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The Effect of Cervical Total Disc Arthroplasty (TDA) Prosthesis Height on the Adjacent Disc Height, Range of Movement of the TDA and Cervical Lordosis

A. Kasis¹, R. Taranu¹, L. Marshman¹, T. Friesem¹

¹University Hospital of NorthTees, Spine Unit, Stockton-on-Tees, United Kingdom

Introduction: Total disc arthroplasty (TDA) is now established as a viable alternative to fusion in the treatment of chronic disabling degenerative cervical spine disease. We investigated the effect of the height of TDA (5,6 and 7 mm) on the adjacent segment height and range of movement (ROM), in a homogenous diagnostic population, and with one surgeon supervising the operative technique. To our knowledge this is the first such study.

Material and methods: N=130 consecutive patients, with degenerative disease associated with chronic neck pain and radiculopathy, were prospectively investigated after inserting a Prestige LP cervical TDA. The pre and post-operative functional scores were recorded. All patients had x-rays of the cervical spine pre-operatively, 6 months, 1 and 2 years post-operatively: the range of movement (ROM), DH at adjacent level and cervical lordosis (Cobb angle C2-C7) were measured. The prosthesis height used was also recorded. All measurements were performed by two observer (ICC = 0.89).

Results: Results were obtained in n=130 patients (186 prostheses). The mean age at surgery was 51.12+/-0.84yrs. The mean follow up was 28+/-0.35 months.

There was a significant improvement in all outcome scores measured:

Assessment were made at n=51 (27.4%) size 5mm, n=102 (54.8%) size 6 mm, and n=33 (17.7%) size 7 mm.

The mean pre-operative disc height of the adjacent level was 4.931 ± 0.09 , compared to 4.9903 ± 0.817 post-operatively, $p=0.661$.

Adjacent disc height:

In levels with size 5 mm prosthesis: the mean pre-operative adjacent disc height level was 4.695 ± 0.122 , and 4.809 ± 0.18 post operatively, $p=0.55$.

In levels wit size 6 mm prosthesis: the mean pre-operative adjacent disc height level was 4.982 ± 0.083 , and 4.898 ± 0.114 post operatively, $p=0.65$

In levels wit size 6 mm prosthesis: the mean pre-operative adjacent disc height level was 5.37 ± 0.178 , and 5.295 ± 0.236 post operatively, $p=0.22$

There was no statistical difference in the adjacent disc height pre and post-operatively between the 3 prosthesis sizes.

Range of movement

In levels with size 5 mm prosthesis: the pre-operative total ROM at the pathological level was 6.43 ± 0.54 , and 8.78 ± 0.43 of the TDA, $p=0.023$

In levels with size 6 mm prosthesis: the pre-operative total ROM at the pathological level was 5.34 ± 0.595 , and 9.01 ± 0.348 of the TDA, $p=0.003$

In levels with size 7 mm prosthesis: the pre-operative total ROM at the pathological level was 6.24 ± 0.398 , and 8.961 ± 0.597 of the TDA, $p=0.009$

There was no statistical difference in the ROM pre and post-operatively between the 3 prosthesis sizes.

Cervical lordosis

In levels with size 5 mm prosthesis: the pre-operative mean cervical lordosis was 5.41 ± 1.48 , and 14.58 ± 1.46 postoperatively, $p < 0.001$

In levels with size 6 mm prosthesis: the pre-operative mean cervical lordosis was 4.11 ± 1.16 , and 13.14 ± 1.11 postoperatively, $p < 0.001$

In levels with size 5 mm prosthesis: the pre-operative mean cervical lordosis was 4.86 ± 1.12 , and 13.55 ± 2.03 postoperatively, $p < 0.001$

There was no statistical difference in the cervical lordosis pre and post-operatively between the 3 prosthesis sizes.

Conclusion: The ROM, adjacent DH and the cervical lordosis are independent on the prosthesis height (5,6 and 7 mm) We conclude that choosing intra-operative prosthesis height (size), by judging the tension of the trial after releasing the distraction is accurate.