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MEDIA RELEASE

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Osteoarthritis assessment to go hi-tech

Scientists have reported an advanced new imaging technique that allows the condition of joint cartilage to be examined—right down to a molecular level. The technique has potential for diagnostics and treatment-planning of cartilage disease and impairment, including for osteoarthritis.

“Damage and degradation of cartilage around joints leads to severe pain and loss of mobility,” says Dr Saabah Mahbub, Research Fellow at the ARC Centre of Excellence for Nanoscale BioPhotonics (CNBP) and lead author of the published study.

“We need a tool to help us to determine objectively, the degree of problem that the joint cartilage is exhibiting. We then need a way to be able to monitor the effectiveness of any cartilage regeneration therapies that are able to be undertaken,” he says.

“Ideally we need to be able to do this monitoring at a molecular level and in a minimally invasive way.”

A cutting-edge technique termed hyperspectral imaging was used by Dr Mahbub to achieve this. This combined the power of an advanced optical microscope together with high powered data analysis, to measure and image the electromagnetic light-waves being given off by the cartilage tissue and cartilage cells known as chondrocytes.

“In this study, we applied our advanced hyperspectral microscopy to osteoarthritic human cartilage—to investigate its capacity to generate molecular data and to help us characterise the cartilage disease-state, as well as to examine potential treatment effects,” he says.

“Using this approach, we were able to identify types and amounts of collagen (collagen I and collagen II) in the cartilage tissue as well as to test for the specific co-enzymes FAD and NADH in the chondrocytes.”

In a breakthrough for Dr Mahbub, the hyperspectral-based study was also capable of detecting effects related to cartilage treatments (in this case the use of secretions from stem cells). This was indicated by hyperspectral imagery indicating changes in the composition of the cartilage – ratios of collagen I to collagen II – when comparing pre and post cartilage treatment activity.”

“We believe that levels of collagen I, collagen II and associated proteins may be sensitive to improvements in cartilage health and could be used to monitor patient progression and to discern between effects of different osteoarthritis therapies,” says Dr Mahbub.

It is envisaged that, in the future, this new imaging technique will be available to patients in a clinical setting where it would be deployed endoscopically through small incisions in targeted areas of the body.

Next steps for Dr Mahbub and the research team are to further investigate the molecular underpinnings of the progression of cartilage deterioration as well as regeneration.

This research was reported in the journal ‘Scientific Reports’ with scientists affiliated with CNBP, Macquarie University, UNSW Sydney, Quantitative Pty Ltd and Regeneus Pty Ltd. Dr Saabah Mahbub was a CNBP Research Fellow based at Macquarie University when the research was undertaken.

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PAPER:
Non-Invasive Monitoring of Functional State of Articular Cartilage Tissue with Label-Free Unsupervised Hyperspectral Imaging.
URL: https://rdcu.be/bqPpG

IMAGES:


Dr Saabah Mahbub, CNBP - https://flic.kr/p/2f4MmiU


Examining joint cartilage - https://flic.kr/p/2dKAhxt

Examining joint cartilage - https://flic.kr/p/T1gs7j

ABOUT:
The Centre for Nanoscale BioPhotonics (CNBP) is an Australian Research Council Centre of Excellence, with research focused nodes at the University of Adelaide, Macquarie University, RMIT University and Griffith University. A $40m initiative, the CNBP is focused on developing new light-based imaging and sensing tools, that can measure the inner workings of cells, in the living body. http://cnbp.org.au/

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