

EMRS Fall Meeting

Development of a sheep vertebroplasty model for bioceramic materials assessment

Sheep has been widely used as an animal orthopaedic model. Although several studies report anatomic and biomechanical similarities as well as distinctions of ovine lumbar vertebrae when compared to human's, only a few studies describe its actual use as a vertebroplasty model. Due to distinct anatomic features, sheep lumbar vertebrae pose a challenge when developing a minimally invasive procedure for vertebroplasty material testing, under conditions meant to be the most similar to clinical procedure.

The present work describes the development of an appropriate surgical percutaneous vertebroplasty model in the lumbar spine of sheep, applicable in vivo, that minimizes the risk of post-surgical complications. This model was mechanically evaluated ex-vivo regarding its safety, and used to evaluate the injectability and radiopacity of two new bioceramic materials when compared to a commercial bioceramic bone substitute (Cerament™ SpineSupport). Microtomography techniques helped in the development of the model and results assessment.

Under fluoroscopic guidance, a defect was created through a bilateral modified parapedicular access in the cranial hemivertebrae of 30 sheep lumbar vertebrae (L4, L5 and L6). The manually drilled defect had an average volume of $1209 \pm 226 \text{ mm}^3$ and allowed the novel materials injection through a standardized injection cannula placed in one of the entrance points. Adequate defect filling was observed with all tested materials. No mechanical failure was observed under loads higher than the physiological.