



Advanced Imaging Technology to Predict Heart Attacks

New research by scientists in the field of imaging has come up with a technology that might help not just stop a heart attack in the making but also prevent them from ever occurring. For the first time, researchers have used multi-detector computed tomography (CT) imaging in combination with a novel contrast agent to detect dangerous, high-risk plaque in blood vessels.

Plaque, when present in high levels, can cause heart attack and stroke. High-risk plaque is characterized by its cellular and biological structure. Such plaque, when rich in macrophages or cells can rupture them, leading to a heart attack or stroke. So far researchers have had success only in identifying high-risk plaque in coronary arteries; however they haven't been able to determine the composition of dangerous plaque as it requires special imaging. This was proving to be a major hurdle in pre-empting and preventing cardiac events.

For the new technology, researchers at the Mount Sinai School of Medicine led by Zahi A. Fayad used a novel agent known as N1177 in combination with multi-detector CT to check the composition of plaque. The research team used N1177, which is an iodinated nanoparticulate contrast agent to detect macrophages in an animal model with 64-slice CT.

The animal model used had high-risk plaque with high levels of macrophages that was comparable to human coronary plaque in size and content. Researchers first injected N1177 into the plaque and then compared the enhanced macrophage rich plaque with the results obtained from a conventional CT contrast agent.

They found that in comparison to the injection of a conventional CT contrast agent, injection of N1177 significantly enhanced the macrophage rich plaque and made it specific and clearer in the inside of the vessel wall.

We were amazed at these results. The introduction of N1177 allows us for the first time to look

directly at the coronary arteries and pinpoint these dangerous, heart attack causing plaque, said Dr. Fayad, who is Professor of Radiology and Medicine (Cardiology) and Director of the Translational and Molecular Imaging Institute at Mount Sinai School of Medicine.

Coronary CT imaging has advanced the diagnosis and prognosis of heart disease, said Dr. Fayad. But, what if we had the opportunity to prevent a heart attack from happening? This modality may allow us to do just that. The researchers believe their findings, which are published in the May issue of *Nature Medicine* and available online before print, may help physicians diagnosis a heart attack before the attack occurs.

N1177 had successfully progressed through Phase 1 clinical trials for use as a cancer staging agent, said Don Skerrett, CEO of NanoScan Imaging, LLC, which provided the N1177. The unique properties of N1177 make it a versatile agent with a range of applications including, intravenous administration for the assessment of atherosclerosis and identification of vulnerable plaque, inhalation delivery for improved lung cancer staging and subcutaneous delivery for assessing cancerous extension into lymph nodes.

The Mount Sinai researchers believe their development might have broader clinical implications. N1177-enhanced CT will be helpful for diagnosis and prognosis of disease states. In the future, this technology may allow for the targeting of macrophages to specifically dispense therapeutic agents to disease tissue.