

SPONDYLOLISTHESIS IN CHILDREN AND ADOLESCENTS

By

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The incidence of spondylolysis and spondylolisthesis in anatomically examined series is given at about 5 per cent (*Neugebauer, Willis, Roche & Rowe*). Radiographic examinations of the lumbar spine of adults gives an incidence of spondylolisthesis of 2 to 3 per cent (*Allen & Lindem, Hult, Runge*). The incidence does not seem to increase between the ages of twenty and seventy and after the age of twenty progression of the displacement appears to be exceptional (*Friberg, Brocher, Taillard*, and others). Progression is not rare during the growth period, however, as was pointed out by *Friberg, Francillon, Brocher, Taillard, Laurent*, among others. The incidence of spondylolisthesis in the age groups eleven to twenty years is probably not any lower than the incidence in the older age groups (*Friberg, Taillard*). Despite numerous investigations neither spondylolysis nor spondylolisthesis has been demonstrated in foetuses or newborn infants (*Batts, Brocher, Friberg, Glorieux & Roederer*, and others). The number of reported cases under ten years of age is insignificant, amounting to some ten cases up to 1951 (*Marique*). This can probably be ascribed to the fact that, at this age, the lesion does not, as a rule, produce subjective symptoms, nor does it result in any deformity of the spine, and thus it escapes notice. So far as we know, radiological examinations of the lumbar spine of children for the purpose of investigating the frequency of spondylolisthesis have been carried out only by *Baker & McHollick*. These authors examined 400 children aged six to seven years. The incidence of spondylolisthesis was 4.5 per cent, which is the same as in adults. There is a hereditary predisposition to the lesion, a fact which has also been demonstrated earlier (*Friberg, Bakke, Francillon, George, Wiltse, Laurent*, and others). Only two more extensive series of patients under twenty years of age with this lesion have been reported on (*Taillard, Laurent*).

M A T E R I A L

During the 15-year period of 1944 to 1959, 75 cases of spondylolysis and spondylolisthesis were observed at the Orthopaedic Hospital of the Invalid Foundation in patients under twenty years of age. Of these, 58 cases have been briefly described in a previous report (*Laurent 1958*). The age and sex of the patients are given in Table I.

TABLE I
Age and sex on admission.

Age	Boys	Girls	Total
0- 4	--	2	2
5- 9	6	1	7
10-15	13	14	27
16-19	24	15	39
	43	32	75

The sex distribution shows a slight preponderance of boys. In *Taillard's* series comprising 62 patients the incidence was the same for both sexes. Rather less than half the patients were under sixteen years of age, nine patients being under ten. The youngest patient was ten months old.

The age at the onset of symptoms is seen from Table II.

TABLE II
Age at onset of symptoms.

Age	0-9	10-13	14-16	17-19	Total
No. of cases	12	21	33	9	75

In 33 cases symptoms first appeared when the patient was under 14 years of age (44 per cent). This would indicate a comparatively early onset. The location and nature of the lesion at the first examination are shown in Table III.

TABLE III
Location and kind of lesion on admission.

	L 4	L 5	Total
Lysis	1	10	11
Olisthesis	4	60	64
	5	70	75

The lesion was located in the fifth lumbar vertebra in 93.4 per cent of cases and in the fourth lumbar vertebra in 6.6 per cent. Spondylolysis without displacement was demonstrated at the first examination in 14.7 per cent of cases. Unilateral lysis was present in 5 cases, the remaining cases exhibiting bilateral lysis.

Twelve patients ascribed their disorder to trauma of greater or lesser degree. In *Taillard's* series trauma occurred in 28 per cent of cases. Trauma is often the factor releasing the symptoms in spondylolisthesis. There is possibly a tearing of the fibrous tissue in the pars interarticularis of the vertebral arch leading to increased instability.

The frequency of various lesions in the lumbar spine occurring in conjunction with spondylolisthesis will be seen from Table IV.

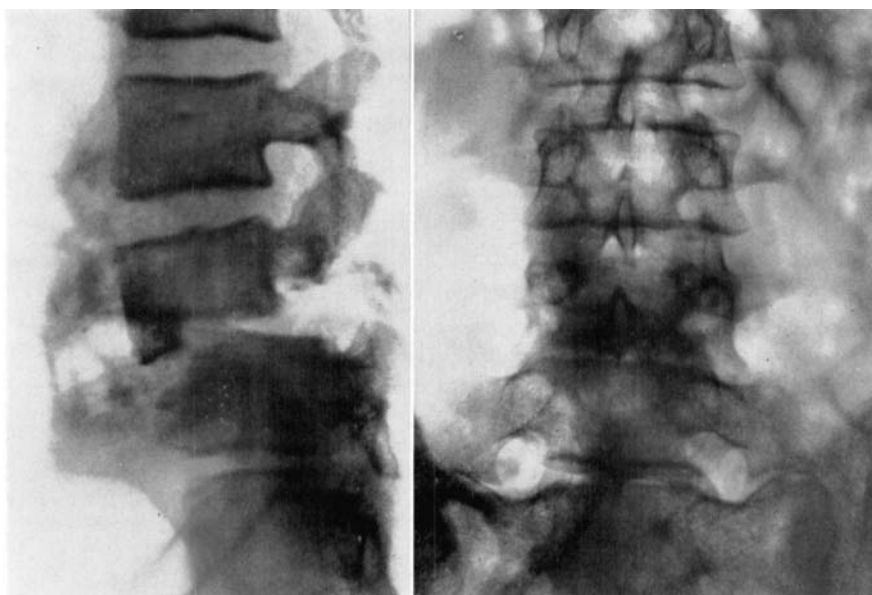
TABLE IV
Associated lesions.

Spina bifida	16 (22 %)
Sacralization	2
Transition vertebra	5
Trapezoid shape of the olisthetic vertebra	24
Upper anterior border of underlying vertebra rounded off	39
Osteochondrosis juvenilis of the spine	6

Spina bifida is often present in cases of spondylolisthesis. The incidence in *Taillard's* series was 42 per cent. In *Friberg's* series this incidence was 28 per cent, in *Meyerding's* 35 per cent. Juvenile osteochondrosis in lumbar vertebrae above the lesion occurred in three patients who were siblings and whose parents also had spondylolisthesis. This family has been described in a previous paper (*Laurent 1958*). In two patients there was a considerable deficiency of the anterior upper part of the vertebra below. A defect of so marked a degree is rare and may prompt a suspicion of an inflammatory or expansive process. Fig. 1 shows such a defect of the fifth lumbar vertebra in a 13-year-old boy with spondylolisthesis of the fourth lumbar vertebra. The fifth lumbar vertebra was sacralized. The patient underwent dorsal fusion and the operation revealed changes characteristic of spondylolisthesis in the dorsal portion of the fourth lumbar vertebra.

CLINICAL SYMPTOMS

A low degree of scoliosis occurred in 27 cases. In some cases the scoliosis was more pronounced and in these a rotation of the vertebra in the frontal plane could be observed in the frontal radiogram. In



a

Fig. 1.

13 year old boy. Olisthesis of the fourth lumbar vertebra. The fifth lumbar vertebra is sacralized. Great defect of anterior upper border of the fifth lumbar vertebral body.

these cases unilateral spondylolysis, which according to *Glorieux & Roederer* predisposes to scoliosis, was not present. Rotation in the frontal plane may probably also take place solely as a result of the instability of the olisthetic vertebra.

While in adults pain in the lumbar region dominates the clinical picture in the majority of cases, *Taillard* reports that radiating pain in the lower extremities often occurs in adolescents with spondylolisthesis. The clinical picture in the present series is given in Table V.

TABLE V
Clinical picture in relation to age.

	0-9	10-15	16-19	Total
No pain	5	4	2	11
Low back pain	4	13	21	38
Low back pain and radiating pain	—	10	16	26
Positive Laségue's sign	—	10	10	20
Loss or diminution of ankle jerk	—	8	6	14
Sensory disturbances	—	1	—	1

Eleven patients were subjectively symptom-free, while 38 had pain in the lumbar region only. About one-third of the patients had radiating pain, an incidence that tallies with that in adult patients (*Laurent* 1958). There were jerk disturbances in one-fifth of cases. One patient exhibited a cauda equina syndrome with sensory disturbances and partial bladder paresis. This case has been described in a previous paper (*Laurent* 1958). The frequency of various disorders and deformities occurring in conjunction with spondylolisthesis will be seen from Table VI.

TABLE VI
Associated diseases and deformities.

Post-poliomyelitic sequelae	4
Tuberculosis of the spine	1
Idiopathic scoliosis	1
Spastic cerebral diplegia	1
Congenital dislocation of the hip	1
Talipes equinovarus	1
Other deformities of the feet	3
Perthes' disease	1

PATIENTS UNDER TEN YEARS OF AGE

The age and sex of the patients are given in Table VII.

TABLE VII
Age and sex of patients under 10 years old.

Age	Girls	Boys	Total
0-4	2	—	2
5-7	...	2	2
8-9	...	5	5
	2	7	9

The lesion was in all cases located in the fifth lumbar vertebra. The first examination revealed spondylolysis without displacement in four cases, and slight displacement, which did not exceed one-third of the vertebral length, in five cases. The spondylolysis was unilateral in three cases, two of which showed slight displacement. Seven patients were followed up $\frac{1}{2}$ to 1 year later and the examination demonstrated that a slight displacement of 2 to 3 mm. had taken place in two cases and a somewhat more marked displacement of 5 mm. in one case. In

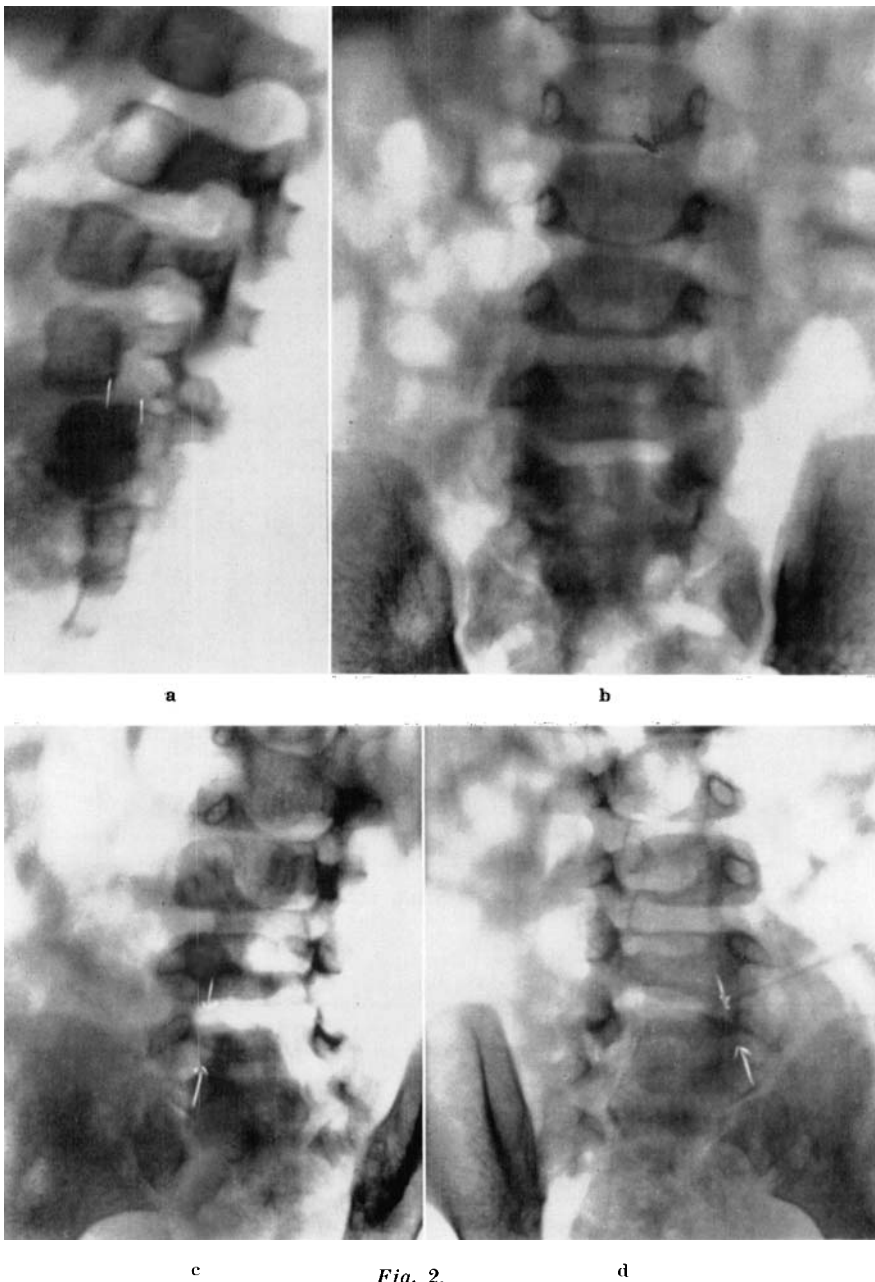


Fig. 2.

10 month old girl with a congenital left club-foot, Olisthesis of the fifth lumbar vertebra. The neural archs are hypoplastic, in the right arch there seems to be a defect. Spina bifida is present.

these cases there had been no displacement primarily. In four cases no progression of the displacement was observed.

The youngest patient was a ten-month-old girl who was admitted to the hospital for left congenital club foot. Radiographic examination of the lumbar spine showed unilateral spondylolysis and slightolisthesis of the fifth lumbar vertebra. The affected neural archs were hypoplastic and spina bifida was present. (Fig. 2). Eight months later the condition was unchanged.

The second youngest patient was 4½ years old and was admitted to hospital for spastic diplegia of the lower extremities present since birth. A cesarean section had been performed because of transverse position. A radiogram of the lumbar spine revealed bilateral spondylolysis of the fifth lumbar vertebra, which had slipped 3 mm. forwards. (Fig. 3).

Friberg had examined a ten-month-old girl with spondylolysis of all lumbar vertebrae. The patient had numerous other congenital malformations such as dislocation of the hip, club feet, and subluxation of the knee and elbow joints. In this case the spondylolyses were most probably also congenital. It is possible that the spondylolisthesis in our youngest patient was likewise congenital. The four-year-old girl had spastic paraparesis with characteristic spastic gait. In this case a stress moment could be imagined which might have contributed to the occurrence of spondylolysis. *Kleinberg* observed spondylolisthesis in a 17-month-old girl with congenital dislocation of the hip. Despite olisthesis comprising one-half of the length of the vertebra, no deformity of the lumbar back could be demonstrated clinically. *Brailsford* observed spondylolisthesis in a three-year-old patient and *Schmorl* found this lesion at autopsy in two children aged 2 to 2½ years.

Our observations indicate that spondylolysis and spondylolisthesis are not rare among children aged 5 to 9, a fact which has also been demonstrated by *Baker & McHollick* in an extensive radiographic series of children 6 to 7 years of age. It is generally a question of spondylolysis or a slight degree of olisthesis. Since, on the other hand, spondylolisthesis has not been observed in newborn infants, this would seem to indicate that spondylolysis occurs during the first few years of life, possibly when the child begins to stand up and to walk and when the lumbar lordosis develops.

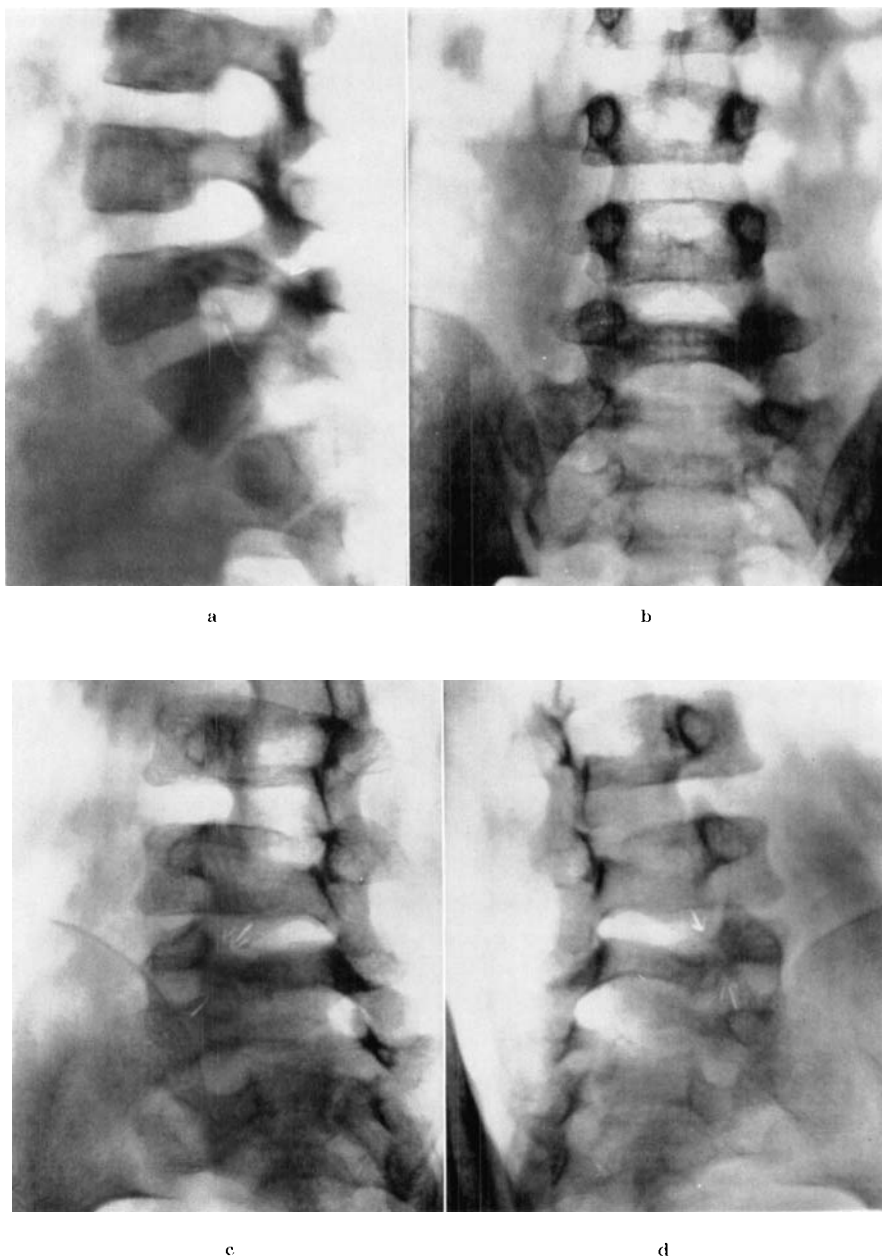


Fig. 3.

4½ year old girl with cerebral spastic diplegia. Olisthesis of the fifth lumbar vertebra and bilateral spondylolysis.

OBSERVATIONS ON SLIPPING

The degree of slipping was measured as a percentage of the length of the olisthetic vertebral body. (Fig. 4).

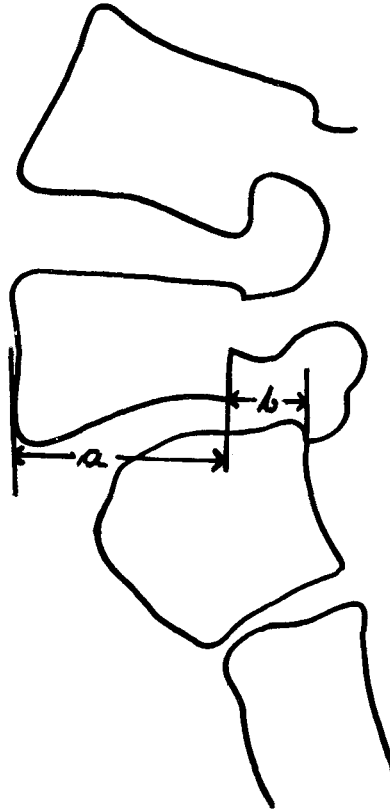


Fig. 4.
Slipping (per cent) = $\frac{b \times 100}{a}$

The degree of slipping in relation to the age of the patient at the time of the first examination is shown in Table VIII.

There was spondylolysis or a slight degree of olisthesis in 44 cases (58.7 per cent). It seems as if the displacement often progresses in those cases in which it exceeds 30 per cent, gradually leading to subtotal or total olisthesis.

Of 75 patients 52 were followed up, the time of observation being 2 to 9 years. In the remaining 23 cases either the patient could not be followed up or else the period of observation was less than one year. Nineteen patients were operated on straightway, while 4 patients later

underwent operative treatment for progressive slipping. The frequency of progressive slipping is shown in Table IX.

TABLE VIII
Degree of slipping in relation to age on admission.

	0-9	10-15	16-19	Total	%
Lysis without slipping	4	1	6	11	14.7
Slipping less than 30 %	5	11	17	33	44.0
– 30-50 %	–	1	4	5	6.7
– 50-75 %	–	7	6	13	17.3
– subtotal or total	–	7	6	13	17.3
	9	27	39	75	100.0

TABLE IX
Progression of slipping in conservatively and operatively treated cases.

	Pro- gression	No pro- gression	Not fol- lowed up	Total
Lysis (not operated)	4	4	3	11
Olisthesis (not operated)	13	14	18	45
Olisthesis (operated)	6	11	2	19
	23	29	23	75

Thus progression occurred in 23 out of 52 cases which could be followed up (44 per cent). There was progression in six operated cases. The frequency of progression of the slipping in the different age groups is shown in Table X.

TABLE X
Progression of slipping in relation to age.

Age	Not operated	Operated	Total
0- 9	3	–	3
10-15	10	4	14
16-19	4	2	6
	17	6	23

Progression seems to take place most often at the age of 10 to 15 years. Since, according to Table VIII, a slipping exceeding 30 per cent often predisposes to further progression, operation should be considered at the age of 10 to 15 years if a displacement of over 30 per cent is present.

In spondylolisthesis of the fourth lumbar vertebra no high grade slipping could, as a rule, be established (*Laurent 1958*). Cases in which the fifth lumbar vertebra is sacralized constitute exceptions.

According to *Taillard* a trapezoid shape of the affected vertebra is a characteristic finding in spondylolisthesis. The dorsal height of the vertebra is less than its ventral height. This can be expressed by means of the so-called lumbar index.

$$\text{Lumbar index L 5} = \frac{\text{Dorsal height of the vertebral body}}{\text{Ventral height of the vertebral body}} \times 100.$$

Taillard examined the lumbar index of the fifth lumbar vertebra in 100 children without deformities, the average index being 89.5. In 50 cases of spondylolisthesis this index was 72. In the present series the index was likewise 72. The frequency of progression in relation to a lumbar index higher or lower than 70 in 52 followed up cases is shown in Table XI.

TABLE XI
Progression of slipping in relation to lumbar index.

	Progression	No progression	Total
Index more than 70	14	14	28
Index less than 70	9	15	24
	23	29	52

It will be seen from the table that the lumbar index does not provide any reliable criterion for estimating the risk of progression of the slipping. In olisthesis below 30 per cent, the index was as a rule higher than 70, whilst at a higher degree of slipping the index was often less than 70. This would seem to indicate that compression of the dorsal portion of the olisthetic vertebra is a secondary deformity arising when the slipping exceeds 30 per cent. However, in the present series the lumbar index was also lower than the average of normal subjects.

During the period of observation slight slipping occurred in four cases where there had primarily been no olisthesis. In seven out of nine cases with slight displacement, the olisthesis progressed insignificantly without exceeding 30 per cent; there was considerable progression in two cases. In one out of three cases with olisthesis amounting to 50 to 70 per cent, the olisthesis became total. In all six cases with subtotal olisthesis progression to total olisthesis took place. Thus, considerable

progression of the displacement took place in 9 out of 52 cases (17.3 per cent).

According to *Taillard*, the shape of the ventral upper edge of the sacrum is a valuable guide to prognosis. If this edge is rounded off, there is a risk of progression. The frequency of such changes in the present series is shown in Table XII.

TABLE XII
Changes in the underlying vertebra (anterior border rounded off) in relation to the grade of slipping.

	Border normal	Border rounded off
Slipping less than 30 %	36	8
Slipping more than 30 %	—	31
	36	39

The table seems rather to indicate that the changes in the ventral edge of the underlying vertebra are secondary, occurring, as a rule, when the displacement exceeds 30 per cent. In exceptional cases a significant defect may be observed. (Fig. 1).

TREATMENT

Of the 75 patients, 52 (69.3 per cent) were treated conservatively, while 23 (20.7 per cent) underwent surgery.

CONSERVATIVE TREATMENT

Of the conservatively treated patients 31 could be followed up, the period of observation being 2 to 9 years. Sixteen patients could not be followed up and in five cases the period of observation was less than one year. In these 21 cases the treatment consisted of a cloth corset in eight cases and of physical therapy in three cases, while in ten cases no treatment was considered necessary. In the 31 followed-up cases the treatment was as follows:

No treatment	5
Physical therapy	15
Surgical corset	11
	31

The functional results of treatment were divided into three groups as follows:

- Group I: No pain.
- Group II: Slight low back pain occasionally.
- Group III: Low back pain and radiating pain frequently.

The results of the conservative treatment are shown in Table XIII.

TABLE XIII
Functional results of conservative treatment.

	Group I	Group II	Group III	Total
No treatment	3	2	—	5
Physical therapy	5	8	2	15
Surgical corset	1	3	7	11
	9	13	9	31

Despite corset and physical therapy, backache and radiating pain persisted in nine out of 31 cases. The symptoms were not so marked, however, as to constitute indications for operation. Three of these patients were remitted to a vocational school for the disabled. During the period of observation the degree of olisthesis remained unchanged in 18 cases, while in 10 cases an insignificant progression of 1 to 15 per cent occurred. Considerable progression had taken place in three cases, subtotal olisthesis progressing to total in two of these. These patients probably should have been operated on even though it would have been uncertain whether progression could have been arrested by this measure.

OPERATIVE TREATMENT

Twenty-three patients underwent operative treatment. The indications for operative treatment were as follow:

Low back pain	2 cases
Low back pain and radiating pain	15 cases
Risk of progression and displacement	6 cases
	23 cases

The operations carried out were as follows:

Reduction and dorsal fusion	1
Dorsal fusion	14
Dorsal fusion with exploration or laminectomy	4
Ventral fusion	2
Laminectomy alone	2
Re-operation	3

At dorsal fusion a tibial graft was, as a rule, applied, and during recent years two grafts and cancellous bone from the upper end of the tibia. The intervertebral joints were left intact. The patients were confined to bed for six weeks after operation, and were then given plaster jackets for 2 to 3 months. Of the 19 cases of dorsal fusion 15 could be followed up, the period of observation being 2 to 10 years, 5 years on average. The period of observation was less than one year in four cases.

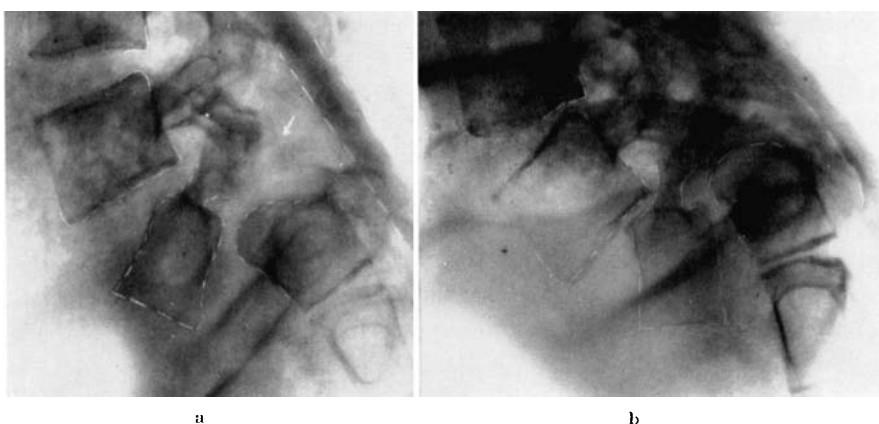
In one case reduction according to *Watson-Jones's* method was attempted. The patient was twelve years old and had spondylolisthesis of the fifth lumbar vertebra of 22 mm. (78 per cent). At reduction the displacement was reduced by 5 mm. but this was lost again and a control radiogram six weeks after dorsal fusion showed the same degree of slipping as before operation. In *Taillard's* series considerable reduction of the displacement was obtained in seven cases, but in only one case could the reduction be maintained by dorsal fusion.

The functional results in fifteen cases in which dorsal fusion was carried out, were as follows:

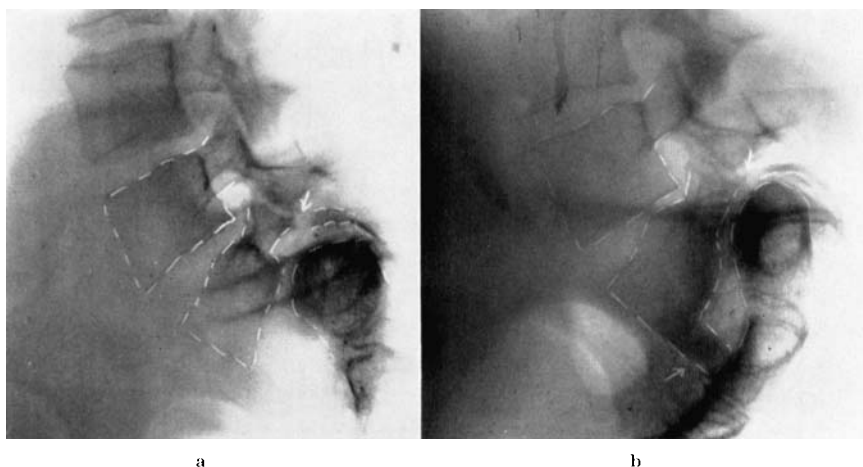
Group I	5
Group II	5
Group III	5

In the last group three patients were reoperated on. In two cases exploration was carried out for recurrence of radiating pain and one patient was operated on for persisting backache. In two of these cases pseudarthrosis of the graft was present. Two of the patients were symptom-free after reoperation, while one had slight symptoms periodically. Control examination showed that in eleven cases the displacement was unchanged after operation, while progression had taken place in four cases despite good consolidation of the graft. Fig. 5 shows such a case.

Consolidation of the graft was achieved in twelve cases, two of which, however, exhibited pseudarthrosis above the area involved. Here the graft was unnecessarily long. In two cases in which there was pseudarthrosis of the graft, reoperation was carried out. Consolidation was uncertain in one case.

*Fig. 5.*

15 year old boy. Subtotal olisthesis of the fifth lumbar vertebra. Dorsal fusion with bilateral paraspinous grafts was performed six weeks earlier. Two years later the slipping has progressed and is now total. The grafts are slightly bent.

*Fig. 6.*

14 year old boy. Subtotal olisthesis of the fifth lumbar vertebra. Ventral fusion with an iliac graft was performed. Four years later the olisthesis is total. There is pseudarthrosis between the graft and the sacrum.

Satisfactory functional results were thus achieved in thirteen out of fifteen cases by means of dorsal fusion and after three reoperations had been carried out. Despite dorsal fusion, progression could not be prevented in four cases. In three of these subtotal olisthesis progressed to total olisthesis. Here ventral fusion might possibly have prevented progression.

The results seem to indicate that olisthesis in adolescents should be operated on before it becomes subtotal. When the displacement begins to exceed 30 per cent operation should be considered and should further progression occur, operation is indicated. In most of these cases progression can be arrested by dorsal fusion.

Ventral transperitoneal fusion was carried out in two cases in which the patients were under 20. The body of the fifth lumbar vertebra was fused with the first sacral vertebra by means of an iliac graft. There were no operative complications. Consolidation was achieved in one case, the patient being symptom-free at follow-up examination. The olisthesis, which was primarily 90 per cent, was unchanged. In the second case pseudarthrosis occurred and the displacement increased during the period of observation from 77 per cent to total. (Fig. 6).

The symptoms were alleviated after operation but there was slight low back pain periodically. The patient was remitted to a vocational school for the disabled.

Laminectomy without fusion was carried out in two cases. One patient had a cauda equina syndrome and total olisthesis of the fifth lumbar vertebra. After operation the backache and bladder disturbance were relieved, the other neurological symptoms, which have been described earlier (*Laurent* 1958), persisting unchanged. The other patient was a 17-year-old girl on whom laminectomy was carried out for sciatica. Although the radiating pain was somewhat alleviated after operation, the backache persisted unchanged. At follow-up the displacement, which was 90 per cent, remained unchanged. In this case a console had developed at the ventral upper edge of the sacrum and this console had evidently prevented further progression. Such console formation is common in adult individuals with spondylolisthesis but seldom takes place in patients under the age of 20.

In our opinion, in young individuals with spondylolisthesis laminectomy without simultaneous fusion should only be carried out on special indications.

The functional results after operative treatment in 19 followed-up cases are shown in Table XIV.

Backache and radiating pain which are not affected by conservative treatment, constitute operative indications. As a rule, conservative treatment should first be attempted. Patients with a displacement exceeding 30 per cent of the length of the vertebral body should be carefully followed up and further progression should be prevented by operation. Dorsal fusion results in satisfactory relief of pain but cannot

always arrest progression of the displacement. In subtotal olisthesis progression to total olisthesis cannot, as a rule, be prevented by dorsal fusion. Ventral fusion might give better results but there is a risk of complications after this operation. In our opinion dorsal fusion should be carried out before the olisthesis has become subtotal. Reduction may occasionally succeed, but the results of reduction are difficult to maintain.

TABLE XIV
Functional results of operative treatment.

	Group I	Group II	Group III	Total
Dorsal fusion (3 re-operations)	7	6	2	15
Ventral fusion	1	1	—	2
Laminectomy	—	—	2	2
	8	7	4	19

CONCLUSIONS

A study of 75 cases of spondylolysis and spondylolisthesis in children and adolescents gave rise to the following conclusions:

1. This lesion is not uncommon in children under ten years old. At this age there is generally only a slight degree of displacement, if any, and subjective symptoms are often altogether absent. The lesion therefore mostly eludes diagnosis at this age. Spondylolysis probably occurs during the first few years of life.

2. Progression of the displacement is common in children and adolescents. Progression was observed in 23 out of 52 followed-up cases (44 per cent). Progression seems most frequently to take place between the ages of 10 to 15. At the first examination spondylolysis without slipping was present in 14.7 per cent of cases, and in 44 per cent the slipping was less than 30 per cent of the vertebral length. The slipping was 30 to 75 per cent in 24 per cent of cases, subtotal or total olisthesis being present in 17.3 per cent of cases. Subtotal olisthesis as a rule progresses to total olisthesis despite dorsal fusion.

3. Sciatica was present in one-third of cases.

4. A trapezoid shape of the olisthetic vertebra and rounding off of the anterior edge of the underlying vertebra are often observed. Our material indicates that these changes are secondary, occurring when the olisthesis exceeds 30 per cent. The lumbar index does not provide a safe basis for the estimation of the risk of progression. If the displace-

ment exceeds 30 per cent, it often progresses further towards a more severe degree ofolisthesis.

5. Dorsal fusion provides good results in cases in which conservative treatment does not relieve the pain. As a rule, dorsal fusion cannot prevent progression from subtotal to total olisthesis. In such cases ventral spondylodesis may afford better results. If the displacement amounts to 30 per cent, the patient should be kept under close observation and dorsal fusion should be carried out when there are signs of progression and before the displacement has become subtotal. Reduction may succeed but it is difficult to maintain.

S U M M A R Y

During the period 1944 to 1959, 75 cases of spondylolysis or spondylolisthesis in children and adolescents were observed. Nine patients were under ten years old, the youngest being ten months. 52 patients were followed up, the period of observation being 2 to 10 years. Progression of the displacement occurred in 23 cases (44 per cent). Sciatica was reported in one-third of cases. Little displacement if any, occurred in 58.7 per cent of cases and a higher degree of olisthesis in 41.3 per cent. Progression most frequently took place at the age 10 to 15 years. If the displacement exceeded 30 per cent, further progression usually took place. Subtotal olisthesis as a rule became total, even despite dorsal fusion. Dorsal fusion tended to relieve the pain. If the displacement amounts to 30 per cent of the vertebral length, the patient should be kept under close observation and if there are signs of progression, dorsal fusion should be carried out before the displacement has become subtotal. If there is subtotal olisthesis, ventral fusion may prevent further slipping.

R E S U M E

Durant la période 1954 à 1959, 75 cas de spondylolyse ou de spondylolisthèse chez les enfants et les adolescents ont été étudiés. Neuf malades avaient moins de 10 ans, le plus jeune n'ayant que 10 mois. 52 malades ont été suivis pendant une période d'observation entre 2 et 10 ans. Une progression du glissement a été constatée dans 23 cas (44 %). Des sciatiques ont été rapportées pour un tiers des cas. Un léger déplacement a été observé dans 58,7 % des cas et un plus haut degré d'olisthèse dans 41,3 %. La progression prend fréquemment place entre 10 et 15 ans. Si le déplacement dépasse 30 %, il se produit généralement

une nouvelle progression. Une olisthèse subtotale devient en règle générale totale, même en dépit d'une fusion dorsale.

La fusion dorsale tend à soulager des douleurs. Si le déplacement s'élève à 30 % de la longueur de la vertèbre, le malade doit être tenu sous observation et s'il y a des signes de progression, une fusion dorsale doit être pratiquée avant que le déplacement ne devienne subtotal. S'il y a olisthèse subtotale, une fusion ventrale peut empêcher un glissement ultérieur.

ZUSAMMENFASSUNG

Während des Zeitraumes 1944 bis 1959 wurden 75 Fälle von Spondylolysis oder Spondylolisthesis bei Kindern oder Jugendlichen untersucht. Neun Patienten waren unter zehn Jahre alt. Der jüngste von ihnen war zehn Monate alt. 52 Patienten wurden nachuntersucht. Der Beobachtungszeitraum erstreckte sich von 2 zu 10 Jahren. Ein Fortschreiten der Verschiebung trat in 23 Fällen (44 %) auf. Ischias wurde in einem Drittel der Fälle berichtet. Eine kleine, wenn überhaupt eine, Verschiebung, trat in 58,7 % und ein höherer Grad von Olisthesis in 41,3 % der Fälle auf. Die Zunahme der Verschiebung geschah am häufigsten im Alter von zehn zu fünfzehn Jahren. Wenn die Verschiebung mehr als 30 % überstieg, kam es in der Regel zu einem weiteren Fortschreiten. Subtotal Olisthesis bekam in der Regel total, selbst trotz dorsaler Fusion.

Die dorsale Fusion erleichterte gewöhnlich die Schmerzen. Wenn die Verschiebung 30 % der Wirbellänge beträgt, sollte der Patient unter genauer Beobachtung gehalten werden und wenn Zeichen des Weitergleitens auftreten, sollte die dorsale Fusion vorgenommen werden ehe die Verschiebung eine subtotale geworden ist. Wenn eine subtotale Verschiebung bereits vorhanden ist, kann eine ventrale Fusion weiteres Abgleiten verhindern.

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