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Editorial

Adult Spinal Deformity and Novel Classifications: Is Coronal Malalignment Making a Comeback?: Commentary on "Obeid-Coronal Malalignment Classification Is Age Related and Independently Associated to Personal Reported Outcome Measurement Scores in the Nonfused Spine"

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See the article "Obeid-coronal malalignment classification is age related and independently associated to personal reported outcome measurement scores in the nonfused spine" via https://doi.org/10.14245/ns.2142458.229.

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Hippocrates, the prominent Greek physician of antiquity, introduced novel evidence-based practices to improve diagnosis, management, and prevention of diseases.[1] Protocols and guidelines for the classification of diseases were fundamental to Hippocratic medicine.[1] Since then, countless classification systems for various medical diseases have been proposed and refined, culminating in the numerous standardized algorithms and treatment paradigms available for today's physicians. Although classification systems for adult spinal deformity (ASD) have been previously proposed,[2,3] there is currently no clear consensus regarding the optimal assessment and/or classification of global coronal malalignment (CM; lateral displacement of coronal C7 plumbline from center sacral vertical line) and its potential coronal deformity subtypes (e.g., CM ipsilateral to major curve concavity vs. convexity).[4,5]

After the success of the Lenke classification for guiding treatment of adolescent idiopathic scoliosis,[6] the Scoliosis Research Society (SRS) developed a novel classification for ASD in 2006.[3] This initial ASD classification included a global CM modifier, but the CM modifier was subsequently removed in the 2012 SRS-Schwab ASD classification.[2,3] This may have partly been due to several landmark studies emphasizing the importance of sagittal spinal malalignment and its significant impact on pain and disability, while also suggesting that the magnitude of coronal deformity and extent of coronal correction were less critical.[7,8] However, more recent studies suggest that the clinical impact of CM may have been previously underestimated.[9] Furthermore, novel classifications of CM have been proposed, which include the Qiu classification and Obeid-Coronal Malalignment (O-CM) classification.[4,5]

Given the resurgence of interest and focus on coronal deformity in contemporary ASD

literature,[4,5,10] we commend Kieser et al.[11] for their timely analysis and rigorous investigation of the O-CM classification and its treatment modifiers. Briefly, the O-CM classification (from Obeid et al.[4]) includes the following modifiers: type 1A1 (concave CM with flexible thoracolumbar/lumbar [TL/L] main curve), type 1A2 (concave CM with rigid TL/L main curve), type 1B (concave CM with main cervicothoracic/thoracic curve), type 2A1 (convex CM with flexible, non-degenerated lumbosacral junction), type 2A2 (convex CM with rigid, degenerated lumbosacral junction), type 2B (main short lumbosacral deformity [convex-like CM]).[4] Based on these different coronal deformity patterns and modifiers, Obeid et al.[4] proposed a novel surgical algorithm to guide operative planning.

In the current study by Kieser et al.,[11] the authors evaluated the 6 O-CM classification modifiers according to patient age, sagittal alignment (using global tilt), CM, and various patient-reported outcome measures (PROMs) in ASD patients without prior spinal fusion. Their results demonstrated that CM subtypes according to the 6 O-CM modifiers were age-dependent.[11] That is, the distribution of the O-CM modifiers correlated to patients' age, with mean age 35 years for 2A1, 44 years for 1B, and approximately 63–65 years for all other O-CM modifiers (1A1, 1A2, 2A2, 2B). Next, CM patients were dichotomized using age cutoff 50 years and results demonstrated that most (76%) patients < 50 years were 2A1. In comparison, patients > 50 years had more broad distribution of O-CM modifiers, with 2A2 and 1A2 being the most common at 35% and 23%, respectively.[11]

Kieser et al.[11] then utilized the O-CM modifiers to determine the clinical impact of coronal deformity on ASD patients at baseline. For age < 50 years, 2A1 demonstrated worse Oswestry Disability Index sex life (0.52 vs. 0.77, $p = 0.033$) but higher satisfaction (3.56 vs. 3.22, $p = 0.015$) than coronally-aligned patients. For age > 50 years, 1A1 and 1A2 had worse SRS-22 self-image (2.2 vs. 2.5, $p = 0.014$) than coronally-aligned patients. Also, 2A2 and 2B patients had worse SRS-22 self-image (2.3 vs. 2.5, $p = 0.000$), SRS-22 satisfaction (2.8 vs. 3.2, $p = 0.002$), and SF36 physical function (32.9 vs. 35.2, $p = 0.015$) than coronally-aligned patients.[11]

An interesting finding from the subgroup analysis of patients < 50 years was the association of CM with significantly higher satisfaction scores.[11] The authors reported no age or radiological confounders, but since the only investigated sagittal parameter was global tilt, the possibility of another sagittal deformity parameter confounding these study results (or any of the other results in the study) could not be excluded.[11] We commend Kieser and colleagues for recognizing and acknowledging this potential study weakness in their discussion.[11]

The authors consistently identified SRS-22 self-image as being significantly different among CM vs. coronally-aligned patients.[11] For example, significant differences in SRS22 self-image scores were reported as 0.2 and 0.3 in several of the study's comparisons.[11] Although these comparisons achieved statistically significance, it was not clear if such small differences in this subdomain truly represent a clinically meaningful difference. If the analysis had focused on assessing treatment outcomes, then using a previously reported value of minimum clinically important difference for SRS-22 self-image (0.8) could be useful.[12] However, the lack of literature regarding subdomains of the SRS-22 instrument and minimum measurement differences for various subpopulations may limit interpretation of these results.

Next, Kieser et al.[11] investigated the various factors that may have impacted the decision to pursue operative treatment rather than continue nonoperative care. The analysis revealed that worse SRS-22 self-image was the consistent determinant among CM patients of all ages who elected for operative treatment.[11] Of note, Bess et al.[13] previously reported that operative treatment of younger adults with scoliosis was driven by coronal deformity whereas operative treatment of older adults with scoliosis was driven by pain and disability. Collectively, these results contribute to the literature and data available to surgeons for preoperative counseling of ASD patients and the decision to transition from nonoperative to operative management.

In conclusion, the current study by Kieser et al.[11] represents an important contribution and progress towards a clinically relevant classification of CM in ASD. Their analysis of a large ASD cohort (n = 1,243) demonstrated that the Obeid classification of CM provides clinically useful modifiers that can potentially facilitate surgical counseling and decision-making.[4] Notably, the authors reported that the Obeid-CM modifiers correlated to both patient age and various PROMs, with SRS22 self-image being the most consistent subdomain to manifest statistically significant differences among coronally-malaligned versus aligned patients.[4,11] In the future, a study utilizing the Obeid-CM classification modifiers to assess the clinical impact of operative intervention could provide further evidence in support of this classification system.[4] Until then, no definitive recommendations can be made as to whether recently published CM classifications, such as the Qiu classification[5] and/or Obeid classification,[4] warrant a potential update to the SRS-Schwab ASD classification with inclusion of novel coronal modifiers.[2]

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CONFLICT OF INTEREST

The author has nothing to disclose.

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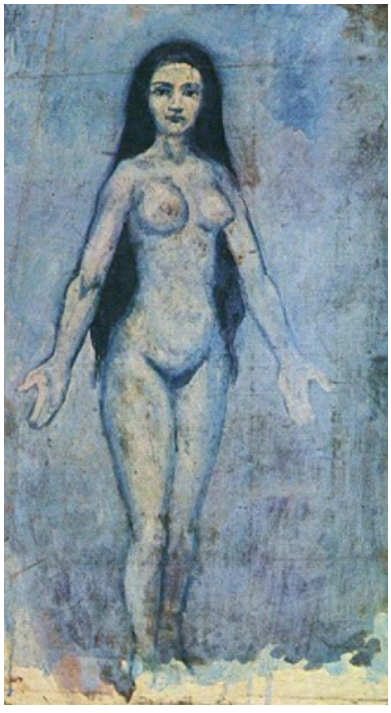

Title: Naked woman with dripping hair
Artist: Pablo Picasso
Year: 1902