EXPERIMENTAL SCOLIOSIS IN AN IMMATURE GOAT MODEL: A METHOD THAT CREATES IDIOPATHIC-TYPE DEFORMITY WITHOUT VIOLATION OF THE SPINAL ELEMENTS ALONG THE CURVE

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PURPOSE: The purpose of this study is two-fold. First, to create a progressive, structural, idiopathic-type, lordoscoliotic curve in the right thoracic spine of the immature goat. Second, to maintain the anterior and posterior elements of the spine along the maximal curve in a pristine state to allow for subsequent study of the deformity.

METHODS: Scoliosis was created in 40 Spanish Cross X female goats (age 1-2 months, weight 17-23 pounds) using a left posterior asymmetric tether (PAT) from T4-6 to L1-2. Contralateral rib resection and ipsilateral rib tethering from T8-T13 were performed prior to compression across the rigid construct (TSRH Pediatric stainless steel sublaminar hooks and a 3/16 rod). Goats were followed over a 6-15 week period with serial radiographs to document progression of deformity. After 16 weeks of PAT, goats were randomized into treatment and control groups for additional study.

RESULTS: Of the 40 goats that underwent PAT with rib procedures, seven (18%) encountered substantial complications (five deaths, two neuro injuries). Of the 33 available for analysis, 27 goats (82%) developed progressive, structural, idiopathic-type, lordoscoliotic curves in the right thoracic spine. Initial scoliosis after PAT measured 42° on average (range 33-50 °) and progressed to 60 ° on average (range 44-73 °) over 6-15 weeks. The average progression of +18 ° (range 6-37 °) was statistically significant (<.001). All 27 curves demonstrated characteristic radiographic features of idiopathic scoliosis including significant displacement of the apical vertebra from the midline, wedging of both the vertebral body and disc space, rotation (average Nash-Moe II at 6-15 weeks) and decreased flexibility.

DISCUSSION: This study establishes an experimental model for scoliosis that creates progressive, structural, idiopathic-type, lordoscoliotic curves in the right thoracic spine of the immature goat with high statistical significance (<.001). Our previous work (a pilot study with PAT in 16 goats without contralateral rib resection or ipsilateral rib tethering) demonstrated the inability to produce any substantial scoliosis with an intact thoracic cage. The rib procedures are essential to the creation of progressive curves of significant magnitude. In addition, this method of experimental scoliosis creation avoids violation of the spinal elements throughout the maximal portion of the curve providing an ideal opportunity for the study of various fusionless treatments of a progressive, idiopathic-type deformity.