

IDIOPATHIC SCOLIOSIS, A PRELIMINARY REPORT

By

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Many afflicted with structural scoliosis will usually become deformed to a high degree and also become a chronic invalid. For this reason, doctors had an early interest in the disease but systematic studies have been made only in this century. For adequate treatment, knowledge of the aetiology is necessary. *Cobb* has suggested a useful aetiological classification of the structural scoliosis in 5 main groups. Four of these groups have a clear pathogenesis, but the 5th is not associated with any other pathological condition and is therefore diagnosed by process of exclusion. This is idiopathic scoliosis.

Idiopathic scoliosis does not appear in animals and it is therefore impossible through animal experimentation to achieve an understanding of the cause and it is as difficult to test different forms of treatment. *Langenskjöld & Michelsson* have experimentally produced progressive scoliosis in rabbits through unilateral resection of the posterior ends of the 6th to 11th ribs, including the costal parts of both costo-vertebral joints. They also produce a prominent rotation of the vertebrae.

Slight scoliosis has also been produced in animals in other ways: excision or denervation of muscles (*Schwartzmann & Miles, 1945*), operations on growth zones of vertebrae (*Haas, 1939, Bisgard & Mus-salma, 1940, Nachlas & Borden, 1951*).

In order to produce scoliosis in animals, a considerable interference in normal anatomy has to be made and the clinical interpretation of the progress is difficult.

Another way to clarify the mechanism of production of the disease is to study the disease processes in patients. Several different avenues and ideas have been followed. *James* (1952, 1954, 1959) has by follow-up studies of a large number of patients during long periods reported the prognosis and results of treatment. He also made a post mortem

examination on a spine in an 11 months old child, who for 8 months had a progressive scoliosis. The vertebral column showed rotation without congenital anomalies. Microscopic examination of the vertebral epiphyses showed a normal histological pattern.

Farkas (1954) is of the opinion that the differences in the oblique position of the intervertebral joints causes a more pronounced rotation on lateral flexion. The epiphyseal ring is the weakest part of the vertebral column. Before its closure, it is very loosely attached at its periphery. Slipping of the Epiphyseal Ring on the Body is preceded by a number of phenomena which together constitute the predisposing causes of idiopathic scoliosis. According to *Farkas* this predisposition, coupled with the mechanical factor of weightbearing, brings about the scoliosis deformity.

McCarroll & Costen (1960) investigated the epiphyseal rings of the vertebral body in 4 operated cases. They found such pronounced changes that they considered this may help to explain the aetiology of the idiopathic scoliosis.

Trueta (1957) reports disturbances in the blood flow to the epiphyseal rings. This may cause either excessive or diminished rate of growth as well as the opposite, or a permanent cessation of growth.

The metabolism of scoliotic children has been investigated by *Stearns, Jo-Yun Chen & McKinley* (1955). They found no change in the mineralization but a definite change in protein metabolism.

As seen from the above, the different investigations have not given conclusive evidence nor homogeneous results. Several authors speak about a disposition connected with other factors. *Murdock* (1959) describes cases of uniovular twins who both had right convex scoliosis between Th 5-11 at 46° and 55°, respectively. According to him this could well be due to an hereditary factor.

PERSONAL INVESTIGATIONS

The developmental history of the vertebral column is complex, and the vertebrae and the discs cannot be dissociated from each other. In their structure and function, the discs and vertebrae likewise must be recognized as two elements of one unit. The notocord is the forerunner of the vertebral column and, though all trace of the notochord is normally lost within the vertebral bodies, it is intimately concerned with the formation of the intervertebral discs. The intervertebral disc has the most complex development of all the joints, largely because of the

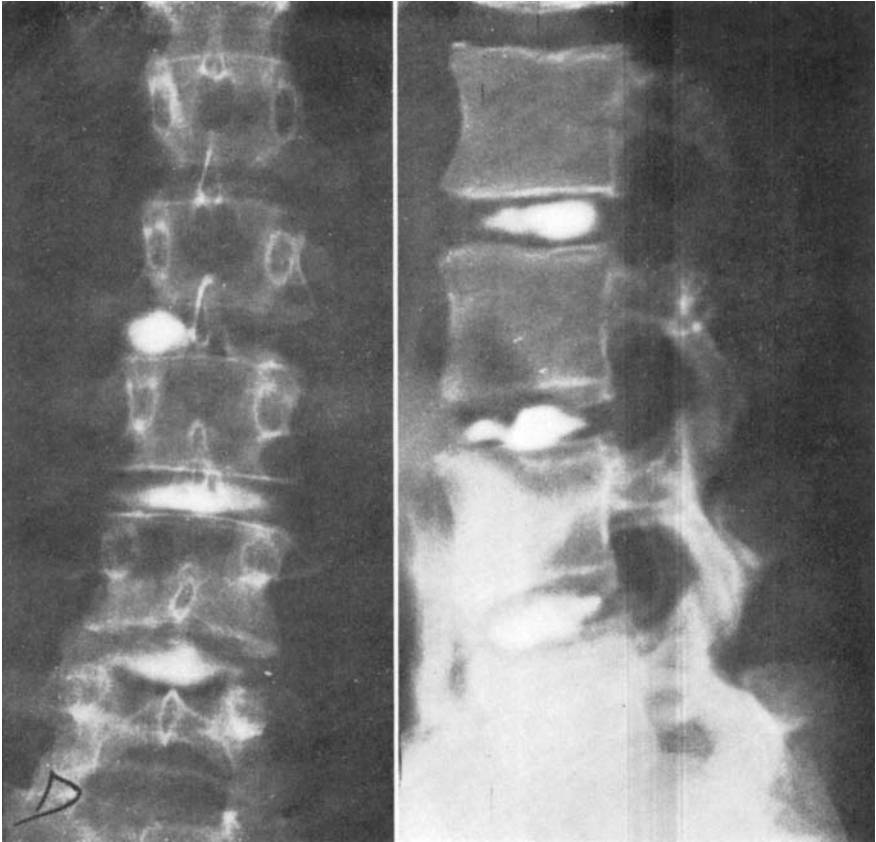


Fig. 1.

Case K.S. Discography in L₂-L₄. It is a curve of 15°. L₃ and L₄ have the nucleus in centre, L₂ has the nucleus extremely to the concave side.

notochord within the primitive disc. The end result is that the peripheral part of the primitive disc forms the annulus fibrosus, whereas the central part, with the notochord, forms the nucleus pulposus.

The long developmental chain to the final vertebral spine presents several possibilities for different anomalies. It is not unusual that the notochord causes an anomaly, two discs may hang together through a canal in the vertebral body. The canal may have a horse-shoe shape with a forward concavity. There is thus the possibility of the nucleus being developed asymmetrically in the disc. An eccentric nucleus must result in an abnormal movement between vertebral bodies and may cause both lateral curvature as well as rotation.

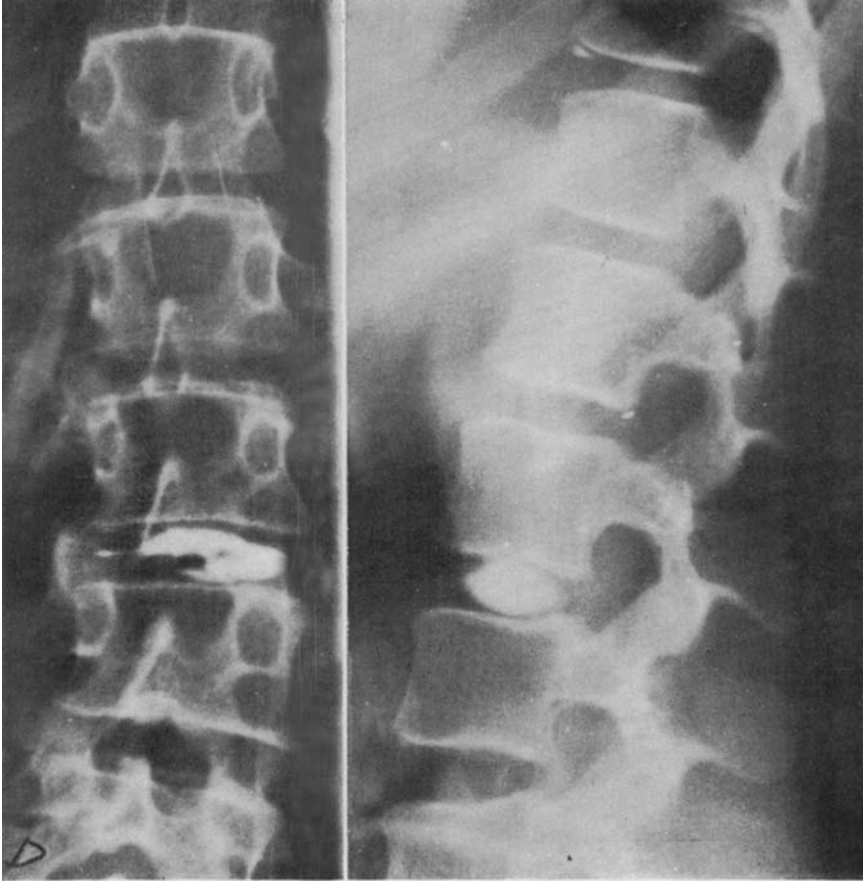


Fig. 2.

Case Y.A. Scolios curve of 18°. The disc between L₂-L₃ is examined.
The nucleus is laterally situated to the convex side.

In order to find out if this reasoning has a background of reality, three patients with idiopathic scoliosis were examined by discography as per *Lindblom* (1947). A criticism of this method of investigation is that it may be dangerous on the grounds that the injection canal may provide an outlet for disc herniation, *Pease* (1935). This has not been found either at microscopy two months after discography, (*Perey*, 1951), or at mechanical investigations, *Friberg* (1941), *Perey* (1957),

The 3 patients were thoroughly examined before discography to try to exclude any already known aetiology for the scoliosis. EMG, for instance, was performed both on the erector spinae as well as on the

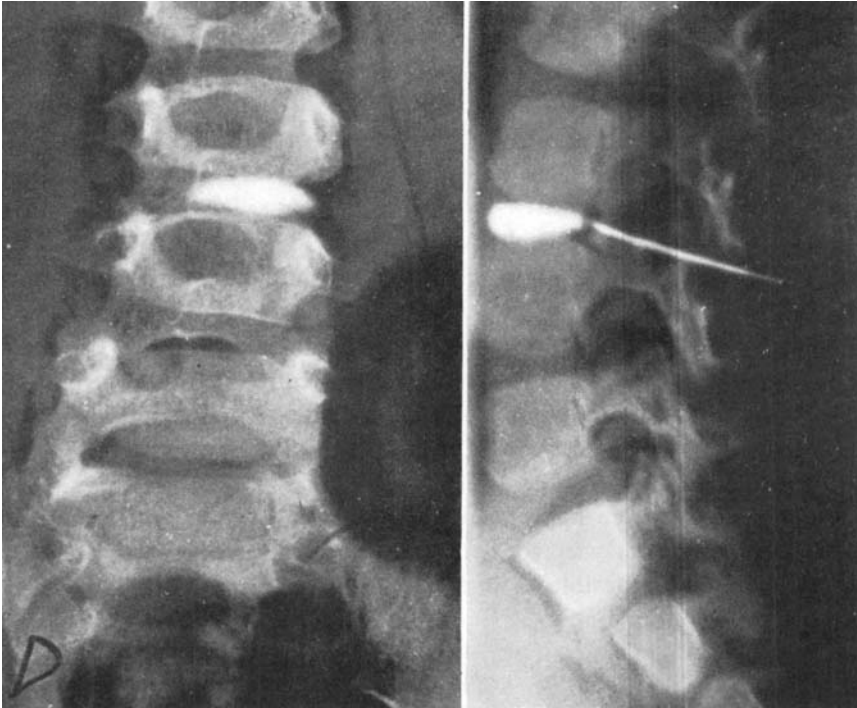


Fig. 3.

Case I.D. Discography of L₃. The curve was 15° when the scolioses was discovered.

The nucleus is dislocated laterally to the convex side.

On L₅ and S₁ there is a spina bifida.

abdominal musculature. The 3 children (K.S. 14 years, Y.A. 12 years and I.D. 2 years old) had recently detected scoliosis. The two older ones were examined every year by the school physician and we are of the opinion that the scoliosis developed during the last year. It may thus be concluded that the findings are not secondary to the scoliosis.

Discography showed that in the apex of the scoliotic curve the nucleus was not situated centrally in the disc. In two cases it was dislocated laterally on the convex side, in one case (K.S.) very far on the concave side. In the other discs examined, the nucleus was centrally placed in the disc.

It is to be noted in all three cases examined that the nucleus was located asymetrically in the disc at the apex of the curve. It seems more natural that the nucleus should be on the convex side, which it is in two cases. In the case in which the nucleus lies on the concave side, it

is so much dislocated that the outer wall has to be formed by a very thin annulus. That the nucleus, in fact, is situated so far laterally as seen from the picture is proven by biplane pictures as well as by rotation of the patient at screening.

It is of interest to note that both in the 2-year old and in the 12-year old patients there are lateral ruptures in the discs examined. Ruptures that can be filled with contrast medium are considered a degenerative change caused by age and which seldom appear before the age of 20. Ruptures in the discs of these children are additional evidence for a primarily abnormal disc.

These 3 cases are too few to constitute evidence, but they give rise to a supposition of a congenital anomaly contributing to a lateral curvature and a rotation which later can be accelerated by other factors, such as straining of the musculature, *Roaf* (1958) and changes of the epiphyses.

In older cases which have been operated on, *Roaf* has observed that the nucleus pulposus was very near the lateral border of the disc. In these cases it is impossible to judge if the dislocation of the nucleus is primary or secondary.

SUMMARY

Three cases of very early idiopathic scolioses were examined by discography. At the apex of the scoliotic curve the nucleus pulposus was dislocated laterally and this finding suggested a congenital anomaly contributing to a lateral curvature.

RESUME

Trois cas de scolioses idiopathiques très précoces ont été examinées par discographie. Au sommet de la courbe scoliotique, le noyau spongieux était disloqué latéralement et cette trouvaille fait supposer la présence d'une anomalie congénitale contribuant à la flexion latérale.

ZUSAMMENFASSUNG

Drei Fälle von sehr frühzeitiger idiopathischer Skoliose wurden mittels Diskographie untersucht. Am Scheitel der skoliotischen Kurve war der nucleus pulposus nach lateral disloziert und dieser Befund legt den Gedanken einer angeborenen Anomalie nahe, die zur lateralen Krümmung beiträgt.

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