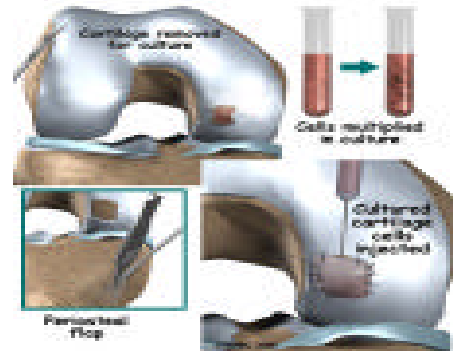


Stem Cell Regeneration: A Technique to Restore Articular Cartilage

Articular cartilage is elastic tissue, which covers the ends of bones and enables the bones to move smoothly over one another. When it becomes damaged through an injury or as it degenerates over time it causes much pain, swelling, and reduced mobility. Many Americans suffer from this but new technology and biological advances show promising techniques to restore the articular cartilage. These techniques include Osteochondral grafting, Autologous chondrocyte implantation, and Mesenchymal stem cell (MSC) regeneration. Osteochondral grafting can either use the patient's own tissue (autograft) or a donor's tissue (allograft). Here healthy cartilage is transported to the injury site of the patient. Autologous chondrocyte is used for younger patients, when the bone under the lesion is not badly damaged. This technique uses cultivated cartilage cells. Lastly the newest technique uses MSCs. These cells found in the adult bone marrow, capable of developing into bone, cartilage, heart muscle, and other tissues.

One study tested the potential of stem cells in the repair of damaged cartilage. This study used muscle-derived stem cells (MDSCs) engineered with a therapeutic protein (BMP-4) to repair the articular cartilage in rats. This protein is known to promote chondrogenesis, the formation of cartilage. This study induced damage to the knee joints of thirty-six (12-week old) rats, which were divided into three groups. Group 1 was treated with MDSCs embedded in fibrin glue, Group 2 was treated with the MDSCs engineered to express BMP-4, and Group 3 (control group) was treated with



fibrin glue. After eight weeks group 2 rats developed well-integrated repair tissue, which continued to enhance after 24 weeks. The other two groups showed little cartilage repair and by 24 weeks the tissue began to deteriorate. After the 24-week study, group 2 was found to have smooth, uniform tissue repair. This study showed that BMP-4 can enhance articular cartilage healing and that MDSCs proved to be a good carrier for the therapeutic gene.

Currently there is still no method to fully restore injured cartilage. Many people with articular cartilage problems have the osteochondral grafting or autologous chondrocyte procedure. These treatments have complications and require the patient to go through rehabilitation. This newer tissue engineering using stem cells is showing promising results and researchers hope that one day it will become the method to fully restore articular cartilage.

References

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