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EVALUATION OF CARDINAL LIGAMENT'S LENGTH AND CURVATURE BETWEEN PATIENTS WITH AND WITHOUT PELVIC ORGAN PROLAPSE

Hypothesis / aims of study
Cardinal ligament (CL) curvature has previously been assessed as the tangent direction difference (1). We introduce a new more precise automated measurement technique using spline calculations.
Objective : To validate and compare length and curvature (radius) measurements of CL in patients with and without pelvic organ prolapse using the spline technique.

Study design, materials and methods
The length and curvature of CL were compared between 19 women with pelvic organ prolapse (cases) to healthy women (controls) using 2 different 3D measuring techniques after MR Imaging : tangent direction difference using Slicer software and minimum radius (spline methodology) using SciLab software. Weakest points along the ligament were determined.

Results
Mean right and left CL lengths (73 vs 57 mm, $p < 0.0002$ and 76 vs 58 mm, $p < 0.0001$) and curvature (106° vs 90°, $p < 0.001$ and 111° vs 84°, $p < 0.0002$) were respectively increased in the prolapse group using the conventional Slicer measuring technique. On using spline (SciLab) technique, length measurements were increased with a significant difference between patients with and without prolapse (77 vs 64 mm, $p= 0.003$ for right CL and 80 vs 62, $p = 0.0003$ for left CL). CL curvature measured as a radius was on the contrary significantly decreased in the prolapse group (15 vs 19 mm, $p<0.002$ for the right CL and 13 vs 19 mm, $p<0.009$ for the left CL). Minimum radius of curvature was identified in the middle of the ligament which would correspond to its weakest point.

Interpretation of results
Spline technique length measurement seems to be more accurate than the conventional one as values are closer to those found in vivo during surgery.

Concluding message
This is a first study using minimum radius to define ligament curvature which is more appropriate as it evaluates curve change along the whole ligament whereas the same angle measurement can be obtained following different ligament curvatures.

References
1. Chen L et al. Cardinal and deep uterosacral ligament lines of action. MRI ?? based 3D technique development and preliminary findings in normal women. Int Urogynecol J 2012

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