Declaration of Conflict of Interest or Relationship

Speaker Name: Joëlle K. Barral

I have the following conflict of interest to disclose with regard to the subject matter of this presentation:

Company name: GE Healthcare
Type of relationship: Research Support Agreement
3T Skin Imaging

Joëlle K. Barral, N. K. Bangerter, B. S. Hu, and D. G. Nishimura
Stanford University
Motivations

• Isn’t the naked eye enough?

• Why MRI?
  – Non-invasive
  – Anatomy: morphology & microscopic structures
  – Physical & chemical tissue parameters

Target

Epidermis ~ 100 μm

Dermis ~ 1 mm

Hypodermis ~ 1 cm

Methods: Hardware

- 1 inch diameter receive-only surface coils

\[ R_{\text{coil}} \propto \sqrt{\omega} \]
\[ R_{\text{body}} \propto \omega^2 \]

<table>
<thead>
<tr>
<th></th>
<th>Q_{\text{unloaded}}</th>
<th>Q_{\text{loaded}}</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 T</td>
<td>184</td>
<td>129</td>
</tr>
<tr>
<td>3 T</td>
<td>200</td>
<td>92</td>
</tr>
</tbody>
</table>
Methods: 3D pulse sequences

- Fast Large Angle Spin Echo (FLASE)
- b-SSFP
- Gradient-spoiled GRE (+IDEAL)

Ma, MRM, 1996:35:903-910
Increasing B0

1.5 T

IDEAL GRE

bSSFP

FLASE

Epidermis

5 mm

3 T

Dermis

Hypodermis

05/08/2008
ISMRM 742

Joëlle Barral
3T, 6 min

GRE, TE 5 ms
bSSFP, TE 11 ms
FLASE, TE 14 ms

117*117*500 μm³ resolution
Fat-water separation

GRE, TR 88 ms  
Scan time 6’

IDEAL GRE, TR 28 ms  
Scan time 5’34

Water image

Fat image

05/08/2008  
ISM RM 742  
Joëlle Barral
## Discussion

<table>
<thead>
<tr>
<th></th>
<th>SSFP</th>
<th>FLASE</th>
<th>GRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidermis</td>
<td>Unclear</td>
<td>Well delineated</td>
<td>Unclear</td>
</tr>
<tr>
<td>Dermis</td>
<td>Visible</td>
<td>Mostly Invisible</td>
<td>Visible</td>
</tr>
<tr>
<td>Hypodermis</td>
<td>Visible</td>
<td>Visible</td>
<td>Visible</td>
</tr>
</tbody>
</table>
Conclusions and Future directions

• Clinical-based choice
• 7T?
Acknowledgments

NIH & GE Healthcare
ISMRM Educational Stipend

jbarral@stanford.edu