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Assessing accuracy of measurement methods of bony fusion assessment after anterior cervical discectomy

(Comparing different radiographic measurements to determine the most accurate method and cut-off value for the establishment of bony fusion after anterior cervical discectomy.)

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Currently, there is no universally accepted method for assessing radiological fusion after anterior cervical discectomy. Five-year follow-up (FU) radiological X-rays demonstrating solid fusion or absence of fusion provided a gold standard for comparison with various assessment methods.

Establishing the most accurate assessment method for bony fusion, by comparing different cut-off values for the difference in interspinous distance and the change in Cobb angle on dynamic radiological images against the established gold standard.

In this post-hoc analysis from the Netherlands Cervical Kinematics (NECK) trial, dynamic X-rays of patients that underwent anterior discectomy were reviewed.

At 5-year FU, bony continuity of the vertebra adjacent to the operated level was indisputable and served as gold standard. Qualitative assessments were performed by a senior spine surgeon. Cobb angles and interspinous distances on flexion-extension images were measured independently by two investigators. Optimum agreement between the gold standard and the two methods was assessed, evaluating varying cut-off values, considering sensitivity, specificity, and area under the curve (AUC).

Dynamic radiographic assessments revealed fusion in 29 out of 40 patients (mean age: 49 years ± 7.6 ; 57.5% women). For Cobb angle (optimal cut-off: $\leq 3.0^\circ$), the AUC was 0.864 with 100% sensitivity and 72.7% specificity. For interspinous distance (optimal cut-off: ≤ 1.5 mm), the AUC was 0.892 with 96.6% sensitivity and 81.8% specificity. The highest AUC (0.909) was observed for combined cut-off values (Cobb angle $\leq 3.0^\circ$ and interspinous distance ≤ 2.0 mm), yielding 100% sensitivity and 81.8% specificity.

The combination of cut-off values $\leq 3.0^\circ$ for Cobb angle and ≤ 2.0 mm for interspinous distance was assessed to be a reliable diagnostic criterion for fusion evaluation on lateral flexion-extension X-rays. This tool provides an applicable method for assessing fusion during FU after anterior discectomy.