Title:

Evaluation of thoracic vertebrae rotation and deformity in patients with chest wall deformities using dynamic surface topography

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Aim of Study:

Scoliosis and thoracic vertebral rotation is associated with chest wall deformities. However, the impact of asymmetry in pectus excavatum (PE) and pectus carinatum (PC) on thoracic deformity has not been clarified in detail. This study examined the implication of asymmetric chest wall deformities on the thoracic spine using surface topography based motion analysis.

Methods:

A total of 20 patients PE and PC were prospectively analyzed between January 2020 and April 2022 by thoracic MRI and dynamic surface topography (Diers-formetric 4D motion lab). Pearson correlation coefficient was used to assess the relationship between sternal rotation (SR) and Haller index (HI) one the one side and thoracic scoliosis angle (SA) and deformity on the other side.

Results:

Mean SR was 15 degrees (standard deviation 11.1, 95% confidence interval: 9.8–20.2). Half of the patients (n=10) had scoliosis with a CA > 10 degrees (frontal plane) and the maximum vertebrae rotation (transversal plane) was found at level T6 and T7 in PE and PC. Preoperatively SR and HI correlated positively with thoracic SA (r^{SR} = 0.585, p^{SR} = 0.023, r^{HI} = 0.555; p^{HI} = 0.032).

In PE subgroup we noted a positive correlation of right sided deflection of the line plumb line in frontal plane and HI (r^{HI} =0.648, p^{HI} =0.009, n=15).

Conclusion:

Surface topography based motion analysis is a valuable and radiation free tool to assess spine misalignment in patients with chest-wall deformities. Sternal rotation in PE and PC has a high probability to effect statics and posture of the thoracic spine. Therefore, spinal malalignment and deformity should be evaluated routinely in these patients.