CoMMiT
Comprehensive Obesity and Metabolism Management and Treatment Program

COLUMBIA UNIVERSITY

Endoscopic Management of Bariatric Surgery Complications

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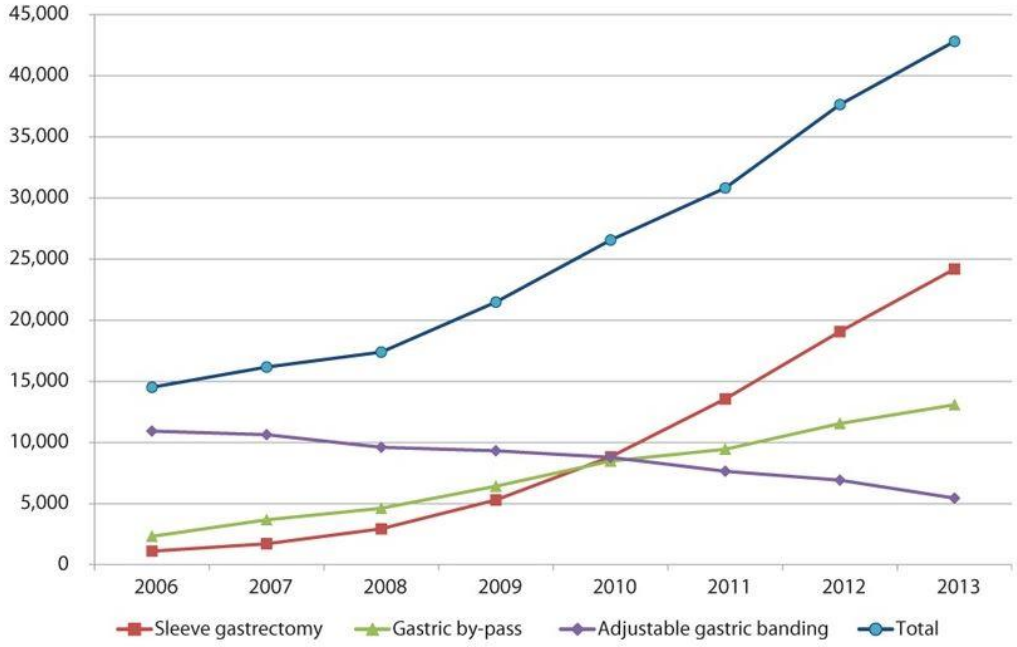
Outline

- Increasing number of bariatric surgeries
- Common complications
  - LSG
    - Stenosis
    - Leaks
    - (Esophageal pathology)
  - RYGB
    - Ulceration and Bleeding
    - Leaks
    - Stenosis
    - (Fistula)
    - (Choledocholithiasis)
    - (Gastrojejunal anastomosis dilation)
- Endoscopic options, approaches and efficacy



Complications of bariatric surgery

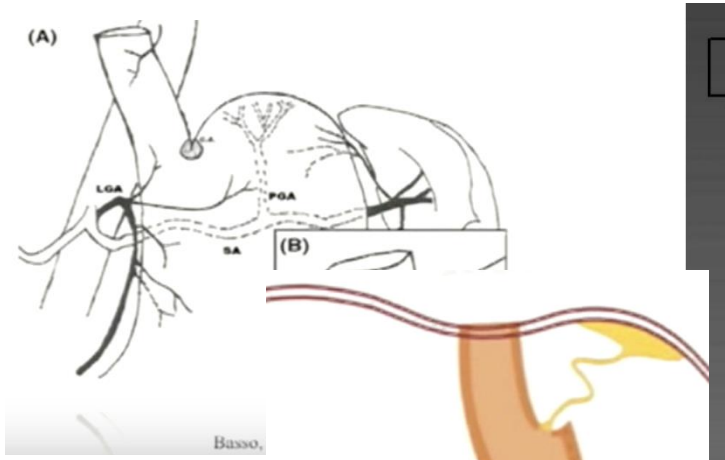
1. Bleeding
    - RYGB 1-5%
    - LSG 0-8%
    - LAGB 0-0.5%

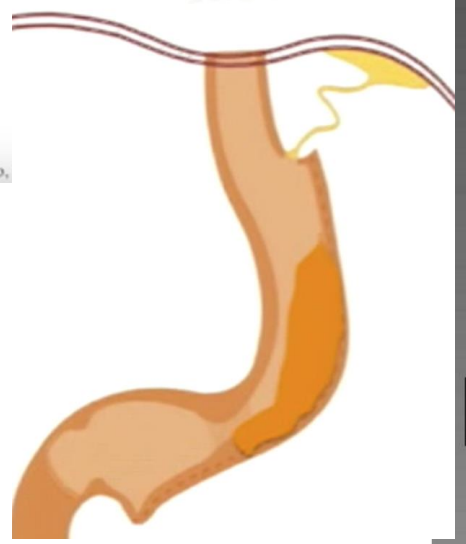
- General Treatment Principles
    - Identify and remove foreign body at bleeding site
        - Suture and staple material
        - Band erosion
    - Prefer injection/(spray)/mechanical treatment > thermal therapy
    - Suturing of anastomotic non healing ulcers
    - PPI (open capsule +/- antacid in RYGB)
    - Treat HP infection
    - Smoking cessation

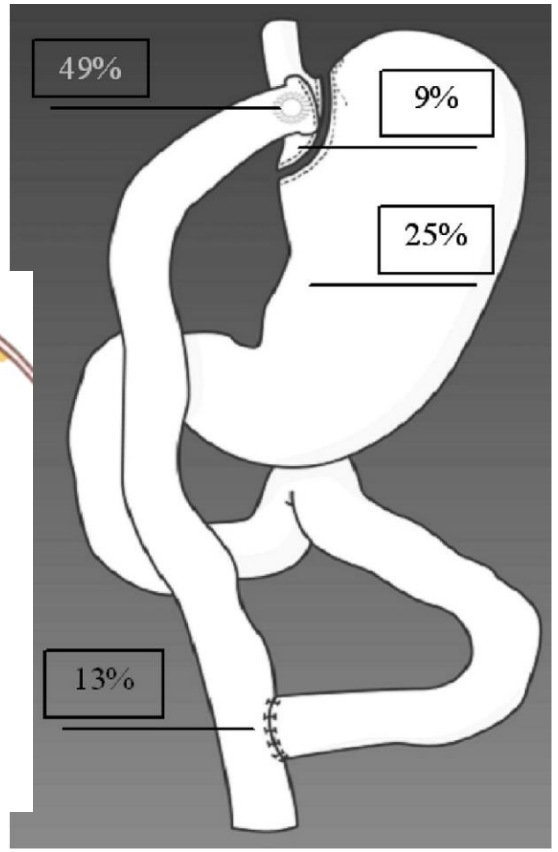
- Success of endoscopic and pharmacologic therapy >97%

Complications of Bariatric Surgery

- 2. Leaks
  - Most feared complications and second most common cause of death after bariatric surgery
  - RYGB
    - First few days: Technical reasons
    - Sub-acute: ischemia
    - 2-5% Laparoscopic RYGB
    - 1.6-2.6% in open RYGB
  - LSG
    - 0.6-7%
    - Most occur near angle of His
    - Ischemia and high pressure in the sleeve is primary etiology







Approach to leak management

- Timing of complication determines initial approach
  - Chronicity correlates with success of closure
- Stabilization of patient is critical – providing sufficient drainage prior to attempting other interventions
- Understand risk factors for impaired healing of leak
  - modifiable risk factors -> smoking, NSAIDs, steroids,
  - presence of stenosis -> creates high pressure that may sustain leak -> dilate
  - tissue ischemia -> less likely to heal, close
  - Presence of foreign bodies - > impedes healing ->removal
  - Size of the defect -> less then 1 cm early post-op defects have a greater chance of closure

Timing of complication determines initial approach

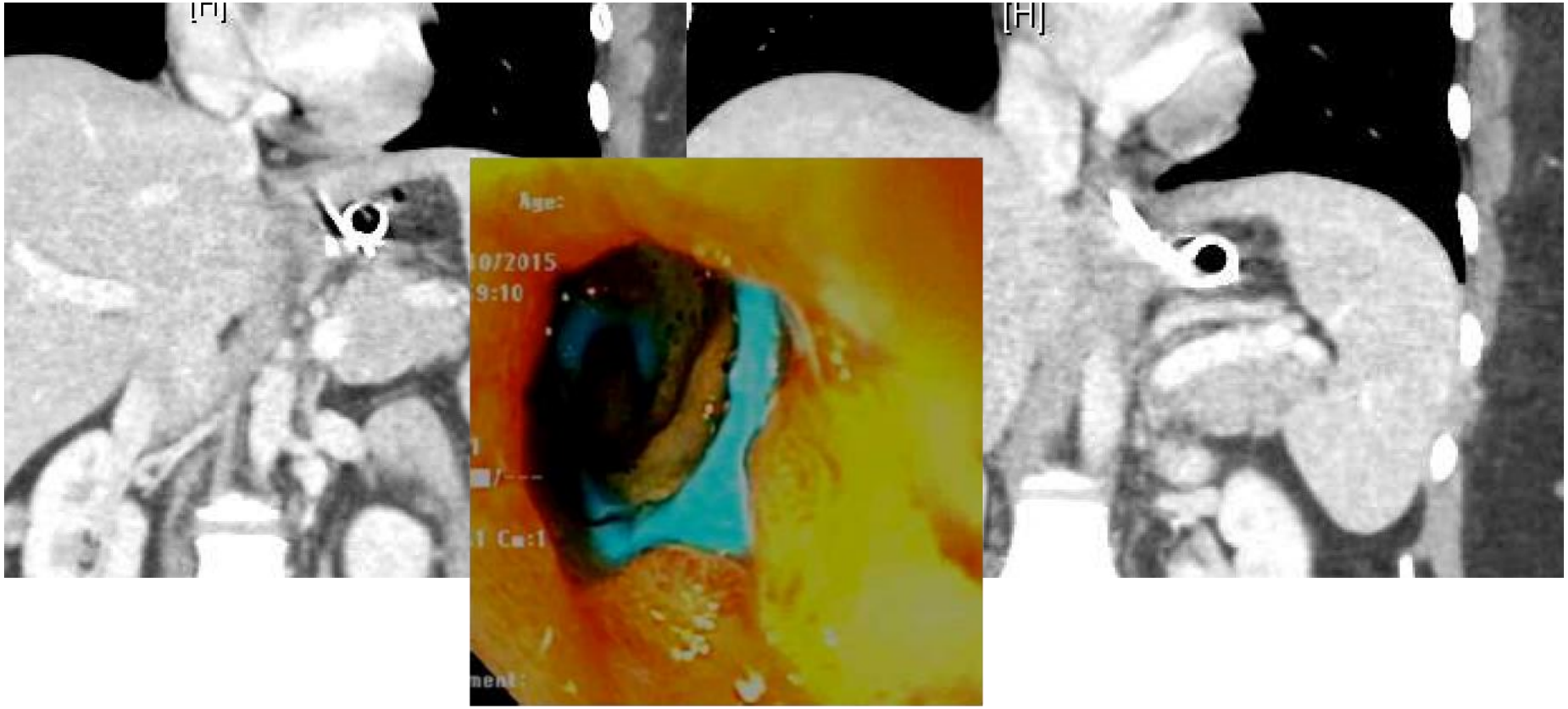
- Acute
  - Technical causes are common (dehiscence)
  - Peritonitis
  - Often without well formed abscess
  - Therapeutic priority: Stabilize, Emergent Drain, Close/Divert
- Subacute
  - Tissue Ischemia most likely cause
  - Perigastric abscess/collection
  - Urgent Drain, Cover/Stent
- Chronic leaks
  - Often associated with high distal pressure +/- ischemia
  - Fistula or abscess/collection
  - Drain, open>close defect

Endoscopic Treatment Options for Leaks

- Endoscopic Drainage
- Stenting
- Defect closure
- Dilation
- Septotomy

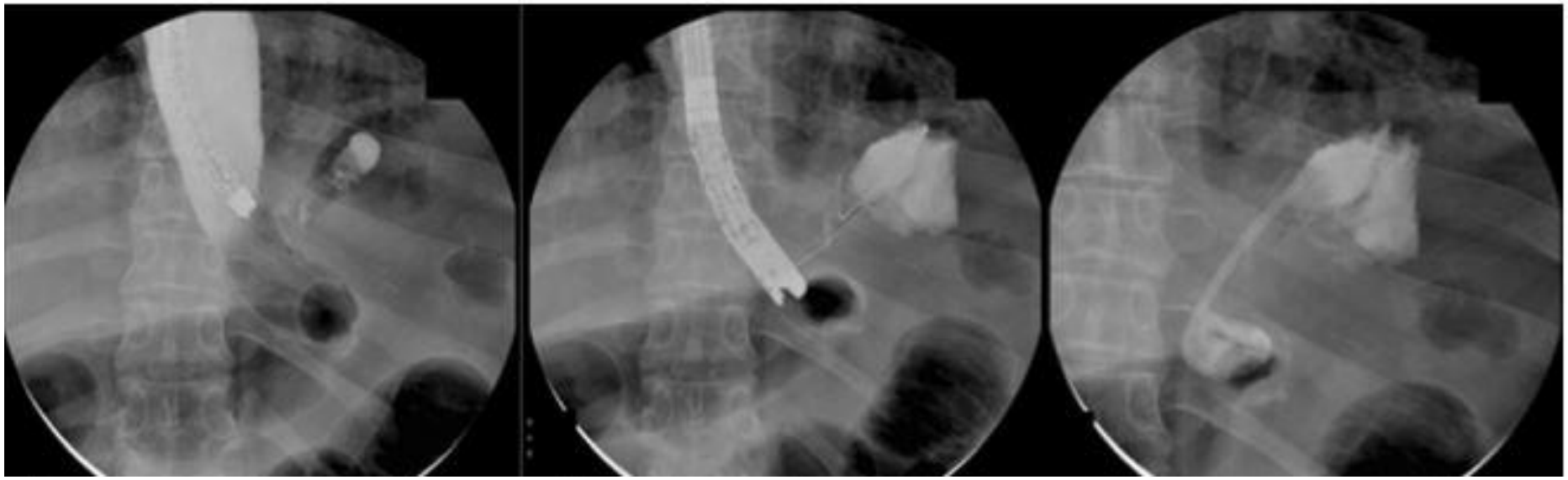
Primary endoscopic internal drainage

- Endoscopic drainage may be the best option in stable small leaks



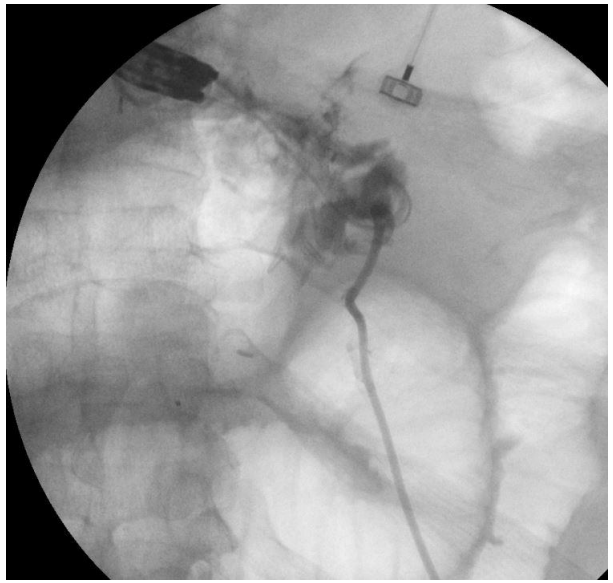
Primary Endoscopic Internal Drainage

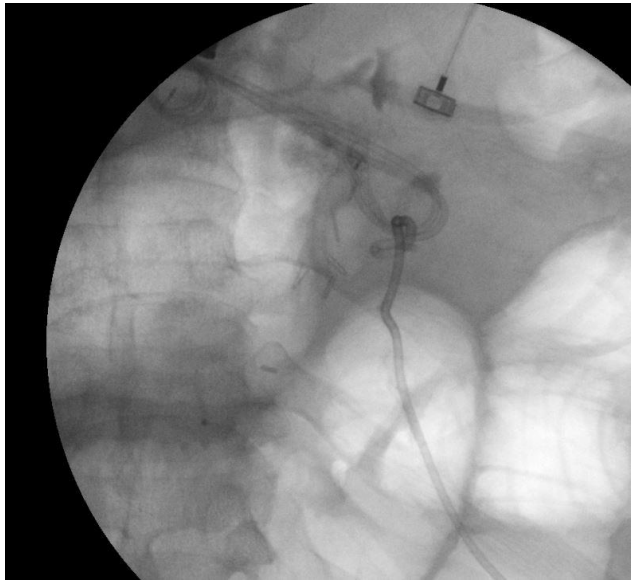
- Drainage of distant cavities may also feasible



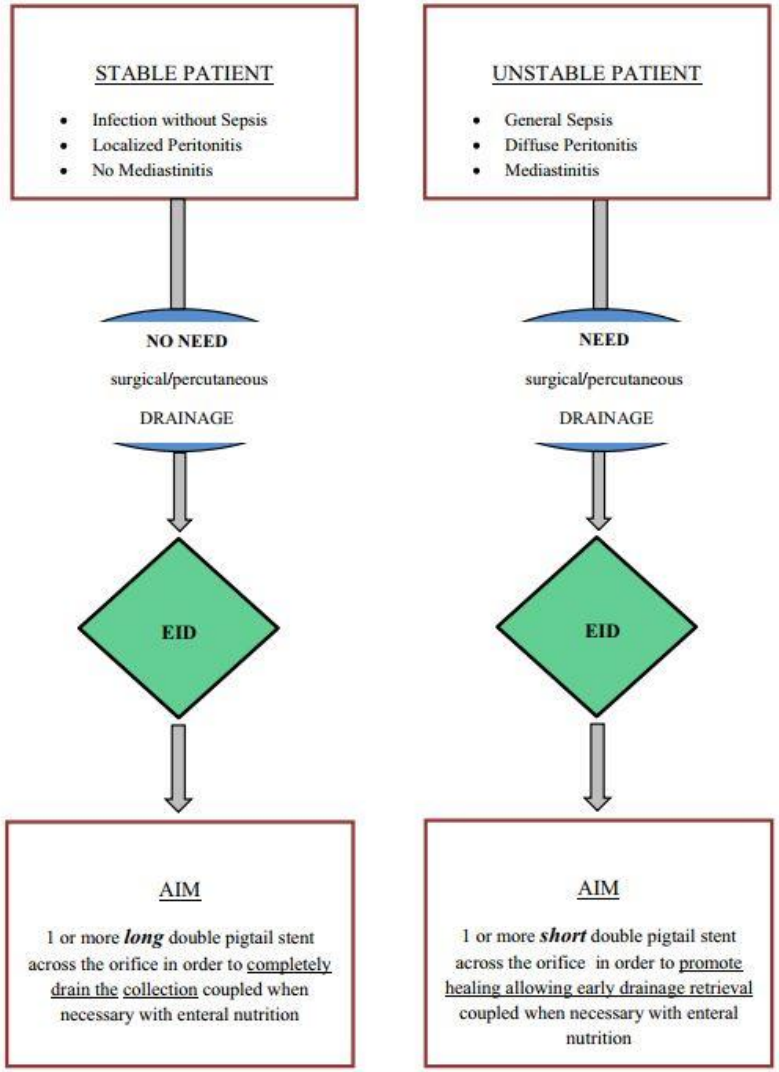
Secondary Endoscopic Internal Drainage

- Internal Drainage of surgically drained or IR drained cavities to aid drain removal





Role of Endoscopic Internal Drainage



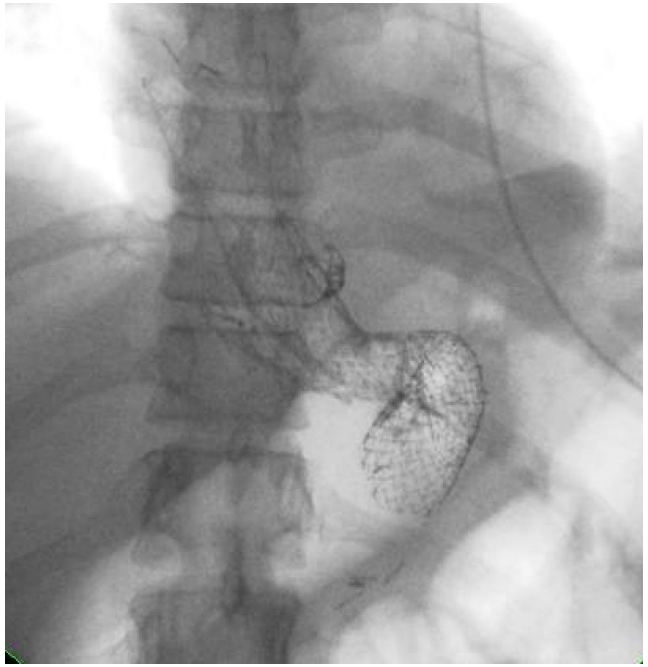
No. of points cured by EID	50/64 (78.2 %)
No. of points under treatment	9/64 (14 %)
No. of points not cured by EID	5/64 (7.8 %)
Length of treatment for healing (days)	57.5 (10–206)
Mean no. of endoscopic sessions	3.14 (2–16)
Late complications	6 stenosis
Mean follow-up (days)—50 pts	316 (20–600)

Donatelli G et al
Obes Surg 2015

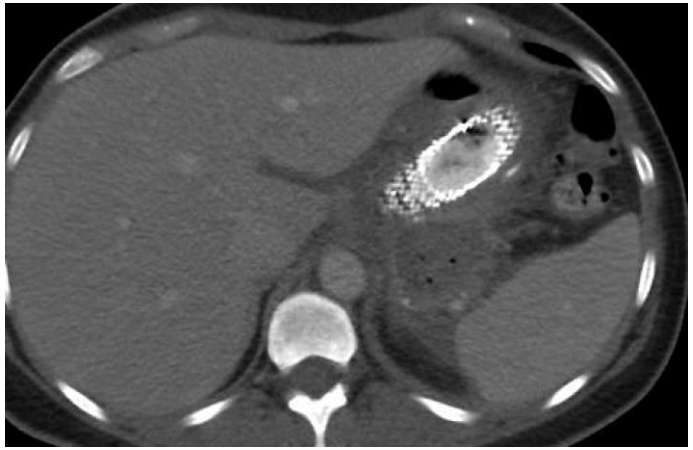
Management of leaks after LSG
Stent placement

- Endoscopic therapy should rarely

be undertaken without previous drainage



4 wks later

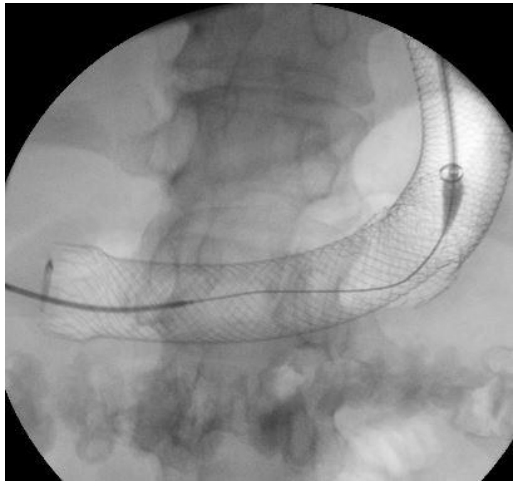


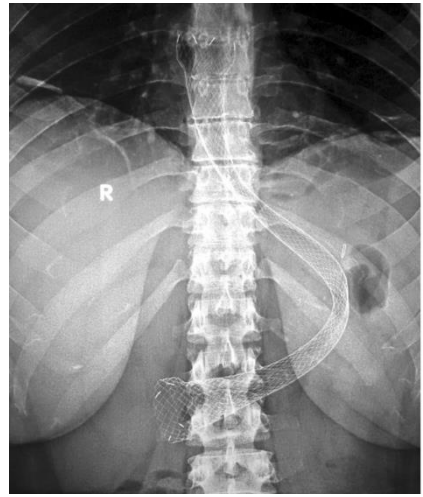
Management of leaks after SG
Stent placement

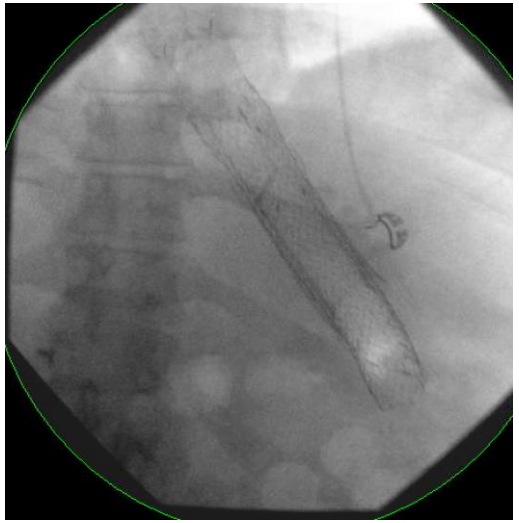
- Fully Covered
  - easily removable but migrate (>17%)
  - Leakage around stent proximally and distally
- Partially Covered
  - Tissue ingrowth allows a seal
  - Distal reflux can happen around stent
  - Inability to remove in 1 session in >45%
- Long stents or multiple stents to cover entire sleeve length

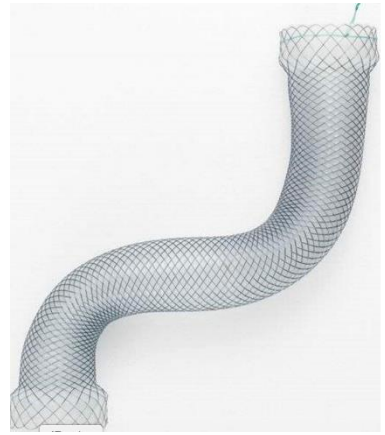
Stent in stent configuration

Long stents not available in US









Management of leaks after SG
Stent placement

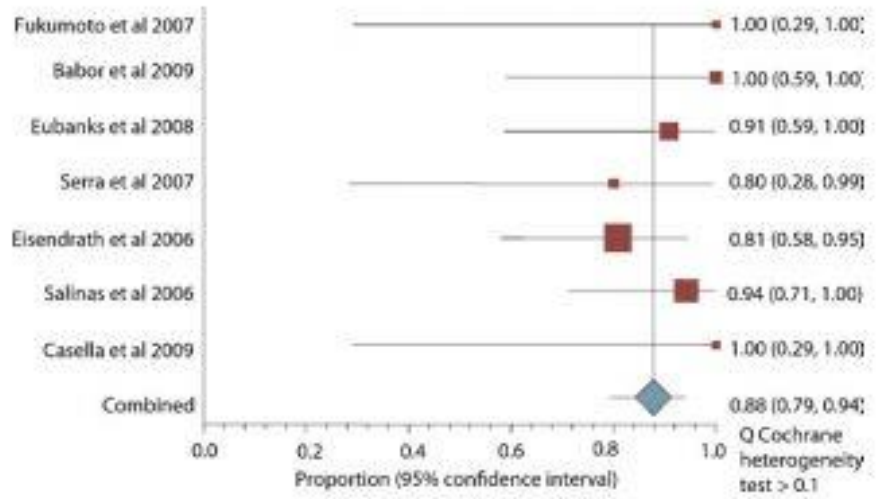
- Assure seal by two modalities
  - Esophagogram
    - Good at excluding leak around proximal edge of stent and detecting migration

      Leak persists-> stent repositioning; Partially Covered Stent
  - Dye test if external drain in place
    - Leakage can occur around distal edge of the stent
    - Distal -> Extension to duo sweep

- Consider diet modification, jejunal feeding, TPN

Management of leaks after SG
Stent placement

- Variable success
  - 60-90% resolution of leak in some studies
- Possible complications
  - 9% inability to remove
- Migration
  - 17% migration rate
  - Anchoring reduces migration rate of stents placed for benign indication
    30% vs 16%



Ngamruengphong S
Endoscopy 2016
Puli SR et al GIE 2012

Management of leaks after SG

Closure

- Small early leaks
- Assure concurrent drainage

- Closure devices
  - Clips
  - OTSC/Padlock
  - Suturing
- (IR or surgical)
- Benefit of de-epithelialization (APC)
- Simultaneous metal stent placement?

Type of fistula	Age (years)	Sex	Etiology	Time between fistula diagnosis and OTSC (days)	Leak size (mm)	Additional treatment	Complications	Efficiency
Upper GI early fistulas	75	F	Gastrocutaneous fistula after duodenopancreatectomy	30	NA	Cyanoacrylate glue injection	0	Secondary efficacy
	70	M	Colorectal anastomotic leak	30	8	0	0	Primary efficacy
	38	F	Esophagogastric fistula after LSG	20	5	0	0	Primary efficacy
	25	F	Esophagogastric fistula after LSG	15	8	0	0	Secondary efficacy
	33	F	Esophagogastric fistula after LSG	7	10	SEMS	Mediogastric stenosis caused by OTSC	Primary efficacy
	44	F	Esophagogastric fistula after LSG	20	7	0	0	Primary efficacy
	59	F	Esophagogastric fistula after LSG	8	5	0	0	Primary efficacy
	68	M	Duodenal perforation after mucosectomy	10	20	SEMS	0	Primary efficacy
	70	M	Esophageal perforation after mucosectomy	0	NA	SEMS + standard clips	Twin incarcerated	Primary efficacy
Upper GI chronic fistulas	45	F	Gastro-gastric fistula after gastric bypass	1100	3, then 10	0, then SEMS	0	Failure
	47	F	Esophageal leak after Mason gastroplasty	3600	15 and 20	0	0	Failure
	45	F	Esophagogastric fistula after LSG	120	15	SEMS + standard clips + glue	0	Secondary efficacy
	31	F	Esophagogastric + enterocutaneous fistula after LSG	50	3	0	0	Primary efficacy
	54	F	Gastro-cutaneous fistula after LSG	165	5	0	0	Secondary efficacy
	49	M	Esophagogastric fistula after LSG	90	NA	0	0	Primary efficacy
	31	F	Esophagogastric fistula after LSG	160	5	0	0	Primary efficacy
	38	M	Esophagogastric fistula after LSG	50	NA	0	Anchor migration	Primary efficacy
	36	F	Gastro-cutaneous fistula after LSG	360	10	0	Fistula edges torn by anchor	Secondary efficacy
	38	M	Gastro-cutaneous fistula after LSG	760	5	0, then SEMS + standard clips	0	Failure
	23	M	Esophagogastric fistula after LSG	90	NA	0, then SEMS + standard clips	0	Secondary efficacy
	29	M	Esophagogastric fistula after LSG	325	6	0	0	Primary efficacy
	52	F	Esophagobronchial fistula after LSG	60	NA	SEMS	0	Primary efficacy
	36	F	Esophagogastric fistula after LSG	120	5	SEMS	0	Failure
	36	M	Esophagogastric fistula after LSG	135	NA	0	0	Primary efficacy

Mercky P Dig
Endoscopy 2015

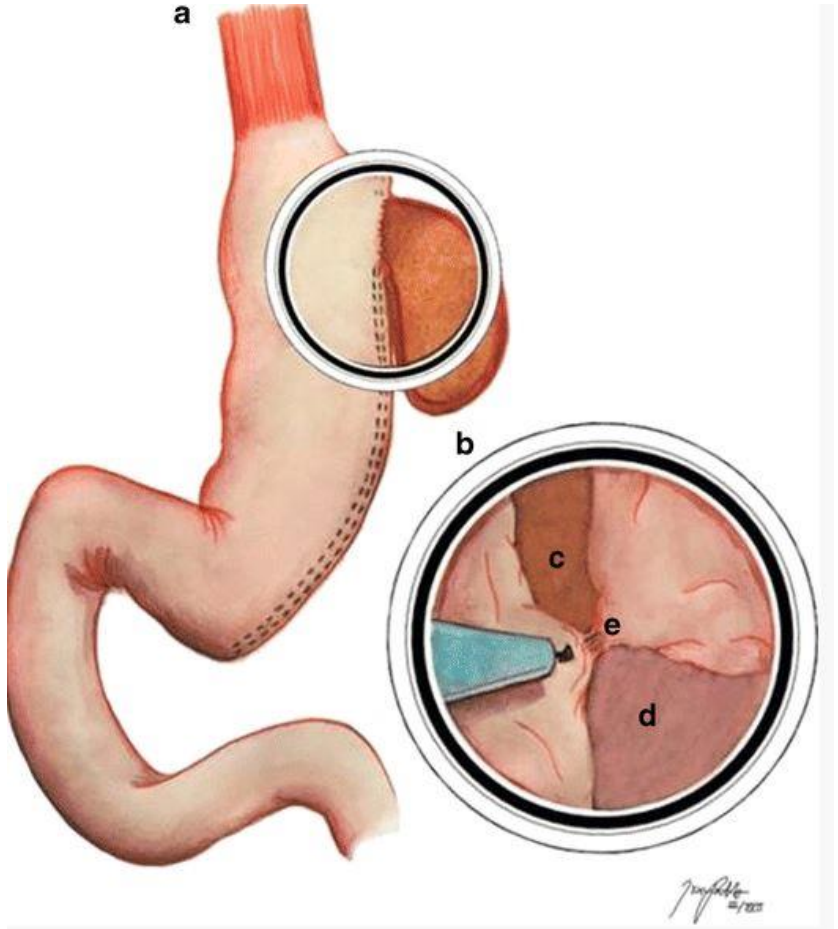
Management of leaks after SG
Dilate

- Stenosis distal to leak leads to increased pressure
- RYGB dilation of GJ using CRE balloon up to 20 mm
- Sleeve dilation for strictures and angulation
  - Pneumatic/Achalasia balloon 30 mm
- Pyloric channel dilation
  - +/- Botox injection

Management of leaks after SG "Open"

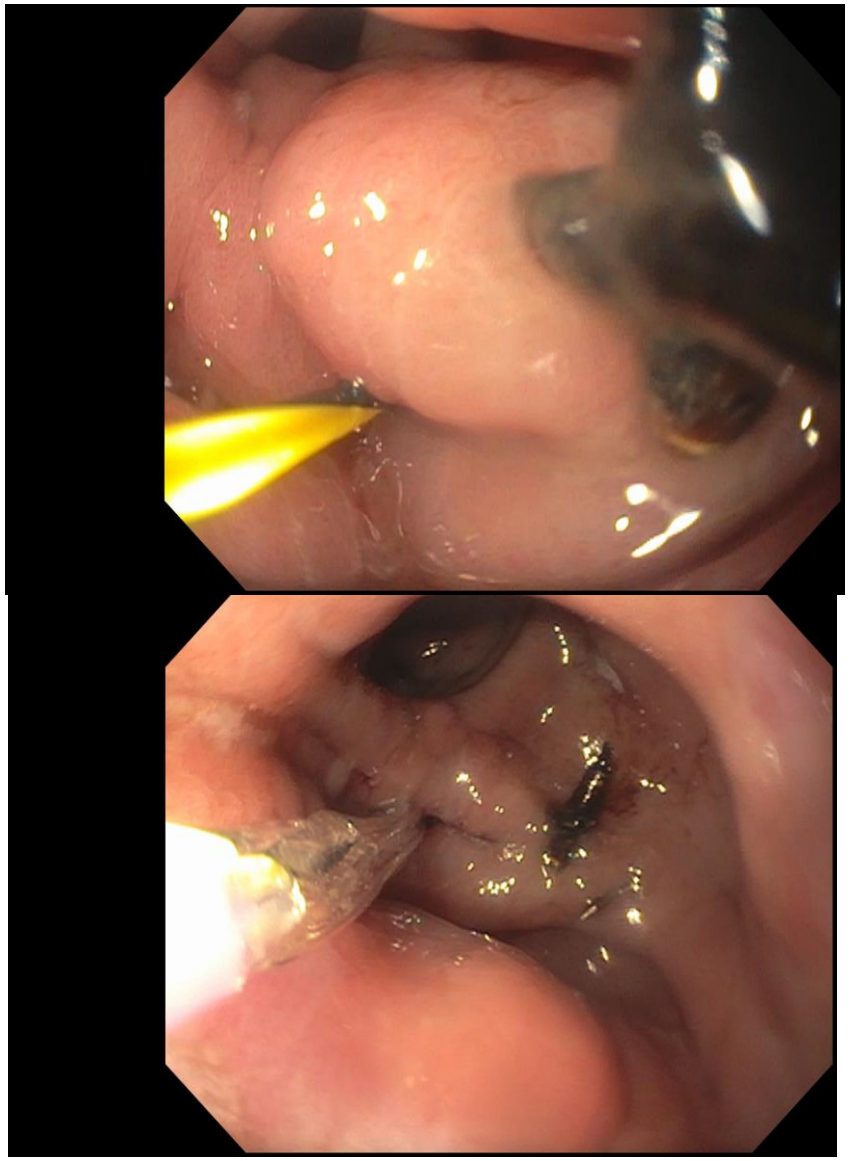
- Septotomy
  - Cutting the septum (suture line) between defect and lumen
  - Increase internal drainage
  - Less likely to evolve into abscess
  - ?Epithelialization of the cavity

  - (remove most staples and other foreign material)
  - APC, NK, IT knife
  - Often combined with stenting and dilation



Management of leaks after SG "Open"

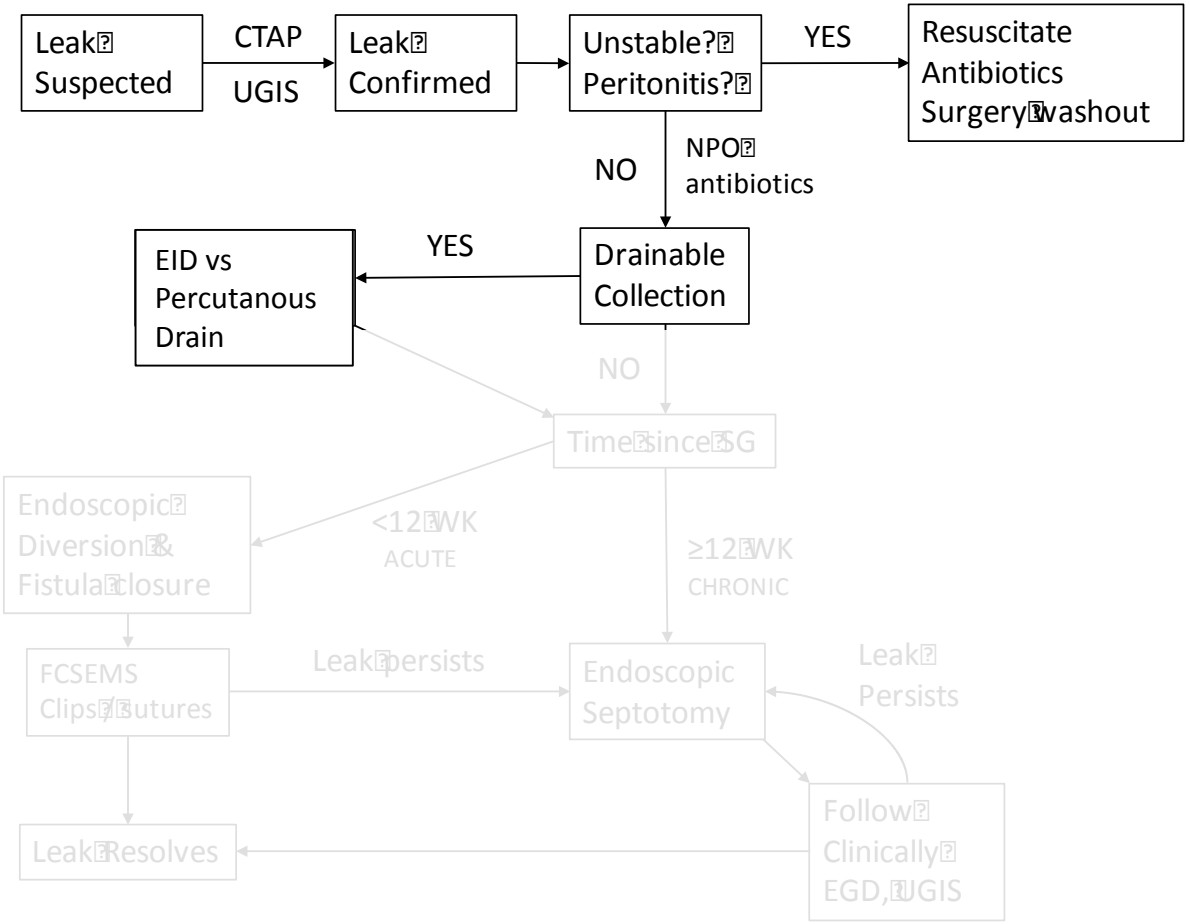
- Septotomy
  - remove most staples and other foreign material
  - Irrigate /debride cavity
  - APC, NK, IT knife
  - Often combined with stenting (pigtail) and dilation



Septotomy: our experience (CU + JHU)

	n	%
N	9	
Device used for ES		
APC	6	67
NK	3	33
Distal stenosis dilated	5	56
Complications		
Immediate bleeding	3	33
Transfusion	0	0
Delayed complications	0	0
Procedure duration/min, mean (range)	87.2	(28-167)
Reoperation	0	0
Symptom resolution	9	100
Persistent cavity open to lumen	3	33
Follow-up/weeks, mean (range)	21.2	(7-33)

Leak after Bariatric surgery: proposed algorithm



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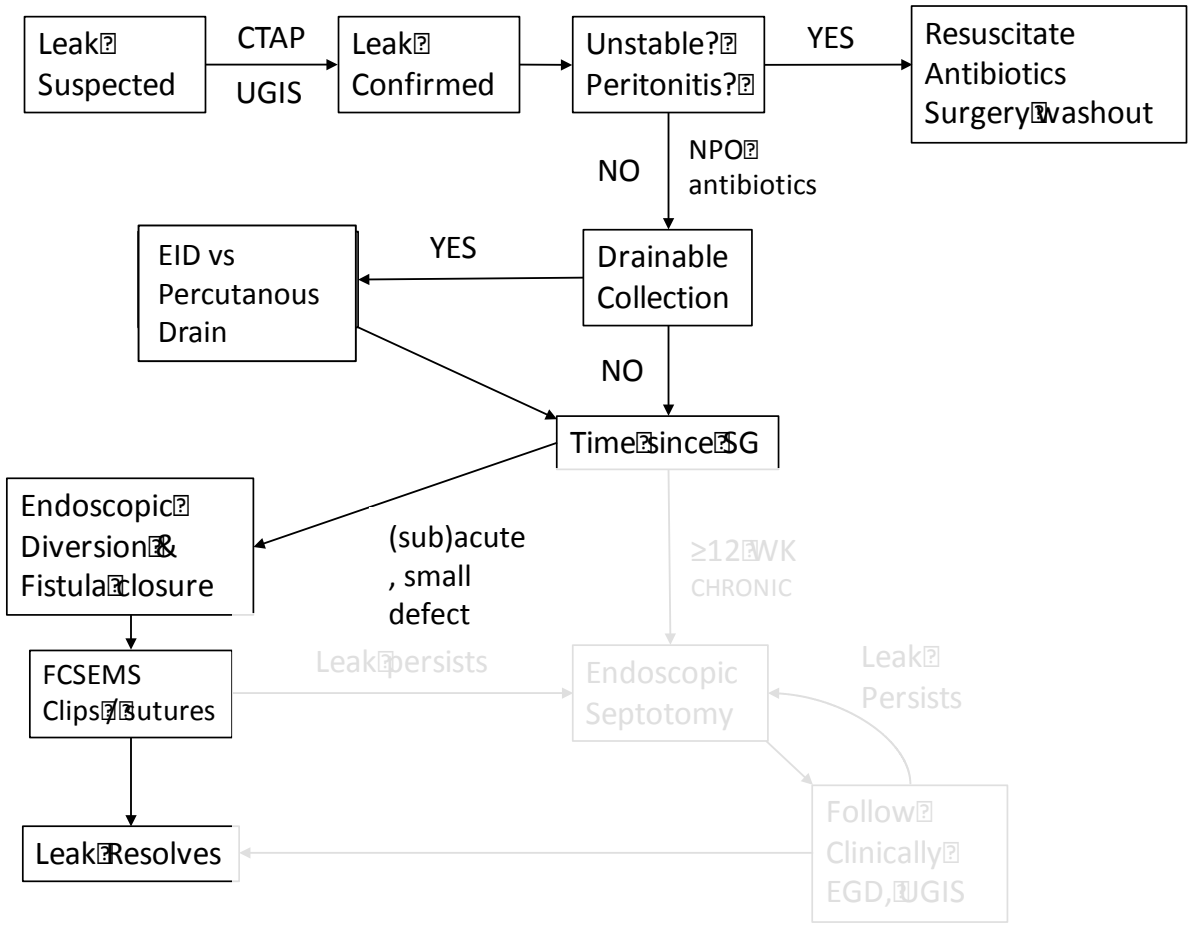

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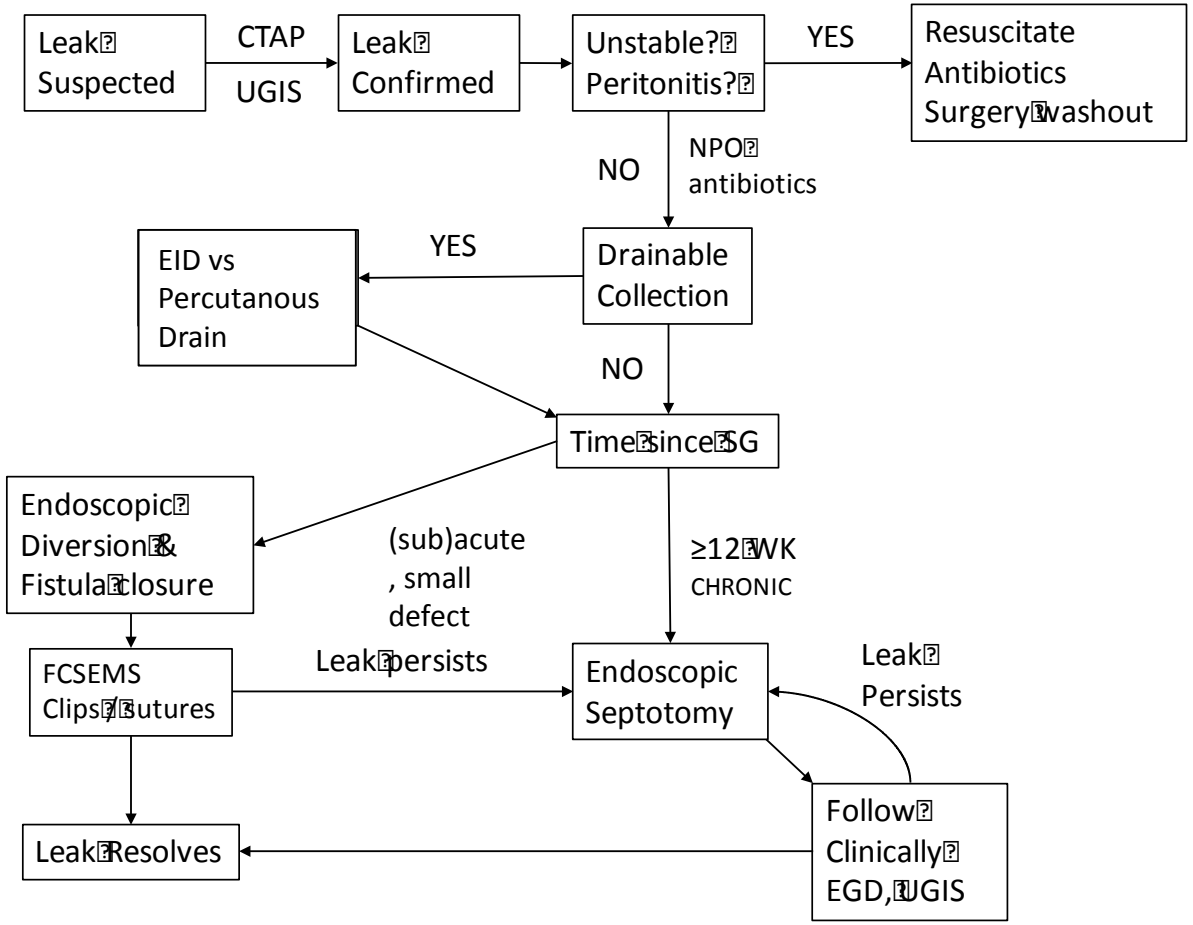


Complications of Bariatric Surgery
3. Stenosis

- Stenosis after RYGB
  - Incidence: 3-28%
  - Usually > 10 weeks after surgery
  - Modifiable RF: NSAIDs,

  smoking and alcohol
  - GJ diameter max 20 mm -> CRE balloon dilation up to 20 mm
  - Endoscopic dilation is successful

  in 89-100% of cases
  - Perforation risk : 0-3%

Stenosis after RYGB

- High success rate
- Durable Benefit
- Low complication rate

Ref.	No. patients	Time interval to stricture diagnosis (d)	No. of sessions	Success rate (%)	Balloon diameter	Complication rate (%)	Perforation rate (%)
Barba *et al*[36]	24	28-270	1-3	100	8-13 mm	0	0
Go *et al*[37]	38	53.9 (21-168)	1-6	95	12-16 mm	3 1 pneumothorax and pneumomediastinum	3
Rossi *et al*[38]	38	-	1-3	100	-	0	0
Carrodeguas *et al*[39]	94	52.7 (20-154)	1-4	99	-	2.1 Perforations	2.1
Catalano *et al*[40]	26	63 (28-63)	1-7	96.2	8-15 mm	3.8 Surgical revision for recurrent stenosis	0
Peifer *et al*[41]	43	49.7 (24-197)	1-3	93	9-20 mm	0.5 Surgical revision for recurrent stenosis	0
Caro *et al*[42]	111	56 (3-237)	1-4	100	6-18 mm	2.7 2 contained perforations 1 esophageal hematoma	1.8
Ukleja *et al*[43]	61	60 (30-180)	1-5	100	6-18 mm	4.9 3 perforations	2.2[1]
Mathew *et al*[44]	58	66.2 (12-365)	1-7	100	6-20 mm	3.2 Perforations	3.2
Da Costa *et al*[45]	105	90 (30-270)	1-4	100	6-20 mm	3.8 1 hemorrhage 3 perforations	1.8[1]
Espinel *et al*[35]	22	126 (26-768)	1-4	100	12-20 mm	4.5 Small tear	0
Yimcharoen *et al*[46]	72	46 < 90 25 > 90	1-15	84.7 98% < 90 d 61% > 90 d	8-18 mm	1.3 1 perforation, pneumoperitoneum and death	1.3

Stenosis after LSG

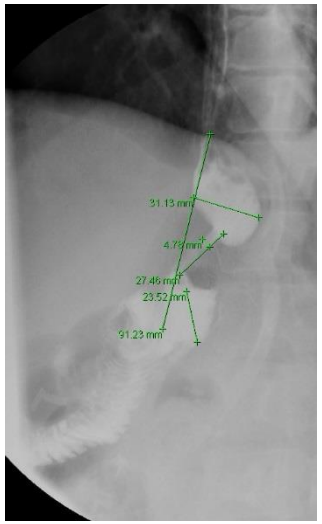
- Incidence 0.3-4%
- Mechanical stenosis: proximal sleeve
- Axial deviation/Functional stenosis: at incisura angularis
- Typical symptoms:
  - GERD
  - Nausea
  - Pain
  - Dysphagia
  - Weight loss

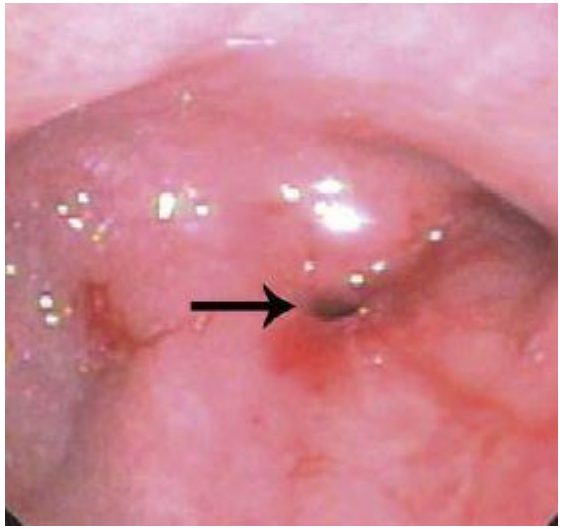
Helix stenosis after LSG – evaluation

Esophagogram

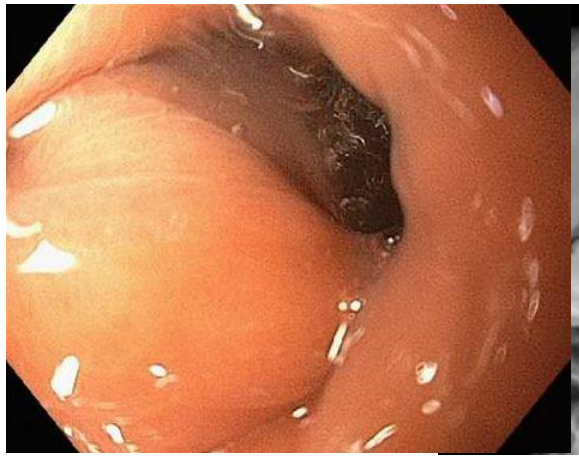
Endoscopy with fluoroscopy

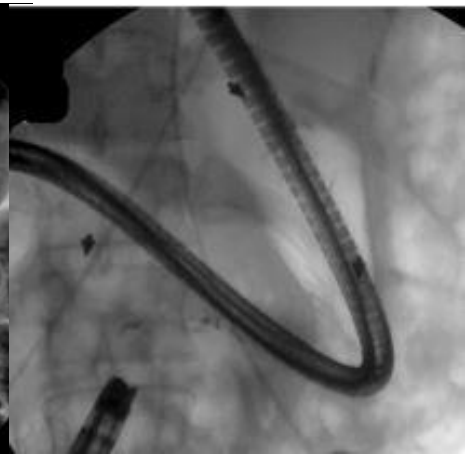
Mechanical stenosis





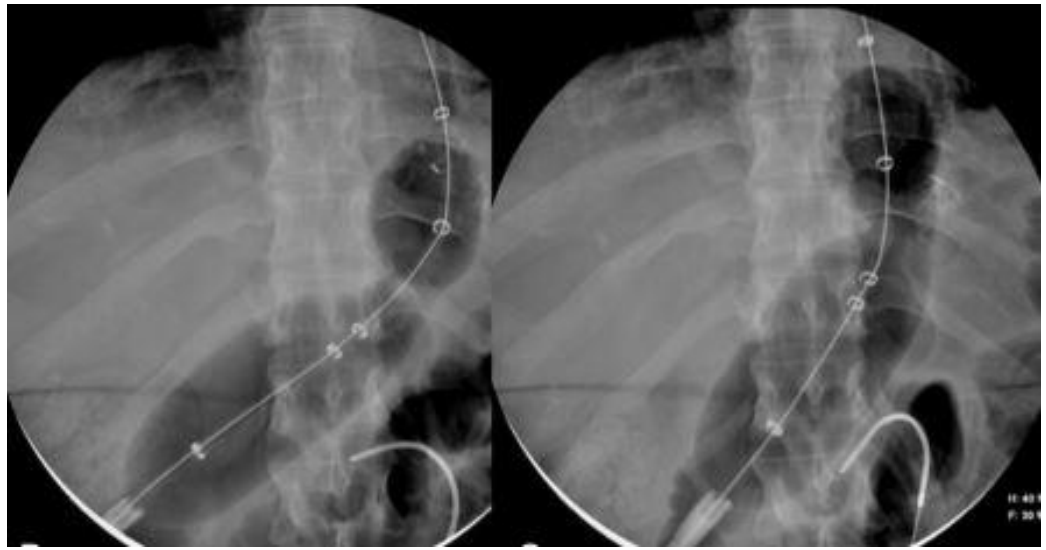
Functional stenosis



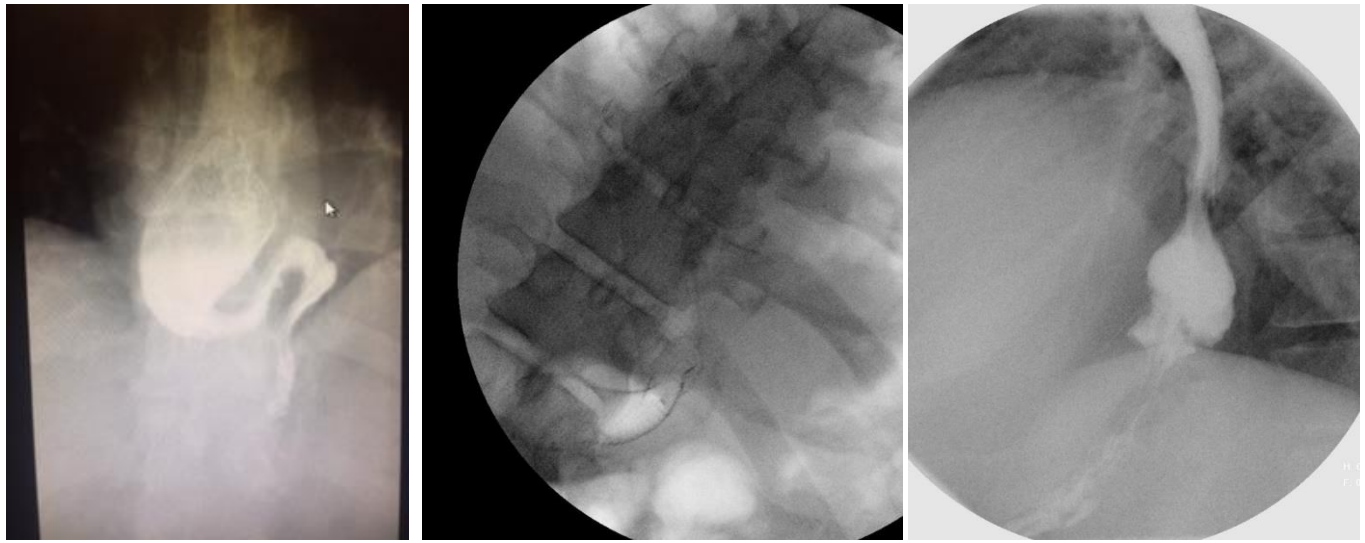


Helix stenosis after LSG – endoscopic treatment options

Pneumatic Dilation

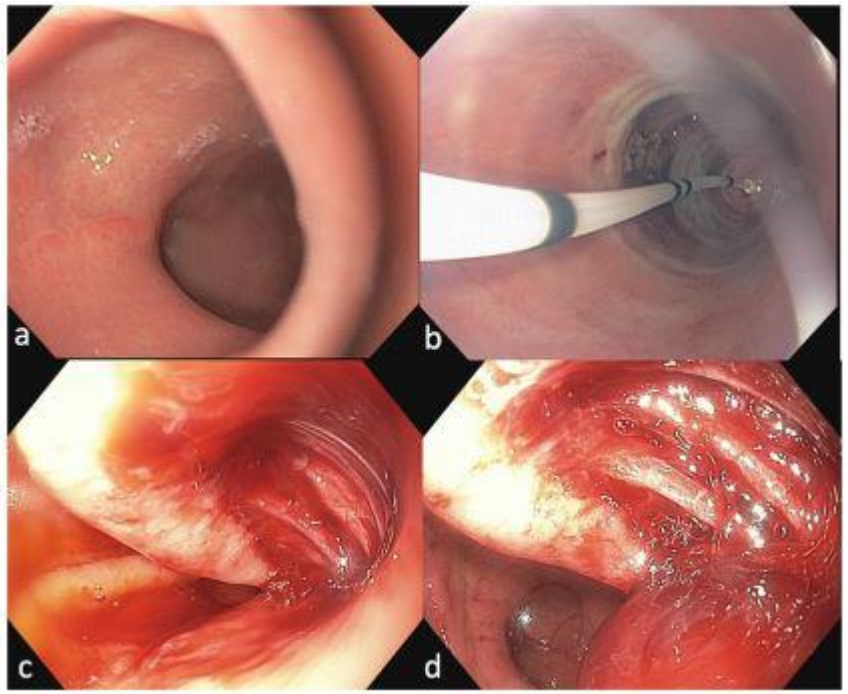


Stenting

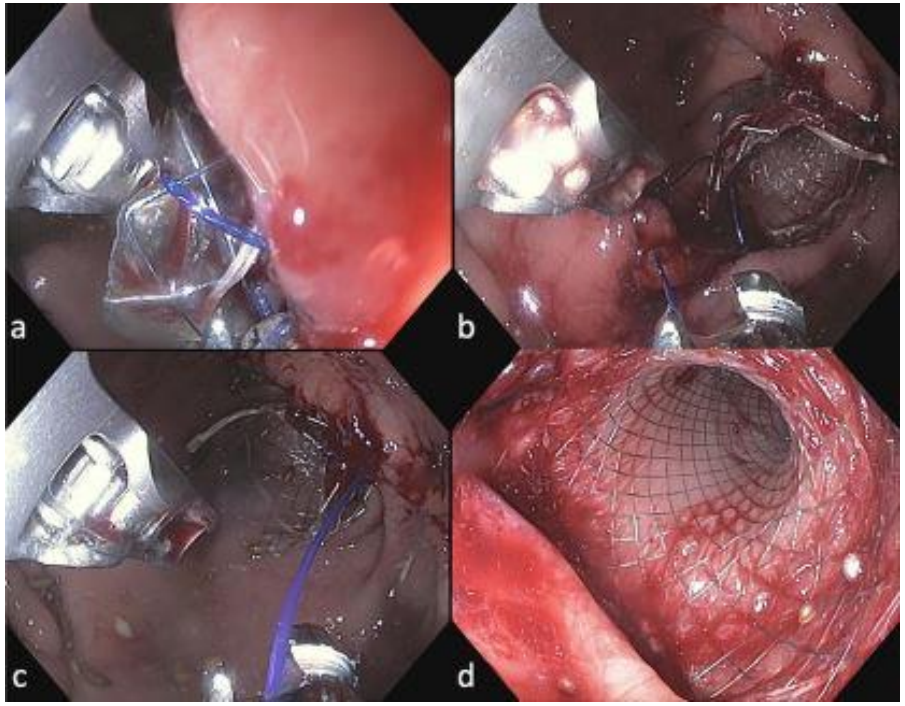


Helix stenosis after LSG – endoscopic treatment options

Pneumatic Dilation



Stenting



Helix stenosis – outcomes after dilation

Authors	Publication year	% Successful cases treated endoscopically	Mean # of endoscopic treatments (range)	Endoscopic modalities	Complications	% Failure cases (revisional surgery)
Parikh et al. [11]	2012	80% (8/10)	1.6 (1–2)	CRE (range 15–18 mm) Stent (2/10) for long segment stenosis	Not reported	20% (RYGB)
Shnell et al. [3]	2014	44% (7/16)	N/A (1–3)	CRE 20 mm (31% success) Achalasia balloon 30 mm (100% success)	None	56% (5 cases RYGB + 1 case re-sleeve + 3 cases lost to follow-up)
Ogra et al. [5]	2015	100% (26/26)	1.6 (1–4)	CRE <20 mm Achalasia balloon 30 mm (15 psi) + 35 mm (15psi) Stent (2/26)	4% (1 stent migration)	N/A
Rebibo et al. [12]	2016	88% (15/17)	2 (1–3)	Achalasia balloon 30 mm (20 psi), then 35–40 mm (20 psi) Stent (2/17)	None	12% (RYGB)
Nath et al. [14]	2016	69% (23/33)	N/A	CRE (10–18 mm)	N/A	31% (N/A)
Al Sabah et al. [10]	2016	88% (23/26)	2.3 (N/A)	Achalasia balloons 30–35–40 mm	None	12%
Manos et al. [15]	2017	94.4% (17/18)	1.3 (1–4)	Achalasia balloon 30–35 mm (25 psi) Stent	None	6% (RYGB)

Deslauriers V et al
Surg Endo 2017

Stenosis after LSG – outcomes after stenting

Total number of patients $N = 21$	Gastric sleeve stenosis without concomitant leak $N = 16$
Number of stents/patient	1.5
Number of endoscopic sessions/patient	2.8 (2–7)
Mean stent width (mm)	18.2
Mean stent length (cm)	13.6
Stent migration	31%
Median duration of treatment (days)	34.5 (11–73)

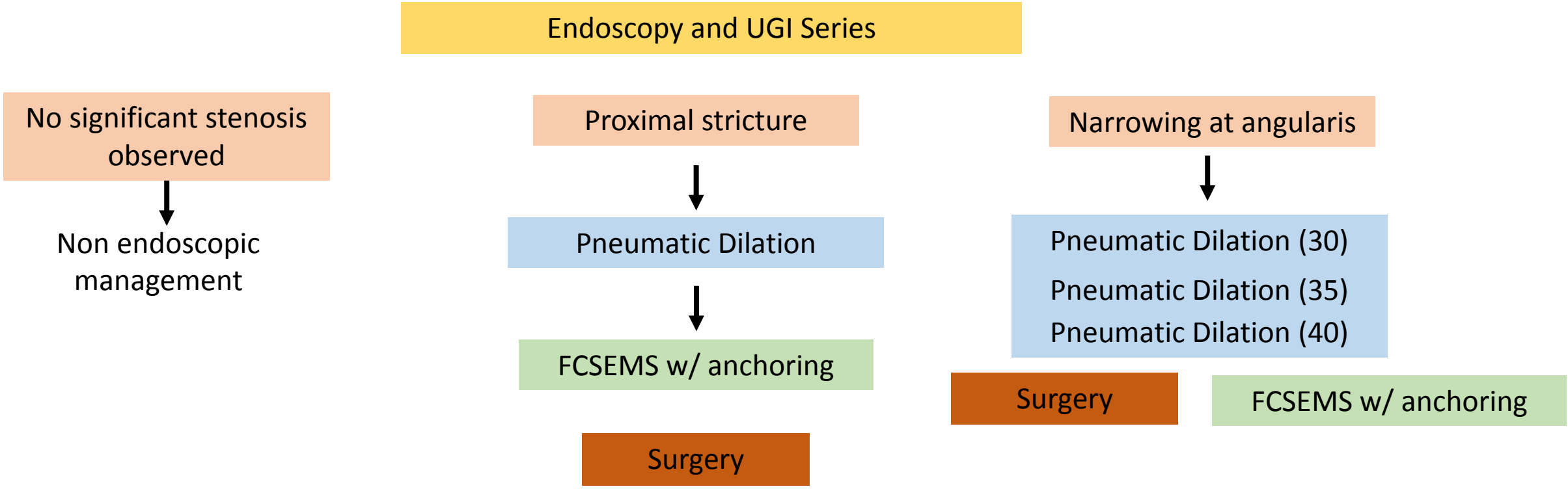
Resolution of stricture w/ initial procedure: 70%
Resolution after stent repositioning: 100%

Aburajab MA et al Dig Dis Sci 2017

Possible predictors of success treating post LSG helix stenosis

- Pneumatic dilation vs CRE
  - 30-35-40 mm achalasia
- Sequential 1-3 (mean 1.7) treatment vs single dilation
- Incisura/angularis stricture > proximal stricture
  - Sequential dilation for incisura strictures (upto 3 sessions): 95% success
  - Stent placement following 1-2 dilation in proximal stenosis: 89% success

Algorithm to manage post LSG stenosis



Advice for endoscopic management following bariatric surgery (lessons learned…)

- Understand anatomy
- Discuss early with surgery, IR
- Use CO2 and fluoro capable setting
- Remove foreign bodies, sutures, etc
- Consider diversion of feeds early
- Open rather then close defects
- Be patient!

Summary – endoscopic management of bariatric complications

- Bleeding – high success rate with endoscopic and pharmacologic therapy
- Leaks
  - multidisciplinary approach but increasingly endoscopic
  - Increasing role for “opening” rather then “closing” defects
- Stenosis
  - best outcomes for mechanical (especially RYGB) related stenosis
  - Use of Pneumatic balloons improves efficacy in LSG related strictures