Autologous Chondrocyte Implantation (ACI ACT, MACT, Maci)

Introduction

Autologous chondrocyte implantation – mostly known as - (ACI) is a relatively new, state-of-the-art procedure used to treat isolated full-thickness (down to bone) articular cartilage defects of the knee. It has been approved by the FDA USA and EMA Europe for the knee and hip joint. ACI has been widely performed for defects of all joints like shoulder, ankle and more in addition to other joints of the body. Autologous chondrocyte implantation is a two-stage operative procedure which could be performed totally minimal invasive.

Material and Methods

The first procedure is performed arthroscopically in less than 30 minutes. The surgeon will harvest a small piece of articular cartilage from the patient's joint, typically the size of one or two Tic-Tacs. This cartilage biopsy is then sent to a laboratory where the biopsy is treated in order to isolate the chondrocytes, which are the cartilage-producing cells of the body. Once these chondrocytes are obtained, they are then expanded in number and sent back to the surgeon approximately 3 to 8 weeks (depending on the company) later for implantation.

The second-stage operation is usually also an minimal invasive procedure (depending on the company and size of the cartilage defect) or open procedure whereby a small patch is sewn over the articular cartilage defect or so called spherocytes injected. The chondrocytes that have been harvested and expanded are then injected where they adhere to the patient's cartilage defect to form what is known as hyaline-like cartilage which resembles the native joint cartilage. Following implantation there is a period of restricted weight-bearing for up to 8 weeks. During this time, physical therapy emphasizing range-of-motion of the knee and strengthening activities is prescribed. A surgeon may also recommend the use of continuous passive motion (CPM) machine to improve the graft's success. Return to light sports activities is typically allowed at approximately 6 months with return to full sports activities between 9 and 12 months following the procedure based on the recovery.

Results

The overall success rate of ACI is approximately 85% in allowing patients to return to pain-free activities, which has been proven in many prospective randomized trials. Evidence level 1a. Therefore FDA and EMA proved.

Advantages

ACI is the only level 1a proved therapy which can result in regeneration of cartilage and can avoid further pain and disability of the joint function as well as total replacement of this joint. If it is done at an early stage of the cartilage lesion the joint is fully regenerated to its former condition.

Weakness

It needs 2 procedures and a recovery period. The costs are relatively high and higher as in an implantation of an artificial total joint.

Future perspective

Patients with pain and disability normally want to avoid a total joint implantation. Because of postoperative pain, danger of infections, malfunction and early loosening as well as it is a one-way road where you cannot come back to a naturally given joint with the potential of self - regeneration. Therefore, a society which preferres biological nutrition, medications and therapies will also prefer regenerative therapies. Regarding scientific proved cartilage regeneration, the ACI will be the future therapy for cartilage lesions.

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