Novel Magnetic Anastomosis Device for Gastrointestinal Compression Anastomosis

Sumeet K. Mittal[1], Steven A. Edmundowicz[2]

1. Creighton University (Phoenix campus), 2. University of Colorado School of Medicine

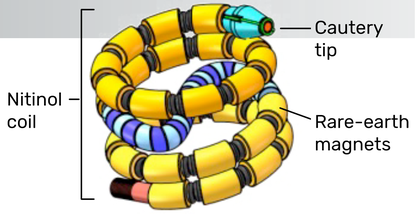
Objective of the technology or device:

- Anastomotic leaks are a significant complication of all gastrointestinal anastomosis and are associated with significant morbidity, mortality and healthcare cost.
- Current staplers for anastomosis have made anastomosis technically easier but have not eliminated anastomotic leaks.
- Magnets for creating compression anastomosis have been described in both animals and humans. Contrary to standard anastomosis, by creating the fusion of the gastrointestinal wall before final resection of the intervening tissue, magnetic compression anastomosis holds the potential for eliminating anastomotic leak.

Attract Medical (Medford, NJ) has created a single-operator, flexible catheter-based magnetic compression anastomosis system which can be delivered through a 3.7 mm catheter system to create compression anastomosis.

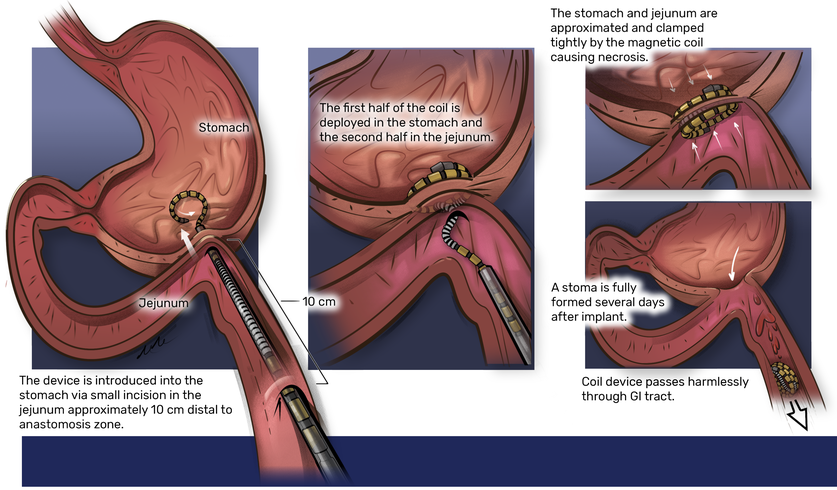
Description of the technology and method of its use or application:

The system contains series of rare-earth magnets, loaded onto a Nitinol coil, which forms two, self-aligning parallel loops of magnets that compress two adjacent gastrointestinal walls to create an anastomosis within 5-7 days.



After the anastomosis is formed, the magnetic coil is naturally eliminated with the bowel movement between 7-10 days. The magnetic coil is fitted with a monopolar cautery tip to facilitate puncture of gastrointestinal walls.

After IACUC approval gastro-jejunal, jejuno-jejunal anastomosis and cholecysto-gastrostomy were attempted in a porcine survival model using both endoscopic and surgical delivery device. In the endoscopic approach, the catheter was placed using a therapeutic endoscopic ultrasound (EUS). Under ultrasound guidance the cautery tip was used for transmural puncture through gastric wall into the adjacent lumen of small bowel or gallbladder. In the surgical approach, a small enterotomy was performed close to the anti-mesenteric border of a loop of jejunum and the catheter was passed through the lumen across the bowel into the lumen of adjacent loop of jejunum or stomach. Both open and laparoscopic models were created separately. The enterostomy site was closed primarily after the device was deployed. The animals were then recovered and survived for 20 days. The stools were collected to recover the magnetic device after spontaneous passage.



Preliminary results:

After multiple device modifications, we were able to create a complete gastro-jejunostomy and jejuno-jejunostomy in a porcine model. There were no leaks in any of the animals and the anastomosis was devoid of inflammation or fibrosis.

Conclusions/Future directions:

We have developed a novel, flexible catheter-based magnetic compression anastomosis system that has safely created gastro-jejunal and jejuno-jejunal anastomoses. With the device design finalized, we plan to perform end-to-end colo-colic anastomosis as our first procedure of choice. In parallel, we are developing the endoscopic device to create a cholecysto-jejunostomy and cyst-gastrostomy for pseudocyst drainage. By reducing or eliminating the risk of anastomotic leaks, the device offers potential advantages over traditional anastomotic techniques.

Disclosure Statement: This research is sponsored by Attract Medical (Medford, NJ) and may lead to the development of products for which both authors provide consulting services.

SAGES 2021 Aug 31 - Sept 3, 2021 MGM Grand, Las Vegas, Nevada

©2021, Attract Medical (Medford, NJ)