Bandage made of your own stem cells to fix a dodgy knee

By CAROL DAVIS

STEVE ROTHERY has always been keen on sport, and enjoyed yoga as well as surfing and snowboarding.

But in October 2013, after a night out with friends, the 40-year-old father of two woke up to find his left knee horribly swollen and painful.

'I had no idea why, and my GP referred me for an MRI scan,' says Steve, a banking project manager from Bristol.

'The surgeon explained that I had a tear right through the meniscus.'

The menisci are cushioning pieces of cartilage found in the knee joint that act as shock absorbers, and help lubricate the joint to reduce friction when you put weight on it.

Meniscal tears are common and are often caused by patients twisting a knee playing sport, but can occur in everyday life in older people, especially as their meniscus is thinner. Most of the meniscus has a poor blood supply, so many tears don't heal and the cartilage has to be removed to prevent lifelong pain.

Around 70,000 Britons have surgery for meniscal tears each year. But without the cushioning cartilage, half will develop osteoarthritis within five years.

'The surgeon explained that he'd need to remove my meniscus completely,' recalls Steve. 'Without it I could develop arthritis, as bone grinds on bone and causes more pain. I was horrified.

'My daughter, Elsie, was just one and I wanted to be a dad who could run around and play with her.'

Luckily for Steve, his surgeon — Mike Whitehouse, a consultant orthopaedic surgeon at North Bristol NHS Trust — was running a trial for a special internal bandage packed with stem cells and which promised to repair all types of meniscus tears.

Stem cells are the body's building blocks, which can grow into different types of cell in the body.

Steve joined the trial and was among the first patients to try it.

'We know that if we simply repair some tears using sutures, the repair will not last,' says Mr Whitehouse. 'It will fail within the first year, the pain and symptoms — such as the knee locking or giving way — come back and the meniscus stops protecting the joint. But using this new stem cell bandage can give lasting results because it can stimulate the meniscus to repair itself.'

First, surgeons extract stem cells from the patient's bone marrow and then grow them in a lab on a sheet of collagen (a protein that gives strength to most connective tissue in the body).

Two weeks later the fully developed stem cell patch is applied like a bandage around the torn meniscus, where it is thought to stimulate repair.

In November 2013, Steve underwent the first procedure to extract stem cells under general anaesthetic: 10ml of bone marrow was taken from his hip through a small incision. In a lab, the stem cells were spread on to a patch of collagen, and chemicals called growth factors were applied to the stem cells for two weeks until there were about 20 million of them.

Steve was then called back for a second operation to have the patch inserted.

This involved cutting a 3cm square of the stem cell patch and placing it around the torn meniscus via a small incision on his knee. The idea was that the stem cells would grow into new cartilage and repair the tear — a process that would take about 13 weeks.

Steve wore a knee brace for six weeks after the operation and had six months of physiotherapy to strengthen his knee.

Results of the trial were published recently in the journal Stem Cells Translational Medicine and showed that all five patients treated with the stem cell bandage had an intact meniscus after 12 months, and three still had an intact meniscus three years on. (The other two have since had further meniscus injuries.)

'Meniscal injuries are one of the most common,' says Mr Whitehouse. 'There is also potential for this to work for similar injuries elsewhere in the body, such as the hip and shoulder.

'It is less likely to be successful in an older population, where the meniscus is more prone to tearing, making it more likely to fail.'

RHIDIAN Morgan-Jones, a consultant orthopaedic surgeon at University Hospital Llandough in Wales, adds: 'For people in their 20s and 30s who face a big risk of osteoarthritis, it has to be a good thing.'

Professor Anthony Hollander, chair of stem cell biology at the University of Liverpool and co-founder of the firm that developed the procedure, says: 'We are developing another version of the bandage using stem cells donated by patients undergoing orthopaedic procedures, which will reduce the cost and remove the need for two operations.'

The bandage is available only as part of trials, but more are planned soon.

Steve's knee is now free from pain and he is exercising again. 'I'm so relieved to know I don't face arthritis, and can be an active dad once more,' he says.