Histological study of the role of mesenchymal stem cells in cartilage regeneration in a canine osteoathritis model

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Mesenchymal stem cells (MSCs) are self renewing progenitor cells that have the potential to differentiate into chondrocytes, osteoblasts, adipocytes, fibroblasts and other tissues of mesenchymal origin Stem cells have generated a great deal of excitement and promise as a potential source of cells for cell-based therapeutic strategies, primarily owing to their intrinsic ability to self renew and differentiate into multiple functional cell types. Stem cells have been utilized to regenerate viable cartilage tissue, which lacks the ability to self-repair or regenerate itself.This present study was done to investigate the healing capacity of autologs bone marrow derived mesenchymal stem cells and to compare this with mesenchymal stem cells undergoing chondrogenic differentian in cartilage regeneration in osteoarthritisThe present experimental study was performed on twenty joints of five dogs which were divided into three groups according to the disease affection as followsGroup I:Four joints were used as controls negative and each one leaved without measuresGroup II:Four joints were used as controls negative and each one was induced osteoarthritis by meniscectomy.Group III:Twelve joints, each one Osteoarthritis was induced in each joint then divided into two subgroups (6 joints for each):Subgroup (IIIA): Each joint received an autologous mesenchymal stem cells intraarticular.Subgroup (IIIB): Each joint received differentiated mesenchymal stem cell (chondrogenic cells) itraarticular.The animals were evaluated eight weeks after surgical procedureEvaluations based on:--clinical examination, for lameness and joint affection.-radiographic examination.-Pathologic examination:-The animals were scarified at the end of the experiment and specimens of cartilage were obtained for:Gross pathologic examination.Histological examination. :the histological methods were used H&E & safranin O and alcian blue stains to demonstrate the general architecture of examined tissue and their connective tissue content.Clinically the chondrogenic transplanted groups showed low grade of lameness compared with osteoarthritic groups .radiographically ,there was no evidence of any osseous reaction or radiographic finding in the subchondral bone of the chondrogenic transplanted groups and also mesenchymal stem cells transplanted groups compared with osteoarthritic groups .Grossly the meniscal defect was identifiable and show fibrous appearance compared to chondrogenic transplanted groups in which their surfaces were smooth and no obvious signs of degeneration.Histological examination revealed that the chondrogenic transplanted

groups and mesenchymal stem cells transplanted groups were filled predominately by hyaline cartilage while the osteoarthritic groups were filled with repair tissue which was either fibrous tissue or mixture of fibrous tissue and fibro cartilage and also show degenerative changes .There was an increased staining intensity to Safranin-o in. osteoarthritic groups compared with the repair tissue in the chondrogenic transplanted groups and mesenchymal stem cells transplanted groups. The fibrous repair tissue in the osteoarthritic groups did not stain with Safranin-O, while fibro cartilage repair tissue showed poor staining affinity to Safranin-O.Results of clinical, radiographic and histological evaluation of the repair tissue in the present study compatible with the morphologic observation that the defects were repaired with hyaline-like cartilage, which was thicker than normal, and with subchondral bone. Using the green fluorescent protein cells derived from the transplanted ones were detected within both the cartilaginous and the subchondral bone layers also this study detect that chondrogenic cells improved healing of menisical tear better than in the mesenchymal stem cellsCONCLUSIONMesenchymal stem cells are one of the stem cells that are being introduced in the clinic for treatment of several degenerative diseases.Based on our study, the transplantation of autologus differentiated mesenchymal stem cells (chondrogenic cells) in the canine knee is an effective method of replacing meniscal tear in osteoarthritic modal. We observed viable hyaline cartilage at the joint surface and healing of the subchondral bone for up to 8 weeks after autologus mesenchymal stem cells transplantation in canine knees. Although the cartilage peripheries appear to integrate consistently into the native cartilage, this detected histologically.We did not test the mechanical properties of our joints, Future studies to test compressive forces and mechanical loading between transplanted cells and normal articular cartilage may be useful.Our system was designed for small, isolated articular cartilage defects, and we believe this information can be -examined for large and multiple cartilage defects, Future studies with longer follow up, possibly with the use of growth factors and/or cultured chondrocytes aids, may improve rates of cartilage healing at the periphery, Studies testing mechanical loading forces between transplanted cells and normal cartilage are needed, as well as our study comparing this procedure with other surgical types of treatment.