

**FACET JOINT AND ADJACENT LEVEL DEGENERATION FOLLOWING  
TOTAL LUMBAR DISC REPLACEMENT:  
A PROSPECTIVE CLINICAL, X-RAY AND MRI INVESTIGATION \***

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Study Design: Prospective clinical, X-ray and MRI investigation following total lumbar disc replacement (TDR) with ProDisc II (Synthes, Paoli, PA).

Objectives: To examine the progression of adjacent level degeneration (ALD), facet joint degeneration (FJD) as well as associated risk factors following TDR.

Summary of Background Data: Fusion procedures have been associated with adjacent level morbidities and facet joint pathologies in a considerable number of patients. Whether the incidence of these negative side effects can be reduced with TDR remains unestablished.

Methods: Clinical outcome scores Visual Analogue Scale (VAS), Oswestry Disability Index (ODI) and patient satisfaction rates were acquired within the framework of an ongoing prospective study with ProDisc II. The mean index-level ROM was established for every patient over the entire postoperative period from multiple flexion / extension X-ray images. The progression of ALD and FJD was evaluated from pre- and postoperative MRI images by 2 independent radiologists.

**Results:**

Results from 93 patients with an average FU of 53.4 months (range 24.1-98.7 months) were included in this study. The overall results revealed a significant improvement from preoperative VAS and ODI levels ( $p < 0.0001$ ).

The incidence of ALD was 10.2% ( $n = 11/108$  levels). The degenerative changes were mild and occurred late postoperatively (mean 65.2 months, range 37.9 – 85.6 months). There was no significant correlation between index-level ROM and the occurrence of ALD ( $p > 0.05$ ).

Progression of FJD was observed in 20.0% of all facet joints ( $n = 44/220$ ). FJD occurred significantly more often at the lumbosacral junction in comparison to the level above the lumbosacral junction ( $p < 0.02$ ) and was observed more frequently at index-levels than at non-index levels ( $p < 0.001$ ).

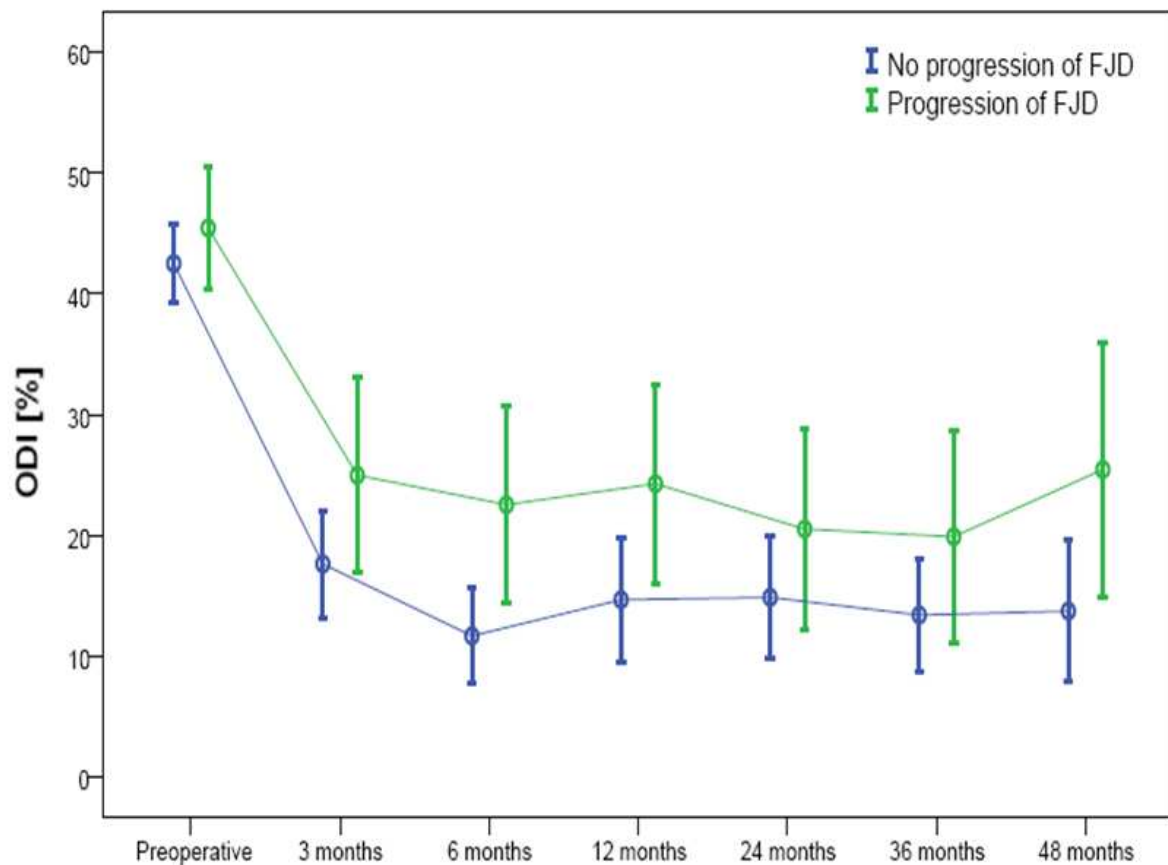
The degenerative changes were associated with a negative influence on postoperative outcome parameters VAS and ODI ( $p < 0.03$ ) that were already detected early postoperatively (Fig. 1). The mean postoperative ROM was significantly lower in patients with progression of FJD in comparison to the remaining cohort (Fig. 2;  $p < 0.0001$ ).

**Conclusion:**

TDR proved to have a beneficial effect with respect to adjacent level disc preservation. The degenerative changes were mild, occurred late postoperatively and did not reveal a negative effect on postoperative clinical outcome. There was no significant correlation between index-level ROM and the occurrence of ALD ( $p > 0.05$ ).

TDR was, however, associated with a progression of index-level FJD in a considerable number of patients, particularly at the lumbosacral junction. Lower segmental mobility and less favourable clinical results point to the fact that a particular cohort of patients may predominantly be affected in which TDR shows inferior compatibility with the index-segment's biomechanics.

**Figure 1:** Influence of facet joint degeneration (FJD) on the clinical results as outlined by pre- and postoperative Oswestry-Disability-Index (ODI) scores following total lumbar disc replacement. Comparison between both groups revealed significantly inferior results for patients with progression of FJD which were already detectable early postoperatively at the 3 ( $p < 0.03$ ), 6 ( $p < 0.002$ ) and 12 ( $p < 0.002$ ) month FU, respectively.



**Figure 2:** Correlation between mean postoperative range of motion (ROM) following monosegmental disc replacement procedures in patients with and without progression of facet joint degeneration (FJD). Inferior index-level mobility was observed in patients with progression of FJD, statistical analysis revealed highly significant differences between both groups ( $p < 0.0001$ ).

