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Anterior Lumbar Interbody Fusion (ALIF) with Carbon Composite Cages

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Introduction

Intervertebral fusion cages or "disc cages" are inserted by an anterior approach to restore disc space height and stabilize the anterior column of the lumbar spine.

They contain autologous bone graft, which will eventually achieve a solid bony fusion between the two vertebrae.

We report our experience with ALIF using an OstaPek, i.e. carbon-composite cage manufactured by Co-Ligne in 244 patients.

Material and Methods

A total of 244 patients have underwent an ALIF procedure. Of these 244 patients all had preoperative and intraoperative or immediate postoperative evaluation. 224 had a follow-up of at least 3 months, 113 had a follow-up of 1 year, and 59 were reexamined at 2 years.

In addition, 104 of these 244 patients have had a combined anterior and posterior approach. All are included in these results.

The patients pre- and postoperative clinical parameters are summarized in figure 1. A score of 0 means intolerable back and leg pain, walking capacity of less than 3 minutes, working capacity of 0%, immobile patient needing assistance and 0 muscle function, i.e. full motor radicular deficit (see table 3).

A score of 4 means no pain, unrestricted walking, full working capacity, ability to do heavy work and normal neurological examination.

Patient population

Of the 244 patients enrolled in this study, the proportion of men and women was equal at 122: The average age was 41.5 years (range 25 to 79 years).

Over two third of the patients (N=172) have been enrolled prospectively. The primary indications for surgery included failed back (N=111), degenerative disc disease (N=109), congenital (N=18), and trauma/other (N=6).

The secondary diagnosis (a single patient may have more than one of the below listed pathologies) included instability (N=204), spondylolisthesis (N=43), disc herniation (N=42), epidural fibrosis (N=37), central canal stenosis (N=17), pseudoarthrosis (N=12), degenerative spondylolisthesis (N=11), and deformity (N=7).

Of these 244 patients 129 (53%) presented with an additional systemic illness. Half of the patients (N=123) had no previous surgery, 94 had a previ-

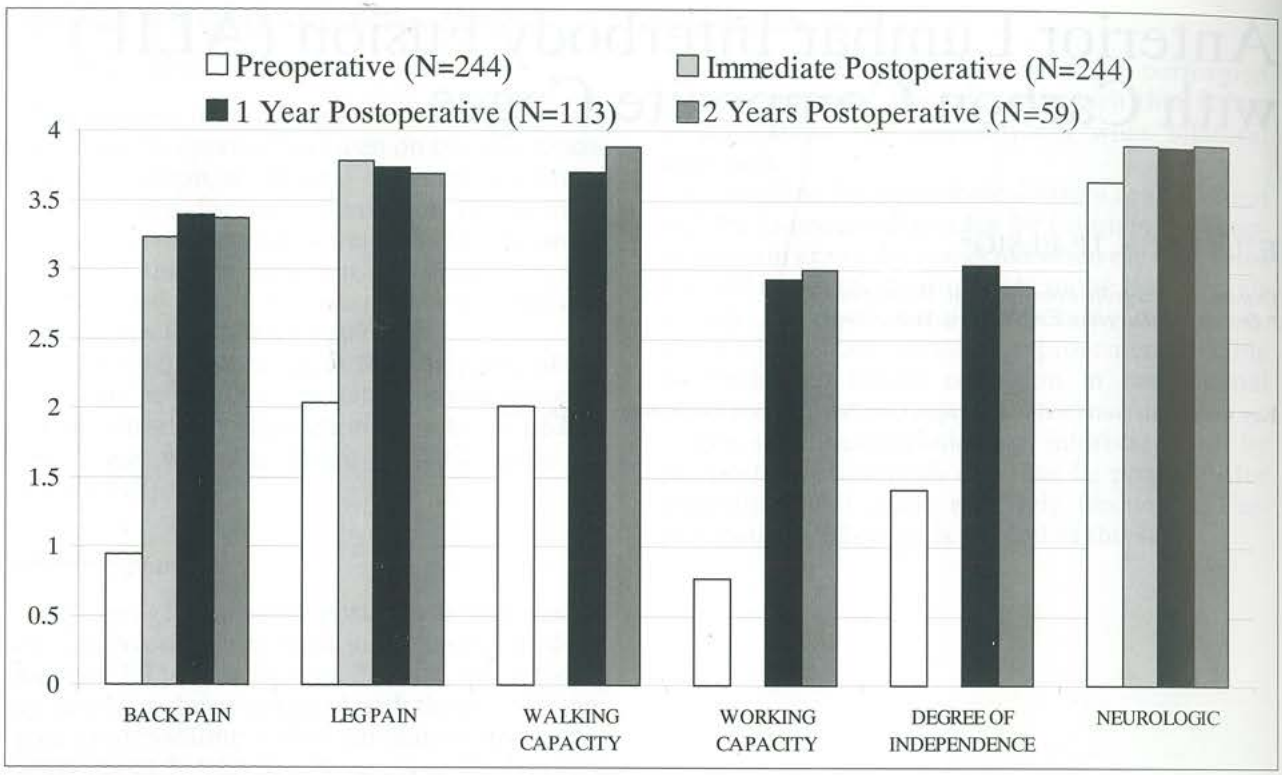

Figure 1 Mean preoperative and postoperative patient parameters. The 0 through 4 scale (vertical axis) is defined for each of these in table 3.

Table 1 **Distribution of procedure and implants according to operative level**

Levels	Decompression	Insertion of Cages	Instrumentation
Above L3	1	4	5
L3-L4	2	5	
L4-L5	57	100	59
L5-S1	73	176	62
Total	133	285	121

Table 2 **Percentages of patients with associated measures of postoperative correction**

Correction	Anteroposterior	Lordosis	Height
None (in situ)	0 %	< 1 %	0 %
Partial	5 %	1.5 %	< 1 %
Complete	94.5 %	97 %	98 %
> Complete	< 1 %	< 1 %	1.5 %

ous discectomy, 46 a prior decompression, 24 an osteosynthesis, i.e. posterior instrumentation, 5 a previous PLIF and 4 a previous ALIF surgery. Social group distribution included patients who were recieving disability pension (6%), active (93%), and retirees (1%).

Operative Data

The average hospital stay was 9.3 days, of which 7.9 days were postoperative. Patients averaged an anesthesia duration of 149 minutes and a surgery duration of 108 minutes. Per procedure the average blood loss was 162 cc. All 244 surgeries included an anterior interbody fusion.

The types of interventions included (a single patient can have more than one of the below listed): decompression (N=97), wide decompression (N=9), removal of scar tissue (N=17), posterior fusion (N=86), osteosynthesis, i.e. posterior instrumentation (N=104), and iliac bone graft (N=237).

The number of and specific levels of decompression, cages usage and instrumentation are summarized in table 1. In the vast majority of patients, a partial or complete deformity correction was achieved (see table 2).

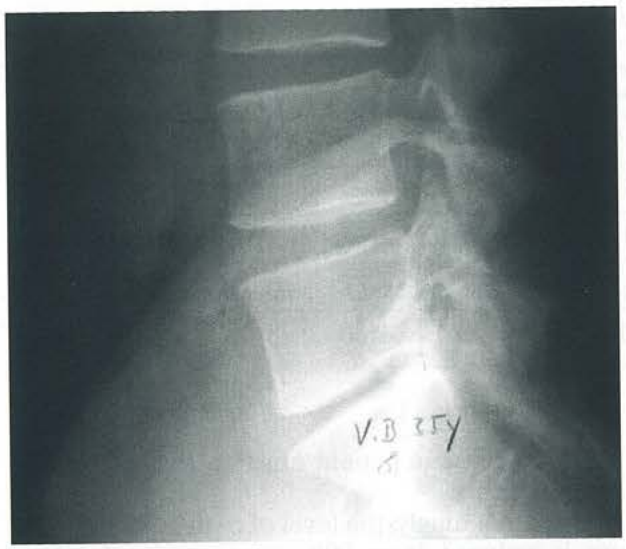

Figure 3 L5-S1 disc collapse.

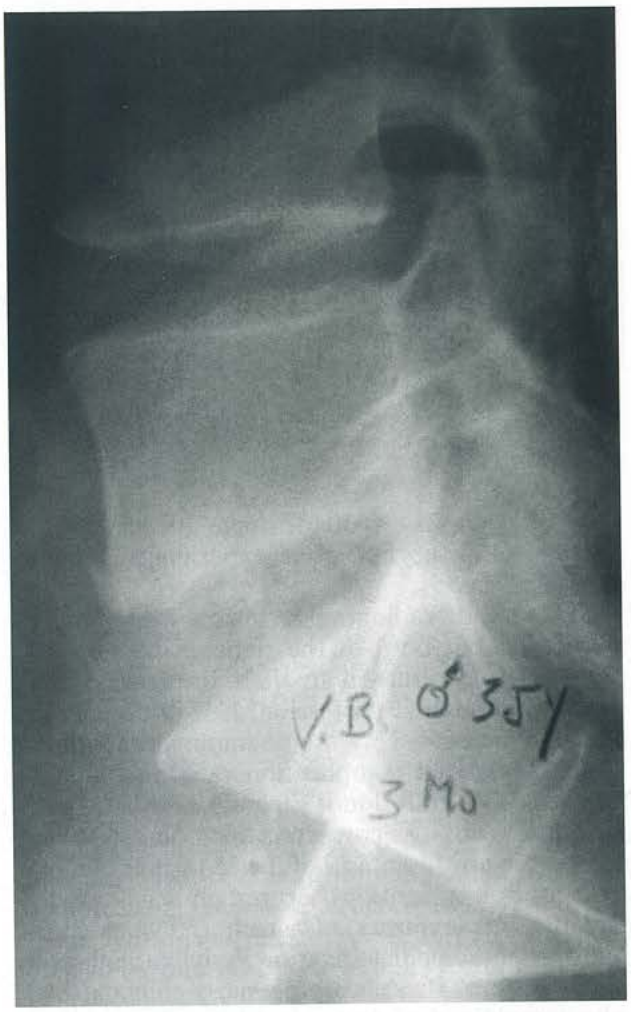

Figure 4 Restoration of L5-S1 disc space height after ALIF.

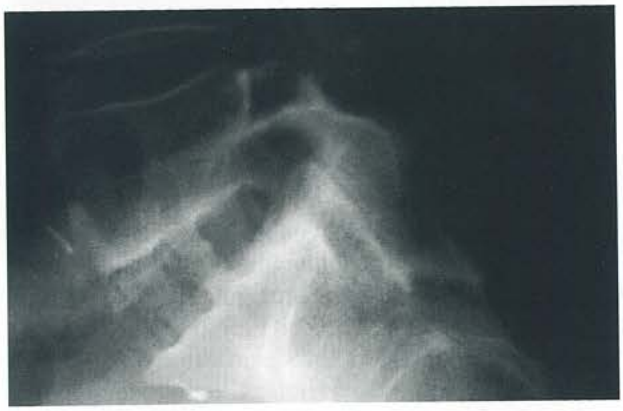

Figure 5 L5-S1-ALIF: 1 year follow-up.

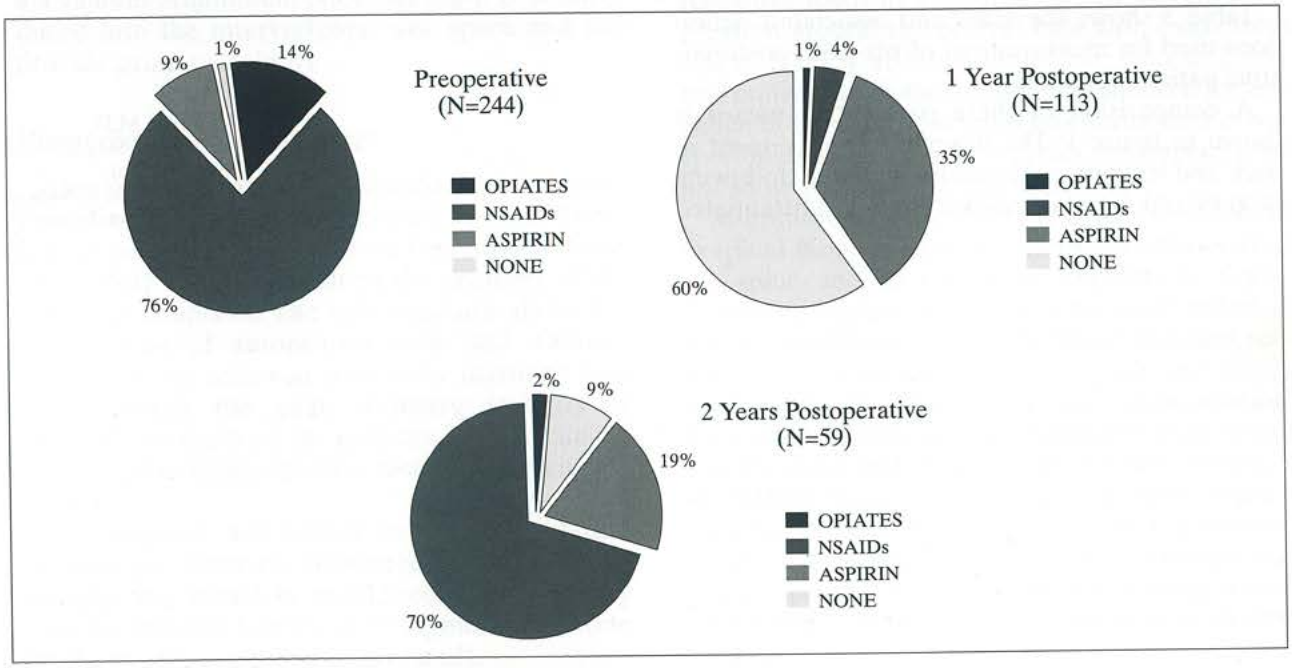

Figure 2 Mean preoperative and postoperative patient medication usage.

Table 3 **Definitions used for the 5-point scales used to compare preoperative and postoperative patient outcome**

Score	Back and Leg Pain	Walking Capacity	Working Capacity	Level of Independence	Neurologic
0	Intolerable	< 3 minutes	0 %	Immobile	Muscle function 0
1	Severe	< 15 minutes	25 %	Dressing	Muscle function 1-2
2	Moderate	< 30 minutes	50 %	House work	Muscle function 3-4
3	Mild	< 1 hour	75 %	Light work	Sensory
4	None	No limit	100 %	Heavy work	Normal

Outcome

A total of 224 patients have at least three months follow-up and none experienced implant complications.

Evidence of radiographic fusion was found in 99.5% (all but one) of the patients. 63% of the patients have returned to their previous profession, 15% changed profession, 11% are recieving disability pension, 11% are unemployed/other.

The associated complication rates include 0% implant, 3.5% graft donor site pain, and 10% local, including a loss of correction in 4, and adjacent segment involvement in 7 of the 224 patients. Some form of reintervention occured in 5.4% of the patients, the majority of which (50%) was for removal of the pedicle fixation in the patients with a 360° fusion. These were primarly thin patients, who complained of discomfort from their posterior hardware.

Table 3 shows the scale and associated definitions used for measurement of pre- and postoperative patient outcome.

A comparision of these parameters means is shown in figure 1: The dramatic improvement in back and leg pain achieved immediately following surgery and maintained over time is substantiated by the increase in patient function (work, walking and indepence).

Correspondingly, the level of patient medication use is reduced from 99% preoperative level to 30% at the 2 years follow-up.

The patients themselves graded their outcome as 62.5% good, 32% improved, 5% not improved, and none worse than before the surgical procedure.

Conclusions

ALIF with OstaPek cages filled with autologous bone graft from the iliac crest is an efficient method with a high successful fusion rate of 99.5%.

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