

## **VENOUS COMPONENT SEPARATION FROM A PULSE OXIMETER SIGNAL with Ultrasound Imaging as Reference**

**A severe drop of blood pressure occurs in up to every fifth dialysis treatment. This troublesome complication is often accompanied with vomiting and fainting and may lead brain damage or even death. No robust method to predict this occurrence exists at the time of writing. One approach to solve this could be to monitor the venous system using optical measurements of the tissue.**

It is known that certain mechanisms in the vascular system comes into play during hypotension, especially so in the venous part. Our work aimed to establish a connection between changes in venous pressure and optical measurements of the tissue. Because of the complex mix of blood vessels in the body, absorption of light in the cardiovascular system was investigated. The acquired data was treated mathematically as an attempt to separate the signals that are thought to originate from a mix of arteries and veins.

With the use of two signal separation techniques (PCA and SOBI), the estimated separated source signals were compared with an ultrasound reference signal. At times, a venous-like signal was extracted that also correlated well with the reference signal. This indicates that it may be possible to separate venous and arterial signals from a mixed optical signal.

The extraction of the venous component can be useful for non-invasively approximating the central venous pressure and as an alternative to peripheral intravenous analysis. This may in turn provide an easily acquirable parameter that can be used to predict and prevent severe drops of blood pressure during dialysis treatment.

As this was an experimental study, further research is required in this area. One avenue for practical devices could be the use of wearable technology, such as smartwatch solutions, in-ear devices or optics glued to the fingernail.