

## Innovation Session (cont.)

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### THREE-DIMENSIONALLY PRINTED SURFACE FEATURES TO ANCHOR ENDOLUMINAL SPRING FOR DISTRACTION ENTEROGENESIS

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**Purpose:** Spring-mediated distraction enterogenesis has been studied as a novel treatment for short bowel syndrome. Previous approaches are limited by multiple surgeries that are needed to restore intestinal continuity or to place extraluminal devices. Purely endoluminal devices require a period of intestinal attachment for enterogenesis. The purpose of this study is to modify the surface of springs to allow for sequential endoluminal placement in a porcine model.

**Methods:** Roux-en-Y jejunostomy with a defunctionalized stoma was created in juvenile mini-Yucatan pigs. Three-dimensionally printed, biocompatible springs with unidirectional or bidirectional surface features were endoluminally placed via the stoma. Springs with smooth surfaces were used as controls (Figure). Spring location was evaluated weekly by abdominal radiographs. Bowel was examined directly for the presence of spring at 4 weeks.

**Results:** Control springs with smooth surfaces passed through the intestine in less than 1 week after placement. Endoluminal springs with unidirectional surface features stayed attached for up to 3 weeks before passing through the intestine. Springs with bidirectional surface features were anchored to the intestine for the entire 4 weeks. Intestinal diameter at the site of spring placement was increased compared to normal jejunum ( $15.7 \pm 0.6$  mm versus  $7.3 \pm 0.4$  mm). Histologically, jejunal architecture was preserved with significantly increased crypt depth and muscularis thickness in comparison to normal jejunum. Animals tolerated the procedure well. Repeated endoluminal spring placement via stoma was feasible.

**Conclusion:** Bidirectional features printed on springs prevented premature detachment. Such novel spring anchors allow for endoluminal placement without any sutures. This approach may lead to the clinical application of the device for patients with short bowel syndrome.