Up and Coming Techniques in Medical Physics Translated into Clinical Practice

**ActiveNeedle Technology**

By

Dr. Muhammad Sadiq
Outline

- Unmet Clinical Need
- Solution - ActiveNeedle Technology
- Competitor Analysis
- Success to date
- Summary
An **unmet** clinical need: To **improve accuracy and safety** by reducing needle placement errors.

**Ultrasound (US) guidance** is a primary technique for a range of needle based procedures.
Unmet Clinical Need

An Example of Poor Needle Tip Visibility

An Example of Needle Tip Deflection
Source: www.bdml.stanford.edu

1 in 10 patients report nerve damage

2 in 10 patients undergo repeat biopsy

Additional clinical time costs over $1200/hr

Needle placement errors costs over $1Bn p.a.

Source: www.sparrow.org/HealthLibrary
Primary Market Research: Results of the nationwide survey conducted with the help of the collaborating clinician
Solution - Prototype

Potential Clinical Benefits

**Increased Visibility:** Especially at angles steeper than 45°

**Reduced Deflection:** Especially at depths deeper than 3 cm

**Reduced Pain/Trauma:** Better penetration through tissue interfaces
Solution – Demonstration
Solution – Demonstration

**Phantom Model**

- **Inactive Needle**
- **Active Needle**

**Ex-vivo Animal Tissue Model**

- **Freq.** = 22.5 kHz
- **Volt.** = 40 V
- **Vel.** = 300 mm/min

Effect of Activation on Needle Penetration Force

- **Inactive Needle**
- **Active Needle**

Effect of Activation on Needle Tip Deflection
## Competitor Analysis

### Competitor Analysis – ActiveNeedle’s Technology Vs Existing Technologies

<table>
<thead>
<tr>
<th>Feature</th>
<th>Technology</th>
<th>Active Needle</th>
<th>Echogenic Needle</th>
<th>ColorMark Device</th>
<th>GPS Technology</th>
<th>Advanced Imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient comfort</td>
<td></td>
<td>✓</td>
<td>✗</td>
<td>N/A</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Used with standard needle</td>
<td></td>
<td>✓</td>
<td>N/A</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Visibility at depths ≥ 3 cm</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Visibility at angles ≥ 45°</td>
<td></td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Reduced deflection</td>
<td></td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Low cost</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Compatible with all US devices</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
</tbody>
</table>

### Impact

- **Clinical Impact**
- **Patient Impact**
- **Economic Impact**

80% surveyed clinicians would use the ActiveNeedle’s Product
# Team

**Dr. Muhammad Sadiq**  
Founder & Director  
- RSE Enterprise Fellow funded by Scottish Enterprise  
- PhD in Biomedical Engineering  
- BEng (Hons.) in Mechanical Engineering

**Dr. Graeme McLeod**  
Co-founder & Clinical  
- Consultant & Honorary Reader in Anaesthesia  
- MBChB PGCert MedEd MRCGP FRCA FFPMRCA MD  
- Innovation in Anaesthesia Award, 2012
Expert Advisors

Prof. George Corner
Quality Assurance
• Head of Instrumentation, Ninewells Hospital & School
• Consultant Medical Physicist, NHS Tayside
• Quality Controller and Lead Auditor, WSHB

Prof. Sandy Cochran
Scientific Advisor
• Head of Division DIT, University of Dundee
• Deputy Director, IMSaT, University of Dundee
• Raised Research Funding of £11M

Dr. Sarah Vinnicombe
Clinical Advisor
• Consultant & Honorary Reader in Radiology
• Director of Breast Screening, Central and East London
• Raised Research Funding of £1.6M
Traction & Success to Date

Joint Winner of EPSRC funded Venture Competition, 2012

Selected among the 60 projects for showcase at the Parliament, 2013

Best Novel Idea Award, 2013

Runner-up at the EU’s leading Business Competition – OneStart, 2014

2nd Prize at the Scotland’s leading Business Competition – Converge Challenge, 2014

Awarded the Prestigious SE Funded RSE Enterprise Fellowship, 2014