Repairing cartilage with fat: Problems and potential solutions

August 24 2012

Stem cells isolated from fat are being considered as an option for treating tissue damage and diseases because of their accessibility and lack of rejection. New research published in BioMed Central's open access journal *Stem Cell Research & Therapy* shows that this is not as straightforward as previously believed, and that fat-derived stem cells secrete VEGF and other factors, which can inhibit cartilage regeneration. However pre-treating the cells with antibodies against VEGF and growing them in nutrients specifically designed to promote chondrocytes can neutralize these effects.

Chondrocytes make and maintain healthy cartilage but damage and disease including osteoarthritis can destroy cartilage resulting in pain and lack of mobility. Stem cell therapy using cells isolated from adult tissue (such as fat) are being investigated as a way of repairing this damage. Stem cells have the ability to become many different types of tissue so the real trick is persuading them to become cartilage rather than bone, or blood vessels, for example.

Researchers from the Georgia Institute of Technology found that adipose (fat) stem cells (ASCs) secrete large amounts of factors, especially the growth factor VEGF, which prevent cartilage regeneration and actually causes the death (apoptosis) of chondrocytes along with the formation of blood vessels. Treating ASCs with medium designed to encourage their differentiation into cartilage cells was able to reduce the amount of these secreted factors and also prevented the growth of blood vessels. Specifically, an antibody designed to neutralize VEGF prevented

chondrocyte apoptosis.

Prof Barbara Boyan, who led this research, explained, "Non-treated ASCs actually impeded healing of hyaline cartilage defects, and although treating ASCs improved the situation they added no benefit to compared to cartilage allowed to heal on its own. However we only looked at cartilage repair for a week after treatment, and other people have shown that two to six weeks is required before the positive effect of ASCs on influence cartilage regeneration is seen."

So while stem cells from fat may be able to help repair damaged cartilage, careful handling and pre-treatment may be required to ensure a positive result.

Provided by BioMed Central