



Acetabular Labrum Reconstruction with Fresh Meniscus Allograft Transplantation: Validation in a Preclinical Canine Model

Bischoff C, Crist BD, Bozynski CC, Stoker AM, DeFroda S, Cook JL
Thompson Laboratory for Regenerative Orthopaedics, University of Missouri. Columbia, MO
www.thompsonlab.missouri.edu

Introduction

- Acetabular labrum pathology is frequently diagnosed in young, active individuals.
- Methods of hip preservation emphasize recapitulation of labrum structure and function to re-establish joint health and mitigate the development of hip osteoarthritis (OA).
- Labrum reconstruction utilizing fresh, frozen tendon allograft has become a popular option based on good short-term outcomes, however, failure rates are ~24%.
- Meniscus allograft has demonstrated early success as an alternative due to similarities in geometry, tissue composition, and metabolic profile when compared to acetabular labrum tissue.
- Healing of the fresh (viable) meniscus allografts transplantation (MAT) has not been well characterized.

Objective

- To evaluate the safety and efficacy of fresh MAT for acetabular labrum reconstruction in a large animal model.

Methods

- With IACUC approval, menisci were aseptically recovered from skeletally mature dogs immediately after euthanasia.
- Menisci were stored using the Missouri Osteochondral Preservation System (MOPS®) for 51 days prior to transplantation.
- Acetabular labral defects were created in skeletally mature purpose-bred research hounds (N=4).
- Fresh MOPS-preserved meniscus allograft was prepared by sharp dissection from the tibial plateau.
- Meniscus was trimmed to match the length of the defect as well as the width and height of native/remaining labrum.
- Allograft fixation was performed via knotless suture anchors at one-cm intervals from anterior to posterior in the acetabular recipient bed (Figure 1).
- A posterior junctional anchor suture was then placed and used to attach the allograft to remaining native labrum.
- Eight weeks after labral reconstruction, dogs were assessed for hip pain, function, and range of motion (ROM) and then humanely euthanized for gross and histologic assessments of the hip.

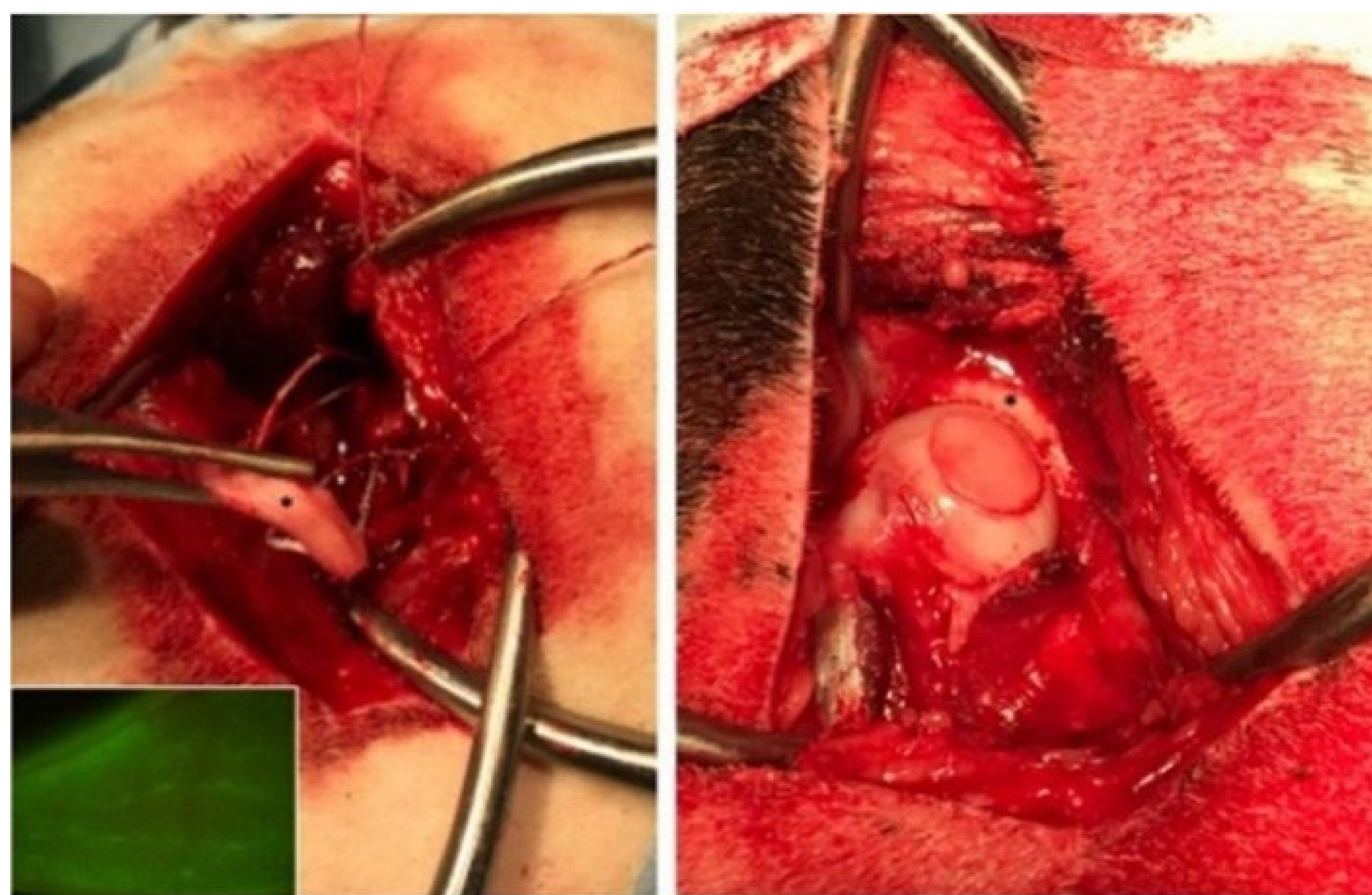


Figure 1: Labrum Reconstruction with MAT

Results

- All MOPS meniscus allografts had > 80% cell viability at time of transplantation (Figure 1).
- All dogs regained pre-operative levels of hip function and ROM 8 weeks after surgery.
- Gross and histologic assessments of acetabular labrum allografts showed consistent maintenance of graft positioning, fibrocartilaginous tissue architecture, and integration with acetabular bone and remaining native labrum (Figure 2)

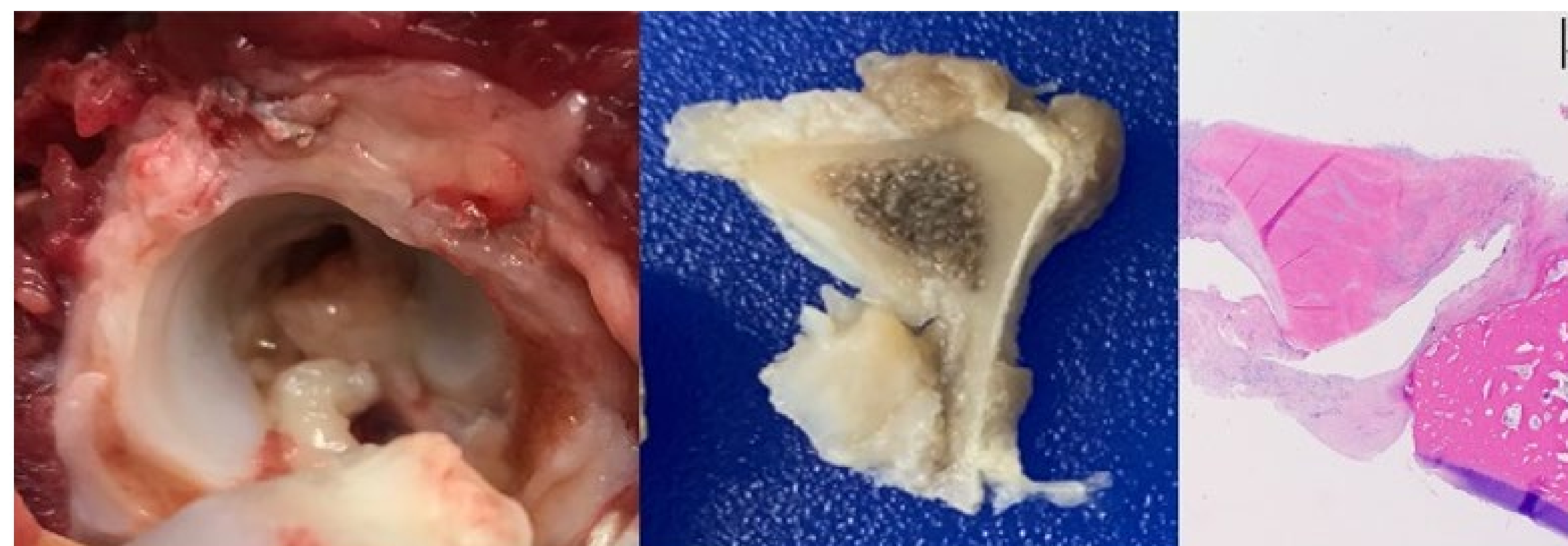


Figure 2: Gross, cross-sectional, and histological images of MAT for labrum reconstruction

Discussion

- Fresh (viable) meniscus allograft transplantation for acetabular labrum reconstruction was safe and effective in a preclinical canine model.
- No untoward immune responses were noted, hip function was regained, and meniscus allografts maintained their size, shape, geometry and fibrocartilaginous tissue composition and architecture while integrating well with acetabular bone and native labrum.
- These findings suggest that fresh meniscus allografts may provide beneficial biologic (e.g., cell viability and metabolism, tissue composition and physiology) and biomechanical (e.g., size, shape, and geometry, architecture, and material properties) components that improve labral healing and function.
- The limitations of the present study must be considered including the use of an animal model with an 8-week study endpoint. Larger populated studies are indicated.

Conclusions

These preclinical translational data support the use of fresh meniscus allografts as an appropriate option for acetabular labrum reconstruction when indicated. However, further research is necessary to determine if these differences are directly related to improved functional outcomes in patients.

