BIOLOGICAL PERFORMANCE OF A POLYCAPROLACTONE-BASED SCAFFOLD PLUS RECOMBINANT HUMAN MORPHOGENETIC PROTEIN-2 (rhBMP-2) IN AN OVINE THORACIC INTERBODY FUSION MODEL

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Introduction

We develop a sheep thoracic spine interbody fusion model to study the suitability of polycaprolactone-based scaffold and recombinant human bone morphogenetic protein-2 (rhBMP-2) as a bone graft substitute within the thoracic spine. The surgical approach is a mini- open thoracotomy with relevance to minimally invasive deformity correction surgery for adolescent idiopathic scoliosis. To date there are no studies examining the use of this biodegradable implant in combination with biologics in a sheep thoracic spine model.

Methods

In the present study, six sheep underwent a 3-level (T6/7, T8/9 and T10/11) discectomy with randomly allocated implantation of a different graft substitute at each of the three levels; (i) calcium phosphate (CaP) coated polycaprolactone based scaffold plus 0.54µg rhBMP-2, (ii) CaP coated PCL- based scaffold alone or (iii) autograft (mulched rib head). Fusion was assessed at six months post-surgery.

Results

Computed Tomographic scanning demonstrated higher fusion grades in the rhBMP-2 plus PCL- based scaffold group in comparison to either PCL-based scaffold alone or autograft. These results were supported by histological evaluations of the respective groups. Biomechanical testing revealed significantly higher stiffness for the rhBMP-2 plus PCL- based scaffold group in all loading directions in comparison to the other two groups.

Conclusions

The results of this study demonstrate that rhBMP-2 plus PCL-based scaffold is a viable bone graft substitute, providing an optimal environment for thoracic interbody spinal fusion in a large animal model.