Cardiac Dyssynchrony Analysis Using Circumferential Versus Longitudinal Strain: Implications for Assessing Cardiac Resynchronization
Circulation Helm et al. 111: 2760

Data Supplement

Movies

Cine displays of regional wall motion and dyssynchrony in a canine left ventricle with heart failure and left bundle branch block (LBBB). The individual small dots outlining the left ventricle are based on mid-wall motion determined from the magnetic resonance tagging grid lines. At each location, circumferential and longitudinal strain is determined from the 3-D data. Within each short axis slice, a vector pointing from the centroid to each position in the slice is assigned a magnitude equal to the strain value at that site. Vectors are summed to yield the net direction of shortening, shown in the figures as a series of arrows in each of the short axis planes. The larger the arrow (and more deviation to the red-end of the color spectrum), the more one portion of the wall is shortening out of phase with the other ï¿½ i.e. dyssynchrony. The direction of the arrow points to the wall that is shortening the most at any given moment in the cardiac cycle. The color and vector magnitude scaling is identical for all cine views. The red markers on the heart denote the position of the intraventricular septum. Systole and diastole are denoted both by changing the color of the cardiac wall motion marker points (green and yellow, respectively), and by the label at the lower left portion of the movie.

Two movies are provided. A. Circumferential strain shows marked dyssynchrony under conditions of right atrial (RA) pacing (LBBB), with net shortening pointing rightward (towards septum) in early systole and markedly leftward (towards lateral wall) in late systole. With left ventricular (LV) pacing, late systolic shortening points in the opposite direction (towards the septum) but with a smaller magnitude. Bi-ventricular (BiV) pacing results in more uniform synchrony (vector magnitudes are much smaller). B. Longitudinal strain shows a similar display with motion derived in the longitudinal orientation. With RA pacing, the level of basal dyssynchrony is less than that based on circumferential analysis (magnitude of arrows is smaller, less red color), and varies more between short axis segments. LV pacing produces less uniformity of motion with vectors pointing at various directions in different short axis segments. Net synchrony is less clear with longitudinal verses circumferential-based strain analysis. Finally, BiV pacing improves synchrony, but more variability in the response (vector size and orientation) remains, depending on the segment (i.e. apex to base) examined.

Files in this Data Supplement:

- Movie A - (AVI) (756 kb).
- Movie B - (AVI) (778 kb).