is visible in the roentgenogram.

Hulme\textsuperscript{10} warned about hard calcified bulbous extremities of the disc being adherent to the dura mater and also warned about the blood supply of the cord being in jeopardy, as evidenced by an ominous bluish translucency where it is stretched over the protrusion. He said any manipulation may be sufficient to cause a complete and permanent interruption of conduction. His first experience with thoracic protrusion was dissastrous. He thus resorted to a lateral approach devised by Crafoord et al.\textsuperscript{6} and has had no other case complicated by paraplegia. The approach is similar to a costotransversectomy for spinal tuberculosis. Chesterman\textsuperscript{4} recently reported a case with resultant paraplegia despite the lateral approach.

Tovi and Strang’s\textsuperscript{29} report from the Sera-
fimer in 1960 is unique in that it described the average pre-operative symptoms as lasting 45 months. Two important statements followed in their discussion:

"If the disc is of uniformly firm consistency, attached to the dura and associated with long tract signs, it is probably safest to perform a simple decompression, leaving the mass undisturbed in situ. . . . Spinal cord infarction, with or without hemorrhage, is the probable cause of all cases of sudden, complete paralysis both pre-operatively and postoperatively."

Their Case 7 is very pertinent to this series. A 45-year-old housewife had a weak right leg with pain for 2 years and she was found to have a disc with calcium in the 9th interspace. Laminectomy disclosed that the disc penetrated the anterior wall of the dural sac and was adherent to the cord. A small amount of soft material and the bony hard protrusion were removed intradurally. The patient became paraplegic immediately and remained so.

To date, Arseni and Nash reported the greatest personal experience with 23 cases, although a combined series of 61 cases has been reported from the Mayo Clinic. Arseni and Nash concluded that early surgery is necessary to avoid serious sequela. The results were "bad" in 23.5 per cent and good in 67.7 per cent of their cases. The patient in Case 17 of their series had an atrophic cord and only a decompressive laminectomy with sectioning of the dentate ligaments was done. He was not worse. All other cases were subjected to removal of the protrusion.

The following personal cases will be discussed in the light of experience of others.

Case Reports

Case 1. A 47-year-old male artist had "alcoholic neuritis"—numbness of legs 3 years prior to entry. Later his left leg became numb and his right leg weak. He had backache. Paralysis of Brown-Séquard type indicated a lesion at the 9th thoracic dermatome. Biceps' sign was upward, and the right toe reflex was extensor. Routine thoracolumbar spinal roentgenograms were normal. A thoracic myelogram demonstrated a complete block opposite the body of T10. The cerebrospinal fluid contained 42 mg. per cent protein. Laminectomy was done. No lesion was found in the gutters extra- or intradurally. There were large distended veins on the dorsal surface of the cord with a "very angry" bluish discoloration. This simulated an intramedullary angioma of the cord; the dura mater was left open and the wound was closed. Postoperatively, he could move only his toes. Reoperation was performed 48 hours later. Radical rotation of the cord disclosed a sequestrated hard disc embedded in the anterior substance of the cord. This was removed. The posterior longitudinal ligament showed no tear in its continuity and the disc lay 1 in. below the interspace. His postoperative flaccid paraplegia became spastic, and the function of bowel and bladder was automatic. Walking with aid of crutch and brace was ineffectual.

Case 2. A 35-year-old man was thrust forward vigorously in an accident in a motor vehicle and soon after had vague complaints referred to head, neck, back and abdomen. These complaints lasted 6 months. On neurosurgical evaluation extensive weakness of the legs, most marked in the quadriceps femoris, was noted. Hypalgesia was present in the groin. Routine roentgenograms disclosed no abnormality but a myelogram showed an hour-glass deformity at the 11th interspace. Laminectomy of T10, T11 and T12 disclosed extensive dorsal erosion of the dura mater. The disc was removed without complication by an intradural approach. Postoperative course was uncomplicated and the patient returned to his work.

Case 3. A 42-year-old white woman had lifted a case of shoes and soon after this had severe spasm of muscles with pain radiating to the right upper quadrant. Despite extensive medical investigation and therapy directed at her pain, her symptoms were worse. A most extensive disc at the 11th thoracic interspace was removed by an intradural approach. She was free of disability and returned to work 6 weeks after operation.

Case 4. A 73-year-old woman had paralysis of the Brown-Séquard type attributed to a protrusion at the 7th thoracic interspace. The level of protein in the cisternal fluid was 21 mg. per cent and that of the lumbar fluid was 51 mg. per cent. Laminectomy disclosed a generally atrophic cord and a disc at the 7th space. Removal afforded relief of most of her symptoms and signs.

Discussion

These cases may be fairly represented as showing the following results: 1 excellent, 2 good, and 1 poor. The 2 good results indicated the advisability of early operation once the diagnosis is established. The poor