



The Articular Cartilage Repair Service

Chester Knee Clinic at the Grosvenor Nuffield Hospital

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Autologous Chondrocyte Transplantation (ACT)

Patient and General Practitioner Information Sheet

Although articular cartilage is unable to repair itself, this advanced orthobiologic technology allows cartilage cells, known as chondrocytes, to be harvested from your knee and cultured and multiplied. The fresh chondrocytes are then re-implanted into your knee and cause hyaline-like cartilage to develop and repair the defect in the articulating surface. The technique of autologous cultured chondrocytes implantation was initially researched at the Hospital for Joint Diseases in New York and further developed at the University of Gothenburg and Sahlgrenska University Hospital, Gothenburg, Sweden, in an effort to provide a treatment option for people with joint cartilage damage.

ACT restores the articular surface with your own hyaline-like cartilage without compromising the integrity of healthy tissue or the subchondral bone. This technology has demonstrated significant benefits in patients with a femoral or patellar focal lesion, in terms of diminished pain and improved function. If you have this type of lesion, then ACT may be an appropriate treatment option. Suitable patients would be generally young and healthy individuals, who have had an injury to the knee, or a so-called osteochondritis dissecans lesion, over the past few months or years, and have continued to have pain, swelling and mechanical problems. Although cartilage damage is often associated with ligament and meniscal injuries, it is very important that the knee is stable and that there is no major meniscal deficiency or alignment problems, prior to cartilage repair. Patients with known allergy towards gentamycin or hypersensitivity towards products of bovine origin are unsuitable for this form of therapy. Other conditions in which treatment by ACT is not indicated include osteonecrosis, chondrocalcinosis, osteoarthritis, rheumatoid arthritis and total meniscectomy.

The procedure is initiated through a General Practitioner's or Consultant's referral letter and followed by out-patient assessment and a high-resolution cartilage-sequence Magnetic Resonance Imaging (MRI) knee scan. If the damaged articular area is suitable for ACT repair, the surgical procedure consists of two steps. The first step is a day-case arthroscopic surgery to assess the inside of the joint further and to obtain a small piece of healthy articular cartilage (biopsy). This sample of cartilage is sent to Verigen's tissue-engineering laboratory in Denmark. The first laboratory step is an enzymatic process which separates the chondrocytes from their matrix. Cell culture over a period of about 3-4 weeks induces them to multiply to about 15-20 million dedifferentiated cells. These are then placed into a special nutrient solution or on an inoculated collagen membrane (MACI[®]: Matrix-induced Autologous Chondrocyte Implantation) and sent back to arrive in time for the proposed date of implantation.

The second step is the re-implantation of the cultured chondrocytes. This procedure is done through an arthrotomy (open knee surgery): the surgeon debrides the cartilage defect down to the subchondral bone plate and prepares the recipient site. The defect area is covered with autologous periosteal or tissue-engineered collagen membrane, which is stitched or glued in place and sealed with fibrin adhesive. The chondrocyte suspension is injected into this "bioactive chamber". Within this chamber the cells will undergo re-differentiation and will be stimulated by growth factors to proliferate and regenerate their specific cartilage matrix.

Following this operation the leg is placed in a special hinged protective brace (we use The Sentry 2 (www.technologyinmotion.com), which will limit your flexion for the first 2 weeks. The main purpose of using the postoperative brace is to protect the repaired articular surface from too much compression and friction. We also use the Aircast® Cryo/Cuff device, which combines focal compression with cold to provide optimal control of swelling, oedema, haematoma, haemarthrosis, and pain (www.aircast.com).

To get the maximum benefit from ACI, you should adhere to your specific rehabilitation programme. This will include progressive weight-bearing, range of motion, and muscle strengthening exercises which commence as early as the day after surgery. When you successfully complete your rehabilitation, you should be able to resume normal activities, including sports.

The UK Articular Cartilage Repair Study requires follow-up MRI at 6 months postoperatively and re-arthroscopy and graft inspection/biopsy at 12 or 24 months. Both are required to monitor the development, the quality, and the integrity of the new articulating surface.

This is a new procedure and although it has been performed on over 4000 patients internationally, especially in Sweden and the USA, not every patient is suitable and not every patient achieves a completely satisfactory functional outcome. As with any other surgical procedure, there is a small risk of post-operative complications (bleeding, wound problems, skin and knee joint infection, deep venous thrombosis, graft hypertrophy, etc.). Before you sign your operation and UK Articular Cartilage Repair Study consent forms, please make sure that you have read this sheet and the attached brochure on Articular Cartilage Repair. Also, please visit: www.vtsi.de. If you have any questions or concerns please contact us by email: vbobic@msn.com.

Your arthroscopic and open surgery may be recorded digitally, kept as a part of your record, and used for research, outcome studies, training and educational purposes. Your personal and clinical data, video-clips and digital images will be stored and kept on a secure standalone computer, according to the Data Protection Act 1998 (www.dataprotection.gov.uk). This information will not be shared with anybody else, other than the Knee Cartilage Transplantation Service, RNOH Institute of Orthopaedics Stanmore, or used for any commercial purpose. If we wish to publish any of your clinical images, even if they do not identify you personally, we will ask for your written permission.

The Articular Cartilage Repair Service, founded and led by Mr Vladimir Bobic, is based at the Grosvenor Nuffield Hospital Chester. The Service provides treatment for patients with damaged articulating surfaces of the knee joint with ACT and several other cartilage repair technologies (microfracture, osteochondral autograft transfer, etc). Mr Bobic is a co-investigator in the UK Articular Cartilage Repair Study (the Stanmore ACT Project), led by Professor George Bentley, Director of Knee Cartilage Transplantation Service, RNOH Institute of Orthopaedics Stanmore (www.rnoh-stanmore.org.uk). The study is based on NICE (National Institute for Clinical Excellence, www.nice.org.uk) guidelines on the use of ACT for full-thickness cartilage defects in knee joints. The study is conducted according to Good Clinical Practices (GCP). The chondrocyte culture service is provided by Verigen Transplantation Service Limited.