

New imaging technique signals a breakthrough in the treatment of IBS

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Scientists at The University of Nottingham are leading the world in exploiting MRI technology to assist in the treatment and diagnosis of Irritable Bowel Syndrome (IBS), a condition that causes serious inconvenience and discomfort to sufferers.

In three separate studies, researchers examined the condition in detail and uncovered a novel way of investigating the illness, which could have major implications in how it is both diagnosed and treated in the future.

The three papers examine the effectiveness of using MRI to study the colon, which has a number of unique advantages. Previously, doctors have relied on x-rays to view the colon, which has limitations due to the risks associated with radiation. By using MRI as an alternative, the researchers have been able to image the [bowel](#) continuously with no risk to the patient, enabling them to learn more about the inner workings of the gut.

The research has been led by academics at The University of Nottingham's Digestive Diseases Centre (NDDC) and scientists from the Sir Peter Mansfield Magnetic Resonance Centre at the University. The work is funded by the Medical Research Council, Wellcome, the National Institute for Health Research, the Biotechnology and Biological Science Research Council, as well as industry.

In the first study, 'Fasting and post-prandial volumes of the undisturbed colon,' published online in *Neurogastroenterology and Motility*, scientists

were able to image the colon and divide it into three functional regions—the ascending colon, which is a storage and fermentation area, where unabsorbed residue is broken down by bacteria; the transverse colon, which is a storage area for the residue remaining after bacterial processing, and the descending colon which is a propulsive organ which pushes waste down and out of the body.

With MRI, scientists can also measure the volumes of these regions, which they have never been able to do before.

Professor Robin Spiller is Lead Director of Nottingham Digestive Diseases Biomedical Research Unit which supported this work. The NDDBRU is funded by a five year grant from the NIHR.

Professor Spiller said: "We studied people with accelerated transit and to our surprise, we found that the colon size was rather similar to those with normal transit—suggesting people regulate their bowel habit to keep the colonic size constant. We also know that when you eat a meal the ascending colon expands as the meal is pushed down into it to make space in the [small bowel](#) for the new meal.

"We found that this increase was smaller in IBS patients than in healthy volunteers, suggesting that the IBS patient's ascending colon can't relax enough. With MRI we can actually measure this change in a way that we've never been able to do before. This will have other benefits in the future, for instance we will be able to measure the effect of some drugs on the bowel."

In the second paper—'Novel MRI tests of oro-caecal transit time and whole gut transit time: studies in normal subjects,' published online in *Neurogastroenterology and Motility*, scientists used MRI to measure the actual time it takes for contents to transit the bowel, using specially designed MRI visible markers which subjects ingest. Scientists can then

image the bowel 24 hours later to see how far they have moved. Previously, motility had to be measured using x-rays which has seriously limited the situations when the measurement could be made.

"The use of x-rays in this type of procedure is undesirable for children or young women of child rearing age—which is unfortunate as both of these groups can suffer with [bowel function](#) that may need investigating. So developing this alternative method of examination has particular appeal, particularly in children—who tend to suffer with a wide range of bowel problems," says Professor Spiller.

"Previously, clinicians have had to rely on what the children and their parents say about their illness, which isn't a reliable guide to work out what is going on in the bowel. Having an objective technique, such as our new MRI technique, to be able to assess whether someone has normal or delayed transit in their bowel, will be very useful in the management of IBS and also potentially in its treatment."

In the third study—'Differential effects of FODMAPS on small and large intestinal contents in healthy subjects shown by MRI' published online in the *American Journal of Gastroenterology*, researchers used the colonic imaging technique again, but this time, to improve their understanding of the causes of IBS.

By looking at fructose, a sugar commonly found in fruit, and fructans, which are polymers of fructose, researchers were able see what effects these had on the gut of healthy volunteers.

"We already know that fructose is difficult to absorb, but the novelty with this new method, is that we are now able to image the end effect of this mal-absorption which is the distension of the small intestine and colon. We are currently repeating these studies in patients with IBS to see whether their symptoms correlate with the distension of the colon."

Fructans and fructose are part of a group of chemicals called FODMAPs—which are Fermentable Oligo, Di—Mono Saccharides and Polyhydric alcohols, whose characteristics are that they are relatively hard to absorb, but they are fermentable, so when they go in to the colon they are exposed to the bacteria and produce gas.

Professor Spiller continues: "It's been found that diets that restrict the intake of these things improve symptoms and our MRI studies show us scientifically why that improvement might occur. We were able to show that while fructose alone was poorly absorbed and distended the small bowel, when it was combined with glucose the poor absorption was prevented. We also found that fructans have little effect in the small bowel but a large effect on the colon. In future, will be able to use our MRI techniques to test specific foods to understand how they will affect IBS.

"By defining the link between the chemistry of food to its impact on the bowel our technique will enable us to answer specific questions—e.g—when an apple ripens and the sugar content rises—does the adverse effect reduce? This might explain why green apples can cause stomach ache while ripe ones do not. The fructose in the green apple is malabsorbed but as it ripens the glucose content rises improves fructose absorption, improving the rate of absorption."

More information: Pritchard, S. E., Marciani, L., Garsed, K. C., Hoad, C. L., Thongborisute, W., Roberts, E., Gowland, P. A. and Spiller, R. C. (2014), "Fasting and postprandial volumes of the undisturbed colon: normal values and changes in diarrhea-predominant irritable bowel syndrome measured using serial MRI." *Neurogastroenterology & Motility*, 26: 124–130. [DOI: 10.1111/nmo.12243](https://doi.org/10.1111/nmo.12243)

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