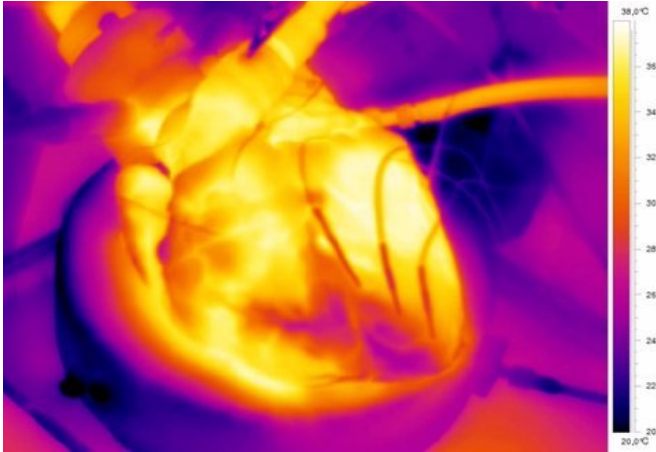


Localized cooling of the heart limits damage caused by a heart attack

12 January 2018



A thermal image of a localized cooled heart. The dark spot at the bottom is the cooled part. Credit: Eindhoven University of Technology

Cardiologists at the Catharina hospital in Eindhoven have succeeded in the localized cooling of the heart during a heart attack, a world first. By cooling part of the heart prior to and following angioplasty, the cardiologists believe that the damage from a heart attack can be limited. On 11 January cardiologist Luuk Otterspoor received his doctorate at Eindhoven University of Technology for this study.

The innovative new procedure was co-developed with scientists of the university in Eindhoven and the company LifeTec Group, a university spin-off.

"We have demonstrated in 10 patients that it is technically possible to cool part of the [heart](#) safely during a heart attack," says cardiologist/intensivist Luuk Otterspoor. "You can compare it with [cooling](#) the knee following a sports collision, for example, where an inflamed reaction occurs and the knee swells. To avoid this swelling, therefore, the muscles are often immediately cooled. We now

apply the same principle to the [heart muscle](#). By cooling the part of the heart that is affected by a clogged or constricted [coronary artery](#), there is less damage to the heart muscle after the constriction is opened up. We believe that this can ultimately reduce the impact of the heart attack and damage to the heart by some 20 to 30 percent."

For patients that have suffered an [acute heart attack](#), there is the risk that some of the [heart muscle tissue](#) will die. So during an angioplasty procedure, the constricted coronary artery is opened up as quickly as possible. However, once the blood begins to flow again, this always causes additional damage to the heart muscle. The [heart muscle cells](#) swell and this pressure causes the capillaries to close. The result is irreversible damage. Otterspoor: "That consequential damage, or reperfusion injury as it is known, is what we want to limit using this new method. It has been internationally demonstrated in animal models that cooling works but to date it has not been possible to localize the cooling of a human heart."

The cardiologists cool the heart down to 4 to 5 degrees by injecting a fluid just past the closure in the coronary artery. The affected part of the heart is then cooled for ten minutes, at which point the coronary artery is opened with a tiny balloon, whereby the blood can again flow to the affected part of the heart. Otterspoor: "After this we cool the heart again for a further ten minutes and place a stent in the constriction."

For the ten patients that have undergone the new treatment, it has been shown that the methods are safe as well as technically feasible and practicable. During the new treatment the clogged up coronary artery is kept closed for 10 minutes longer. "Patients feel pressure on the chest for a further 10 minutes as a result but it is worth it in view of the [health benefits](#) in the longer term." The cardiologists expect that this new method will boost the survival chances of patients who have suffered

a heart attack and will run less of a risk of the same occurring during the rest of their lives, a complication that is more likely to happen if the patient has had a [heart attack](#) previously.

The Catharina Heart and Vascular Center is now starting a major European follow-up study to further test the effectiveness of this method and examine what the health benefits are for patients who undergo local heart cooling. This study is being carried out in six large European heart centers. In addition to the Catharina hospital, the other heart centers are in Aalst (Belgium), Glasgow (Great Britain), Copenhagen (Denmark), Orebro (Sweden) and Budapest (Hungary). 100 patients will receive this new treatment method at these centers over the coming period. A randomized controlled trial will compare this group with 100 other [patients](#) that receive the old, traditional angioplasty treatment. "We expect to have hard facts and figures in three years on the health benefits of this new approach," says Otterspoor. The study is being led by prof. dr. Nico Pijls.

Provided by Eindhoven University of Technology

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