New software better able to predict leakage around aortic stents

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Researchers at the St. Antonius Hospital Utrecht/Nieuwegein and the University of Twente have developed software to better predict the risk of blood leaking around a patient's aortic stent. Last week, Richte Schuurmann, a Technical Physician, was awarded a Ph.D. by the University of Twente for his research on this topic.

Each year, approximately 2700 people in the Netherlands undergo surgery for an aneurysm (dilation) in their abdominal aorta. These procedures usually involve inserting a stent into the aorta, using a minimally invasive surgical procedure. The purpose of this endovascular aneurysm repair (EVAR) procedure is to reduce the pressure on the aneurysm. A number of studies have shown that, within five years, approximately five percent of these patients experience leakage around the stent. This can cause renewed pressure on the aneurysm which, in the worst case scenario, could then rupture. If this were to happen it could have very serious consequences, possibly even resulting in the patient's death.

Researchers at the St. Antonius Hospital in Nieuwegein and the University of Twente have developed and patented a new approach. Based on existing CT scans, this method is better at predicting the risk that a patient's aortic stent will leak.

How the stent works

The stent inserted into the aorta is shaped like a pair of trousers. At the top, it is anchored to the aorta by barbs. At the bottom, the stent's 'trouser legs' are inserted into the left and right iliac arteries. Ideally, the top of the stent should be located as close as possible to the lower renal artery. This maximizes the area of contact between the stent and the non-dilated section of aorta, creating the best possible connection. The top of the stent should preferably be located about 15 millimetres above the aneurysm. One month after surgery (and, often, once again a year after), the patient has a CT scan to check for any leakage, to see whether the aneurysm has shrunk, and to confirm that the stent is still in the right position. Dr. Schuurmann explains that "this is necessary because the human heart beats at least 30 million times a year, which means that the stent is exposed to considerable forces."

Based on CT images alone, it is currently difficult to predict which patients will be at increased risk of leakage. "However," Richte Schuurmann says, "at the moment we are only using a small part of the information contained in these images." To remedy this situation, the researchers developed software to accurately determine the coordinates (position) of the stent, the aneurysm and the arteries. This enables you to clearly visualize the total area of stent that is physically anchored to the arteries. It also shows whether the stent has been fitted 'snugly enough' into the aorta.

The results to date have been very encouraging. However, according to Dr. Schuurmann, more research is needed before this software can be routinely used in healthcare. For instance, the system has not yet been used "predictively." As a result, he is calling for extensive follow-up studies, involving data from an even larger group of patients.

Provided by University of Twente