

Obesity Reduces Fusion Rates and Clinical Outcomes in Nonsmoker Patients Undergoing Instrumented Posterolateral Fusions

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Background

Obesity is a potential risk factor for patients undergoing lumbar spine fusion. Few reports demonstrate that obese patients have more peri and postoperative complications. However, it is uncertain whether the degree of obesity has an effect on the fusion rates or on the clinical outcomes in nonsmoker patients who underwent instrumented lumbar posterolateral fusions. The purpose of this retrospective cohort study is to investigate and to compare both fusion rates and clinical outcomes in nonsmoker obese patients and nonobese patients undergoing lumbar posterolateral fusion.

Patients and Methods

Between September 2006 and July 2009, 46 nonsmoker patients underwent instrumented lumbar posterolateral fusion using only local autogenous bone graft. Body mass index (BMI) was calculated and patients were grouped as obese (BMI \geq 30), or nonobese (BMI $<$ 30). There were 27 females and 19 males. The obese group had 14 females and 7 males and the nonobese group had 15 females and 10 males. Patients ranged from 31 to 77 years of age with an average age of 54 years. The obese group had an average age of 50 years and the nonobese group had an average age of 57 years. The indications for surgery included lumbar canal stenosis in 26 patients, degenerative disc disease in 10 patients, spondylolisthesis in 4 patients, degenerative scoliosis in 4 patients, revision surgery in 2 patients for post laminectomy instability. The number of levels fused ranged from 1 to 5. 21 patients

had a single level fusion and 14 patients had a two-level fusion. There were 5 patients each with 3- and 4- level fusion. One patient underwent fusion at 5 levels.

Lumbar decompression and posterolateral fusion using local autogenous bone graft with instrumentation was performed in 34 patients, whereas 12 patients underwent posterolateral fusion and instrumentation without decompression. All patients underwent a posterolateral fusion with titanium pedicle screws and rods. BMI values ranged from 21 to 42 kg/m² with an average BMI of 31.8 kg/m². The nonobese group had an average of 24.6 kg/m², whereas the obese group had an average BMI of 37.7 kg/m². The average follow-up was 28 (range:12-34) months. The non-obese group had an average follow-up of 30.4 months and the obese group had an average follow-up of 25.8 months.

All patients completed Oswestry Disability Index (ODI) and visual analog scale (VAS) for back and leg pain at the preoperative visit and the every subsequent postoperative visit for all lumbar spine fusion in our practice. After surgery, these parameters are recorded at 2,4,8,12, 24 weeks, and 1 year. In the current study, the body weight and height measurement were also documented before surgery and at their latest follow-up. None of the patients in this study had a history of smoking.

Two surgeons graded the status of fusion on computed tomography (CT) scans using Glassman posterolateral fusion grading system (1). Presence of broken instrumentation, lucencies around the screws, and motion across the fusion mass were not considered in the evaluation of the images. Rigid fixation, which was used in all the cases in the present study, could have prevented the motion normally associated with nonunions. The surgeons reviewing the CT scans were not involved in the care of the patients.

All CT scans were performed at the same institution using the same technique. CT scans were 1mm thick, continuous, nonoverlapping slices. The gantry was tilted to obtain scans parallel to the disc space and stayed constant throughout the scan. The field of view included all fused vertebra to include all transverse processes. Statistical analysis were performed using SPSS version 11.0 (Chicago, IL). The Fisher exact test was used to compare fusion rates. Continuous variables were compared using the Student *t* test.

Results

The fusion rate was 71% in the obese group and 87% in the nonobese group. This difference was statistically significant ($P < 0.05$) (Figure 1). According to the Glassman grading system (Table 1); 19 patients were classified as grade 5, 3 patient was grade 4, there were 2 patients with grade 3 and one patient with grade 2 in the nonobese group. In the obese group, there were 13 patients classified as grade 5, 2 patients were classified as grade 4, four patients were classified as grade 3 and two patients were classified as grade 2.

The average ODI scores for nonobese patients before surgery and at the final follow-up were 68 and 28, respectively and average ODI scores for obese patients before surgery and at the final follow-up were 72 and 44, respectively. There were no significant difference in the average preoperative ODI scores between the nonobese and the obese patients ($p = 0.232$). However the average ODI scores at the final follow-up were significantly better in the nonobese group ($p = 0.035$) (Figure 2).

The average VAS for leg pain before surgery and at the final follow-up for the nonobese patients were 72 and 32, respectively and for the obese patients, these values were 76 and 48, respectively. No statistical significant difference was

observed in the average preoperative values of VAS for leg pain between the nonobese and the obese patients ($p=0.325$). VAS for leg pain at the final follow up in the nonobese group were significantly better ($p=0.024$) (Figure 3).

The average VAS for back pain before surgery and at the final follow-up for the nonobese patients were 74 and 26, respectively and for the obese patients, these values were 78 and 45, respectively. No statistical significant difference was observed in the mean preoperative values of VAS for back pain between the nonobese and the obese patients ($p=0.288$). VAS for back pain at the final followup in the nonobese group were significantly better ($p=0.02$) (Figure 4).

Discussion

Surgical decision-making in the obese and morbidly obese patient is a challenge for the operating surgeon. Excess weight of patients may cause early mortality and greater morbidity because of its relationship with comorbidities such as hypertension, obstructive sleep apnea, diabetes mellitus, and hyperlipidemia (2). Clinically, the effect of smoking has been more widely discussed (3). Several nonrandomized and uncontrolled studies have reported a negative effect of smoking, resulting in delayed healing, increased rates of pseudarthrosis, and a negative effect on the long-term maintenance of fusion (4,5,6). One study has shown smoking to be a prognostic factor for poor outcome after lumbar disc surgery (7). Spine surgeons, however, commonly refuse to perform surgery or recommend a cessation of smoking before surgery and for at least 6 months after a spinal fusion procedure.

The current study eliminated the aforementioned effect of smoking on the posterolateral lumbar spinal fusion and concluded that nonsmoker nonobese patients undergoing instrumented lumbar posterolateral fusions have higher fusion rates and

better clinical outcomes than those of nonsmoker obese patients. Therefore, a spine surgeon should be alert when planning instrumented lumbar posterolateral fusion on nonsmoker obese patients.

-None of the authors has any potential conflict of interest

Table and Figures

Table-1

Glassman posterolateral fusion grading system	
Grade	Fusion Status
1	No fusion
2	Partial unilateral fusion
3	Partial bilateral fusion
4	Solid unilateral fusion
5	Solid bilateral fusion

Figure-1

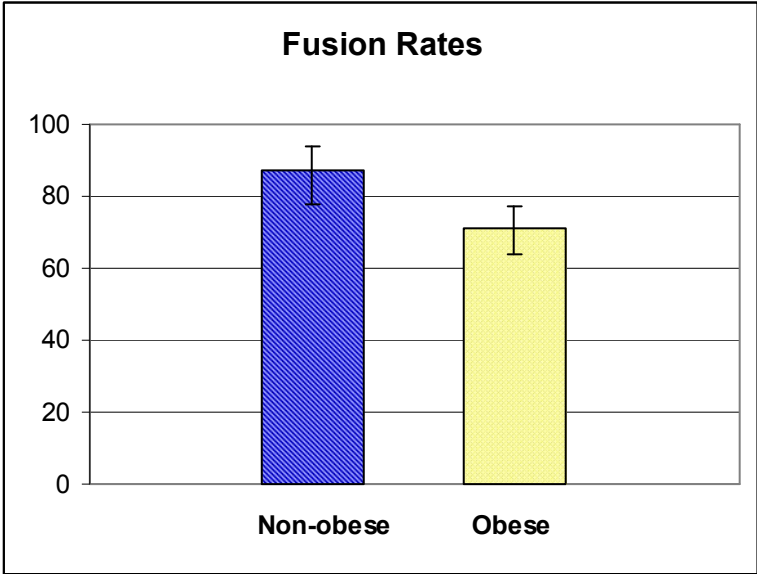


Figure-2

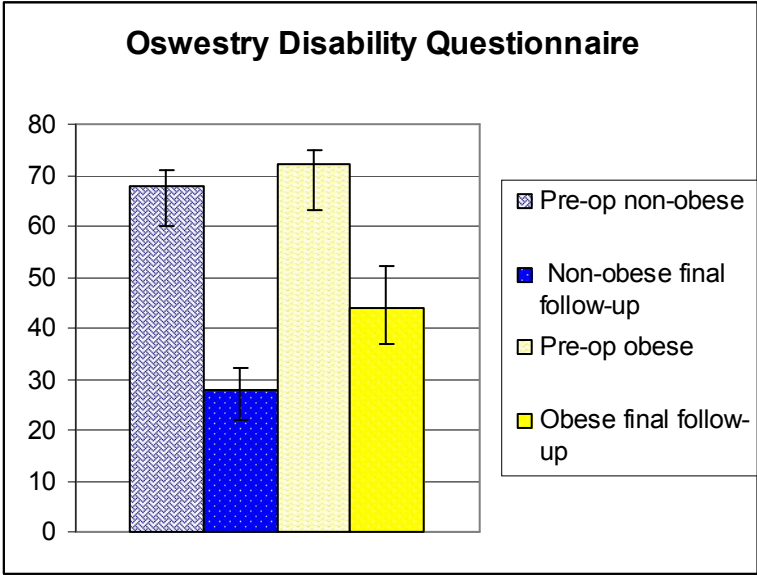


Figure-3

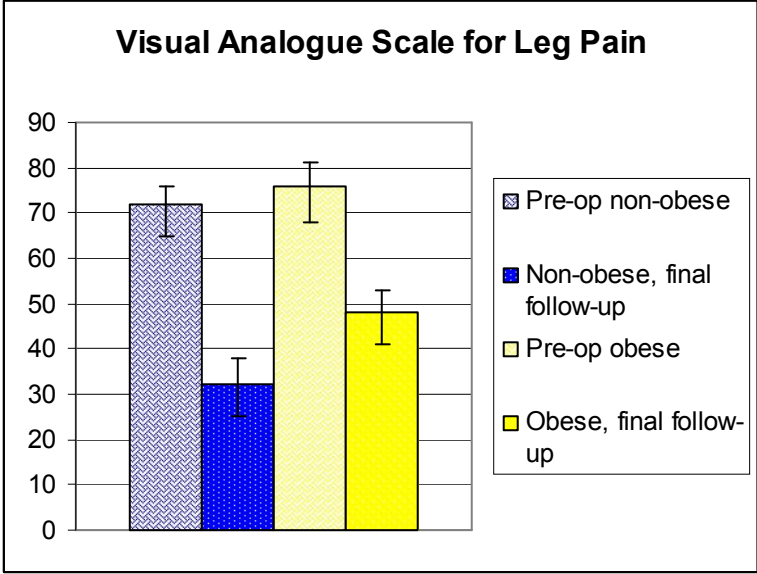
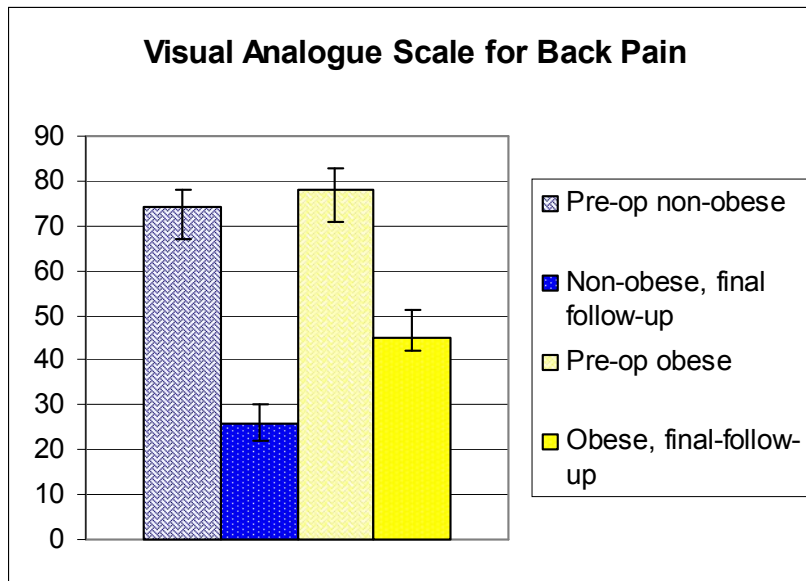


Figure-4



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