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"Stem cell therapy: Boon for osteoarthritis?: Review article."

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Abstract:

Aging and Health is the theme of world health day 2012.However worldwide, osteoarthritis (OA) is estimated to be the fourth leading cause of disability.Most of this disability burden is attributable to the involvement of the hips or the knees. The large and expanding body of publications utilizing stem cell technology in orthopedic applications indicates that the infusion of stem cells and growth factors result in the modulation of T cell activity, decreased inflammatory chemicals and the stimulation of the chondocytes. The advantage that stem cell treatment has over joint replacement surgery is that it's much less invasive. Stem cell therapyVs total knee replacement therapy for osteoarthritis-Long term results of knee replacement have not yet fully established. Immediate and delayed complications particularly infection,loosening,bone collapse and other anesthetic, post operative complications can be considered when other alternatives are exhausted.

Keywords: Stem cell therapy ,primary osteoarthritis

Background: Aging and Health is the theme of world health day 2012.However worldwide, osteoarthritis (OA) is estimated to be the fourth leading cause of disability.Most of this disability burden is attributable to the involvement of the hips or the knees. [1]The prevalence of osteoarthritis mentioned in one study in India was 50% in elderly population in age group of 60-74 years and almost 97% in those above 84 years.[2] The prevalence of osteoarthritis among general population is in the range of 4-10% in other studies conducted among 15+ population in India[3-5]

From an individual viewpoint, symptomatic OA is associated with chronic pain and increasing difficulty performing the usual daily activities necessary to maintain independence. From a societal viewpoint,OA is costly, having high direct costs in the form of increased utilization of hospital and medical services,and also high indirect costs through lost productivity of individuals and their carers.[6-7]Unfortunately,joint replacement surgery, an effective intervention for people with severe OA involving the hips or knees, is inaccessible to most people in these regions. [8]

Primary Osteoarthritis: Primary osteoarthritis of the left knee. Note the osteophytes, narrowing of the joint space (arrow), and increased subchondral bone density (arrow).A number of studies have shown that there is a greater prevalence of the disease among siblings and especially identical twins, indicating a hereditary basis. Up to 60% of OA cases are thought to result from genetic factors.

Stem Cell Therapy:

The large and expanding body of publications utilizing stem cell technology in orthopedic applications indicates that the infusion of stem cells and growth factors result in the modulation of T cell activity, decreased inflammatory chemicals and the stimulation of the chondocytes.

There clearly needs to be an increased utilization of the stem cell approach to safely address this condition. Unfortunately this is unlikely, as the use of expensive

and risky pharmaceutical agents has taken the forefront. The limited options for this disorder suggest other avenues of treatment should preclude the surgeries that typical mark the end point of the disease process. [9.]

Embryonic stem cells are believed to have greatest potential to develop into all of the different cell types[9]. However, there's little risk of rejection when using your own adult stem cells and side effects appear to be minimal. The largest safety concern is the possibility that the cells could migrate from their injection site and possibly change into inappropriate cell types or grow excessively, leading to tumors. As stem cell treatment is still being developed, this concern needs to be researched further.[10]

For each of these therapies, trial data in humans has been published, but more studies are needed to establish that they are safe and effective. Several promising new OA treatments are on the horizon, but challenges remain to finding safe and effective local and systemic therapies for OA.[10]

Treatments and Stem cell therapy: The aim of future therapeutic strategies for articular cartilage regeneration is to obtain a hyaline-like cartilage repair tissue by transplantation of tissues or cells [11,-14].Stem cell therapy could provide a permanent, biological solution, with all sources of stem cells (embryonic, fetal and adult) showing some degree of potential. Mesenchymal stromal/stem cells, however, appear to be the leading candidates because of their ability to be sourced from many or all joint tissues. They may also modulate the immune response of individuals, in a manner influenced by local factors. The advantage of using bone marrow stem cells is that the hip cavity contains a source of multi-potent stem cells, platelets, growth factors, adhesion molecules, and other proteins responsible for tissue repair and regeneration.

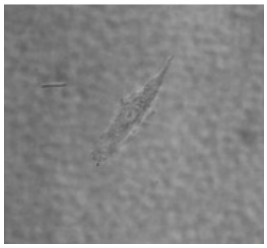
The advantage that stem cell treatment has over joint replacement surgery is that it's much less invasive. Also as body's own cells are used to repair damaged joints, it's also a more "biological approach" as per researchers.

Scope of stem cell therapy in OA- Stem cells are unique in that the are the only cells in the body that has the ability to change themselves into specialized cells. As in cases of osteoarthritis, when we take a patient's own stem cells from their fat – they can mimic and transform into chondrocytes, the cells that produce cartilage. In addition, their presence in a damaged joint seems to stimulate the body's own repair response and 22ccelerates healing. MSCs can modulate the immune response of individuals and positively influence the microenvironment of the stem cells already present in the diseased tissue[15] The mesenchymal stem cells will be tested against chondrocytes, and a combination of both types of cell will also be trialled with the aim of repairing joints, stopping osteoarthritis getting worse and delaying – or even avoiding – the need for knee replacement surgery.[16]

Cartilage regeneration was seen in ten of 23 patients, including in some patients with pre-existing early osteoarthritis of the knee secondary to traumatic injury. Maturation of the implanted, tissue-engineered cartilage was evident as early as 11 months after implantation.[17]

The scientists, from the University of Keele, plan to carry out the first human trial of the treatment on 70 osteoarthritis patients later this year at the Robert Jones and Agnes Hunt Hospital in Shropshire. The researchers say that stem cells taken from the patient's bone marrow could be transferred to the infected joint to encourage growth of the cartilage. The cells would initially be removed by keyhole surgery and then put into a lab for three months allowing them to grow.[19] Similarly, according to scientists at the Cardiff University, stem cells can be turned into cartilage cells and this cartilage can be transplanted in an affected joint. [20]

Bristol university Study : We previously showed that we can tissue engineer cartilage with good biochemical and histological properties using bone marrow-derived mesenchymal stem cells even if these cells are isolated from elderly patients with advanced osteoarthritis. This makes it possible for us to consider treating patients using their own cells, so avoiding the risk of immune rejection of the engineered cartilage after it has been implanted. [21]



A cloned stem cell that will be grown in tissue culture allowing analysis of its potential for making cartilage.

Mesenchymal stem cells (MSCs) due to their multi-lineage potential, immunosuppressive activities, limited immunogenicity and relative ease of growth in culture, have attracted attentions The aim of this study was to examine for clinical use. Aim: whether MSC transplantation could reverse the OA process in the knee joint. After having enough MSCs in weeks) and taking in consideration culture (4-5 all safety measures, cells were injected in one knee of each patient. The walking time for the pain to Results: appear improved for three patients and remained unchanged for one. The number of stairs they could climb and the pain on visual analog scale improved for all of them. On physical examination, the improvement was mainly for crepitus. legislations and policy regarding stem cell therapy in India[15]Legislation governing hESC research varies from country to

country

Stem cell therapyVs total knee replacement therapy for osteoarthritis-Long term results of knee replacement have not yet fully established. Immediate and delayed complications particularly infection,loosening,bone collapse and other anesthetic, post operative complications can be considered when other alternatives are exhausted.[25]

Stem cell guidelines were issued by the Indian Council for Medical Research (ICMR) and the Department of Biotechnology (DBT) in 2007. These guidelines say: “As of date, there is no approved indication for stem cell therapy as a part of routine medical practice, other than Bone Marrow Transplantation (BMT). Accordingly all stem cell therapy other than BMT shall be treated as experimental.

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