

EFFECT OF INTRA-ARTICULAR INJECTION OF BONE MARROW DERIVED STEM CELLS VERSUS EXTRACELLULAR VESICLES ON INDUCED KNEE OSTEOARTHRITIS IN RATS

Wafaa Abdel Rahman Ahmed, Radwa Ali Mehanna,* Elsayed Aly Mohamed Metwally, Sally Mahmoud Mohamed Hussein, Rowan Mostafa Mohamed Kamel Mohamed ElHamamy
Department of Human Anatomy and Embryology, Department of Human Physiology,* Faculty of Medicine, Alexandria University

Introduction

Osteoarthritis (OA) is a complex chronic illness that affects joints and causes substantial pain and impairment. It is the most common cause of disability worldwide and is characterized by articular cartilage (AC) degeneration with subchondral bone sclerosis, cyst formation, osteophyte formation, synovial lesions, and alterations in surrounding structures. Osteoarthritis mostly affects persons above the age of 50, with female predominance.

Aim of the work

The aim of the present work was to study the anatomical and histopathological changes in a rat model of monosodium iodoacetate - induced osteoarthritis and to assess the possible therapeutic effects of intra-articular injection of bone marrow mesenchymal stem cell (BM-MS C) versus extracellular vesicles (EV) in a rat model of MIA induced OA.

Subjects and Methods

In this study we used Monosodium Iodoacetate (MIA) to induce knee osteoarthritis in rats. The current was carried out on 27albino rats. The rats were divided into two healthy male rats (weighing about 30 ± 5 g), to obtain the mesenchymal stem cells, and twenty-five female rats (weighing about 200 ± 20 g) which were considered as the experimental group. The experimental group was then divided into ten rats which served as the control group (group I) which were given free access to water and received a standard diet, an OA induced untreated group (group II) which consisted of five rats that received knee intra-articular injection of 1 mg of MIA dissolved in 25µl of saline, and ten rats that received Intra-articular injection of 1×10^6 BM-MS Cs (group III) per joint for three weeks after the MIA OA induction.

Results

The cartilage surfaces of the lower end of the femur and upper end of tibia were grossly assessed and scored for the extent of degeneration. All animals of the control groups (group I) showed similar results. There was normal articular cartilage with a median gross anatomical score of 0.On induction, the articular cartilage of the OA induced untreated group (group II) revealed loss of normal smooth surface in comparison to the control group (group I). Upon treatment with BM-MS Cs (subgroup IIIa) the median macroscopic score decreased significantly to reach 1compared to 4 in the OA induced untreated group (Table, Figure).

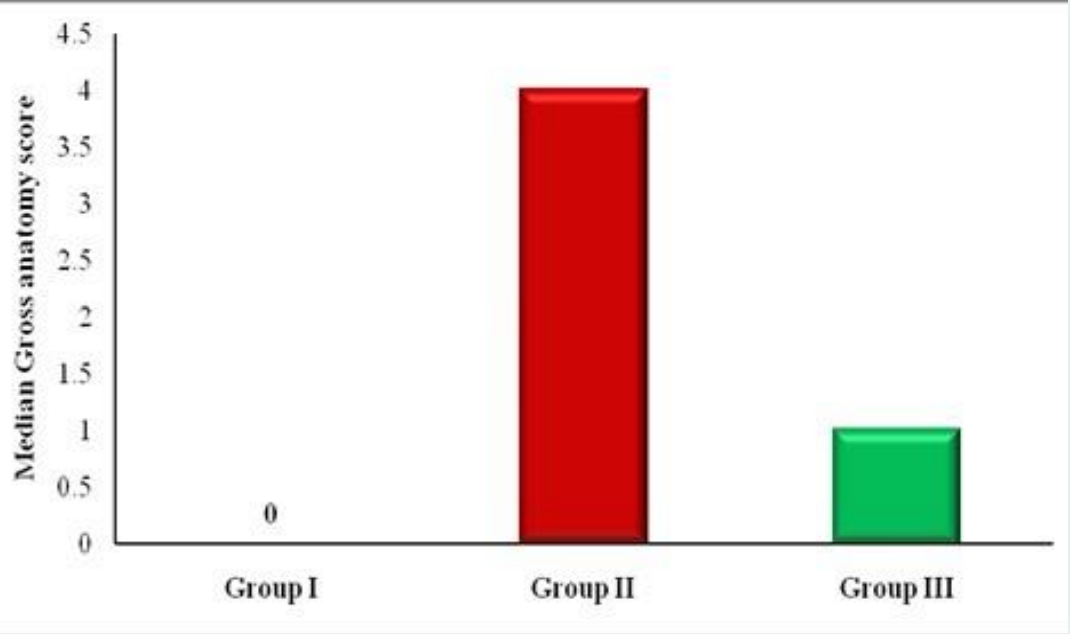


Figure: bar graph showing the gross macroscopic score of the studied groups

Table : Comparison of gross macroscopic score among the studied groups

Gross Anatomy Score	Group I (n= 10)	Group II (n= 10)	Group III (n= 10)	H= 22.191, p<0.001*
Mean ± SD	0.2 ± 0.42	2.8 ± 1.55 [#]	1.3 ± 1.49 ^{#@\$}	
Median (Min. – Max.)	0 (0 – 1)	4 [#] (1 – 4)	1 ^{#@\$} (0 – 4)	
Significance between groups	p1<0.001*, p2= 0.049*			

H; Kruskal Wallis test, Pairwise comparison was done
p; p value between groups
p; p value between groups
p1; p value between group I and group II
p2; p value between group II and group IIIa
SD; Standard deviation, *, Significant (p<0.05)

Conclusion

The BM-MS Cs treated group (group III) showed moderated improvement of the articular surface when compared to the induced untreated group (group II). Thus, the current work has concluded that BM-MS Cs provide a possible therapeutic agent for the treatment of knee OA.