hDPSCs secretome inhibits inflammation and cartilage degeneration in a rat model of osteoarthritis

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BACKGROUND & OBJECTIVE

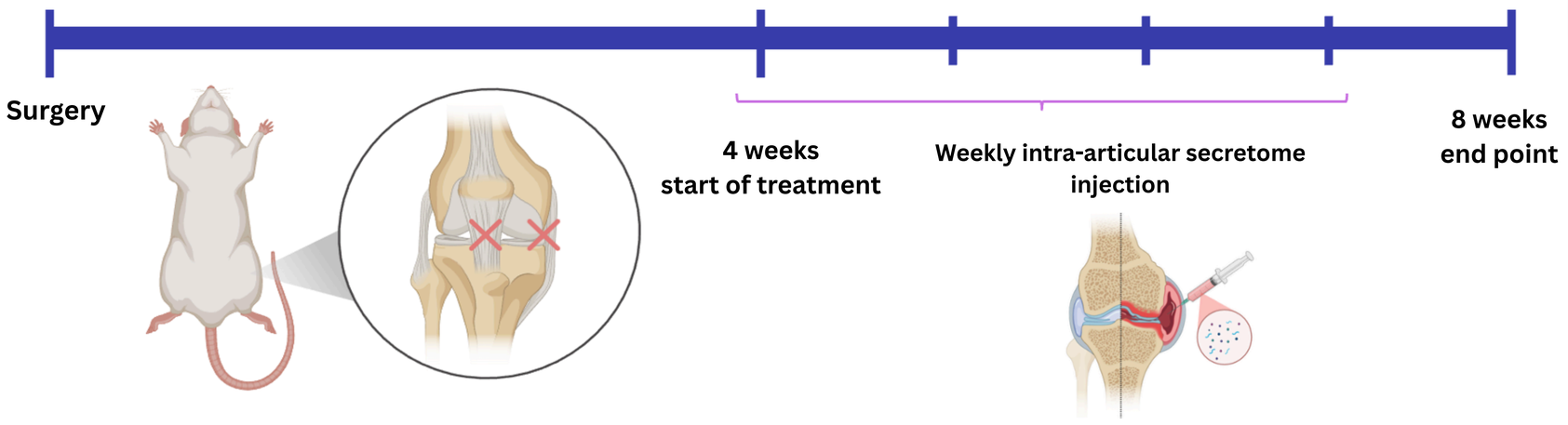
Osteoarthritis (OA) affects over 500 million people worldwide and is now recognized as a chronic inflammatory disease of the whole joint rather than a simple degenerative condition. Current treatments are mainly symptomatic and fail to modify disease progression. The therapeutic effects of mesenchymal stem cells (hDPSCs-human Dental Pulp Stem Cells) are largely mediated by their secretome, a bioactive cell-free product with promising anti-inflammatory and regenerative potential that requires robust *in vivo* validation.

Considering the current clinical challenges, we aimed to evaluate the therapeutic efficacy of hDPSC-derived secretome in a rat model of OA.

METHODOLOGY

SECRETOME MANUFACTURE

- Cell type: hDPSCs
- Culture system: 2D
- Differentiation stimulus: Chondrogenic medium
- Culture duration: 2 weeks
- Secretome processing: Ultrafiltration (>30 kDa)



TISSUE EVALUATION

- Histological analysis: Toluidine blue staining
- Imaging analysis: PET and MRI

Figure 1. Study design and experimental workflow.

RESULTS

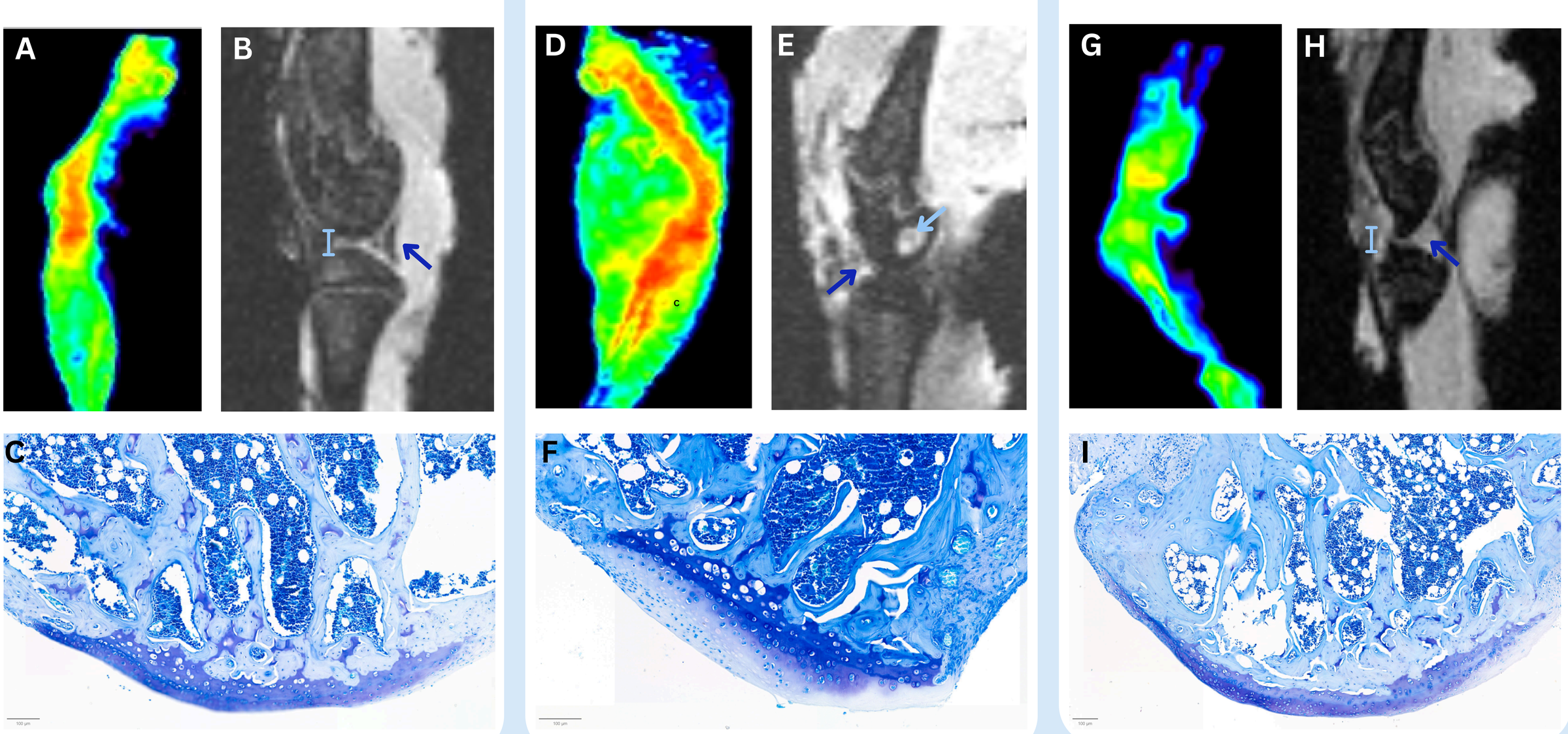


Figure 2. Representative PET, MRI, and toluidine blue staining images of healthy control (**A–C**), surgical control (**D–F**), and secretome-treated group (**G–I**). PET imaging shows low tracer uptake in the healthy control (**A**), markedly increased uptake in the surgical control consistent with elevated inflammation (**D**), and reduced uptake in the secretome-treated group (**G**). MRI analysis reveals preserved joint architecture in the healthy control, with visible meniscus and maintained joint space (**B**); in contrast, the surgical control exhibits loss of joint space, absence of the meniscus, and a large cystic lesion at the posterior femoral condyle (**E**), whereas the secretome-treated group shows preservation of joint space despite meniscal loss and absence of cystic lesions (**H**). Toluidine blue staining demonstrates preserved cartilage matrix in the healthy control (**C**), marked proteoglycan loss with areas of fibrotic tissue in the surgical control (**F**), and improved matrix preservation in the secretome-treated group (**I**). **Dark blue arrows** indicate the presence or absence of the meniscus, **light blue arrow** indicate cystic lesions, and **blue brackets** delineate the joint space.

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CONCLUSIONS

The osteoarthritis model was successfully established, demonstrating characteristic histopathological features. Secretome-treated group exhibited improved cartilage matrix preservation and joint integrity, as confirmed by histological and imaging findings.