MedicalXpress

New MRI technique could expand treatment options for stroke victims

May 28 2015, by Thomas Deane

A recent study by scientists from Trinity College Dublin has shown how a new MRI scanning technique, which looks at sodium levels rather than water levels in the brain, offers the potential to extend the time-window during which drug therapy may be given to stroke patients.

A paper on the study was recently published in the Nature group Journal of Cerebral Blood Flow and Metabolism, and represents the culmination of several years of collaborative research between Professor of Medical Physics at Trinity, Andrew Fagan, who is also of the HRB Centre for Advanced Medical Imaging (CAMI) research centre in St. James's Hospital, Dr Friedrich Wetterling, and Professor Mhairi Macrae in Glasgow.

The vast majority of cerebral strokes are caused by a blockage in one of the arteries in the brain. The cells within the brain tissue, which were being fed by the blocked artery, will suffer what is known as 'bioenergetics failure' and die within minutes of the blockage.

However, tissues in the surrounding areas of the brain may have a residual trickle-flow of blood, which may allow them to survive for several hours. This tissue area, called the penumbra, could be saved by a timely therapeutic intervention in the Emergency Department. And the more that is saved, the less damage there is to the brain.

However, to date, the difficulty has been in determining whether a patient has any penumbra tissue, or tissue that can still be saved, by the

time they present at the Emergency Department. And because of possible side effects with current clot-busting drugs for stroke, clinicians must be conservative in administering it.

In fact, current guidelines only allow for this administration within a four-hour time window from stroke onset, which means that only a small percentage of patients can avail of this treatment. Traditional MRI scanning techniques, which scan for water molecules in the body, do not provide clear enough data on the existence of penumbra tissue.

This new research may open up the time window, by providing a non-invasive imaging technique that can detect the presence of penumbra tissue. This is based on subtle changes in the concentration of sodium atoms in the cells affected by the reduced blood flow, which alters the functioning of the energy-hungry sodium-potassium pump across the cellular membrane in the cells.

Using the sodium-MRI technique, the researchers were able to demonstrate that the sodium concentration decreased by approximately 12% in penumbra tissue, thereby providing a novel way of detecting the presence – or indeed absence – of this tissue.

According to Professor Fagan of Trinity and the HRB Centre for Advanced Medical Imaging (CAMI) research centre in St. James's Hospital: "While still many years away from a clinical diagnostic tool, in the future it is hoped that patients presenting at the Emergency Department could undergo this scan to determine whether they have any residual penumbra tissue, which may guide the decision to administer the therapeutic drugs well beyond the 4-hour time window."

Provided by Trinity College Dublin