

Endoscopic Clipping Devices

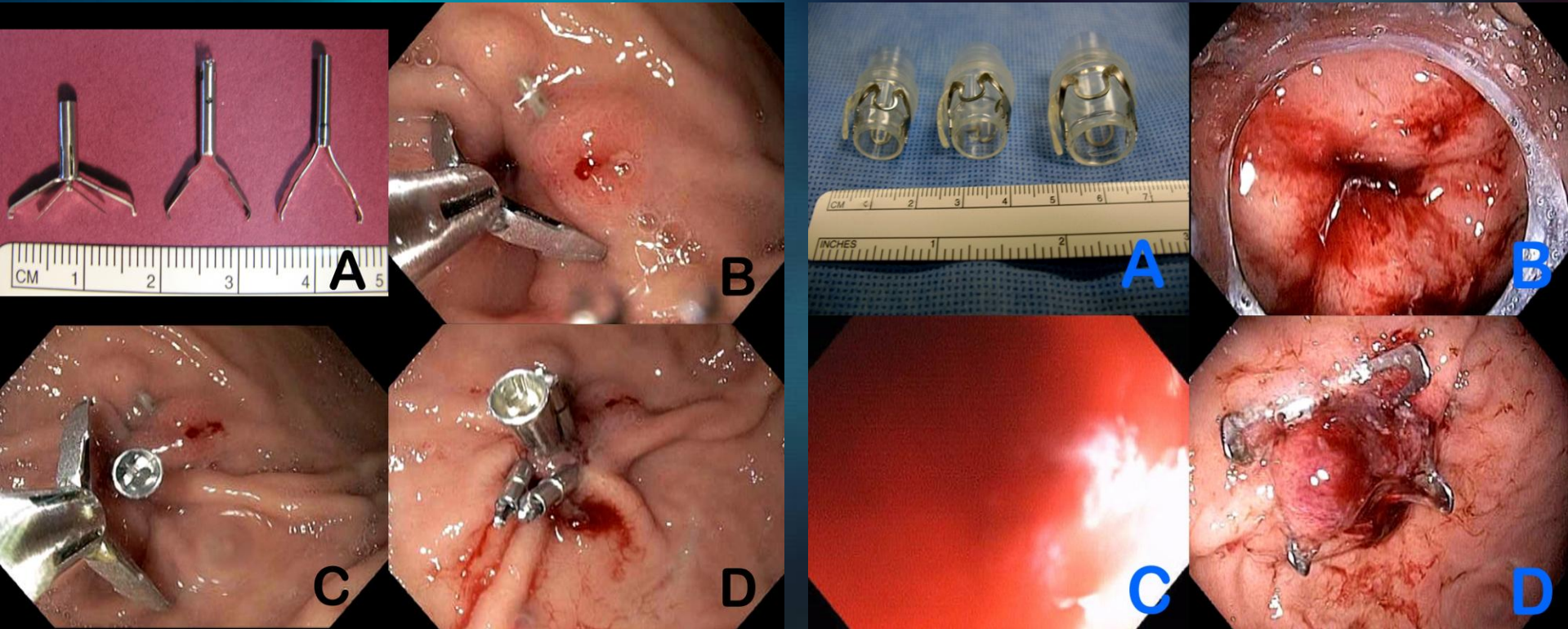
Shou Jiang Tang, MD, FASGE

Director of Endoscopic Research
Professor in Medicine



THE UNIVERSITY OF MISSISSIPPI
MEDICAL CENTER

Through-the-scope clipping devices



Over-the-scope clipping devices

＝原 著＝

内視鏡治療用止血クリップの考案と応用

日本大学 第三内科
(主任：有賀槐三教授)

林 貴雄・米沢 道夫

桑原 龍雄・工藤 勲彦

はじめに

近年内視鏡技術の進歩はいちじるしいものがあり、特に出血後早期の内視鏡検査及びポリペクトミー等の内視鏡治療は高く評価されている。消化管よりの出血に対する内視鏡検査時にしばしば潰瘍底に露出した血管端をみとめることがあるが、この血管端が出血の原因でありまたその後、再出血の危険性を有しているため何らかの方法で止血を行なうことが必要である。

われわれは機械的止血法のひとつとして2種類の止血クリップ(タイプA及びB)を考案し、消化管からの出血、とくに潰瘍底の露出血管の止血及びポリペクトミー後の出血予防等に試みたのでその特徴及び応用についておべる。

クリップの種類と構造

このクリップは血管端を把持したのちに、先端部のみを遊離して残して来るタイプAとクリップ全体を留置するタイプBの2種類があり、その構造は表1のごとくである。いずれも生検用ファイバースコープの鉗子孔より挿入し、生検鉗子と同様に先端部の閉閉はファイバースコープの外で操作する。タイプAは軽量でかつ先端部のみが遊離して消化管壁にとどまるので、図1の左のごと

表1 止血クリップの比較

	タイプA	タイプB
方法	先端遊離式	留置式
重量(先端部)	0.05g	0.5g
大きさ(mm)	長さ5.0、幅1.5	長さ18.0、幅2.0
最大開口径(mm)	5.0	15.0
適用ファイバースコープ	生検用ファイバースコープ	同 左
操作方法	ピストルグリップ操作	ネジ式
材質	先端部 金属 本体 金属ワイヤ	金属
適 応	軽量のた 底の露出 の需要に、 マーキング	

く潰瘍底の露出血管の止血に大きいで図1の右のごとく用いている。

1. タイプAクリップ(先潰瘍底に露出した血管端はからわずかしかり上っていけないようにしてクリップを要である。

そのためクリップの重量を反射による消化管壁の動きに先端部の重量を0.05gと小さく把持後、生検鉗子の様に血

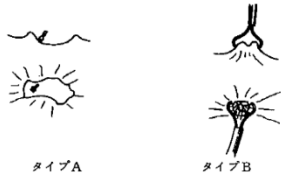
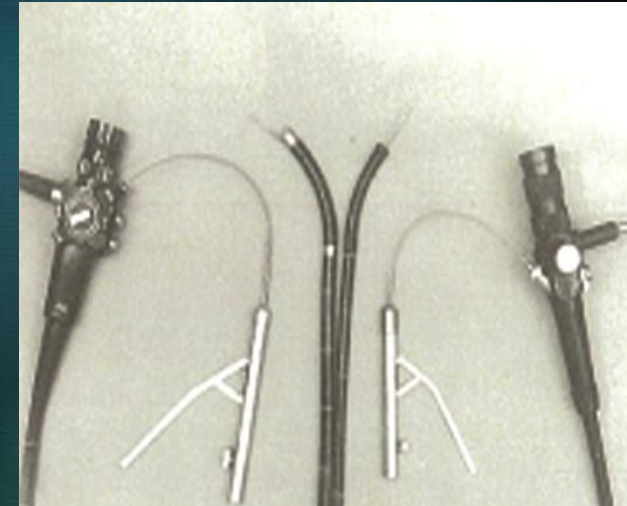
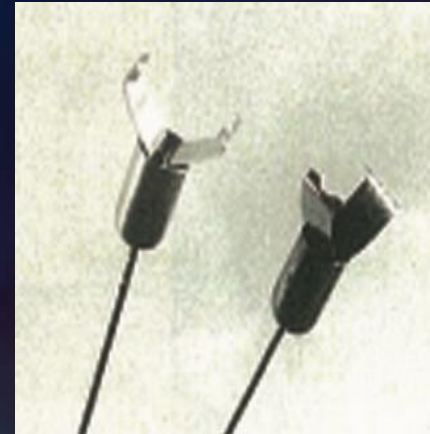


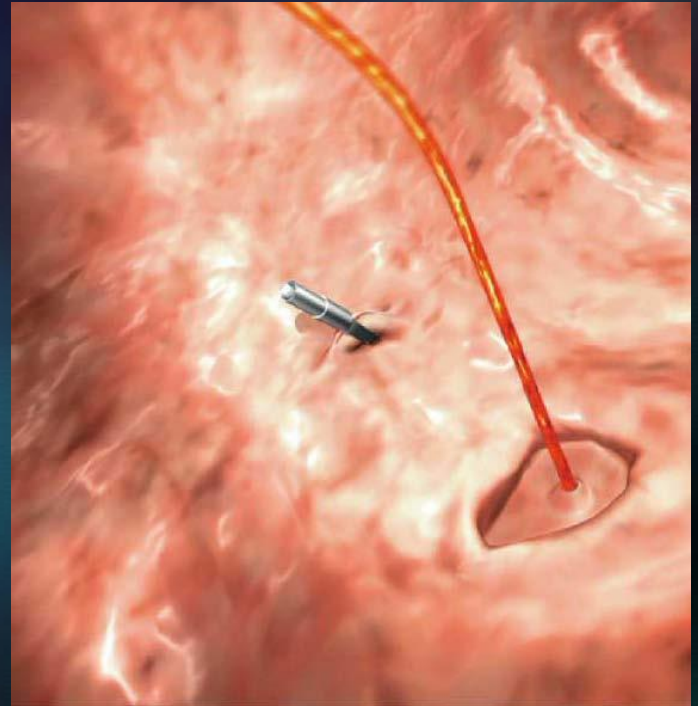
図1

Gastroenterological Endoscopy

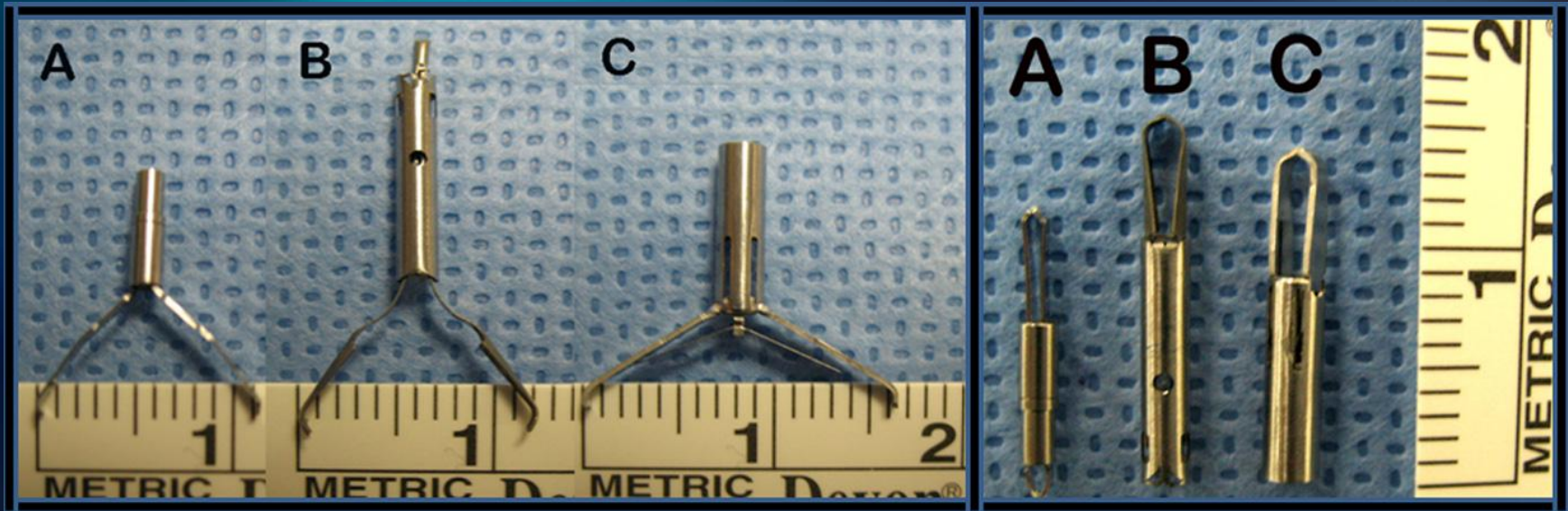
First reported clipping device



Hayshi T, Yonezawa M, Kawabara T. The study on staunch clip for the treatment by endoscopy. Gastroenterol Endosc 1975;17:92-101.



- Evolution of through-the-scope clipping devices



A

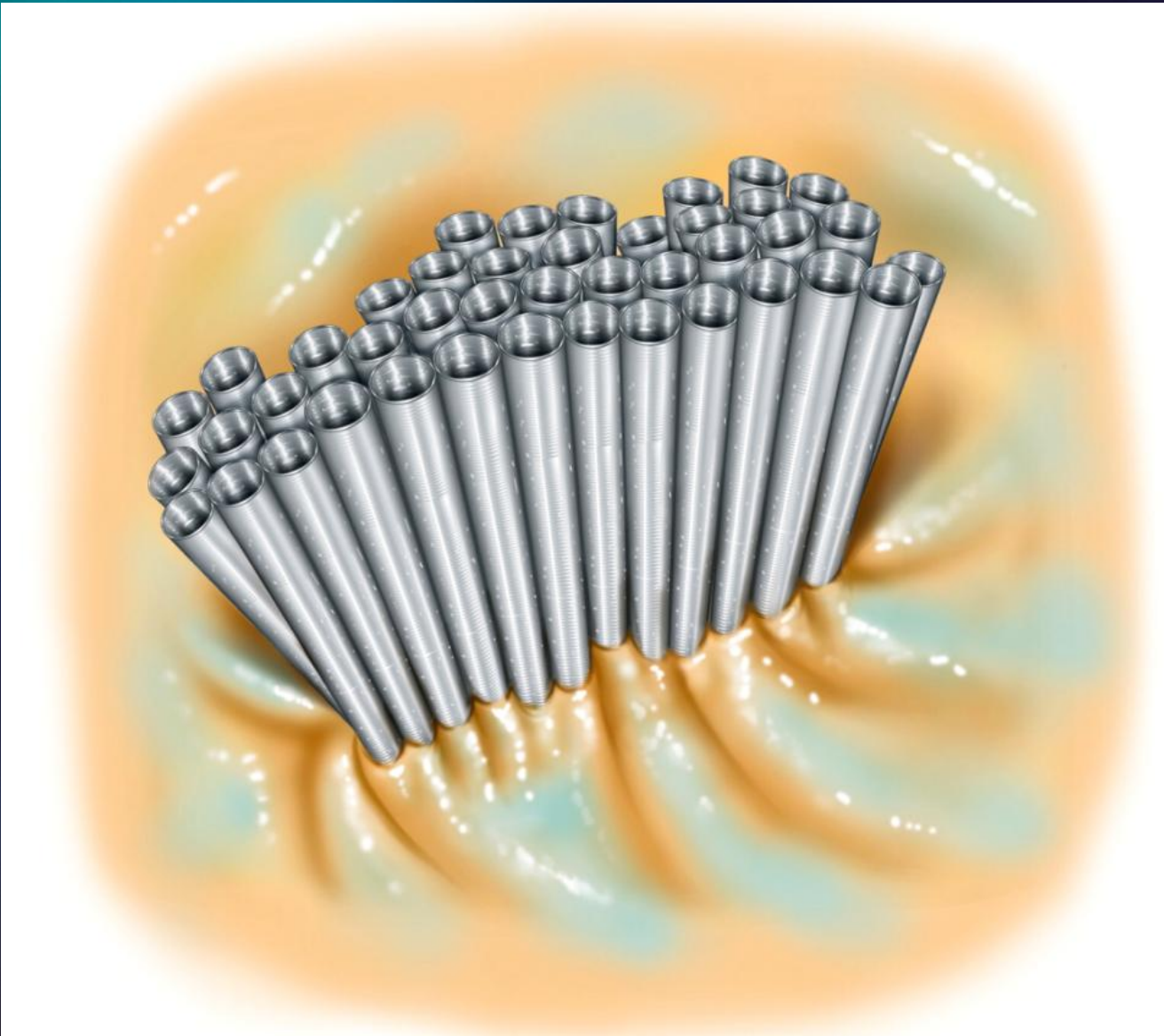
QuickClip2
QuickClip Pro
Olympus

B

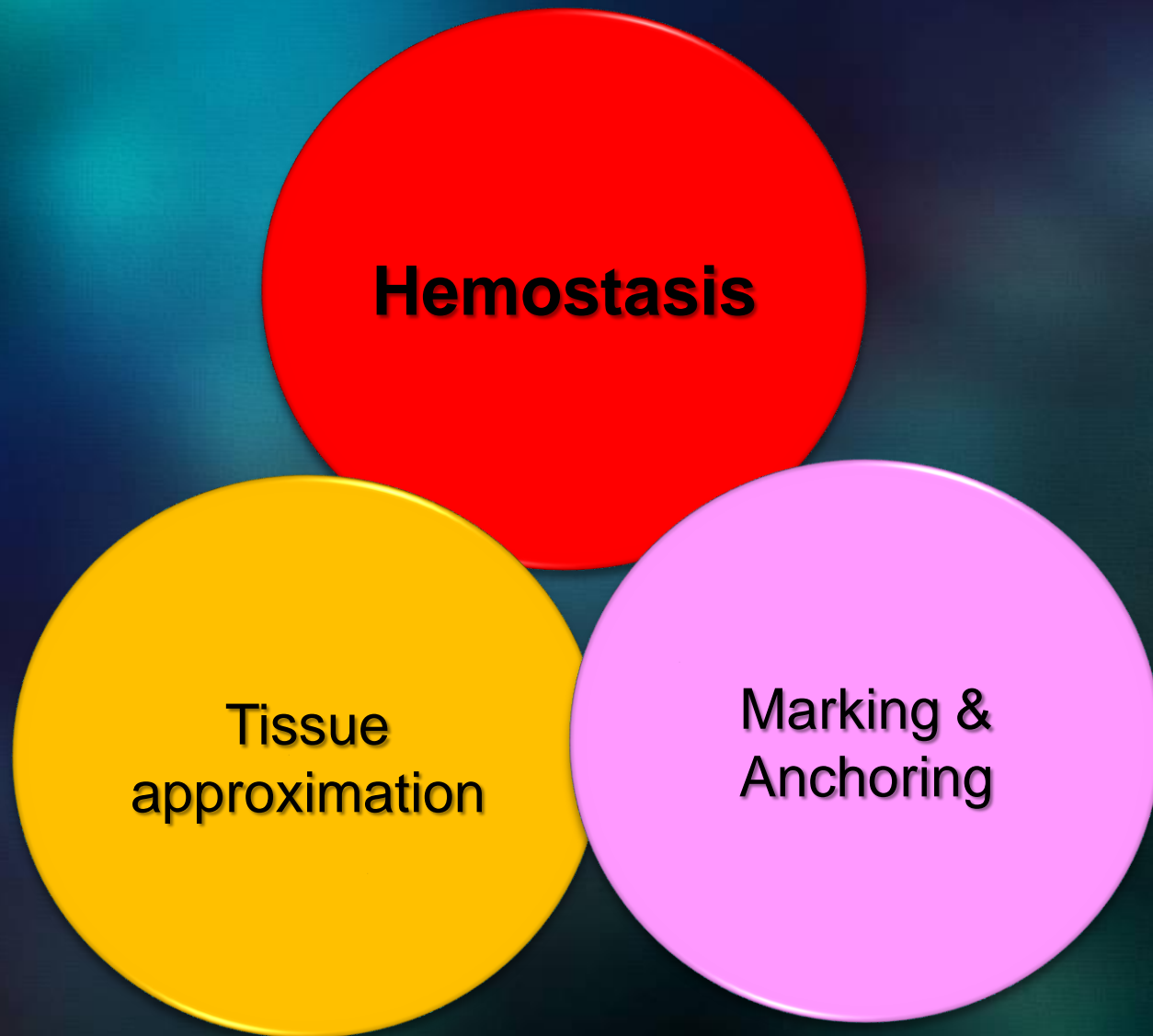
Resolution clip
Resolution 360
Boston Scientific

C

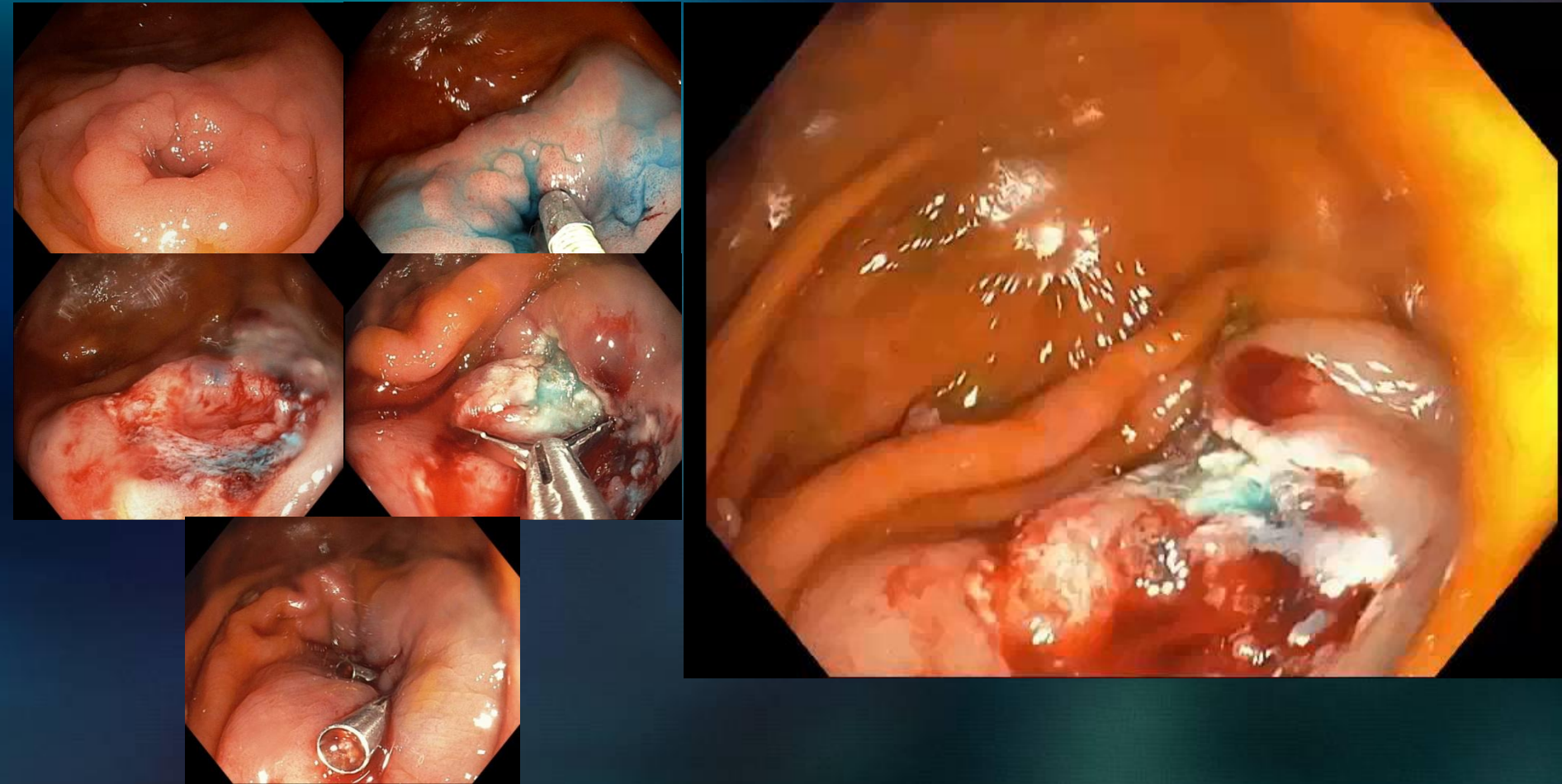
Instinct clip
Cook Medical



- Main indications of TTS clips

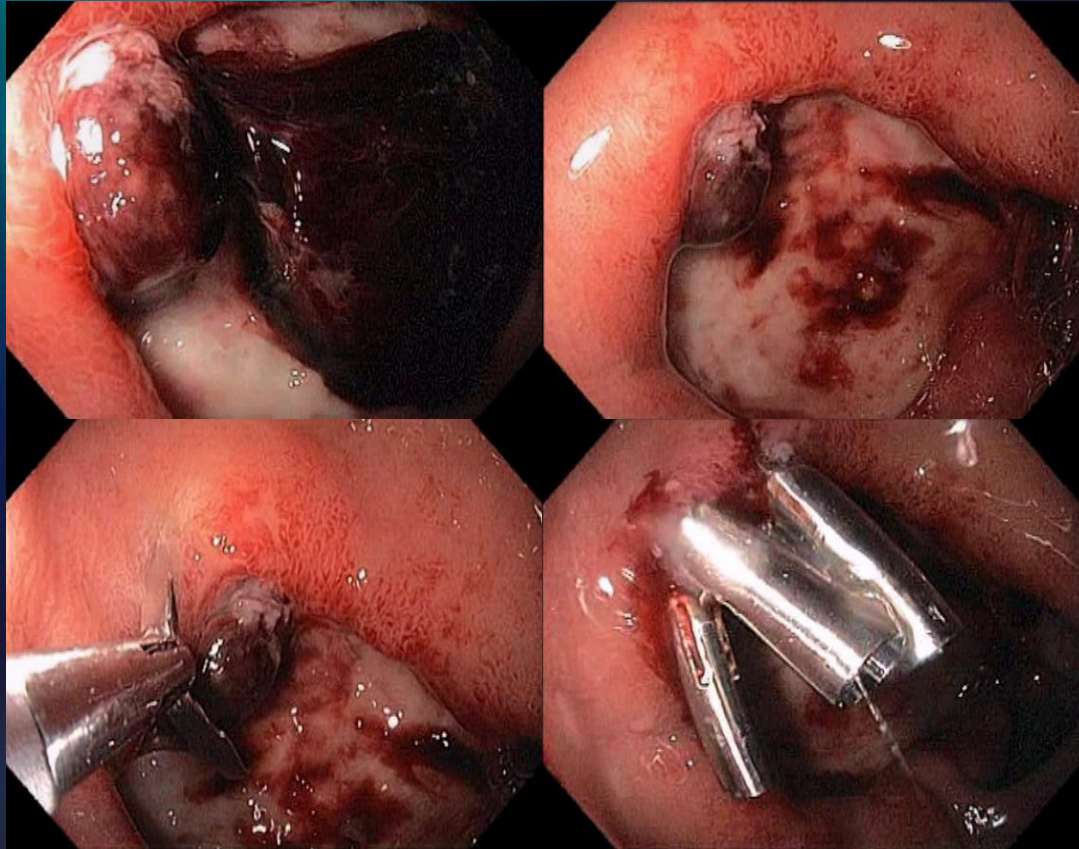


Prophylactic clipping of a peri-appendiceal orifice EMR base



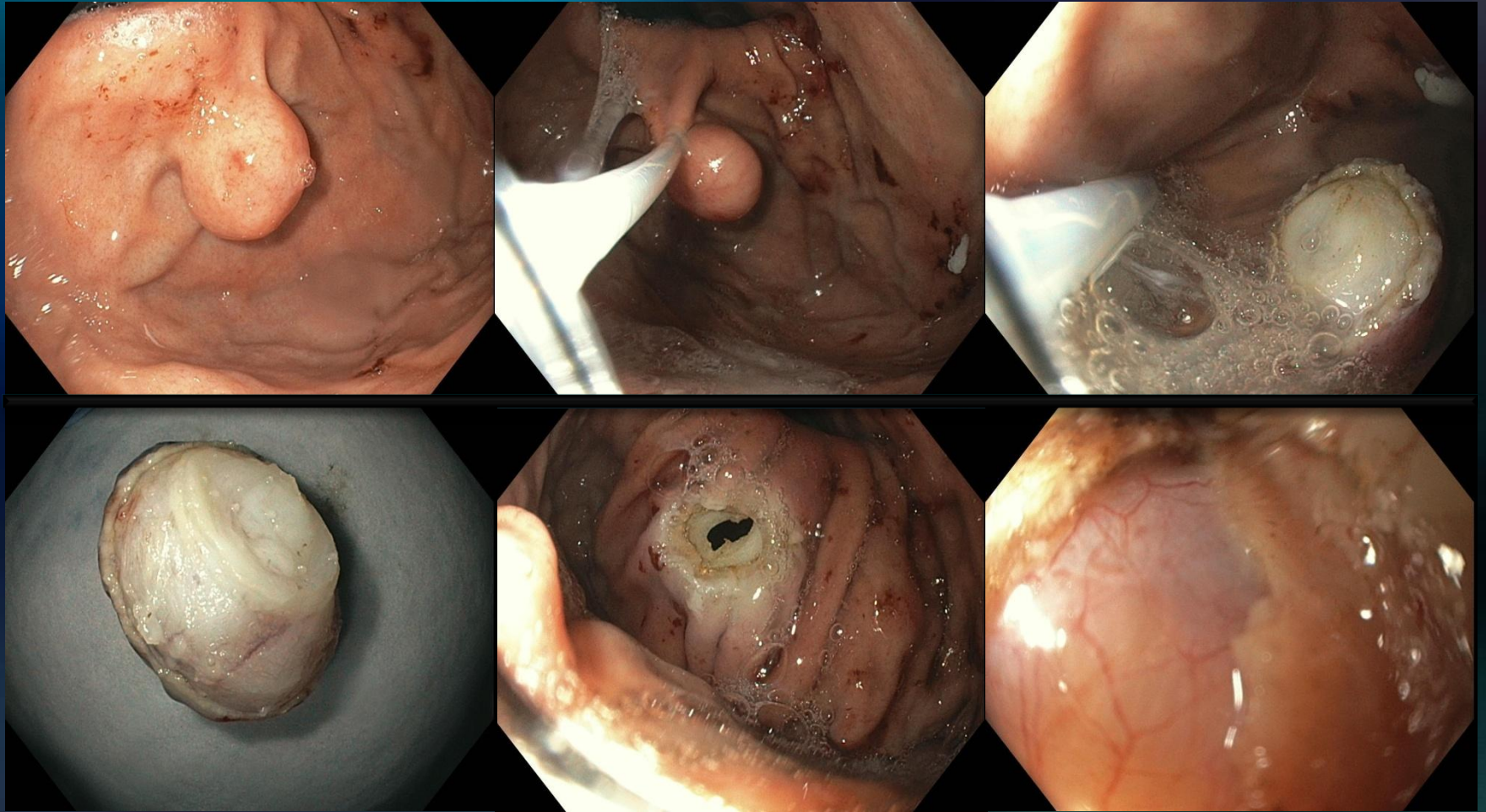
Optimal clip quality required: wide clip arm opening span, reopen and reclose, rotatable, strong

Bleeding ulcer or ulcer with a visible vessel



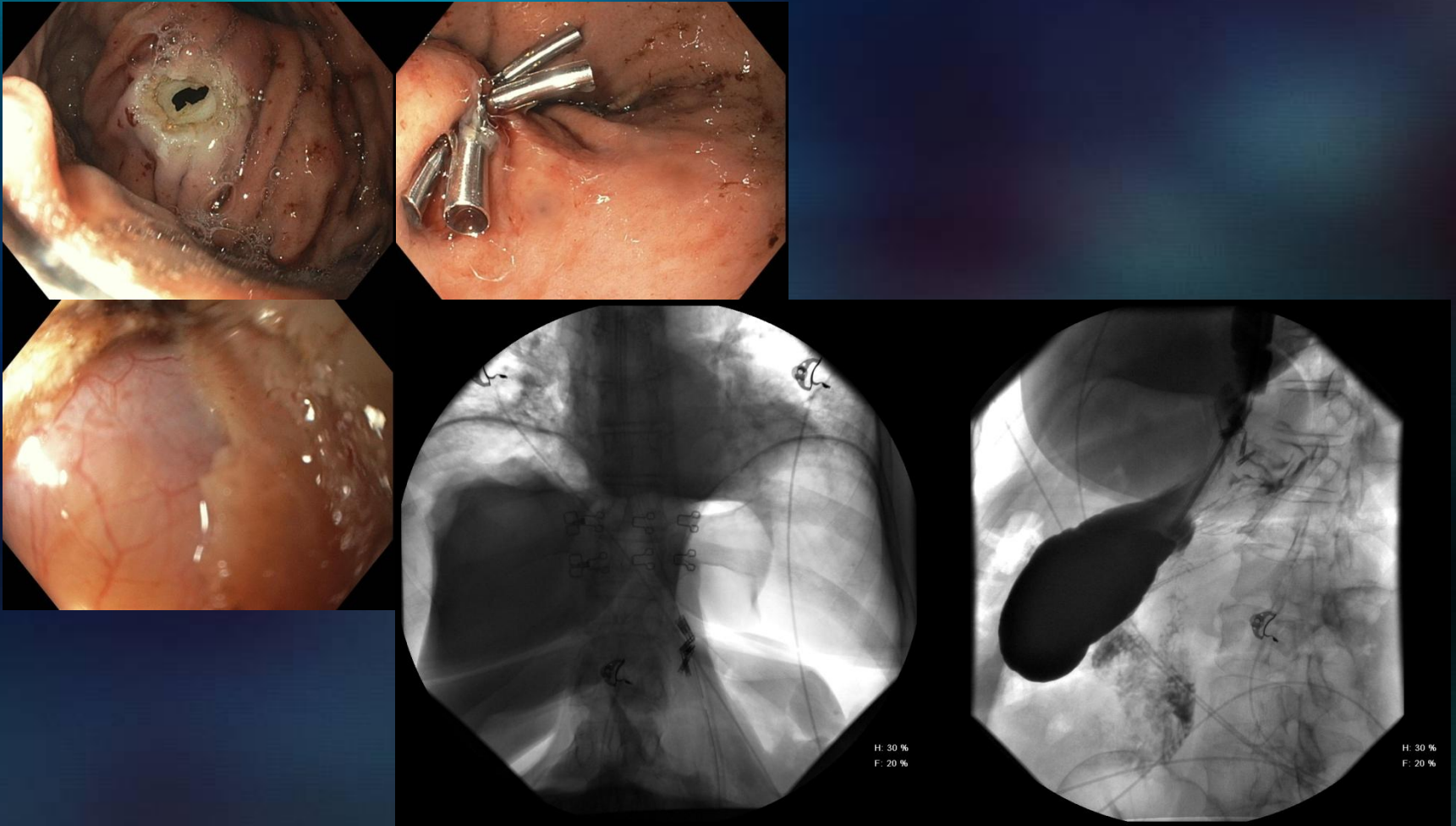
Optimal clips for this situation: rotatable, long clip arms, and can penetrate the ulcer base with strength

A 15 mm – 20 mm submucosal gastric nodule



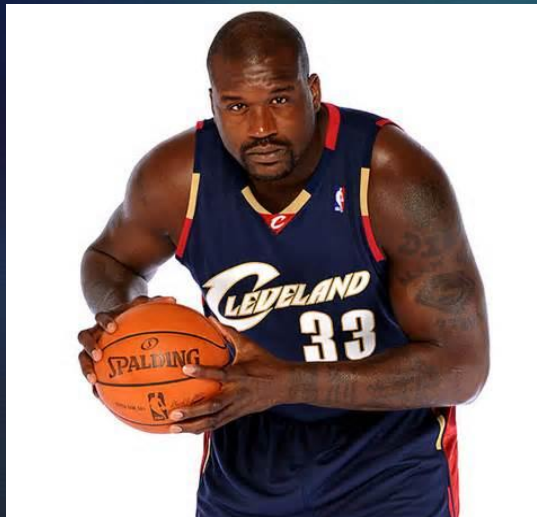
Now what ?

A post EMR gastric perforation



Optimal clips for this situation: rotatable, long clip arms, and can close the base with strength, retain longer

- What are we looking for among different clipping devices



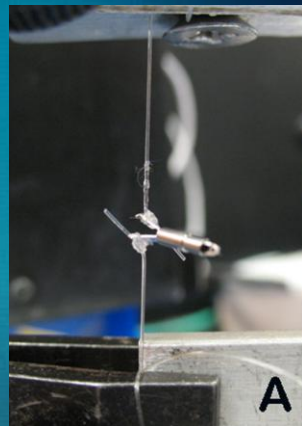
Shaq O'Neal



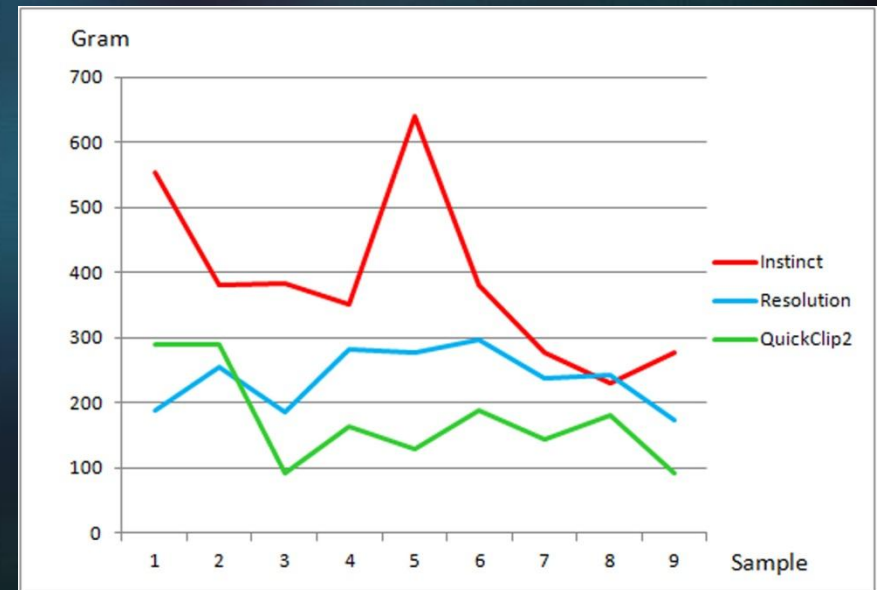
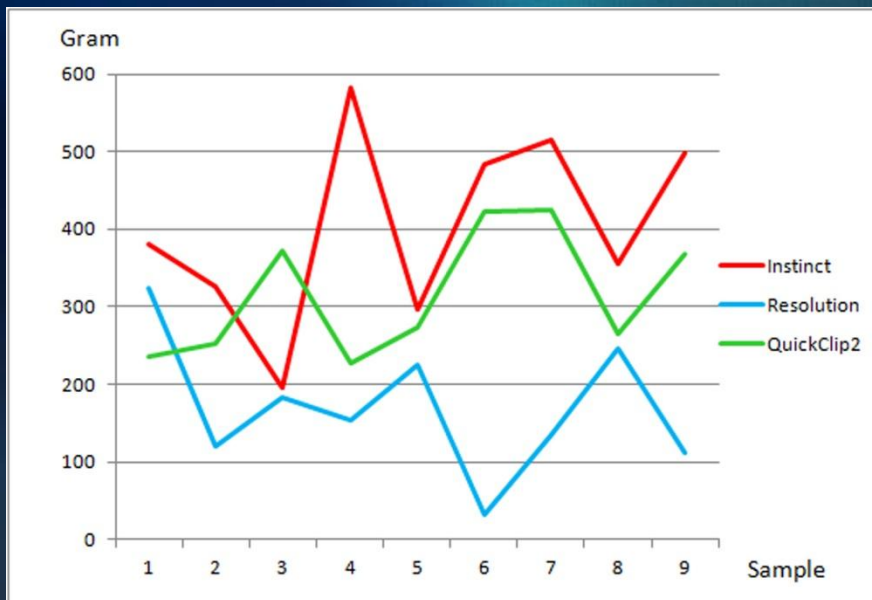
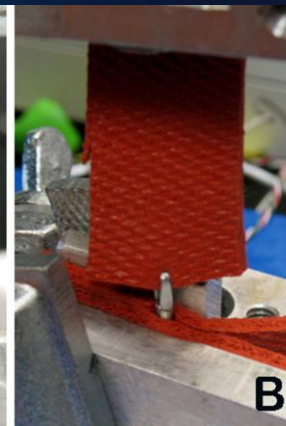
Steve Nash

Instinct clips are inherently the strongest

Opening strength

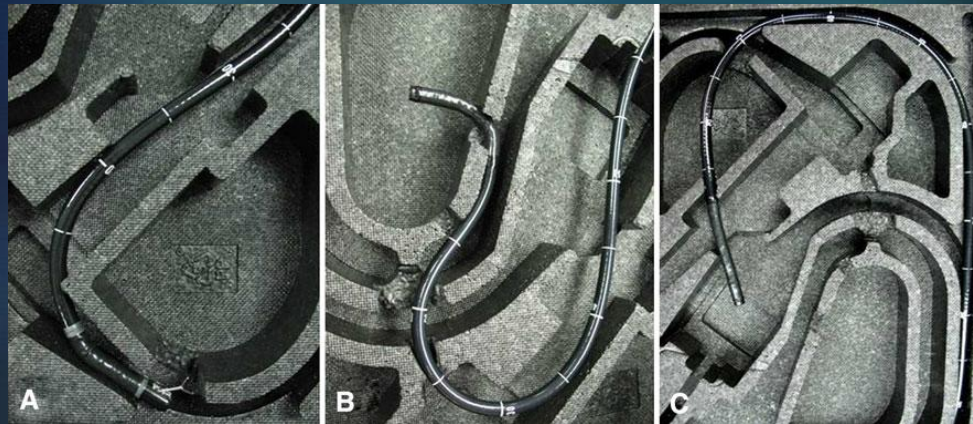
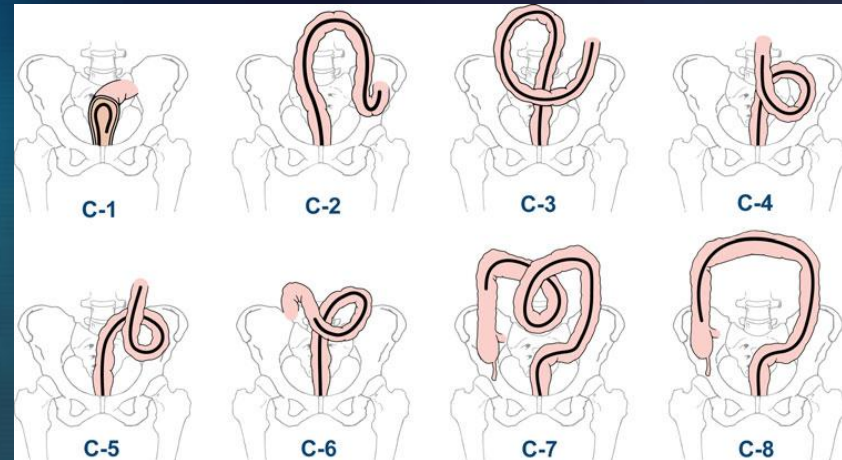
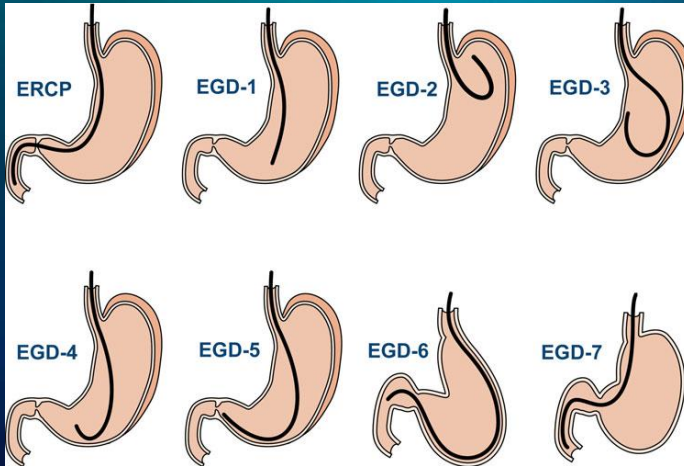


Closing strength



Surgical Endoscopy, January 2013 issue. Sumanth R. Daram, Shou-Jiang Tang, Ruonan Wu, S. D. Filip To.

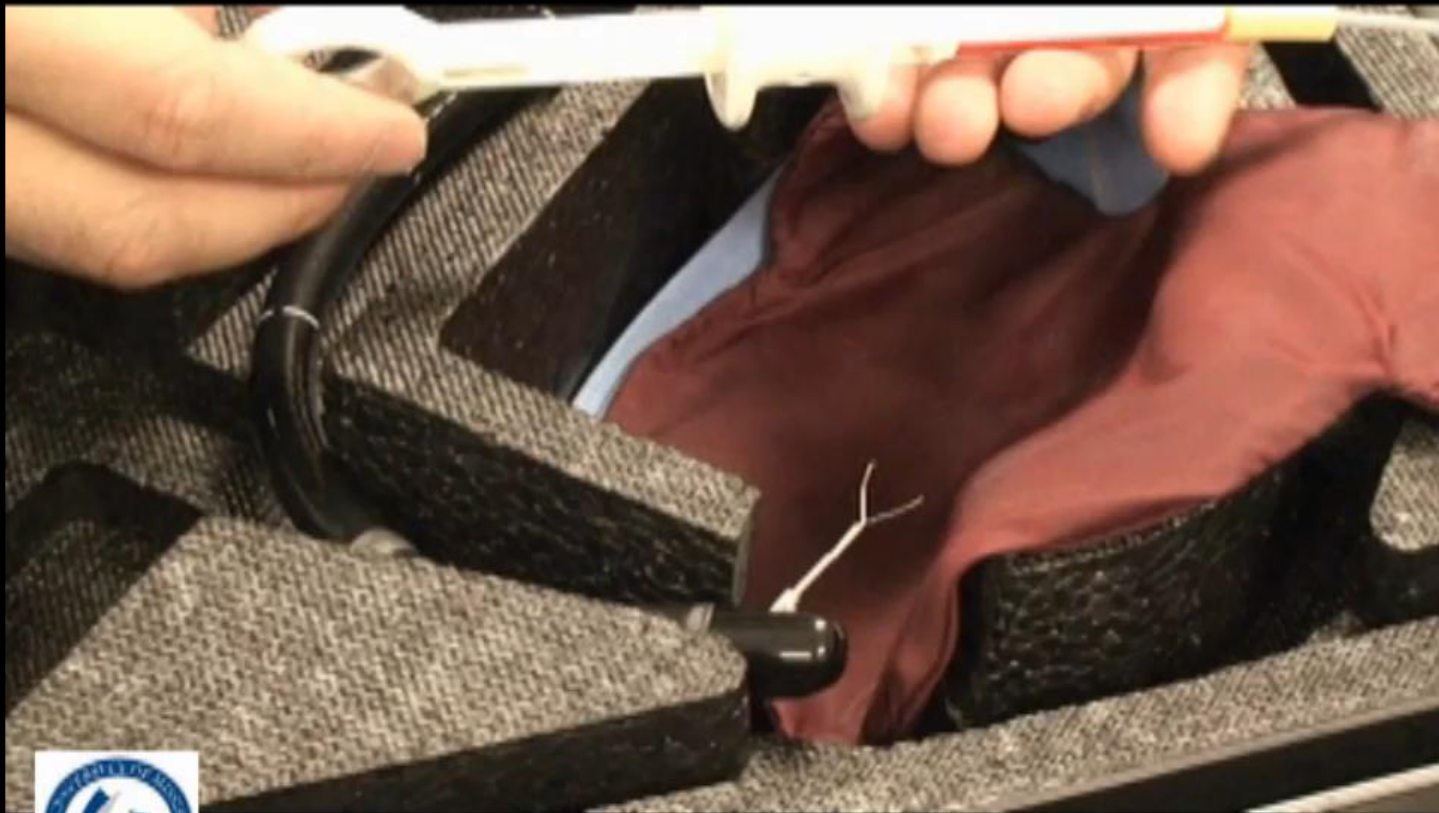
Are these clips agile? Do they rotate well?



Surgical Endoscopy, January 2013 issue. Sumanth R. Daram, Shou-Jiang Tang, Ruonan Wu, S. D. Filip To.

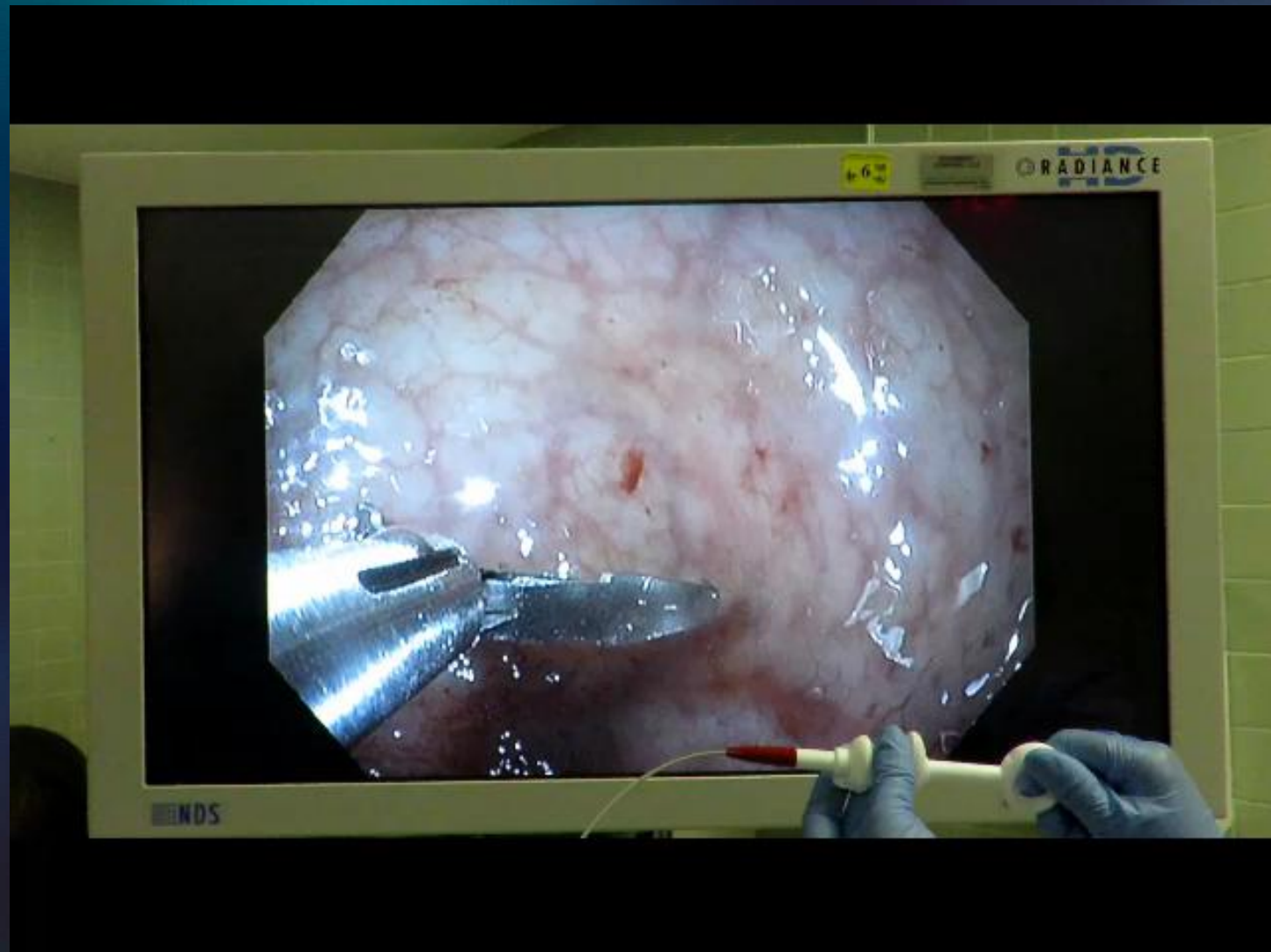
Instinct clips and QuickClip 2 rotate well

QuickClip 2 (Olympus)

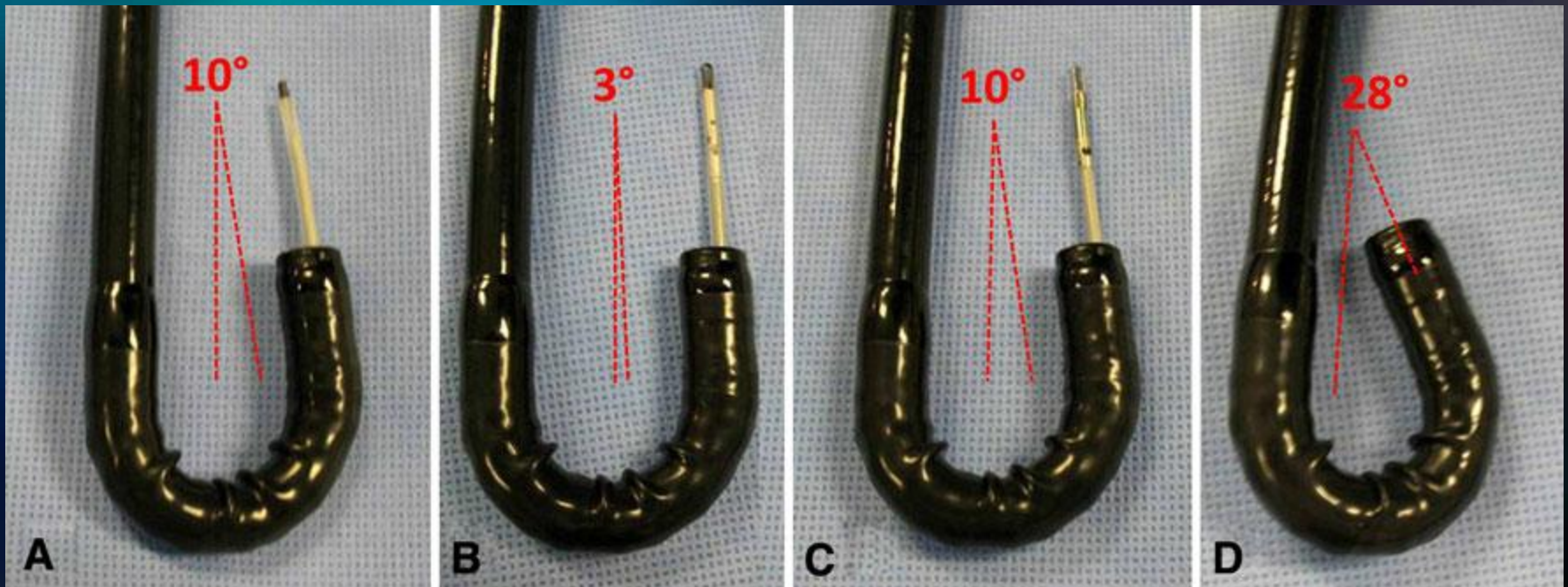


Surgical Endoscopy, January 2013 issue. Sumanth R. Daram, Shou-Jiang Tang, Ruonan Wu, S. D. Filip To.

Instinct clip's rotational ability and agility



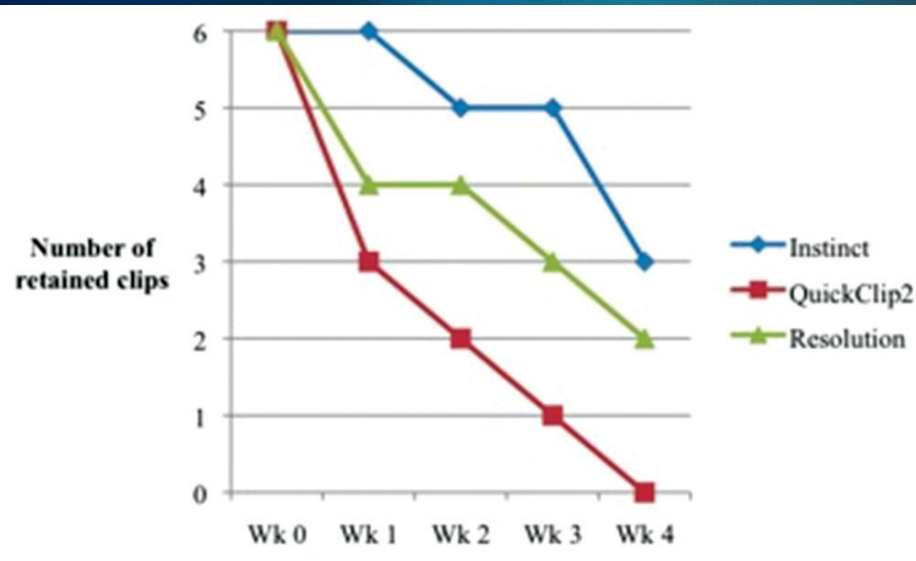
Device catheter flexibility



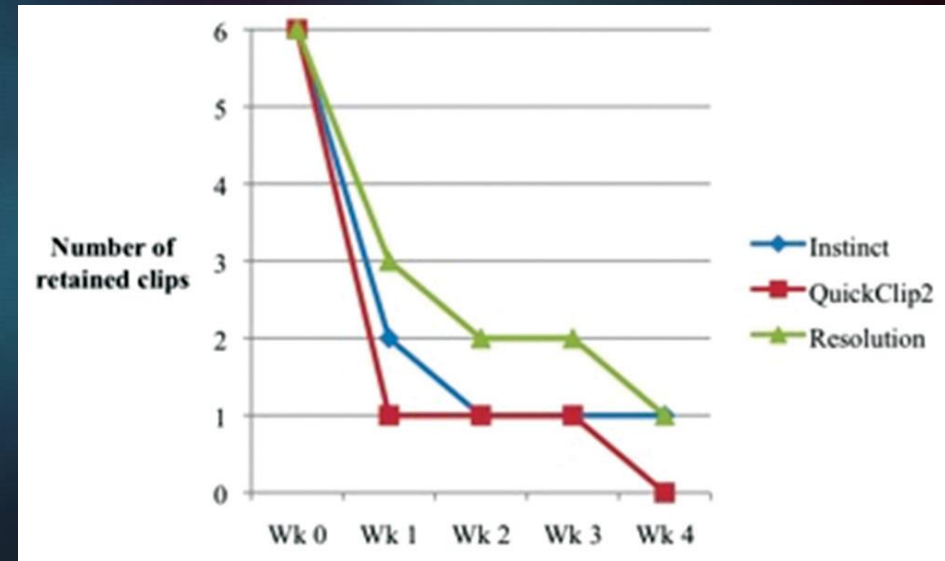
Images showing different device-in-endoscope retroflexion angles (DIERA). QuickClip2 long (A), resolution clip (B), instinct clip (C), without any device (D)

Comparative study of clip retention rates in pig models

Normal mucosa



Simulated ulcers



Payal Saxena and John Hopkins Hospital GI group.
Saudi J Gastroenterol 2014;20:360.

Clip retention rates and rates of residual polyp at the base of retained clips on colorectal EMR sites

Indiana University Hospital

Colorectal polyps (≥ 20 mm) over a 9 years period. EMR sites were closed with a mean of 4 clips

Of 1407 Resolution clips (BS) placed, 59 (4.2%) were retained at follow-up. Of 532 Instinct clips (Cook) placed, 46 (8.6%) were retained at first follow-up ($p = 0.0001$)

There was no difference in follow-up interval for the two clips

No patient had residual polyp by biopsy at the base of a retained clip

Instinct clips placed months ago after polypectomy



● Endoscopic mechanical hemostasis of GI arterial bleeding (Technical Review)

Outcomes after endoscopic clip application of bleeding peptic ulcers have proved similar, if not better, than other endoscopic treatment modalities

Clips are excellent in controlling the bleeding, with significantly **lower rebleeding rates** compared with a combination of epinephrine injection and heater probe cautery (5% vs. 33%, $P < 0.05$)

Lee YC, et al. Endoscopic hemostasis of a bleeding marginal ulcer: hemoclipping or dual therapy with epinephrine injection and heater probe thermocoagulation. *J Gastroenterol Hepatol* 2002;17:1220-5.

RCT (n=47)	Clips	Injection + bipolar	p values
Primary hemostasis	100%	95%	0.45
Re-bleeding	15%	24%	0.49

Saltzman JR, et al. Prospective trial of endoscopic clips versus combination therapy in upper GI bleeding (PROTECCTd UGI bleeding). *Am J Gastroenterol* 2005;100:1503-8.

- Endoscopic mechanical hemostasis of GI arterial bleeding
(Technical Review)

RCT (n=124)	Clips (n=41)	Injection (n= 41)	Injection + clips (n=42)
Primary hemostasis	98%	95%	98%
Complication	0	3	0
Re-bleeding	2.4%	14%	10%
Permanent hemostasis	95%	85%	95%

The combined method does **not** provide substantial advantage over use of the hemoclip method alone in the hemostatic management of bleeding peptic ulcers

Chung IK, et al. Comparison of the hemostatic efficacy of the endoscopic hemoclip method with hypertonic salineepinephrine injection and a combination of the two for the management of bleeding peptic ulcers. *Gastrointest Endosc* 1999;49:13-8.

• When is clipping a good hemostatic solution

- Visible vessel or actively bleeding vessel
- Bleeding lesion within a mucosal defect
 - Post EMR
 - Post polypectomy
 - Fistula and leak
- Continuing bleeding after hemostasis failed to be achieved with other devices
- Anatomically weak location
 - Diverticular bleeding
 - Cecal and small bowel pathologies

• When is clipping a good hemostatic solution

- Refractory post-sphincterotomy bleeding
- Active bleeding ulcer where optimal view is not possible and prompt hemostasis is required
- The endoscopic view is poor with other hemostatic devices
- Fresh anastomotic or stomal bleeding
- Clip-assisted diverticulotomy
- Endoscopic marking of the bleeding site to assist subsequent angioembolization

• Bleeding Culprits

MW tear
Post-EVL ulcer bleeding
Ulcer bleeding
Dieulafoy's lesion



Injection +
Thermal coagulation
APC



Clipping

● Bleeding Culprits

Vessel of larger caliber
True arteriovenous malformation
Diverticular bleeding
Post-EVL ulcer bleeding
Post EMR and polypectomy bleeding
Refractory post-sphincterotomy bleeding
Hemostasis failed to be achieved with
other devices
Urgent hemostasis is needed
Endoscopic view is suboptimal

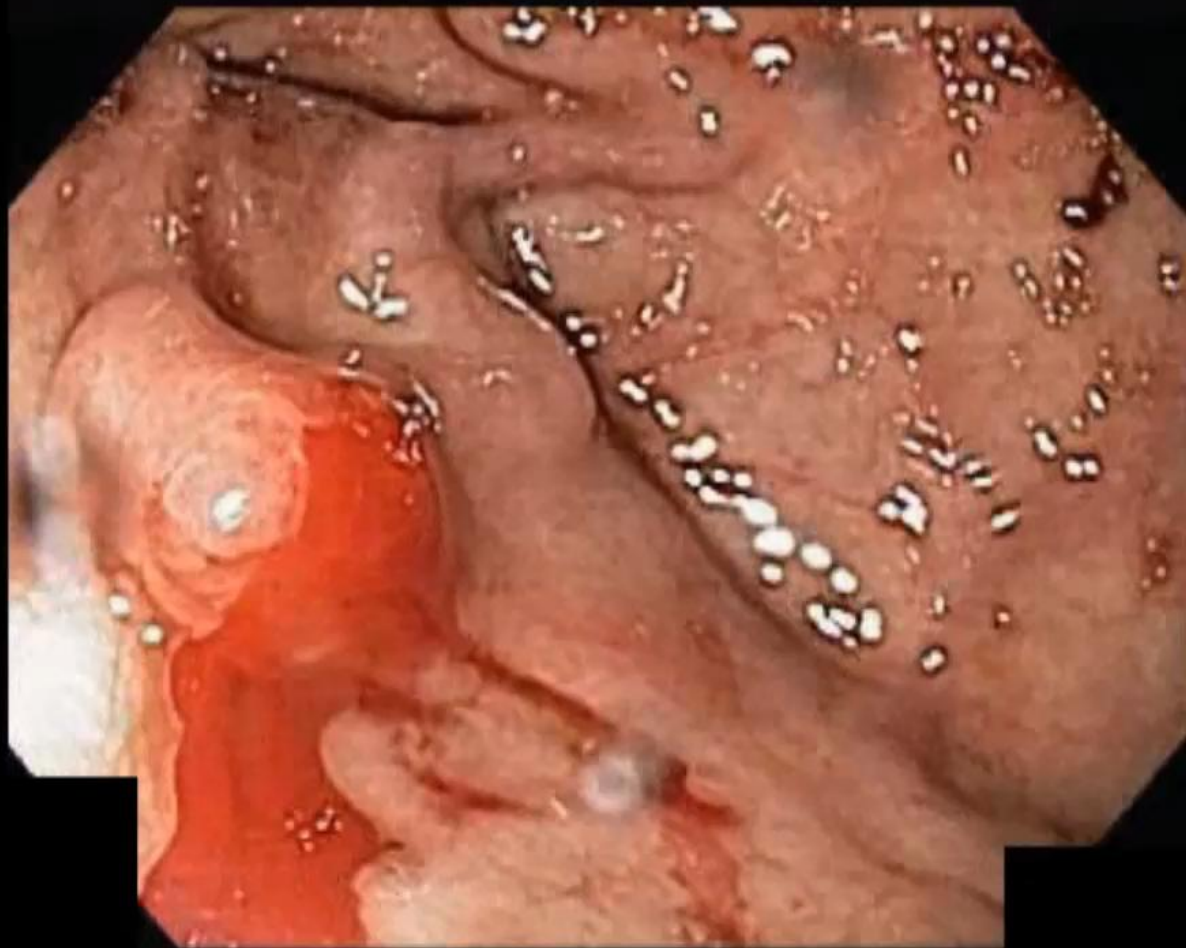


Clipping

- **Are these clips cost-effective**

- We are probably using less clips per case
- Overall, we are using more clips due to
 - Their expanded applications and indications
 - Good clinical outcomes
 - Time saved compared with using other hemostatic devices

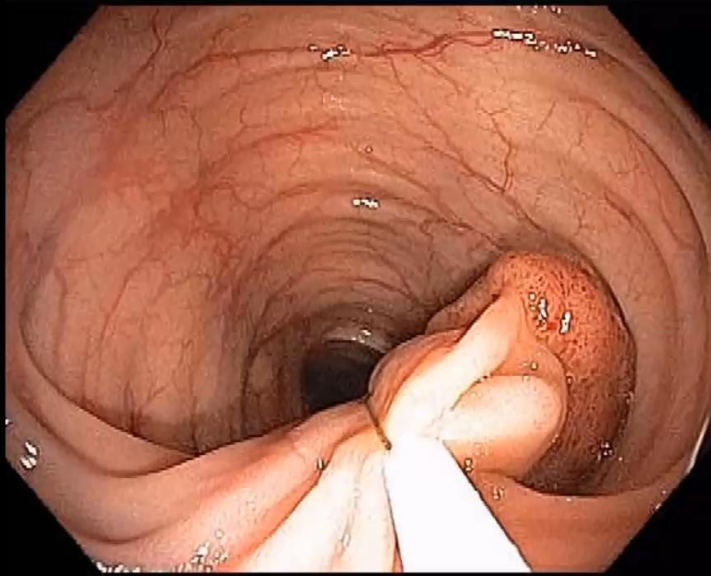
- Clipping a large vessel
(true arteriovenous malformation)



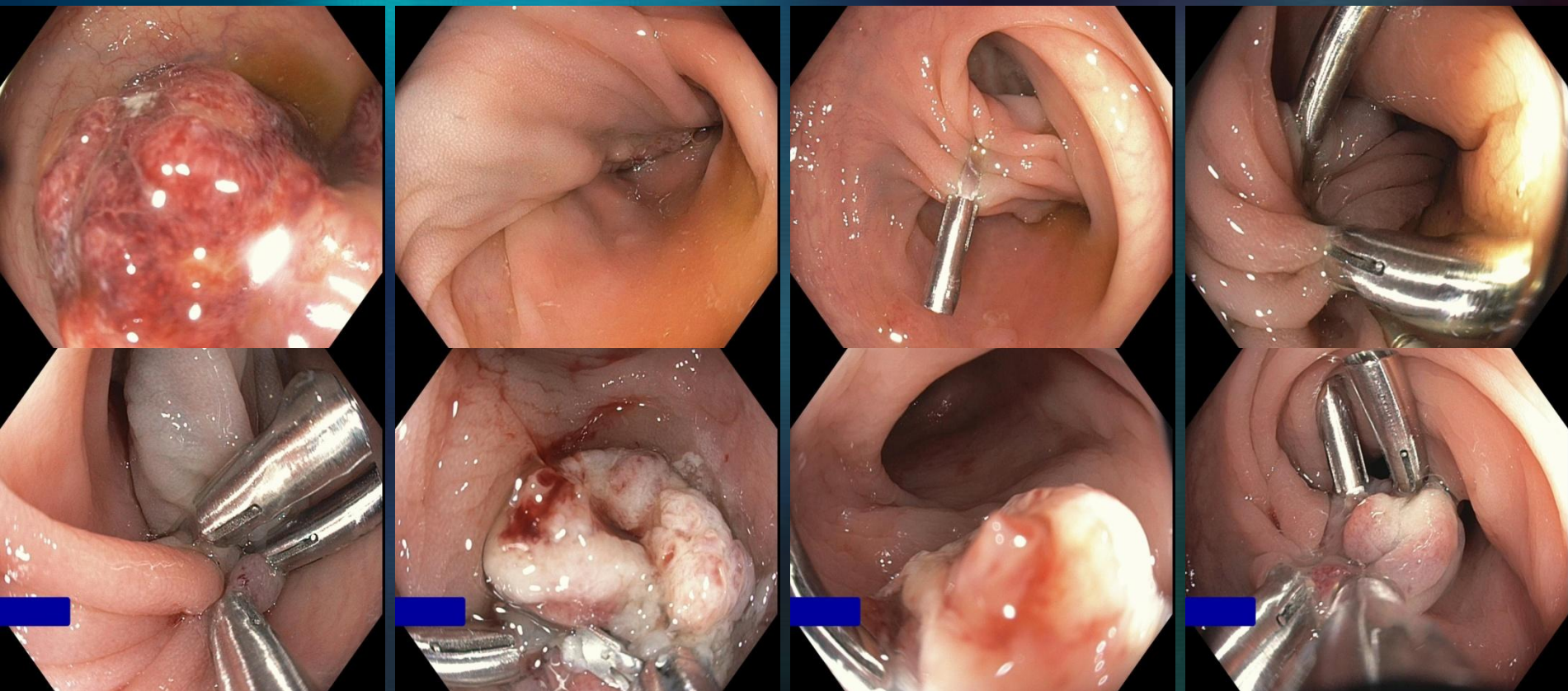
- Post sphincterotomy bleeding



- Post polypectomy bleeding



- Prophylactic clipping prior to polypectomy



● Prophylactic clipping after colon EMR ?

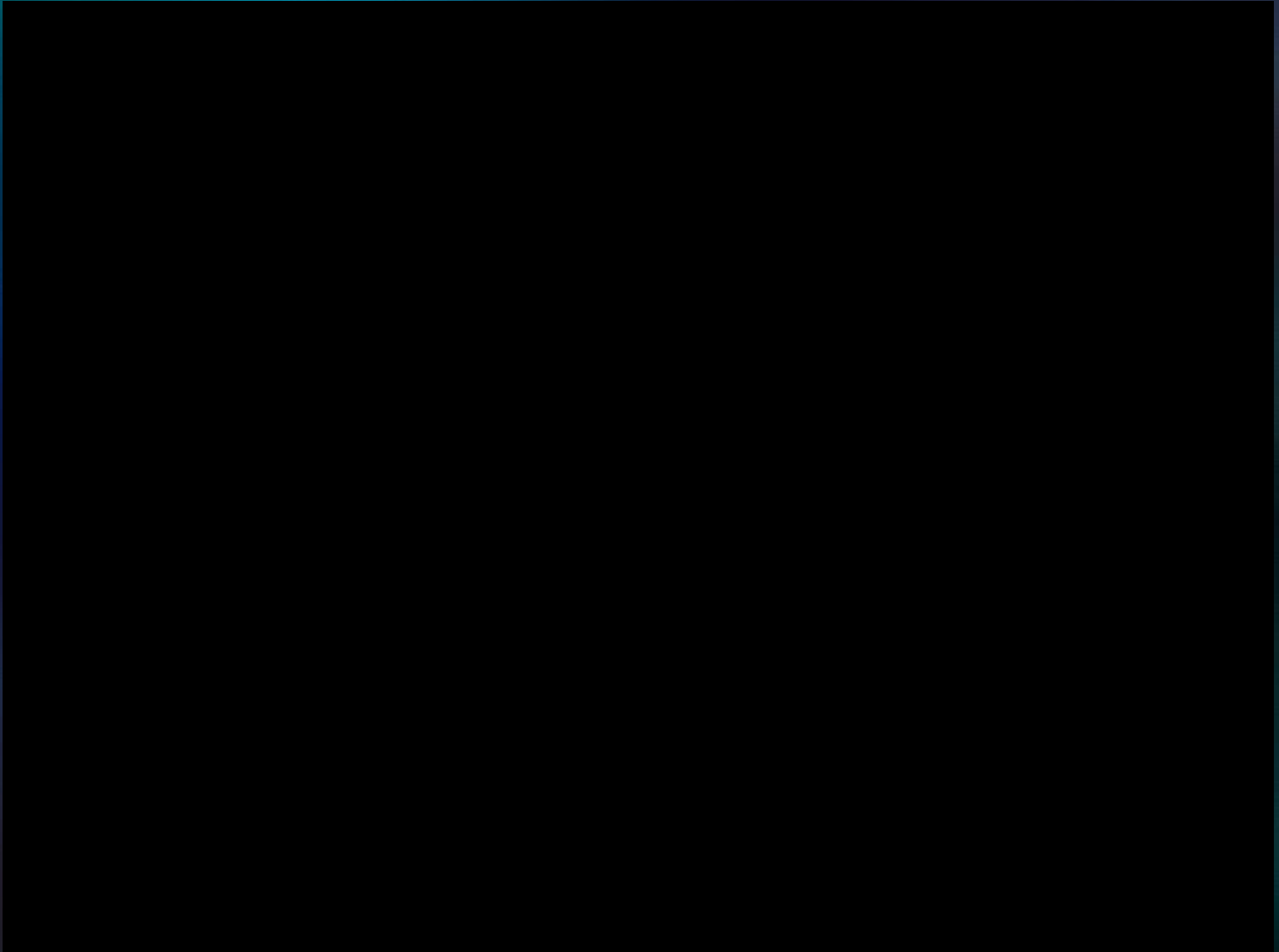
In a non randomized trial of 463 pts, prophylactic clipping when possible significantly reduced delayed bleeding risk from 9.9% to 1.8% after colon EMR >2 cm

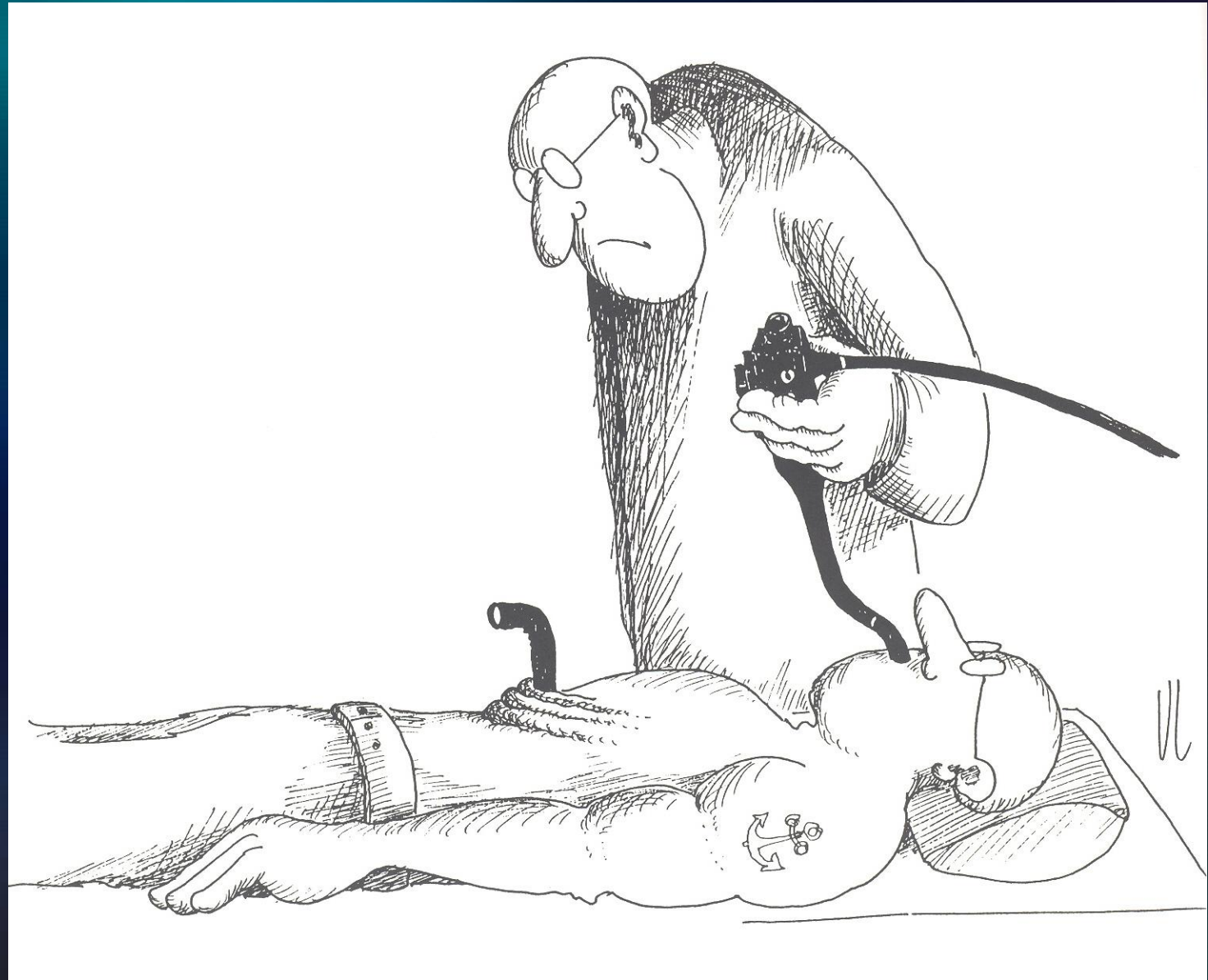
Liaquat, Rex DK. GIE 2013;77:401-7.

Large colon EMR was performed in 155 patients and prophylactic clipping performed in all lesions greater than 3 cm. Delayed bleeding risk 2%, all but one of EMR > 2 cm

Raju et. al. GIE 2016;84:315-325.

- Post band ligation EMR bleeding







TTS clip closure endoscopic perforations: only for small ones (< 1 cm) ?

Seewald & Soehendra. (Editorial) Perforation: part and parcel of endoscopic resection? GIE 2006;63:602-3.

Esophageal, duodenal and colonic perforations ≥ 1 cm in size should undergo surgery

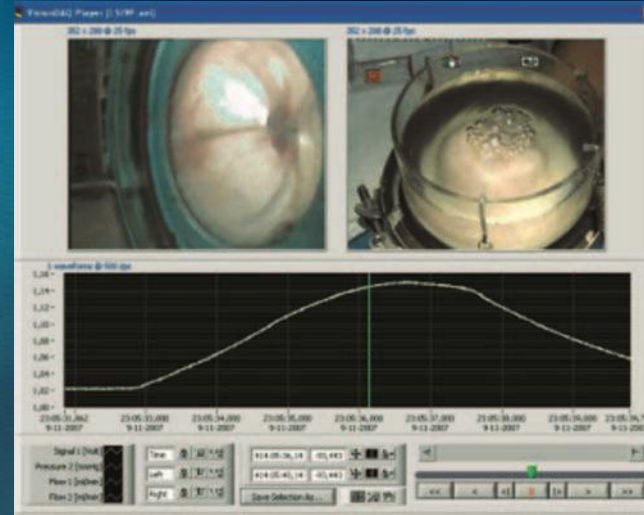
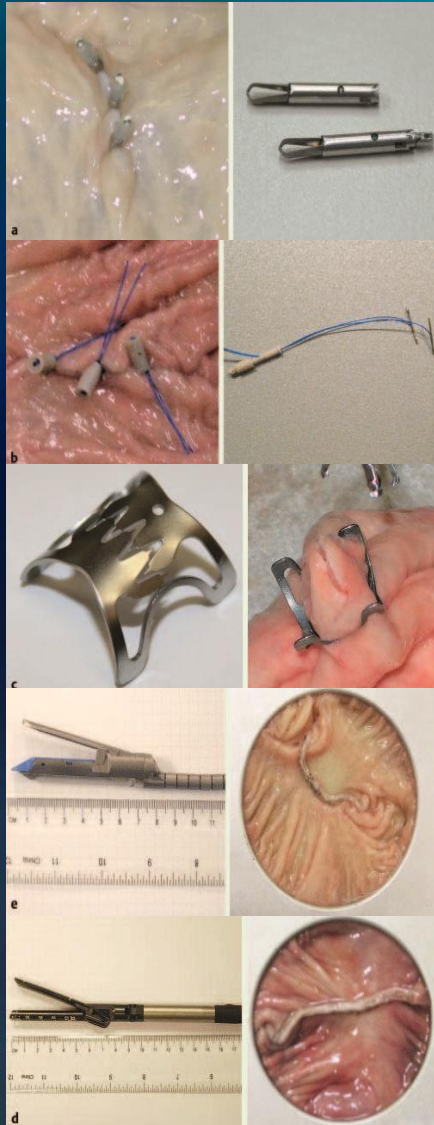
Verlaan et. al. Endoscopic closure of acute perforations of the GI tract: a systematic review of the literature. GIE 2015;82:618-28.

Endoscopic management of colonic perforations: clips versus suturing closure (with videos). GIE 2016;84:487-493.

TTS clip placement is considered a reasonable treatment option for closure of small (<1 cm), while more robust closure methods, such as endoscopic suturing or an over-the-scope clip, for large gaping perforations

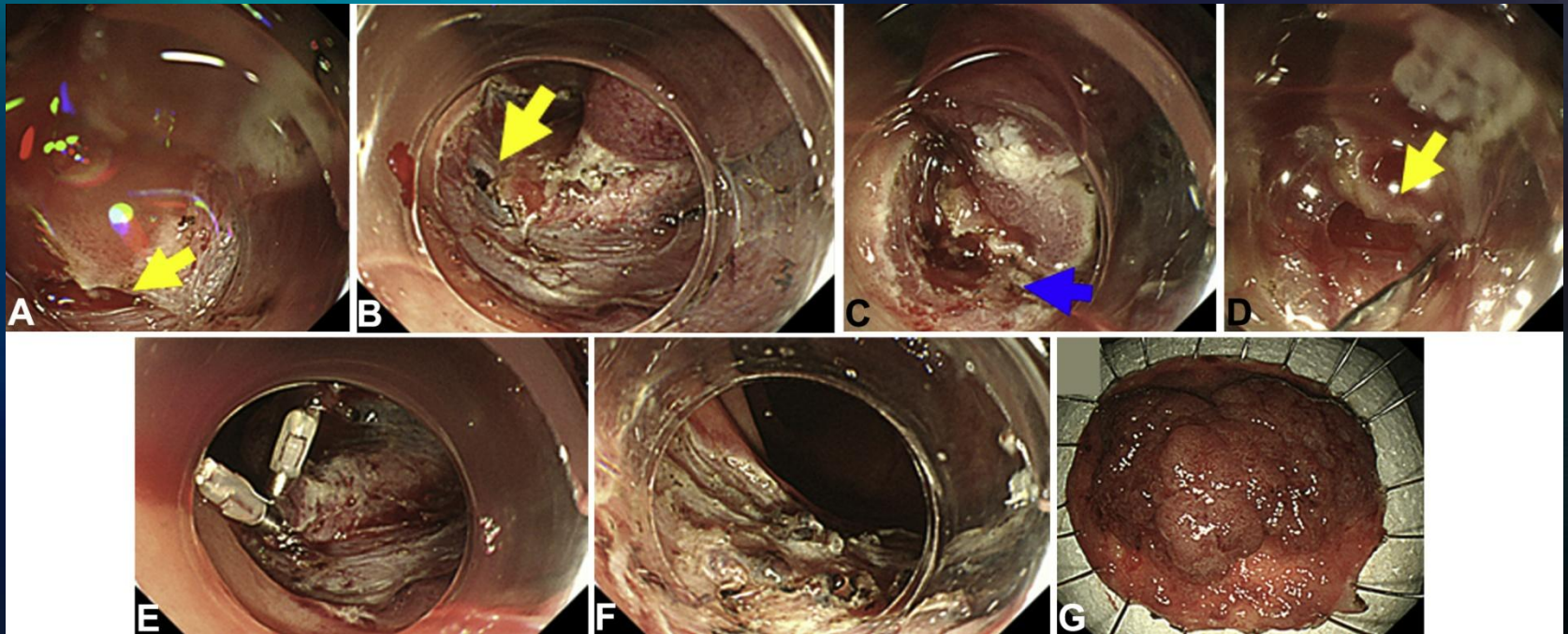
Law & Wong Kee Song. (Editorial) Closing the lid on iatrogenic colonic perforations. GIE 2016;84:503-505.

Comparison of endoscopic closure modalities for standardized colonic perforations in a porcine colon model



OTSCs, TTS clips, and both flexible staplers produced leak test results (85-98 mmHg) comparable to hand-sewn colotomy closure in this *ex vivo* porcine colonic model

Endoscopic closure of post ESD colonic perforations



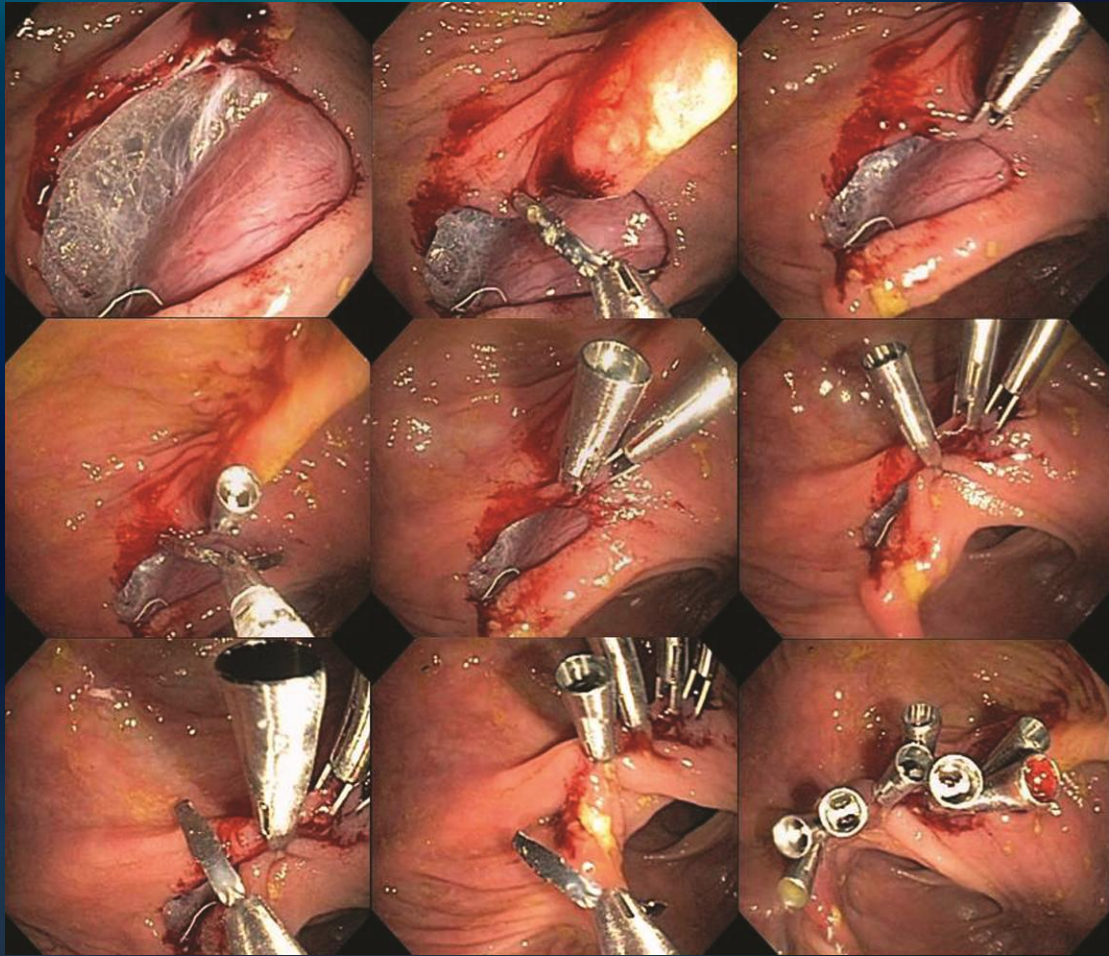
935 ESD (1998 – 2013)

Perforation ($5 \text{ mm} \pm 3 \text{ mm}$) occurred in 25 cases (2.7%)

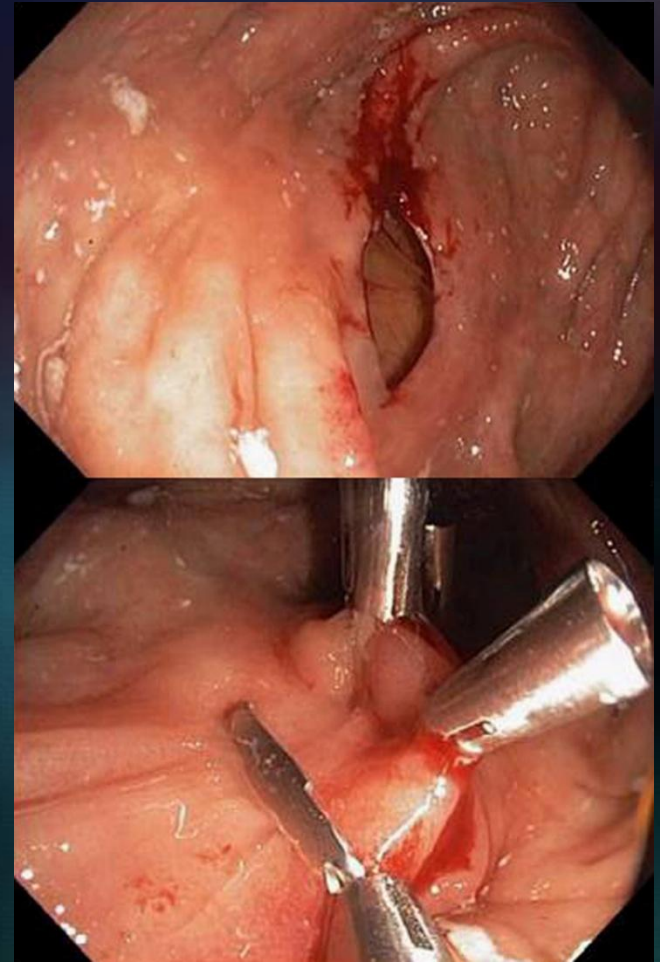
Clip closure was successful in 23/24 (96%) attempted cases

Number of clips used: 7 (1-15)

- Zipper clip closure of large colonoscopic perforations

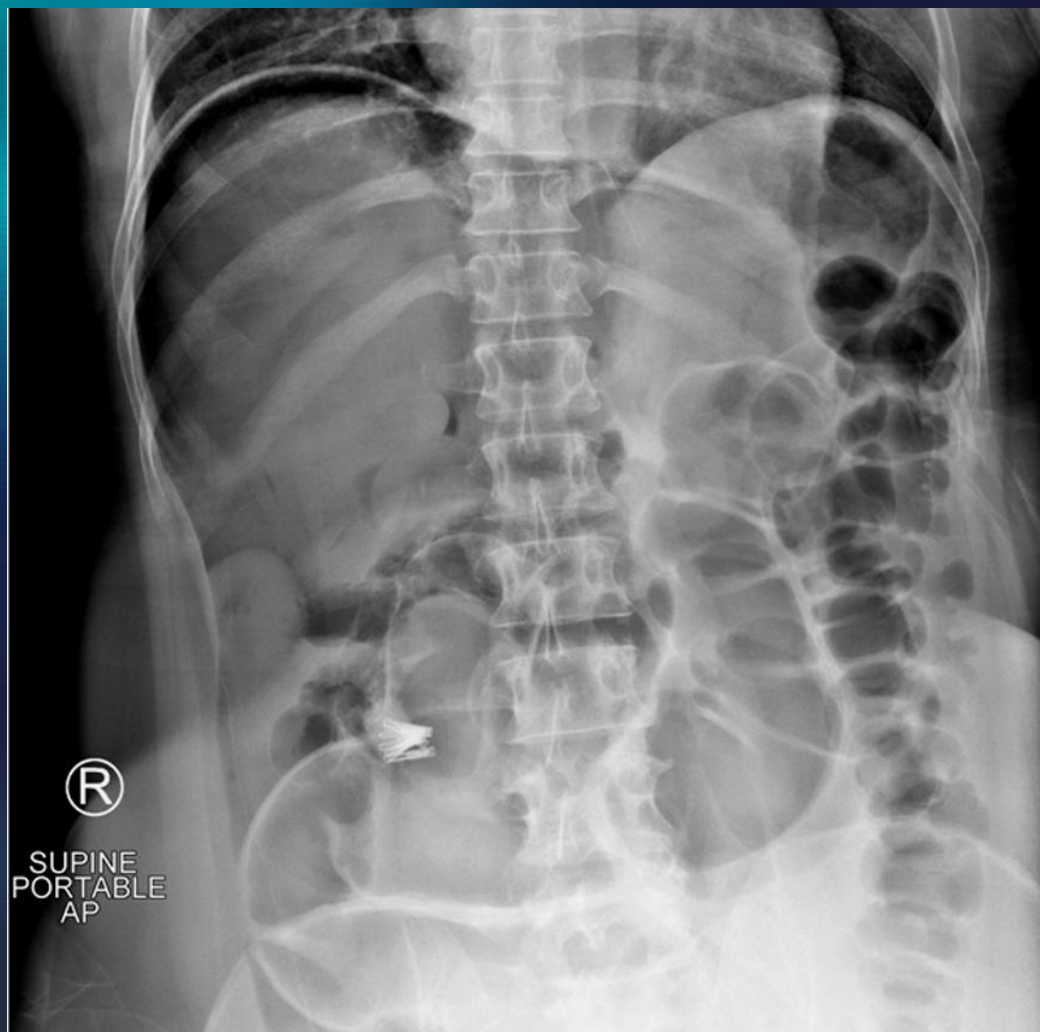


Case 1



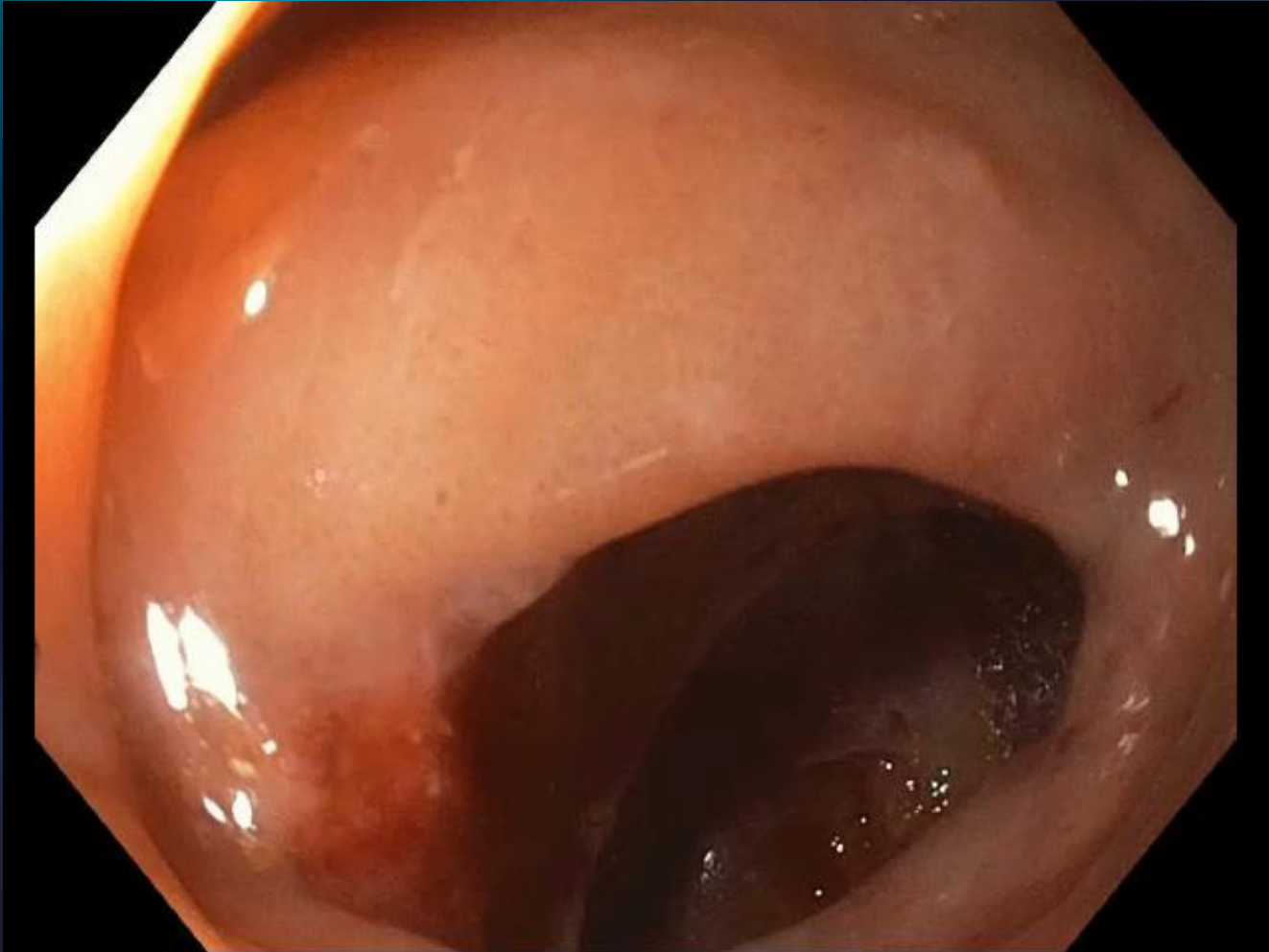
Case 2

- Zipper clip closure of large endoscopic perforations



Case 1

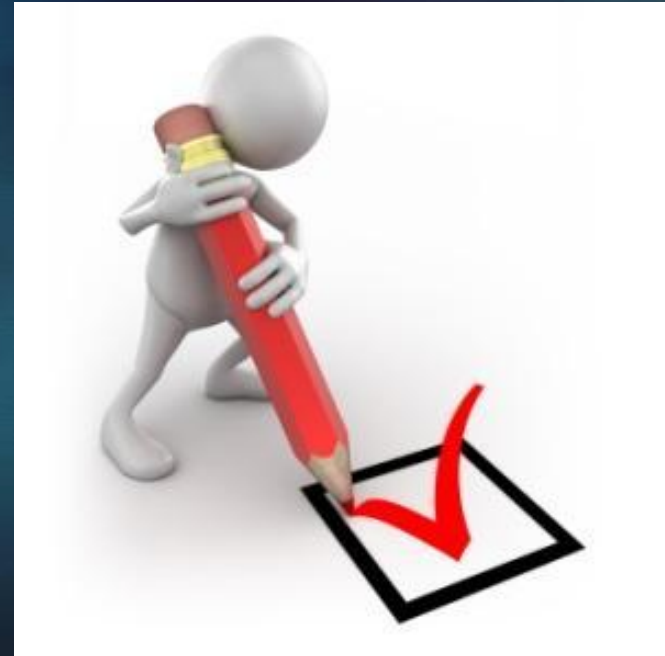
- Zipper clip closure of a sigmoid colon perforation



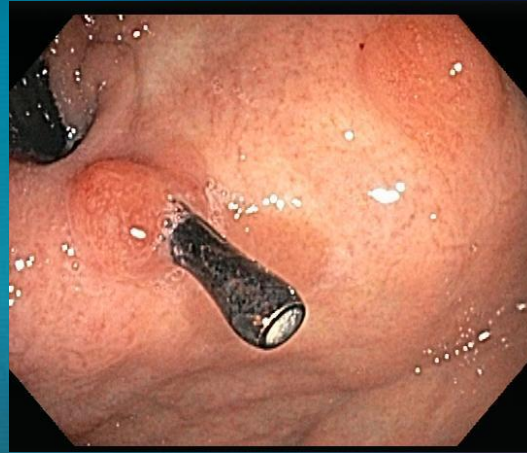
- **Closing endoscopic perforations:
TTS clips should be the first option**

- 1) TTS clips can be easily apply to the perforation site without the need of using or changing to special endoscopes, and re-inserting the endoscopes
- 2) TTS clips are available in every endoscopy lab, easy to learn and use, expedient in application
- 3) Newer generations of TTS clips have larger clip arm opening span (16 mm), stronger, and are more easily controlled
- 4) Zipper clipping with TTS clips can be used to close **small and large** perforations

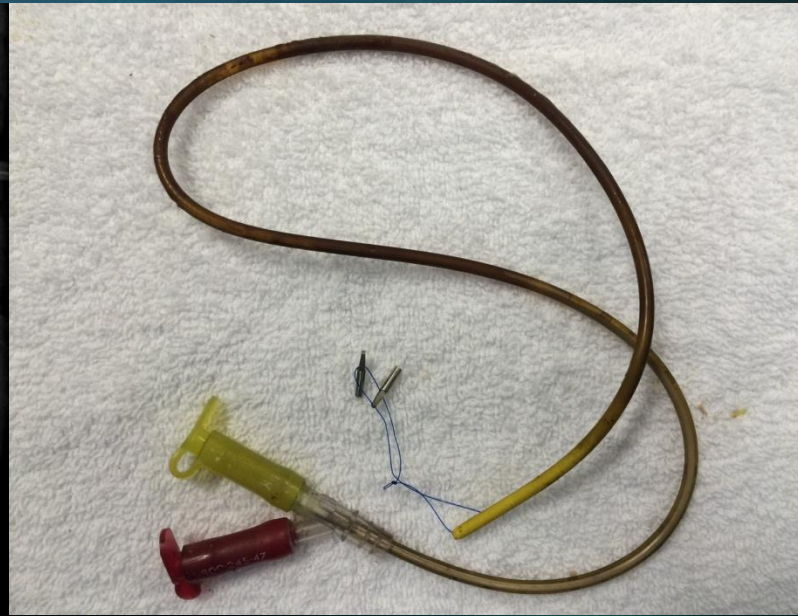
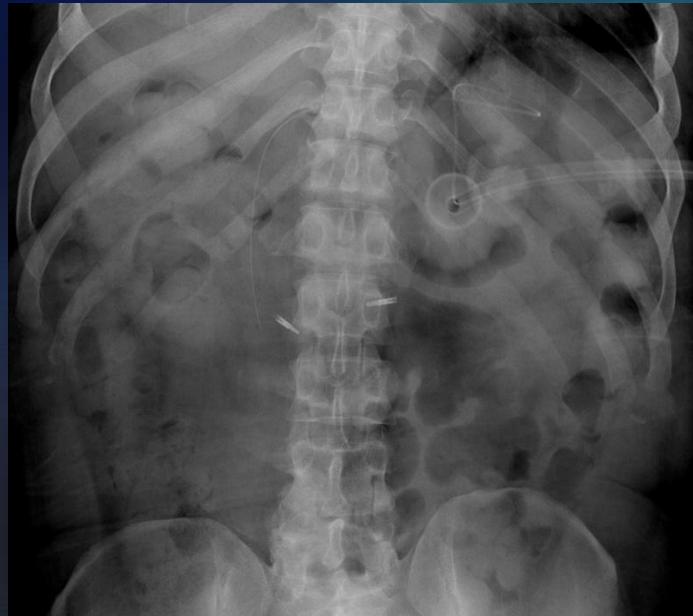
Marking & Attachment



Instinct clip placed one year ago



Instinct clips placed 4 months ago



Fully covered Evolution stenting for GE anastomotic leak-clip anchoring

