

Stem cell treatment offers hope to patients with damaged knee cartilage

High success rate in cartilage regeneration among people suffering from this condition: NUH study



Knee osteoarthritis is estimated to affect as many as 350 million people worldwide, with patients becoming increasingly younger. PHOTO: ISTOCKPHOTO

Clara Chong

The use of stem cells derived from the bone marrow to regenerate damaged cartilage in the knees offers new hope to younger active patients who suffer from cartilage degeneration.

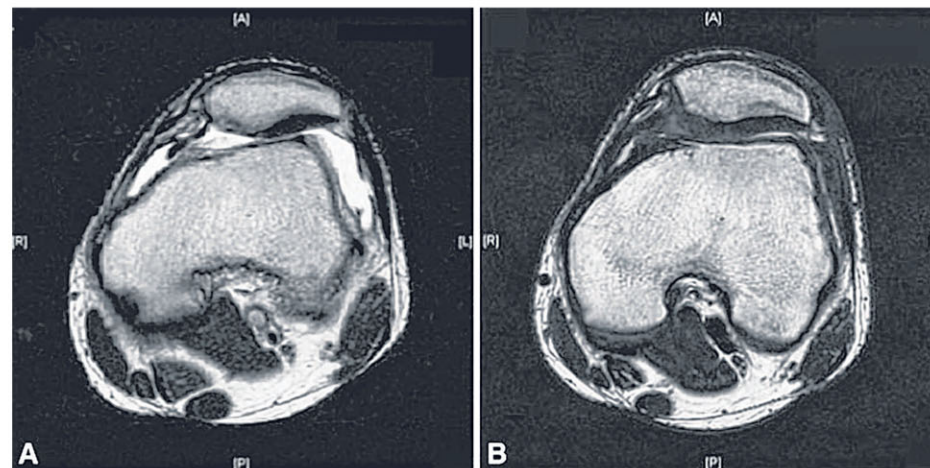
In a study of 440 knees of 392 patients at the National University Hospital (NUH), the use of stem cells has shown an 80 per cent success rate in two years and a 72 per cent continued success rate over 10 years, where patients do not need an additional procedure.

These patients were followed for two to 14 years.

This treatment involves the harvesting of a patient's stem cells from the lower back region, followed by the culturing of these cells in the lab. The cultured cells are then injected back into the damaged knee cartilage, where they develop into new cartilage tissue.

Cartilage acts as a bouncy cushion between bones at the joints. When this cartilage is damaged by trauma and injury or disease, or worn out with age or by overuse, the bones can rub directly against each other, resulting in pain and inflammation. The breaking down of cartilage in the knee joint is known as knee osteoarthritis.

This condition is estimated to affect as many as 350 million people worldwide, with patients becoming increasingly younger. They tend to lead an active lifestyle, resulting in increased wear and tear



Magnetic resonance imaging scans of a patient with damaged cartilage (image B) before surgery and after stem cell treatment (image A). The white parts are representative of new cartilage tissue. PHOTO: PUBMED.NCBI.NLM.NIH.GOV

of the knee joint as well as a higher possibility of knee injuries.

Other factors that predispose people to knee osteoarthritis include malalignment of the knee and predisposed cartilage defects since a young age.

The regeneration and repair of the cartilage is difficult due to a lack of blood supply to the area that is necessary in the creation and duplication of cells.

Stem cells are special human cells that have the ability to develop into many different cell types, ranging from muscle cells to brain cells. However, their unique properties also present risks. For

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instance, the stem cells used here could potentially develop into nasty tumour cells instead of cartilage tissue, resulting in cancer.

But Professor James Hui from NUH, who led the study, said the researchers have not seen a single case of cancer in the knees in any of the patients.

But not all patients are suitable for this procedure.

Prof Hui, who is head and senior consultant of the department of orthopaedic surgery in NUH, added: "We usually prefer seeing patients below the age of 60 as the ability for the cartilage to regenerate is higher for younger patients. More impor-

tantly, the cartilage defects have to be localised, and surrounding joint tissue needs to be healthy."

Based on magnetic resonance imaging scans, the regenerated cartilage is structurally similar to the original cartilage. But it remains to be seen if they have the same degree of functionality and if the regenerated cartilage is as durable in the long run.

Currently, damaged cartilage can be treated through a technique called microfracture. Tiny holes are drilled in the surface of a joint, signalling to the body to create new tissue in the joint.

However, the new tissue is not much like cartilage. It has been reported that this new tissue, otherwise known as fibrocartilage, is more like scar tissue than natural cartilage. It covers the bone and helps to offer some protection, but lacks the elasticity of natural cartilage and also tends to degrade relatively quickly.

Another technique, which is still being researched and experimented on, is autologous chondrocyte implantation (ACI), Prof Hui said. ACI is a process where cartilage cells (chondrocytes) are collected before being multiplied in the lab and then re-implanted into the damaged area of the knee.

The latest ACI technology has shown improved results, Prof Hui said. However, some patients may still have reservations given that this is a two-step procedure done under general anaesthesia.

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