

Preclinical evaluation of a novel osteochondral scaffold showed enhanced bone and cartilage regeneration

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INTRODUCTION: Treatment of large osteochondral defects presents an unmet clinical need in orthopaedics. This study investigated the efficacy of a multi-layered osteochondral scaffold for repair of large defects *in vivo* using sheep condyle model. In addition, the effect of bone marrow concentrate (BMC) as a source of growth factors and stem cells¹ was evaluated in conjunction with the osteochondral scaffold.

METHODS: The multi-layered scaffold was fabricated using additive manufacturing techniques. A collagen/hydroxyapatite scaffold was used as control. 24 sheep were randomly assigned to one of the four treatment groups: scaffold ± BMC and control ± BMC. The tissue was retrieved 6 months post-operation. Bone regeneration was evaluated using μ CT, while cartilage regeneration and quality were examined macroscopically (modified ICRS) and by histology and gene expression. Gait was examined pre-operation and before termination.

RESULTS: Gross evaluations of the joint showed minimal to slight reactions for all groups. Regenerated cartilage was not macroscopically different between the groups, however, a significant upregulation of mRNA for type-II collagen showed an enhance cartilage quality with the novel scaffold. μ CT data revealed that the bone ingrowth was higher in the scaffold group, while bone voids remained in the control groups. Gait parameters were not affected by the choice of the treatment.

CONCLUSIONS: Collectively, these data illustrate that the novel scaffold support bone ingrowth and a hyaline-like cartilage formation. Our results indicated that the addition of BMC to scaffold has some potentially beneficial effects on tissue regeneration but not on the functional endpoint of orthopaedic interest.

REFERENCES

¹ J Chahla et al., Arthroscopy Techniques **6** (2), e441 (2017).