INTRA-ARTICULAR INJECTIONS OF PERIPHERAL BLOOD MESENCHYMAL STROMAL CELLS AND PLATELET-RICH PLASMA PROMOTES SUPERIOR FULL-THICKNESS CARTILAGE DEFECT STUDIES IN RABBITS

[1]Othman R; [1]Aziz A; [1]Liew TWS; [1]Sharfuddin AI; [1]Chong PP; [1]Kamarul T

[1]Tissue Engineering Group (TEG), NOCERAL, Department of Orthopaedic Surgery, Faculty of Medicine, University of Malaya, 50603, Kuala Lumpur, Malaysia.

INTRODUCTION:

The application of peripheral blood-derived mesenchymal stromal cells (PBMSC) is rarely reported due to its low abundance amongst the mononuclear cells blood population (1). However, we were able to demonstrate that PBMSCs can be extracted sufficiently, and when applied together with platelet-rich plasma (PRP) will result in superior cartilage regeneration.

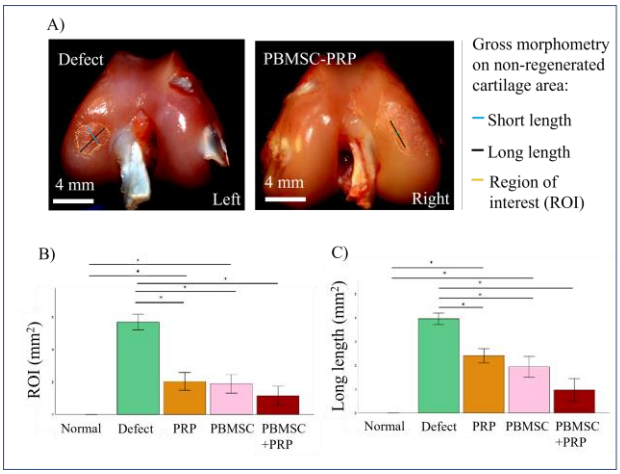
MATERIAL & METHODS:

PBMSC potential were verified *in vitro* in comparison to MSC from bone marrow (BM) and adipose tissue (AT). Full thickness focal cartilage defects were created *in vivo* on the medial femoral condyles of both knees. New Zealand White rabbits (N=30) were divided equally into PBMSC, PRP, PBMSC+PRP, normal control, and untreated defect groups. Weekly intra-articular injections were given for 3 weeks. At 3 and 6 months, animals were sacrificed, and cartilage gross morphology and morphometry (FIJI, ImageJ) were analyzed.

RESULTS:

PBMSCs showed comparable ability with BMSC and ATMSC to differentiate, and manifested similar expression of CD90+, CD31+ and CD13–, with no significant difference in the MFI values ($p<0.05$). Brittberg scores showed significant cartilage repair in PBMSC+PRP and PRP treatments after 3-months, but no significant difference was seen in all treatments between the 3- and 6-months groups. In contrast, gross morphometry analysis showed a better repair with PRP in 3 months treatment compared to PBMSC+PRP and PBMSC alone ($p<0.05$). However, PBMSC+PRP started to show a significant reparative effect after 6-months of treatments ($p<0.05$).

Figure 1. Overview of A) gross morphology and A-C) gross morphometry analyses.



DISCUSSIONS:

Our findings suggest that the morphometry analysis provides a more sensitive evaluation on cartilage repair and proves that combinatorial effect of PBMSC and PRP improves the repair of full-thickness cartilage defect after long-term treatment, showing that PBMSC is more stable and effective when combined with PRP. It is suggested that the release of growth factors from PRP may have been responsible for the positive outcome seen.

CONCLUSION:

This study demonstrates that the use of PBMSC and PRP can result in superior cartilage regeneration when used concurrently.

REFERENCE:

1. Othman R et. al. (2019). Sains Malaysiana 2019; 1947-1958.