

# Bone healing assessment device

**MEDTECH: Diagnostics - Device**

<p><b>The Challenge</b></p>	<p>Using an internal fixation device is a common technique to support the healing of fractured long bones (Figure 1). The fixation device helps to correctly align the bone parts, provides mechanical stability and promotes early use of the limb while the bone is healing. However, the healing process of fractured bones is complicated and can be delayed; mal-unions are common.</p> <p>To assess the state of healing of fractured long bones, clinicians currently rely on visual assessment of X-ray and CT scans. These techniques require radiation, are known to be subjective and can be inconclusive. The healing progress of a fractured long bone can be analysed by measuring bone stiffness over time. However, measurement is not trivial as the bone is surrounded by soft tissue, which adversely impacts signal quality.</p>
<p><b>The Solution</b></p>	<p>Our solution is a vibrational analysis to assess the healing progress of internally fixated long bones. This method avoids the need for X-ray or CT scans to assess the progress of healing in fractured long bones involving internal fixation methods such as screws and plates.</p>
<p><b>Key benefits</b></p>	<ul style="list-style-type: none"> <li>• Radiation-free assessment of bones</li> <li>• Wearable device</li> <li>• No need to analyse images</li> <li>• Non-invasive technique</li> <li>• Low-cost manufacturing</li> </ul>
<p><b>Development Stage</b></p>	<p>Prototype completed.</p>
<p><b>Brief Description &amp; Differentiation</b></p>	<p>This new technology is a wearable device that measures bone stiffness using vibrational analysis. The challenges associated with soft tissue are overcome by:</p> <ul style="list-style-type: none"> <li>• Specific placement of multiple sensors</li> <li>• The mechanics of the wearable device.</li> </ul> <p>The resulting data are processed using known signal-processing techniques and then mapped onto a healing index (Figure 2).</p> <p>The team behind this novel technology is made up of researchers from Monash University, the Alfred Hospital and the National Trauma Research Institute. The clinicians in the team face the bone healing assessment problem first-hand on a daily basis and have access to a large group of patients to conduct clinical trials as part of their normal routine.</p>
<p><b>Research Team</b></p>	<p>Led by Prof Wing Chiu (Mechanical and Aerospace Engineering)</p>
<p><b>Intellectual Property</b></p>	<p>PCT application filed (2019).</p>
<p><b>Key Publications</b></p>	<p>W.K. Chiu, B.S. Vien, M. Russ, M. Fitzgerald (2019) Towards a non-invasive technique for healing assessment of internally fixated femur, <i>Sensors</i> 2019, 19, 857; doi:10.3390/s19040857.</p>



Figure 1: Internally fixated long bone.

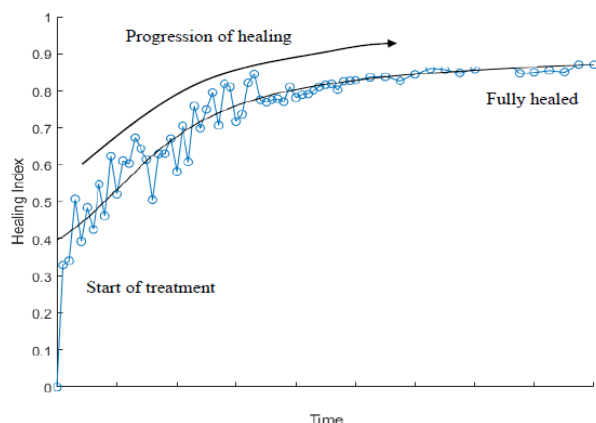


Figure 2: Bone healing index.