Chapter 6

A 10- TO 20-YEAR FOLLOW-UP OF LUMBAR INTERBODY FUSION FOR DEGENERATIVE CHRONIC LOW BACK PAIN

6.1 INTRODUCTION

The discussion on performing lumbar fusion in patients with severe disabling chronic low back pain due to benign segmental degeneration continues.[4,12] General accepted guidelines are not available and the combination of poor patient selection, improper diagnosis and inability to identify the pain moderator have caused over-all disappointing results. Nevertheless, in highly selected patients fairly good till excellent results have been reported.[3,10] To the best of our knowledge there are no publications on the long-term clinical outcome of interbody fusion in this patient category. Long-term results of lumbar fusion have been presented in e.g. spondylolisthesis[7,13,16] and spinal stenosis.[8] In case of spondylolisthesis, clinical success rates ranging from 76% up to 92% are maintained over a period of 10 years, although Takahashi[16] shows a decline in clinical success after 30 years down to 52%. Long-term clinical success rates of posterior lumbar interbody fusion for spinal stenosis vary from 70% up to 80%.[8] However, decompression surgery without fusion for spinal stenosis due to degenerative arthritic changes producing claudication equals or even exceeds these results.[15]

The purpose of this study was to investigate the long-term results of interbody fusion in patients with chronic discogenic low back pain. Between 1980 and 1990, in the Leiden University Medical Center, lumbar interbody fusion was performed in 157 highly selected patients with discogenic low back pain. Patient selection was based on strict in- and exclusion criteria as described in Chapter 5. The choice between posterior lumbar interbody fusion (PLIF) or anterior interbody fusion (ALIF) was made at random and depended mainly on the attending surgeon's preference at the time. Tricortical grafts (auto- or allografts) derived from the iliac crest were used for the interbody fusion. No additional hardware was used. The postoperative regime consisted of immobilization in a "Stryker frame" during woundhealing followed by mobilization in a thoraco-lumbar plaster spica (Baycast®) for three months. A detachable brace was prescribed during the fourth month. The clinical outcomes were prospectively evaluated 1 and 3 years postoperative by an independent observer using the Macnab classification.[11] The degree of pain relief was scored as excellent, good, fair or poor (see Ch 5; table 5.2). A successful clinical outcome was achieved when the Macnab classification was excellent or good. Failure was synonymous with fair and poor.

The initial group of 157 patients (see Ch 5) with chronic severely disabling low back pain consisted of 77 (49%) men (mean age 42, range 24-61) and 80 (51%) women (mean age 38, range 22-58). Of the 157 interbody fusion operations performed, 85 (54%) were by a PLIF-procedure and 72 (46%) by an ALIF-procedure. Fifty-one patients had a one-

level fusion, most commonly affecting the lumbosacral level L5-S1 (32 patients), followed by L4-L5 (18 patients) and L3-L4 (1 patient). Hundred-and-two patients had two levels of involvement most commonly L4-L5 and L5-S1 (94 patients), followed by L3-L4 and L4-L5 (6 patients) and by L3-L4 and L5-S1 (2 patients). A three level fusion was performed in 4 patients. An overall clinical success rate of 67% after 1 and 3 years was obtained and has been described.

6.2 MATERIALS AND METHODS

Of the initial 157 patients, 66 (42%) had changed their address since their last control and could not be traced for long-term follow-up. Of the remaining 91 patients, 9 subsequently died from unrelated causes and 7 patients had emigrated abroard. This leaves a total of 75 (48%) patients to be evaluated 10-20 years after the procedure. The nature of the study was explaned to all patients in a letter that accompanied the patient-completed evaluation form. They all agreed and completed the evaluation process (100% of those available). The long-term clinical results were obtained by a postal questionnaire that existed of a Macnab classification[11], a Roland-Morris[14] disability questionnaire and additional questions concerning remainder medical conditions, psychological state and current medication. The Roland-Morris score (see Appendix) consists of a summation of 24 yes/no questions concerning the disability due to low back pain. Every positive response scores one point so a high score on the Roland-Morris score indicates increased disability. The patients themselves completed the postal questionnaire.

Data Analysis. Statistical analysis was performed using SPSS® 7.5 for Windows (SPSS Inc, Chicago, Illinois) and Confidence Interval Analysis (Gardner & BMJ 1989). The long-term clinical outcome and disability status were compared to the 1- and 3 year clinical outcome, using a Spearman correlation.

6.3 RESULTS

The long-term clinical outcome and disability status was evaluated in 75 patients with a mean follow-up of 16.2 years (range 10-20 years). Thirty-six patients (48%) were men (mean age 38,7, range 24-59) and 39 (52%) were women (mean age 38,9, range 22-59). Of the 75 lumbar interbody fusions that were performed, 45 (60%) were by PLIF and 30 (40%) by ALIF. Twenty-two patients had a one-level fusion, 49 patients had two levels of involvement and four patients had a three-level fusion.

The long-term patient satisfaction after lumbar interbody fusion in the responding group was 71% (n=53). The long-term Macnab classification strongly correlated with the Roland-Morris (RM) disability score (Spearman correlation coefficient –0.743; table 6.1). Satisfied patients had a mean RM-score of 7.4 (range 0-23) indicating a low level of disability while the unsatisfied patients had a mean RM-score of 18.4 (range 3-24) indicating a high level of disability (table 6.2).

Table 6.1 Relation between the Macnab classifications and the Roland-Morris score (Spearman correlation coefficient).

	Macnab1-year	Macnab3-year	Macnab>10-year	Roland-Morris
Macnab1-year	1.000	0.923	0.418	-0.228
Macnab3-year	0.923	1.000	0.400	-0.241
Macnab>10-year	0.418	0.400	1.000	-0.743
Roland-Morris	-0.228	-0.241	-0.743	1.000

Table 6.2 Ten year clinical outcome and the Roland-Morris disability-score.

10-year clinical outcome	Range in RM-score	Mean RM-score
Excellent	0-12	7,4
Good	3-23	9,7
Fair	11-22	18,0
Poor	3-24	19,0

RM-score = Roland-Morris score

The 1-year, the 3-year and the long-term clinical outcomes are presented in table 6.3. The initial clinical success rate of 69% after 1 year shows a minor increase to 71% after more than ten years. Although the overall clinical success rate is about the same after 1-, 3- and more than 10-years, further analysis of table 6.4 shows that individual changes in clinical outcome over time occur. From the 52 (69%) satisfied patients after 1 year, 8 (15%) became unsatisfied more than 10 years postoperatively. On the other hand, 9 (39%) out of 23 initially unsatisfied patients improved. Of the patients who worsened, 5 were women and 3 were men. All of them had a multi-level fusion, 7 were operated by PLIF and 1 by ALIF. In this worsened group, an initial pseudarthrosis was seen in 3 cases. Of the patients who improved, 6 were women and 3 were men. Three patients had a one level fusion while 6 had a multilevel fusion. Five operations were by PLIF and 4 by ALIF. Initial pseudarthrosis was seen in 4 of the improved patients.

Table 6.3 1-year, 3-year, and long-term clinical success rate of interbody fusion.

Outcome	Satisfied	Unsatisfied
After 1 year	52 (69%)	23 (31%)
After 3 years	53 (71%)	22 (29%)
After > 10 years	53 (71%)	22 (29%)

Table 6.4 1-year, 3-year and long-term clinical outcome results of interbody fusion.

	Excellent 21*		Good 31*		Fair 20*		Poor 3*	
	3y	>10y	3y	>10y	3y	>10y	3y	>10y
Excellent	20	8	1	10	0	2	0	0
Good	1	9	28	17	3	7	0	0
Fair	0	4	2	3	17	4	1	2
Poor	0	0	0	1	0	7	2	1

* number of patients and clinical outcome after 1 year.

Of the 48 patients with early established radiological fusion, 77% had a long-term satisfied clinical outcome on the Macnab classification compared to 59% of the patients with initial pseudarthrosis. This difference in proportion was not statistically significant. The mean RM-score in patients with initial radiological fusion was 9.0 compared to 13.5 in patients with initial pseudarthrosis ($P<0.05$: student t-test). A better long-term clinical outcome was seen in patients with a one level fusion (86%) compared to patients with a multilevel (two or three) fusion (64%)(95%CI (0.03-0.42)). Patients with a one level fusion had a mean RM-score of 7.2 compared to a mean RM-score of 12.1 in patients with a multilevel fusion ($P<0.05$: student t-test).

6.4 DISCUSSION AND CONCLUSIONS

Patient satisfaction on clinical success rate in the present series amounted 70% and corresponds to the outcome in other publications on lumbar fusion in a comparable group of patients which report success rates between 30 and 90%.[4] Although in the majority of cases clinical success rate is maintained for a long period of time we have figured out that individual clinical satisfaction may change significantly in a minority of cases (n=17). There is no good explanation for these changes. Apparently measurements of the clinical outcome are time-specific and submitted to variables.

A remarkable finding was that the long-term clinical outcome in patients with initial fusion discrepant differed from the patients with initial pseudarthrosis on the Roland-Morris questionnaire and not on the Macnab classification. At the time of treatment we believed in the hypothesis that the chronic low back pain was caused by movements in a particular motion segment. By achieving a solid interbody fusion these painful motions were prevented and as a result symptoms would subside. The outcome that nearly 60% of the patients with initial pseudarthrosis had a long-term satisfactory clincal results either means that the assumed theory is incorrect or that bony union eventually occurred. Unfortunately the latter possibility is not likely since the same result was seen in the initial group of 157 patients. In that group 50% of pseudarthrosis cases had a successful clinical outcome. A third possibility is the presence of inaccuracies in the determination of postoperative radiological bony union or in the evaluation of the clinical outcome.

The accuracy of predicting solid arthrodesis by radiographs is limited as illustrated by Brodsky[2]. In his study, 175 patients were included who either had internal fixation devices removed after lumbar spinal fusion or who were re-operated for failed back surgery. The pre-operative radiological assessment was compared to the surgical findings. Noncorrelations were present in 36% of plain radiographs, in 41% of polytomographs, in 38% of bending films and in 43% of CT-scans. Other investigators have confirmed the inaccuracy of imaging techniques in evaluating spinal fusion.[1,5,9] Although progress in computed tomography and magnetic resonance imaging is being made, currently most reliable technique is probably offered by roentgen stereophotogrammatric analysis (RSA) (see Ch 7).

Howe and Frymoyer[6] have evaluated 14 different questionnaires on the determination of end results in single lumbar disc surgery. They found out that the satisfactory outcomes ranged from 60% to 97% depending on the questionnaire being used. Especially when a questionnaire with groups rated as excellent, good, fair and poor were ultimately reported as satisfactory and unsatisfactory the finesse was lost. There is only a fine line between a good and a fair result but the shifts from one to another may have significant effects on the results reported as satisfactory and unsatisfactory. We used the Macnab classification

for the clinical outcome evaluation because the Macnab is practical and widely used. To make the difference between a good and fair result on the Macnab classification more obvious we added another condition: would the patient undergo the same procedure again? When a patient scored good on the Macnab but would not have surgery performed again he was scored as fair. A patient who would have surgery done again but with a fair result on the Macnab was scored as good. Howe and Frymoyer[6] also emphasized the importance of the person presenting the results. A patient tends to report better results to his surgeon than to an independent person.

In conclusion, in this retrospective study on 75 highly selected patients with discogenic low back pain treated with lumbar interbody fusion, the initial overall clinical outcome was maintained over a long period of time. The best long-term clinical results were obtained and maintained in patients with a one-level fusion. There was a statistical difference in the long-term clinical outcome between initial fusion and pseudarthrosis on the Roland-Morris disability questionnaire but not on the Macnab classification. The result from this study must be interpreted carefully since reliable evaluation of fusion status and clinical outcome is not feasible. More accurate methods for determining fusion status and clinical end results of lumbar spinal surgery need to be developed in the future.

Appendix: Roland Morris Questionnaire[14]

When your back or leg hurts, you might find it difficult to do some of the things you normally do. This list contains some sentences people have used to describe themselves when they have back pain. When you read a sentence that describes you today, put a check in the yes column. If the sentence does not describe you, check the no column.

Yes	no	
		1. I stay at home most of the time because of my back problem.
		2. I change position frequently to try and get my back comfortable.
		3. I walk more slowly than usual because of my back problem.
		4. Because of my back problem, I am not doing any of the jobs that I usually do around the house.
		5. Because of my back problem, I use a handrail to get upstairs.
		6. Because of my back problem, I lie down to rest more often.
		7. Because of my back problem, I have to hold on to something to get out of an easy chair.
		8. Because of my back problem, I try to get other people to do things for me.
		9. I get dressed more slowly than usual because of my back problem.
		10. I only stand up for shorts period of time because of my back problem.
		11. Because of my back problem, I try not to bend or kneel down.
		12. I find it difficult to get out of a chair because of my back problem.
		13. My back is painful almost all the time.
		14. I find it difficult to turn over in bed because of my back problem.
		15. My appetite is not very good because of my back pain.
		16. I have trouble putting on my socks (or stockings) because of the pain in my back.
		17. I only walk short distances because of my back pain.
		18. I sleep less well because of my back problem.
		19. Because of my back pain, I get dressed with help from someone else.
		20. I sit down for most of the day because of my back.
		21. I avoid heavy jobs around the house because of my back.
		22. Because of my back pain, I am more irritable and bad tempered with people than usual.
		23. Because of my back problem, I go upstairs more slowly than usual.
		24. I stay in bed most of the time because of my back.

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