

# **Prenatal Esophageal Lengthening by Distraction Enterogenesis in a Fetal Lamb Model of Long Gap Esophageal Atresia**

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## **Introduction:**

The Foker procedure has advanced management of long gap esophageal atresia (LGEA) but is associated with significant morbidities including prolonged length of stay and ventilator time. Prenatal intervention to lengthen the esophagus could eliminate the need for staged repair and mitigate the morbidity of LGEA. We aimed to achieve prenatal esophageal lengthening by distraction enterogenesis using an intraluminal spring in a fetal lamb model of LGEA.

## **Methods:**

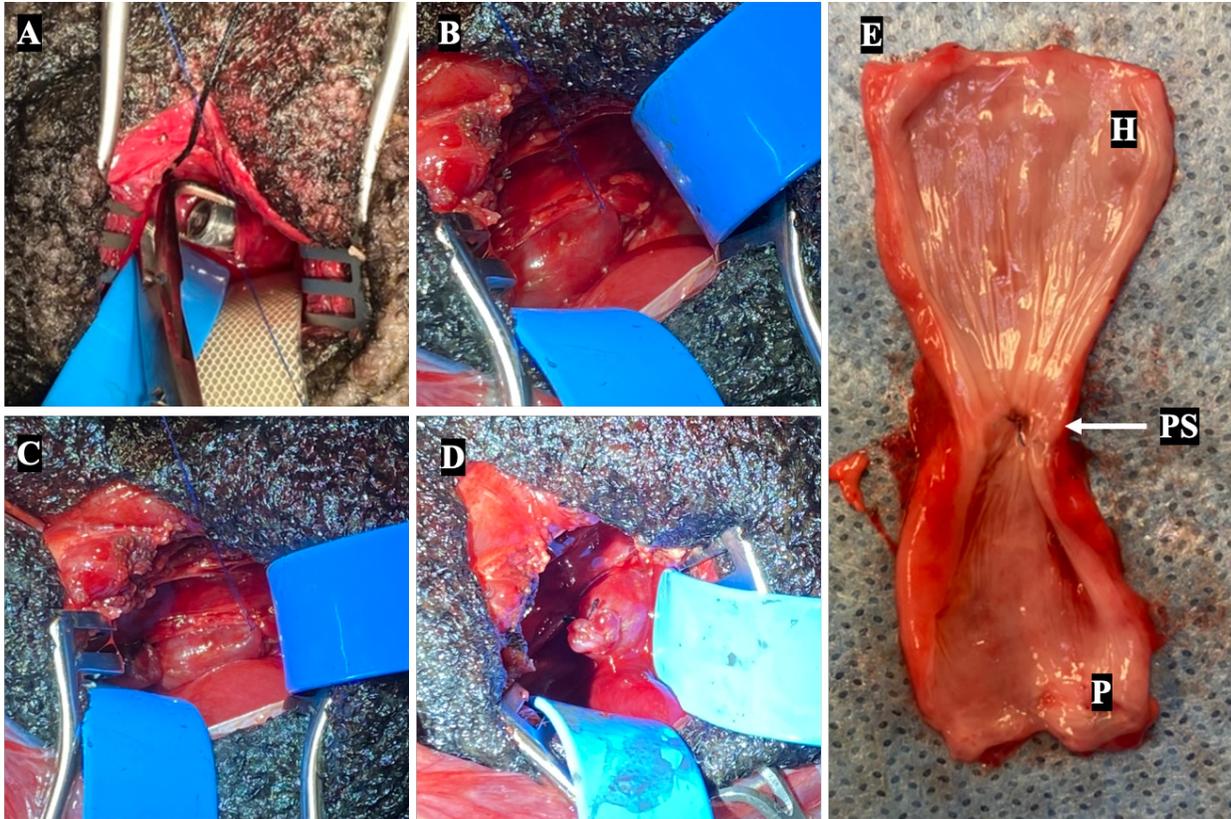
Ewes underwent hysterotomy during late gestation. Fetal lambs underwent thoracotomy and creation of an esophagotomy. A compressed (experimental, n=4) or non-compressed (control, n=2) nitinol spring was placed in the proximal esophagus (Figure 1). The esophagus was narrowed with a plication suture proximal to the spring and suture ligated distal to the spring. The length between the two sutures was measured. The esophagus was suture ligated near the diaphragm and the distal portion of the esophagus was removed. The thoracotomy was closed, and the fetus was returned to the uterus to continue gestation. Delivery by cesarean section and euthanasia were performed near term. The length of the proximal esophageal pouch was measured, and gross tissue was examined.

## **Results:**

The proximal esophageal pouch of experimental animals increased in length from  $13.5 \pm 0.87$  mm to  $21.5 \pm 1.66$  mm ( $p = 0.002$ ). There was no significant change in esophageal length of control animals ( $14.5 \pm 0.5$  mm to  $14.5 \pm 0.5$  mm). The proximal esophageal pouch appeared grossly healthy. The surgical model was well-tolerated with no observed attrition or preterm delivery.

## **Conclusion:**

This study is the first demonstration of prenatal lengthening of the esophagus using an intraluminal spring in a fetal lamb model of LGEA. Distraction enterogenesis appears to be an effective and well-tolerated approach to prenatal esophageal lengthening. Future studies will focus on minimally-invasive approaches to spring placement.



**Fig. 1.** Photographs of (A) spring placement, (B) proximal plication suture, (C) proximal pouch, (D) proximal pouch after removal of distal esophagus, and (E) gross specimen. PS = plication suture; P = lengthened proximal pouch; H = healthy tissue proximal to plication suture

**One-liner:**

Distraction enterogenesis is an effective and well-tolerated approach to prenatal esophageal lengthening in a fetal lamb model of long gap esophageal atresia.