

# BONE HEALING ASSESSMENT DEVICE

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 that involve internal fixation methods such as screws and plates

- **Radiation-free assessment of bones**
- **Wearable device**
- **No need to analyze images**
- **Non-invasive technique**
- **Low-cost manufacturing**



Figure 1: Internally fixated long bone.

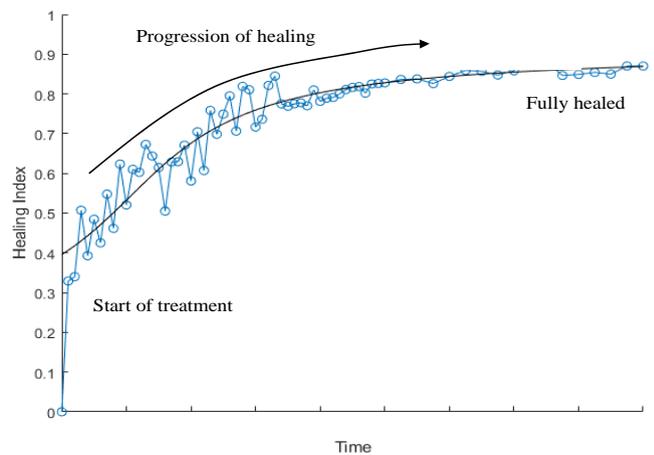


Figure 2: Bone healing index.

## THE CHALLENGE

Using an internal fixation device is a common technique to support the healing of fractured long bones, as shown in Figure 1. The fixation device helps to correctly align the bone parts, provides mechanical stability and therefore promotes an 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 also common.

To assess the state of healing of fractured long bones, clinicians currently rely on visual assessment of X-ray and CT scans. However, these techniques require radiation, are known to be subjective and can be inconclusive.

The healing progress of a fractured long bone can be analyzed by measuring bone stiffness over time. However, this measurement is not trivial as the bone is surrounded by soft tissue, which adversely impacts signal quality.

## THE TECHNOLOGY

This new technology is a wearable device that measures bone stiffness using vibrational analysis. The challenges associated with soft tissue are overcome by:

- specific placement of multiple sensors and
- the mechanics of the wearable device.

The resulting data is processed using known signal processing techniques and then mapped onto a healing index, as shown in Figure 2.

## The Team

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.

## THE OPPORTUNITY

The team is currently running clinical trials at the Alfred Hospital and is working on a refined device design.

We seek a partner to take this opportunity to market.

**Intellectual property:** Australian provisional patent filed in 2018.

## Reference

1. W.K. Chiu, B.S. Vien, M. Russ, M. Fitzgerald (2019) Towards a non-invasive technique for healing assessment of internally fixated femur, *Sensors* 2019, 19, 857; doi:10.3390/s19040857.

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