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June 18–June 21

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Title: The Effect of Injection of Secretome of Umbilical Cord Mesenchymal Stem Cells in Articular Cartilage Repair in Sheep Model

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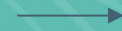
Disclosures: There is no
conflict of interests.



Introduction

Articular cartilage

- Avascular
- Aneural
- Alyphatic

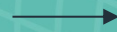


Limited capacity to regenerate

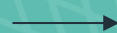


Cartilage defects

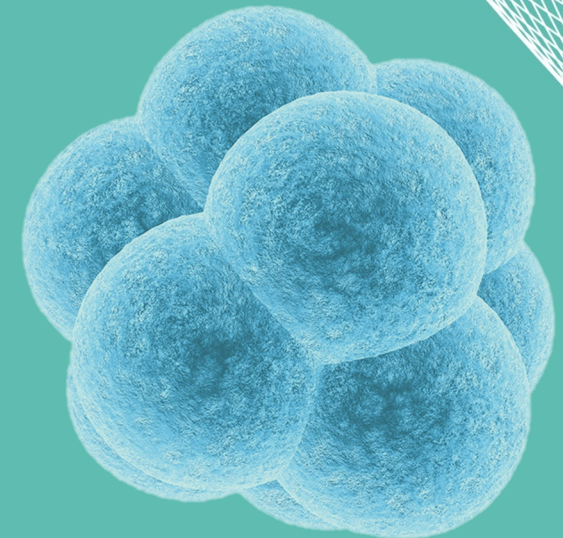
Numerous techniques have been employed to repair or regenerate



success rate varies



most result in the formation of **fibrocartilage**



Methods

Secretome of
UC-MSCs

**Devoid of
cells**



lower
immunogenicity and
lacks tumorigenicity

Research gap

No **published studies** have been conducted regarding the use of human umbilical cord-derived mesenchymal stem cells (hUC-MSCs) in cartilage defect

Easy production,
handling and
storage



This study aims to investigate the effect of hUC-MSCs secretome in sheep models of cartilage defect



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Methods

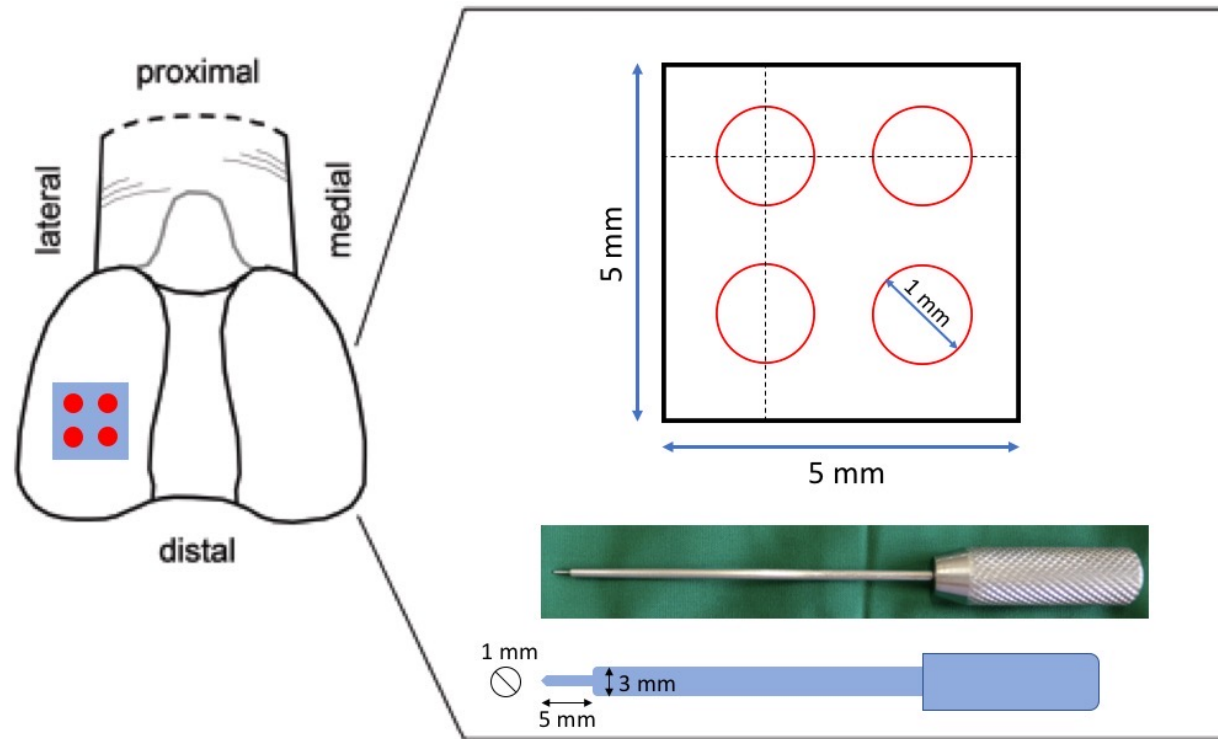


Fig 1. Standardized rectangular full-thickness chondral defects were created in the lateral femoral condyle of 15 adult sheep.

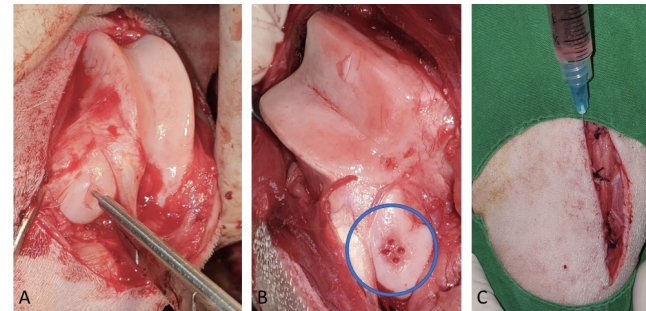


Fig 2. A) The microfracture procedure was performed using a specialized tool; the cartilage defect after the microfracture procedure, (B) the cartilage defect after undergoing microfracture technique, (C) 2 cc of secretome was injected after the wound closed

Three treatment groups were tested:

- Group 1: 4 microfracture perforations using 1.0mm diameter awls
- Group 2: intra-articular injection of hUC-MSC secretome
- Group 3: combination of microfracture and intra-articular injection of hUC-MSC secretome

Osteochondral repair was assessed at **6 months** using established macroscopic and histological analyses.

Results

- Macroscopically, application of combined therapy shows significant improvement of cartilage repair compared to microfracture alone ($p=0.004$).
- Microscopically, the application of combined therapy shows significant improvement of cartilage repair compared to secretome injection alone ($p=0.031$)

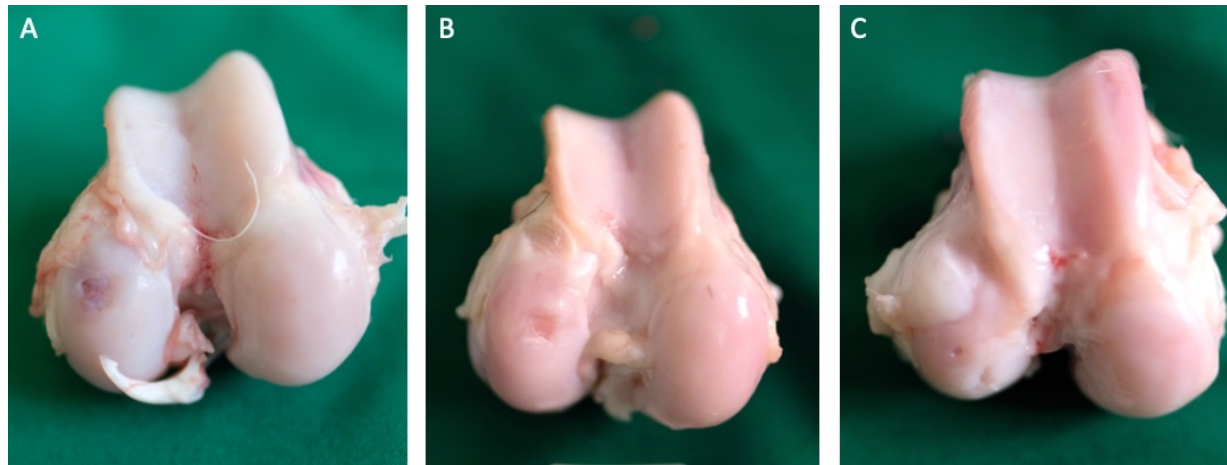


Fig 3. Macroscopic evaluation after 6 months of microfracture-only groups show a fibrillated cartilage with defect (A), injection-only groups show a visible defect (B), and combined therapy groups (C) show a better cartilage regeneration with a small defect and homogenous cartilage.

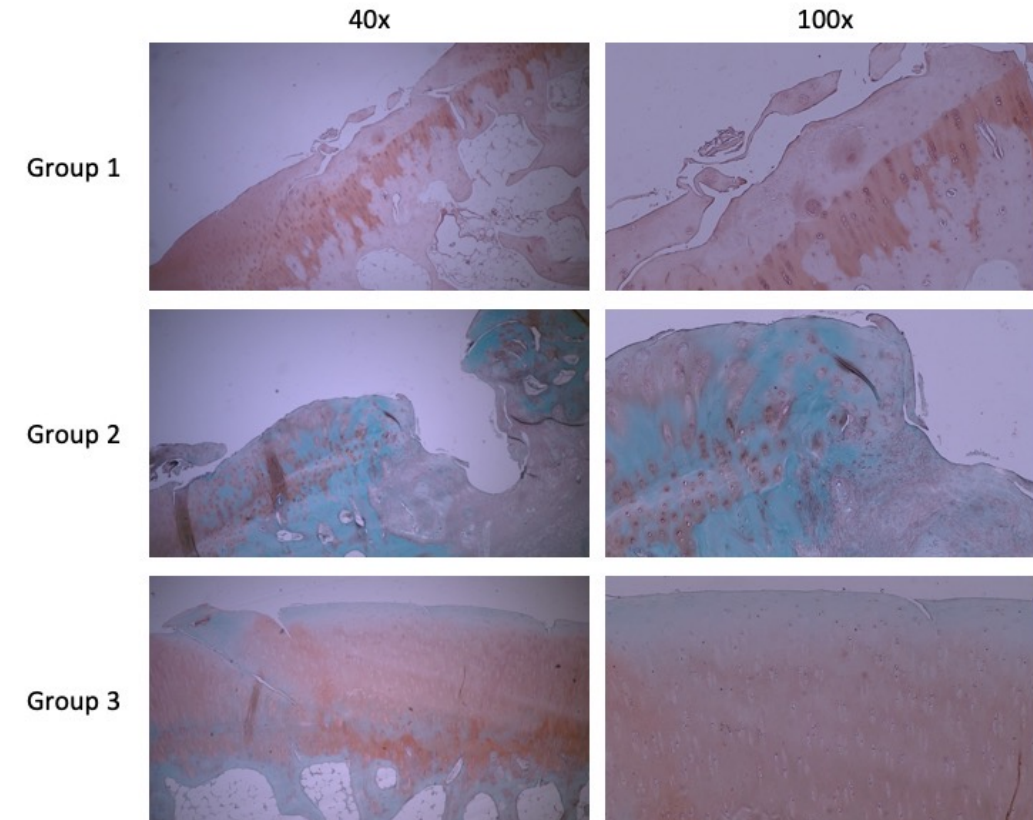


Fig 4. Microscopic analysis of each groups using Safranin-O staining with 40x and 100x magnification. In group 1 (Microfracture-only) there is a detached cartilage with good osteochondral junction; in group 2 (Secretome-only) there is still a defect on the cartilage; and in group 3 (combined treatment) the defect is closed and the staining show cartilage regeneration.

Discussion

- Various treatment methods are available to treat articular cartilage injury; however, most of them often results in **fibrocartilage** instead of hyaline cartilage.
- Macroscopic analysis of cartilage repair showed that a combination therapy of microfracture and injection of hUC-MSCs secretome significantly **improved the macroscopic Goebel score** compared to microfracture treatment but not significantly different with hUC-MSCs injection alone.



Discussion

- Secretome from MSCs may produce variety of **extracellular matrix** (collagen, fibronectin, proteoglycan, GAG) which aid in chondrogenesis
- Moreover, secretome also modulates immune system by inducing antiinflammatory effect in macrophage, which further leads to **cartilage repair**



Conclusion

Microfracture combined with injection of hUC-MSCs secretome could be an effective alternative for repairing articular cartilage defects *in vivo*.



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THANK YOU

