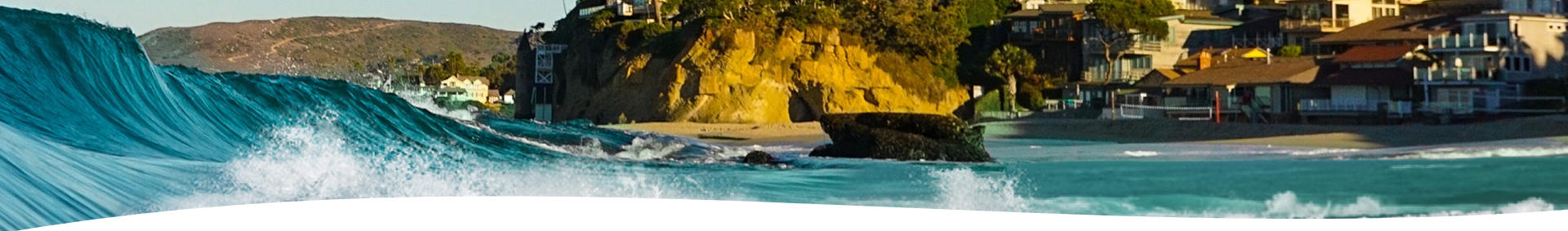


2023 SCSG GI SYMPOSIUM



Endoscopic Defect Closure: *Concepts, Devices, and Techniques*

Kenneth J. Chang, MD, MASGE, FACG, AGAF, FGJES
Executive Director, Digestive Health Institute
Professor & Chief, Gastroenterology & Hepatology
University of California, Irvine

Disclosures

◎ Apollo/BSC

◎ Cook

◎ Creo

◎ Endogastric Solutions

◎ Erbe

◎ Medtronic

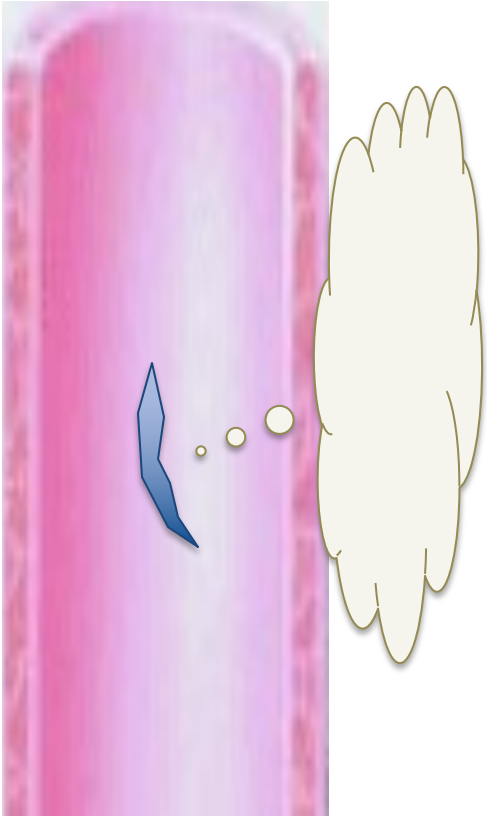
◎ Olympus

Outline



- ◎ Concepts
- ◎ Devices
- ◎ Techniques

Physiologic consequences

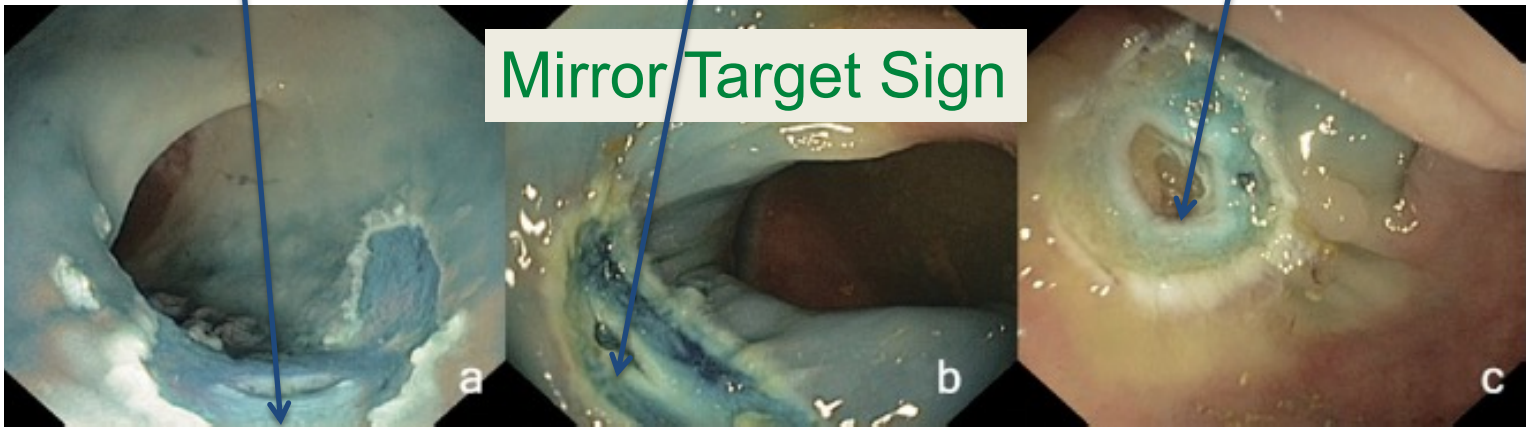
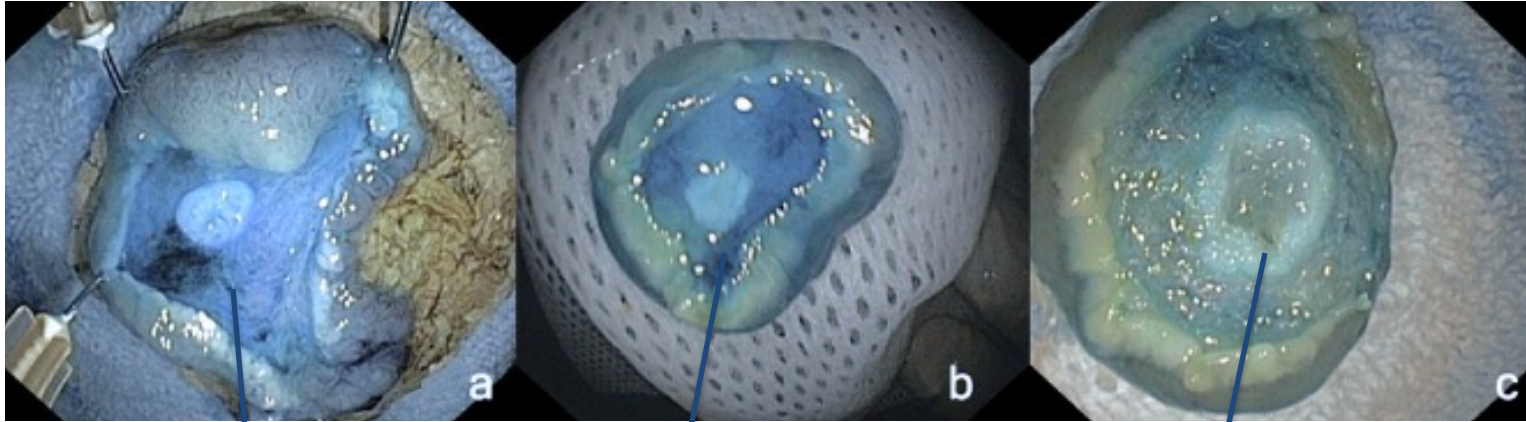


- Immediate – air leak → tension pneumothorax or pneumoperitoneum → hemodynamic crisis
- TO DO:
 - ~ CLOSE hole
 - ~ Decompress tension

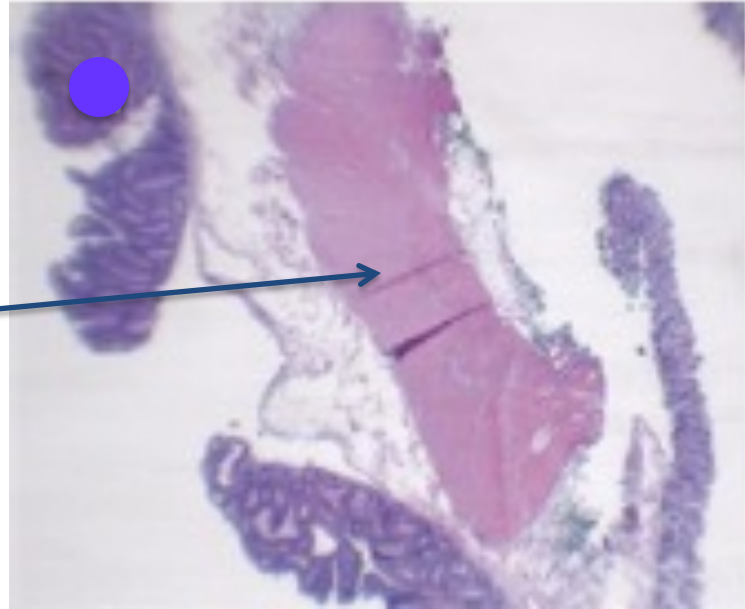
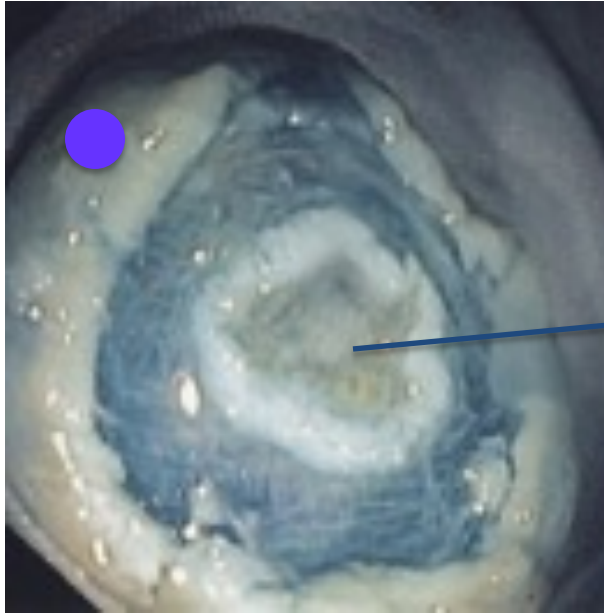
Tension Pneumoperitoneum



Target Sign = MP



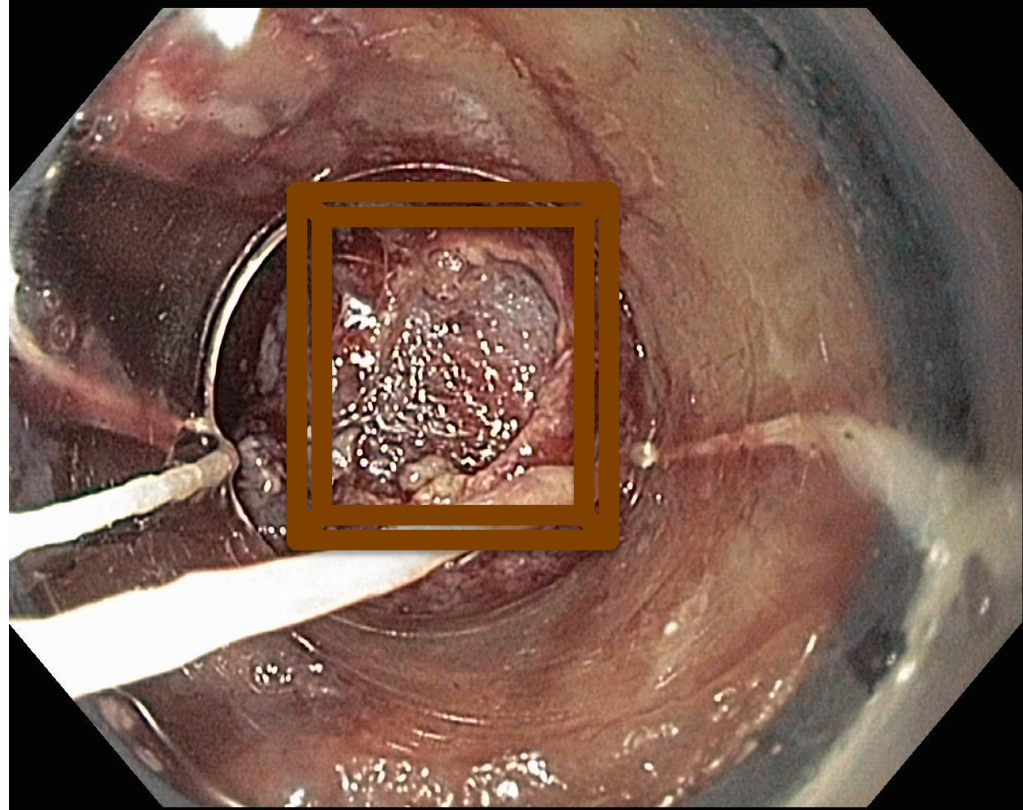
Target Sign = MP

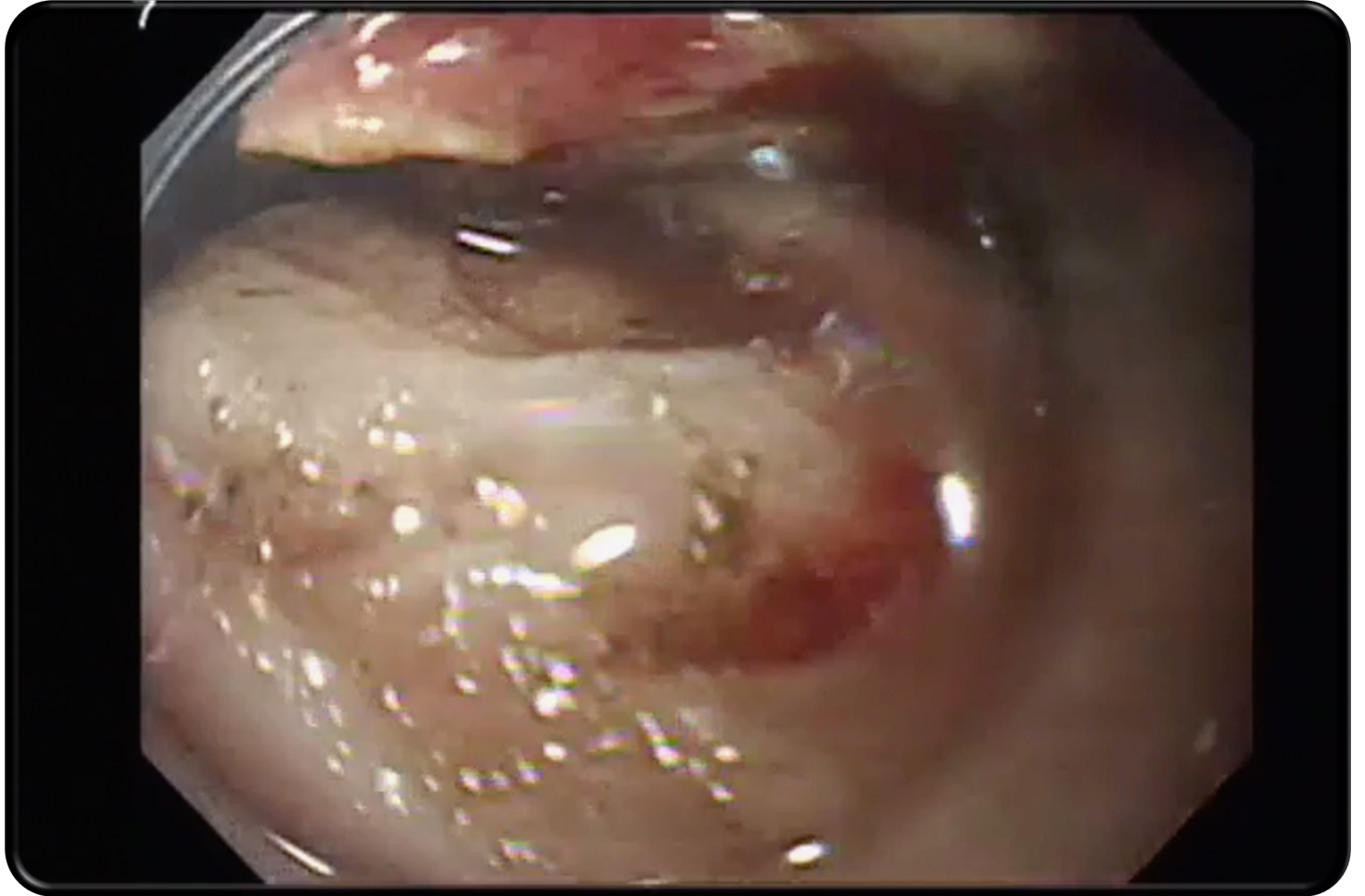


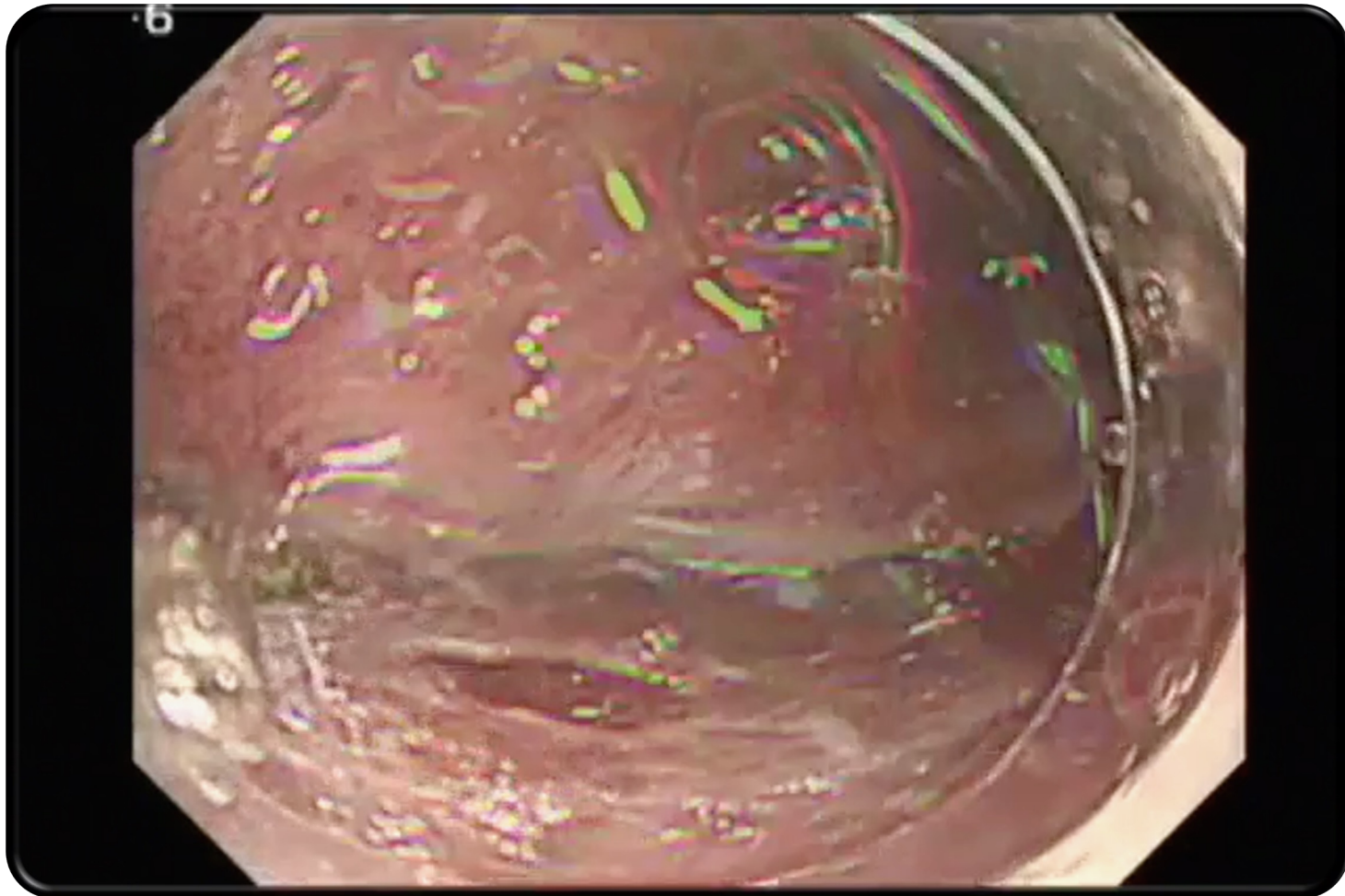
Endoscopic Detection of Perforation

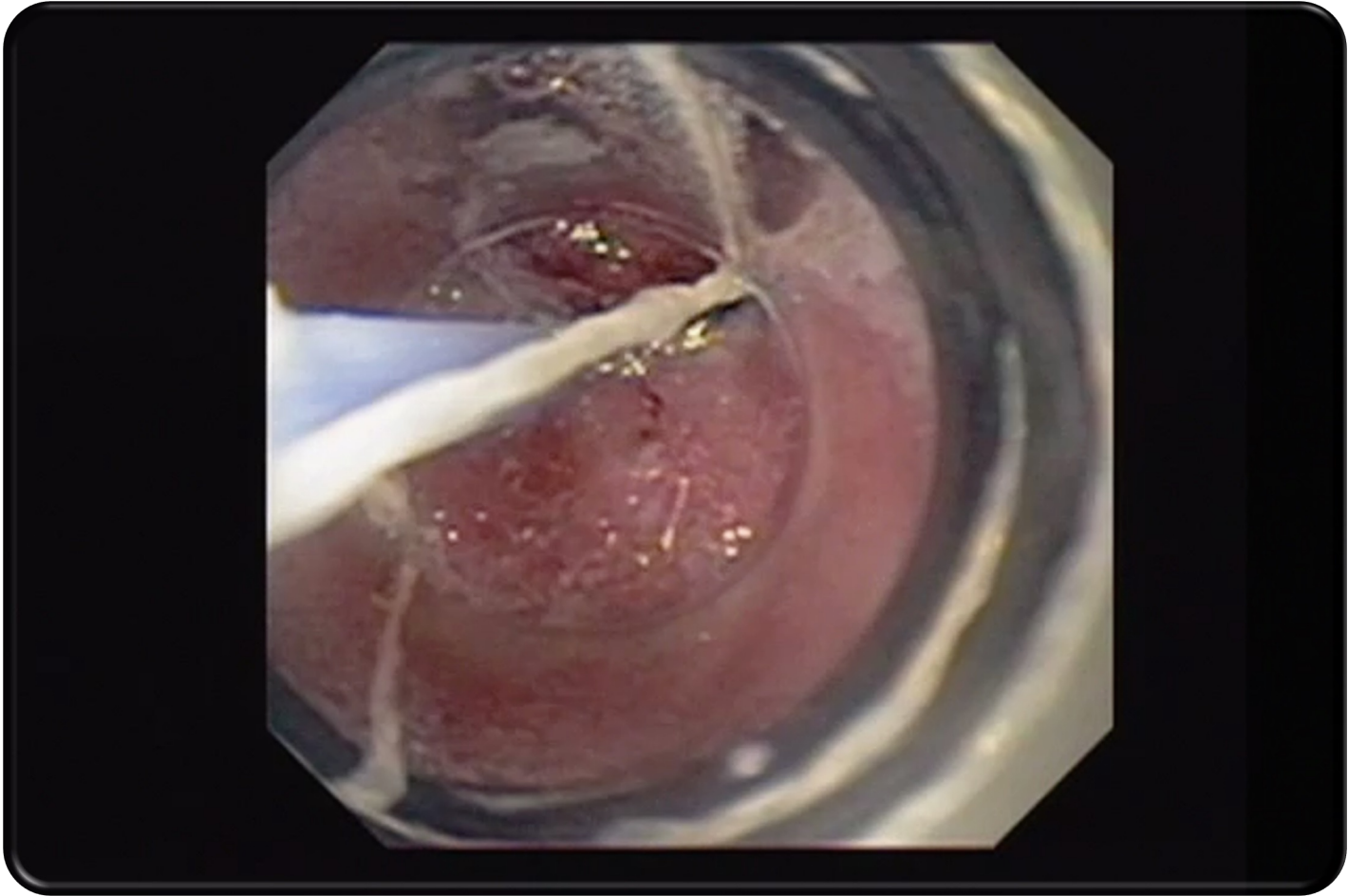


“Tree moving
outside window”









Components of Endoscopic Closure

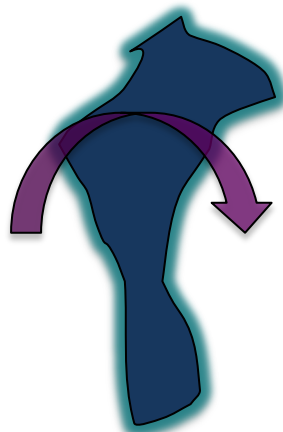
- ◎ Approximation
- ◎ Fixation
- ◎ Seal

Approximation

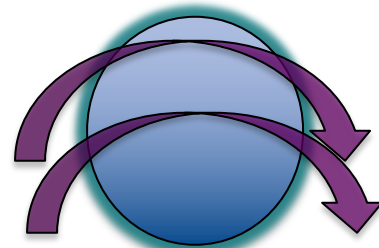


Small Linear

Long Linear



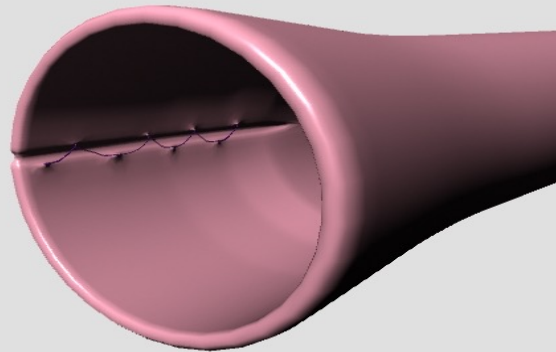
Gaping



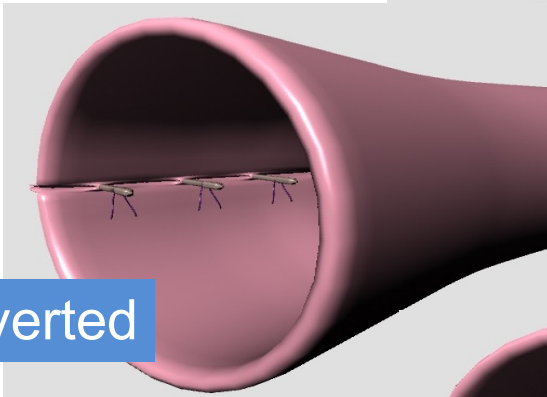
Hole

Types of Fixation

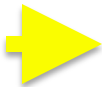
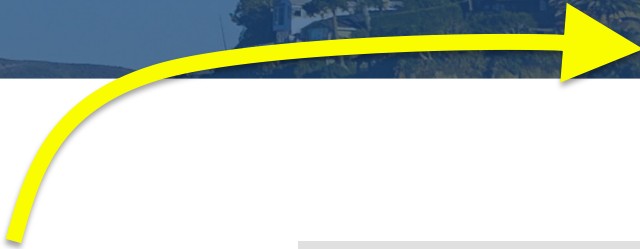
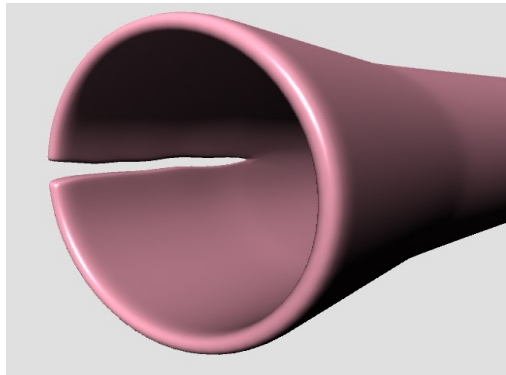
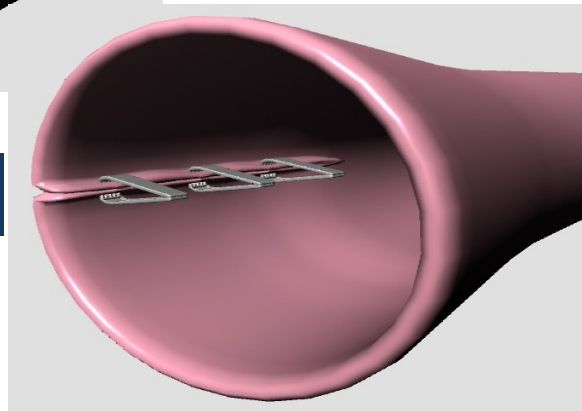
Parallel



Everted



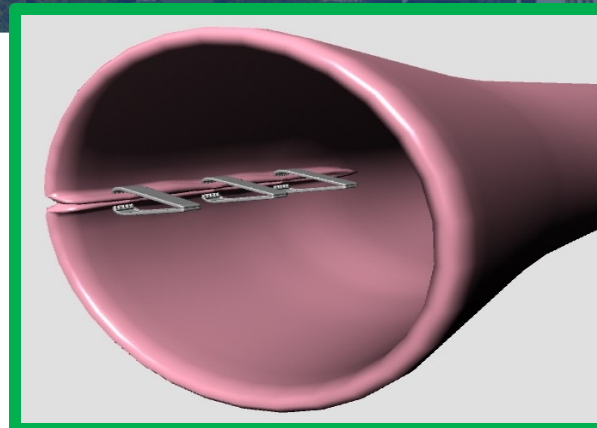
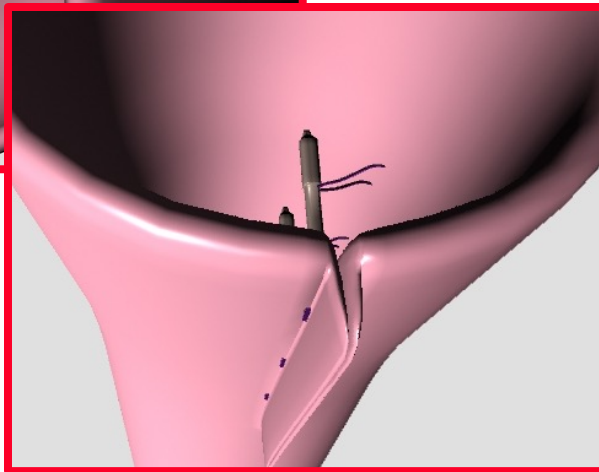
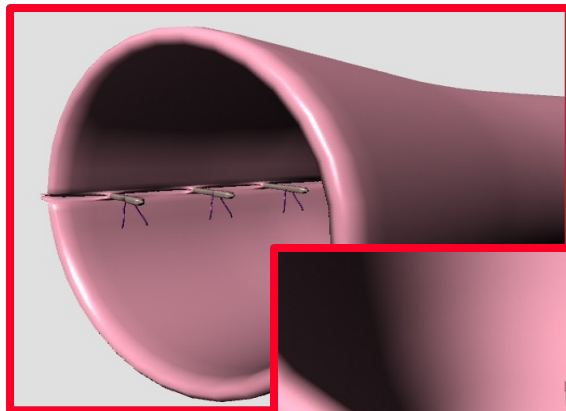
Inverted

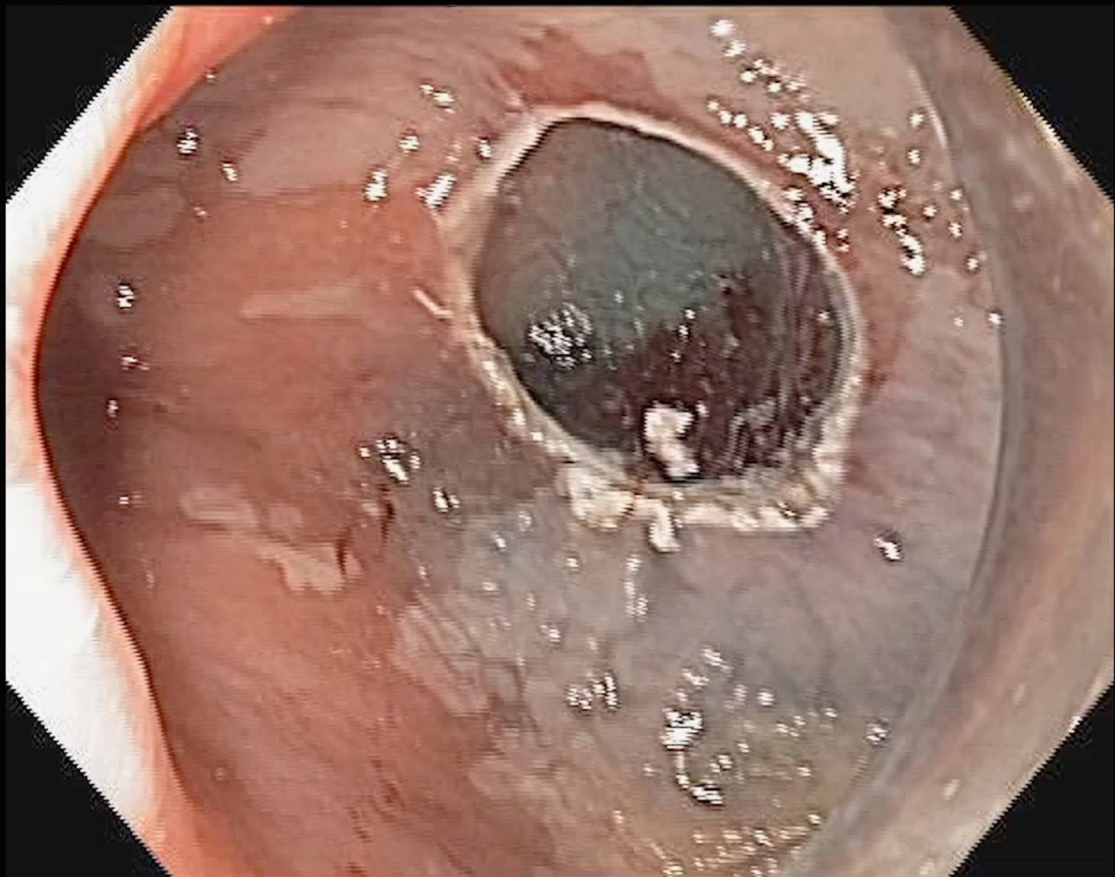


- Fixation

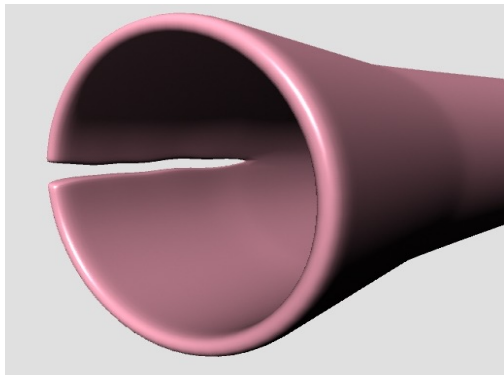
Mucosa to mucosa

Serosa to serosa

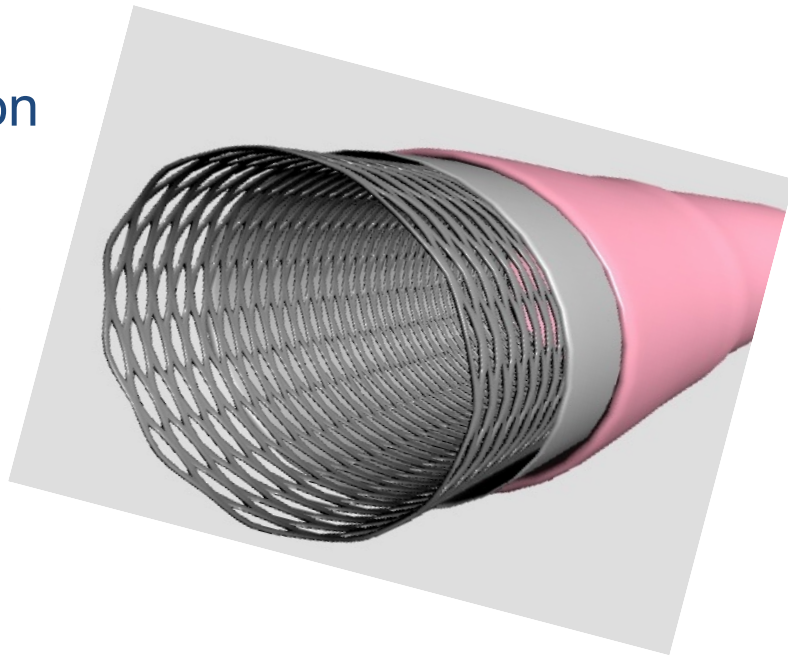




If primary closure not possible...



Diversion



Outline



- ◎ Concepts
- ◎ Devices
- ◎ Techniques

Endoscopic Clipping

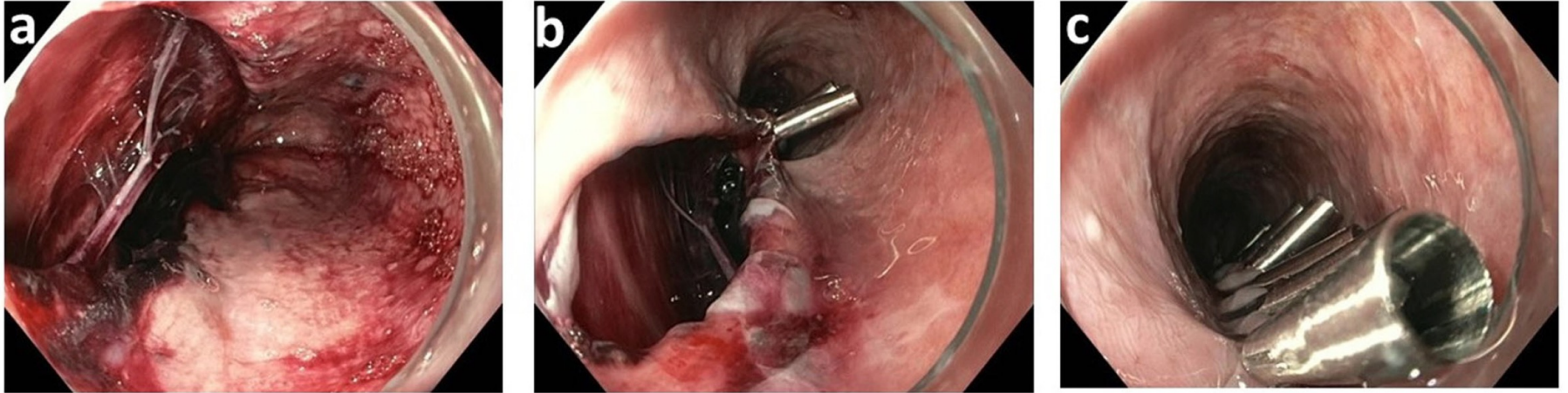


Figure 2. (a–c) Endoscopic images of esophageal perforation in case III. The defect was located just above the esophagogastric junction (a) and was successfully closed with 15 endoclips (b and c).










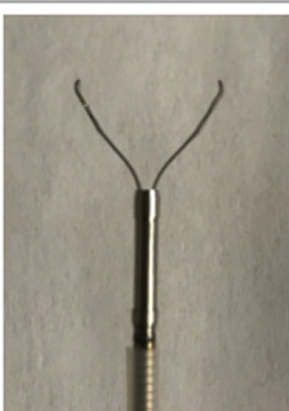




Position	Instinct	Resolution 360	Dura Clip 11mm	SureClip 16mm	Quick Clip Pro
Closed					
Open					

TABLE 2. Physical characteristics of the various clip types

Physical Characteristic		Instinct	Resolution 360	Dura Clip 11mm	SureClip 16mm	Quick Clip Pro
Open Width (mm)		13.5	11	11	14**	11
Jaw Length (mm)		9	9	7	11	10
Clip Length (mm)		15	16	10	14	15
Tail Length (mm)		6	7	3	3	5
Material		Stainless steel, nitinol	Stainless steel, cobalt	Stainless steel	Stainless steel	Elgiloy

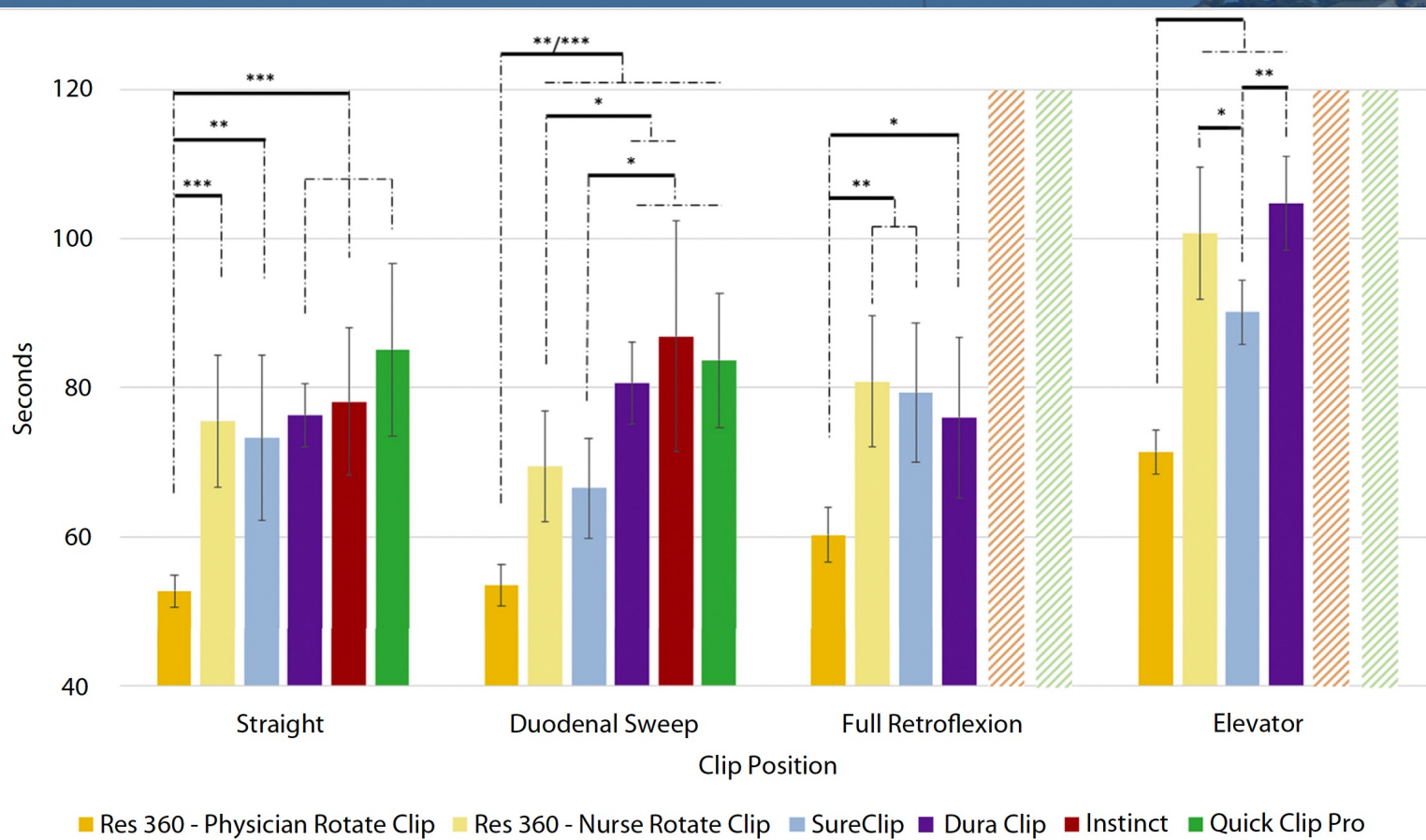


Figure 6. Comparison of clip rotatability among the endoscopic clips. Direct head-to-head comparisons were performed among each clip type at the configurations shown (Student t test, * $P < .05$; ** $P < .005$; *** $P < .0005$). The Resolution 360 has the added option of physician clip rotation at the insertion tube entrance. Hashed bars indicate failure to rotate through the prescribed sequence of clock faces. A minimum of 40 seconds was required for each trial as clips were held at each of the 8 clock faces for 5 seconds to demonstrate stability.

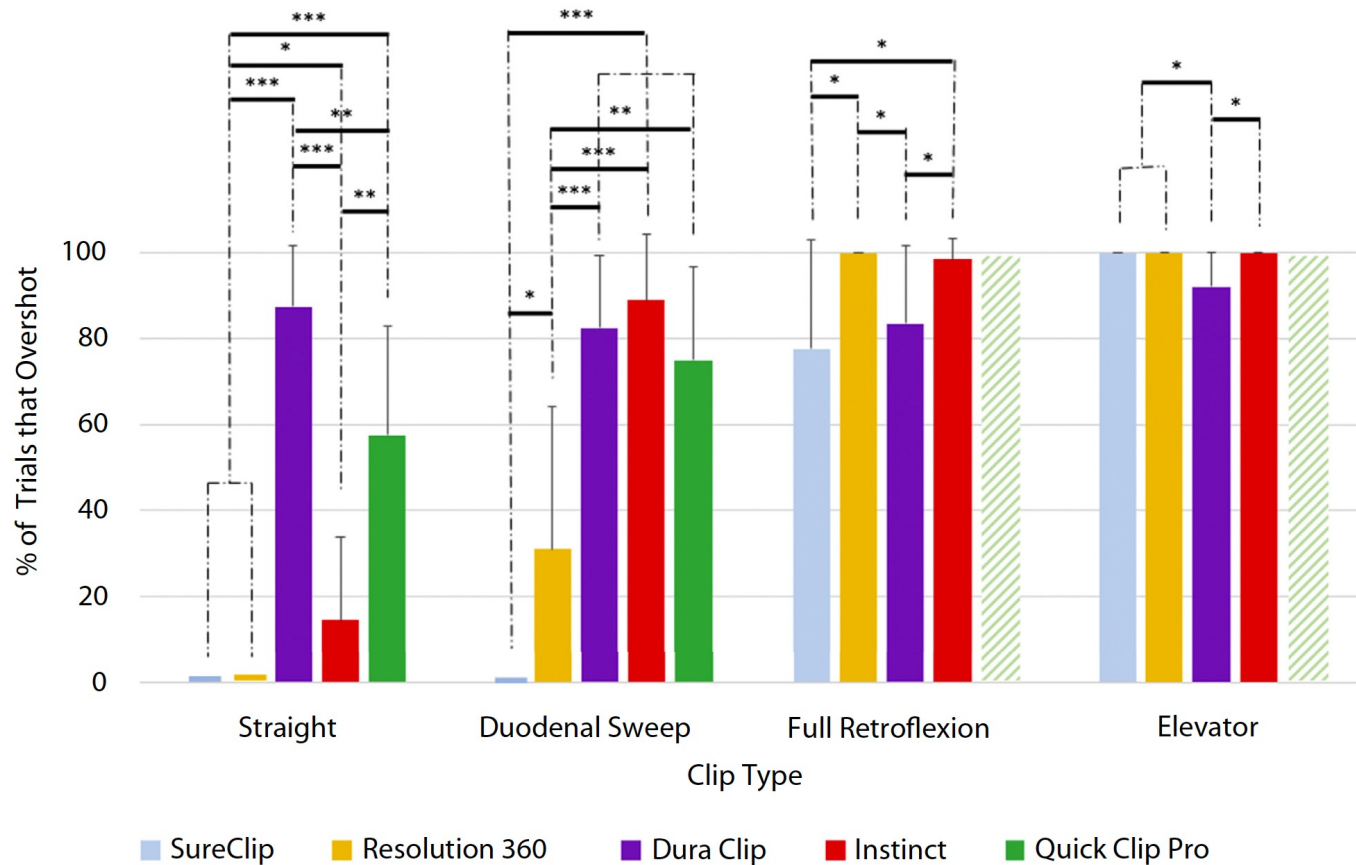


Figure 7. Degree of observed overshoot among clips. Each clip type was tested for overshoot and whip at 4 endoscopic configurations, ordered in increasing strain from left to right (Student t test, * $P < .05$; ** $P < .005$; *** $P < .0005$; $n = 10$ per clip type and per endoscope configuration). Hashed bars indicate failure to perform full 360° clockwise rotations at those configurations.

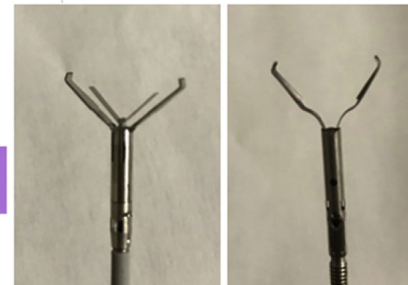
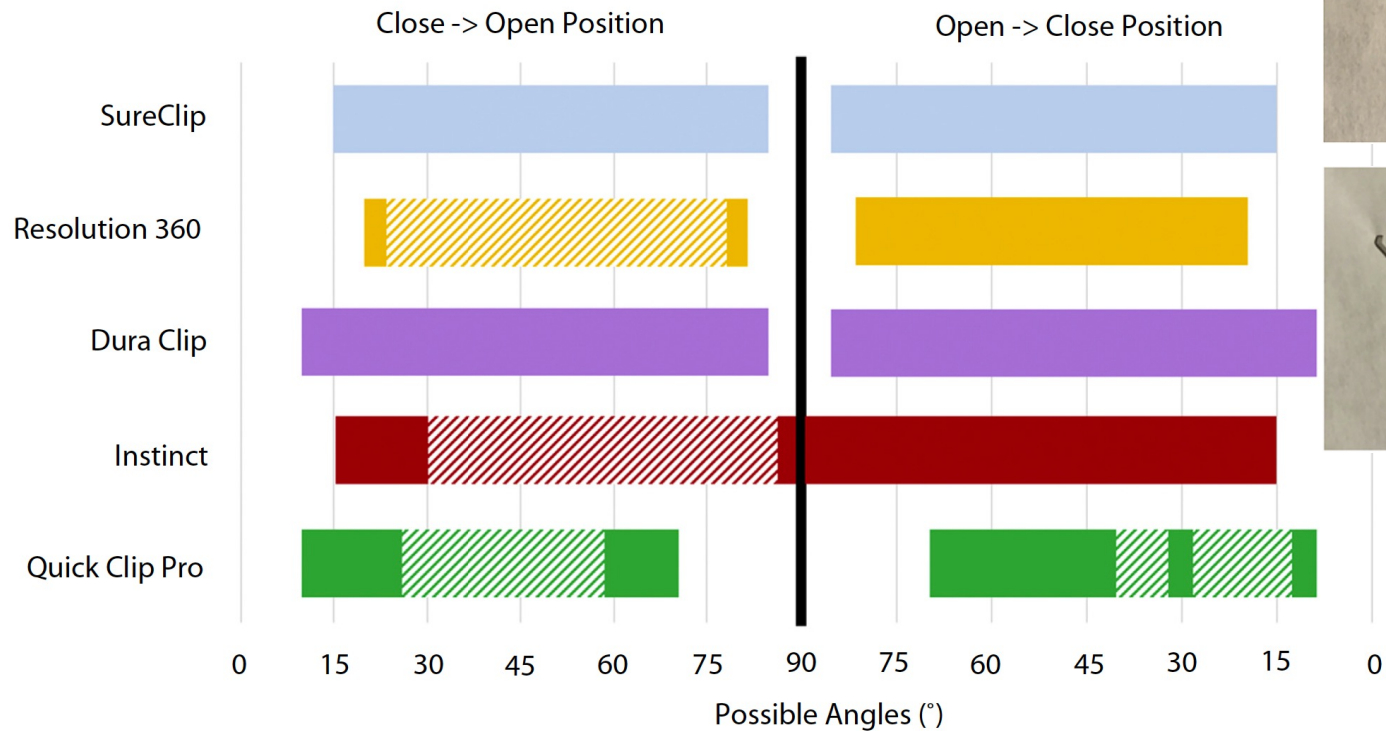


Figure 8. Precision of open/close. All possible angles in opening/closing are visually displayed for each clip. Shaded bars indicate smooth and precise open/closing. Hashed bars indicate angles that certain clips could not achieve during this exercise, rounded to the nearest 5°.

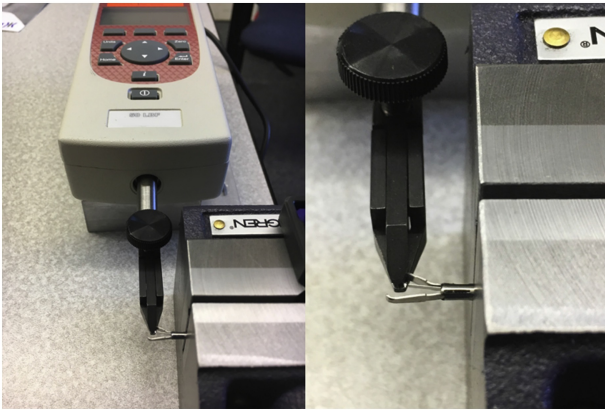


Figure 4. Digital tensiometer for measuring clip tensile strength. Images demonstrate the digital tensiometer attached to one end of the opened clip jaw before clip firing.

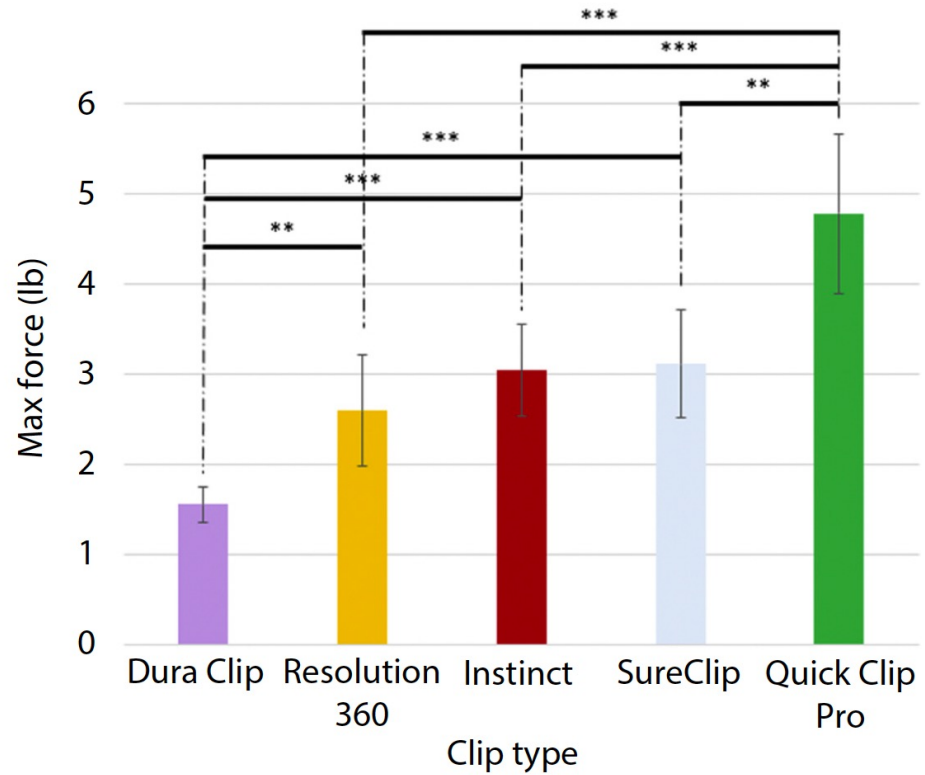


Figure 9. Tensile strength of clips for lateral tissue manipulation. Direct comparisons were performed among each clip type for maximum lateral tensile strength required for clip failure (Student t test, ** $P < .005$; *** $P < .0005$).

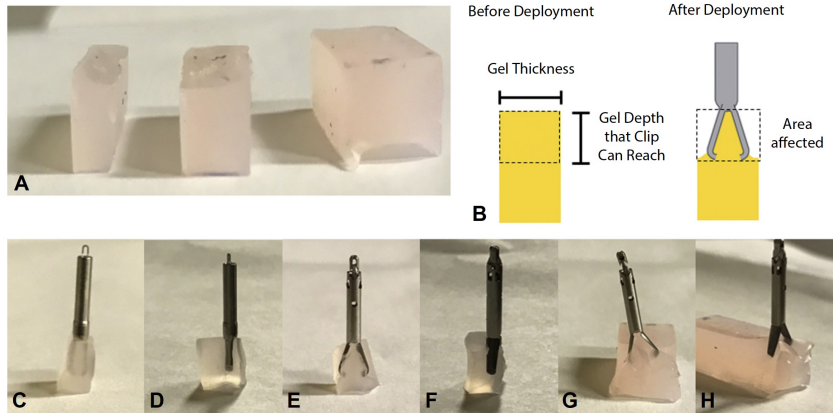


Figure 5. Tissue thicknesses before and after clip deployment. **A.** The gel tissue of 3 different thicknesses from left to right: 3.3 mm, 6.7 mm, and 10 mm. **B.** The depth and affected area are observed visually. **C-H.** The clips deployed on the respective gel tissues (C and D for the 3.3 mm gel tissue, E and F for the 6.7 mm tissue, and G and H for the 10 mm tissue).

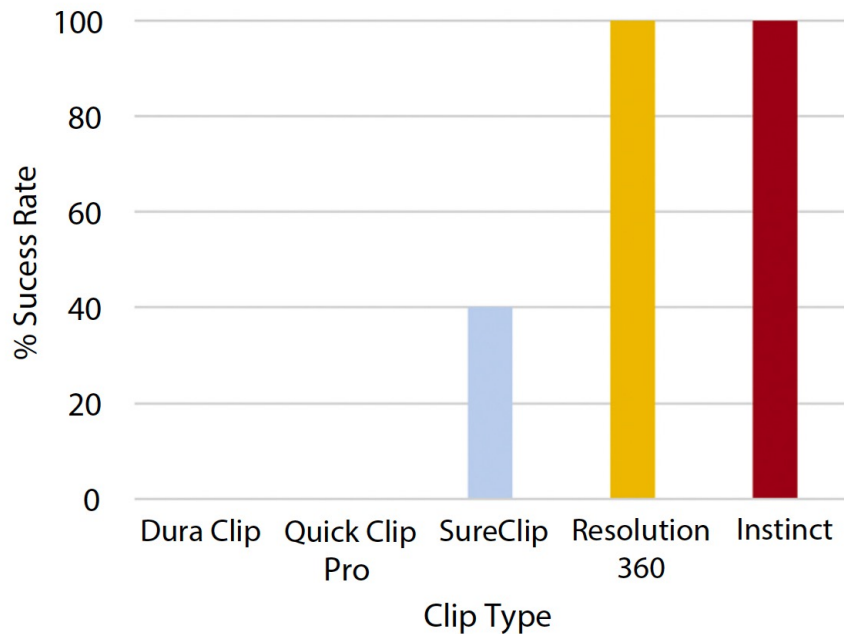
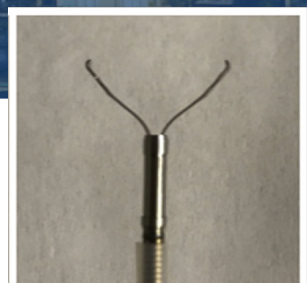
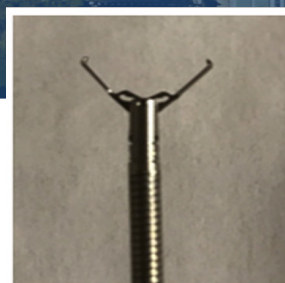
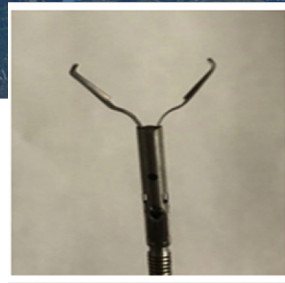
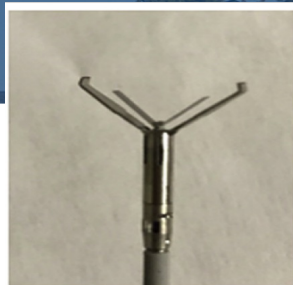
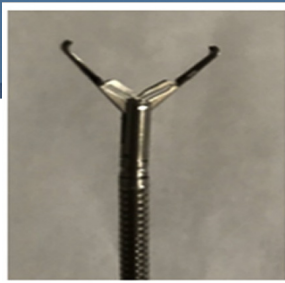


Figure 10. Visual representation of the success rate of all clips when deployed onto 10-mm-thick gel (n = 5 per clip).



SureClip

Instinct

Resolution360

DuraClip

QuickClip Pro

Rotatability

*

**

*

Precision Opening

**

**

*

Tensile Strength

*

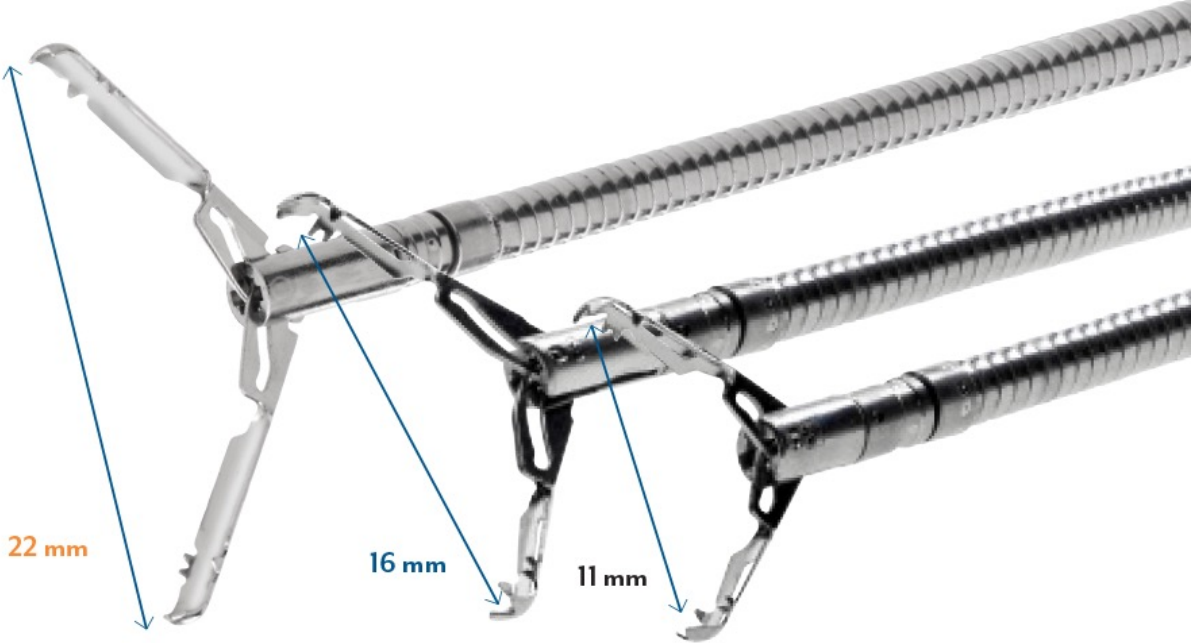
Closure Strength

**

*

*

LOCKADO HEMOSTASIS CLIP

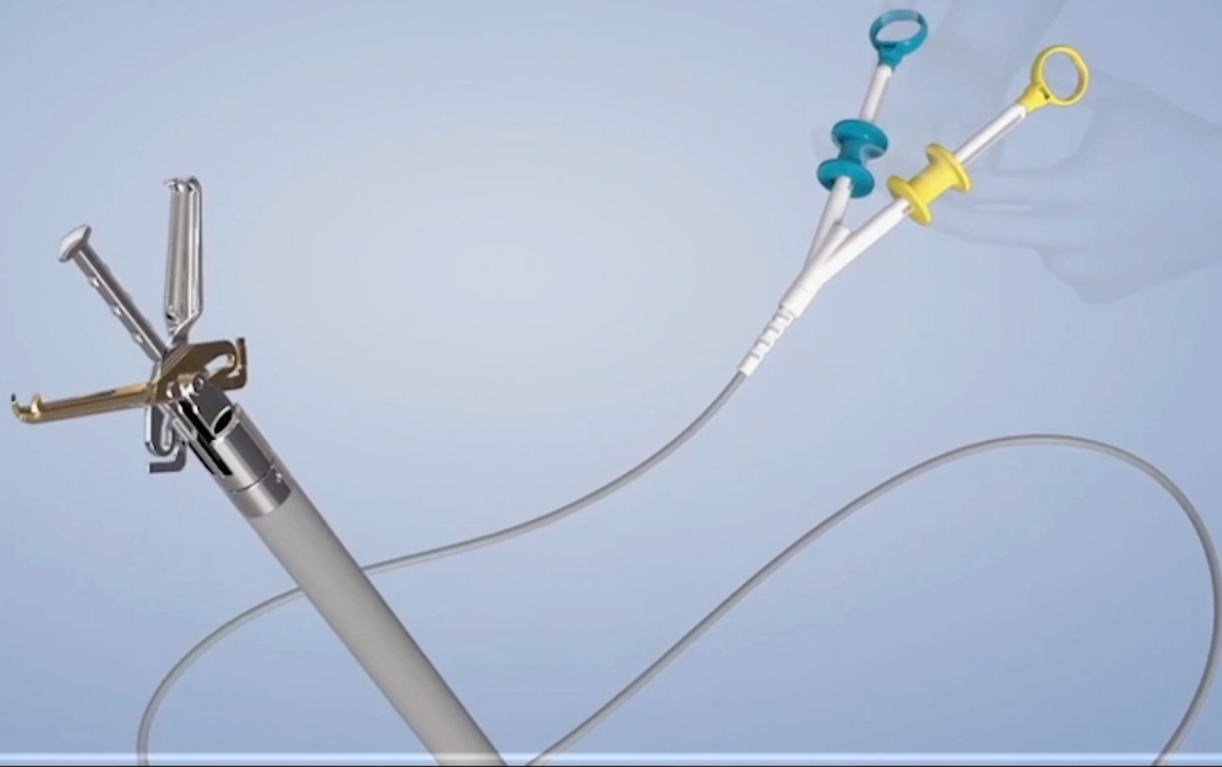


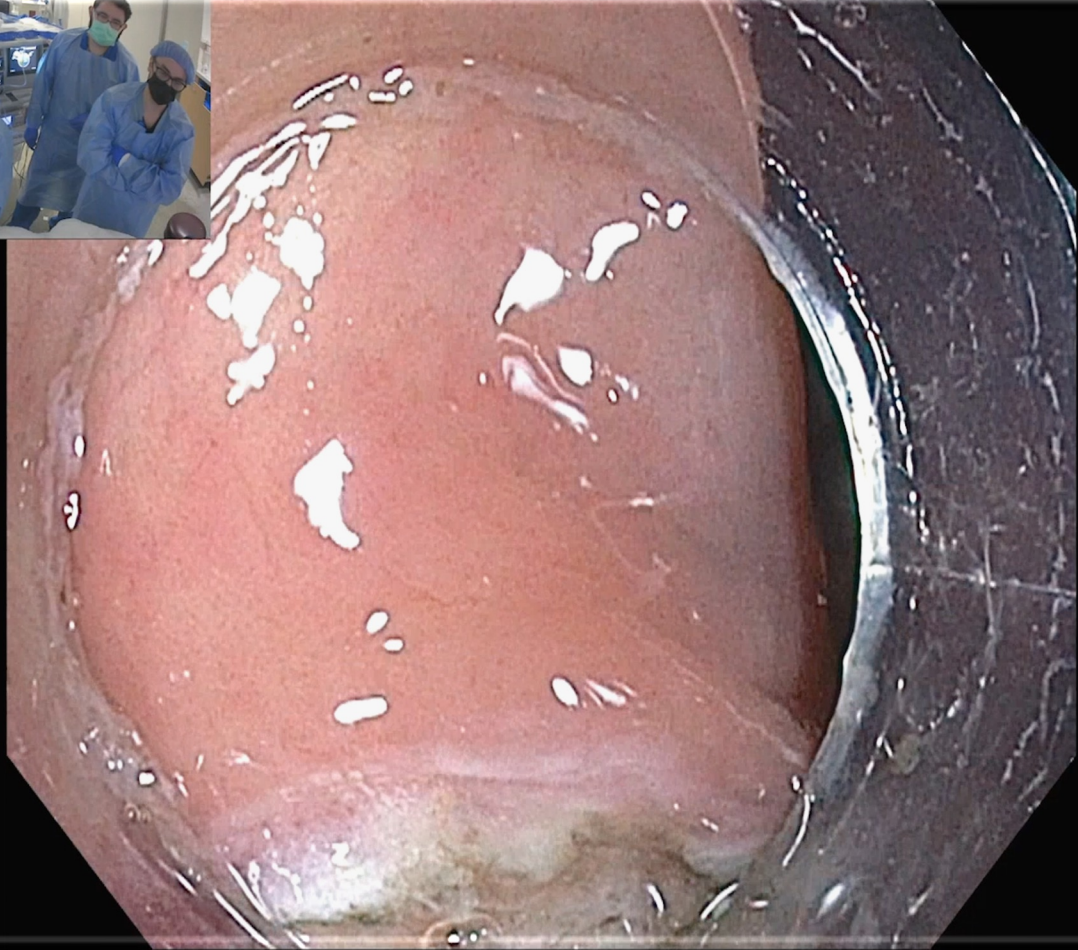
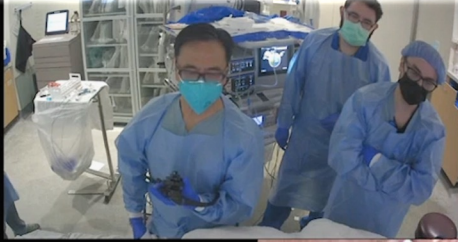
“Gripping Anchors”



to close lesions larger than its jaw opening width,

“Dual Action”





Anchor and Suture Approximation Device



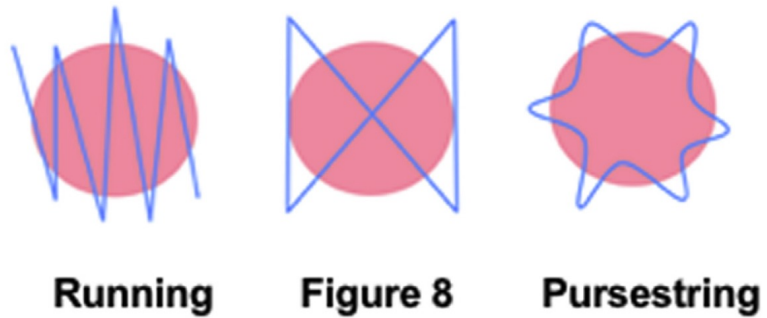


Figure 4. Potential suture patterns.

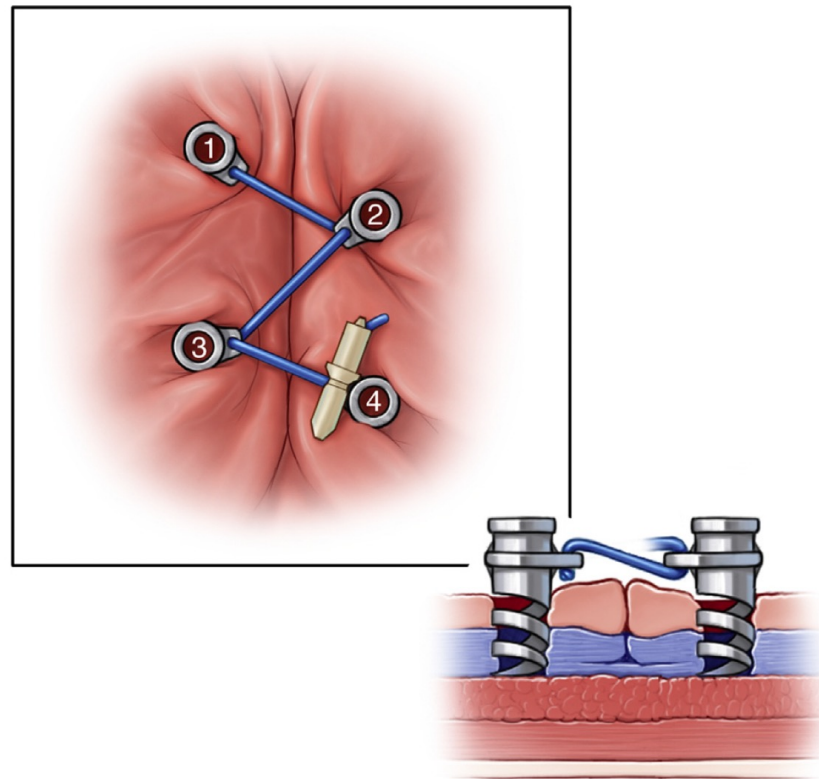
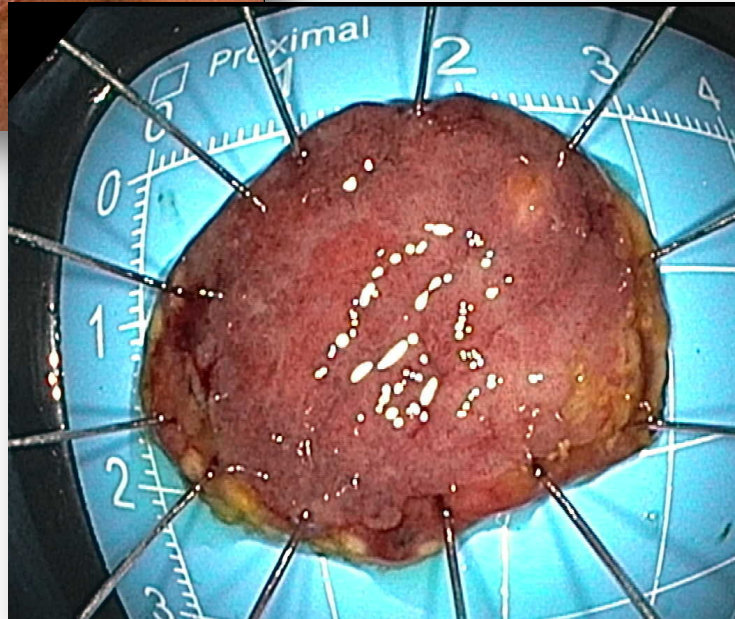
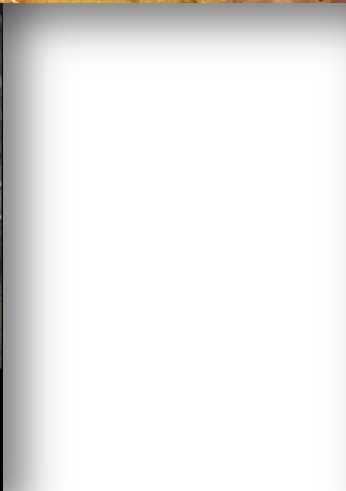
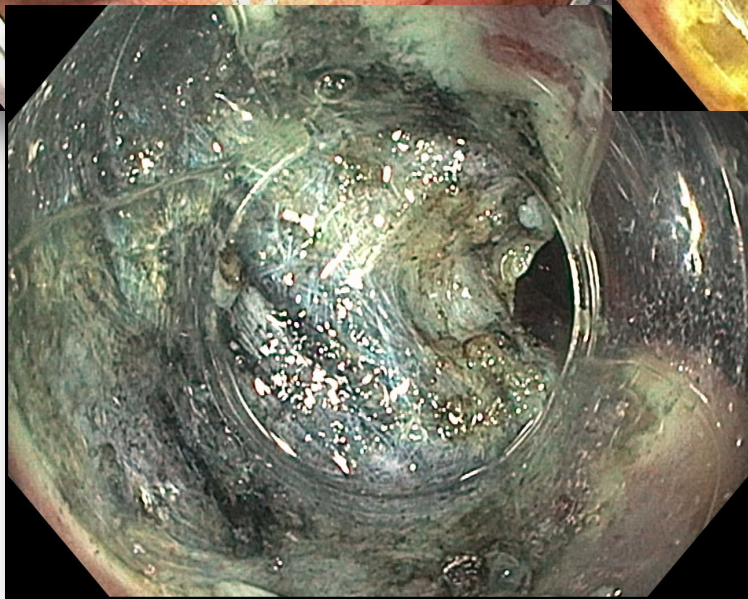
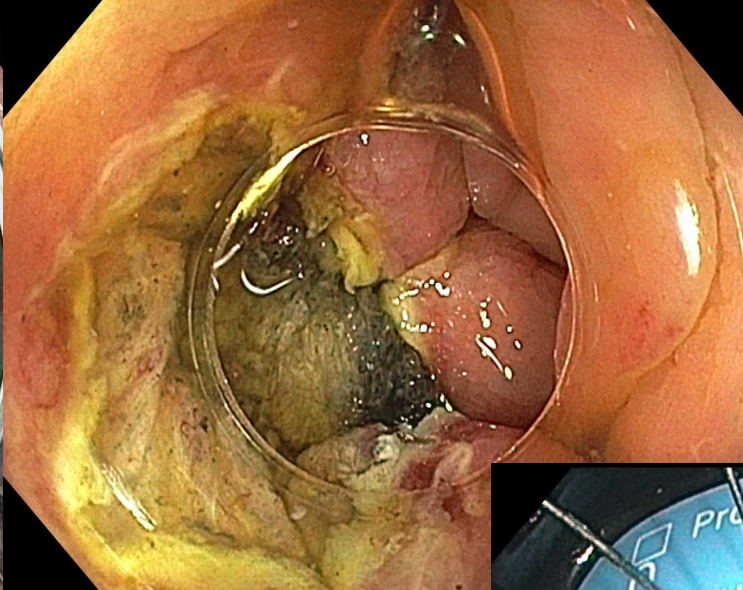
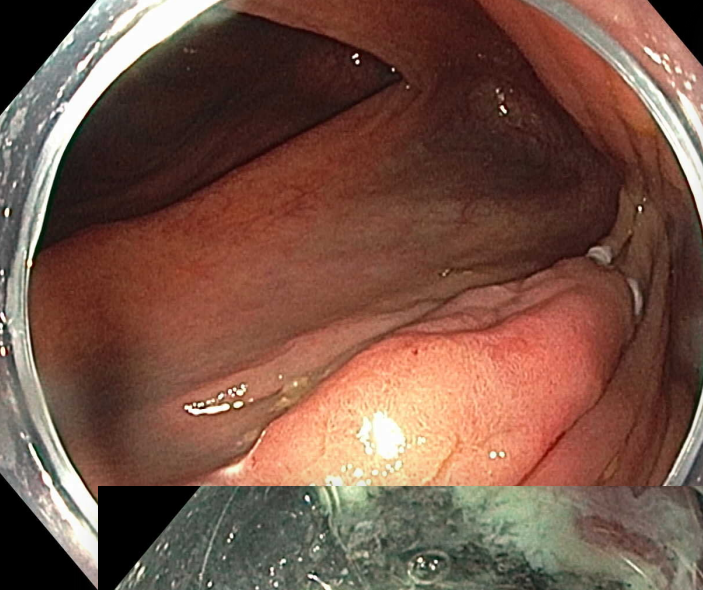
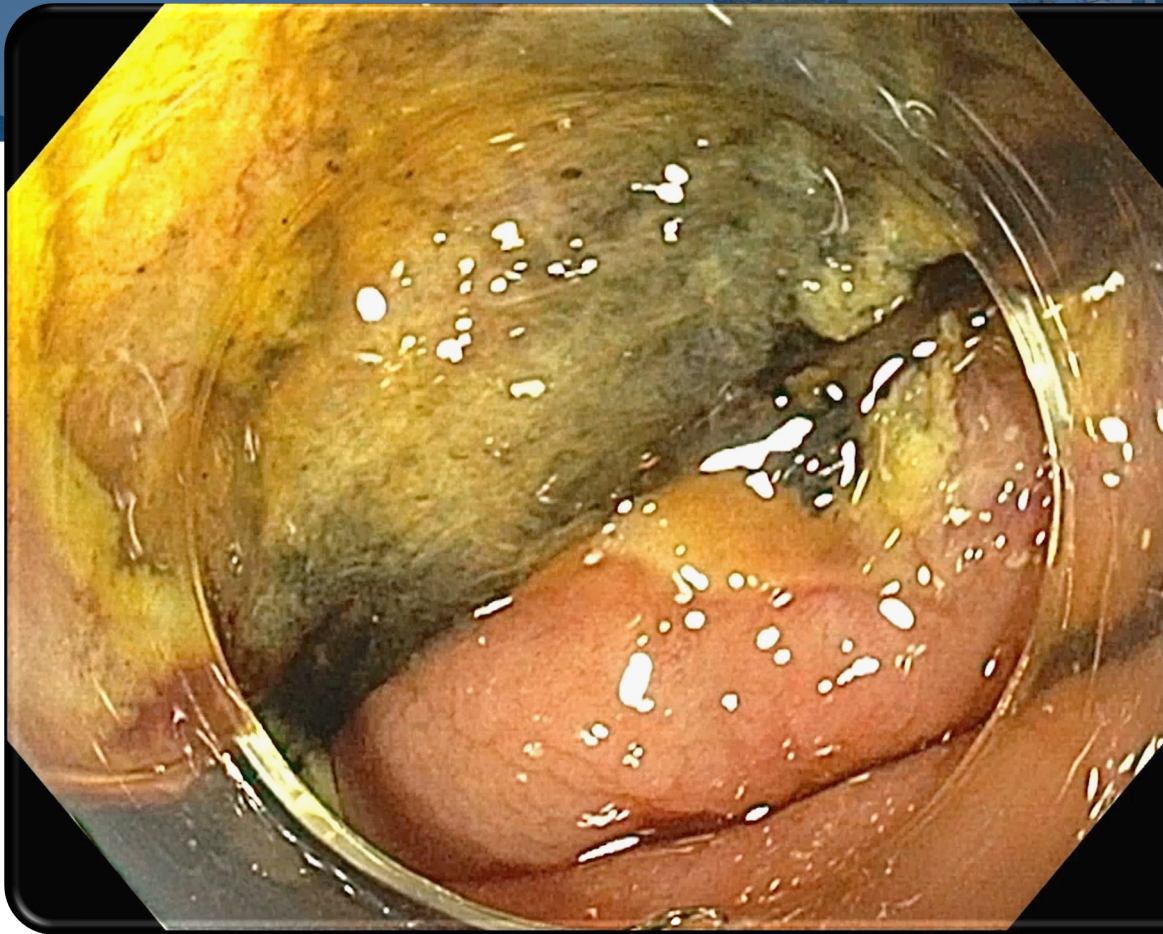


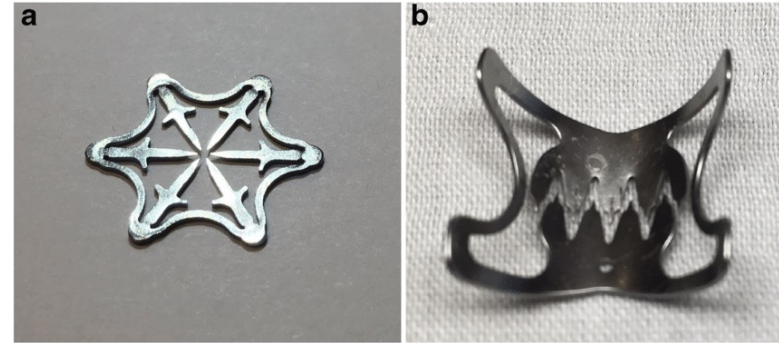
Figure 5. Closure of the defect after cinching the tack and suture construct.







Padlock

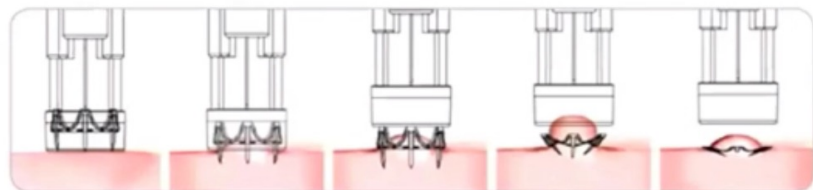


Over the Scope Clips (OTSC)

Ovesco

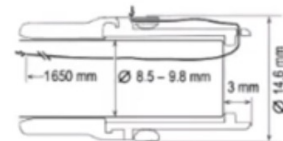


Padlock



The Padlock Clip system lifting and compressing tissue from a target lesion to provide defect closure.

Ovesco



type a

blunt teeth, primarily
compression effect



type t

teeth with small spikes,
compression and anchoring effect



type gc

elongated teeth with spikes,
application: closure of gastric wall



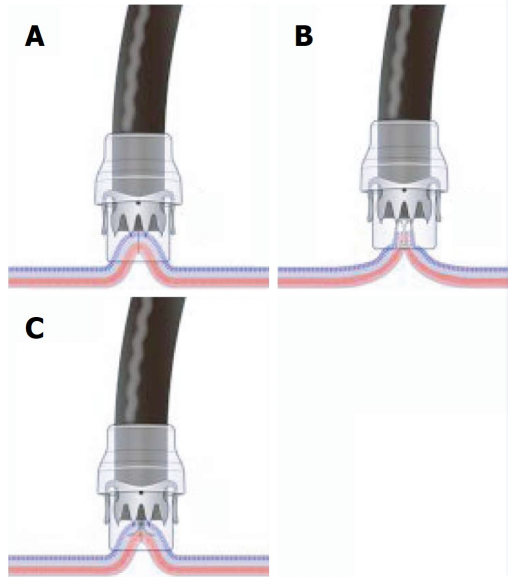
Product Number	Description	Length	Endoscope Distal Tip Diameter	Tissue Chamber Depth	Tissue Chamber Inner Diameter	Housing Outer Diameter
C910001	Padlock Clip® Defect Closure System	177cm	9.5-11mm	10mm	11mm	16mm
C913131	Padlock Clip Pro-Select® Defect Closure System	177cm	11.3, 12.0, 12.5, 13.0, 13.5, 14.0mm	4, 8, 11, 13, 15, 19mm	11mm	19mm

OTSC® version	mini	11	12	14
Endoscope diameter Ø [mm]	8.5-10	8.5-11	10.5-12	11.5-14
Depth of cap	3 mm	● 11/3a ● 11/3t	● 12/3a ● 12/3t	● 14/3a ● 14/3t
	6 mm	● max/6a (ref. no. 100.01) ● mini/6t (ref. no. 100.02)	● 11/6a ● 11/6t	● 12/6a ● 12/6t ● 12/6gc
Max. outer diameter Ø [mm]	14.6	16.5	17.5	21

Table 5 Results of the technical and clinical success rates of the simple suction- and Twin Grasper-groups for each parameter

Parameters	Technical success rate			Clinical success rate		
	SS (n = 14)	TG (n = 42)	P value ¹	SS (n = 14)	TG (n = 42)	P value ¹
Indication						
Refractory bleeding	100 (7/7)	81.8 (9/11)	0.2315	85.7 (6/7)	81.8 (9/11)	0.8288
Leak	100 (2/2)	92 (23/25)	0.6776	50 (1/2)	92 (23/25)	0.0690
Fistula	100 (5/5)	83.3 (5/6)	0.3384	80 (4/5)	83.3 (5/6)	0.8865
Location						
Upper GI tract	100 (8/8)	85.3 (29/34)	0.8725	75 (6/8)	85.3 (29/34)	0.8725
Lower GI tract	100 (6/6)	100 (8/8)		83.3 (5/6)	100 (8/8)	0.2308
Maximum defect size (D), mm						
D ≤ 10	100 (14/14)	100 (9/9)		78.6 (11/14)	100 (9/9)	0.1364
10 < D ≤ 20	-	88.9 (8/9)	-	-	88.9 (8/9)	-
20 < D	-	83.3 (20/24)	-	-	83.3 (20/24)	-
Duration since onset, % (n)						
Immediate ≤ 1 d	100 (3/3)	95.5 (21/22)	0.6994	100 (3/3)	95.5 (21/22)	0.6994
1 < Acute ≤ 7 d	100 (3/3)	87.5 (7/8)	0.1247	66.7 (2/3)	87.5 (7/8)	0.1247
Chronic > 7 d	100 (8/8)	75 (9/12)	0.1250	75 (6/8)	75 (9/12)	1.0000

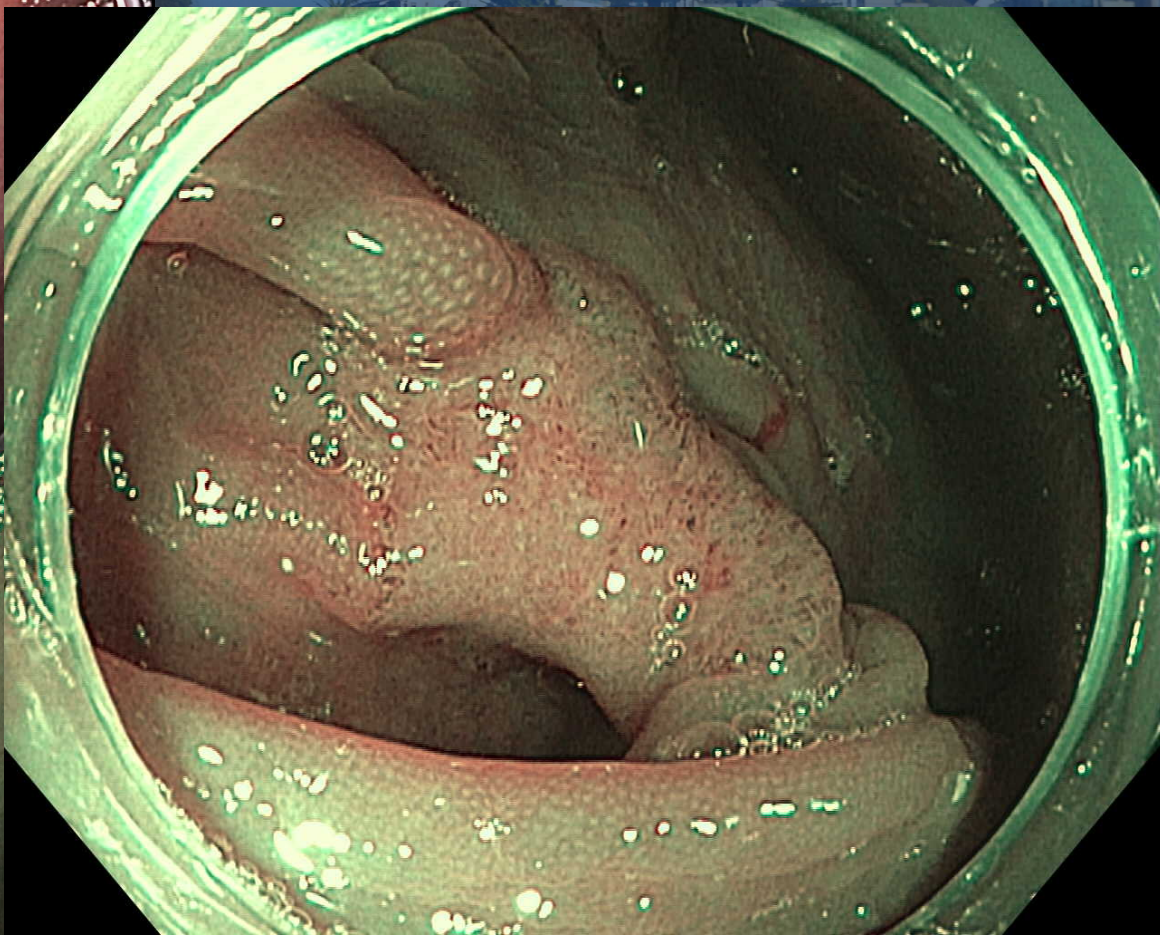
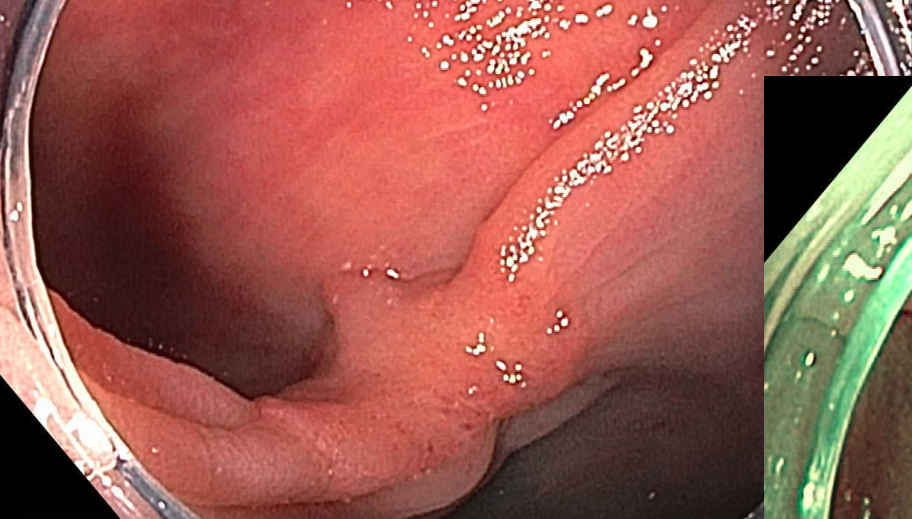
¹ χ^2 test (2-sided). SS: Simple suction; TG: Twin Grasper.

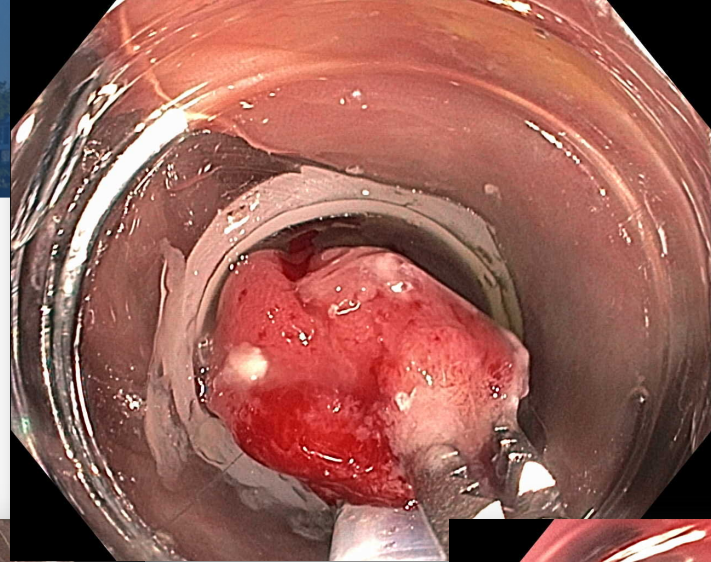
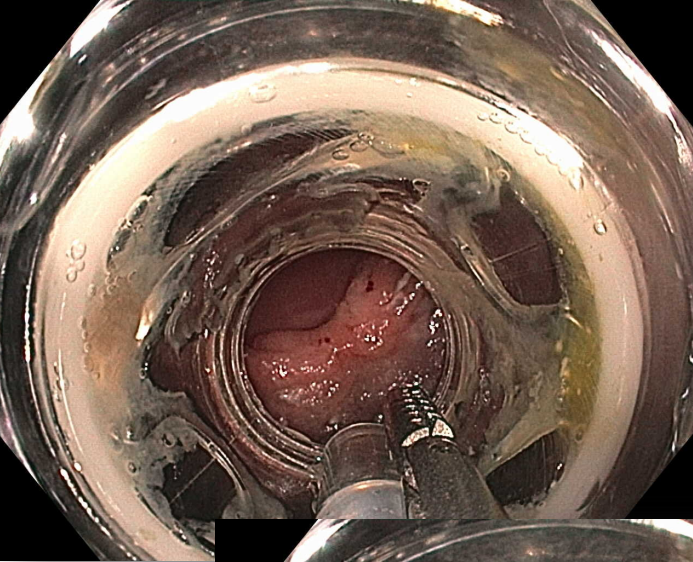


Kobara, H. et al. World J Gastroenterol 2017; 23(9): 1645-1656

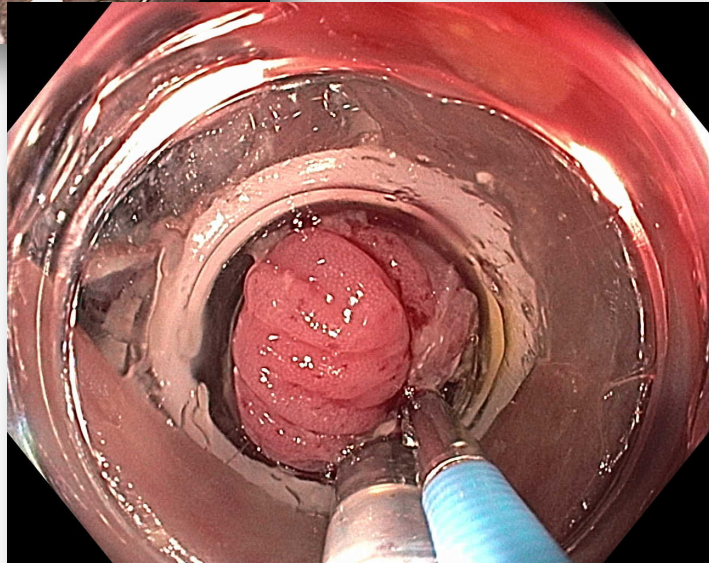
Considerations:

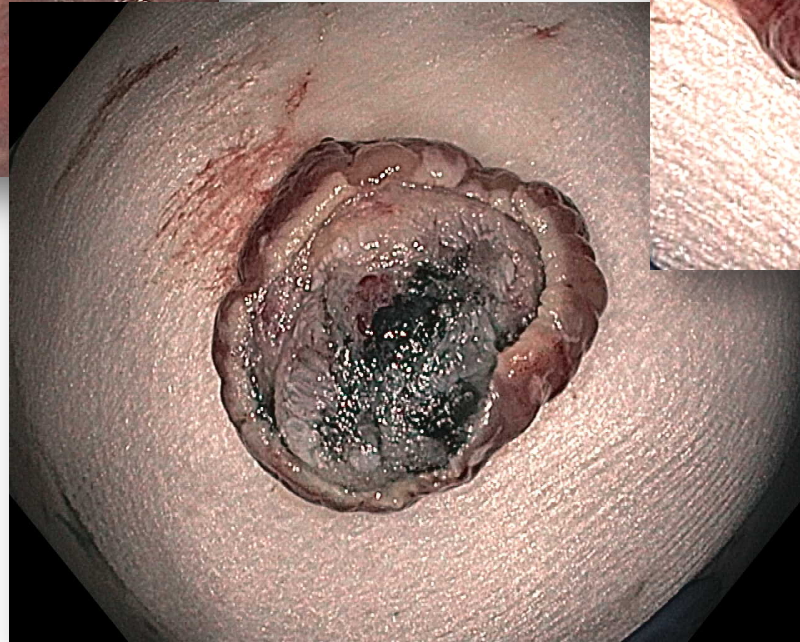
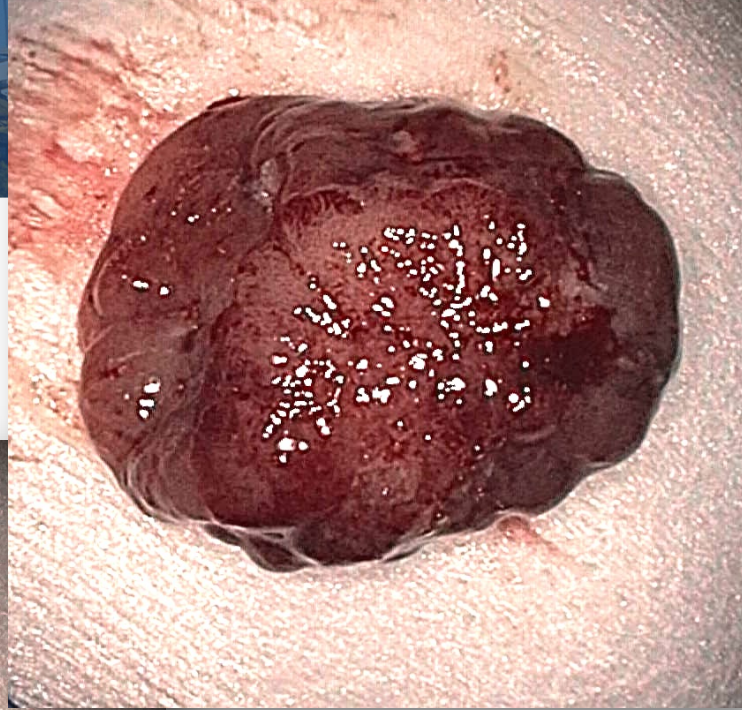
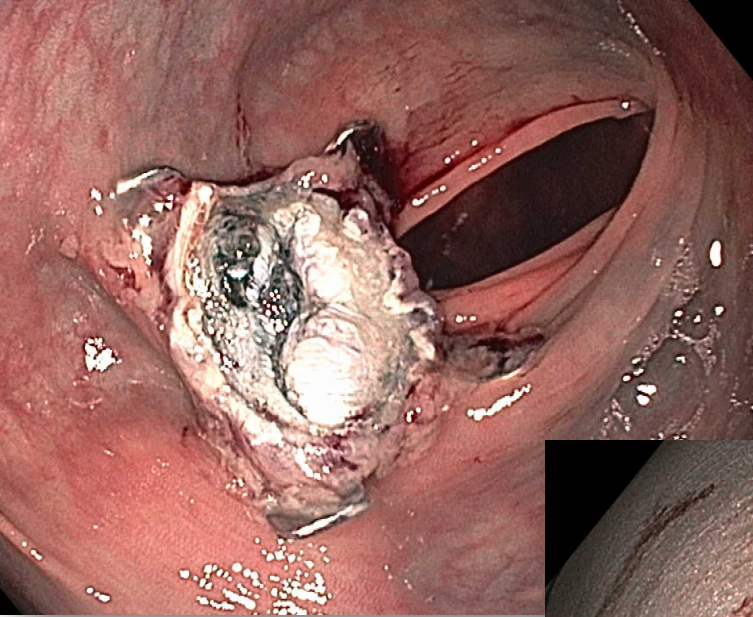
1. Relatively quick and easy to deploy if entire lesion safely captured
2. May be difficult to manage/rescue if mis-deployed
3. Must remove scope and mount cap, which can compromise visibility

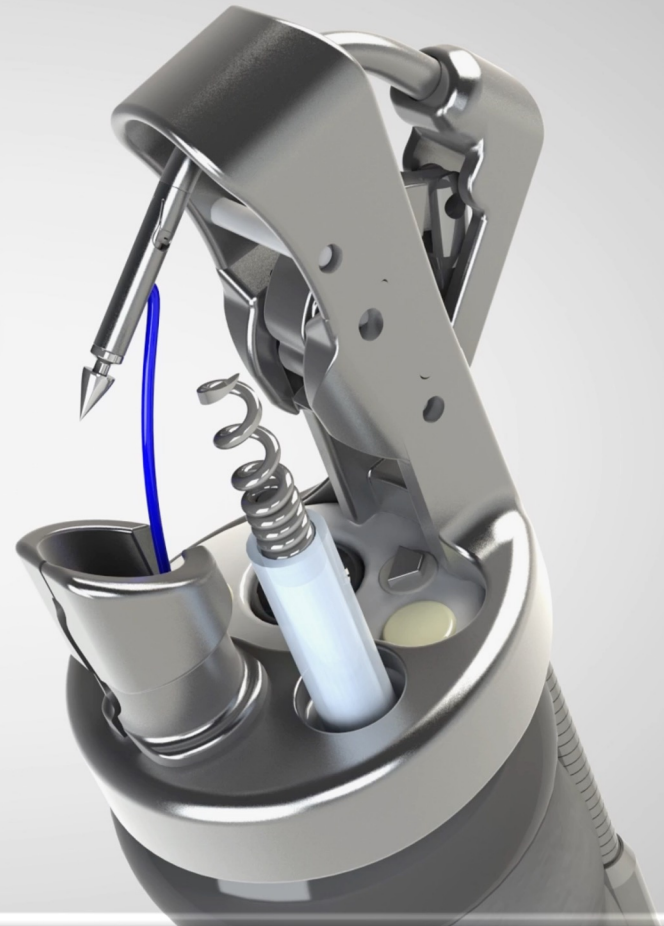




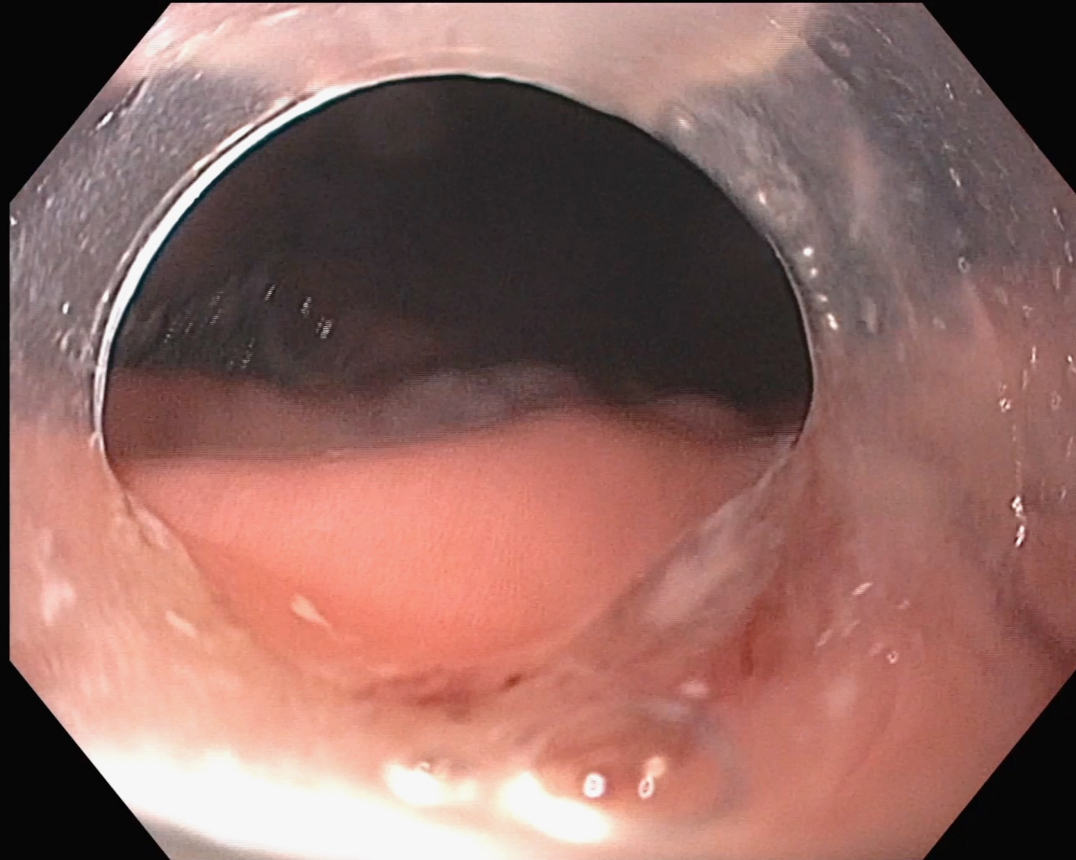
FTRD Device







Full thickness closure large gastric defect



OverStitch - considerations

1. Can close any size defect
2. It can approximate, fixate, and seal, even full thickness defects
3. Can add multiple/reinforcing sutures
4. Can be cut and revised
5. Some areas may be more difficult (right colon, duodenum, anterior position, retroflex)
6. 2T scope preferred (coming soon...newest iteration)
7. Steeper learning curve

2023 SCSG GI SYMPOSIUM



Endoscopic Defect Closure: *Concepts, Devices, and Techniques*

Kenneth J. Chang, MD, MASGE, FACG, AGAF, FGJES
Executive Director, Digestive Health Institute
Professor & Chief, Gastroenterology & Hepatology
University of California, Irvine