Preliminary Analysis of Adjacent Segment Degeneration in Patients Treated with Posterior Cervical Cages – 2 Year Follow-Up

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OBJECTIVE: Select patients with unremitting symptoms of cervical radiculopathy may be treated with indirect foraminal decompression and fusion via placement of a cervical cage placed bilaterally through a tissue sparing, posterior approach. Segmental fusion is known to affect adjacent segments. The aim of this study was to assess the affect of posterior fusion using bilateral cervical cages on adjacent segment degeneration (ASDegeneration) at 2 years post-operatively.

METHODS: Fifty-three patients enrolled in a prospective multi-center study who completed the imaging protocol were available for follow up at 2 years. Lateral cervical X-rays were acquired pre-operatively and at 1- and 2-years postoperatively. Imaging was evaluated for adjacent level degeneration using the following criteria:

1) Disc height ratio (DHR) – ratio of the disc height and the lower vertebrae height measured at level above and below;
2) Proximal junctional kyphosis (PJK);
3) Kellgren and Lawrence Osteoarthritis Severity Grade (KLOSG); and
4) Heterotopic Ossification (HO).

The results were compared with a repeated ANOVA test and Bonferroni correction; $p<0.05$ was considered significant.

RESULTS: At 2-years post-operatively, there were no revision surgeries at the operated level or new surgeries at adjacent levels. Of the 102 segments evaluated, ASDegeneration was identified at 21 levels cranial to and 21 levels caudal to the index level. At 3 levels new mild ASDegeneration signs developed, 1 in level above and 2 in level below operated segment after 2 years. In patients with pre-existing disc degeneration, mild progression of ASDegeneration signs developed in 6 upper and 2 lower segments. There were no significant changes in DHR and PJK in all patients; however, when patients with signs of ASDegeneration only were evaluated, a significant decrease of DHR was found. The mean DHR before surgery, 1 and 2 years after surgery in all patients was 44.0 ± 8.1, 44.0 ± 8.2 and 43.1 ± 8.4; $p=0.1006$ and in ASD patients 43.8 ± 7.3, 41.9 ± 6.3 and 39.6 ± 8.3; $p=0.0062$, respectively. Overall, at 2 years postoperative, ASDegeneration was identified in nine patients (17.6% when compared to all evaluated patients before surgery).

CONCLUSIONS: In patients treated with posterior cervical cages placed bilaterally between the facet joints, mild progression of ASDegeneration can be expected in 17.6% of patients. Further evaluation to establish long-term incidence is needed.

KEY INSIGHTS

- Radiographic assessment of Adjacent Segment Degeneration in 53 patients enrolled in a DTRAX Cervical Cage prospective, multi-center study; analysis at one and two years after surgery compared to baseline
- Mild ASDegeneration signs developed in 6 upper and 2 lower segments
- For all patients, mean Disc Height Ratio before surgery, one, and two years after surgery was 44.0, 44.0, and 43.1, respectively

Comparison of the current study with published data for ACDF (similar follow-up periods)

Study	Subjects	ASDegen (%)	Scale	ASDisease Re-operation (%)	Follow-up Mean/ Min (months)
Current study	51	17.6%	KLOSG, Park HO	0%	24/24
Robertson et al.	158	34.6%	Authors' method	3.2%	24/24
Coric et al.	133	24.8%	Authors' method	6.1%	24/24
Li et al.	116	24.1%	Authors' method	0%	31/24
Kim et al.	56	44.7%	Robertson method	Not reported	20/12
Ishihara et al.	112	Not reported	Hillibrand method	6.3%	24/24

- For mild ASDegeneration patients, mean Disc Height Ratio before surgery, one, and two years after surgery was 43.8, 41.9, and 39.6, respectively
- Mild ASDegeneration most likely related to decreased disc height
- No revision surgeries at the operated level and no new surgeries at adjacent levels
- Overall at 2 years postoperative, ASDegeneration was found in nine patients, or 17.6% of evaluated patients