**percutaneous vertebroplasty: a new animal model**

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**Abstract**

*Background Context*

Percutaneous vertebroplasty is a surgical minimally invasive procedure and is frequently needed in humans for surgical treatment of vertebral fractures. It depends on cement injection into the vertebral body and achieves rapid and significant pain relief.

*Purpose*

The testing of novel biomaterials depends on suitable animal models. The aim of this study was to develop a reproducible and safe model of percutaneous vertebroplasty in sheep.

*Study Design*

Ex vivo and in vivo large animal model study (Merino sheep).

*Methods*

Ex vivo vertebroplasty was performed through a bilateral modified parapedicular access in twenty four ovine lumbar hemivertebrae, divided into four groups (n=6). Cerament™ (Bone Support, Sweden) was the control material. In the experimental group a novel composite was tested - Spine-Ghost® -, which consists of an alpha-calcium sulphate matrix enriched with micrometric particles of mesoporous bioactive glass. All vertebrae were assessed by microCT and underwent mechanical testing.

For the in vivo study sixteen sheep were randomly allocated into control and experimental groups (n=8), and underwent percutaneous vertebroplasty using the same bone cements. All vertebrae were assessed post-mortem by microCT, histology and rt-PCR.

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*Results*

In the ex vivo model the average defect volume was 1275.46 ± 219.29 mm3. Adequate defect filling with cement was observed. No mechanical failure was observed under loads which were higher than physiological. In the in vivo study cardiorespiratory distress was observed in two animals, and one sheep presented mild neurological deficits in the hind limbs, before recovering.

*Conclusions*

The model is considered suitable for pre-clinical in vivo studies, mimicking clinical application. All sheep recovered and completed a 6 month implantation period. There was no evidence of cement leakage into the vertebral foramen in the post-mortem examination.