

# REGENERATION OF FULL-THICKNESS FOCAL CARTILAGE DEFECT OF THE KNEE IN RABBIT MODEL USING NON-MOBILIZED PERIPHERAL BLOOD-DERIVED MESENCHYMAL STROMAL CELLS AND PLATELET-RICH PLASMA

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## INTRODUCTION:

The application of peripheral blood-derived mesenchymal stromal cells (PBMSCs) is rarely reported, due to its low frequency in the mononuclear cells blood population. This study shows for the first time the potential of non-mobilized PBMSCs with growth factor-rich biologic, platelet-rich plasma (PRP), on repairing rabbit's cartilage defect.

## METHODS:

Focal articular cartilage defect of full-thickness was created in the medial femoral condyle of both knees. Twelve males of New Zealand White rabbits were divided into four groups consisting of three rabbits each; PBMSCs, PRP, PBMSCs with PRP, and controls consisted of both normal and untreated defect. One week post-surgery, treatments were given by intra-articular injection, once in three-consecutive weeks. Post 3 months, each cartilage was evaluated using 3-Tesla magnetic resonance imaging (MRI) for the qualitative and semi-quantitative measurements in concert with the hematoxylin and eosin (H&E) histology.

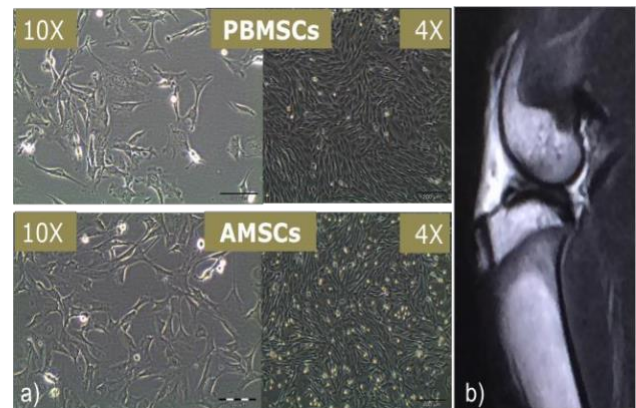
## RESULTS:

PBMSCs showed a fibroblastic-like cell similar to that of adipose-derived mesenchymal stem cells (AMSCs) as a control for *in vitro* characteristics. MRI image showed a significant increase in the cartilage thickness when treated with PBMSCs and PRP compared to PBMSCs or PRP alone, correspond with the hyaline-like cartilage development in H&E histology.

## DISCUSSIONS:

Isolation of PBMSCs is attainable without mobilizing agent, similar to previous human model (1). Non-mobilized PBMSCs have the same regenerative potential to mediate cartilage repair. Synergistic effect of PBMSCs and PRP improves the repair of full-thickness cartilage

defect compared to individual treatment, which correlates with a previous finding (2).



**Figure 1.** a) *In vitro* culture of PBMSCs and AMSCs. b) Overview of *in vivo* MRI scanning.

## CONCLUSION:

This study could be used as a proof of concept for ease-of-use treatment using blood as a source of MSCs and PRP. Correlation between MRI and histology may provide valuable information for the prediction of cartilage repairing level, especially for the clinical practice. Further research on the cartilage biomechanical properties is required.

## REFERENCES:

1. Chong PP et. al. Human peripheral blood derived mesenchymal stem cells demonstrate similar characteristics and chondrogenic differentiation potential to bone marrow derived mesenchymal stem cells. *J Orthop Res.* 2011;30(4): 634-642.
2. Samuel S et. al. Platelet rich concentrate enhances mesenchymal stem cells capacity to repair focal cartilage injury in rabbits injury. *Science Direct.* 2018; 49(4): 775-783.