

Articular Cartilage Regeneration with Autologous Peripheral Blood Stem Cells and Adjuvant Hyaluronic Acid: An Animal Study in Sheep Model

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INTRODUCTION:

The purpose of this study was to assess histologically whether intra-articular injections of autologous peripheral blood stem cells (PBSC) resulted in better regeneration of articular cartilage.

MATERIALS & METHODS:

Fifteen sheep were equally divided into three groups. An 8mm diameter full thickness articular cartilage defect was created, followed by subchondral drilling into the left stifle joint. Group A (Control group) underwent surgery only; Group B (HA group) received 2 mL of hyaluronic acid (Ostenil®, TRB Chemedica AG, Germany) post-surgery; and Group C (PBSC+HA group) received injections of 2 mL PBSC along with 2 mL HA post-surgery. Three injections were administered: on the day of surgery and 1 weekly injection for 2 consecutive weeks. PBSC in Group C were harvested via apheresis one month before surgery. All animals were sacrificed at 24 weeks post-surgery. The stifle joints were harvested and examined macroscopically and histologically, utilizing the ICRS Visual Assessment Scale II and Gill scores. Statistical analysis was conducted using SPSS, with comparative analysis being two-tailed, and the level of statistical significance set at $p < 0.05$.

RESULTS:

All animals in the study survived throughout its duration. In terms of Gill scores, Group C demonstrated a significant improvement compared to Groups A and B, with $p=0.012$ and 0.033 , respectively. Regarding the ICRS II scores (Figure 1), higher scores indicate better regenerated cartilage. Group C showed a statistically significant difference compared to Group A ($p=0.003$) and Group B ($p=0.026$), highlighting its superior regenerative outcomes.

DISCUSSIONS:

Macroscopic evaluation showed cartilage regeneration in all groups, but incomplete filling of chondral defects due to the short joint harvesting duration. Histological images from PBSC-treated group depicted cartilage most closely resembling normal cartilage (Figure 2), consistent with prior clinical study findings.¹

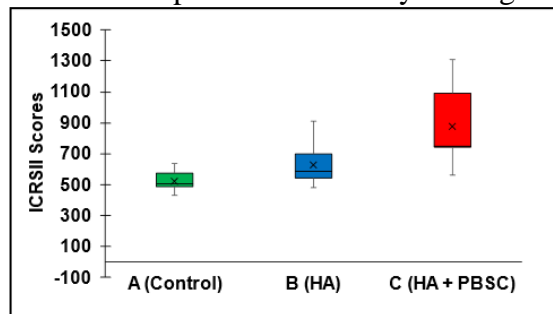


Figure 1: ICRS II graph showing highest scores obtained with PBSC group.

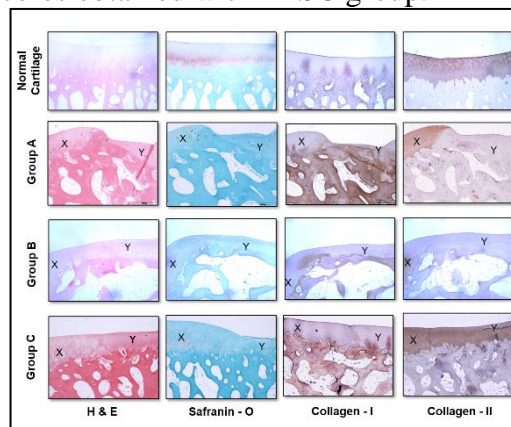


Figure 2: Histology images of different groups as compared to normal cartilage. X= original cartilage; Y = regenerated cartilage.

CONCLUSION:

Intra-articular injections with PBSC resulted in better articular cartilage regeneration based on histological evaluation.

REFERENCES:

Saw et al. Arthroscopy 2013;29: 684-94.