MRE Biomarker Committee

Co Chairs:
Patricia Cole, MD, PhD
Richard L. Ehman, MD

QIBA Annual Meeting
May 6-7, 2015
Alexandria, VA

MRE Biomarker Committee

• Edward Ashton, PhD
• Patricial Cole, MD, PhD
• Richard Ehman, MD
• Edward Jackson, PhD
• Frank Miller, MD
• Mark Palmeri, MD, PhD
• Suraj Serai, PhD
• Claude Sirlin, MD
• Sudhakar Venkatesh, MD
MR Elastography:
Quantitative Imaging of Tissue Stiffness

- Main current application: Assessing liver fibrosis
- Installed clinical base ~ 450 systems worldwide
- Acquisition time: less than 1 minute

Normal | Mild | Fibrosis | Severe

Acoustic waves at 60Hz
Imaging time: 15 sec
Three Patients with Fatty Liver Disease

Commercial MRE Configuration
GE, Siemens, and Philips

Common Features:
- Shear driver hardware
- 2D MMDI Inversion
- Reporting $|G^*|$
- Default 60 Hz
- Standard 0-8 kPa display
- Standardized color scale
- Confidence map overlay
MRE Biomarker Committee

Teleconferences
• January 13, 2015
• March 10, 2015
• April 14, 2015

Face-to-face
• May 6, 2015

Initial Focus: What is a reasonable claim?

Measurement Accuracy of MRE?
Average ± Standard Deviation of Shear Modulus (kPa)
Calculated from Dynamic Mechanical Analysis and Magnetic Resonance Elastography

<table>
<thead>
<tr>
<th>%Agar</th>
<th>DMA</th>
<th>MRE</th>
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</thead>
<tbody>
<tr>
<td>1.5</td>
<td>14.28 ± 1.34</td>
<td>17.45 ± 1.07</td>
</tr>
<tr>
<td>2</td>
<td>25.02 ± 0.21</td>
<td>32.94 ± 0.47</td>
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<tr>
<td>2.5</td>
<td>49.26 ± 1.38</td>
<td>56.14 ± 1.49</td>
</tr>
<tr>
<td>3</td>
<td>80.81 ± 1.57</td>
<td>87.42 ± 4.50</td>
</tr>
<tr>
<td>3.5</td>
<td>108.30 ± 4.35</td>
<td>107.07 ± 2.18</td>
</tr>
</tbody>
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Liver Stiffness: 6.5 kPa (~3 x normal)

Ringleb, MRM 53:1197-1201 (2005)
Test- Retest Repeatability

Healthy Volunteer

Chronic Hepatitis C

0 min 10 min 0 min 10 min
First Visit 2 weeks Second Visit

Shire NJ et al. Test–Retest Repeatability of MR Elastography. JMRI 2011

Provisional Framework:
MRE Profile Longitudinal Claim

For a given measured percentage change in the magnitude of the complex shear modulus, a plausible range for the true change is the measured change ± ??%, with 95% confidence.

(Assuming no change in hardware and software platform and analyst)

Pre-Treatment

Post-Treatment

47 yo female with Autoimmune Hepatitis
What Might Be Next?
Cross-Cross Platform Reproducibility?

GE Signa 1.5T (60cm)  Mean = 2.08 ± 0.30 kPa

Siemens Avanto 1.5T (60cm)  Mean = 2.12 ± 0.24 kPa

-- Thank you! --