Rivista di Neuroradiologia 12 (Suppl 1): 103-106, 1999

Posterior Lumbar Interbody Fusion (PLIF) with Carbon-Composite Cages

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Key words: PLIF, carbon composite cages, lumbar disc disease

Introduction

Intervetebral fusion cages or "disc cages" can be inserted through a posterior approach to restore disc space height and to stabilize the anterior column of the lumbar spine.

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

We report our experience with PLIF using an OstaPek, i.e. carbon composite cage manufactured by Co-Ligne in 667 patients. In 636 cases posterior instrumentation was added to achieve a three column stabilisation of the lumbar spine.

Material and Methods

A total of 667 patients have been implanted with PLIF cages. Of these 667 patients, all had preoperative, intraoperative and/or immediate postoperative results, 509 had a follow up of at least 3 months, 271 had a follow up of one year, 173 were examined at 2 years and 107 were seen at three years.

These results are presented in a temporal manner utilizing the maximum number of patients available at each time period from the above population totals, in order to avoid the elimination of patients with a too short follow-up.

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

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 667 patients enrolled in this study, 300 were male and 367 female with an average age of 50.5 years (range 13.7 to 86.8 years). Over two-thirds of the patients (N=482) have been enrolled prospectively.

The primary indications for surgery included degenerative disc disease (N=61), failed back (N=226), congenital (N=74) and trauma (N=2).

The secondary diagnoses included (a single patient may have more than one of the below listed pathologies) spondylolisthesis (N=93), degener-

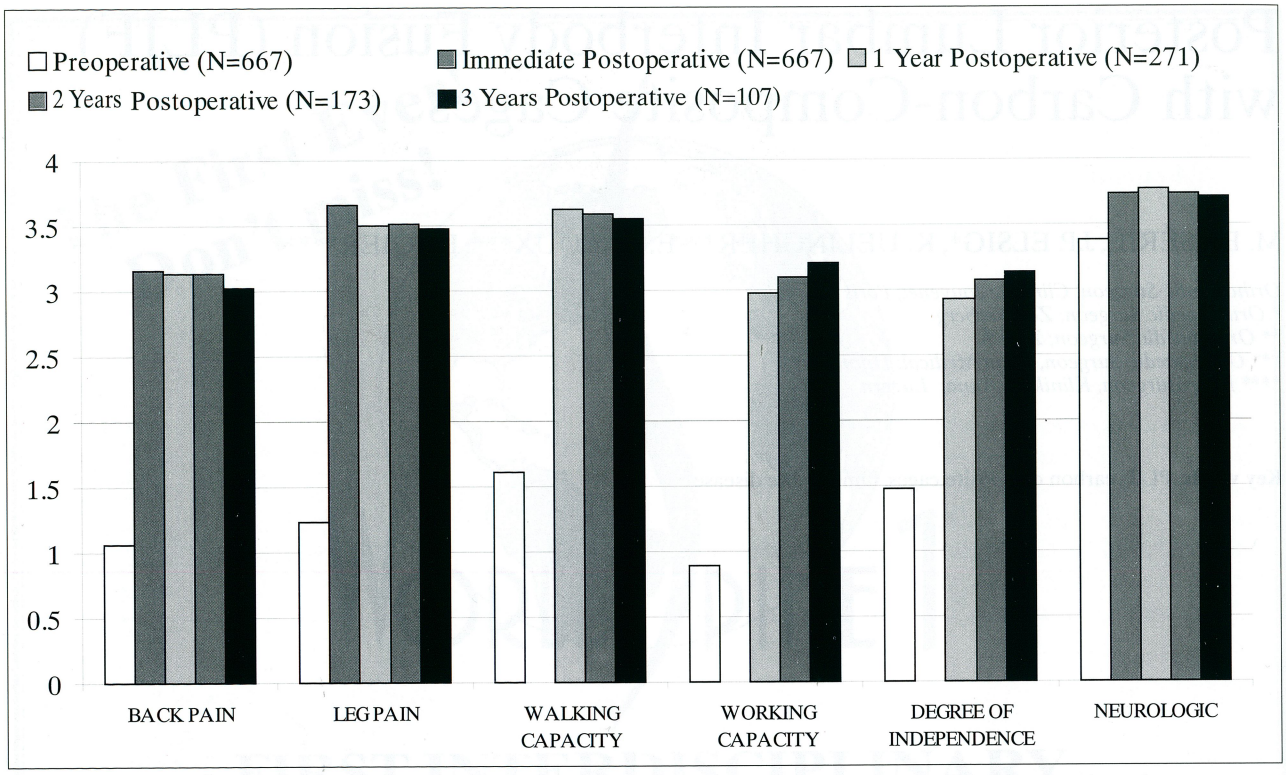

Figure 1 Mean preoperative and postoperative patient parameters. The 0 through 4 scale (vertical axis) is defined for each of these in table 3.

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

Levels	Decompression	Insertion of Cages	Instrumentation
Above L2	4		10
L2-L3	34	20	33
L3-L4	134	81	127
L4-L5	461	395	444
L5-S1	354	315	346
S1-S2	1		2
Total	988	811	962

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

Correction	Anteroposterior	Lordosis	Height
None (in situ)	2 %	2 %	1 %
Partial	15 %	23 %	27 %
Complete	82 %	74 %	67 %
> Complete	< 1 %	< 1 %	5 %

ative spondylolisthesis (N=170), central canal stenosis (N=409), instability (N=433), disc herniation (N=310), fibrosis (N=169), scoliosis (N=39), pseudarthrosis (N=17) and deformity (N=7). Of these 667 patients, 380 (57%) presented with 631 additional systemic illnesses; the primary of which was obesity (199).

Over half of the patients (N=363) had had no previous surgery, 206 had a previous discectomy, 165 a prior decompression, 41 instrumentation, 24 a previous PLIF surgery and 5 a previous ALIF surgery. Social group distribution included patients who were pre-professional (>1%), on disability pension (6%), active (72%) and retirees (21%).

Operative data

The average hospital stay was 14.9 days of which 12.4 days were postoperative. Patients averaged an anesthesia duration of 235 minutes and a surgery duration of 188 minutes. Per procedure, the average blood loss was 750cc; the use of autologous and banked blood averaged 380cc. All surgeries were performed trough a posterior approach and included an interbody fusion.

The types of interventions included (a single patient can have more than one of the below listed

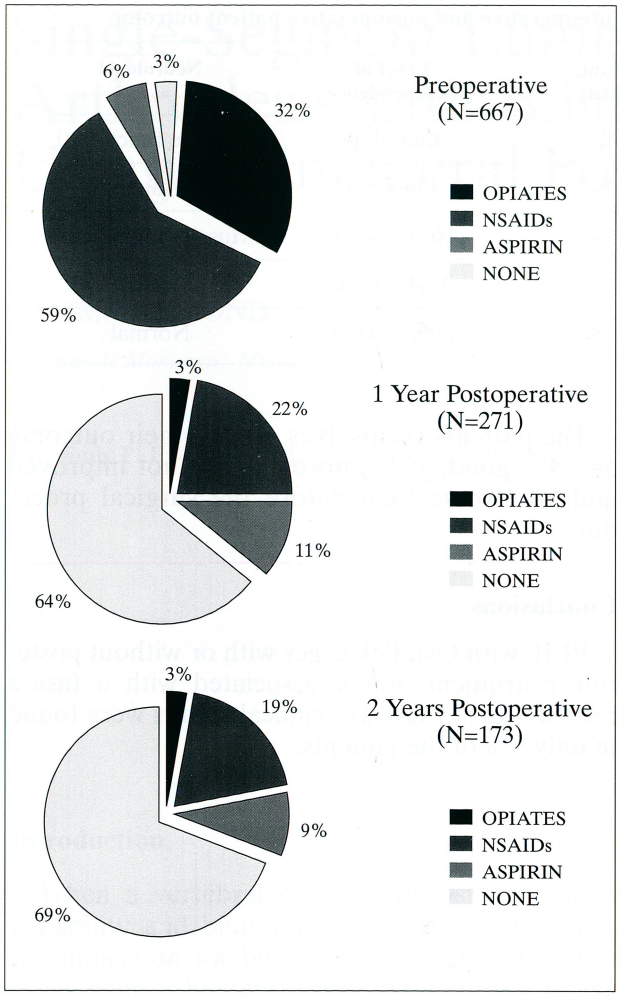

Figure 2 Mean preoperative and postoperative patient medication usage.

surgical procedures): decompression (N=228), wide decompression (N=498), removal of scar tissue (N=198), posterolateral fusion (PLF, N=238), osteosynthesis, i.e. posterior instrumentation (N=636) and iliac bone graft (N=432).

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

Outcome

A total of 509 patients had at least three months follow up. 490 had no implant complications, 19 had complications: 6 were cage related, 11 screw related and 4 plate related.

Radiographic evidence of fusion was determined for 92.5% of the patients. Sixty-two percent of the patients have returned to their previous

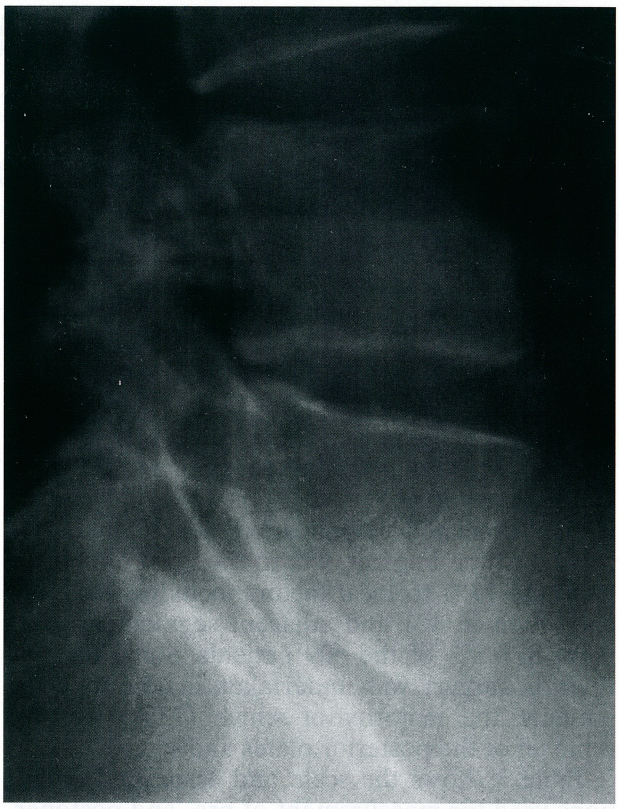

Figure 3 L4-L5 disc degeneration.

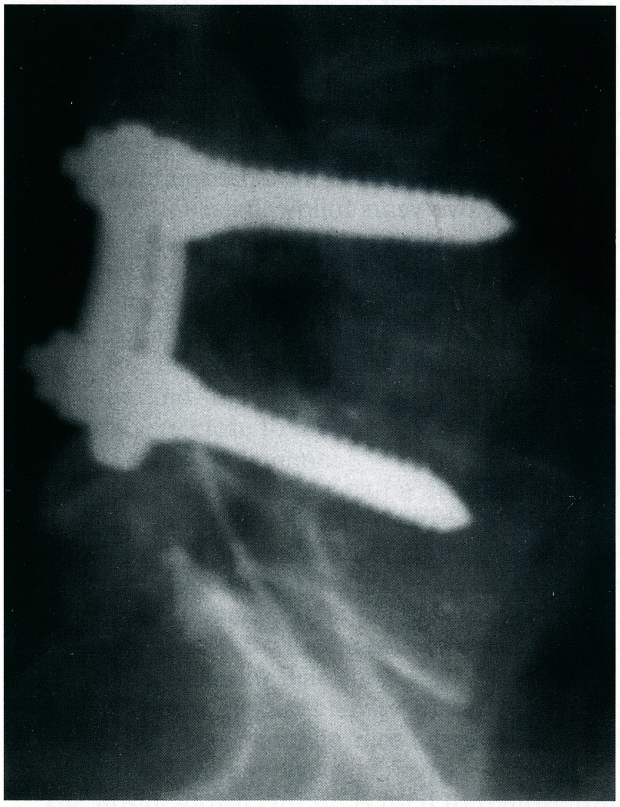

Figure 4 L4-L5 PLIF.

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

work level, 7% changed the nature of their work, 9% are receiving disability pension, and 22% are unemployed/other.

The associated complication rates include 4% related to the implant, 9% to the graft donor site pain and 17% to local factors including a loss of correction in 4% and adjacent segment involvement in 6.5% of the 509 patients. Some form of revision surgery was undertaken in 15.6% of the patients, the majority of which (73%) was for removal of the posterior plates and screws.

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

Correspondingly, the level of patient medication intake is reduced from a 97% preoperative level to 31% at the two years follow up.

The patients themselves graded their outcome as: 54% good, 39% improved, 5% not improved and 1% worse than before the surgical procedure.

Conclusions

PLIF with OstaPek cages with or without posterior instrumentation is associated with a fusion rate of 92,5%. Negative clinical results were found in only 6% of the patients.

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