

Comparison of the Novel Coin Test and the Modified Japanese Orthopaedic Association (mJOA) Score in Assessing Cervical Spondylotic Myelopathy

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INTRODUCTION: Cervical spondylotic myelopathy (CSM) diagnosis requires a combination of clinical evaluations such as positive Hoffman's or Tandem gait as well as confirmation by imaging such as MRI. Due to the complex nature of isolating a myelopathic lesion, having specific tests that can be administered in clinic with reasonable accuracy is imperative to timely diagnosis. Although beneficial, the Tandem Gait can be influenced by stenosis in the lumbar or thoracic spine as well as balance problems, radicular pain, or neuropathies. The novel Coin Test (CT) introduces a simple yet effective assessment tool for evaluating upper extremity function, aiding in the diagnosis of CSM compared to other traditional assessment tools. This test can serve as a quick and reliable measure to detect cervical myelopathy in the majority of patients while evaluating their fine motor abilities. The Coin Test requires very little equipment, minimal set up, and is able to be readily interpreted by the clinician to add to their diagnostic toolkit. This study aims to assess and correlate pre- and postoperative Coin Test times with modified mJOA scores to see if the Coin Test is able to follow the trends of mJOA given that mJOA is the gold standard of myelopathic evaluation. This study also seeks to explore potential correlations between Coin Test results and compression ratios in patients with CSM.

METHODS: A single-center prospective observational study was conducted from 2022 to 2025, comparing 64 patients diagnosed with CSM based on clinical examinations and MRI. In the Coin Test assessments, patients diagnosed with CSM were instructed to transfer five pennies from a randomly arranged starting position on a flat surface to make another stack about 2-inches away. Time to complete was recorded pre- and postoperatively (PO). The mJOA and Coin Test time were obtained postoperatively (PO) at each patient's follow-up: 6 weeks, 3 months, 6 months, and 12+ months PO. A paired-samples T-test was used to assess for statistically significant difference between pre- and postoperative Coin Test and mJOA. Cervical cord compression from a preoperative MRI was calculated by dividing the anteroposterior (AP) diameter (D) of the spinal cord in the affected intervertebral disc level by the AP diameter (DC2) of the cord at the C2 mid-vertebral body, which served as a reference. A compression ratio (CR) was calculated as $D/DC2$. All statistical analyses were performed using Microsoft Excel 2016.

RESULTS:

The cohort had a mean age of 66.92 years. The mean mJOA score improved from 12.9 to 15.9 for the 6 weeks group, 13.6 to 16 for 3 months, 12.3 to 15.1 for 6 months, and 12.4 to 16.3 for 12+ months. The mean preoperative Coin Test time (seconds) decreased from 22.53 to 14.76 for 6 weeks, 21.43 to 12 at 3 months, 29.57 to 16.35 at 6 months, and 27.38 to 13.13 at 12+ months.

The mean postoperative follow-up duration was 6.17 months. Paired T-test analysis showed statistically significant increase in mJOA scores from preop to mean PO ($p < 0.001$). It also showed a statistically significant decrease in Coin Test completion times ($p < 0.001$) comparing preop to postop. Pearson correlation analysis revealed a poor correlation (Figure 3; $r = 0.011$) between the CR and preop mJOA as well as between CR and preop CT ($r = -0.122$). Postoperative Coin Test completion time and mJOA were correlated more strongly (Figure 2; $r = -0.635$).

DISCUSSION AND CONCLUSION: Our preliminary findings underscore the utility of the Coin Test as a simple and effective tool for assessing upper-extremity function in CSM patients. The ease of integration, minimal equipment required, and rapid responsiveness to intervention further supports its use clinically. Coin Test times exhibited a promising significant correlation with mJOA scores, however there was not a statistically significant correlation between the compression ratios to the mJOA or the Coin Test. Given that the mJOA is the gold standard of evaluation, this still lends credibility to the Coin Test's ability to predict myelopathic presentations. One benefit of the Coin Test is the ability to isolate cervical pathology when evaluating for myelopathy. Tandem gait could be impacted by inherent balance issues or by thoracic/lumbar stenosis whereas Coin Test allows evaluation solely of the C spine. The Coin Test also removes subjectivity from the evaluation where a patient is unlikely to have their results influenced by their mood or state of being, an issue shared among other tests even the mJOA. Future directions for this could include studying the patients' trends over time to see if they developed myelopathic symptoms again and if the Coin Test was able to detect these before they displayed reportable symptoms. These results highlight the potential of the Coin Test to complement traditional assessments and provide valuable prognostic information for CSM management.

