Myocardial Tissue Characterization by Ultrasonic Imaging

Mark R. Holland, PhD
Washington University, St. Louis, MO

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Ultrasonic Tissue Characterization

The intrinsic structural, organizational, and compositional properties of the heart are reflected in the measured ultrasonic properties...

... hence, an assessment of the myocardium can be achieved through echocardiography-based analyses.
SPECIFIC EXAMPLE:

Determination of Myocardial Fiber Orientation of Intact Hearts from Quantitative Analyses of Echocardiographic Images
Fiber Architecture of the Left Ventricle
The objective of this study was to explore the feasibility of implementing echocardiographic-based methods for imaging the intrinsic cardiac fiber structure of individual hearts.
Excised Sheep Heart
Acquire a series of apical images of excised sheep hearts in 5° increments...
Determine Relationship Between the Level of Ultrasonic Backscattered Signals and Fiber Orientation
Relationship Between Fiber Angle and the Level of Ultrasonic Backscatter

N = 5
(Mean ± SD)

parallel
perpendicular
Radial Backscatter Profiles
Fiber Orientation Image

Fiber Orientation

0° 10° 20° 30° 40° 50° 60° 70° 80° 90°
in-plane  out-of-plane
Clinical Implementation
3D Echocardiographic Imaging

2D Array Probe

3D Volume Acquisition
3D Echocardiographic Image
Summary

• The echocardiography-derived fiber orientation appears consistent with the known left-ventricular fiber structure.

• The echocardiographic-derived fiber structure agrees reasonably well with the corresponding DT-MR obtained images of fiber structure.

• Results of this study suggest that echocardiographic-based methods may represent feasible approach for imaging the intrinsic cardiac fiber structure of individual hearts.
Thank You!

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Mark Holland