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**Biomechanics of Disc Arthroplasty. What Can Be Done to Improve Results - Present and Future Perspectives**

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**Introduction:** Current lumbar total disc replacement (TDR) devices require an anterior approach for implantation. The anterior approach to place lumbar TDR devices has inherent biomechanical limitations and surgical risks. Within the possible intraoperative issues are: the damage to various abdominal structures, such to the grand vessels, to bowel components and to the sympathetic neural plexus, without mentioning the long discharge and rehabilitation time. Besides the surgical risks, there is resection of the anterior longitudinal ligament (ALL). Placement of a TDR device from a true lateral (XLIF) approach allows for easier, less invasive access to the disc space, as has been shown in reports of XLIF for fusion procedures. Lateral implantation of TDR also preserves the stabilizing ligaments, which are a natural restraint to excessive rotations and translations, and thereby help to minimize facet stresses. Importantly, implantation from a lateral approach leaves greater opportunity for safer revision surgery, if necessary, by avoiding scarring of anterior vasculature. Additionally, the footprint of the lateral TDR device capitalizes on the biomechanical support of the ring apophysis.

**Methods:** A TDR device designed for implantation through a true lateral, retroperitoneal, transpsoas approach (XLIF) was implanted in 36 patients with discography-confirmed 1- or 2-level DDD. Clinical and radiographic outcomes assessments were prospectively collected.

**Results:** Patients included 16 males and 20 females, average age 43 yrs (24-60). Surgeries included 14 1-level, 3 2-level, and 19 hybrid TDR/ALIF cases. The surgery is performed through a 4cm lateral incision in an average of 134 minutes (90-300) and with an average 58cc blood loss (30-150). There have been no intra-op or post-op complications. Postoperative x-rays show good device placement, with restoration of disc height, foraminal volume, and sagittal balance. All patients were up and walking within 12 hours of surgery and all but 9 were discharged the next day (7/9 were hybrid TDR/ALIF cases). 5/36 patients (13.8%) had psoas weakness and 3/36 (8.3%) had anterior thigh numbness postoperatively, both resolving within 2 wks. 4/36 (11%) had postoperative facet joint pain, all in hybrid cases. VAS pain scores improved from an average of 9.3 at pre-op to 2.4 immediately post-op, 3.2 at 6 wks, 1.9 at 3 mos, 2.6 at 6 mos, and 2.4 at 1 yr. Oswestry Disability Index improved from an average of 57 at pre-op to 31 at 6 wks, 23 at 3 mos, 21 at 6 mos, and 15 at 1 yr. Average postoperative ROM remains steady, not significantly different from preoperative values.

**Conclusion:** Mid-term results of a laterally placed TDR device demonstrate maintenance of pain relief and functional improvement. The benefits of this technique -- minimal morbidity, avoiding mobilization of the great vessels, preserving the anterior longitudinal ligament, biomechanically stable orientation, and broader revision options - suggest a promising new direction for TDR procedures.