

Total disc arthroplasty: consequences for sagittal balance and lumbar spine movement.

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Study design. This in vivo biomechanical study was undertaken to analyse the consequences for sagittal balance and lumbar spine movement in three different lumbar disc prostheses.

METHODS: A total of 105 patients underwent total disc replacement in three different centers. The Maverick prosthesis was used in 46 patients, SB Charité device was used in 49 patients and Prodisc device was utilized in 10 patients. The analysis was computer assisted, using Spineview and Matlab softwares. The intra and interobserver reliability and measurement uncertainty was performed. The analysis of lateral X-ray films in flexion-extension, allowed to measure the prosthesis positioning, the range of motion, the localization of the mean center of rotation, the vertebral translation and the disc height, for each prosthesis device. The sagittal balance was analysed on full spine film. The parameters studied were described by Duval-Beaupère. The results were compared to the data found in literature, and compared to 18 asymptomatic patients, and 61 asymptomatic subjects, concerning the sagittal balance.

RESULTS: Prostheses allowed an improvement of the range of motion of less than 2°. The range of motion of L5-S1 prostheses ranged from 11.6 to 15.6% of the total lumbar motion during flexion-extension. At L4-L5 level, the range of motion decreased when there was an arthrodesis associated at L5-S1 level. There was no difference of range of motion between the three prostheses device. The mean center of rotation was linked to range of motion, but did not depend on the prosthesis offsetting. The disc height improved for any prosthesis, and decreased in flexion or in extension, when the prosthesis is off centered. Translation indicated a minor increase of range of motion at L4-L5 level for the Maverick versus the SB Charité. L5-S1 arthrodesis was linked with an increase of the Pelvic Tilt. The lumbar lordosis curvature increased between L4 and S1, even more when a prosthesis was placed at L3-L4 level.

DISCUSSION & CONCLUSIONS: Total disc arthroplasty is useful in the surgical management of discogenic spinal pathology. The three prostheses studied allowed to restore the disc height, the range of motion, without disrupting the sagittal balance, but induced modification of the lumbar curvature. Lumbar prosthesis seems to be an alternative to lumbar fusion.