

# Multi-modal management of walled-off necrosis

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PACE, Gastroenheden  
Hvidovre Hospital





**PACE**  
**Hvidovre Hospital**

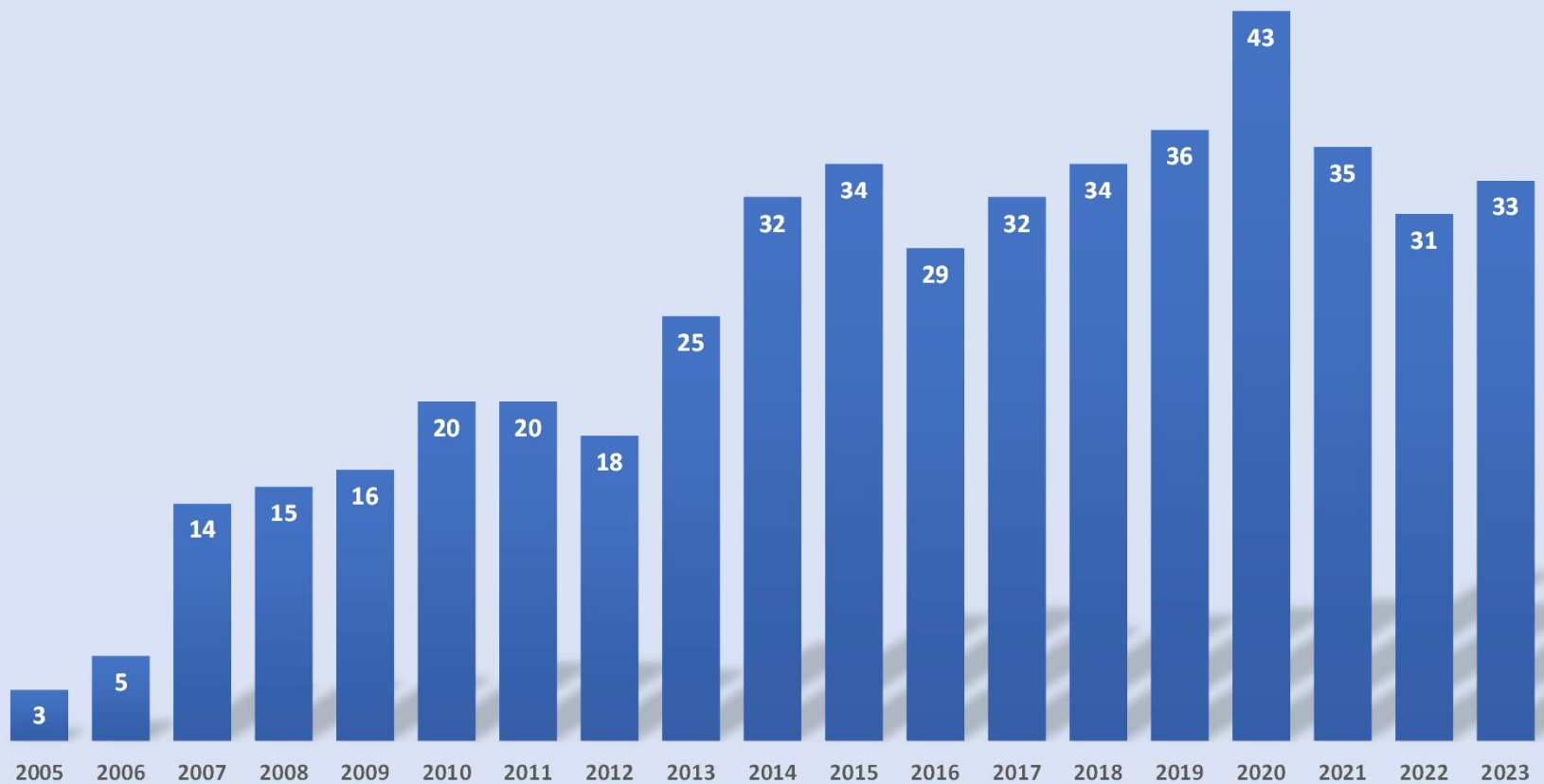
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Highly specialized service regarding endoscopic treatment of WON in eastern DK (population = 2.6 mill.)

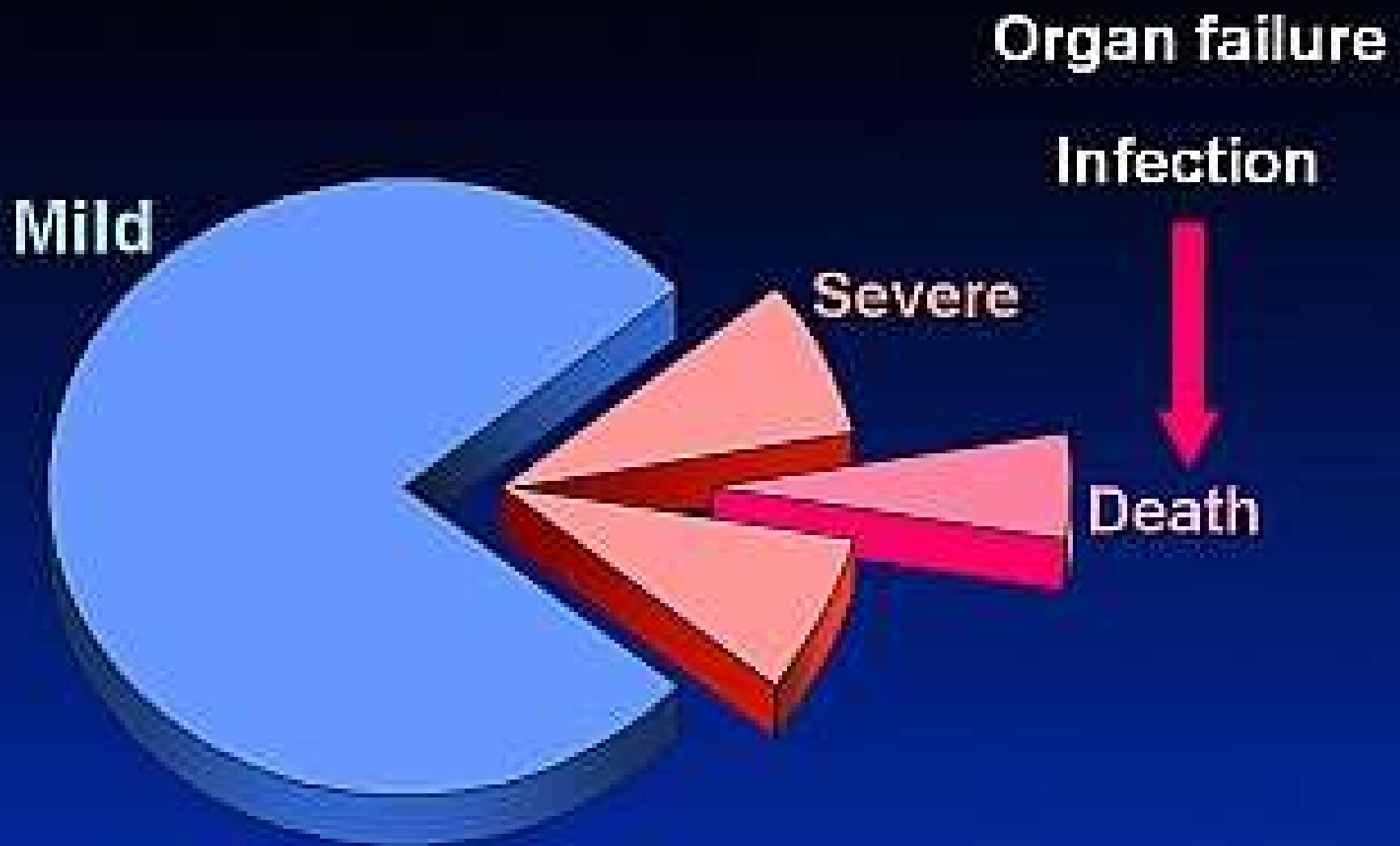
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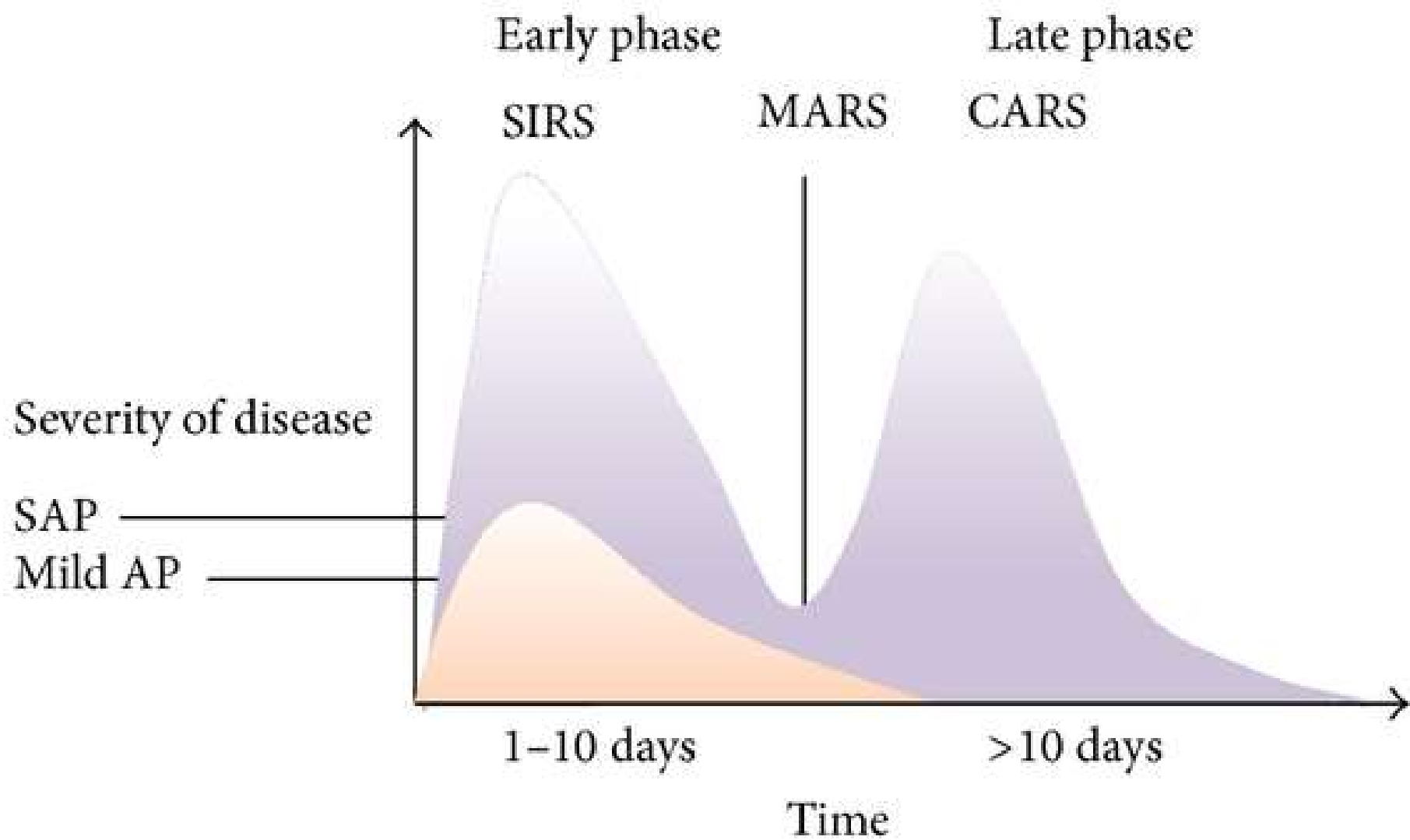
Since 2005 more than 500 cases

### Status per October 30th 2023



## Acute Pancreatitis - Natural History





# Walled-off pancreatic necrosis

- Four weeks from symptom debut
- Encapsulated collection
- Fluid vs. Solid component

*Revised Atlanta 2012*



# CASE-debut

## 18-03-2022

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52-years, male, healthy

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ERCP induced AP

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Bleeding from papilla

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Multi organ failure same day as ERCP

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Severe inflammation

Case-referral  
to PACE  
20-06-2022

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73 days in ICU

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CRP 150 mg/l; Antibiotic treatment:  
Meropenem, Vancomycin, Amphotericin B

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Need for haemodialysis and inotropics

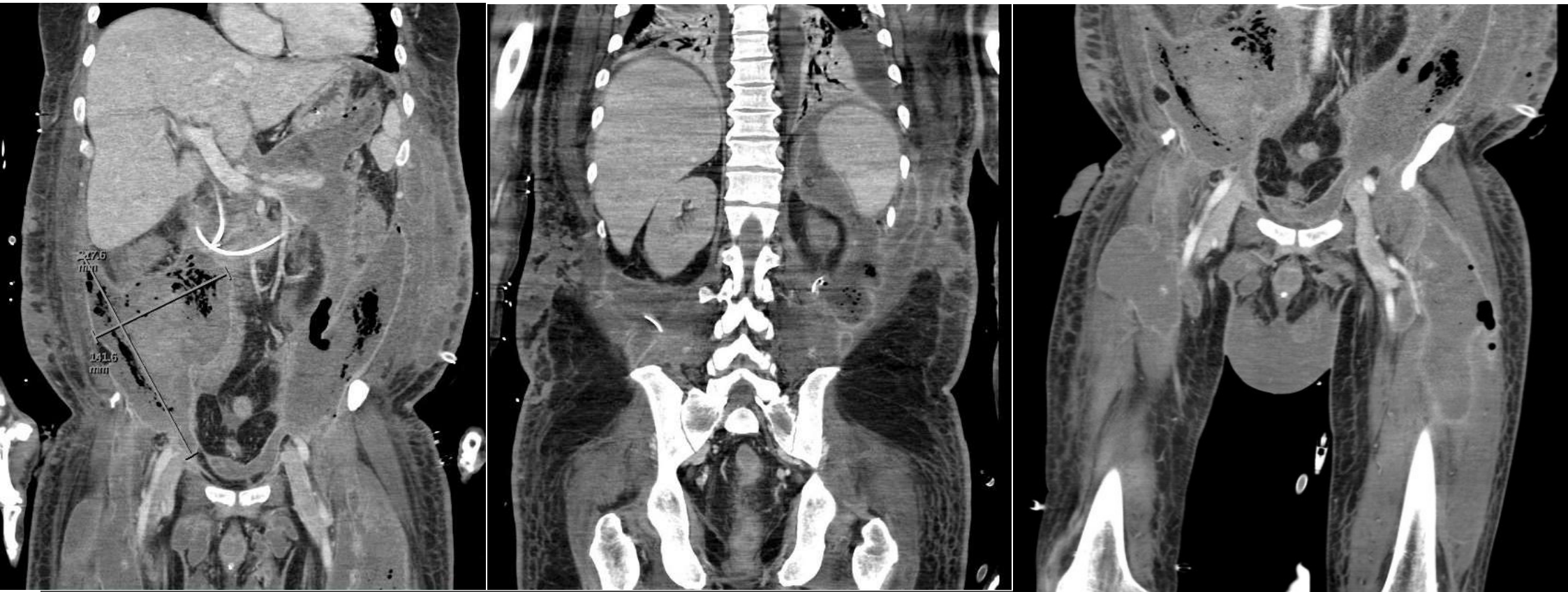
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Delirium

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On parenteral nutrition



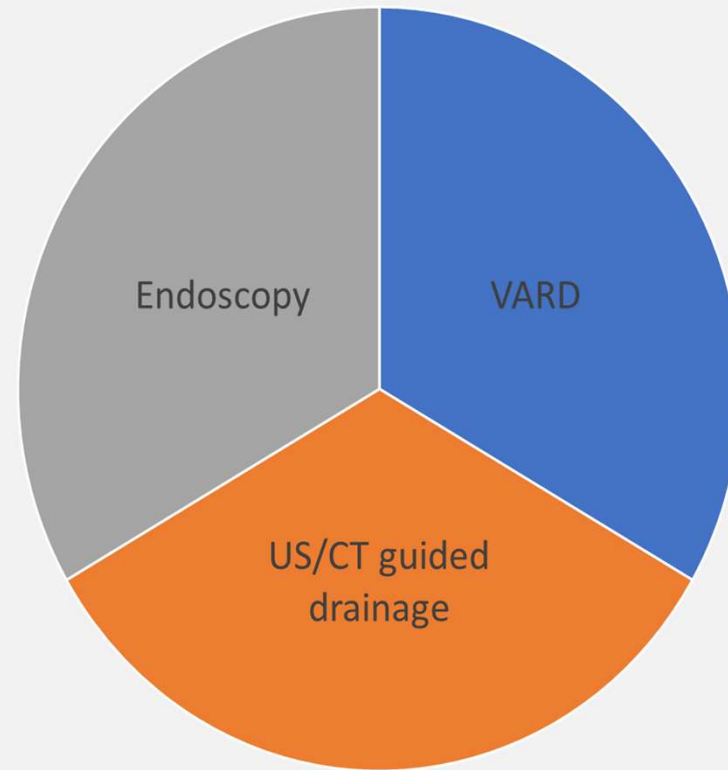


15.06.2022 – 87 days after debut of symptoms

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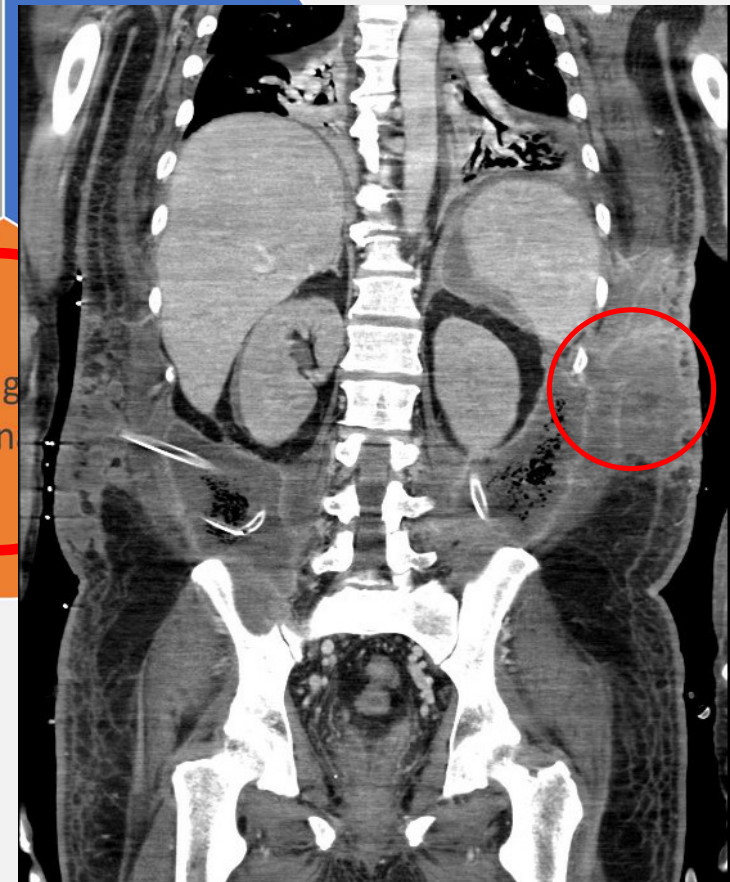
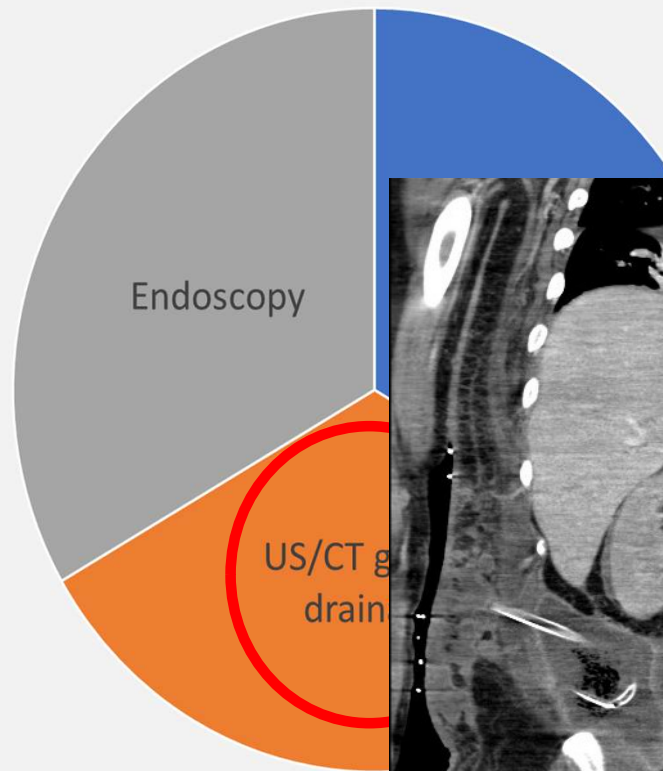
What to do?

Treatment of WON in PACE



What to do?

### Treatment of WON in PACE

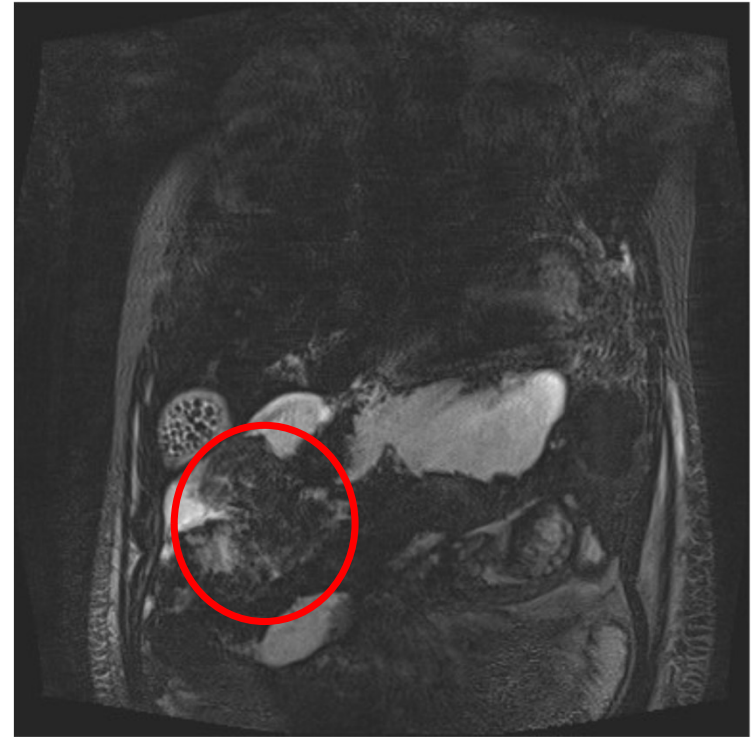


Before intervention – get to  
know your WON - AND your  
patient

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# It is all about the content

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Drainage alone cannot do the job!

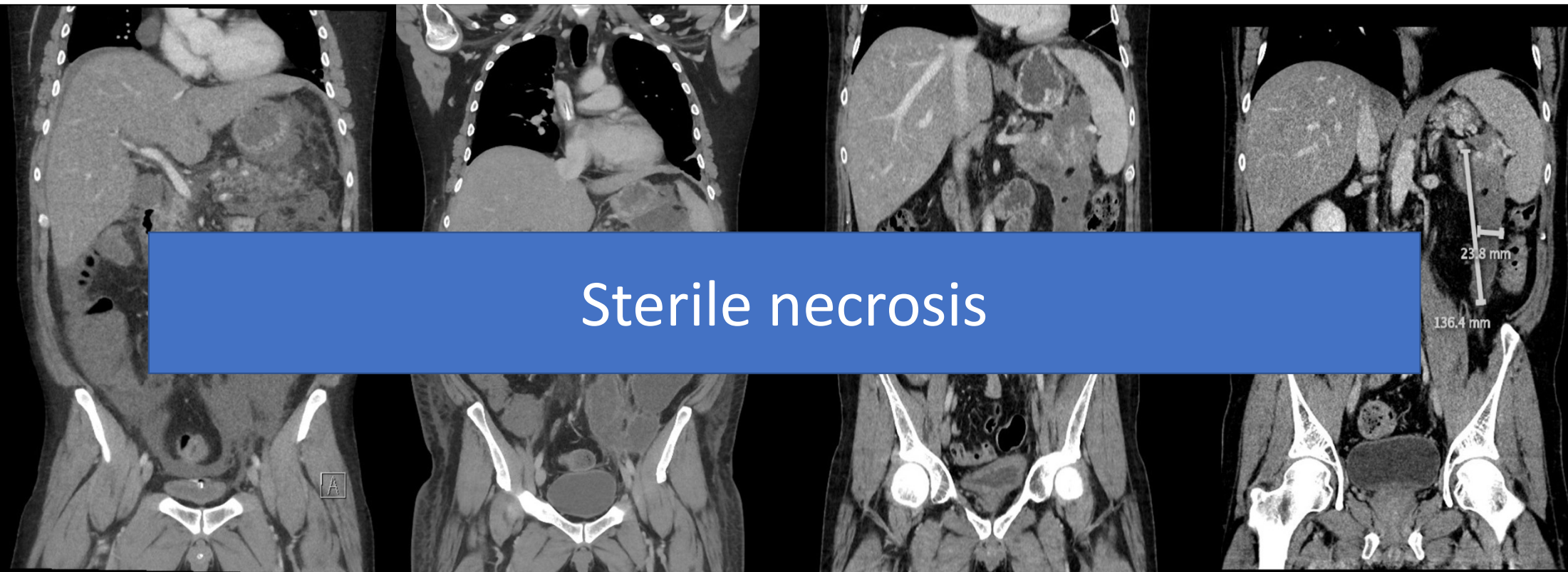
# When to intervene?

February 12th 2018

March 13th 2018

May 12th 2018

September 12th 2018



Sterile necrosis

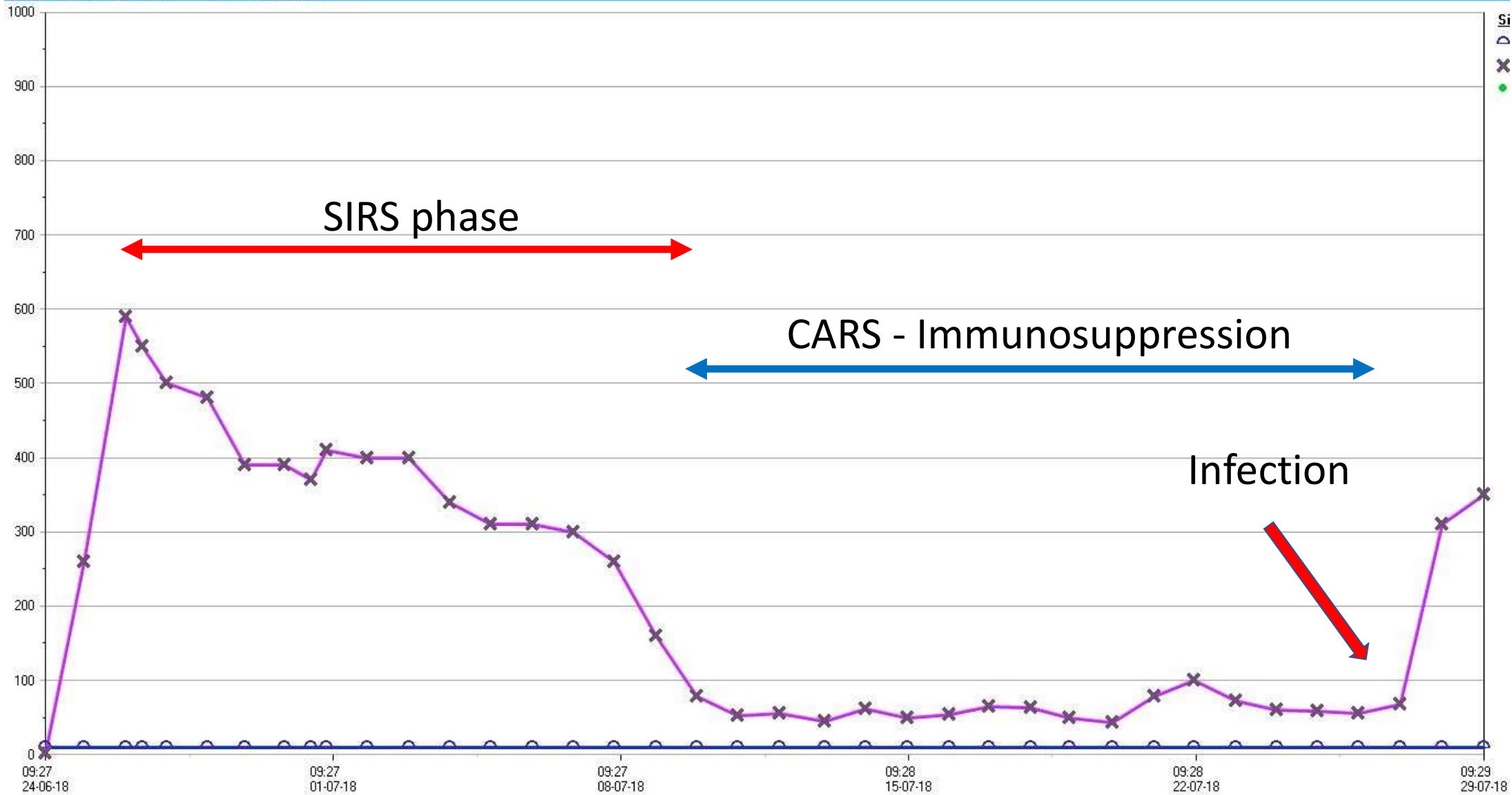
23.8 mm  
136.4 mm

**WON > 15 cm**

	<b>N=144</b>
Days from onset of symptoms to index intervention, median (IQR)	28.5 (23-39)
Antibiotics before index intervention, n (%)	105 (73)
Percutaneous drainage before index intervention, n (%)	31 (21)
CTSI, median (IQR)	7 (6-9)
mCTSI, median (IQR)	10 (8-10)
<b>Indications, n (%) *</b>	
- Infection	131 (91)
- Gastric outlet syndrome	14 (10)
- Intractable pain	10 (7)
<b>Microbiological findings, n (%)</b>	
Culture-verified infection on index intervention	124 (86)
Polymicrobial infection	64 (52)
<b>Index intervention, n (%) *</b>	
- ETDN	134 (93)
- Percutaneous SEMS	6 (4)
- VARD	4 (3)

CRP as marker of both inflammation and infection

Graf (24-06-18 09:27 - 29-07-18 09:29)



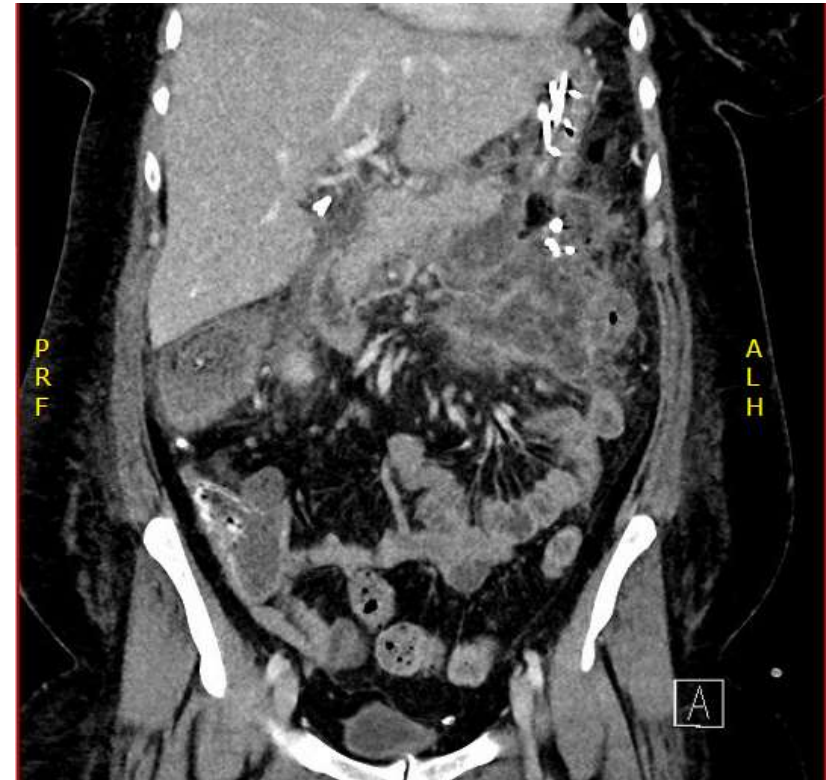


# A rare indication for intervention

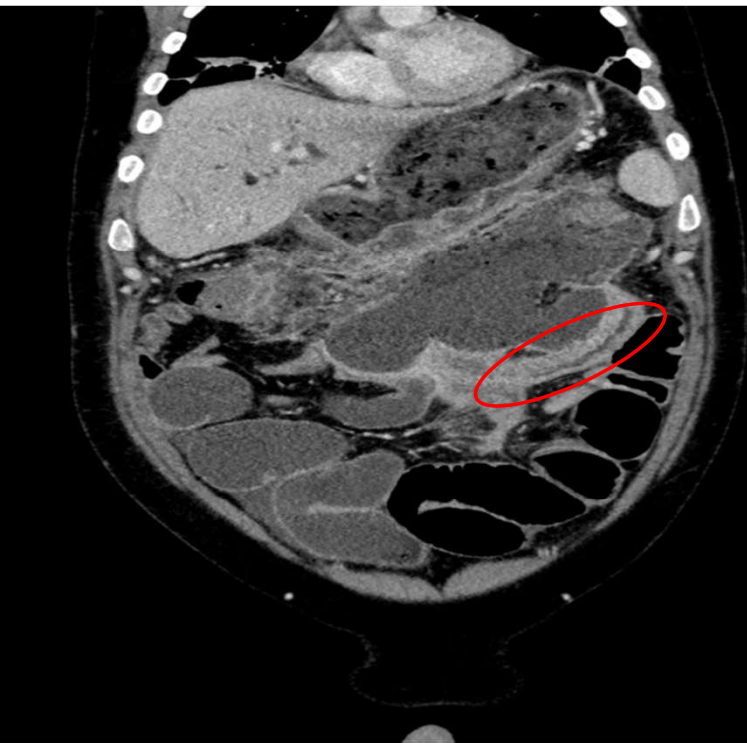
**Before transgastric drainage**



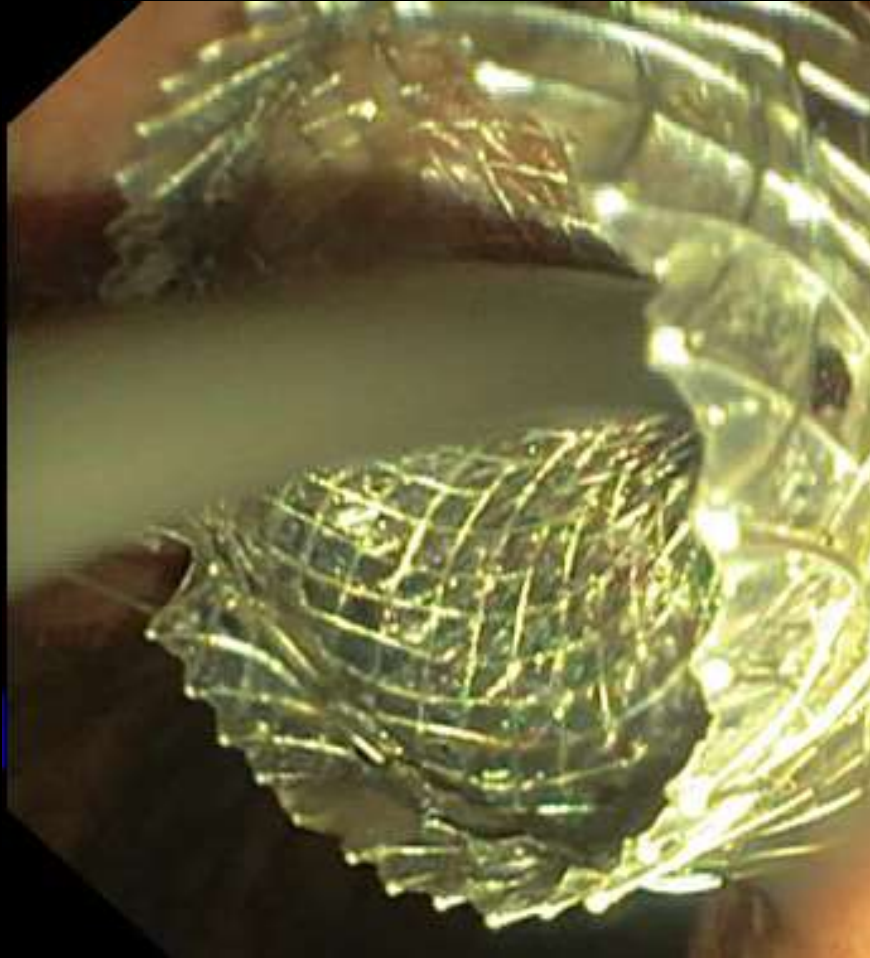
**Two days after transgastric drainage**



# Small bowel obstruction due to WON

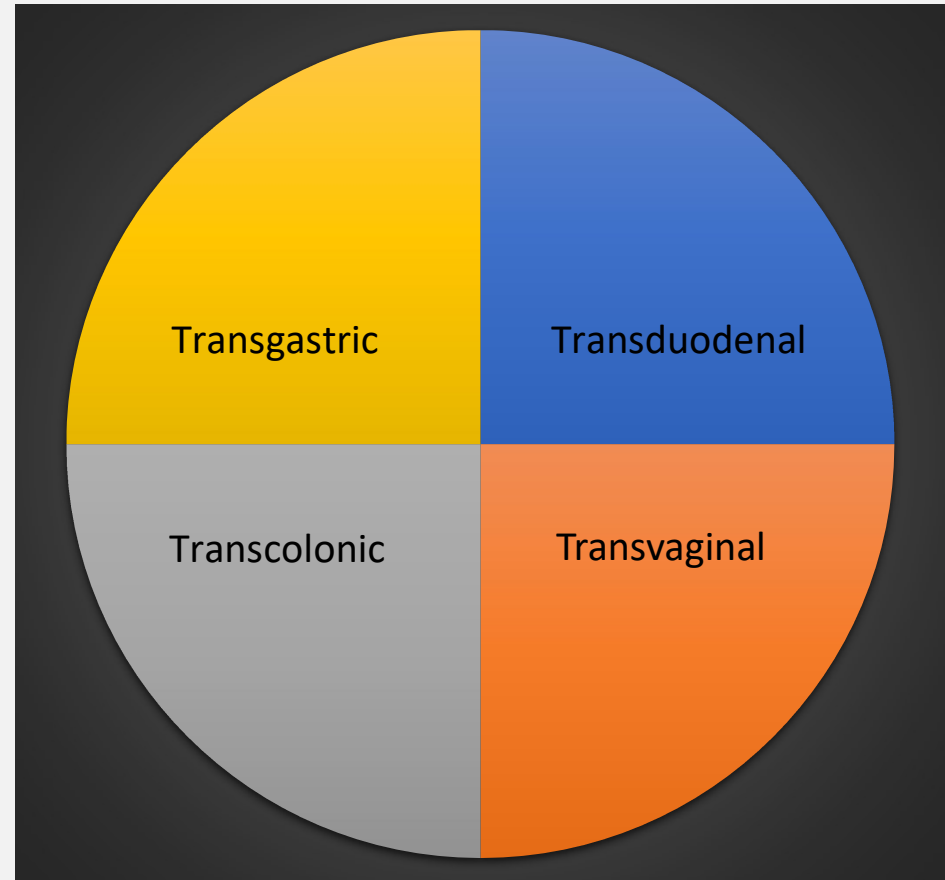






Drainage –  
the initial  
step

# Endoscopic approach



Combining  
approaches  
seems  
reasonable

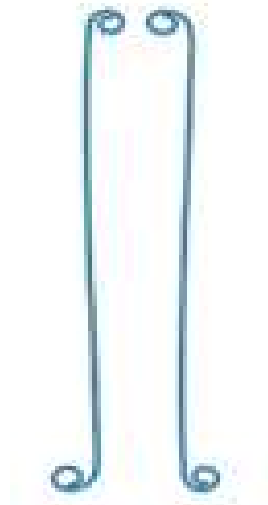


# The essens of creating a stoma in WON

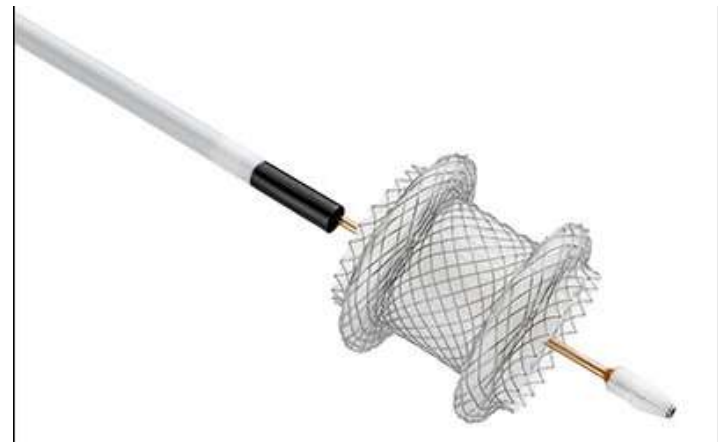
- allow fluid drainage
- minimize occlusion with solid debris
- facilitate subsequent direct endoscopic necrosectomy

## The choices for drainage

- Plastic double pigtail technique



- Lumen apposing metal stents (LAMS)





Plastic double  
pigtail technique







6.17



6.17  
cm/s

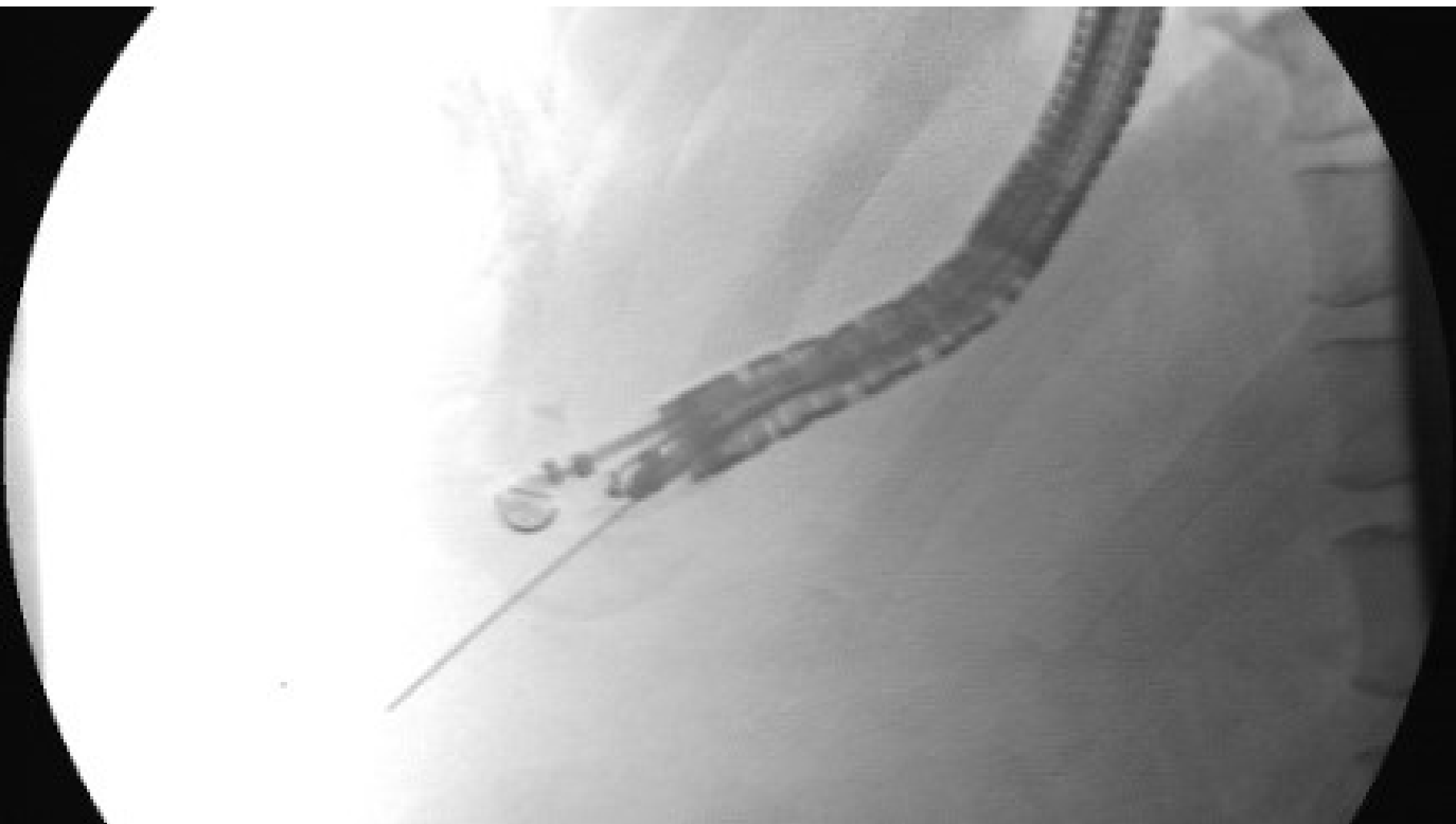
AP: 100% 30 FPS



-1

-2

-3



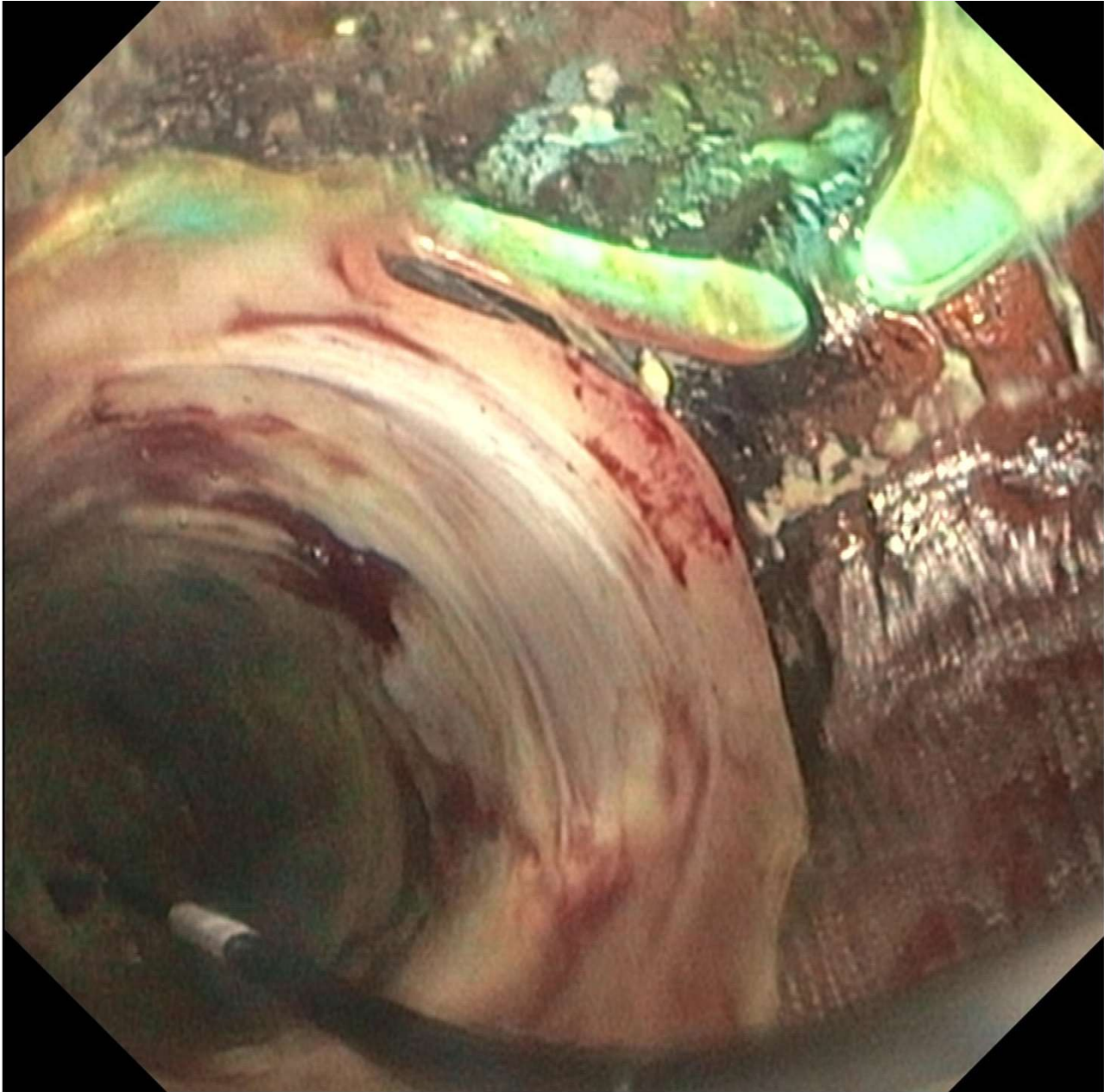


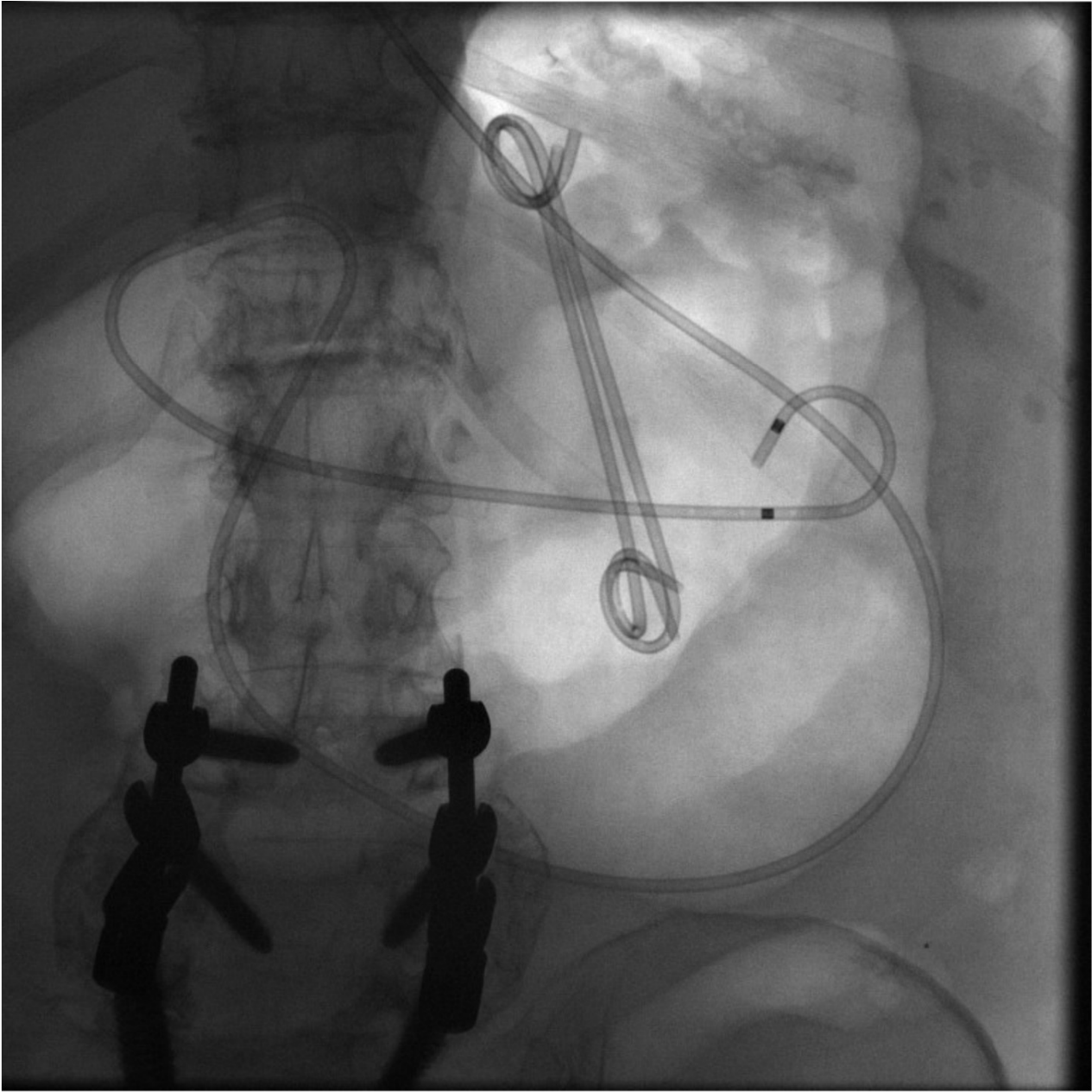


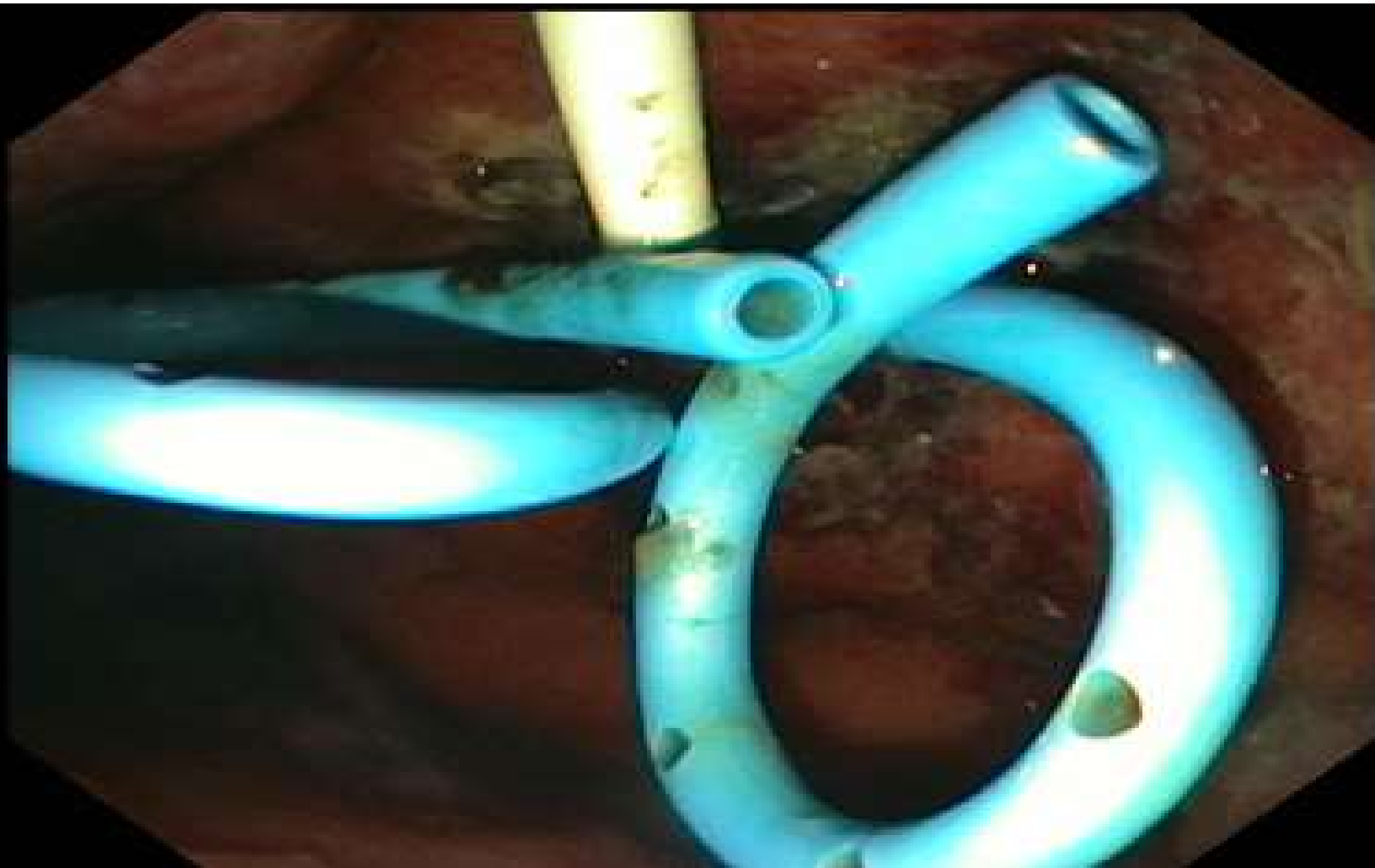












LAMS technique

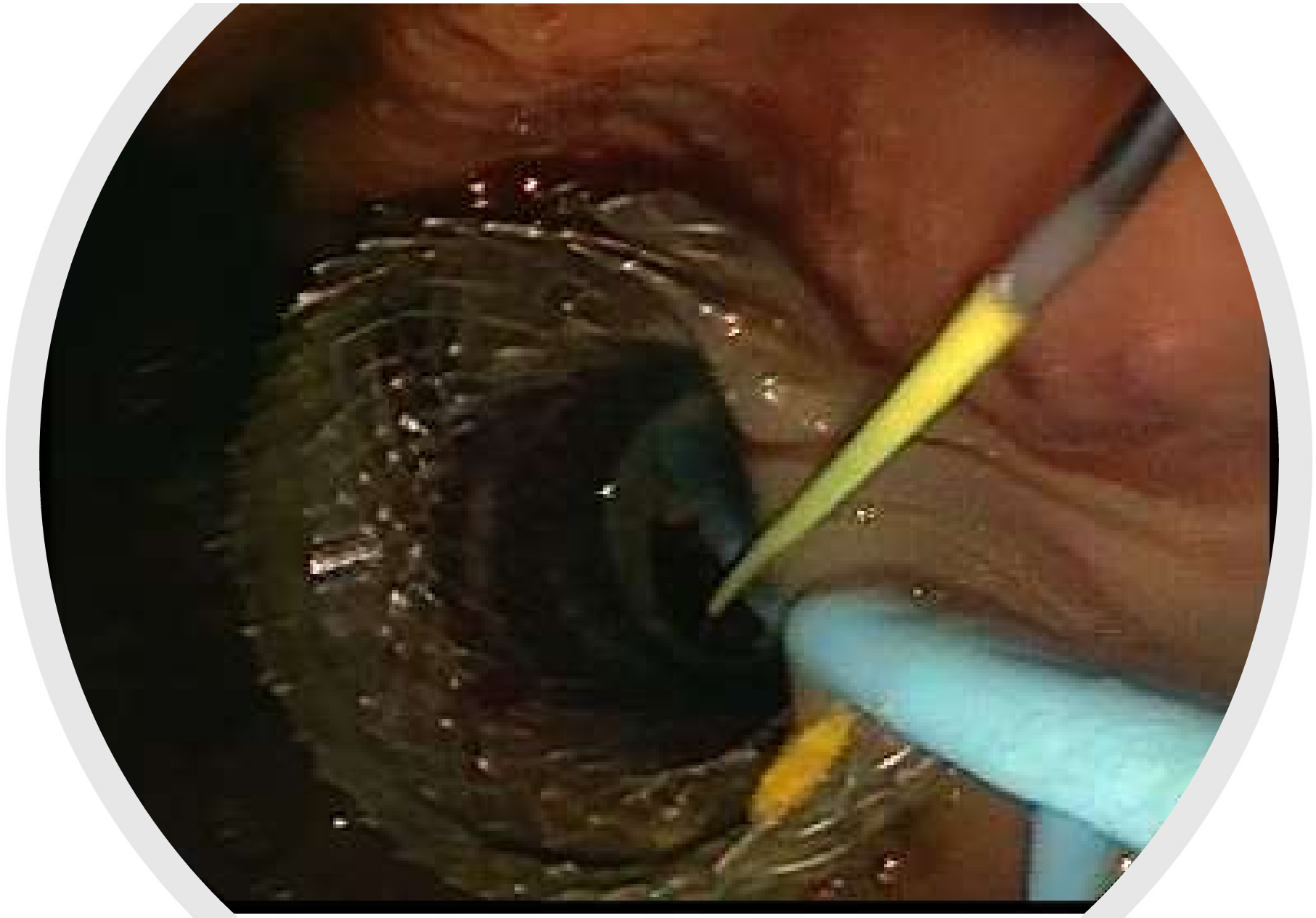


12.2  
12.2  
cm/s

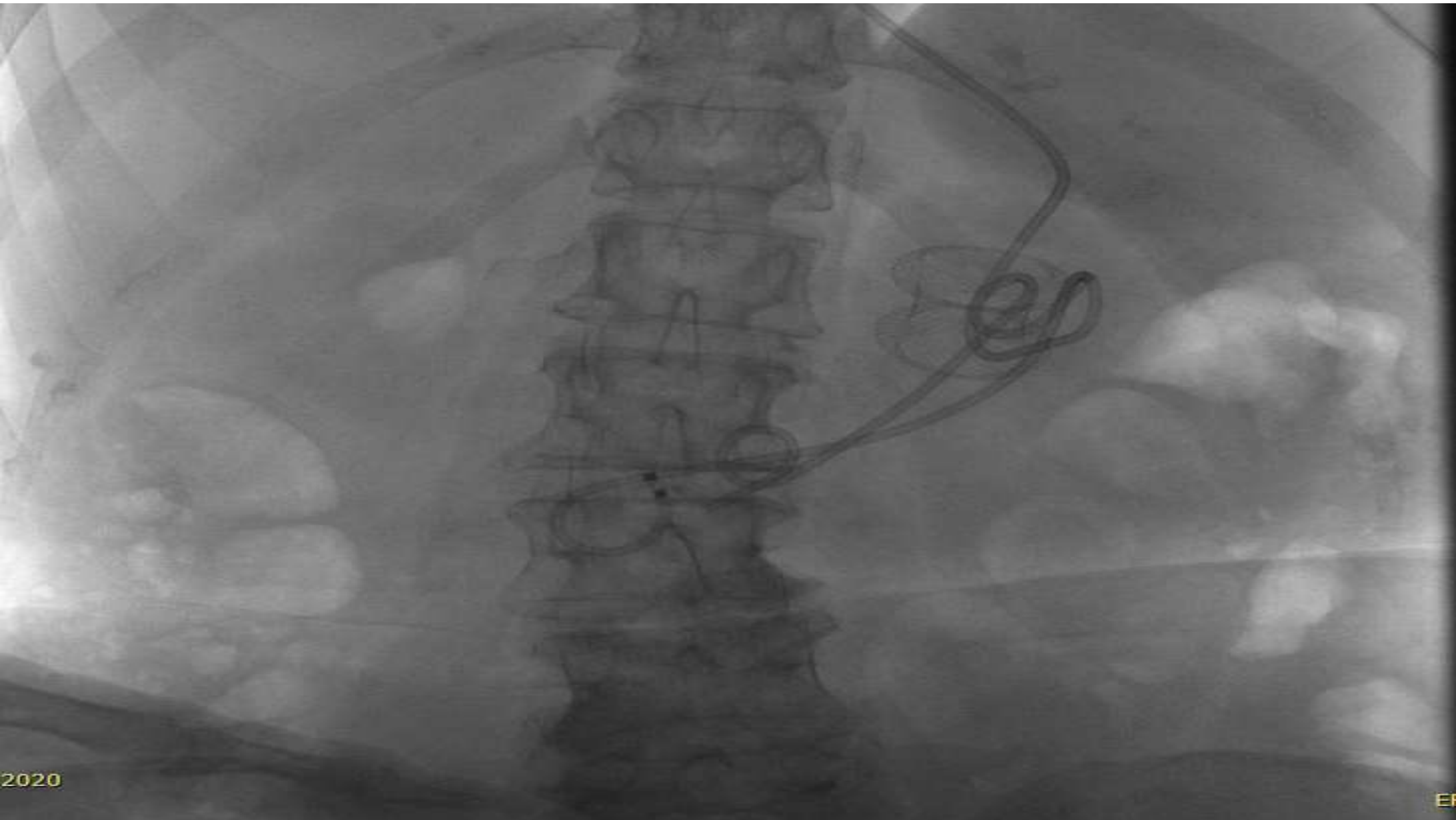
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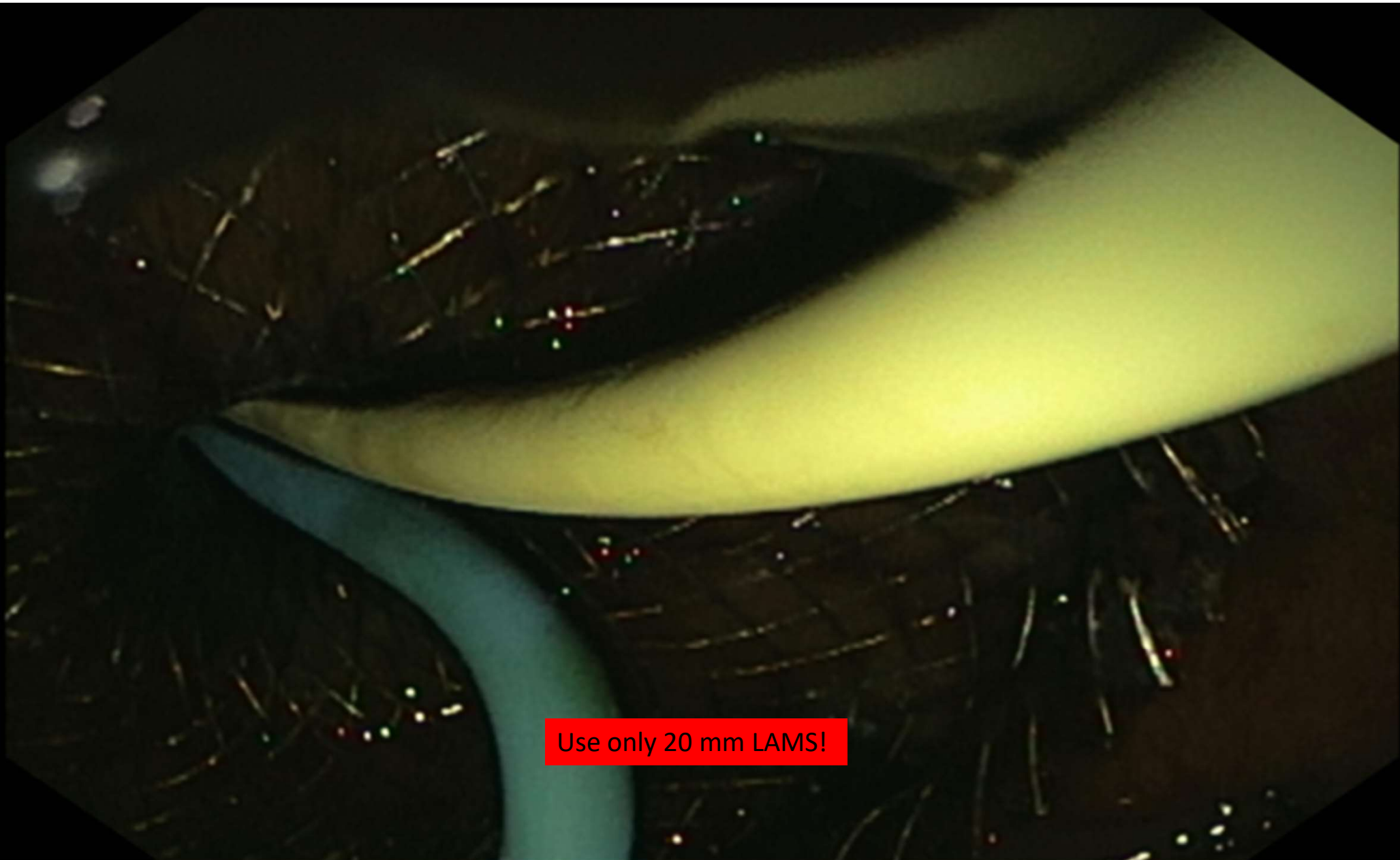


0  
1  
2  
3









Use only 20 mm LAMS!



# Local instillation of AB – an alternative or supplement?

**Gentamicin 40 mg TID**

40 mg Gentamicin added to 100 ml isotonic NaCl

**Gentamicin 80 mg TID**

80 mg Gentamicin added to 250 ml isotonic NaCl

**Vancomycin 100 mg TID**

500 mg Vancomycin dissolved in 10 ml sterile water; 2 ml of this solution (100 mg) added to 100 ml isotonic NaCl

**Vancomycin 250 mg TID**

500 mg Vancomycin dissolved in 10 ml sterile water; 5 ml of this solution (250 mg) added to 250 ml isotonic NaCl

**Amphotericin B 50 mg TID**

50 mg Amphotericin B added to 10 ml sterile water; this solution added to 100 ml sterile water

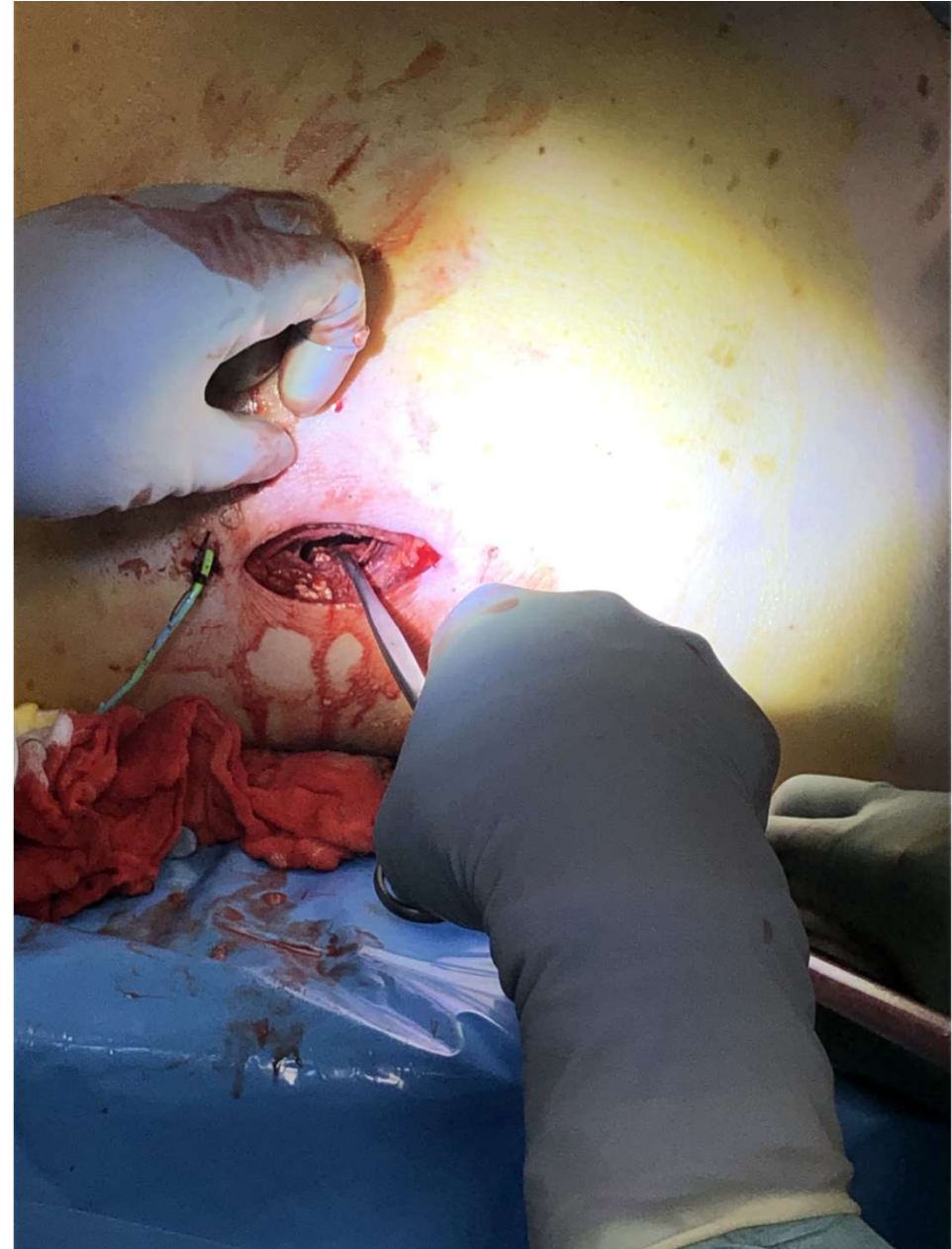
**Amphotericin B 100 mg TID**

100 mg Amphotericin B added to 20 ml sterile water; this solution added to 200 ml sterile water.

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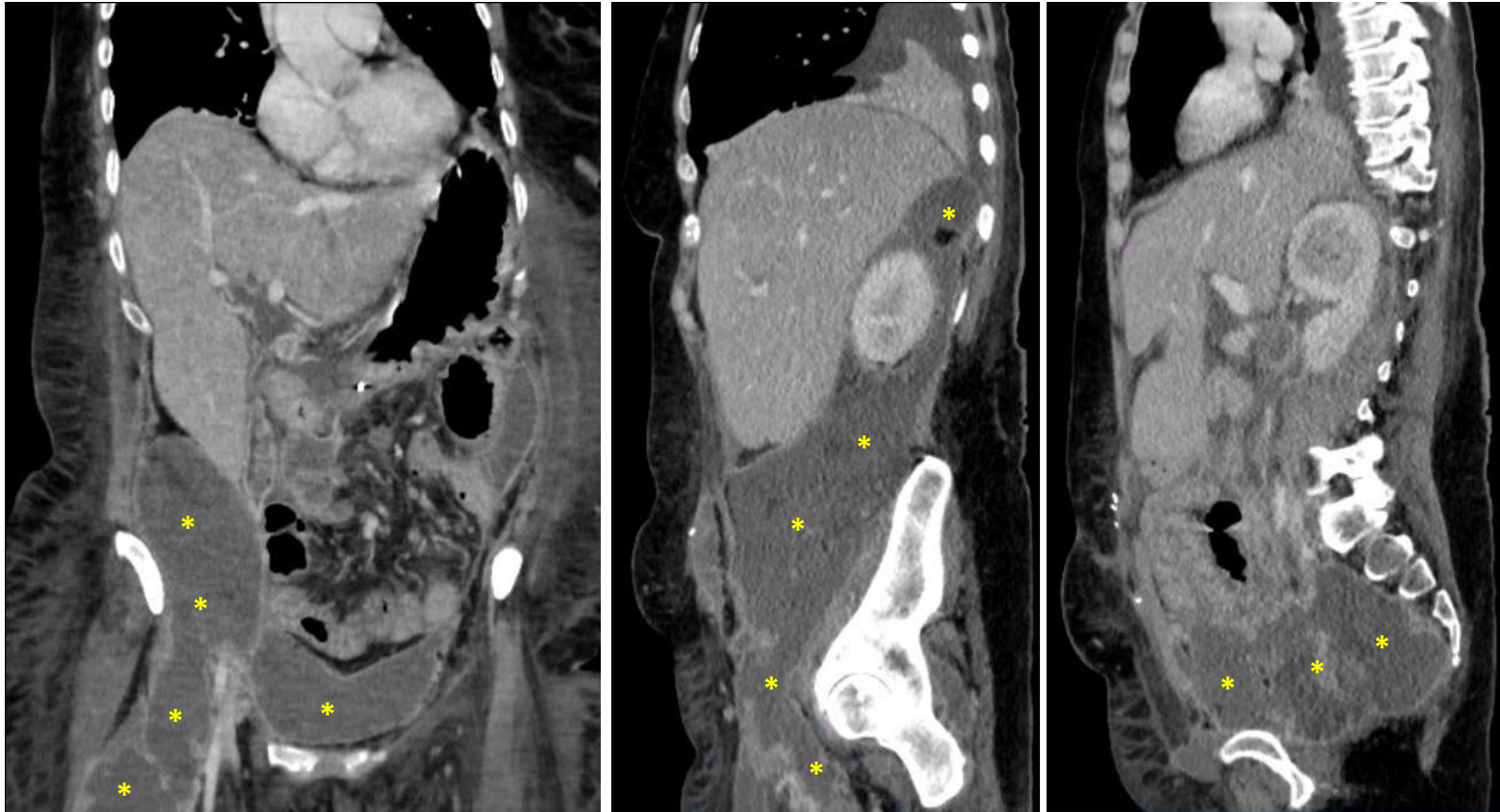
# Video-assisted retroperitoneal debridement (VARD)

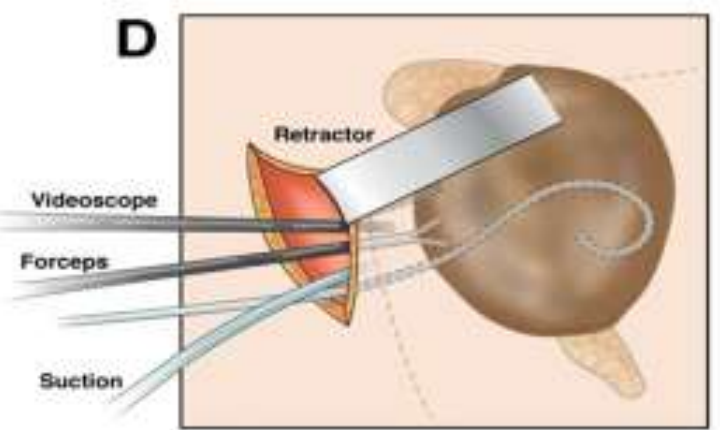
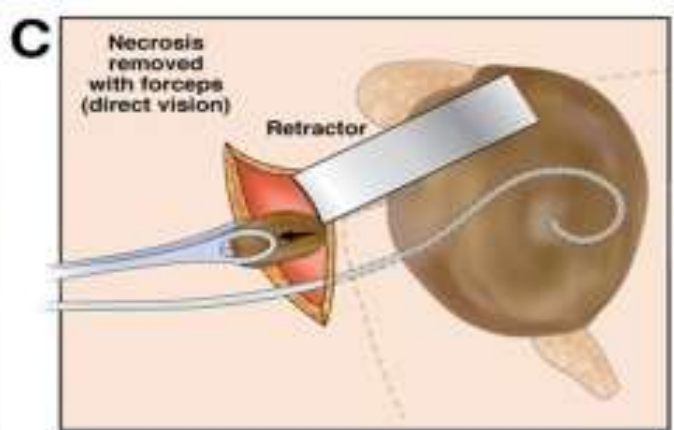
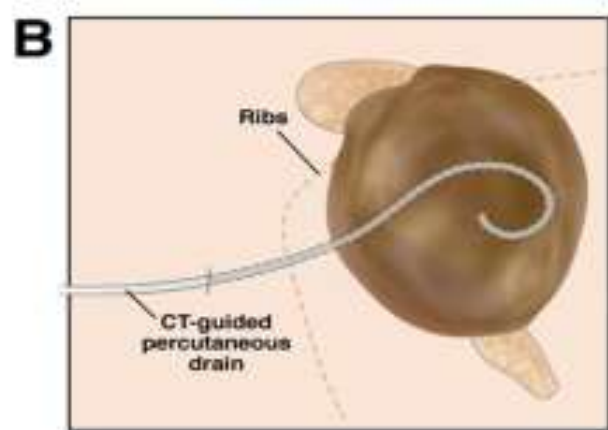
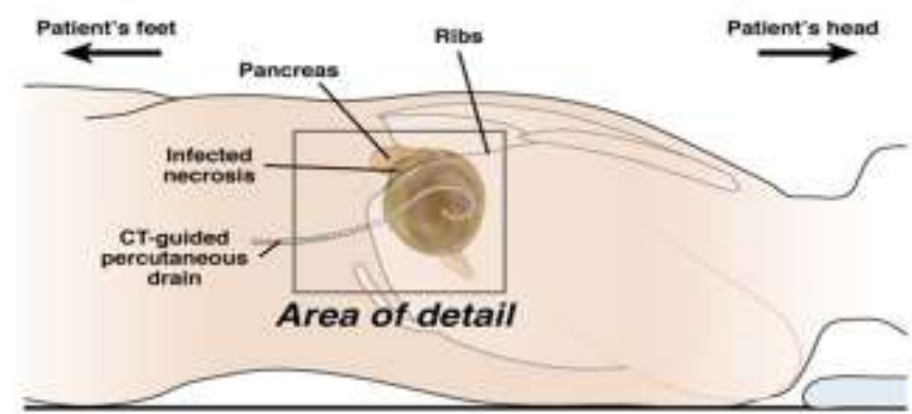
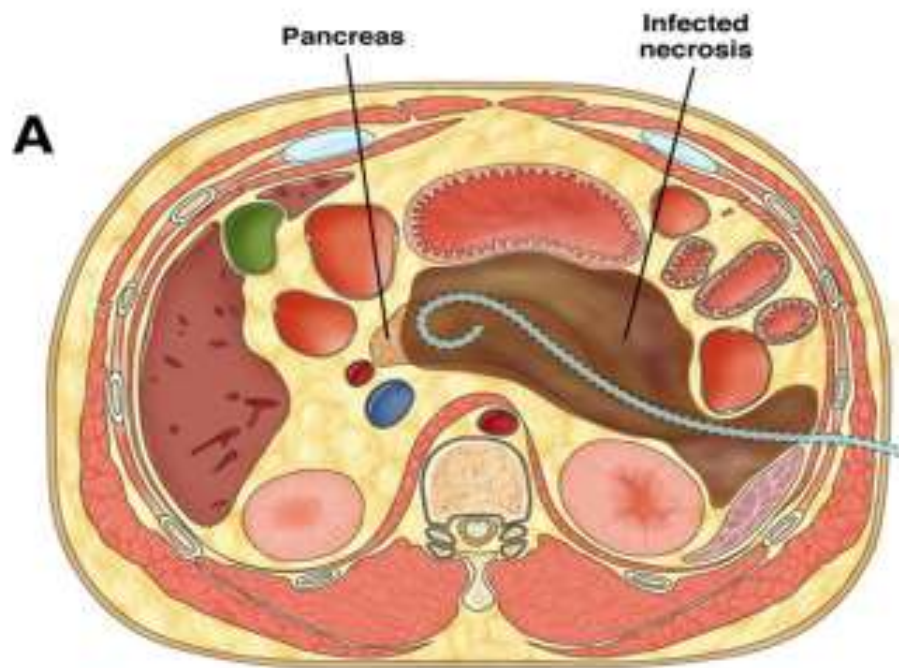
1. Collections inaccessible to transluminal intervention
2. Accelerate the necrosectomy



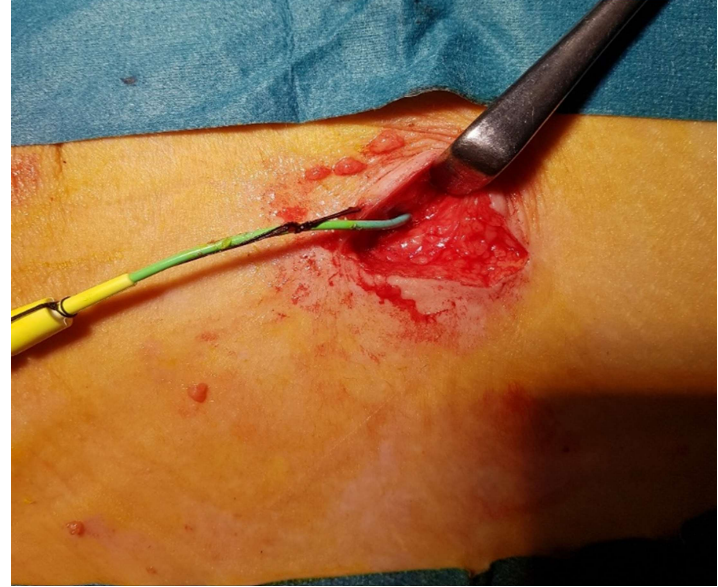
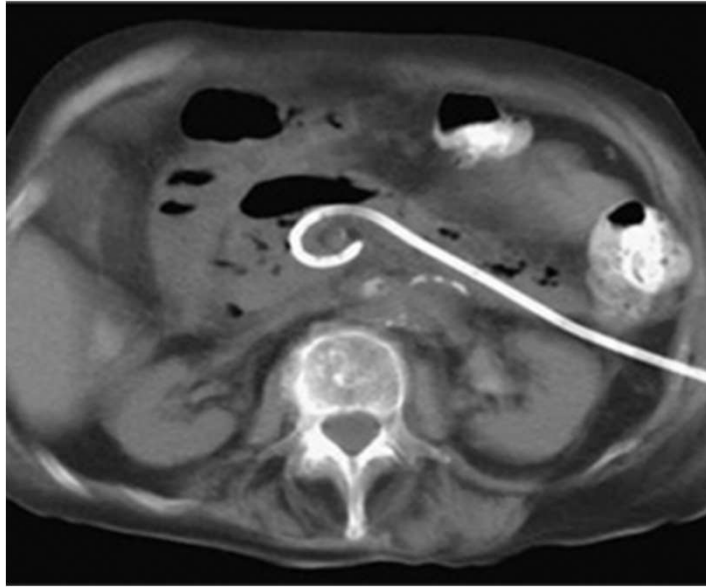


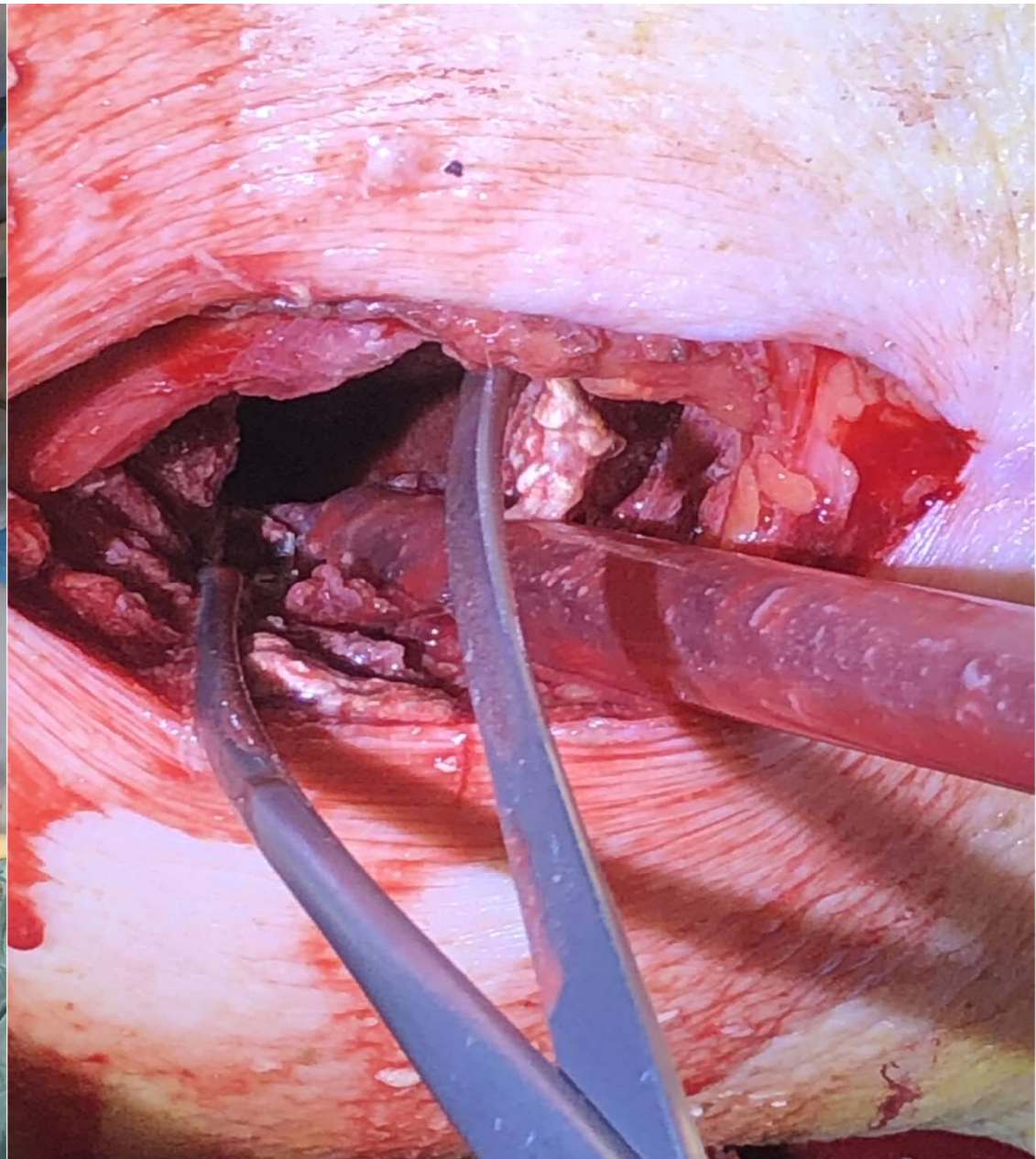
At referral



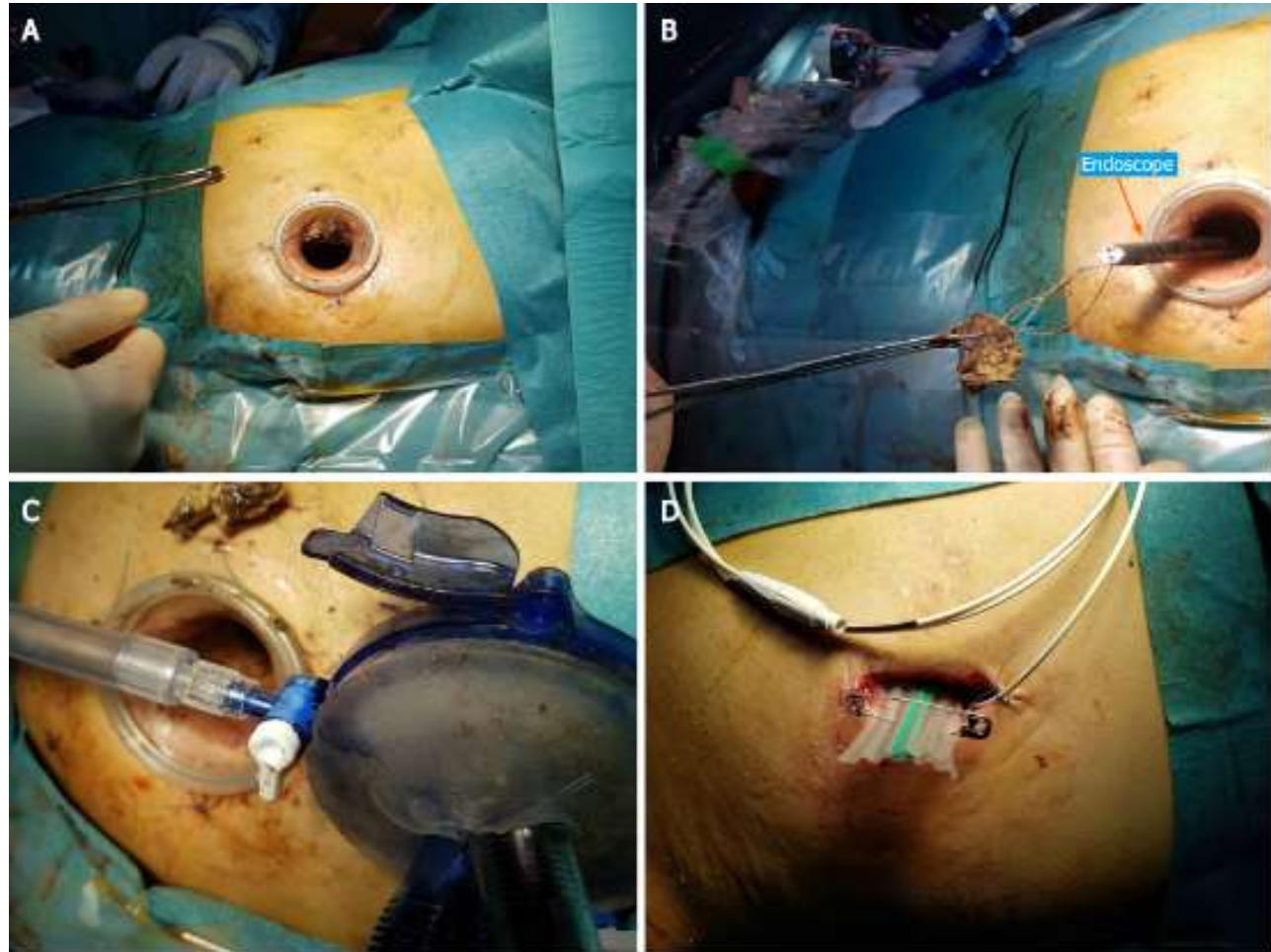




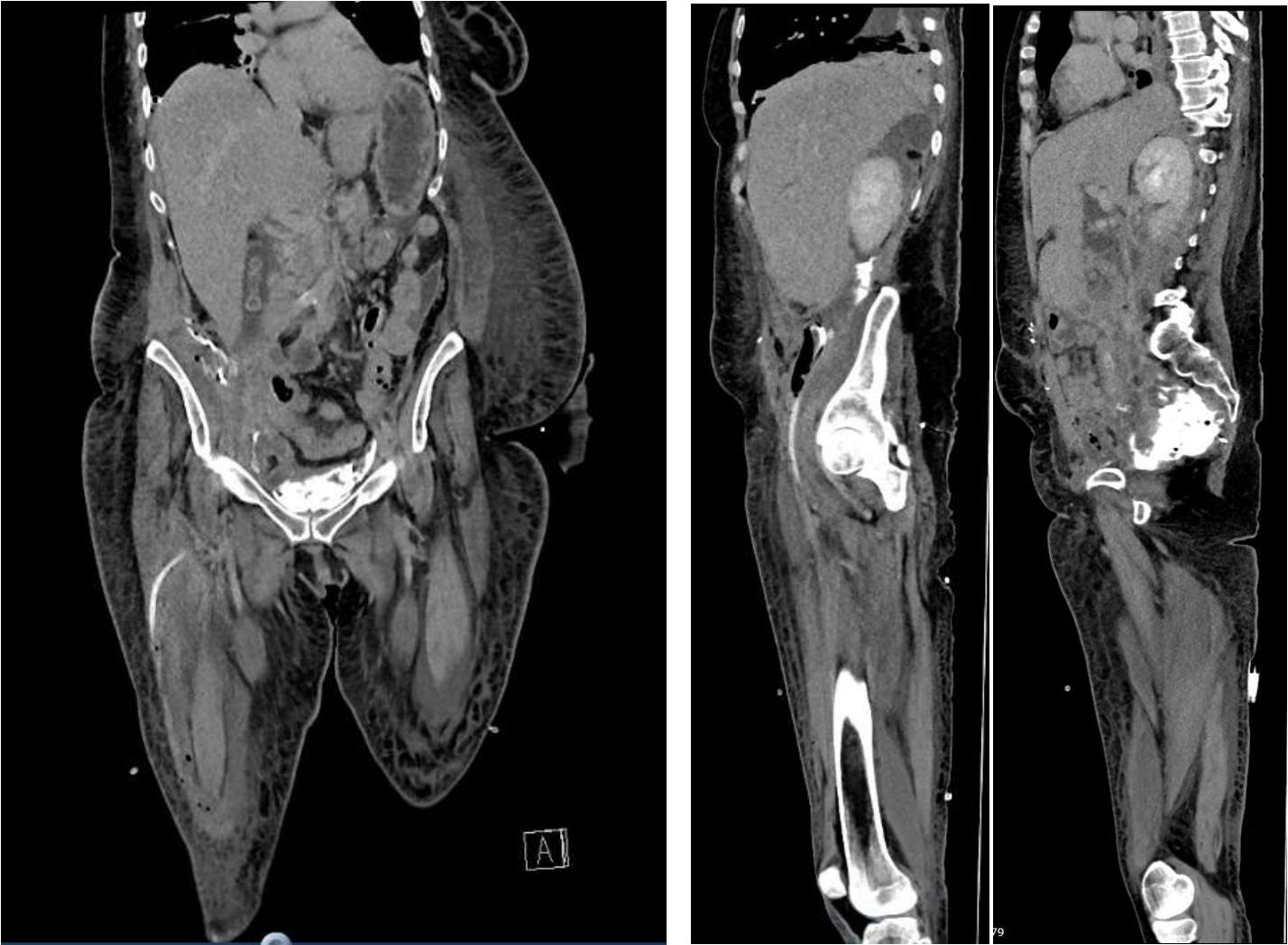




# Endoscopic-laparoscopic retroperitoneal debridement

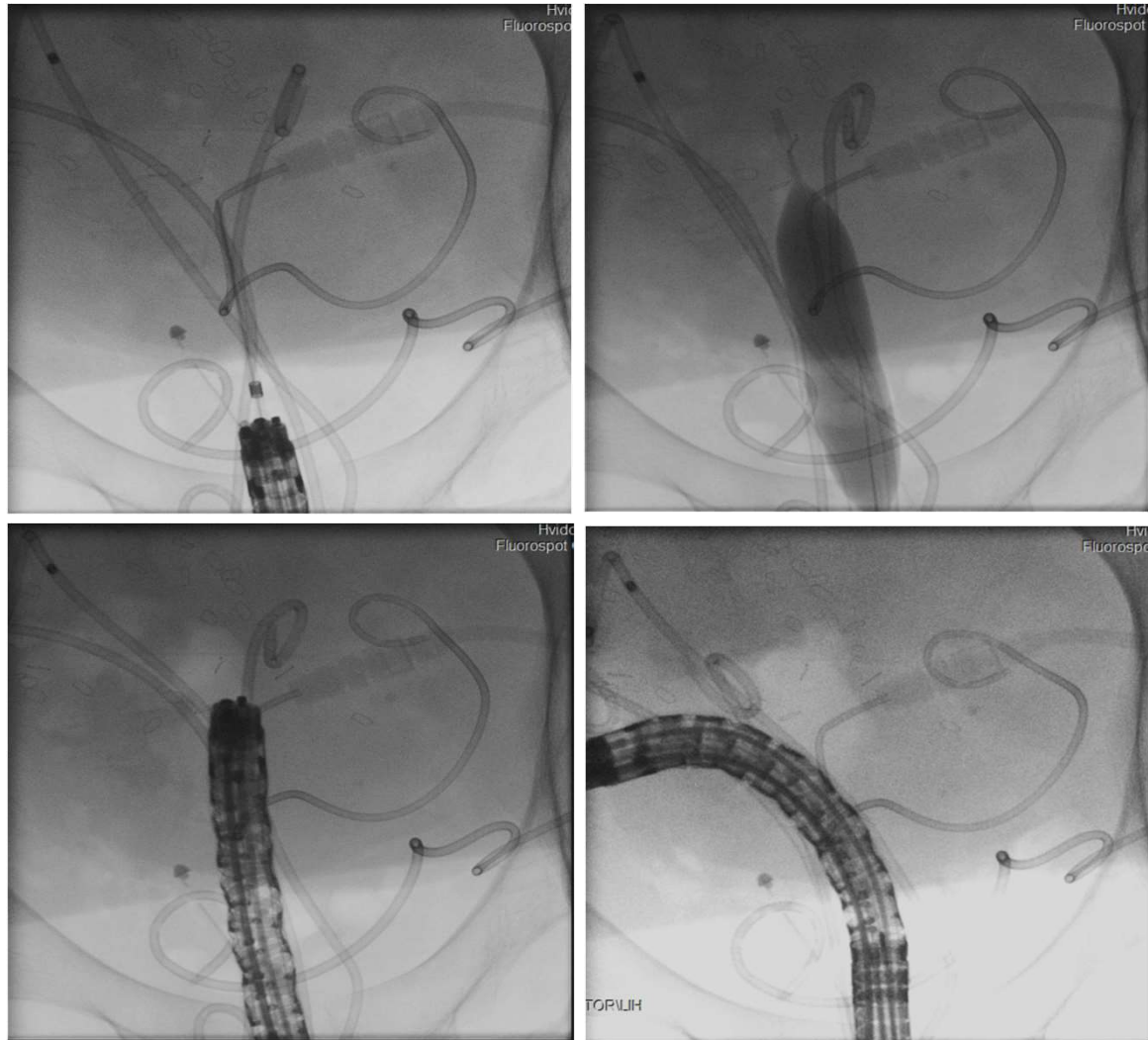


After initial VARD

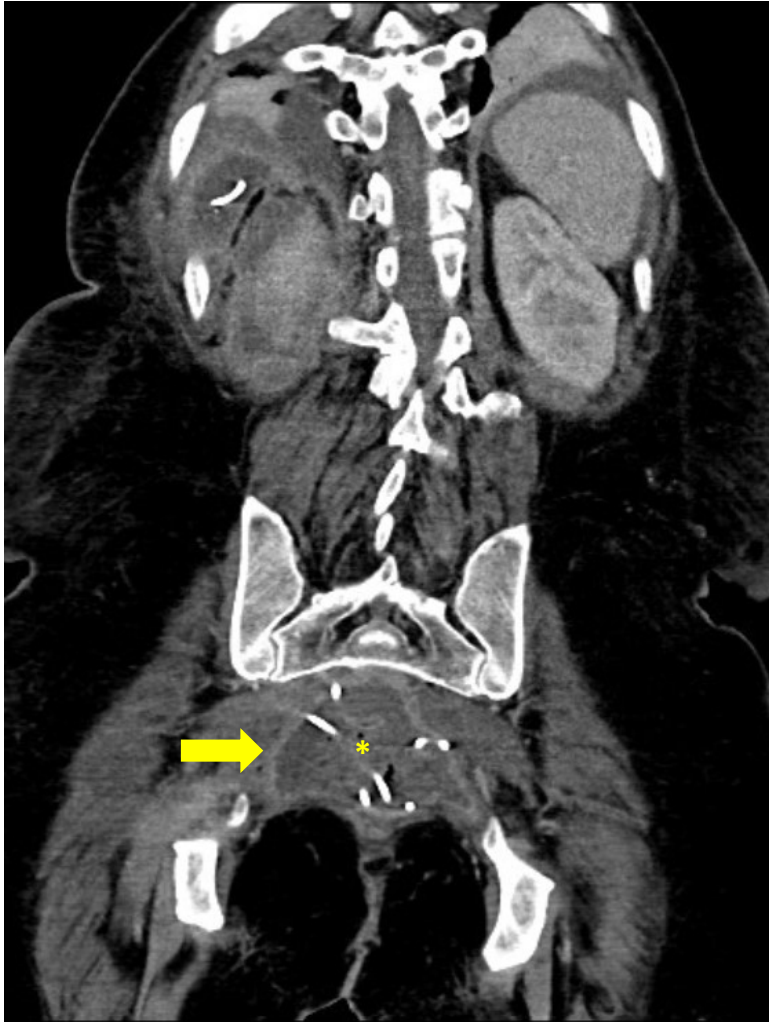




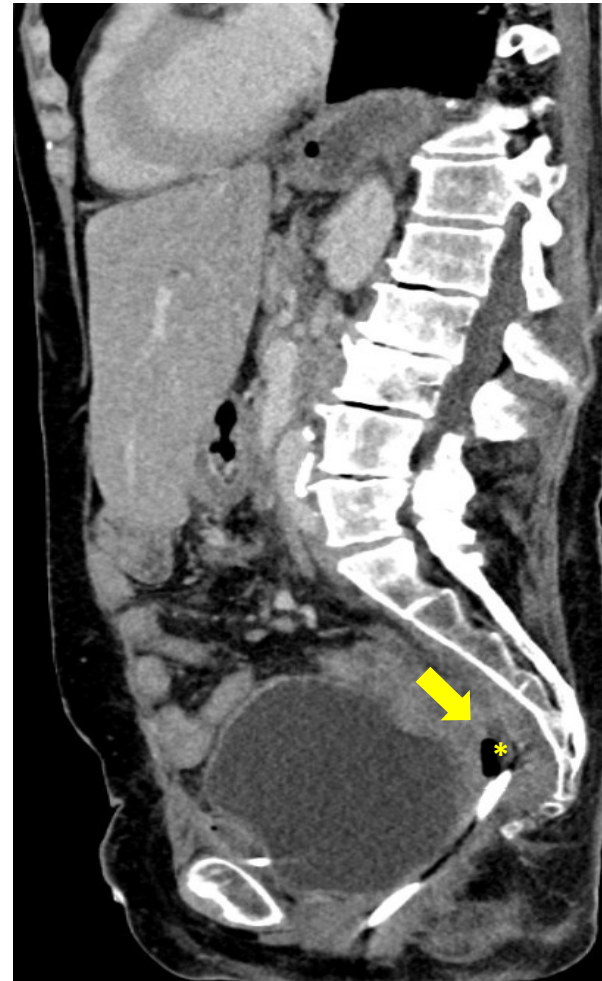
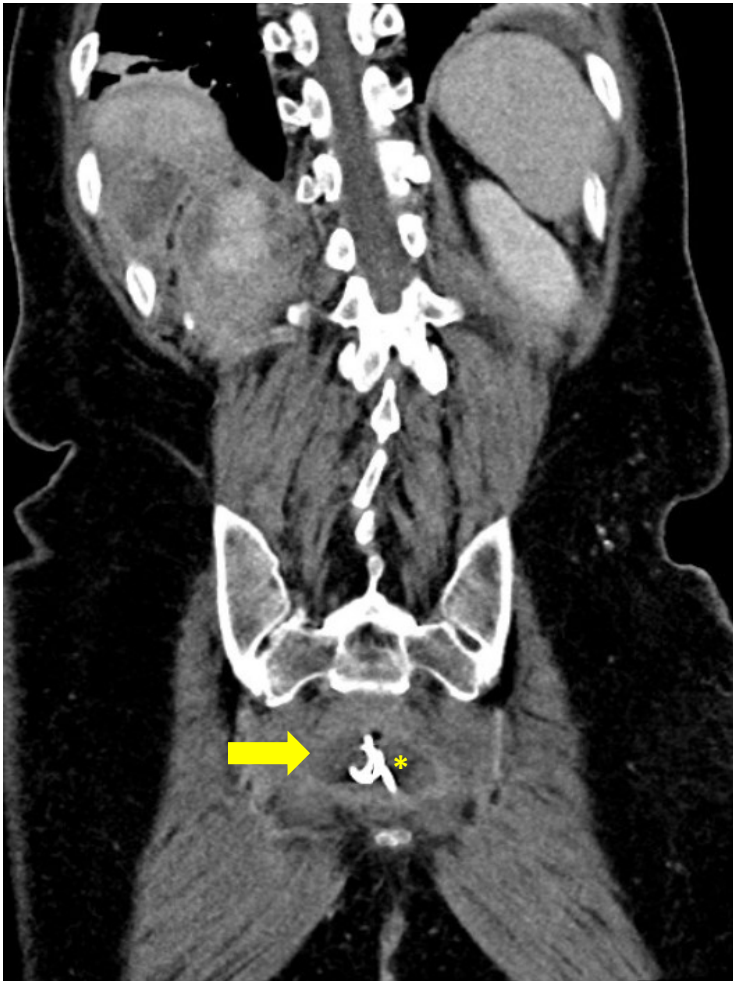
## Transvaginal balloon dilation and necrosectomy



4 days after primary transvaginal drainage

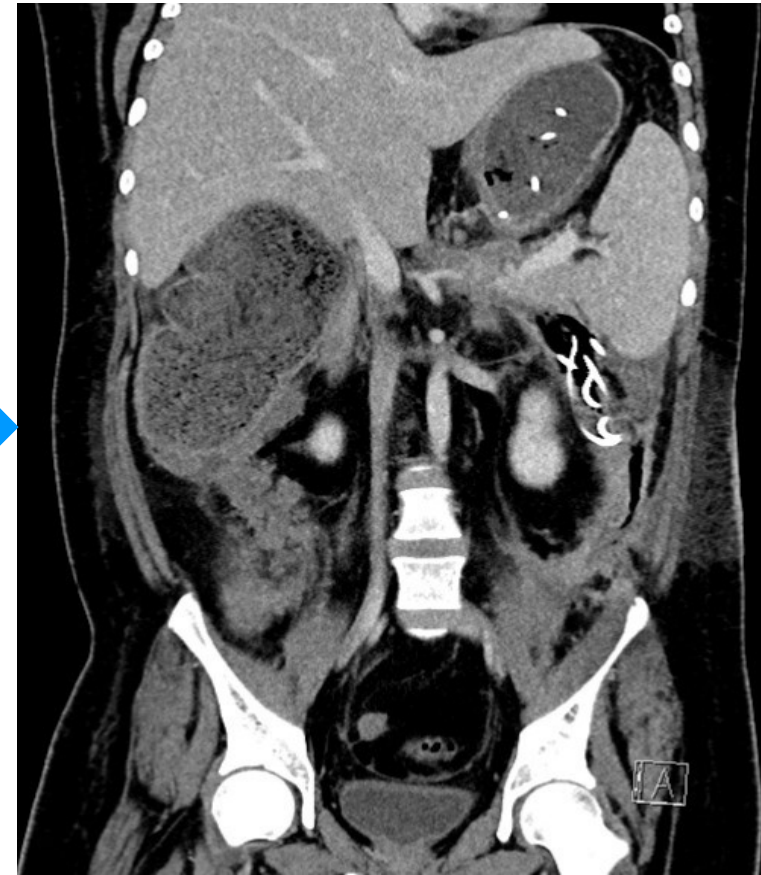


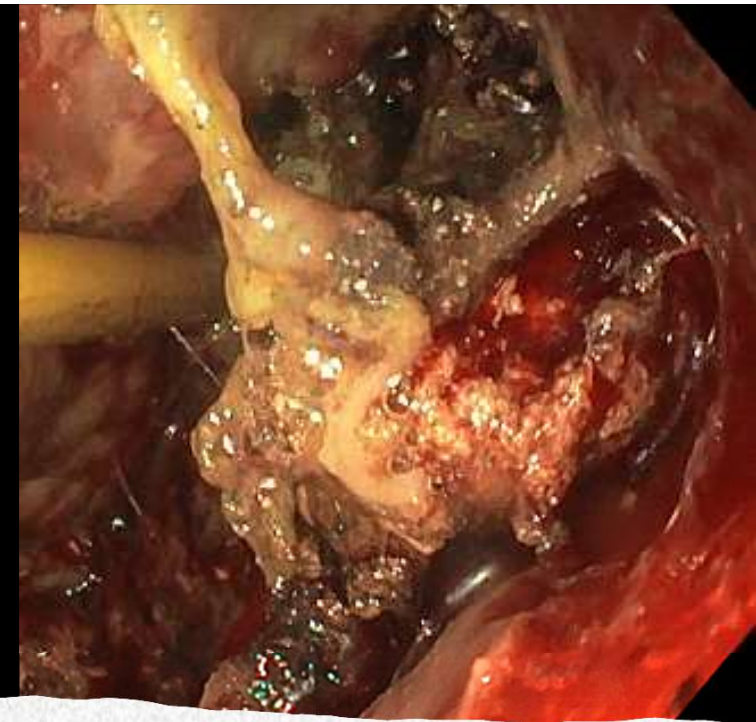
After 4 transvaginal and 7 VARD proc. in 7 weeks





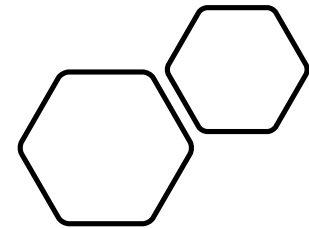
Before and after 5 weeks and 9 procedures

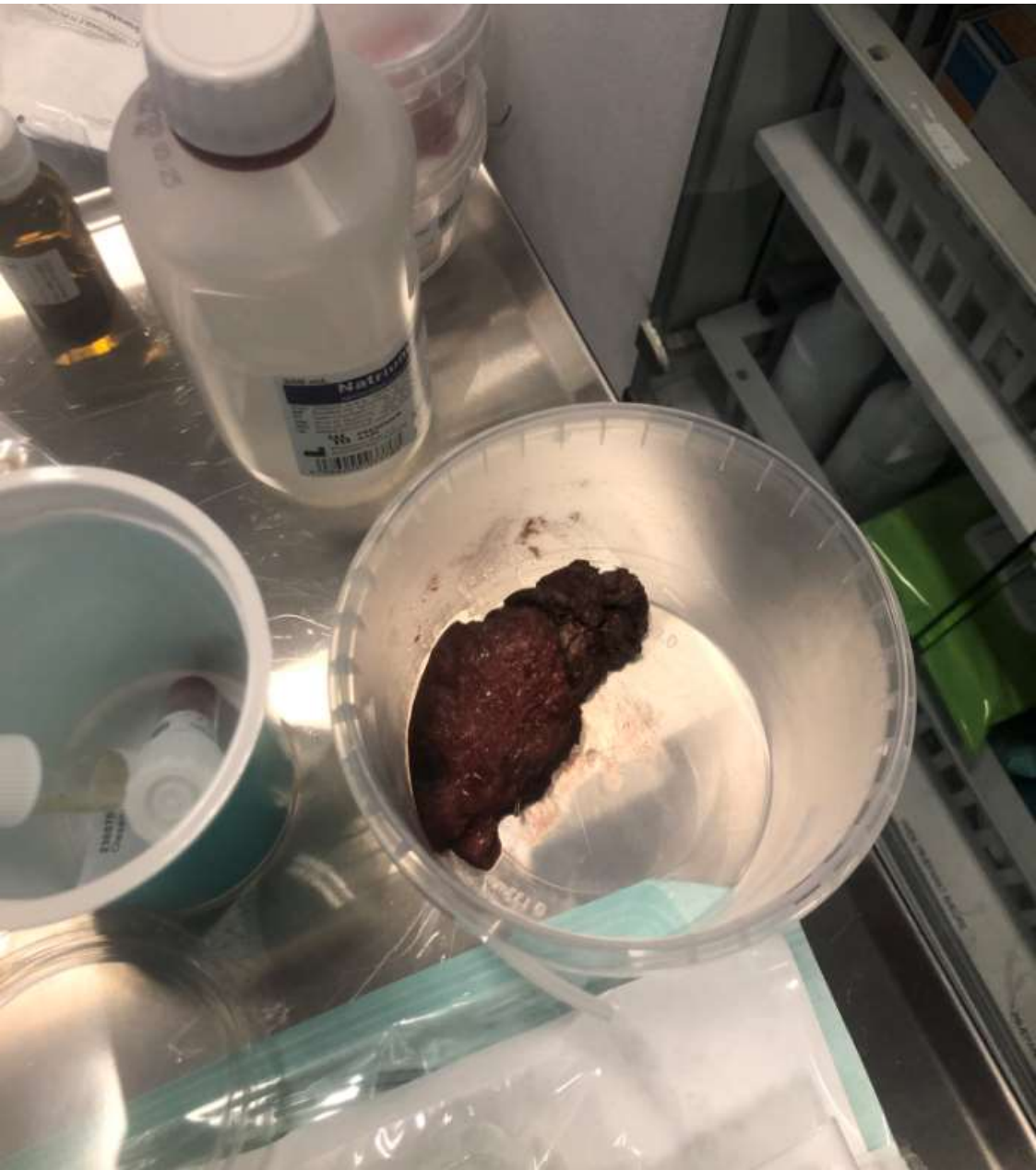




Case – 21-06-2022  
93 days after debut

Simultaneous  
transgastric drainage  
and necrosectomy and  
VARD





# Status per September 13<sup>th</sup> 2022

Transferred to referring hospital, still in ICU, need for small volume of NA

	Duration, min	Procedure
21.06.2022	255	Transgastric necrosectomy and VARD
24.06.2022	121	Transgastric necrosectomy and VARD
28.06.2022	172	Transgastric necrosectomy and VARD
05.07.2022	168	Transgastric necrosectomy and VARD
08.07.2022	152	Transgastric necrosectomy and VARD
14.07.2022	142	Transgastric necrosectomy and VARD
20.07.2022	87	Transgastric necrosectomy
28.07.2022	87	Transgastric necrosectomy
04.08.2022	113	Transgastric necrosectomy
11.08.2022	178	Transgastric necrosectomy and VARD
18.08.2022	122	Transgastric necrosectomy
23.08.2022	76	Transgastric necrosectomy
08.09.2022	118	VARD
<b>Total</b>	<b>1.791</b>	

13 procedures and 29,9 hours



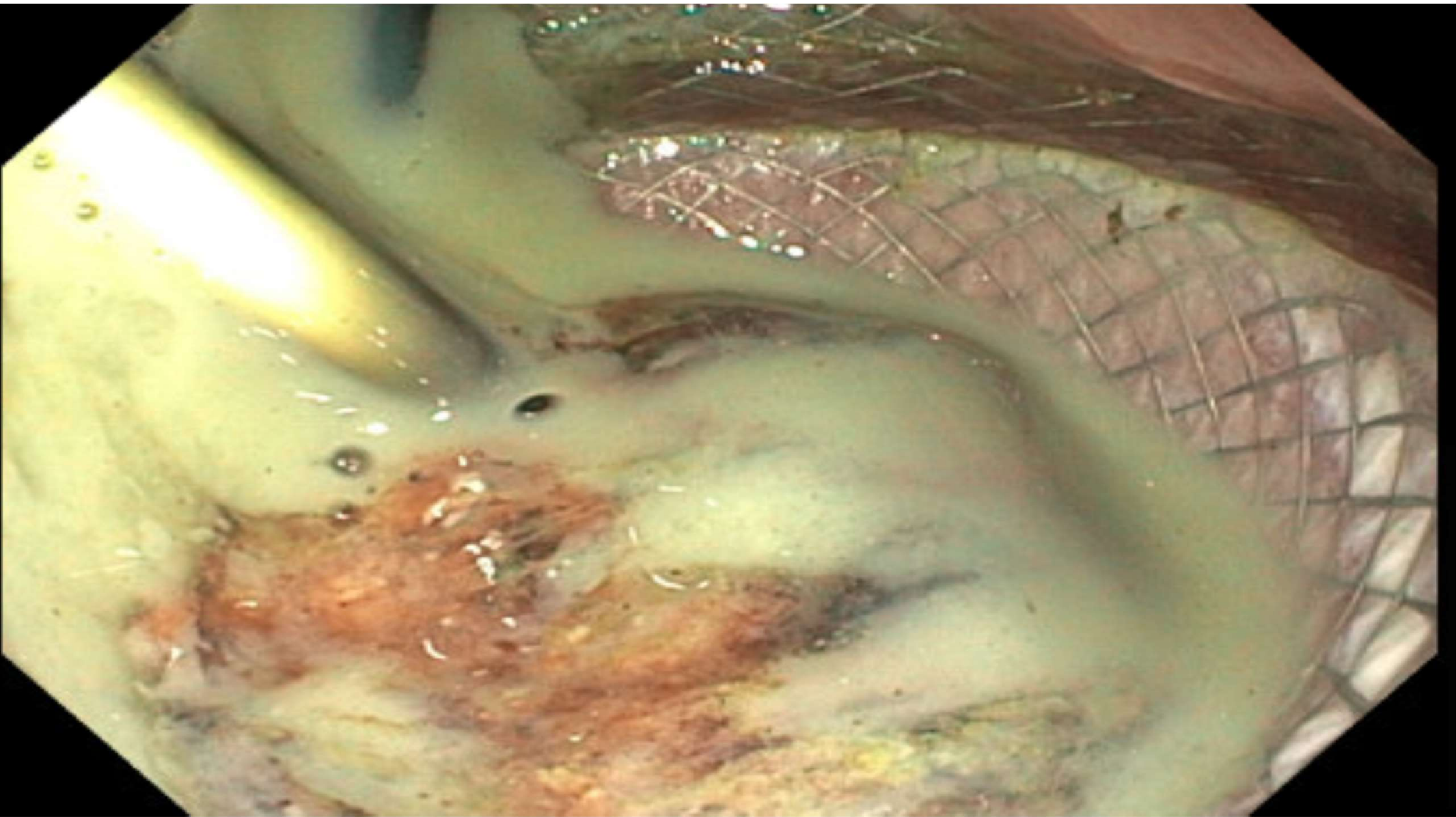
# Can drainage only do the job?

- Only 20 mm LAMS!

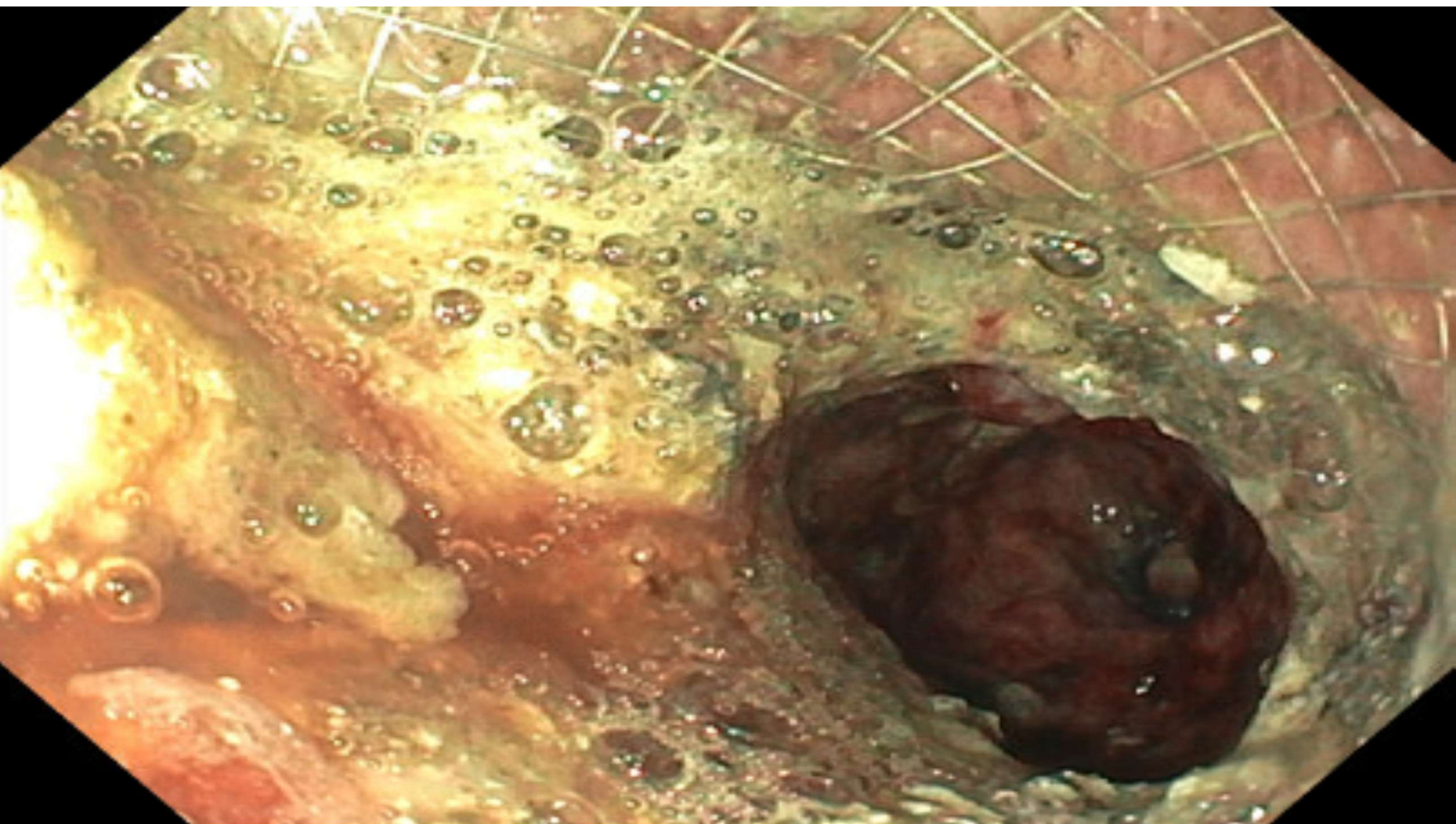
	DPT (n=22)	LAMS (n=20)	p-value
<b>Index drainage</b>			
Technical success, n (%)	22 (100)	19 (95.0)	0.48
Procedure time, minutes, median (P25-P75)	59 (36-67)	30 (28-54)	0.12
Resolution of SIRS at 48 hours postintervention, n (%)	9 (60.0%)	7 (58.3%)	1.0
<b>Endoscopic procedures after index drainage*</b>			
Need of necrosectomy, n (%)	11 (50.0)	8 (42.0)	0.76
Time from index drainage to first necrosectomy, days, mean (SD)	20.7 (9.9)	16.1 (8.8)	0.26
Number of necrosectomies, mean (SD)	2.2 (3.1)	3.1 (3.7)	0.42
Number of necrosectomies, median (P25-P75)	0.5 (0-4.0)	1.0 (0-6.0)	0.92
Total number of endoscopic procedures, median (P25-P75)	6.5 (4.8-11.0)	5.0 (3.0-10.0)	0.85
Cumulative duration of endoscopic procedures per patient, hours, median (P25-P75)	3.1 (2.5-7.1)	4.6 (2.4-8.6)	0.50
<b>Percutaneous drainage and VARD after index drainage*</b>			
Need of percutaneous drainage, n (%)	3 (13.6)	6 (31.6)	0.26
Need of VARD, n (%)	1 (4.5)	3 (15.8)	0.23
Need of surgical necrosectomy, n (%)	0	0	

What to do  
when  
drainage is not  
sufficient?

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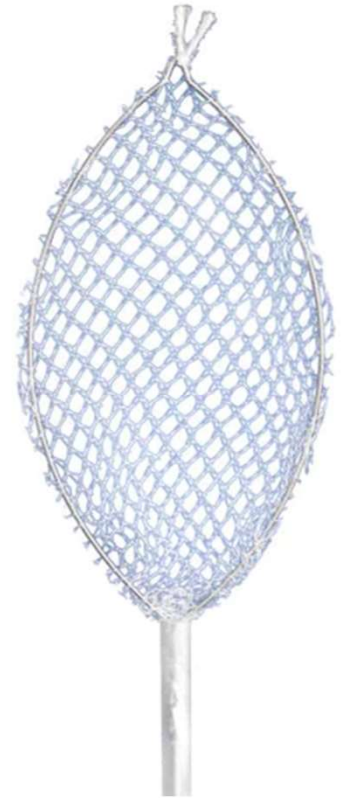
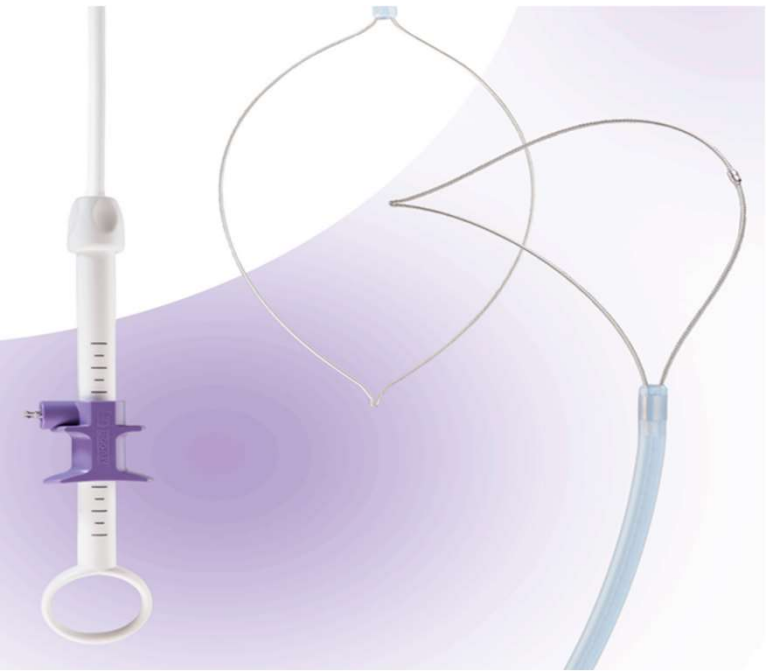






# Necrosectomy







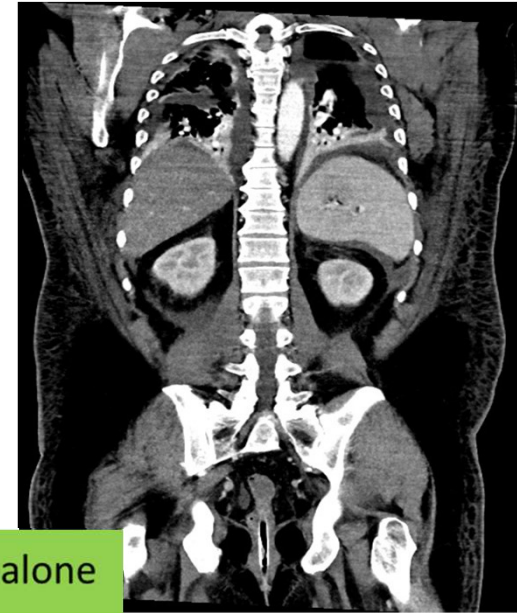
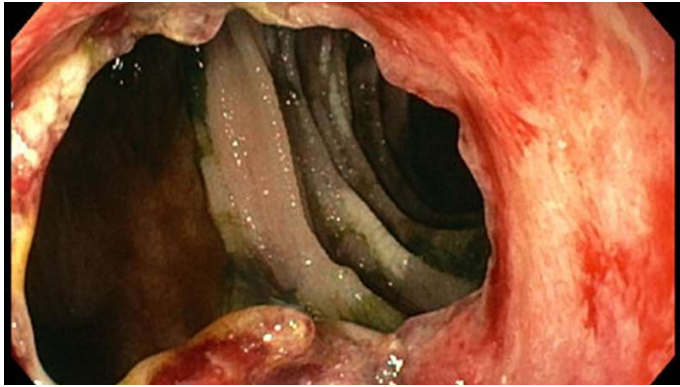
# Dedicated tools

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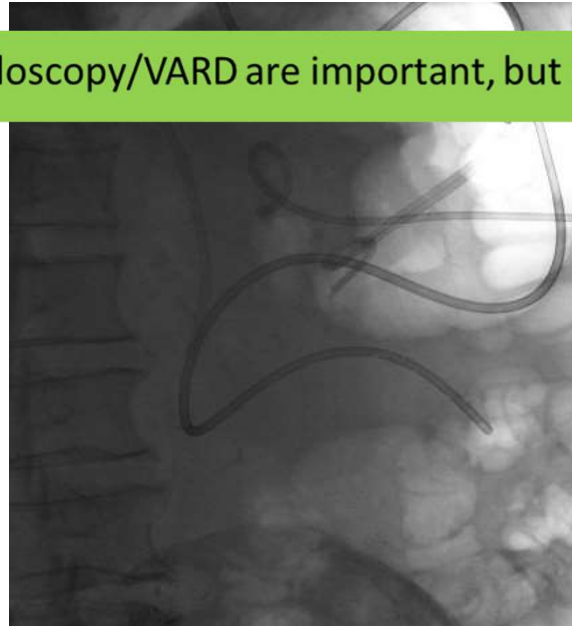


# Complications





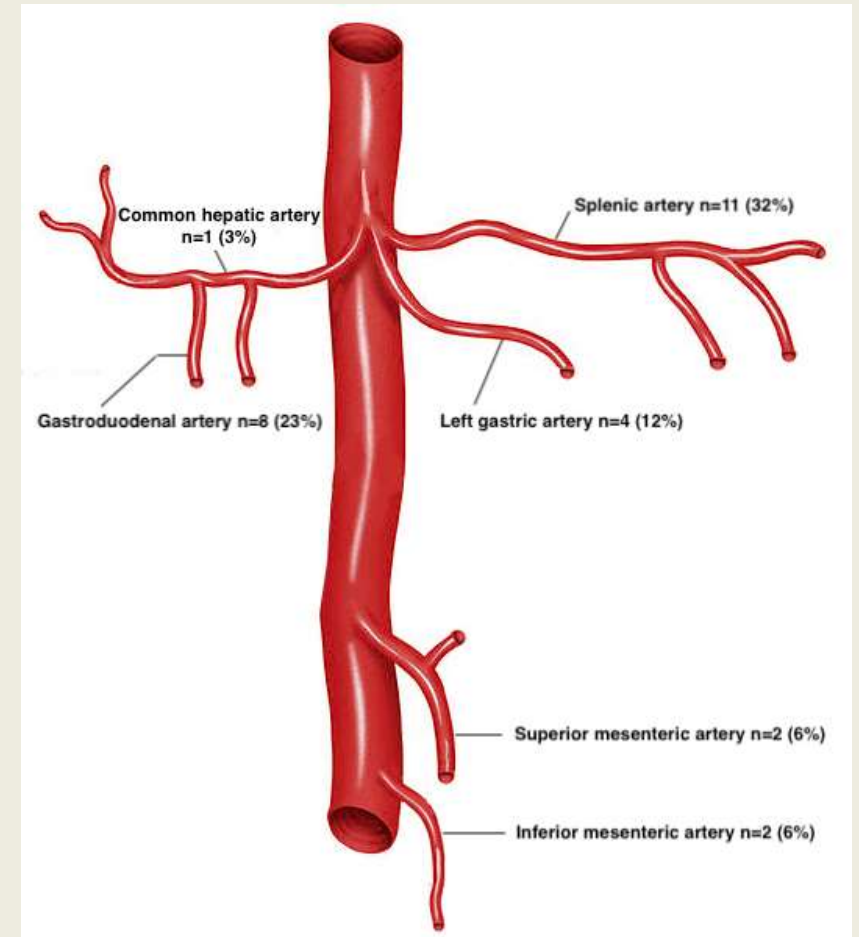
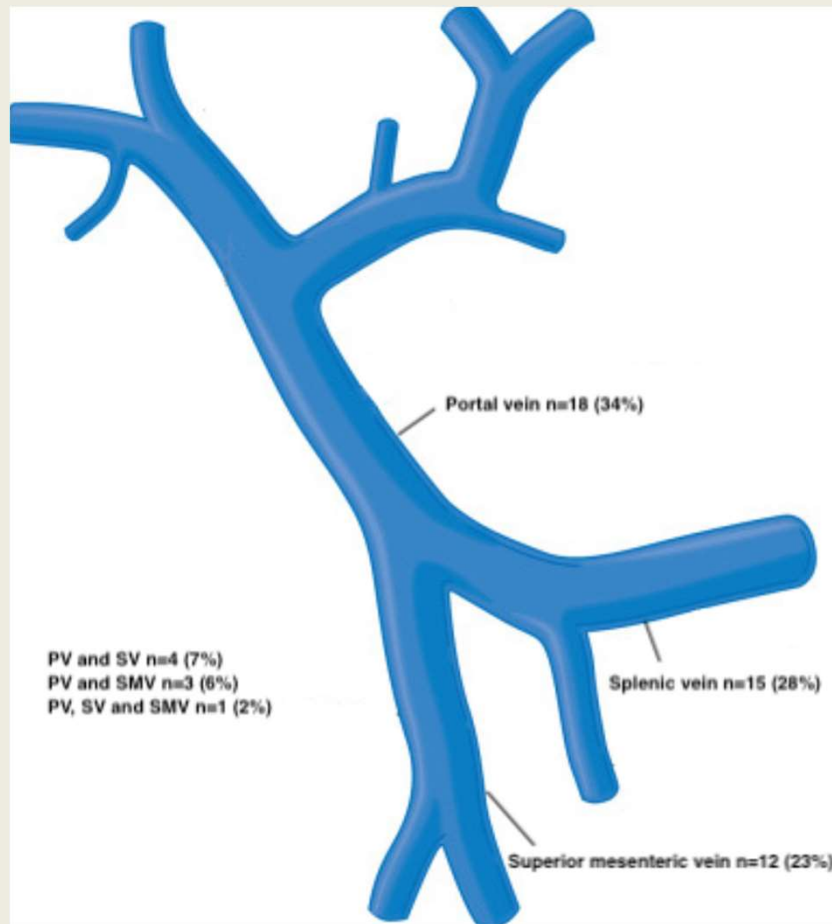
Endoscopy/VARD are important, but cannot stand alone



## Vascular complications

- 20% of WON patients develop splanchnic thrombosis, 80% occur before before index intervention
- 10% of WON patients develop pseudoaneurisms requiring embolization, 80% occur after index intervention

# Vascular complications

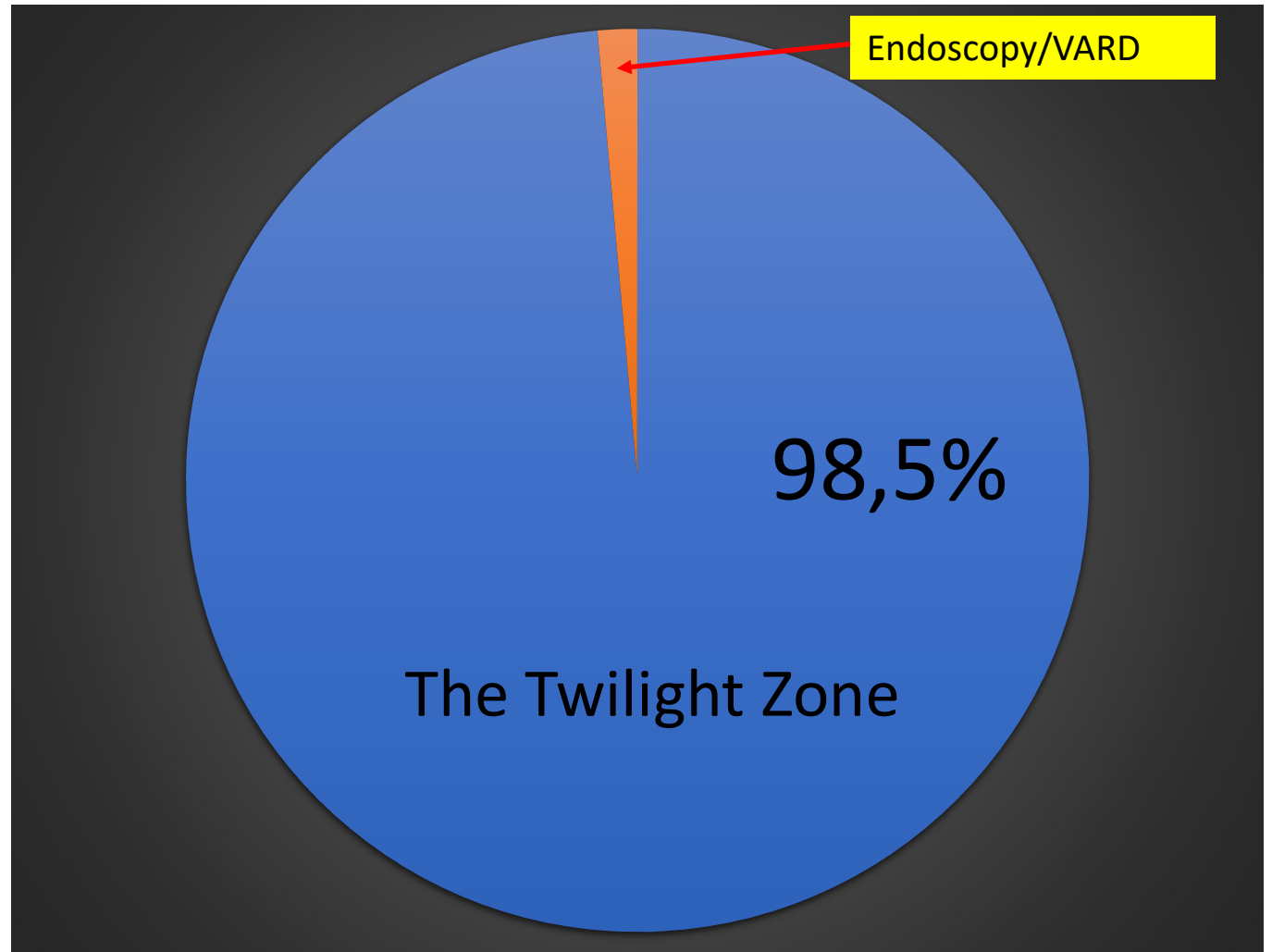




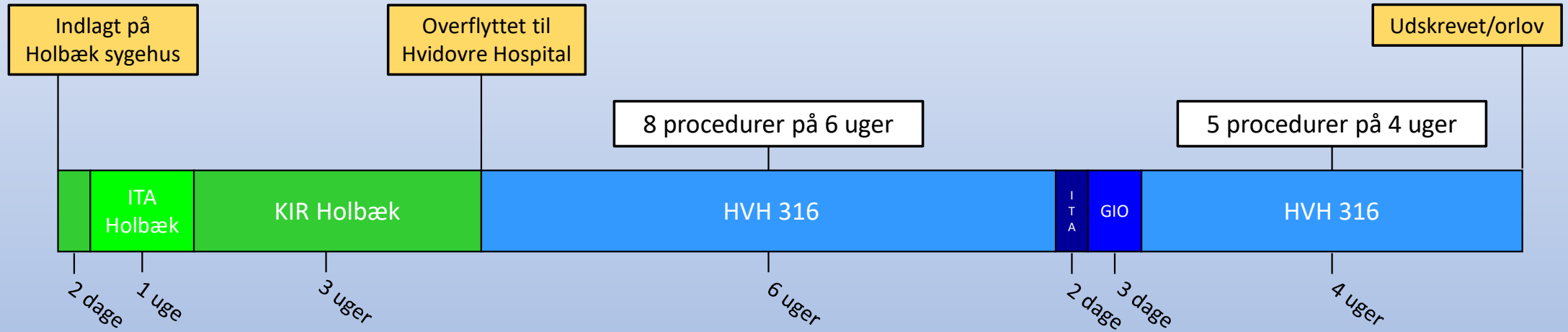
# Perforations in the stomach



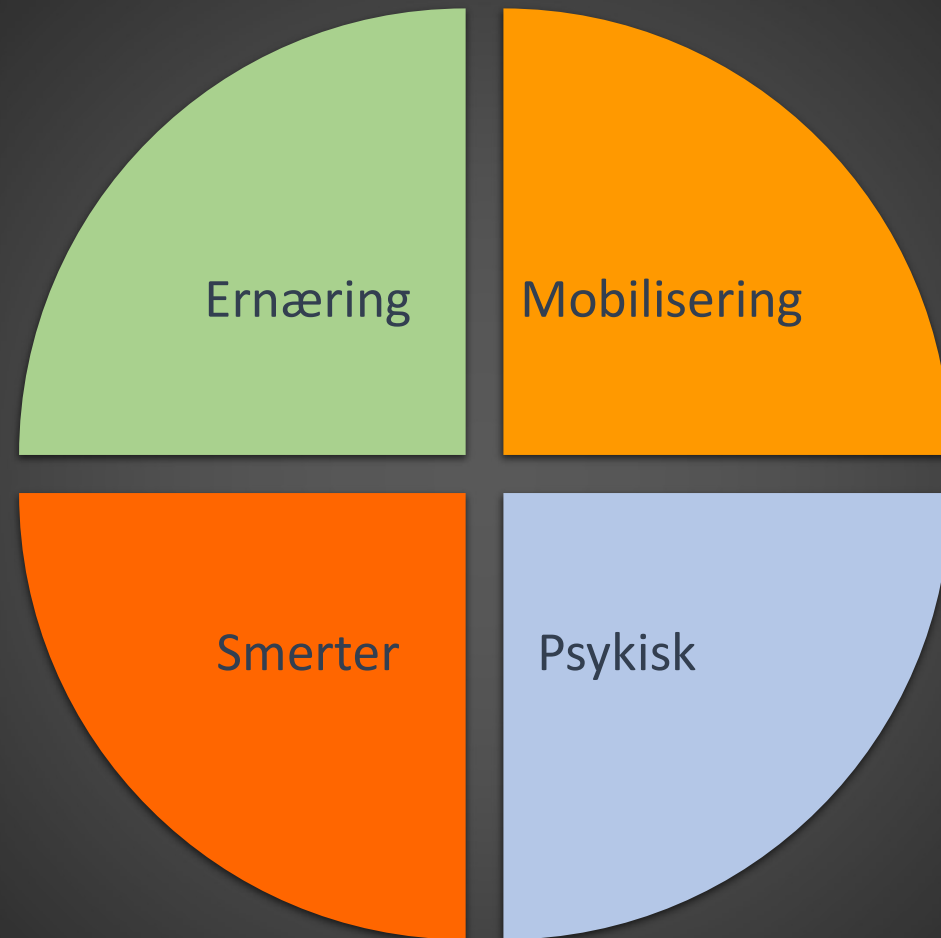
Is it time to  
change focus?

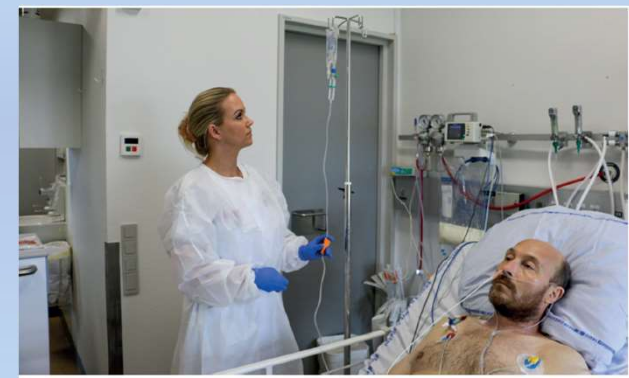
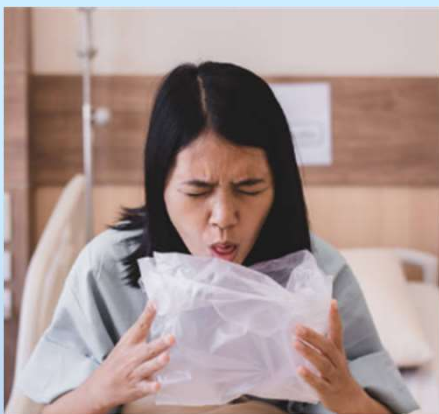
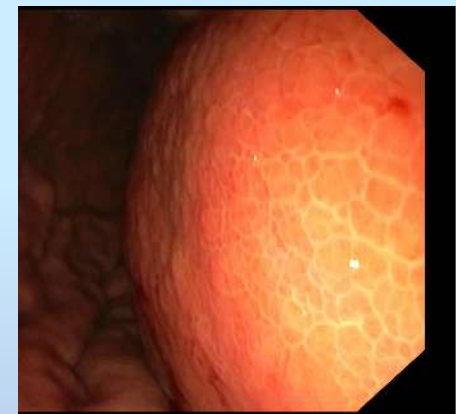


# Indlæggelsesforløb på 3,5 måned.



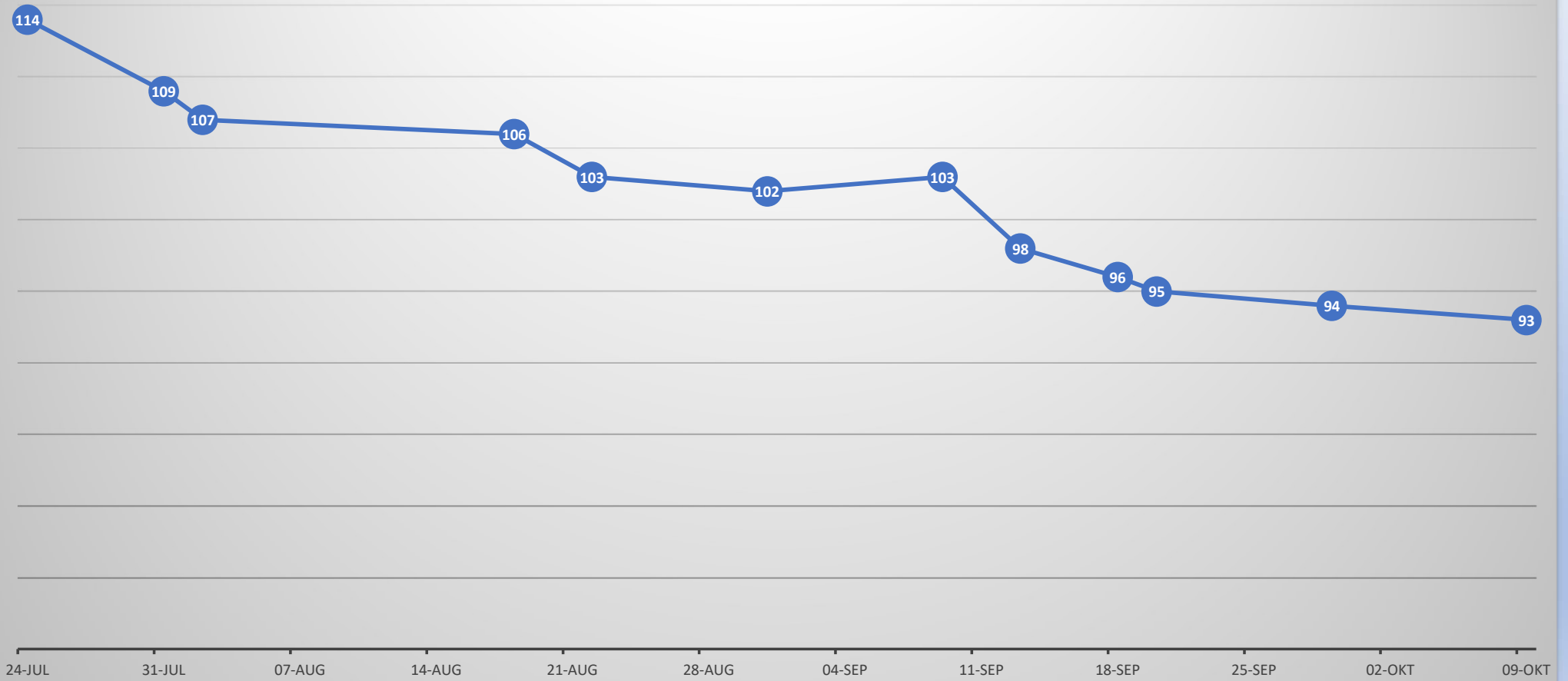
## Udfordringer i forløbet

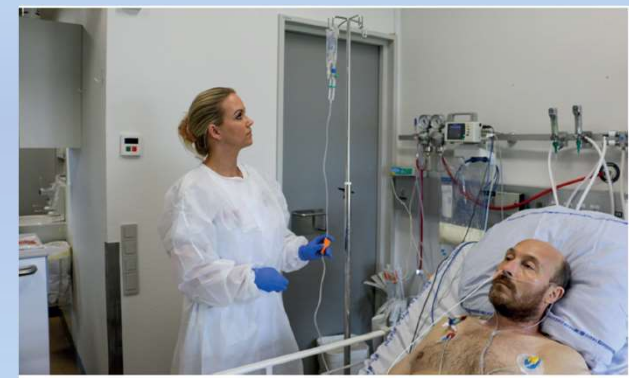
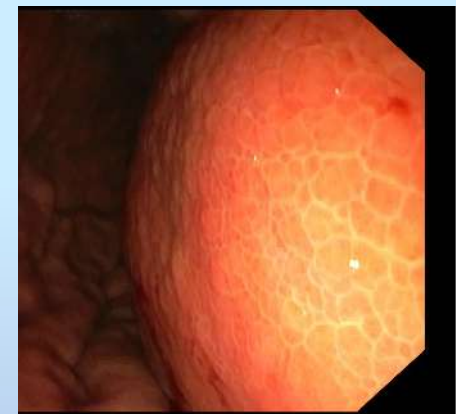




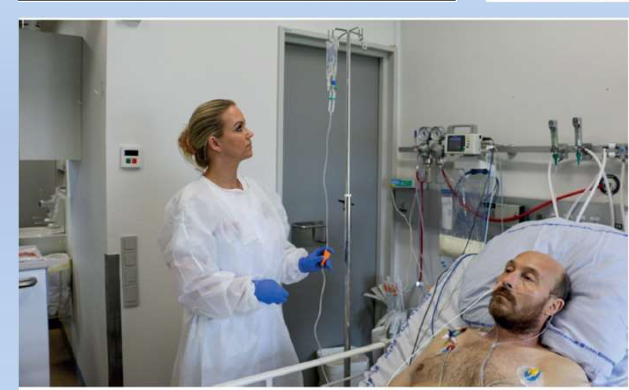
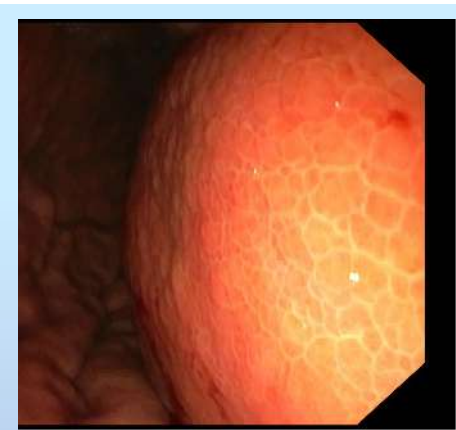
- Nedsat appetit

## Vægttab på 21 kg. over 2,5 måned



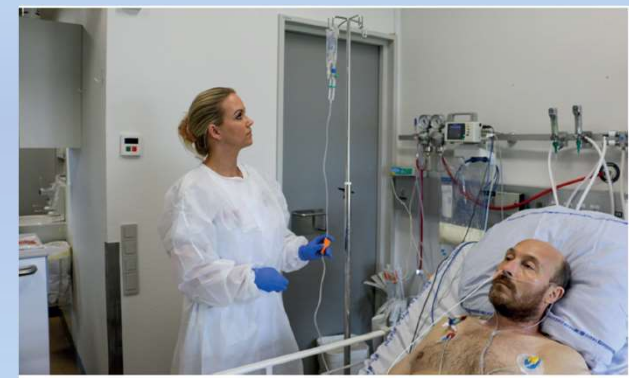
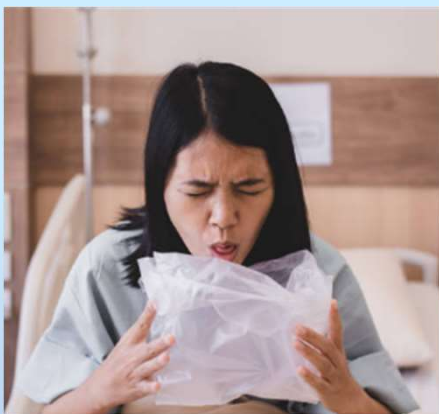
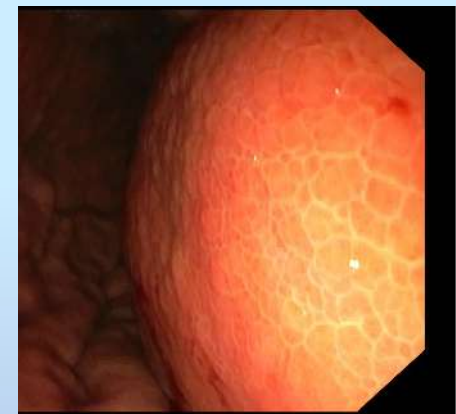


- Nedsat appetit
- Nedsat mobilitet



- Nedsat appetit
- Nedsat mobilitet
- Smerter





- Nedsat appetit
- Nedsat mobilitet
- Smerter
- Psykisk påvirkning

# Kliniske sygeplejeobservationer

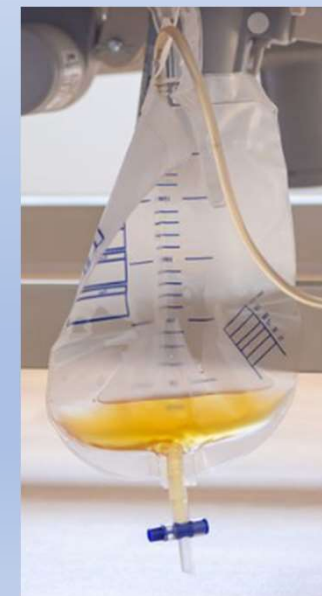


## qSOFA

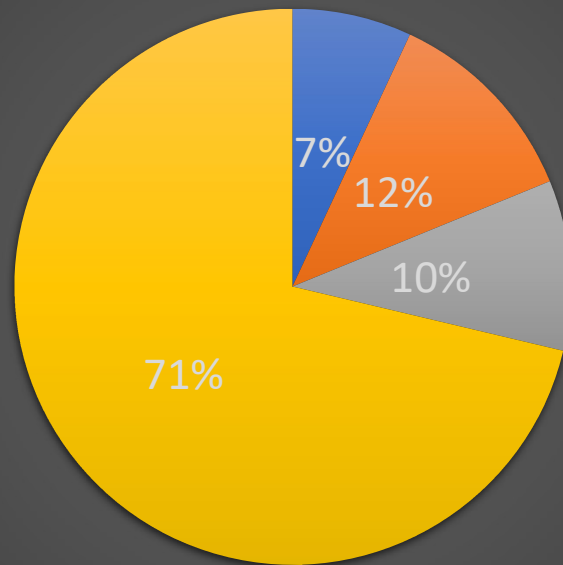
- Systolisk BT < 100 mmHg (1 point)
- Respirationsfrekvens  $\geq 22$  pr. min (1 point)
- Ændret mentalstatus (1 point)

## Sepsis

- Påvist eller mistænkt infektion **og**
- Organpåvirkning (stigning i qSOFA-score  $\geq 2$  fra baseline værdi)



# Economic aspects



■ Endoscopy ■ Lab, imaging ■ Medication ■ Ward

**Table 3**

Costs per patient for different subareas and total costs in US \$.

Type	Mean
Endoscopic treatment	\$3,794
Blood products	\$982
Diagnostic imaging	\$2,431
Wards	\$41,260
Lab analyses	\$3,579
Drug administration	\$5,440
<b>Total costs</b>	<b>\$57,486</b>

*S. Neermark et al / Pancreatology 19 (2019) 828–833*

Hvidovre Hospital  
PACE - Pancreatitis Centre East

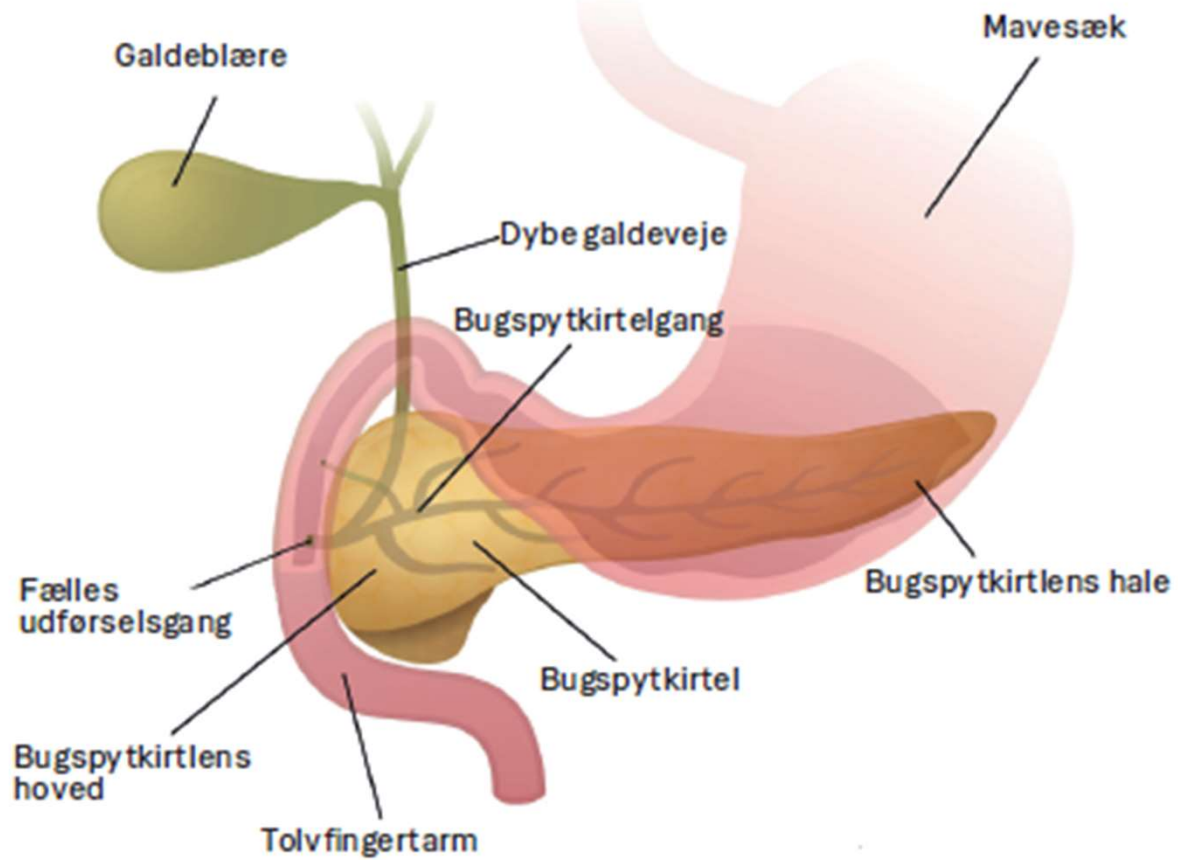
## Betændelse i bugspytkirtlen med indkapslet ansamling



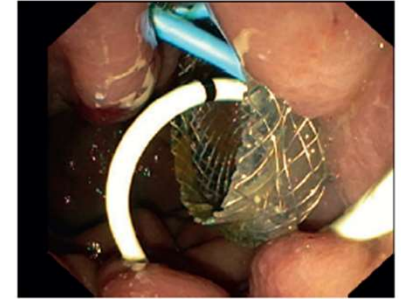
EN KOMBINERET HÅNDBOG OG DAGBOG  
TIL PATIENTER OG PÅRØRENDE

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Metalstent.



Anlagt metalstent igennem mavesækkens bagvæg med et gult skylledræn og en blå plastikstent.



Enden af en kikkert med kamera.



To stents.



Skylledræn.



Dato for indlæggelse på Hvidovre Hospital:

Vægt ved indlæggelsen:

Ansamlings størrelse ved indlæggelsen:

Dato for udskrivelse fra Hvidovre Hospital:

## Dato

### DAGSKEMA

DÆKKET ERNÆRINGS-BEHOV (%)	
FASTE OG TØRSTE	
VÆGT	
TEMPERATUR	
INFEKTIONSTAL	
UNDERSØGELSE	
ANSAMLINGENS STØRRELSE	

### FYSISK AKTIVITET

SIDDE PÅ SENGEKANTEN 	
SIDDE I STOL 	
GÅ TIL TOILETET 	
ANTAL SKRIDT GÅET 	
ANTAL KM PÅ GULVCYKEL 	
TRÆNING MED FYSIOTERAPEUT 	
HOLDTRÆNING MED FYSIOTERAPEUT 	
ANDEN TRÆNING 	

Noter og spørgsmål

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”

Du skal ikke blive forskrækket,  
hvis der kommer tilbageslag.  
Du ryger ikke tilbage til start.

Henrik, 68 år, indlagt 11 uger på Hvidovre Hospital

”

Lægerne og sygeplejerskerne  
har fuldstændig styr på din  
sygdom - stol på dem.

John, 45 år, indlagt 14 uger på Hvidovre Hospital

”

Der er dage, hvor det er svært at  
komme ud af sengen. Skub kærligt  
på - bare en kort tur ud til hallen.

Sanne, pårørende

”

Du skal ikke være bekymret  
for kikkertbehandlingerne,  
det er ikke slemt - man er  
helt væk.

Henrik, 68 år, har fået udført ni kikkert-  
behandlinger over 11 uger

”

Bevar roen og hav tålmodighed! Der  
kommer modgang - vær klar på det.

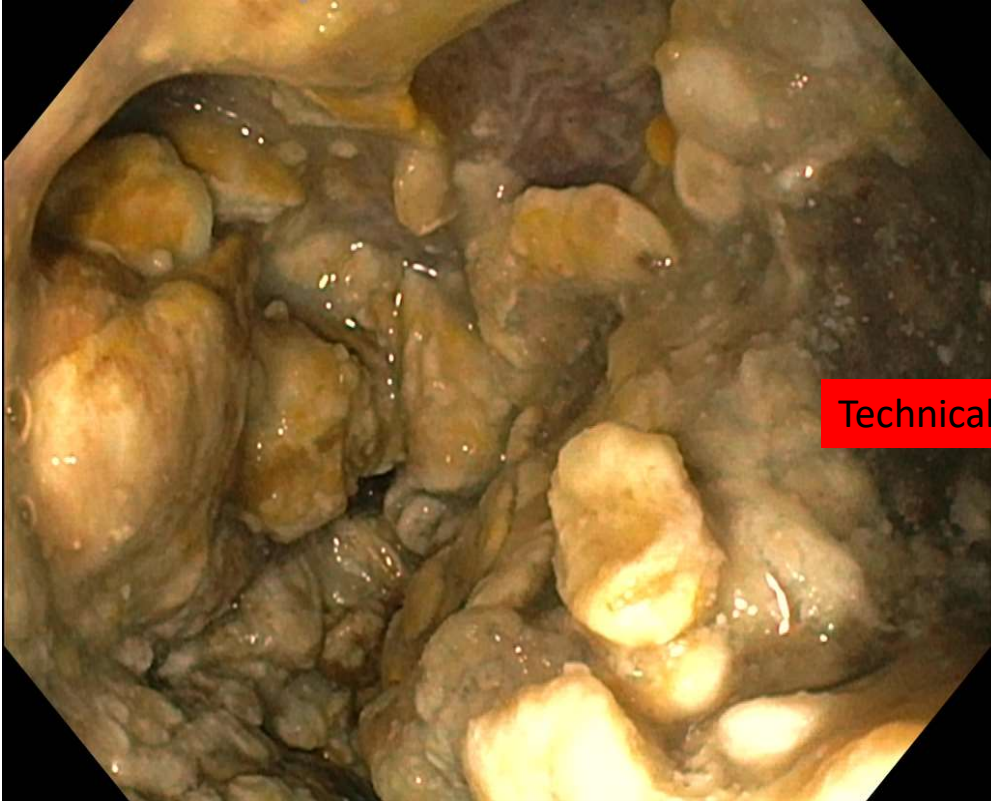
John, 45 år, indlagt 14 uger på Hvidovre Hospital

”

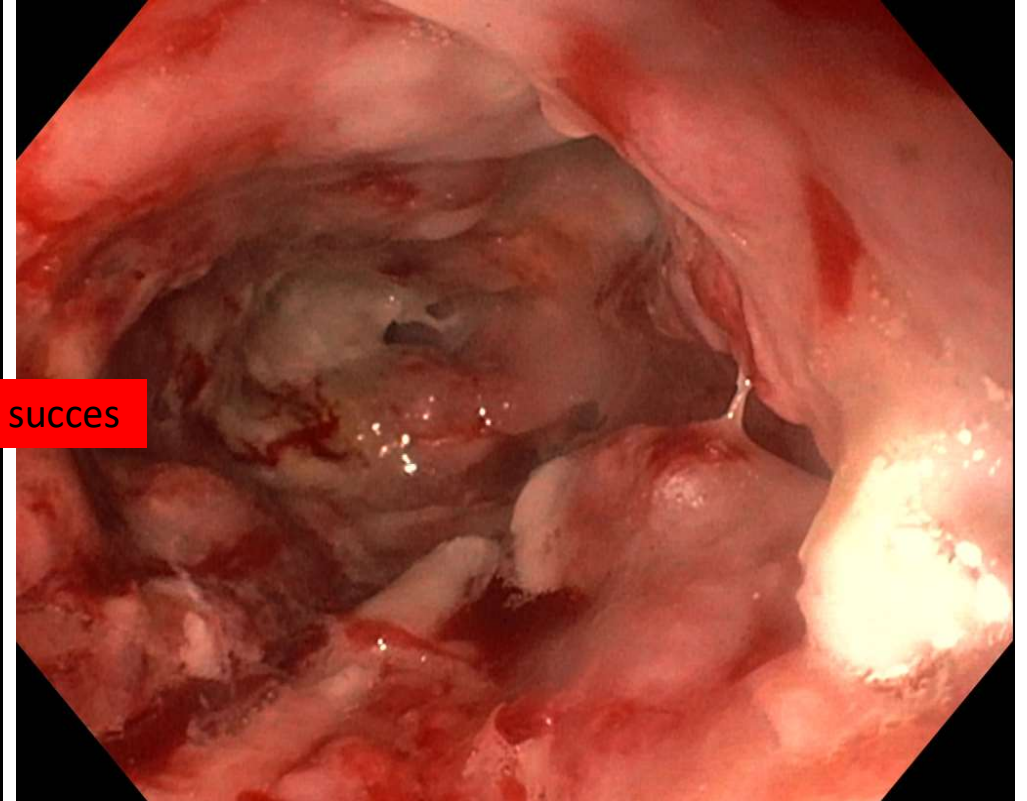
I de tre måneder, jeg var indlagt,  
tabte jeg 20 kg, selvom der var  
masser af god mad at vælge imellem.

Niels Jørgen, 77 år, indlagt 11 uger på Hvidovre Hospital

## Defining successful treatment



Technical succes





Clinical success

## What does the future offer for patients with WON?

<b>N = 125</b> <b>Median 4,3 years</b> <b>Range 1,2 – 9,1 years</b>	<b>At onset of AP</b>	<b>At endoscopic intervention</b>	<b>At discharge</b>	<b>At follow-up</b>
Exocrine insufficiency, N (%)	0	13 (10)	22 (18)	22 (18)
Endocrine insufficiency, N (%)				
- NIDDM	11 (9)	6 (5)	7 (6)	14 (11)
- IDDM	2 (2)	43 (34)	24 (19)	35 (28)
Analgesics (N%)				
- No medication			34 (27)	70 (56)
- Use of non-opioids			36 (29)	34 (27)
- Use of mild opioids			34 (27)	10 (8)
- Use of potent opioids			21 (17)	11 (9)
Social status, N (%)				
- Married	87 (70)			81 (65)
- Single	38 (30)			44 (35)
Working status, N (%)				
- Retired	36 (29)			49 (39)
- Early retirement	10 (8)			13 (10)
- Unemployed	14 (11)			14 (11)
- Employed	63 (50)			49 (39)
- Student	2 (2)			0