

OLISTHETIC SCOLIOSIS

By

HENNING TØJNER

Our knowledge of scoliosis is in many respects deficient. Very often a case has to be classified aetiologically as genuine or idiopathic. In our Clinic we found, in the course of two weeks, three cases of lumbar torsion scoliosis which we would primarily have been inclined to classify as idiopathic, while radiography of the lumbar spine in the oblique projection showed lumbar spondylolysis. We, then, decided to analyse our material to ascertain the frequency of torsion and scoliosis in patients with spondylolysis and spondylolisthesis.

Perusal of the literature soon revealed that the concept "olisthetic scoliosis" is known and previously described, but fairly unheeded in Scandinavian literature.

As early as 1888 *Neugebauer* observed typical torsion scoliosis of the lumbar spine which he related to unilateral spondylolisthesis which he called "hemiospondylie". According to *Taillard* (9) similar cases have later been published by others (4), but the mechanism of this scoliosis was not described in detail until 1937 by *Glorieux & Roederer* (6) (cf. Fig. 1). Their figure was accompanied by the following explanation:

When one spondylolysis—in a spine having bilateral spondylolysis—"gapes", the anterior vertebral segment slips over the sacral bone, rotating at the same time on the narrower spondylolysis. This slipping has several consequences:

1. The rotation of the vertebral body gives rise to a lateral shift of the body, as the axis of rotation is eccentric. The body leaves the mid-line, approaching the sacro-iliac joint closer to the axis of rotation.
2. This rotation exerts a traction on the intervertebral disc, especially on the side opposite to the axis of rotation. This traction reduces the height of the disc. In consequence, the vertebral body will "sink" on the side opposite to the point of rotation.

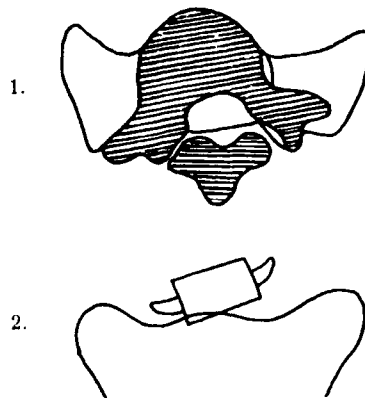


Fig. 1.

The mechanism of the development of the olisthetic scoliosis in the lumbosacral region. (From *Glorieux, P. & Roederer, C.: La Spondylolyse et ses conséquences.* Masson Paris 1937.)

This explanation has been accepted, in all essentials, by subsequent workers. *Taillard* (9) has summed up the criteria of an olisthetic scoliosis as follows:

"Curvature of the lumbar spine with marked torsion, visible particularly on the overlying body. The olisthetic body is frequently asymmetrical, showing a reduced height on one side. Moreover, it is exposed to marked torsion, but the vertebral arch is not involved in this rotation, remaining symmetrical in the anteroposterior view."

This is, of course, the logical consequence of the mechanism in *Glorieux's* sketch. *Taillard* adhered strictly to these criteria and therefore found only a few cases of olisthetic scoliosis.

Brocher (3) accepted *Glorieux's* explanation, as far as the rotation on the spondylolytic gap on the contralateral side is concerned, while on the mechanism of onset of the scoliosis he states: "This rotation has an unfortunate influence upon static function, affecting one of the most vulnerable sites of the spine, viz. the lumbo-sacral junction."

From a series of 115 patients with spondylolisthesis, *Bosworth, Fielding et al.* (2) concluded that a clear relationship seems to exist between scoliosis in the lumbar spine and spondylolisthesis. In their series 26 out of 115 patients, or 23 %, had some measure of scoliosis. There was no relationship between the degree of olisthesis and the severity of scoliosis. It is not mentioned whether these cases fulfilled the criteria of *Glorieux*.

Among 75 patients with spondylolysis and spondylolisthesis under

20 years of age, *Laurent & Einola* (7) found scoliosis in 27, i.e. 36 %. No patient, not even those with marked torsion, showed signs of unilateral spondylolysis which according to the first publications by *Glorieux* is supposed to predispose to this condition.

In an American series of 3,000 healthy males, aged 18–65 years, submitted to pre-employment radiological examination of the lumbar spine, *Allen & Lindem* (1950 (1)) found scoliosis in 0.5 %. The degree of scoliosis is not stated, and no mention is made of torsion. These values are given for comparison with those mentioned above.

PRESENT SERIES

The X-ray films of all cases diagnosed as spondylolysis and/or spondylolisthesis, from the time the Out-patient Clinic was established in 1950 up to the end of 1961, were reviewed. Sufficient radiography was available for nearly all the patients, and supplementary films were obtained of the remainder.

The films of 261 patients were reviewed. From this material 24 patients were excluded for the following reasons: Some had been subjected to spondylodesis or hemilaminectomy, and all having hemisacralization and spondylopseudolisthesis were ruled out in order to obtain a more "pure" series and exclude certain known causes of scoliosis.

This leaves 237 patients distributed as follows:

- A. Lumbar spondylolysis: 62.
- B. Lumbar spondylolisthesis: 175.

In both groups there are about twice as many males as females, and the average age—at the time when the patient was first seen—was as shown in Fig. 2.

Table 1 corresponds to the usual finding, i.e. that in about four-fifths of all cases it is the fifth lumbar body which is involved.

Table 2 shows that the great majority of patients had mild forms of spondylolisthesis. If the severity of spondylolisthesis did increase with advancing age, the average age would be expected to be highest for the Stage III and IV patients. In the present series, however, these stages were represented only in very young patients.

In analysing the cases of scoliosis the criteria of *Glorieux* were only partially observed. In order to attribute the scoliosis to spondylolysis it

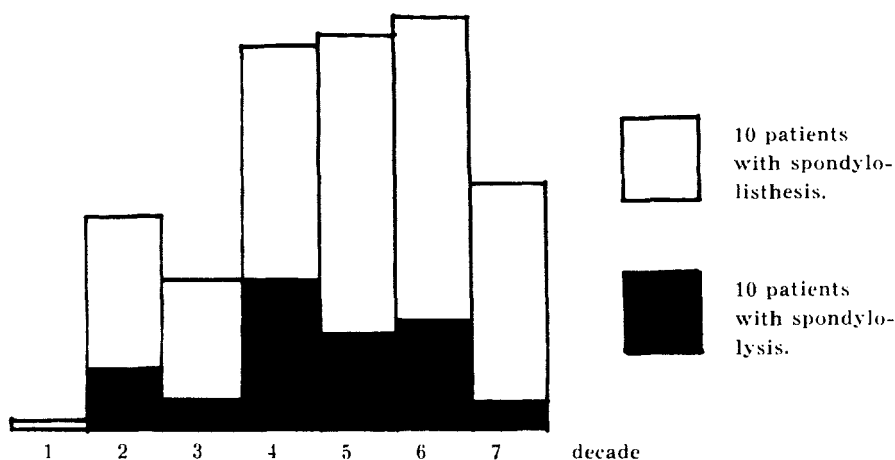


Fig. 2.

The patients average age at their first visit to the clinic. There are two summits, in the 2. and in the 5.-6. decade, representing the age when the olisthesis or the torsion appears and the age when the low back pain gives more severe trouble.

TABLE 1
Site of spondylolysis.

	Fifth lumbar	Fourth lumbar	Third lumbar	Other vertebrae
Number of cases	183	60	6	1
Percentage	72.2 %	24 %	2.4 %	0.4 %

TABLE 2
Severity of spondylolisthesis.

Meyerding's stages	No. of males	No. of females	Total	In %	Average age
Stage I, less than 25 % slipping	71	42	113	64.6	44 years
Stage II 25-50 % slipping	33	20	53	30.3	43 years
Stage III 50-75 % slipping	4	2	6	3.4	28 years
Stage IV, more than 75 % slipping	2	1	3	1.7	15 years

was demanded first that it was a true torsion scoliosis and secondly that the torsion had its maximum at the lytic or olisthetic vertebra. Therefore, all cases of scoliosis unaccompanied by torsion and all cases in which the torsion had a maximum in another site are listed separately. Moreover, cases having only torsion of the lumbar spine with a maxi-



Fig. 3.

A 45-year-old labourer. The mildest form of torsion included in the series. The oblique views disclosed spondylolysis of the fifth lumbar body on both sides of the arch. No spondylolisthesis.

mum at the site of the spondylolytic body are given separately. The torsion had to be indubitable, the mildest cases included being of the order of magnitude illustrated in Fig. 3. On the other hand, no regard was paid to whether the spinous process on the olisthetic body was in alignment with the other spinous processes. Frequently the spinous process of the fifth lumbar body is of an abnormal situation owing to all the transitional varieties to spina bifida which according to several authors (5, 7, 9) is of an increased incidence in patients with spondylolysis. Moreover, no regard was paid to whether the olisthetic body had "sunk" on the olisthetic side or on the contralateral side—which may occur too according to the present series. Briefly, as so-called olisthetic scoliosis I included all forms of torsion scoliosis in the lumbar spine starting at the site of the olisthetic or lytic vertebra and decreasing upwards, if no other causes of the scoliosis or torsion were demonstrable.



Fig. 4.

A 55-year-old smallholder. Distinct torsion scoliosis. Other X-rays disclosed bilateral spondylolysis of the fifth lumbar body and spondylolisthesis of 36 %. In this case there is a question of asymmetrical slipping with simultaneous torsion and subsequent scoliosis.

According to Table 3 the incidence of torsion scoliosis among patients with spondylolysis and spondylolisthesis is about 30 %. It is evident also that among the patients with spondylolysis more than a quarter had distinct torsion. This torsion is so typical that whenever we observed it on an anteroposterior view, we did an oblique view of the lumbar spine. As yet, we are unable to submit the accurate frequency of spondylolysis in these cases, but we found it very often.

In *Taillard's* opinion the majority of the scolioses which do not fulfill the named criteria of *Glorieux* are due to pain. It seems to be a characteristic of pain-induced scoliosis that as a rule it changes. It may be mentioned that in 10 cases we possess repeat radiographies after an interval of 1–6 years. All 10 patients are over 25 years of age and belong

*Fig. 5.*

A 52-year-old smallholder. Distinct torsion scoliosis starting at the third lumbar body. In this case the lateral displacement is pronounced.

TABLE 3
Frequency of torsion and scoliosis in:
A. Patients with spondylolysis.

	Torsion	Torsion scoliosis with maximum torsion at the spondylolytic vertebra	Scoliosis with- out torsion or having maxi- mum torsion in another site
Females	5	6	2
Males	12	15	1
Total	17	21	3
Per cent	27 %	34 %	4.8 %

B. Patients with spondylolisthesis.

Females	1	20	7
Males	9	32	4
Total	10	52	11
Per cent	5.7 %	30 %	6.3 %



Fig. 6.



Fig. 7.

Figs. 6-7.

Fig. 6. Oblique view of the patient shown in Fig. 5. A comparison with Fig. 7 revealed that the slipping is asymmetrical, i.e. a torsion. Spondylolysis is present.

Fig. 7. Again, the patient from Figs. 5 and 6, in the opposite oblique projection. On this side the forward slipping is not visible.

to the group of spondylolisthesis. Moreover, we have repeat X-rays of 6 patients having spondylolysis with torsion. Neither the scoliosis nor the torsion had changed in any of these 16 cases. This should be compared with the fact that in the present series, as in most others, it was not possible to demonstrate any definite increase in the degree of spondylolisthesis after the age of 25 apart from what may be due to an associated degeneration of the disc (*Friberg* (5) and others).

CONCLUSION

On the basis of the present series and upon studies of the literature it seems justified to establish that—apart from giving rise to olisthesis—lumbar spondylolysis may cause torsion of the lumbar column and that this torsion, when attaining a severe degree or when olisthesis super-

venes, may give rise to scoliosis in the lumbar spine. Thus, this type of scoliosis may be classified among the osteogenic, structural scolioses and is characterized as follows:

1. On the X-ray film it presents itself as torsion scoliosis, the maximum torsion being at the lytic vertebra, usually the lumbo-sacral junction.
2. As a rule it arises at the same time as the spondylolisthesis, i.e. during the growth period.
3. After its onset it undergoes practically no changes.
4. The incidence in our series was about 30 % in a group of patients with spondylolysis and/or spondylolisthesis having low-back pain.

S U M M A R Y

Analysis of the X-ray films of 237 patients with spondylolysis and/or spondylolisthesis revealed associated torsion scoliosis in about 30 %. The literature on this type of scoliosis is reviewed and the criteria summed up. Moreover, typical torsion of the lumbar spine was found in 27 % of the patients with spondylolysis.

R E S U M E

L'analyse des radiographies de 237 malades souffrant de spondylolyse ou/et de spondylolisthèse a révélé une scoliose associée dans environ 30 % des cas. La littérature sur ce type de scoliose est passée en revue et il est donné un résumé des critères. Par ailleurs, une torsion typique de la colonne lombaire a été trouvée chez 27 % des malades souffrant de spondylolyse.

Z U S A M M E N F A S S U N G

Die Analyse von Röntgenfilmen von 237 Patienten mit Spondylolyse und/oder Spondylolisthese zeigte eine damit verbundene Torsionsskoliose in ungefähr 30 %. Die Litteratur über diese Skoliosetype wird durchgegangen und ihre Kennzeichen werden aufgezählt. Darüber hinaus wurde eine typische Torsion der Lendenwirbelsäule in 27 % der Patienten mit Spondylolyse gefunden.

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