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ANTERIOR INTERBODY FUSION OF THE LUMBAR SPINE

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Anterior interbody fusion of the lumbar spine by the extraperitoneal technique was performed in 47 patients with incapacitating low-back pain due to spondylolisthesis (26 patients) or disc degeneration (21 patients). The mean age was 38.2 years. Forty-five patients were re-examined 2–6 years postoperatively. According to the patients' own evaluation at follow-up, 53 per cent were free or almost free of back pain, 29 per cent were improved, 11 per cent unchanged and 7 per cent felt that the condition had deteriorated. Non-union occurred in nine patients, but among these three were free of pain, four were better and two were worse than before operation. The results do not seem to be correlated with age, sex, duration of pain before operation, degree of slipping in spondylolisthesis or the length of time out of work before surgery.

It is concluded that this method may be worth continuing, but the patients should be selected with care.

Key words: low-back pain; low lumbar disc degeneration; lumbar interbody fusion; spondylolisthesis

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Treatment of disabling low-back pain is a difficult problem. If the pain is caused by either localized disc degeneration or spondylolisthesis some orthopaedic surgeons favour spinal fusion when nonoperative treatment fails. Anterior interbody fusion is preferred by some and posterior techniques by others (Hoover 1968, Morscher 1974, Sörensen 1978, Zimmermann 1968, Weber & Peyer 1974). The results of fusion operations reported in the literature have varied within wide limits (Flynn & Hoque 1979, Freebody et al. 1971, Harmon 1963, Stauffer & Coventry 1972, Morscher et al. 1979, Sörensen 1978, Tunturi et al. 1979, Werlinich 1974), presumably to some extent because the indications have differed, and perhaps also because there is a high placebo effect particularly when the follow-up period is too short.

We have been using interbody fusion done by the anterior extraperitoneal approach since 1974. A follow-up study was carried out to decide whether this treatment should be continued. Our results and conclusions are presented in this paper.

PATIENTS AND METHODS

During the period December 1973 to December 1977 we performed lumbar spine fusion by the anterior retroperitoneal technique in 47 patients.

Figure 1 shows the age and sex distribution. The age range was 18–55 years (mean 38.2 years). Twenty-six patients with spondylolisthesis (mean age 33.6 years) and 21 patients with disc degeneration only (mean age 44.0 years) were operated on. The indications for surgery were incapacitating low-back pain caused by either disc degeneration affecting one or at most two discs, or pain associated with spondylolisthesis. Some of the patients with spondylolisthesis also had pain radiating down to the buttocks and/or thighs. This pain did not have the characteristics of sciatica, and in doubtful cases a myelogram was done to exclude disc

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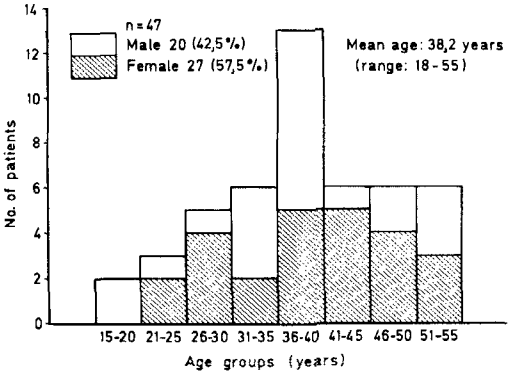

Figure 1. Age and sex distribution.

herniation. Most of the patients had had pain for more than 1 year and many patients had been suffering for several years, often with increasing pain, and had also been out of work for a long time. In all cases adequate nonoperative treatment had been tried, but had failed. Most of the patients used analgetics regularly.

All the patients in the "degeneration group" had a severe narrowing of the affected disc. Sclerosis of the end plates and marginal osteophytes were also common findings. The degree of slipping in the "spondylolisthesis group" according to Meyerding (1932) is indicated in Table 1, and the level of fusion in the whole material is shown in Table 2.

The patient was placed supine and a left-sided paramedian longitudinal incision was used. The sacral promontorium was reached by blunt dissection retroperitoneally and distally to the bifurcation of the aorta and vena cava. To expose the disc and retract the soft tissues, four Steinmann pins covered with rubber drains were hammered into the corpus above and below the disc. The annulus fibrosus was opened in front, the disc emptied and the end plates resected by chiselling until good cancellous and bleeding bone was reached and until the gap between the adjacent corpora was of a suitable size, usually about 2 cm. During the chiselling

Table 1. Degree of slipping in patients with spondylolisthesis. Grading of slipping according to Meyerding (1932)

Grading of slipping	Number of patients
1	18
2	4
3	4
4	0
Total	26

Table 2. The level of fusion in 47 patients, 26 patients with spondylolisthesis and 21 patients with disc degeneration only

Level of fusion	Number of patients
L 4	7
L 5	36
L 4 + L 5	4
Total	47

the patient was kept in a position of increased lordosis by adjusting the table to make the disc space open up slightly. Thereafter two full-thickness grafts were taken from the left iliac crest, their size being adjusted to fit well into the opening made between the corpora. The grafts were placed side by side either in a transverse or a sagittal position by cautiously ramming them into position. Both wounds were closed with suction drainage. When the hyperlordotic position was straightened out, the two adjacent corpora gripped the grafts firmly.

Patients with spondylolisthesis were kept in bed for 12 weeks, and patients with disc degeneration for 3–4 weeks. When mobilization started the patient used a supporting corset for a varying length of time. All patients were given Warfarin for thromboembolic prophylaxis.

Bleeding from a lesion in the right iliac vein occurred during the operation in two cases. In one of these cases this forced the surgeon to terminate the operation after having repaired the vein. In the second case the spondylodesis was completed without further problems. Three patients developed rather severe deep vein thrombosis and in one of these thrombectomy had to be performed by our vascular surgeons. Neither pulmonary embolism nor postoperative ileus was recorded clinically in any patients.

Forty-five patients were followed up clinically and roentgenologically. The follow-up time varied from 2–6 years (mean 4.0). One patient, mentioned above, had to be excluded at follow-up because of the bleeding complication, which precluded the anterior fusion, and one patient could not be traced. If there was some doubt as to whether the fusion was solid or not, a tomography and/or flexion-extension films were taken.

RESULTS

Of the 49 discs operated on (four patients had fusion done at two levels) 40 were found to be solidly fused (Figure 2). In nine cases (18.4 per

Table 3. Radiological results at follow-up in 45 patients (49 discs) 2–6 years after operation

	All patients		Patients with spondylolisthesis		Patients with disc degeneration	
	Number of discs	Per cent	Number of discs	Per cent	Number of discs	Per cent
Union	40	81.6	20	76.9	20	87.0
Non-union	9	18.4	6	23.1	3	13.0
Total	49	100	26	100	23	100

Table 4. Clinical results according to the patients' own evaluation at follow-up 2–6 years after operation

	45 patients		26 patients with spondylolisthesis		19 patients with disc degeneration	
	Number	Per cent	Number	Per cent	Number	Per cent
Cured	24	53.3	11	42.3	13	68.4
Better	13	28.9	9	34.6	4	21.1
Unchanged	5	11.1	4	15.4	1	5.3
Worse	3	6.7	2	7.7	1	5.3
Total	45	100	26	100	19	100

cent) we found a possible or definite pseudarthrosis (Table 3 and Figure 3).

At follow-up half of the patients were free or almost free of pain and nearly one-third had constant or periodic pain, but definitely less pain then before the operation (Table 4). Fourteen patients used analgetics more or less regularly. Ten patients still had some pain radiating down to the buttocks or upper part of the thighs, but without the characteristics of root pain and with a negative straight-leg-raising test. Before the operation 18 patients had this type of pain. One

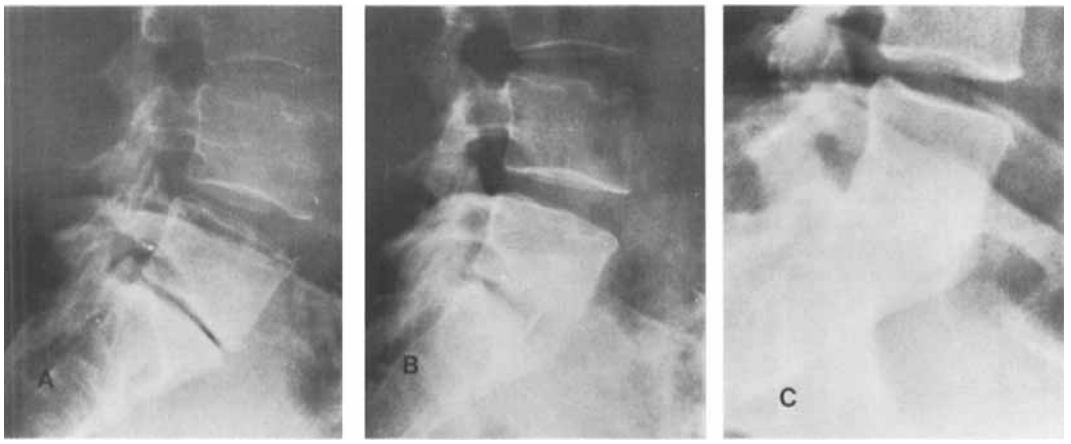

Figure 2. X-rays of a 43-year-old woman. A: Severe narrowing of the 5th lumbar disc and sclerosing of the end plates. B: Early postoperative X-ray. C: X-ray 2 years postoperatively showing solid union.

Figure 3. X-ray of a 44-year-old woman showing union at the 4th lumbar interspace and non-union at the 5th interspace, 2 years postoperatively.

patient had more severe pain in the legs, and as root compression was suspected a laminectomy was done, not revealing any certain root compression. This patient still has pain.

When we compare the roentgenological results at follow-up with the patients' own evaluation (Table 5), we see that lack of roentgenological fusion did not necessarily mean a poor subjective result, nor did solid fusion always indicate that the patient was free of pain.

One important aspect of the result is the patient's working ability (Table 6). Among the 45 patients about half went back to their previous jobs, about half of these involving heavy manual work. Ten patients had to change to lighter work, but were employed full-time. Four patients had full disablement pensions and two partial disablement pensions. Before the operation four patients had disablement pensions. Seven other patients were out of work at the time of the follow-up, six being periodically out of work because of low-back pain and the seventh being unemployed for other reasons. A few patients complained of minor pain or discomfort from the left iliac crest from which the bone grafts had been taken. Most of the patients, but not all, were asked about sexual function and none complained of impotence.

Table 5. Comparison of subjective results and radiological results at follow-up

	36 patients with union		9 patients with non-union	
	Number	Per cent	Number	Per cent
Cured	21	58.3	3	33.3
Better	9	25	4	44.4
Unchanged	5	13.9	0	0
Worse	1	2.8	2	22.2
Total	36	100	9	100

Table 6. Employment situation at follow-up

	Patients	
	Number	Per cent
Same work resumed	22	48.9
Lighter work	10	22.2
Out of work	7	15.5
Disablement pension awarded	6	13.3
Total	45	100

DISCUSSION

Care should be taken in selecting patients for spinal fusion for low-back pain (Sörensen 1978), and some surgeons advise against fusion in nearly all instances (Tunturi et al. 1979). Among those who recommend spinal fusion there is a continuing debate about the best surgical technique to employ and it seems to us that one can not decide from a study of the literature whether posterior or anterior fusion is the most reliable method (Sörensen 1978, Hoover 1978, Morscher 1974, Zimmermann 1968, Weber & Peyer 1974). As indicated we have selected our patients for surgery very carefully. Our series is of course too small to give general and valid answers to all these questions, but we think it tends to show that spinal fusion may be indicated both in cases of spondylolisthesis and disc degeneration and that the anterior technique is acceptable. Some

surgeons stress that the operative technique of anterior fusion is difficult. Provided that the surgeon has sufficient experience, however, we think that the procedure described here is safe. One might object that a non-union rate of nearly 20 per cent is high. But here we have to consider that among nine patients with non-union, we found that seven had a clinically good or acceptable result, having definitely less pain than before the operation or no pain at all. Although a greater proportion of the patients do well if the fusion heals solidly, it seems that a roentgenological non-union does not preclude a good subjective and clinical result. This may be called a placebo effect, but the same has also been observed by others (Flynn & Hoque 1979, Morscher 1974). In this series non-union was more frequent in the spondylolisthesis group than in the disc degeneration group, but the numbers are too small to indicate a significant difference. The subjective results and working ability differed very little between the two groups. Although it is difficult to present exact numbers, it seems to us that among those with a clinically poor result we found more patients with some social or mental problems than among those clinically well. We therefore strongly recommend that great care be taken when considering operation for patients with this kind of problem in addition to the low-back pain. Some authors report poorer results with increasing age (Sörensen 1978, Tunturi et al. 1979, Weber & Peyer 1974). We did not observe this, but it must be repeated that our series is small. The results at follow-up in our series show no correlation with the duration of pain before operation, length of time out of work before the operation, level of fusion, type of work, degree of slipping in spondylolisthesis or sex.

CONCLUSIONS

Lumbar spine fusion may be indicated in cases with incapacitating low-back pain due to spondylolisthesis or severe disc degeneration in which adequate nonoperative treatment fails. In our series anterior interbody fusion gave an acceptable result in 37 out of 45 patients. Non-union at the fusion site was seen in 20 per cent of the patients. This however does not seem to rule out an acceptable clinical result.

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