عنوان مقاله:

Prediction of Fusion Rod Curvature Angles in Posterior Scoliosis Correction Using Artificial Intelligence

محل انتشار:

مجله استخوان و جراحی عمومی, دوره 12, شماره 7 (سال: 1403)

تعداد صفحات اصل مقاله: 12

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خلاصه مقاله:

Objectives: This study aimed to estimate post-operative rod angles in both concave and convex sides of scoliosis curvature in patients who had undergone posterior surgery, using neural networks and support vector machine (SVM) algorithms.Methods: Radiographs of ۷۲ scoliotic individuals were obtained to predict post-operative rod angles at all fusion levels (all spinal joints fused by rods). Pre-operative radiographical indices and pre-operatively resolved net joint moments of the apical vertebrae were employed as inputs for neural networks and SVM with biomechanical modeling using inverse dynamics analysis. Various group combinations were considered as inputs, based on the number of pre-operative angles and moments. Rod angles on both the concave and convex sides of the Cobb angle were considered as outputs. To assess the outcomes, root mean square errors (RMSEs) were evaluated between actual and predicted rod angles.Results: Among eight groups with various combinations of radiographical and biomechanical parameters (such as Cobb, kyphosis, and lordosis, as well as joint moments), RMSEs of groups ۴ (with seven radiographical angles in each case, which is greater in quantity) and ۵ (with four radiographical angles and one biomechanical moment in each case, which is the least possible number of inputs with both radiographical and biomechanical parameters) were minimum, particularly in prediction of the concave rod kyphosis angle (errors were ۵.۵° and ۶.۳° for groups ۴ and ۵, respectively). Rod lordosis angles had larger estimation errors than rod kyphosis ones.Conclusion: Neural networks and SVM can be effective techniques for the post-operative estimation of rod angles at all fusion levels to assist surgeons with rod bending procedures before actual surgery. However, since rod lordosis fusion levels vary widely across scoliosis cases, it is simpler to predict rod kyphosis angles, which is more essential for surgeons. Level of evidence: IV

کلمات کلیدی:

Biomechanical modeling, Cobb angle, Neural Networks, posterior surgery, Rod kyphosis