Molecular Imaging: Finding The Root of Rheumatoid Arthritis

A team of researchers has presented a study at the 2014 annual meeting of the Society of Nuclear Medicine and Molecular Imaging, announcing the development of an innovative molecular imaging technique capable of visualising joint inflammation.

By using multiple molecular imaging systems, positron emission tomography (PET) and single photon emission tomography (SPECT), the team has successfully given clinicians a clear interpretation tool for the persistent pain and joint destruction caused by rheumatoid arthritis, a condition affecting almost half of adults nearing retirement age.

The visualisation was made possible through the use of specialised detectors that pick up signals from injected radionuclide imaging agents. Researchers assessed anti-fibroblast activation protein (FAP) antibodies involved in the inflammation linked to rheumatoid arthritis. This was achieved with radiotracers, which combine the molecular compound 28H1, capable of binding to FAP in the body, with the radionuclides In-111, used in conjunction with SPECT imaging systems, and Zr-89, used with PET systems.

Peter Laverman, PhD, assistant professor of nuclear medicine from the department of radiology and nuclear medicine at Radboud University Medical Center in Nijmegen, The Netherlands, remarked that it was the first time radiolabeled anti-FAP antibodies had been used in molecular imaging for rheumatoid arthritis. He explained that these antibodies had proven successful in cancer imaging, but could also be used to image FAP expressed on activated fibroblasts in arthritic joints. Via SPECT and PET imaging in a preclinical study using small animal scanners, the team uncovered a high accumulation of radiolabeled anti-FAP antibodies in arthritic joints.

In comparison to another antibody agent evaluated as a control, study findings regarding In-111 28H1 and Zr-89 28H1 showed a three to four times higher increase in imaging agent engagement, or uptake, in inflamed joints. When evaluating FDG, a very commonly used imaging agent, to visualise the inflammation uptake of this agent was not associated with the severity of inflammation, proving that 28H1 tagged with either In-111 or Zr-89 is a superior method for imaging arthritis.

Laverman estimated that further research periods of two to three years were required prior to receiving mainstream clinical practice approval for the use of these agents for arthritis imaging.

An autoimmune disorder with unknown root causes, the chronic inflammation resulting from rheumatoid arthritis affects one in five Americans. In 2013 data, the US Centers for Disease Control and Prevention (CDC) reports close to 50 percent of those aged over 65 years suffer from some form of arthritis, gout, rheumatoid arthritis, fibromyalgia or lupus.

Scientific Paper 329: Peter Laverman, Danny Gerrits, Tessa van der Geest, Marije Koenders, Wim Oyen, Otto Boerman, Radboud University Medical Center, Nijmegen, Netherlands; Tapan Nayak, Hoffmann-La Roche, Basel, Switzerland; Anne Freimoser-Grundschober, Christian Klein, Roche-Glycart AG, Schlieren, Switzerland, "PET and SPECT imaging of rheumatoid arthritis with radiolabeled anti-FAP antibody correlates with severity of arthritis," SNMMI's 61th Annual Meeting, June 7–11, 2014, St. Louis, Missouri.

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