

The Department of Orthopaedic Surgery, The University of Hong Kong, and The Duchess of Kent Children's Orthopaedic Hospital, 12 Sandy Bay Road, Hong Kong.

## DISCOGRAPHY IN PARALYTIC SCOLIOSIS

### *The Progressive Displacement of the Nucleus Pulposus*

JOHN PATRICK O'BRIEN\*, ANTHONY P. DWYER\*\* & ARTHUR R. HODGSON\*\*\*

Accepted 25.x.74

The purpose of this paper is to demonstrate the progressive macroscopic alterations, as visualised by discography, of the intervertebral disc in patients with paralytic scoliosis.

Lumbar discography was described by Lindblom in 1948 as a means of investigating the causes of low back pain and sciatica. Perey in 1961 performed discography in a patient with idiopathic scoliosis. The nucleus pulposus at the apex had shifted to the convex side of the deformity. He concluded that this may be a congenital anomaly responsible for the scoliosis.

Kazmin et al. (1969) used operative discography to demonstrate the displacement of the nucleus pulposus. Del Torto (1968) demonstrated with discography the persisting lateral displacement of the nucleus in scoliosis after surgery.

### MATERIAL AND METHODS

Ten patients with paralytic scoliosis had discograms done at the time of Dwyer's anterior instrumentation. There were five males and five females; the average age at the time of surgery was 14 years. All the scolioses were thoraco-lumbar or lumbar in type.

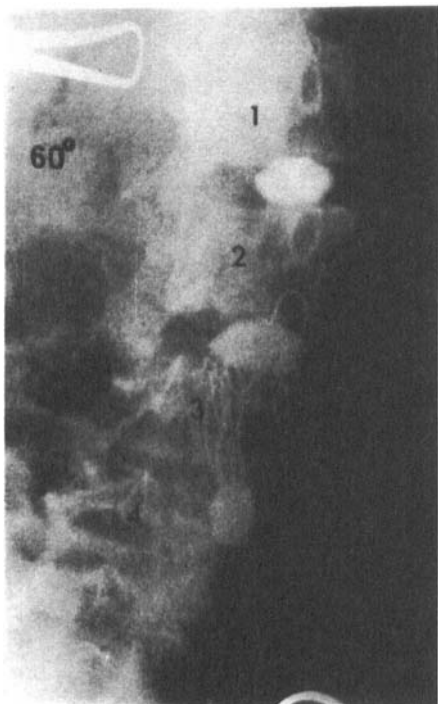
During the routine anterior approach to the spine, the discs at the apex of the curve were identified and a 2 ml syringe used to inject Hypaque sodium 50 per cent (Winthrop), a water soluble radio opaque medium, into the nuclei of two or three intervertebral discs at the apex of the curve. The volume of dye injected was noted

---

\* Present address: 12 Sandy Bay Road, Hong Kong.

\*\* Visiting lecturer. Department of Orthopaedic Surgery, University of Hong Kong, Hong Kong.

\*\*\* Professor, Department of Orthopaedic Surgery, Hong Kong University.



*Figure 1. Case 1. Operative discogram in a patient with a lumbar scoliosis measuring 60° in the sitting position. Discograms taken at the L12, L23 and L34 levels. Note the globular intact appearance of the disc which has migrated towards the convex side of the curvature.*

and an antero-posterior radiograph taken on the table before disc excision and instrumentation.

The progressive stages in severity of the intervertebral disc changes are typified by the following three examples:

#### CASE REPORTS

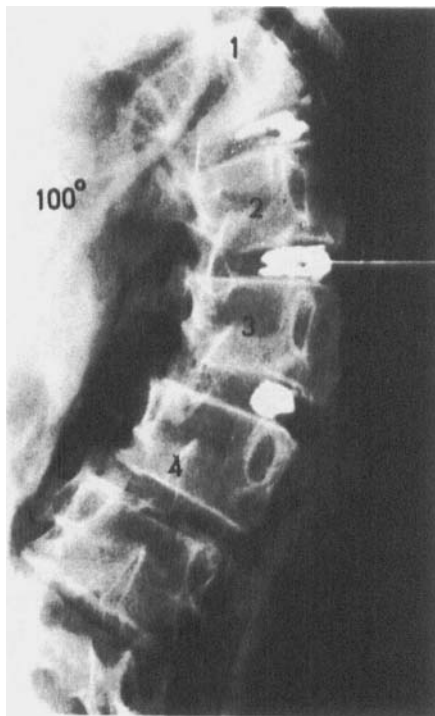
##### *Case 1*

A 16-year-old female had acute poliomyelitis when aged 3 years. When she was 12 years old a lumbar scoliosis was detected which measured 45° and had progressed only 15° over the past 4 years. Operative discograms were done at L12, L23 and L34 levels (Figure 1). The nuclei had migrated to the convex side of the curvature, they were normal in shape and the volumes injected measured from 0.9 to 1 ml. There were no gross vertebral body changes other than the rotation present.

##### *Case 2*

A 12-year-old female had had a paralytic lumbar scoliosis for ten years; it had progressed rapidly from 50 to 100° over the previous 12 months. Operative discography was done at the L12, L23 and L34 levels (Figure 2). The nuclei accepted from 0.6 to 1 ml of the radio opaque medium. They had migrated further towards the convexity of the curvature where the annulus fibrosus is thinner than normal,

*Figure 2. Case 2. A lumbar scoliosis, more severe and more long standing, in a 13-year-old female, measuring 100° in the sitting position. Operative discograms have been done at the L12, L23 and L34 levels. Note the increase in rotation and the further migration of intact nuclei towards the convexity. Note also the early scalloping of the vertebral bodies adjacent to the nuclei with thinning of the annulus fibrosus on the convexity.*



especially at the L23 level. Rotation of the vertebral bodies at the apex was more marked and there was early scalloping of the lower surface of the third lumbar vertebral body in contact with its corresponding nucleus pulposus.

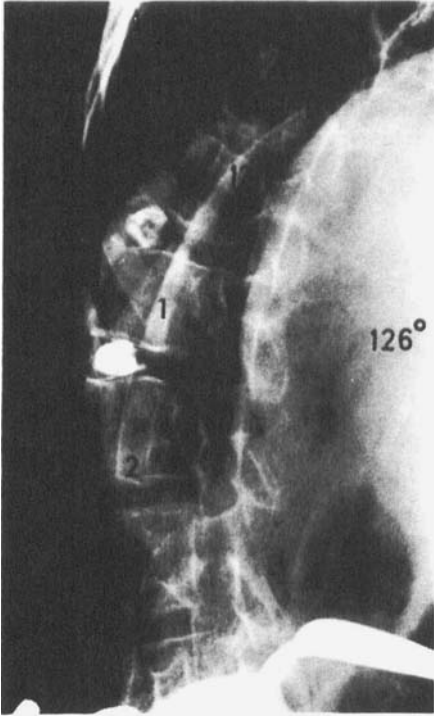
#### *Case 3*

A 12-year-old male had acute poliomyelitis when 10 months of age; a scoliosis developed immediately after the acute illness, and at the time of operation measured 126° (Figure 3).

Operative diagrams were done at two levels, D12, L1 and L12 (Figure 3). The former nucleus accepted 0.6 ml and the latter 0.7 ml of radio opaque dye. The nuclei were not degenerative but they had migrated even further to the convex side of the deformity and again there was apparent thinning of the annulus fibrosus adjacent to the displaced nucleus. The rotation of the vertebral bodies was extreme and their excavation by the nuclei was marked. Osteoporosis was also more evident than in the radiographs of the previous two patients.

## DISCUSSION

With increasing deformity in scoliosis, the nucleus pulposus is displaced more and more towards the convexity of the curvature.



*Figure 3. Case 3. A severe paralytic scoliosis in a 12-year-old male. Operative discograms done at the apex of the deformity (D12, L1 and L12). Note the extreme rotation at the apex of the curvature, also thinning of the convex annulus fibrosus and the marked excavation of the adjacent aspects of the vertebral bodies.*

Compression of the nucleus against the annulus fibrosus in this situation is responsible for thinning of the annular fibres presumably by pressure atrophy (Figure 2, L23 level). Another feature observed in the more severe curves is scalloping of the vertebral bodies adjacent to the nucleus pulposus (best seen in Figure 3).

These changes in the intervertebral disc and adjacent vertebral bodies are secondary phenomena, the primary defect being muscle imbalance.

The volume and contour of each nucleus is within normal limits and in none of the discograms done have degenerative patterns been observed.

#### SUMMARY

Observations are made on the progressive alterations of the intervertebral disc in paralytic scoliosis, demonstrated by discography.

## REFERENCES

- Del Torto, U. (1968) *Le Scoliosi*. (Monograph.) Tipografia S. Pipola Napoli 49.
- Kazmin, A. I., Fischenko, V. I. & Plotnikova, I.I. (1969) Surgical treatment of the scoliotic patient by discotomy. *Ortop. Travm. Protez. (Moscow)* 4, 34.
- Lindblom, K. (1948) Diagnostic puncture in intervertebral discs in sciatica. *Acta orthop. scand.* 17, 231.
- Perey, O. (1963) Discography in early cases of idiopathic scoliosis. *Acta orthop. scand.* 33, 392.

*Key words*: spine; scoliosis; discography; intervertebral disc; poliomyelitis; nucleus pulposus

## Correspondence to:

John Patrick O'Brien, F.R.C.S. (Edin)  
The Duchess of Kent Children's Orthopaedic Hospital  
Sandy Bay  
Hong Kong