

Lumbar Disc Arthroplasty versus Hybrid Lumbar Disc Arthroplasty and Fusion for Spinal Spondylosis: A Matched Multicenter Study

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Background

Lumbar degenerative disc disease represents a prevalent cause of debilitating back pain and functional impairment. Surgical interventions at multiple levels are needed for sufficient decompression of the spine. Although lumbar disc arthroplasty (LDA) and fusion have been widely employed to alleviate symptoms, both have not been commonly used simultaneously at multiple levels as a hybrid procedure. Our study aimed to compare the surgical outcomes of patients undergoing the hybrid procedure compared to those undergoing only LDA.

Methods

A retrospective analysis was conducted on a cohort of patients who underwent lumbar disc procedures at the three participating sites. Patients were divided into two groups: the hybrid procedure group and the LDA group, which was not fused at any level. Baseline characteristics, including age and gender distribution, were compared between the groups. Optimal statistical matching was used to adjust for

potential confounders that can affect the outcomes of measure. The outcomes of interest included estimated blood loss (EBL), operative time, length of stay (LOS), and non-routine discharge, among others.

Results

A total of 546 patients underwent LDA, of which 95 (17.4%) received it as a hybrid procedure. Prior to the matching, the hybrid procedure group exhibited a significantly higher mean age (49.0 ± 12.1 vs. 43.1 ± 10.9 years, $p < 0.01$) and a lower proportion of female patients (29 (30.5%) vs. 199 (44.1%), $p = 0.02$) compared to the non-hybrid lumbar disc arthroplasty group.

In the matched cohorts, patients undergoing the hybrid procedure experienced significantly greater estimated blood loss ($EBL > 100\text{ml}$: 84 (89.4%) vs. 113 (60.4%), $p < 0.01$), longer operative times (243.5 ± 107.9 vs. 156.3 ± 85.2 minutes, $p < 0.01$), and longer LOS (3.72 ± 1.57 vs. 2.87 ± 1.67 days, $p < 0.01$) when compared to those undergoing non-hybrid lumbar disc arthroplasty. However, no significant differences were observed in terms of non-routine discharge,

reoperation rates at 30 days, or readmissions at the 3-month follow-up.

Conclusion

This matched study is one of the first to analyze hybrid procedures of LDA and spinal fusion. Although the hybrid procedure was associated with increased estimated blood loss, prolonged operative time, and extended hospital stay, it did not report significant differences in terms of postoperative outcomes at the follow-up. The procedure can allow multilevel spinal decompression without the need for a separate second-stage fusion surgery.

	Total (N=471)
Age (years)	43.97 (11.52)
Female Sex	205 (43.5%)
BMI (kg/m ²)	26.98 (4.78)
Revision Surgery	52 (14.9%)
Current Smoker	56 (11.9%)
White Race	428 (90.9%)
Anxiety	59 (12.5%)
Depression	79 (16.8%)
Obesity	110 (23.4%)
Employed	369 (82.4%)
Motor Weakness	82 (38.3%)
Estimated Blood Loss (ml)	
<100	204 (43.8%)
100-250	165 (35.4%)
250-500	65 (13.9%)
>500	32 (6.9%)
Operative Time (min)	146.12 (72.11)

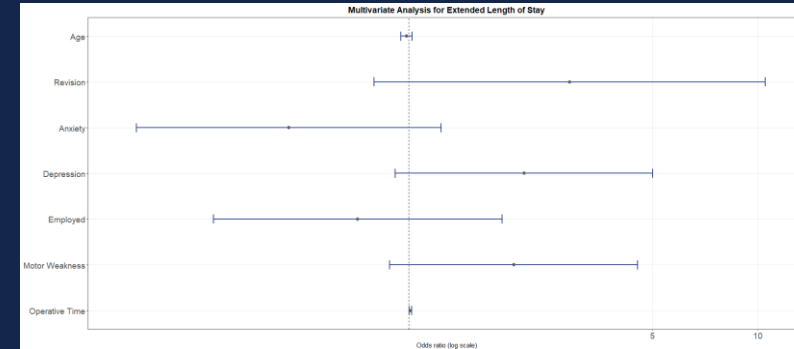


Figure 1: A multivariate model for the length of hospital stay for patients undergoing lumbar disc arthroplasty. Extended LOS was independently associated with longer operative time.

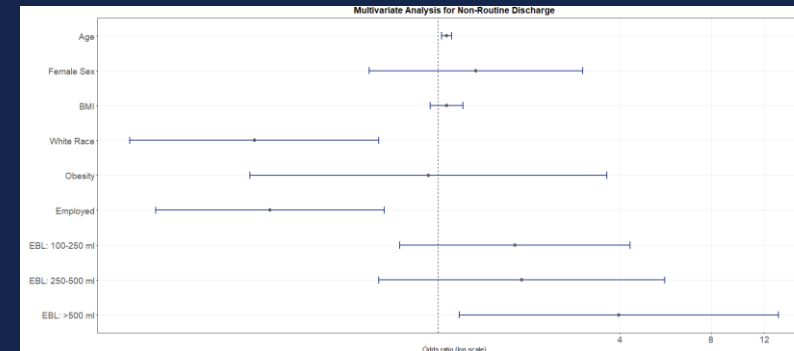


Figure 2: A multivariate model for non-routine discharge of patients undergoing lumbar disc arthroplasty.

Table 1: Characteristics of patients undergoing lumbar disc arthroplasty.