LEFT VENTRICULAR TWIST: COMPARISON BETWEEN 2 AND 3-DIMENSIONAL SPECKLE TRACKING ECHOCARDIOGRAPHY IN A GROUP OF HEALTHY VOLUNTEERS
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BACKGROUND:
Left ventricular (LV) twist is the result of the clockwise rotation of the base and the counterclockwise rotation of the apex and plays a vital role in the ventricular systolic function. Two-dimensional speckle tracking (2DT) has been validated as a reliable tool to measure LV mechanics. A novel three-dimensional speckle tracking (3DT) has been developed to track three-dimensional myocardial motion, not available in current versions of 2DT.

PURPOSE:
The aims of this study were to evaluate the feasibility and to compare LV twist values as determined by 2DT and 3DT in a group of healthy volunteers.

METHOD:
39 normal adult volunteers (32 ± 9 years) were enrolled in the protocol. LV twist was defined as net difference between averaged 2DT apical (4 segments) and basal (6 segments) rotations (figure 1). 3DT twist was obtained from the LV volumetric image and shown as the averaged global value of 17 segments (figure 2). Feasibility was calculated as the percentage of segments acceptable for analysis. All values are presented as mean ± SD. Significant differences between the two techniques were tested using the paired Student’s t-test. P values < 0.05 were considered significant.

RESULTS:
Acceptable data quality was available in 378/390 segments (97%) using 2DT and 636/663 segments (96%) using 3DT (p = NS). 2DT twist mean value was 13.8 ± 7.9 degrees at a frame rate of 50 ± 2 frames/s and global 3DT twist mean value was 10.2 ± 7.6 degrees at a volume rate of 20 ± 1 volumes/s (Table). Twist by 3DT was significantly smaller than by 2DT (p < 0.01).

Table – Left ventricular (LV) mean 2DT values of peak basal and apical rotations and peak twist and mean 3DT values of peak twist.

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<tr>
<th></th>
<th>2DT</th>
<th>3DT</th>
<th>p</th>
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<tbody>
<tr>
<td>Basal rotation (º)</td>
<td>-7.5 ± 5.4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Apical rotation (º)</td>
<td>6.3 ± 3.5</td>
<td>-</td>
<td>-</td>
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<tr>
<td>LV twist (º)</td>
<td>13.4 ± 8.2</td>
<td>10.2 ± 7.6</td>
<td>&lt;0.05</td>
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2DT: two-dimensional speckle tracking echocardiogram; 3DT: three-dimensional speckle tracking echocardiogram; NS: not significant; (º): degree.

CONCLUSION:
LV twist measured by 2DT and 3DT showed good and comparable feasibility. Although both techniques are based on the same principles, they showed significant difference between averaged values. This discrepancy may be explained by the 3D myocardial movements not measured by 2DT and the use of different tracking algorithms. While further investigations using 3DT are needed to validate this promising technology, caution should be taken when comparing 2DT and 3DT values of LV twist.