

SPONDYLOLISTHESIS

Treatment by Excision of the Loose Lamina and Resection of the Pedicle

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Eighty patients were treated by radical arch resection, i.e., removal of the loose lamina and the fibrous tissue in and around the pseudarthrosis and resection of the caudal portion of the ventral part of the pedicle. In 17 patients an additional spinal fusion was performed. The mean observation time was 4.7 years. The forward dislocation increased by 25 per cent in the group without fusion compared with 16 per cent in the fused group. The symptoms of nerve root affection for the most part improved, but the back pain persisted in 28 patients. Fifty per cent of the patients were in full-time employment at the time of the follow-up. A total of 75 per cent were improved and 25 per cent unchanged or worse.

Key words: lamina excision; pedicle resection; spondylolisthesis

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The treatment of spondylolisthesis in our department, for more than 15 years, has been surgical procedures for younger patients while a more conservative approach has been the rule with older patients. During the period 1955-1970, 220 operations were performed, 80 laminectomies and 140 spinal fusions.

Studying the results of the early operations, we learned that simple laminectomy was not sufficient and that the Gill procedure (Gill et al. 1955), in our hands, failed to provide relief in several cases. Alvik (1969) found, in a high percentage of cases, a special mechanism causing nerve root impingement in spondylolisthesis: The root proximal to the dislocated segment was found to be compressed to a greater or lesser extent between the pedicle of the spondylolisthetic arch and

the posterior part of the underlying corpus and disc (Figure 1).

As a consequence of this we have altered the surgical procedure. The purpose of this paper is to study the results of this revised surgical method: Laminectomy combined with resection of the pedicle, in our department called "radical arch resection".

METHOD

Radical arch resection consists of removal of the loose lamina and the fibrous tissue in and around the pseudarthrosis and, in addition, resection of the caudal portion of the ventral part of the pedicle (Figure 1). The patients are allowed to get out of bed 1-2 days after the operation, without a corset. Active exercises are started at once.

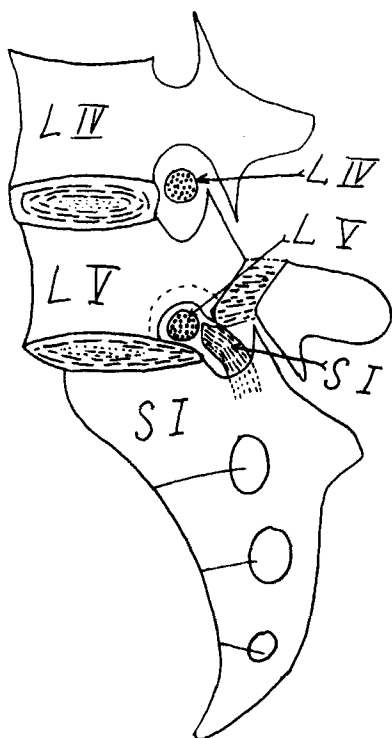


Figure 1. The part of the pedicle to be resected marked with the dotted line. The fifth lumbar root is compressed between the pedicle and the underlying bone and the disc.

PATIENTS

A series of 80 patients have been treated with this operation during the period 1955-1970; there were 43 males and 37 females, aged 12-68 years. The mean age was 39.6 years. The age distribution is shown in Figure 2. The observation time was 2-18 years with an average of 4.7 years. In 17 patients some form of spinal fusion was carried out in addition to the arch resection: 16 had posterior (intercorporeal, intertransverse or dorsal) and one anterior fusion. The fused patients were immobilised—mostly in a plaster cast—for 4 months.

In Figure 3 the anterior dislocation is graded according to Meyerding (1932). Most of the cases belonged to grades I and II (Table 1). Standard X-rays were supplemented by oblique projections in order to get an exact impression of the pseudarthrosis, which was present in all cases. The spondylolisthesis was located to L_5-S_1 in 52 cases, L_4-L_5 in 23 cases, L_6-S_1 in three cases, L_5-L_4 in one, and to both L_4-L_5 and L_5-S_1 in one case. Spina bifida was found at the level of the fifth lumbar vertebra in three patients, at the

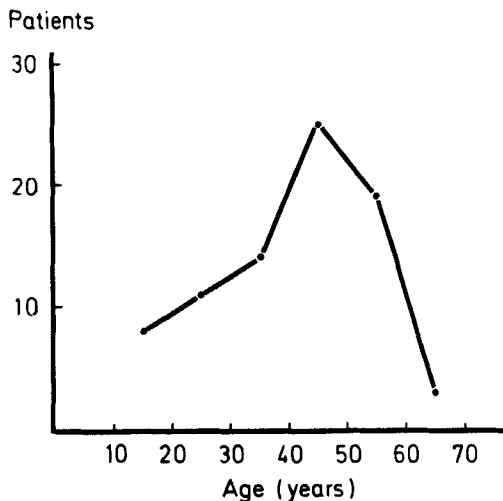


Figure 2. Age distribution.

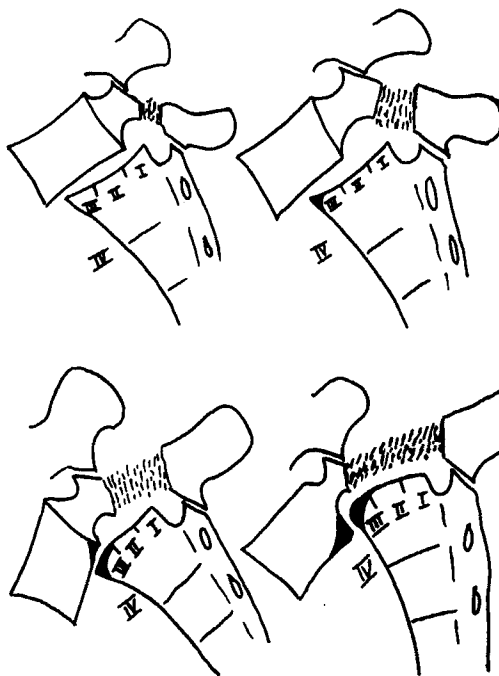


Figure 3. Grading of spondylolisthesis according to Meyerding.

first sacral in five and at both the first and second sacral vertebrae in one patient. The amount of anterior dislocation of the vertebral body was recorded as a percentage of the antero-posterior diameter of the inferior surface of the displaced segment. The average slipping was 10.8 mm (24.6 per cent) ranging from zero to

25 mm. In males the average slipping was 22.9 per cent and in females 28.4 per cent.

Table 1. Grading of anterior dislocation.

	I	II	III	IV
Before operation	62	17	1	0
After operation	54	22	3	1

Radiculography was performed in 76 patients. Signs of nerve root affection were found in 65 cases (Figure 4). In 55 of these the radiculographic and neurologic findings correlated well. A herniated disc was found in six cases and was verified in five cases at operation. One additional prolapse, not demonstrated radiculographically, was found at operation.

Complications, reoperation and additional spinal fusions

In the group of 63 patients without fusion, there were no immediate postoperative complications. Three patients, however, were reoperated and neurolysis performed because of persistent root symptoms. Only one improved. Another four patients had additional anterior transperitoneal fusion because of a considerable increase in anterior dislocation following the initial operation. One of these did not heal (Figure 5). In one case a third operation—neurolysis—was performed because of persistent radicular and back pain, but no improvement resulted. This patient also developed a ventral hernia after the fusion operation. Additional fusion was done in another three patients because of persistent severe back pain: one intertransversal, one combined dorsal/intertransversal and one dorsal. The latter patient developed a deep wound infection with a fistula and had to be reoperated because of non-union.

In the combined radical/fusion group of 17 patients, two developed superficial infection. Non-union occurred in two of the six intercorporal fixations. Intertransversal fusion was done in one of them. Of the three dorsal fixations, two did not heal and were reoperated twice. One of them has a persistent pseudarthrosis. One patient with anterior fusion initially was reoperated and intertransversal fixation performed because of persistent back pain.

RESULTS

Postoperative slipping. Following radical resection without fusion the anterior dis-

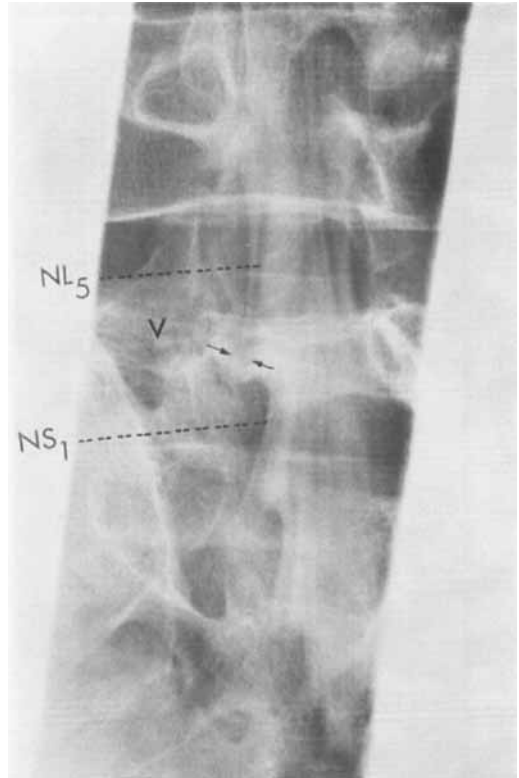


Figure 4. Radiculogram. The fifth lumbar root is disrupted at the pseudarthrosis level, marked with arrows. Note increased interval between pedicle and root.

Table 2. Pre- and postoperative slipping for patients having radical arch excision without fusion.

Age (years)	No. of patients	Dislocation pre- and postop. (mm)	Dislocation increase (mm)	% increase
< 25	8	13.9-17	3.1	22.3
25-40	20	11.6-15.1	3.5	30.2
> 40	35	10-12.1	2.1	21
Total	63	11-13.7	2.7	25

location increased from 11 mm to 13.7 mm (Figure 6). The slipping was most marked in the middle age group (25-40 years) (Table 2). Surprisingly this group

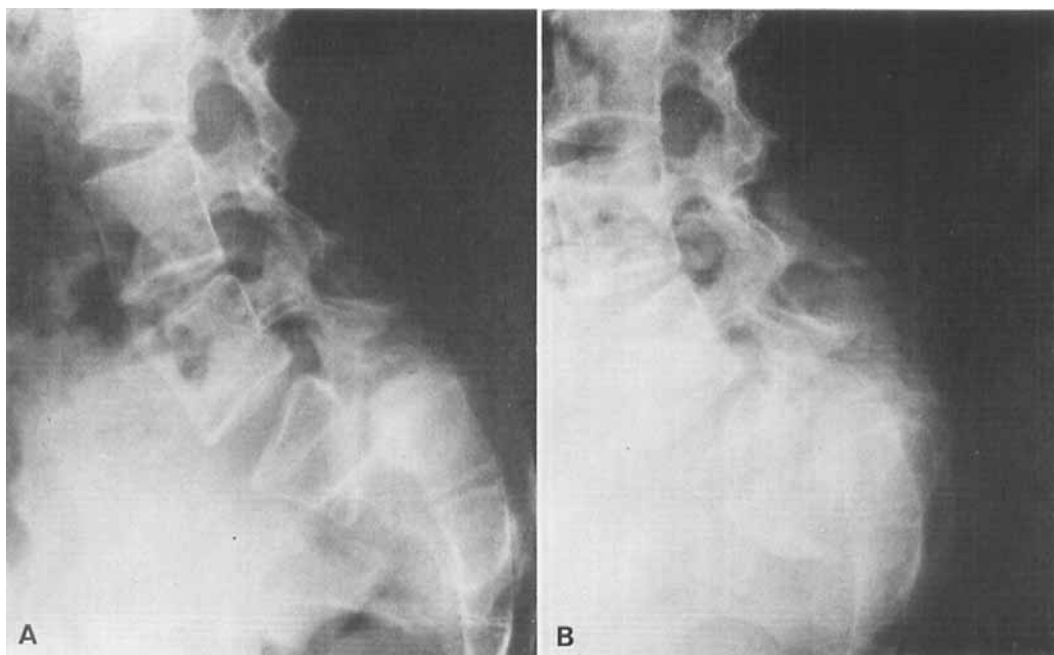


Figure 5. Grade 3-4 spondylolisthesis. a) Before operation. b) After radical arch excision and later anterior fixation, which did not unite.



Figure 6. Typical increase in slipping. a) Before and b) after radical arch excision.

had less backache than the other two groups. Among the fused patients there were 10 without increased postoperative

slipping, four with moderate and three with a marked increase (4-12 mm). The last three have persistent pseudarthrosis.

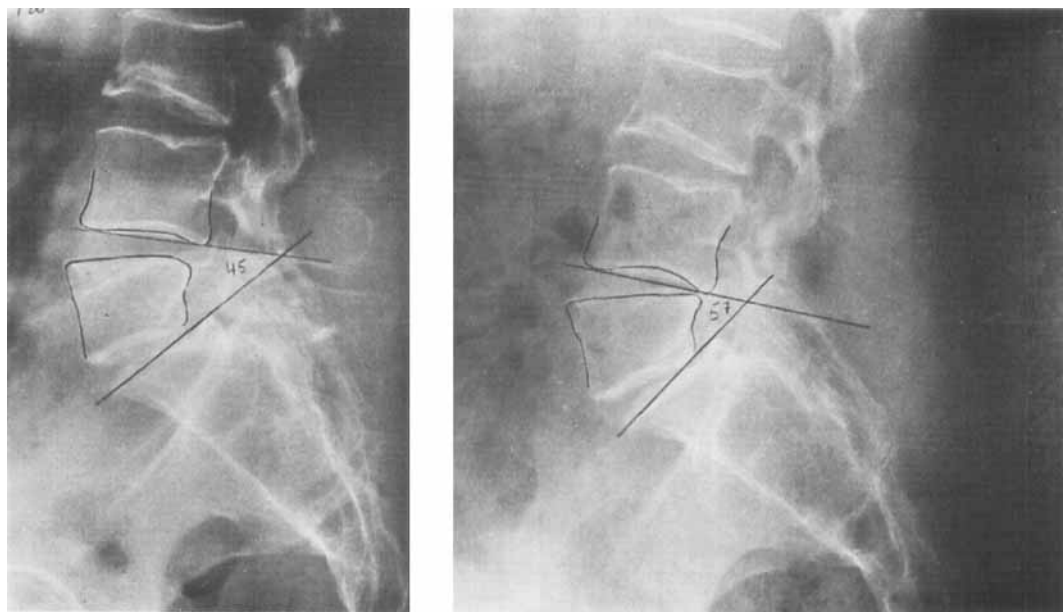


Figure 7. Postoperative "rolling". The angle between the upper sacrum and the fourth vertebra has increased.

In some cases "rolling" was observed on X-ray examination, i.e., an increased angle between the sacrum and the vertebra above the slipping vertebra (Figure 7).

Nerve root affection. The signs of root affection were markedly improved. The radicular pain, which was present in all cases before operation, was improved in 63 (78.8 per cent). Objective signs present in 45 patients preoperatively were improved at follow-up in 38 (Table 3).

Table 3. Nerve root symptoms before and after operation.

		Radicular pains	Objective root signs
Before operation		80	45
After operation	No symptoms	45	30
	Improved	18	8
	Unchanged	12	6
	Worse	5	1

Local back pain. In 49 patients (61.3 per cent) the back pain was considerably improved. It was unchanged in 22 and worse in six patients. Three patients had no pain before or after operation. One patient without back pain before opera-

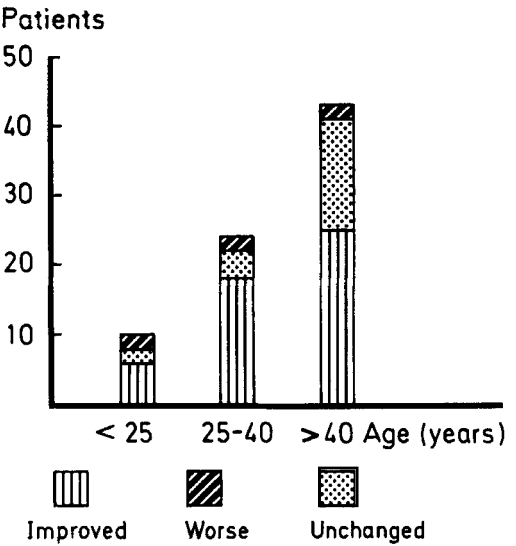


Figure 8. Back pain related to age. See text.

tion complained of pain at the follow-up. The middle age group seemed to be the most pain-free (Figure 8).

Working capacity. As shown in Table 4, the working capacity was greatly improved. The number of patients in employment was doubled after operation.

Table 4. Working capacity.

	Before oper- ation	After oper- ation
Incapable of working	46	20
Partial working capacity	14	20
Full working capacity	20	40

Overall end results were graded as follows:

- Excellent – No pain or mild occasional pain. Able to carry out all activities.
- Fair – Improved with moderate pain in the back and/or extremities. Working capacity reduced to some degree.
- Poor – Persistent or increased pain in the back or lower extremities. Incapable of working.

As demonstrated in Table 5, half of the patients obtained a very satisfactory result, 75 per cent were improved and 25 per cent are classified as failures. Without fusion, 30 per cent were failures.

Table 5. Overall results.

	Radical arch excision		Combined operation	
	No. of patients	%	No. of patients	%
Excellent	31	49	9	53
Fair	13	21	7	41
Poor	19	30	1	6
Total	63	100	17	100

DISCUSSION AND CONCLUSION

Bosworth et al. (1955) and Marmor & Bechtol (1961) thought that removal of the loose lamina might lead to instability with increasing anterior dislocation. Gill et al. (1955) did not share this opinion. In agreement with Friberg (1939), Gill et al. (1955) and Turner & Bianco (1971) we have not found any correlation between the grade of slipping and back pain.

In addition to the radical arch excision we now invariably perform intervertebral fusion in patients below 50. Since 1969, we have used the intertransversal method, which is simple and has proved for us to be the most reliable. After radical arch excision the symptoms of nerve root affection as a rule disappear or improve, but the back pain often persists. We believe that the backache is largely due to small movements in the dislocated segment. Residual back pain after arch excision is therefore logically treated by secondary fusion.

Compared with Gill's series our number of good results seems to be rather modest. But they correspond well with the results of Cedell (1961) and Cedell & Wiberg (1970) who recorded distinct improvement in about 70 per cent of their series. The evaluation of the results, however, is not always commensurable. We believe that the present attitude towards treatment of spondylolisthesis is not the final one. It may be that the selection of cases for surgical treatment should be more restrictive. We feel that a few of the patients in the 'failure' group would have been dissatisfied irrespective of treatment. These patients are particularly liable to be victims of "multisurgery".

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