Dual agent scan differentiates diabetic foot disorders

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Researchers are kick-starting better diabetic foot care and promoting reduced radiation dose with a new take on a hybrid molecular imaging technique. By targeting both bone cell activity and immune response and improving imaging data interpretation, doctors can better distinguish diabetic foot infection from another common foot condition that often requires an additional bone-marrow scan for definitive diagnosis, say researchers presenting a study at the Society of Nuclear Medicine and Molecular Imaging's 2013 Annual Meeting.

Diabetes, if not well managed, can damage blood vessels and nerves, causing poor circulation, reduced healing, a condition called neuropathy and loss of sensation, especially in sufferers' feet. In time, infection can develop in soft tissues and spread to bone (osteomyelitis), and weight-bearing joints can degenerate in a condition called Charcot joint, named after the discoverer of the disease. This study reveals that with enhanced visual and data analysis of standard hybrid imaging that combines agents targeting bone cell activity and white blood cell immune response, physicians can accurately diagnose diabetic foot disorders and avoid second-day bone marrow imaging.

"Optimizing imaging protocol for detection and localization of diabetic foot conditions aids attending physicians in distinguishing between true bone infection and bone marrow overgrowth associated with Charcot joint," says Sherif Heiba, MD, director of nuclear medicine residency program and associate professor of radiology at Mount Sinai School of Medicine, New York, NY. "This helps patients considerably by not only

eliminating unnecessary scans but also reducing imaging time and the total radiation dose required to make that determination."

Current imaging standards advise an additional bone marrow scan if initial scanning comes back positive for white blood cell activity in foot bone, indicating osteomyelitis but also possibly caused by hyperplasia, a proliferation of cells in the bone marrow of patients with Charcot joint. In this study, researchers investigated new data analysis for single photon emission computed tomography (SPECT) and computed tomography (CT), which together provide both biological and anatomical information about diabetic food disorders. The combination of imaging agents technetium-99mhydroxymethylene diphosphonate (HDP)—an expert biomarker for targeting bone—and a white blood cell or leukocyte biomarker that seeks out hot spots of infection can provide new comparative imaging data that make accurate diagnosis possible with a single scan.

A total of 22 diabetic patients were imaged with dual-isotope SPECT/CT for suspected diabetic foot infection. Scanning detected 27 lesions, 10 of which were confirmed as osteomyelitis. Osteomyelitis correlated with adjacent deep soft tissue infection in white blood cell SPECT/CT scan in nine of the 10 lesions. Researchers also analyzed patterns of wash-out of the white blood cell imaging agent to differentiate actual osteomyelitis from Charcot joint. Initial scans for 15 of the 17 lesions that were confirmed to represent Charcot joints showed white blood cell wash-out. Results were confirmed by an additional bone marrow scan, proving that dual-isotope bone and white blood cell SPECT/CT scan can positively identify osteomyelitis from Charcot joint without an additional bone marrow scan.

This study shows that accurate detection, differentiation and localization of foot disease with this molecular imaging technique can improve the lives of diabetic patients while simplifying the current imaging standard

and reducing overall radiation exposure. Further investigation is needed to replicate these results in order to implement a change in standard imaging practice for diabetics with suspected foot infection.

An estimated 347 million people worldwide are currently living with diabetes, according to 2013 diabetes statistics from the World Health Organization. The highest rates of hospitalization due to diabetes complications relate tofoot infections that refuse to heal.

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