

First patients with heart failure to receive pacemaker using three-dimensional image-controlled guidance

Utrecht, May 02, 2017 – At the University Medical Center (UMC) Utrecht a pacemaker has been implanted in patients with heart failure using three-dimensional imaging to position the stimulation wires on the heart for the first time. Cardiologists expect this technology to render pacemakers much more effective in patients with heart failure than is presently the case and to potentially reduce the burden and mortality associated with the disease.

[Cardiac resynchronization therapy](#) (CRT) is a treatment for patients with heart failure where a special type of pacemaker with three stimulation wires boosts the heart's pumping capacity. Each heartbeat is supported by two simultaneous stimuli in the right and left ventricles. This causes the ventricles to contract simultaneously and increases the blood flow to the tissues, thereby enhancing their performance. When implanting a CRT device, it is essential that the cardiologist positions the stimulation wire with the utmost precision. However, positioning the wire at the left ventricle is a complex procedure due to the anatomy of the blood vessels of the heart, the presence of connective tissue after a myocardial infarction and/or the location of the phrenic nerve, which runs close to the heart towards the diaphragm. At present, the stimulation wire at the left ventricle is placed incorrectly in 30 to 45 percent of cases, as a result of which patients derive no or less benefit from this treatment.

Accurate positioning using 3D imaging

In late 2016 the UMC Utrecht started a study headed by [cardiologist Dr. Mathias Meine](#) with the aim of developing optimum image-controlled CRT positioning. In the last few weeks, CRT devices were successfully implanted in the first 5 patients using this method as part of this study. During the procedure, the cardiologist was aided by a detailed real-time 3D color image of the vessels of the heart and the catheter with which the guide wire is inserted, together with essential information from an MRI scan. This method allowed the stimulation wire to be positioned safely on a part of the left ventricle where the conduction delay is the greatest so as to achieve best possible therapeutic effect.

The 3D color image is compiled using patented software developed by UMC Utrecht spin-off, [CART-Tech B.V.](#) Apart from identifying the conduction delay area, the MRI scan also shows where the electrode wires should be positioned least of all, such as near the site of a myocardial infarction or near the phrenic nerve.

Better clinical prospects

Mathias Meine says, "Now that we're able to optimally visualize the various areas of the heart, a more accurate positioning of the stimulation wires should help increase the number of patients in whom the pacemaker works well the first time round. The procedure also takes less time, because we can directly position the wires at the correct locations. This is a major advantage for both patients and the health care provider: the procedure is shorter and more straightforward, the patient is subjected to less radiation and the result is better. This enhances the clinical prospects and quality of life, while making substantial cost cuts.

Heart failure

According to the [Dutch Heart Foundation](#), every year more than 25,000 people are diagnosed with heart failure in the Netherlands. Potential causes of heart failure are myocardial infarction, high blood pressure and cardiac arrhythmia. There are nearly 142,000 heart failure patients in the Netherlands, of whom 85 percent are over 65 years old. Every year nearly 7,000 patients die from this disorder. About 35 percent of patients are eligible for a CRT.