Correlation between Range of Motion and outcome After Lumbar Total Disc Replacement in Chinese patients

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INTRODUCTION:
As an alternative treatment for discogenic low back pain, total disc replacement (TDR) has risen many doctors and patients interests. It was supposed to maintain disc height and range of motion (ROM) so as to prevent adjacent level degeneration. However, clinical results of TDR are conflicts. Many factors could influence the final outcome. This study investigated the relationship between lumbar TDR ROM and outcome after inserting a Charité SB in a Chinese patient population.

METHODS:
Between 2004 and 2006, 20 discogenic low back pain patients confirmed by discography underwent 1 or 2-level TDR implantation with 22 prostheses. There were 9 male and 11 female patients. Age was 43±6.5 years (range 28-52). All indexed levels were inserted between L4-S1 involved L4/5 in 9 cases, L5S1 in 13 cases and L4-S1 in 2 cases. Clinical outcome were measured by Oswestry Disability index (ODI) and visual analogue scale (VAS). All patients were followed-up range from 3 to 5 years with average 4±0.54. Radiographic outcome measures included flexion/extension ROM, restoration of operative level intervertebral disc height, maintenance of disc height at the final follow-up. The surgical technical accuracy of Charité artificial disc replacement was divided into three groups [1]: I, ideal, was defined as TDR within 3 mm of exact central placement in both coronal and midsagittal planes (Figure 1), II, suboptimal placement, was defined as TDR from 3 to 5 mm exact central placement in at least one axis, III, poor, was defined as > 5 mm TDR from exact central placement in at least one axis. If one axis was graded as ideal but the other axis was graded as suboptimal, the placement was rated as suboptimal. ROM and clinical outcome correlation was evaluated with Spearman rank correlation coefficient. Mann-Whitney testing was used to correlate between ROM and prosthesis placement.

RESULTS:
All postoperative outcome scores improve significantly than preoperative (P<0.01). Mean flexion/extension ROM of all segments, L4-L5, L5-S1 decreased to 5.5±3.9°, 6.6±6.0°, and 4.9±3.4° respectively. Spearman rank correlation coefficient revealed low association between postoperative ROM and clinical outcomes for postoperative ODI (r = -0.118, p = 0.620), back pain (r = 0.107, p=0.654), and leg pain (r = 0.150, p=0.528). Thirteen patients were graded as Group I; 4 Group II and 5 Group III. Postoperative flexion/extension ROM significantly decreased (P<0.01), especially at L5-S1 segments. Although there was a tendency that the flexion/extension ROM improved with the surgical technical accuracy of radiographic placement (Figure 2), no statistically significant results were found (P>0.05). All the prostheses were solidly fixed with the vertebral endplate, and no disc rupture, dislocation, subsidence or heterotopic ossification.

DISCUSSION:
This is the first mid-term follow-up study in a Chinese patient population after total disc replacement. The data indicated that the ROM decreased significantly after TDR in this patient group. Most previous studies reported significant increase in segmental ROM after inserting Charité SB prostheses [1]. These contradictory results might be due to disc heights of the patients. In operation, we found that the disc heights of all patients were lower than European population. Some needed overly distract even with the smallest prostheses. We found a tendency that the poor disc position corresponded to lower range of motion. Although clinical outcomes of TDR with Charité SB are good in literature, it did not achieve the expected results on ROM. Indication should be controlled carefully especially in Chinese patients. Future studies should clearly indicate the optimal locations for disc replacement using anatomic landmarks so surgeons can easily locate them. New disc design with more biomechanical fit for center of rotation in Chinese population may be necessary.

REFERENCE: