Cartilage regeneration possibilities may improve with fetal cartilage cell transplantation

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The self-repair of injured cartilage is difficult for several reasons, foremost of which is the lack of blood supply to the tissue. Therapeutic efforts aimed at cartilage repair are often not optimal. Surgical repair techniques often lead to the formation of fibrocartilage, which is weaker and less durable. Although cell transplantation aimed at cartilage repair has been carried out using mesenchymal stem cells (MSCs), varying outcomes have resulted, despite the propensity of MSCs to proliferate and differentiate.

In an effort to obtain better cartilage repair outcomes from cell transplantation, a research team in Korea conducted a study comparing the regenerative capabilities of transplanted MSCs derived from young donors (ages 8-25) to transplanted fetal cartilage-derived progenitor cells (FCPCs). In in vitro laboratory studies they found that the FCPCs are "more active" in terms of proliferation and differentiation than the MSCs, and provided superior cartilage repair.

Their study will be published in a future issue of *Cell Transplantation* and is currently freely available on-line as an unedited early e-pub.

MSCs have the ability to self-renew and differentiate into a variety of specialized cell types, such as osteoblasts (cells contributing to bone formation), chondrocytes (cartilage cells), adipocytes (fat cells), myocardiocyte-like cells (the muscle cells that make up the cardiac

muscle), and neuron-like cells (nervous system cells). However, MSCs have not provided optimal results when used to repair cartilage.

"We demonstrated the potential of FCPCs as a novel source for cartilage regeneration," said study co-author Dr. Byoung-Hyun Min of the Anjou University School of Medicine. "However, ethical concerns must be discussed in depth before FCPCs can be considered for therapeutic use."

According to the researchers, Korea has well-defined guidelines and regulations concerning the use of fetal tissues, which mandate that all tissues must be obtained from fetuses deceased in utero from natural causes, thus avoiding controversy.

"Securing a good source of FCPCs while following the ethical and legal guidelines should be one of the first tasks for the commercialization of FCPCs," wrote the researchers, who reported that the FCPCs showed yields approximately 24 times greater than those produced by MSCs.

"Fetal cartilage is an immature tissue that is not fully differentiated into cartilage, and the FCPCs may possess some stem cell properties, such as a self-renewal and multi-lineage differentiation ability that exceeds that of bone marrow-derived MSCs from the young donors," explained Dr. Min.

The researchers concluded that "to an extent" FCPCs have stem cell properties and are similar to MSCs, but because they possess greater proliferation and differentiation capabilities than MSCs they should be considered for therapeutic applications.

"While our study suggests that FCPCs are a potential cell source for cartilage regeneration, it is necessary to further identify their characteristics and therapeutic utility for additional clinical applications," the researchers concluded.

"The reported study aimed to demonstrate the high regenerative potential of fetal progenitor cells," said Prof. Yang (Ted) Teng of BWH/Harvard Medical School and VABHS and Dr. Inbo Han of CHA Bundang Medical Center, Korea. "FCPCs appear to be a very useful cell source for cartilage regeneration because the authors harvested a large number of cells from a small amount of tissue. However, potential of functional improvement must be evaluated in future in vivo studies. Furthermore, immunogenicity as well any possible tumorigenicity must also be verified. Importantly, to address ethical concerns regarding fetal tissue research, scientifically solid protocols under standardized regulations should be in place for supporting such studies before this approach could be translated further towards clinical applications."

More information: http://ingentaconnect.com/content/cog/ct/pre-prints/content-CT-1209_Choi_et_al

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