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Does the Presence and Location of Annular Defects Influence Clinical Outcomes Following Lumbar Total Disc Arthroplasty? A Prospective Study

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Background content: Lumbar total disc arthroplasty is often performed in patients with symptomatic annular defects. The location of these annular defects can vary producing differing pre-operative symptomatology. Intra-operative surgical techniques may also vary depending on the location and presence and/or absence of an annular defect.

Purpose: To investigate whether or not the presence and location of annular defects have an effect on clinical outcomes following lumbar total disc arthroplasty.

Study design/setting: Patients were evaluated prospectively from a single site/single surgeon who had undergone single level total disc arthroplasty.

Patient sample: All patients were part of either the Prodisc (98) or Activ-L (19) lumbar prospective clinical trials.

Outcome measures: Patients were evaluated using Oswestry Disability Index and Visual Analog Scales pre op and at 1 yr minum. These patients also had radiographic evaluation.

Methods: Patients undergoing a single-level ADR from L3-S1 were evaluated pre-operatively for the presence or absence of annular defects using both MRI and discography. In those patients with annular defects, the degree (Grade I-V) and location (central, paracentral, lateral) of the defect was documented. All radiographic evaluation was conducted by an attending neuro-radiologist, an attending spinal surgeon, and a spine fellow and inter and intra-observer reliability testing was performed. An ANOVA was performed among the three types of annular defects.

Results: 117 patients were included in analysis. The average follow-up for all patients was 3.4 yrs. The prevalence of annular defects among all patients was 58% (N=68). Outcome data in patients without annular defects was (ODI:65% pre, 27% post; VAS Back 80 pre, 27 post; and VAS leg 29 pre, 13 post). Among those patients with tears, the prevalence of lateral tears was 8%, the prevalence of central tears was 80%, and the prevalence of paracentral tears was 12%. Outcome data in patients with central tears was (ODI: 65% pre, 26% post; VAS Back 78 pre, 25 post, and VAS leg 57 to 5.3). Outcome data in patients with paracentral tears was (ODI: 86 pre, 58 post, VAS Back 88 pre, 33 post, and VAS leg 60 pre, 54 post). Outcome data in patients with lateral tears was (ODI:65 pre to 26 post, VAS Back 92 pre to 32 post, and VAS leg 18 pre, 8.5 post). The degree of annular disruption as defined by discography was equally distributed among the 3 locations of annular defects.

Complications: In those patients with paracentral tears, there was a higher incidence of post-operative radicular complaints both from an intensity as well as a duration standpoint. Other complications did not vary among those patients with or without annular defects.

Conclusions: Although patients with or without annular defects improve after lumbar ADR, patients with central or lateral annular defects have significantly higher ODI, VAS back and leg outcome scores as compared to paracentral defects whose outcome scores were significantly worse (p< 0.05). In particular, patients with central defects improve better with less post-operative leg pain as compared to those patients with paracentral annular defects who had the least improvement in VAS leg pain scores. Further investigation as to the effects of paracentral annular defects and surgical techniques should be further explored.