



臺中榮民總醫院  
Taichung Veterans General Hospital

# Case presentation

台中榮民總醫院 胃腸肝膽科

Reporter 鄭旭恩/指導醫師：連漢仲

# Case introduction

---

- Patient profile: 59 y/o Man, Retired Carpenter.
- Lung cancer, s/p OP on 2019 at A Hospital
- Personal history:
  - Alcohol:denied.
  - Cigarette:denied.
  - Betel nut: denied.
  - **TOCC** : not remarkable.

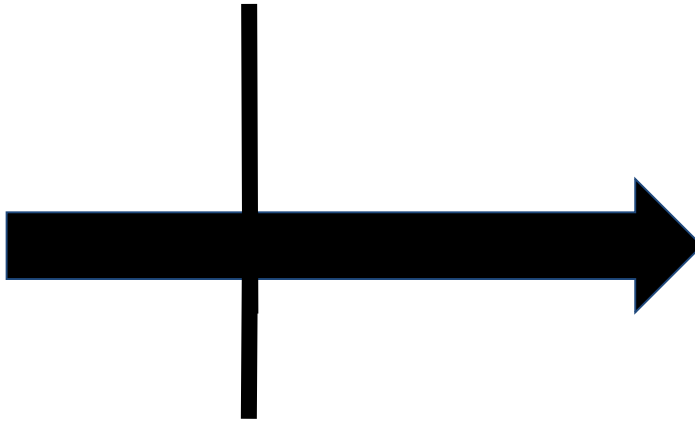
## **Chief complaint :**

Acid regurgitation, dry throat, dyspepsia for years

# Present illness

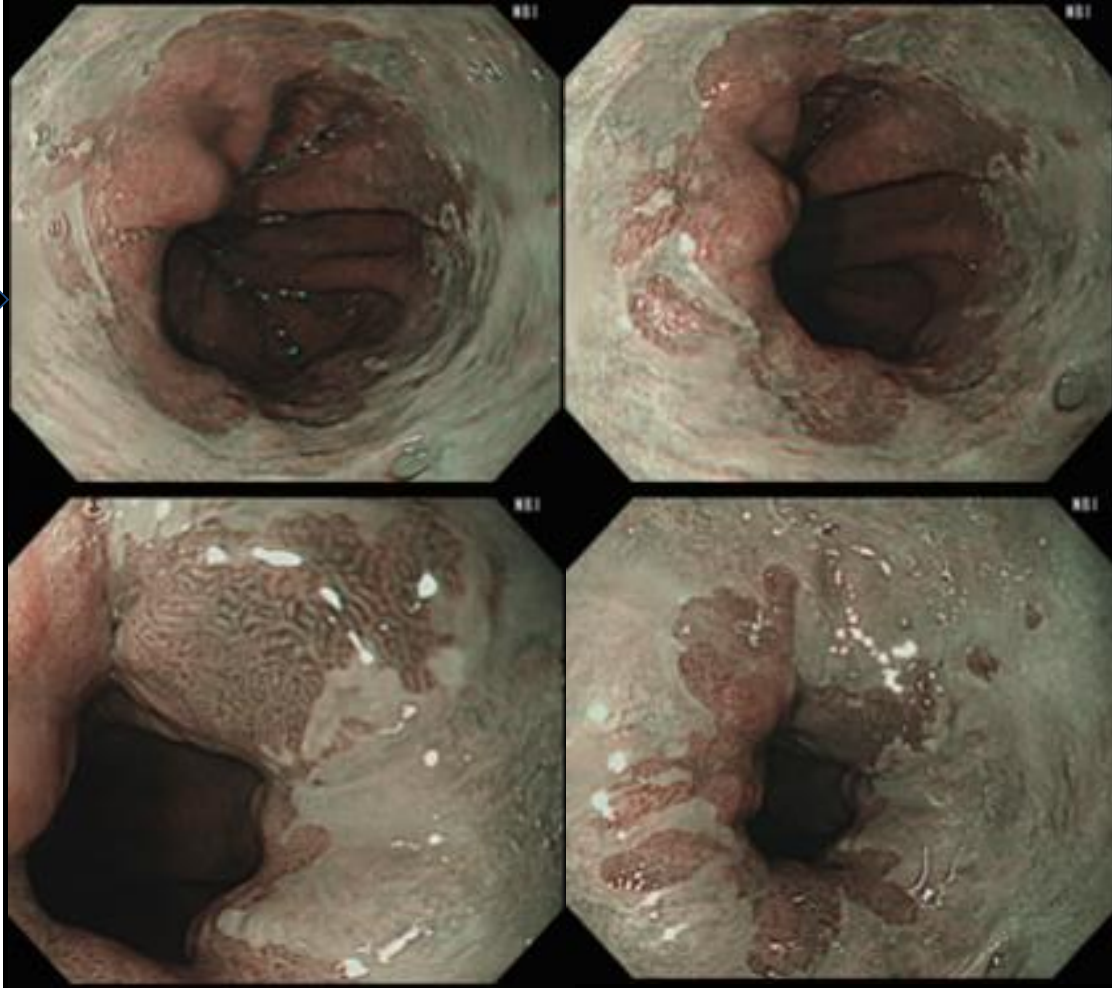
**2019/05**

s/p Stretta at A H.



Symptom improved initially,  
but recurred after operation

# EGD on 2019/05/29



# Present illness

**2019/05**

s/p Stretta at A H.

**2022/07/19**

s/p Fundoplication for hiatal hernia  
at B H, but in vain.

Symptom improved initially, but recurred.  
Complained of Insomnia.

**2022/11/28**

**AR, dry throat recurred**

→ Arrange EGD for r/o GERD.

→ HRIM, MII-pH

# EGD on 2022/12/13

【Endoscope type】 FG 6

【Indications】

Esophageal reflux symptoms

【Premedication】

Oral simethicone solution 10 mL

10 % Xylocaine spray

【Oxygen supplement】 Room air

【Endoscopic findings】

Esophagus: multiple esophagus ulcers and mucosa break over lower third part

EC junction: mucosa breaks more than 5 mm with confluence at lower third, multiple esophagus ulcers also noted

Fundus: suboptimal survey

Body: suboptimal survey

Angularis: normal appearance

Antrum: hyperemia

Pylorus: erosion over pylorus and hyperemia

Duodenum: normal appearance

DIAGNOSIS/IMPRESSION:

【Endoscopic diagnosis/Impression】

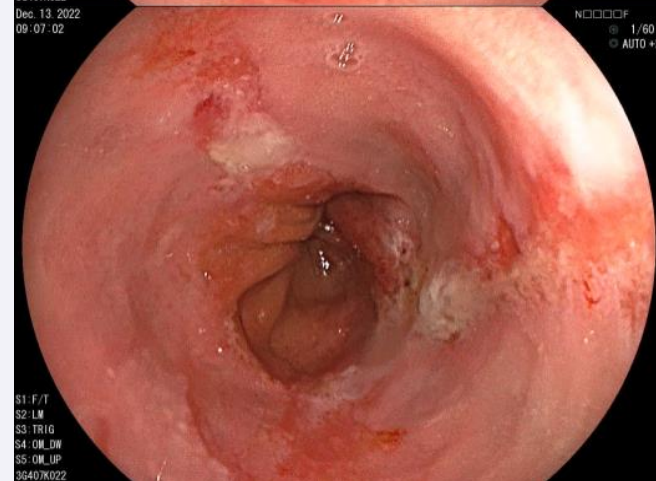
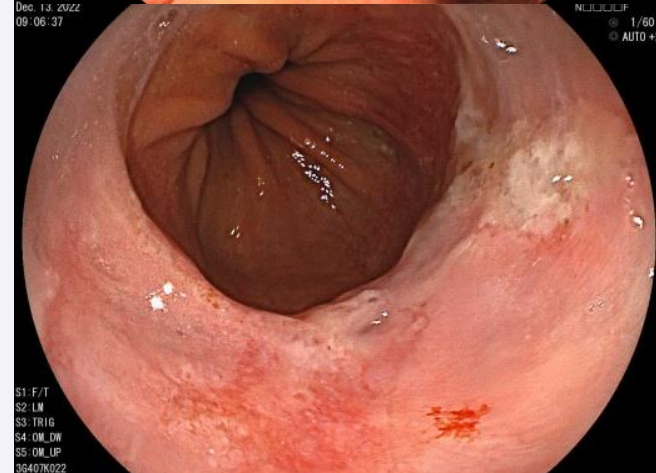
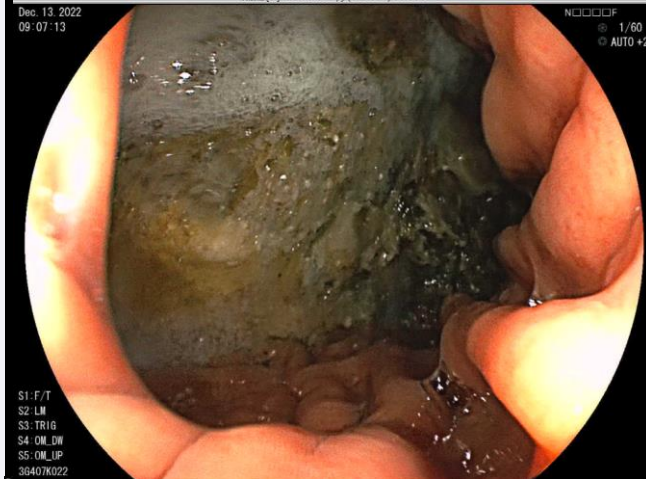
1. Reflux esophagitis, LA, Gr C with multiple esophagus ulcers over lower third part of esophagus
2. Suboptimal survey due to much food remnants
3. Erosions over pylorus

【Endoscopic treatment/Additional procedures】

Hp plate test

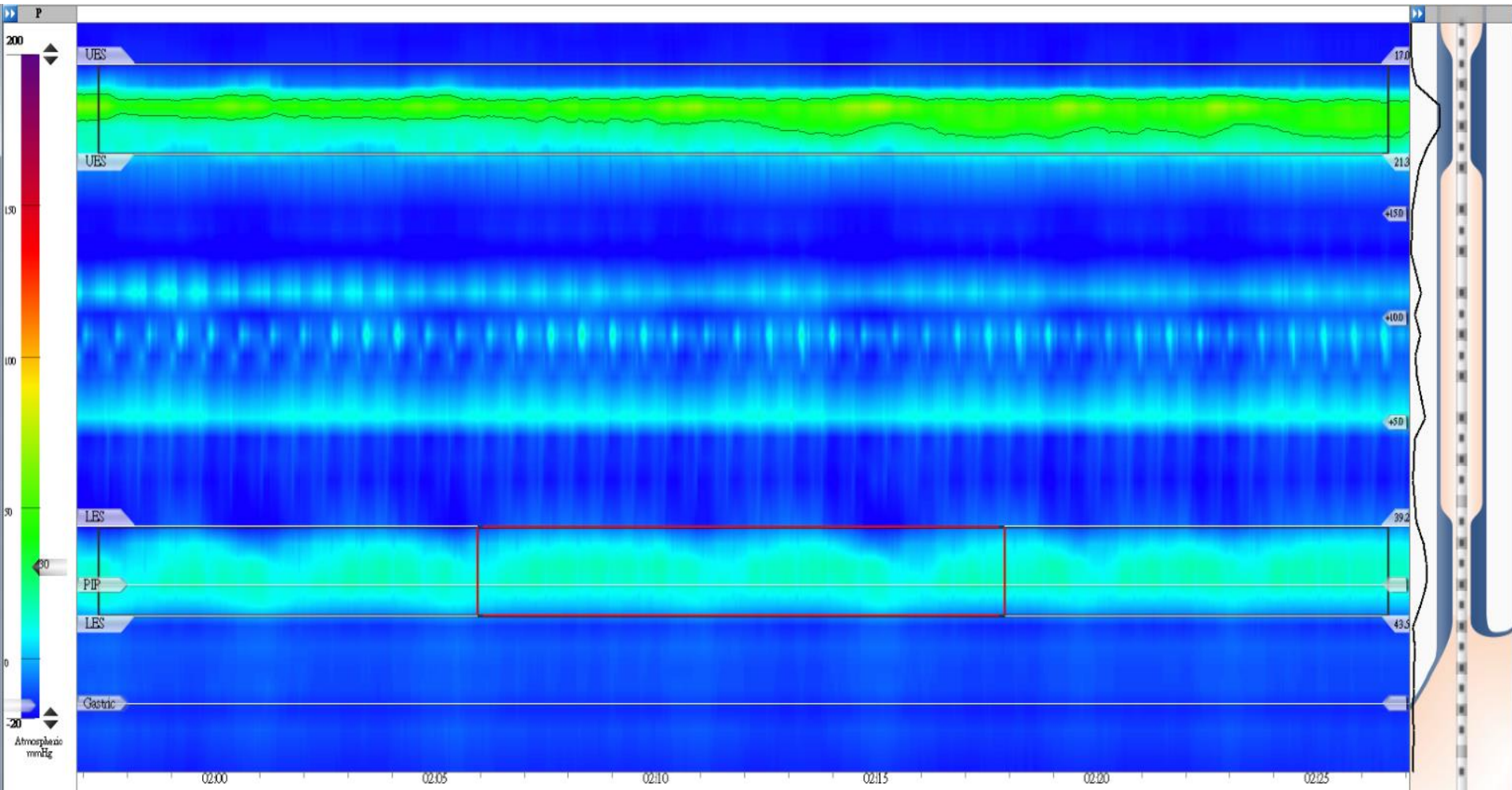
【Suggestions】

Follow-up in OPD



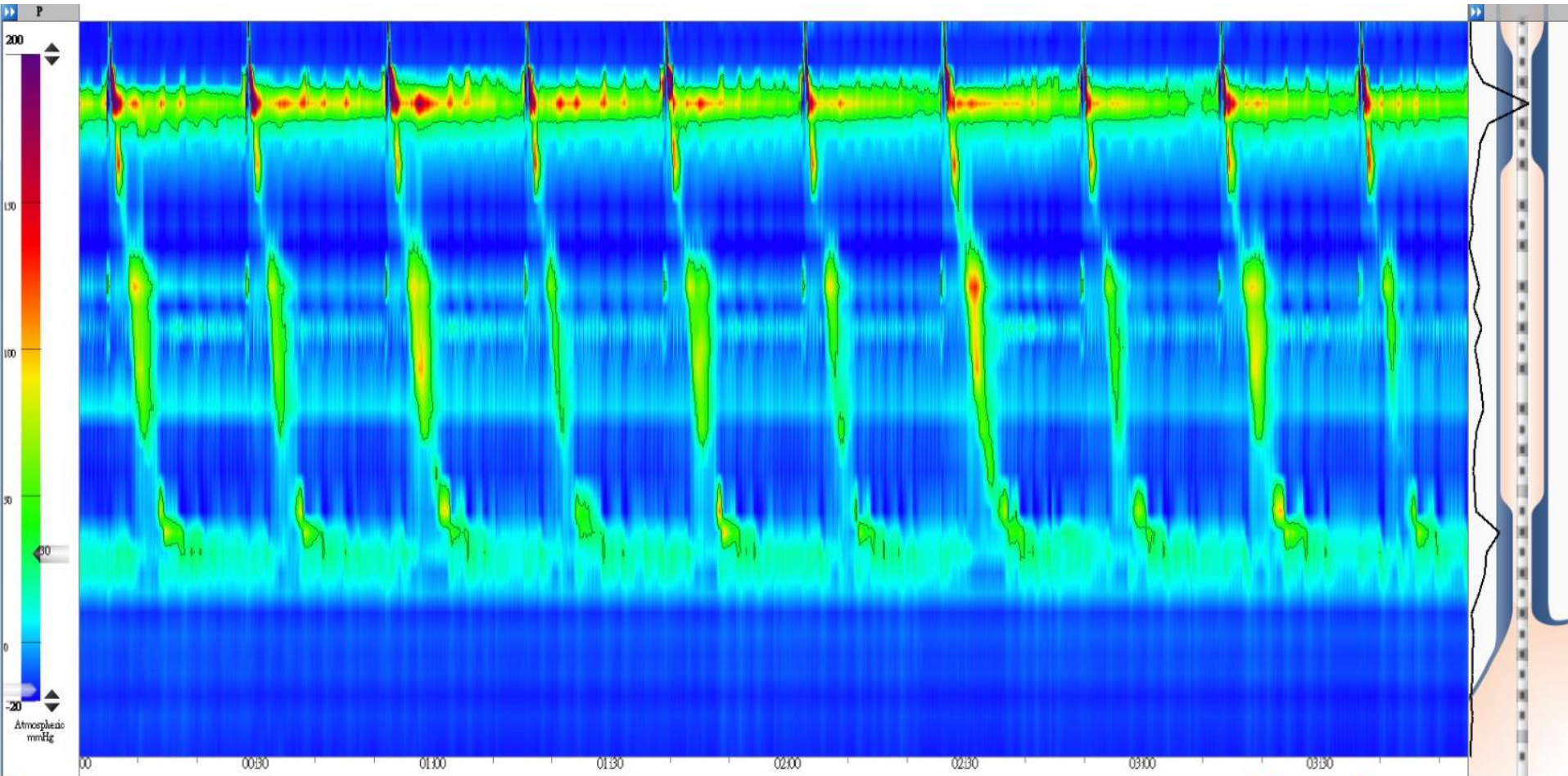


# HRIM on 2022/12/13



Resting pressure [1]		Show in table		Shown in report		Select next	
<b>UES</b>		<b>LES</b>		<b>Esophagus</b>			
Upper border	17.0 cm	Upper border	39.2 cm				
Lower border	21.3 cm	Lower border	43.5 cm				
Length	4.3 cm	Length	4.3 cm				
Resting (5th)	44 mmHg	Resting (5th)	23 mmHg				
Resting (mean)	54 mmHg	Resting (mean)	28 mmHg				
		Resting (min)	21 mmHg	<b>Scoring</b>			
		EGI-CI	87 mmHg.cm	Hiatal hernia <input type="checkbox"/> 否*			
<b>阻抗</b>				UES resting pressure <input type="checkbox"/> Normal*			
				LES resting pressure <input type="checkbox"/> Normal*			

# HRIM on 2022/12/13



**UES**

Upper border	17.0	cm
Lower border	21.3	cm
Length	4.3	cm
IRP 0.2 s	9	mmHg
IRP 0.4 s	27	mmHg
IRP 0.6 s	39	mmHg
IRP 0.8 s	48	mmHg

**LES**

Upper border	39.2	cm
Lower border	43.5	cm
Length	4.3	cm
Median IRP4	23.56	mmHg
IRP 4 s	23	mmHg

**Esophagus**

DCI	687	mmHg.s.cm
DCIa	38	mmHg.s
Peristaltic breaks	3.8	cm
Distal Latency	8.6	s
Largest break	2.3	cm
DCI Exp.	724	mmHg.s.cm

**阻抗**

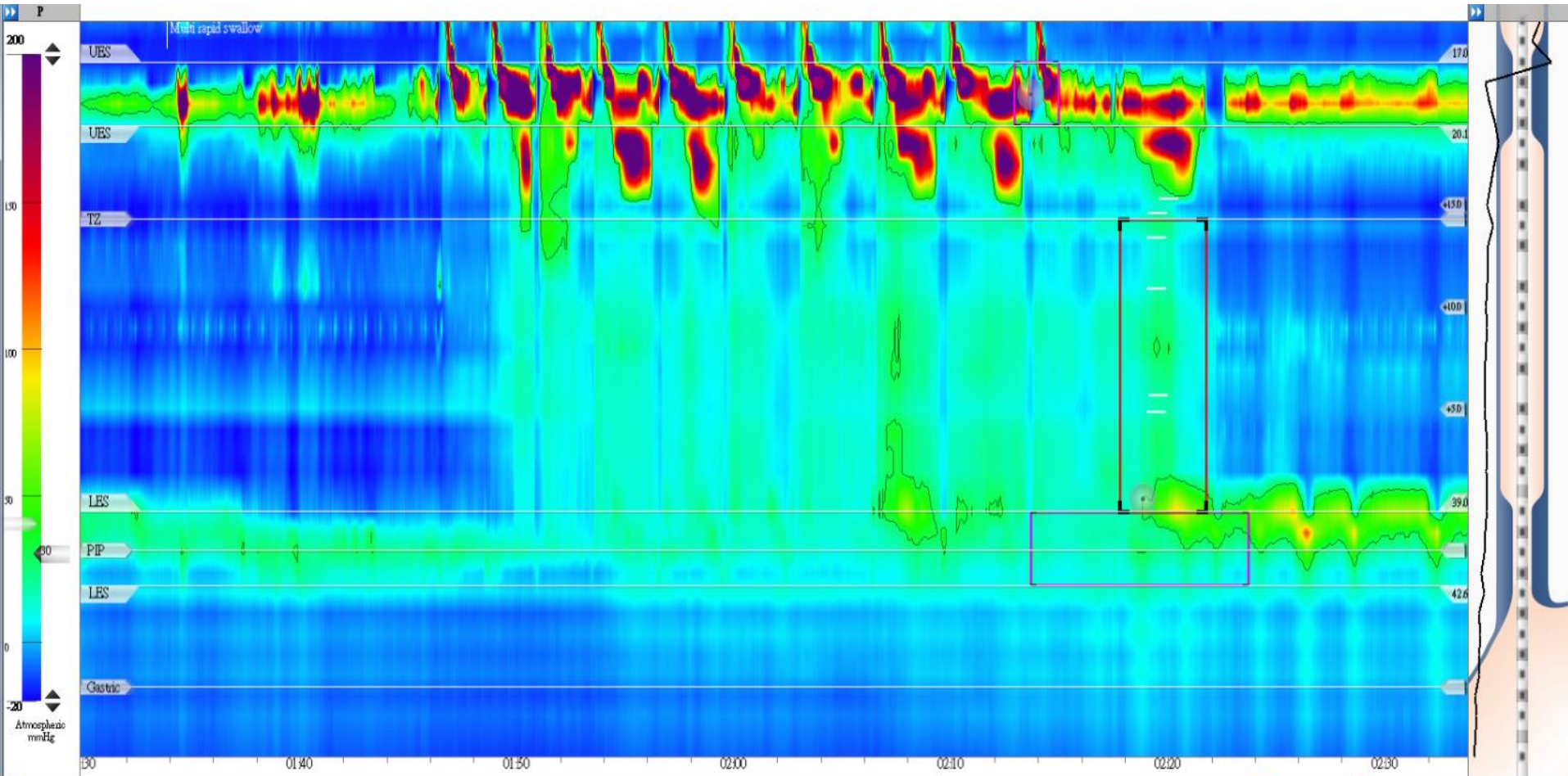
Bolus transit	Undefined
---------------	-----------

**Classification**

LES Obstruction3	<input checked="" type="checkbox"/> 是*
Chicago classification3	<input checked="" type="checkbox"/> EGI outflow obstruction*
LES Obstruction	<input checked="" type="checkbox"/> 是*
Bolus transit	Undefined



# HRIM on 2022/12/13



Multi rapid swallow [1]

Show in table Show in report Go to Overview

UES	
Upper border	17.0 cm
Lower border	20.1 cm
Length	3.1 cm
IRP 0.2 s	20 mmHg
IRP 0.4 s	48 mmHg
IRP 0.6 s	87 mmHg
IRP 0.8 s	114 mmHg

LES	
Upper border	39.0 cm
Lower border	42.6 cm
Length	3.6 cm
IRP 1 s	14 mmHg
IRP 2 s	14 mmHg
IRP 3 s	15 mmHg
IRP 4 s	15 mmHg
IRP > 5 s	16 mmHg

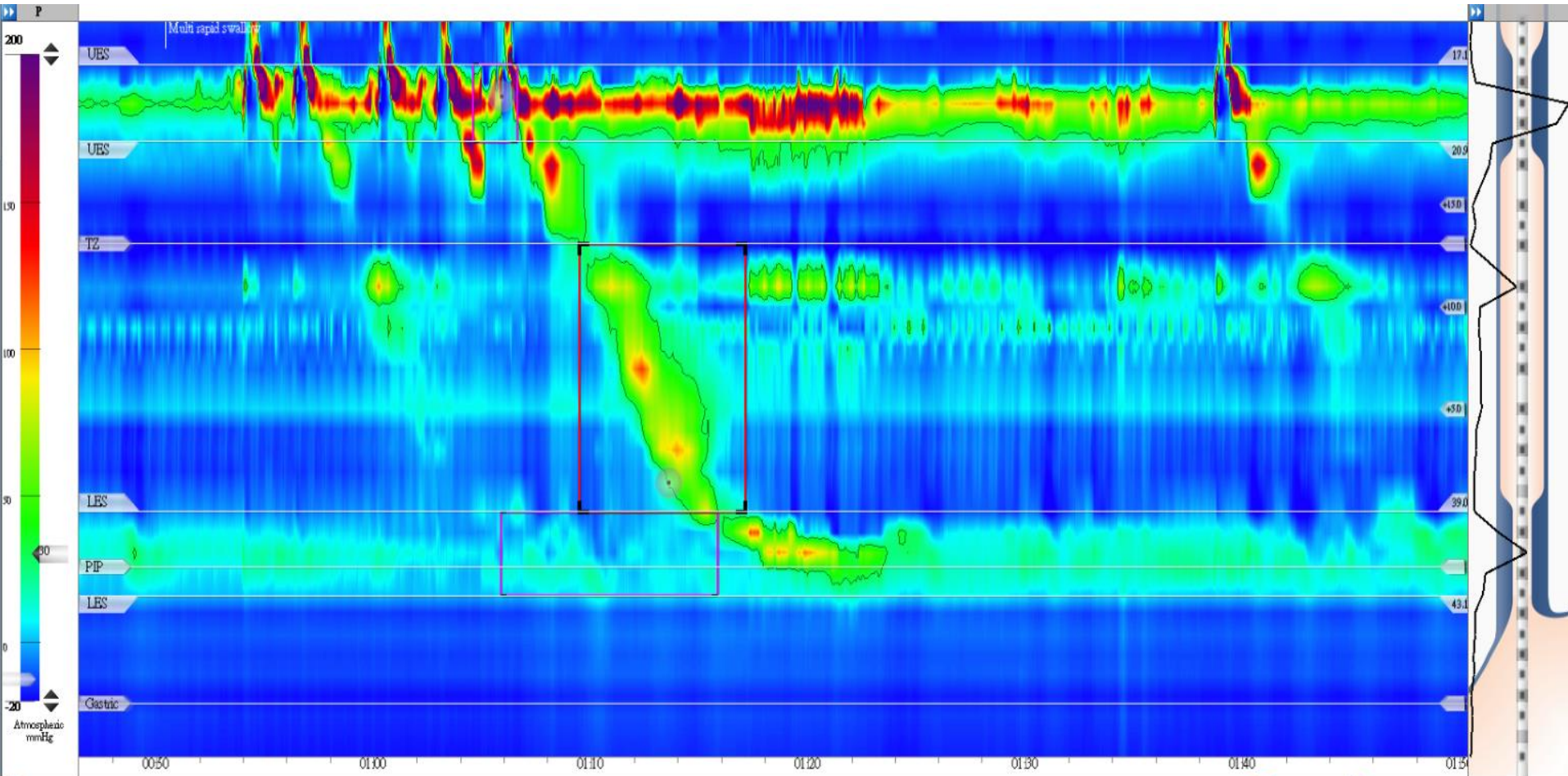
Esophagus	
DCI	161 mmHg.s/cm
DCIa	9 mmHg.s
Peristaltic breaks	3.7 cm
Distal Latency	5.2 s
Largest break	2.4 cm
DCI Exp.	270 mmHg.s/cm

阻抗  
Bolus transit  Undefined\*

Scoring  
 Intrabolus pressure pattern  Unknown pressurization\*  
 Contraction vigor  Weak\*  
 Contraction pattern3  Intact\*  
 Bolus transit  Undefined\*



# HRIM on 2022/12/13



Multi rapid swallow [1]

Show in table Show in report Go to Overview

## UES

Upper border	17.1	cm
Lower border	20.9	cm
Length	3.8	cm
IRP 0.2 s	21	mmHg
IRP 0.4 s	49	mmHg
IRP 0.6 s	69	mmHg
IRP 0.8 s	85	mmHg

## LES

Upper border	39.0	cm
Lower border	43.1	cm
Length	4.1	cm
IRP 1 s	19	mmHg
IRP 2 s	20	mmHg
IRP 3 s	21	mmHg
IRP 4 s	23	mmHg
IRP 5 s	24	mmHg

## Esophagus

DCI	1216	mmHg.s.cm
DCIa	67	mmHg.s
Peristaltic breaks	0.0	cm
Distal Latency	7.7	s
Largest break	0.0	cm
DCI Exp.	1273	mmHg.s.cm

## Scoring

Intrabolus pressure pattern	Unknown pressurization*
Contraction vigor	Normal*
Contraction pattern.3	Intact*
Bolus transit	Undefined*

## 阻抗

Bolus transit  Undefined\*

# HRIM 2022/12/13

## [INDICATIONS]

■ Refractory GERD

## [COMPLETENESS OF THE PROCEDURE]

■ Completed

## [RESULTS]

### 1. Resting measurements

#### ■ Resting pressure

Lower esophageal sphincter: ( 28 ) 10-45mmHg

Upper esophageal sphincter: ( 54 ) 33-180mmHg

#### ■ Location of upper margin

Lower esophageal sphincter: ( 39 )

Upper esophageal sphincter: ( 17 )

#### ■ Length

Lower esophageal sphincter: ( 4.3 ) 2.4-5.5cm

Upper esophageal sphincter: ( 4.3 )

### 2. Esophagogastric junction (EGJ) outflow & peristalsis during wet swallows

#### ■ Integrated relaxation pressure (IRP) (median)

Supine: ( 23.56 ) <21mmHg (by MMS HRIM)

Upright: ( 20.51 ) <15mmHg (by MMS HRIM)

#### ■ Distal contractile integral (DCI) (mean)

Supine: ( 687 ) 450-8000mmHg.s.cm

Upright: ( 570 ) 450-8000mmHg.s.cm

#### ■ Distal latency (mean)

Supine: ( 8.6 ) >4.5s

Upright: ( 9.4 ) >4.5s

#### ■ Multiple rapid swallows (MRS) (DCI ratio)

Supine: ( 1216 ) MRS DCI/( 687 ) Baseline DCI=( 1.77 )(Normal>1)

#### ■ Rapid drink challenge (RDC) (IRP ratio)

Upright: ( 15 ) RDC IRP/( 23.56 ) Baseline IRP=( 0.63 )(Normal <1)

### 3. Esophagogastric junction (EGJ) competence

#### ■ EGJ morphology (supine)

■ Type I (superimposed of LES and crural diaphragm)

#### ■ EGJ contractile integral

( 87 ) mm Hg·cm (supine) Normal range: 65 (47-95, 127) (median (IQR, 95%))

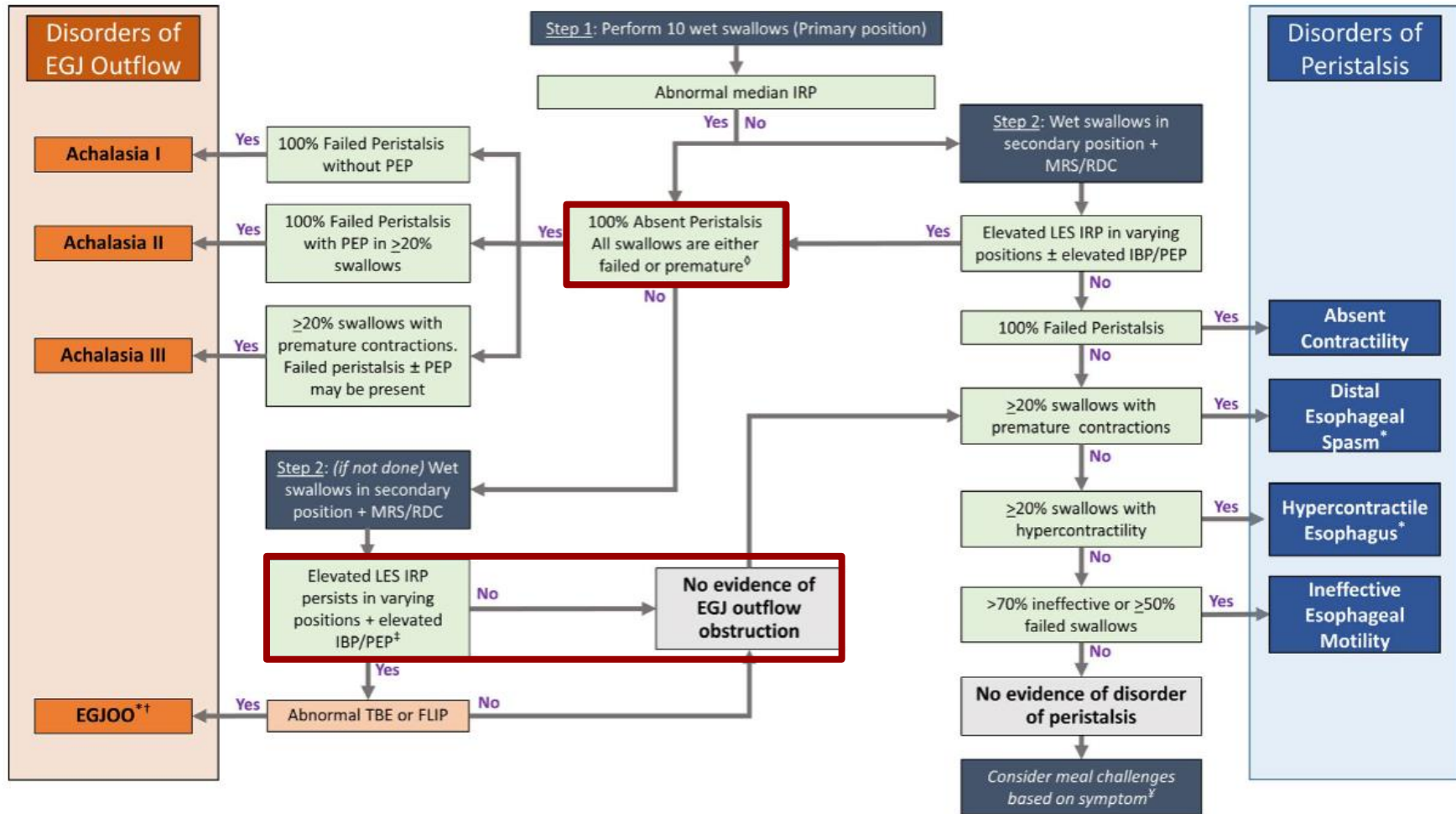
( 77 ) mm Hg·cm (upright)

## [CONCLUSIONS]

■ Normal esophageal motility

- IRP (integrated relaxation pressure) : LES relaxation.  
→ **Mild elevated in supine/upright position.**
- DL (distal latency) :  
lower esophagus peristalsis ability.
- DCI (distal contractile integral) :  
peristalsis contractile ability.  
→ **Normal esophageal motility**

# HRIM 2022/12/13



**Note:**

Supine 10 times Wet swallows: 60% Normal contraction, 40% Ineffective contraction.

Upright 10 times Wet swallows: 60% Normal contraction, 40% Ineffective contraction.

Supine position the median IRP elevated, but there is no intrabolous pressurization, no dysphageal and chest pain. The possibility of EGJ outflow obstruction is low.



# Bernstein test on 2022/12/13

First perfusion of 30 ml of normal saline for 5 min.

At ( 5 ) min ( 0 ) sec, ( 30 ) ml of normal saline produced

■No symptoms

Second perfusion of 30 ml of 1N HCL for 5 min.

At ( 10 ) min ( 0 ) sec, ( 15 ) ml of 1N HCL produced

■Regurgitation

■Other: Acid sensation

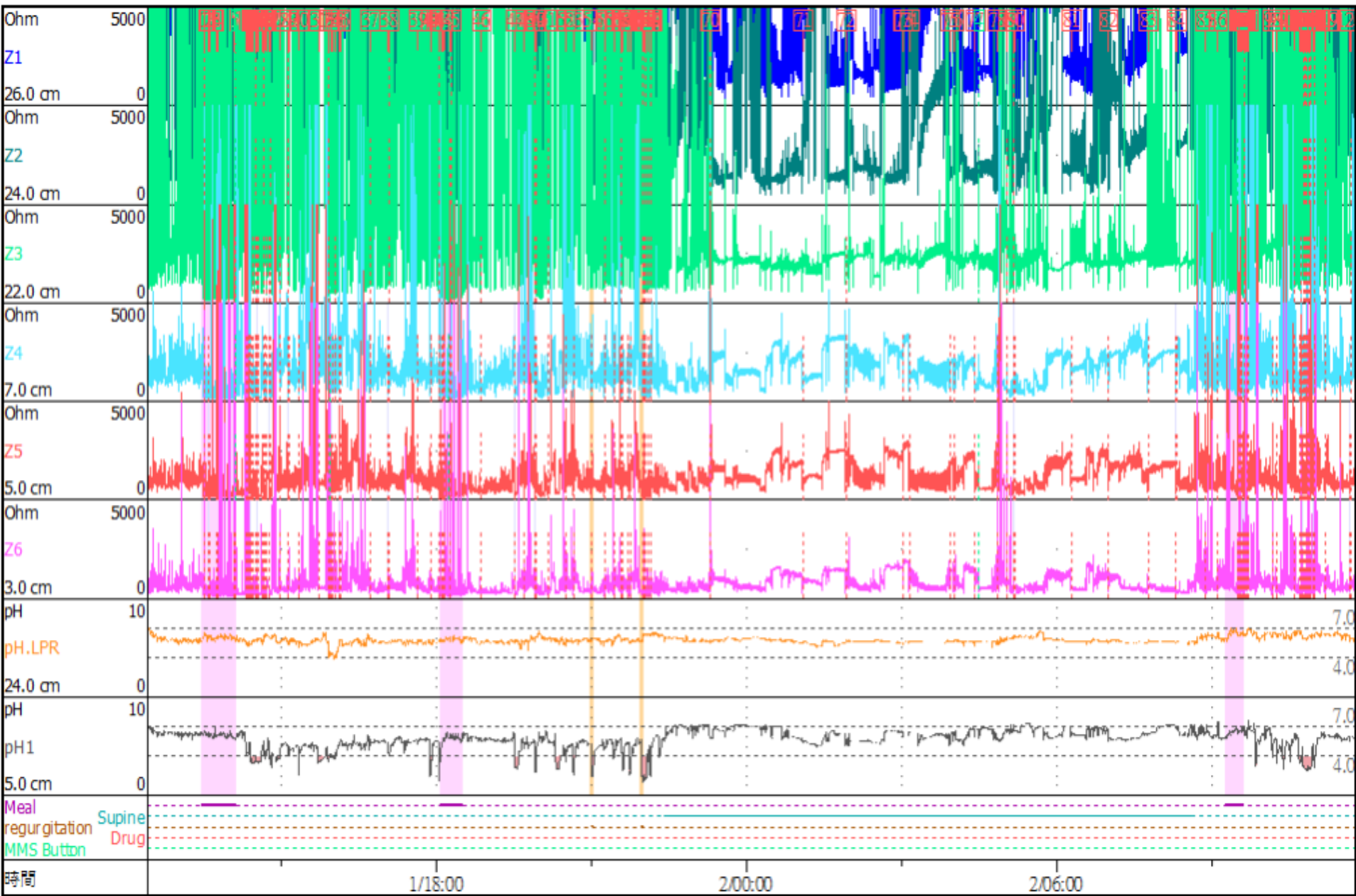
Are the symptoms resemble to the patient's previous complaints?

■Yes

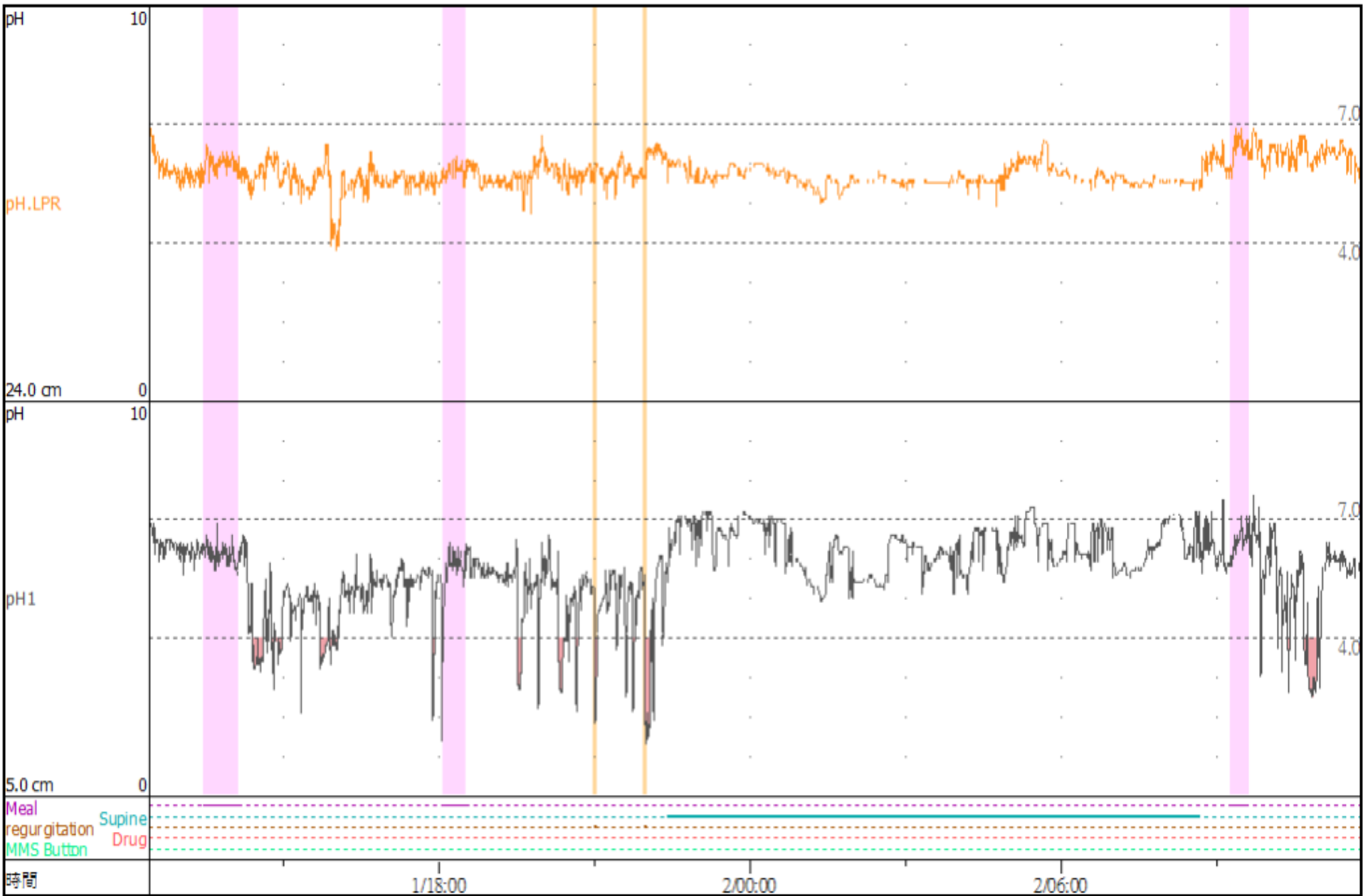
Conclusions:

■Positive

# MIIPH off PPI 2022/12/13



# MIIPH off PPI 2022/12/13





# MIIPH off PPI

## Symptom results - Channel: pH1

症状: regurgitation

#	Symptom time	pH 分析	阻抗分析		Total	
		Acid Reflux (pH < 4.0)	Acid Reflux (pH < 4.0)	Weakly acid (4.0 - 7.0)		Weakly alkaline (7.0 < pH)
1	1/21:01:00	+	+		+	
2	1/21:59:46	+	+		+	
Reflux periods		43	49	54	0	103
SI		100.0%	100.0%	0.0%	0.0%	100.0%
SSI		4.7%	4.1%	0.0%	- %	1.9%
SAP		99.7%	99.8%	0.0%	0.0%	98.6%

## DeMeester scoring results (Score according to DeMeester normal values)

Score component	Patient	Score	Mean	SD	
Total reflux time (Total)	6.6	4.74	1.51	1.36	Total %
Total reflux time (Upright)	12.7	5.44	2.34	2.34	Upright %
Total reflux time (Supine)	0.0	0.37	0.63	1.00	Supine %
Nr of reflux periods	48.6	3.32	19.00	12.76	in 24 hours
Nr of long reflux periods > 5 min.	5.6	5.07	0.84	1.18	in 24 hours
Longest reflux	10.3	1.46	6.74	7.85	min

DeMeester score: 20.39 (14.72 is upper limit of 95.0 percentile of normal)

## Adult scoring graphs

Score component	Patient	Normal			
Total reflux time (Total)	6.6	< 4.3		20	Total %
Total reflux time (Upright)	12.7	< 6.3		20	Upright %
Total reflux time (Supine)	0.0	< 1.3		20	Supine %
Nr of reflux periods	48.6	< 50.2		100	in 24 hours
Nr of long reflux periods > 5 min.	5.6	< 3.2		20	in 24 hours
Longest reflux	10.3	< 9.3		60	min

# MIIPH off PPI

## [INDICATIONS]

- Refractory GERD

This is a

- 24h hypopharyngeal multichannel intraluminal impedance-pH test

pH sensor:

- 2 pH located at
  - hypopharynx and distal esophagus: ( 1 ) cm above UES, ( 4 ) cm above LES

During the test, the patient was

- Off PPI

## [RESULTS]

- Acid-distal esophagus

- Acid %time distal

[Total] 6.6 (<4.2%) [Upright] 12.7 (<6.3%) [Supine] 0.0 (<1.2%)

- No. of reflux distal

[Total] 103 (<80) [Upright] 88 [Supine] 15

- Reflux clearance time (sec)

- Symptom index

[Total] 100% (<50%)

- Symptom association probability

[Total] 98.6% (<95%)

- DeMeester score

[Total] 20.39 (<14.7)

- Acid-pharynx

- Acid %time pharynx

[Total] 0.0 (<1.3%) [Upright] 0.0 (<1.3%) [Supine] 0.0 (<0.0%)

- No. of pharyngeal acid reflux (PAR)

[Total] 0 (<1) [Upright] 0 (<1) [Supine] 0 (<1)

- Impedance

- Impedance- distal esophagus

- Reflux %time

[Total] 1.68 (<1.4%) [Upright] 2.85 (<2.1%) [Supine] 0.34 (<0.7%)

## [SYMPTOM-REFLUX ASSOCIATION]

- Regurgitation

No. of symptoms related to acid reflux 2

No. of symptoms not related to reflux 0

Symptom index (<50%) 100%

## [CONCLUSIONS]

- Overlap between GERD and RH

# Present illness

**2019/05**

s/p Stretta at A H.

Symptom improved initially, but recurred.  
Complained of Insomnia.

**2022/07/19**

s/p Fundoplication for hiatal hernia  
at B H, but in vain.

**2022/11/28**

**AR, dry throat recurred**

→ Arrange EGD for r/o GERD.

→ HRIM, MII-pH : GERD.

→ **Dexlansoprazole 60mg QD on 2023/01**

→ **Biofermin 6 tab TID.**





# The Reflux Symptom Index (RSI)

The Reflux Symptom Index (RSI)		2022/12/13	2023/1/5	2023/2/7	2023/3/3
1	你有沙啞或聲音的問題	4	3	4	3
2	清喉嚨	1	2	3	3
3	過多喉嚨黏液或鼻涕倒流	1	2	3	3
4	吞嚥食物，液體或藥丸困難	0	0	0	0
5	進食或躺下後咳嗽	1	2	3	3
6	呼吸困難或噎到事件	1	2	3	3
7	令人討厭或惱人的咳嗽	1	2	3	3
8	有東西黏在你喉嚨或有塊狀物在你喉嚨的感覺	2	1	3	3
9	心灼熱，胸痛，消化不良或胃酸跑上來	1	3	3	3
	Total	12	17	25	24

the higher the score, the more severe the symptom.

# Reflux Disease Questionnaire (RDQ)

回想過去一個月，您認為以下症狀出現時的如何？		2022/12/13		2023/1/5		2023/2/7		2023/3/3	
程度：0-不會，5-重度 頻率：0-不會，5-每天		程度	頻率	程度	頻率	程度	頻率	程度	頻率
1	胸骨後方感到灼熱-----	0	0	0	0	0	0	0	0
2	胸骨後方感到疼痛-----	0	0	0	0	0	0	2	1
3	上腹中間感到灼熱-----	0	0	0	1	0	0	0	0
4	上腹中間感到疼痛-----	0	0	0	0	2	1	2	1
5	口腔內有酸味-----	4	5	3	5	3	5	3	5
6	有東西從胃部向上移動而感到不適	3	1	2	2	3	2	3	2
Total		13		12		13		13	

分數範圍: 0-40分 ; 正常值<12

# The GERDyzer

The GERDyzer (0-完全沒有 ; 10-很嚴重)		2022/12/13	2023/1/5	2023/2/7	2023/3/3
1	整體來說，過去7天您覺得如何？	10	5.8	6.8	6.6
2	過去7天，生病所帶來的痛苦/不適對您造成的影響有多大？	10	4.9	5.7	7.1
3	過去7天，生病對您身體健康造成的影響有多大？	10	4.5	5.4	7.3
4	過去7天，生病對您精神活力造成的影響有多大？	10	5.5	6.0	7.5
5	過去7天，生病對您日常活動造成的干擾有多大？	10	4.6	5.7	6.9
6	過去7天，生病對您休閒活動造成的干擾有多大？	9.9	5.3	5.6	6.6
7	過去7天，生病對您社交生活造成的干擾有多大？	10	4.7	5.5	7.2
8	過去7天，生病對您飲食習慣造成的干擾有多大？	9.8	5.0	6.0	7.0
9	過去7天，生病對您心情造成的影響有多大？	10	4.9	5.7	7.0
10	過去7天，生病對您睡眠造成的影響有多大？	9.9	5.8	6.2	7.4
	Total	69.7	35.6	41.3	49.3

Score range: 0-70, the higher the score, the worse the QoL.



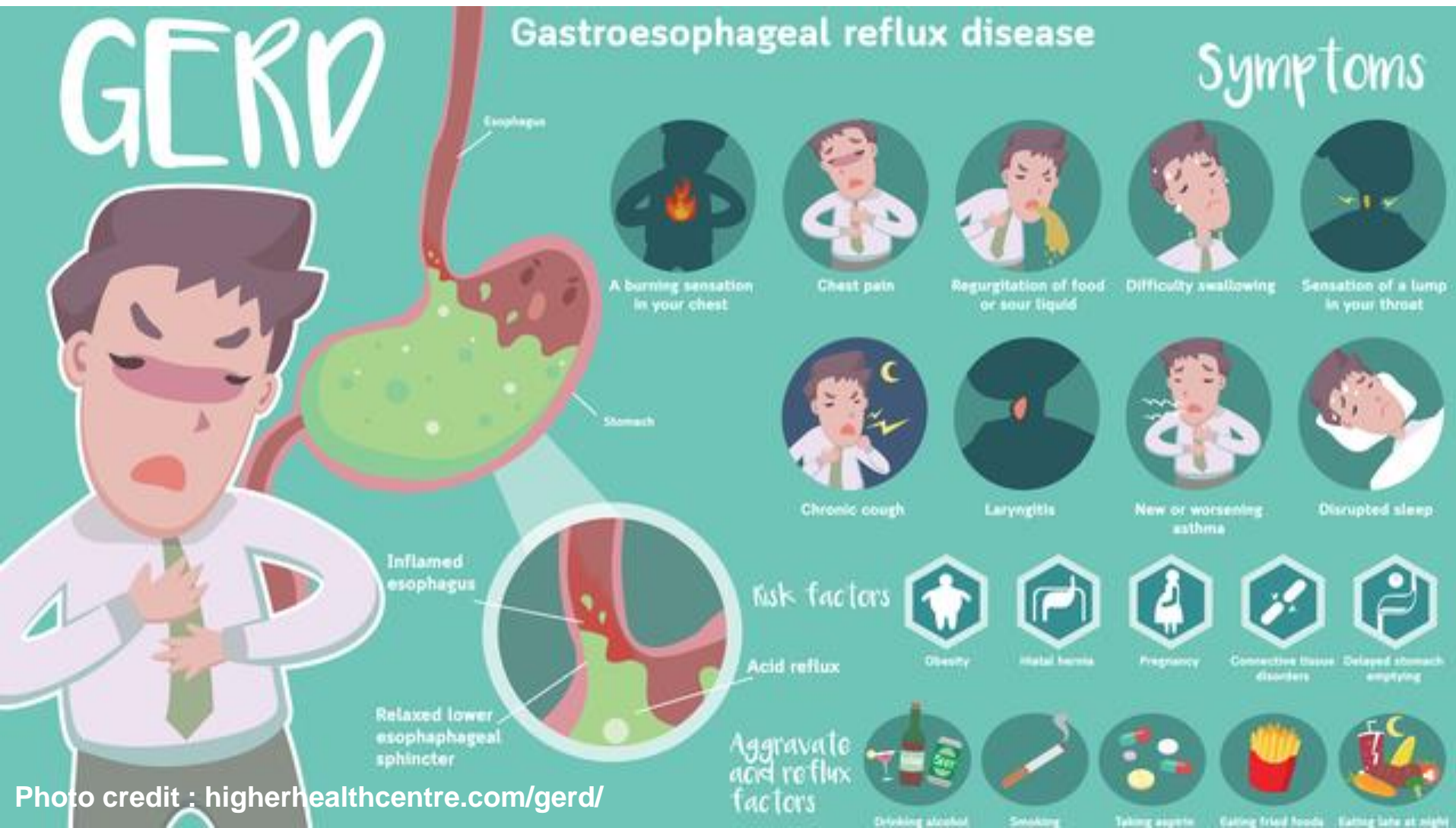
# 食道過度警覺及焦慮量表 (EHAS)

在過去一個月內，以下問題是否影響你？ (0-非常不同意；4-非常同意)		2022/12/13	2023/1/5	2023/2/7	2023/3/3
1	我似乎無法忘記我的症狀	4	2	2	0
2	我很難享受生活，因為我無法擺脫喉嚨/胸部/食道的不適	4	1	2	4
3	這些症狀很可怕，我覺得它們讓我不知所措	3	1	2	4
4	只要一醒來，我就會一整天擔心我的喉嚨/胸部/食道會感到不適	4	1	2	4
5	我經常會擔心喉嚨/胸部/食道的問題	4	1	2	2
6	這些症狀很可怕，我認為它們永遠不會改善	3	1	4	4
7	關於減輕症狀，我毫無辦法	4	4	4	4
8	當我喉嚨/胸部/食道不適時，我會感到害怕	4	4	4	4
9	我焦急地希望這些症狀消失	4	4	4	4
10	我很快就會注意到我的食道症狀的位置或範圍的變化	3	2	4	2
11	我會意識到我的食道有突然或暫時的變化	3	2	2	2
12	即使我忙於另一件事，我也會注意到我的症狀	3	2	2	4
13	我會專注於食道的感覺	2	2	2	3
14	我對心灼熱或胸痛等食道的感覺非常敏感	2	4	2	1
15	我會一直追蹤我症狀的程度	4	4	2	4
	Total	51	35	40	46

# Final diagnosis

1. Refractory GERD, r/o Fundoplication related, complicated with functional heartburn, s/p Stretta on 2019/05.
2. Hiatal hernia s/p Fundoplication on 2022/07/19.
3. Lung cancer, s/p operation on 2019.

# Discussion : Fundoplication related gastroparesis



# Association Between Laparoscopic Antireflux Surgery and Recurrence of Gastroesophageal Reflux

John Maret-Ouda, MD; Karl Wahlin, MSc, PhD; Hashem B. El-Serag, MD, MPH; Jesper Lagergren, MD, PhD

Table 2. Risk Factors for Recurrence of Reflux After Primary Laparoscopic Antireflux Surgery in 2655 Patients

	Patients, Total No. (%)	Recurrence, No. (%)			Adjusted HR (95% CI) for Overall Recurrence <sup>a</sup>
		Overall	Treated With Medication	Treated With Surgery	
<b>Sex</b>					
Male	1354 (51.0)	184 (13.6)	154 (11.4)	30 (2.2)	1 [Reference]
Female	1301 (49.0)	286 (22.0)	239 (18.4)	47 (3.6)	1.57 (1.29-1.90)
<b>Age, y</b>					
≤45	989 (37.3)	133 (13.4)	107 (10.8)	26 (2.6)	1 [Reference]
46-60	951 (35.8)	181 (19.0)	149 (15.7)	32 (3.4)	1.28 (1.02-1.61)
≥61	715 (26.9)	156 (21.8)	137 (19.2)	19 (2.7)	1.41 (1.10-1.81)
<b>Comorbidity score<sup>b</sup></b>					
0	1851 (69.7)	290 (15.7)	234 (12.6)	56 (3.0)	1 [Reference]
≥1	804 (30.3)	180 (22.4)	159 (19.8)	21 (2.6)	1.36 (1.13-1.65)
<b>Year of surgery</b>					
2005-2006	1098 (41.4)	177 (16.1)	138 (12.6)	39 (3.6)	1 [Reference]
2007-2009	802 (30.2)	146 (18.2)	123 (15.3)	23 (2.9)	1.61 (1.27-2.03)
2010-2014	755 (28.4)	147 (19.5)	132 (17.5)	15 (2.0)	3.86 (2.98-5.02)
<b>Hospital volume<sup>c</sup></b>					
≤24	266 (10.0)	38 (14.3)	30 (11.3)	8 (3.0)	1 [Reference]
25-75	863 (32.5)	161 (18.7)	144 (16.7)	17 (2.0)	1.13 (0.79-1.62)
≥76	1526 (57.5)	271 (17.8)	219 (14.4)	52 (3.4)	1.09 (0.77-1.53)

- Retrospective cohort study (Sweden) 2005/01-2014/12
- 2655 underwent laparoscopic ARS
- Risk factors for recurrence :**
- **Female sex** (hazard ratio [HR], 1.57 [95% CI, 1.29-1.90]).
- **Older age** (HR, 1.41 [95% CI, 1.10-1.81])
- **Comorbidity** (HR, 1.36 [95% CI, 1.13-1.65] for Charlson comorbidity index score 1 compared with 0.
- **Hospital volume of antireflux surgery was not associated with risk of reflux recurrence** (HR, 1.09 [95% CI, 0.77-1.53]).



ABSTRACTS: ACCEPTED: STOMACH

## Abnormal Gastric Emptying is Common After Nissen Fundoplication

1226

Versha, Fnu MD; Laique, Sobia Nasir MD; Gabbard, Scott MD

**The effects on gastric motility following surgical fundoplication :**

→ **Proposed mechanisms : impaired post-prandial fundic accommodation and vagal nerve injury.**

Method : Patient received Nissen fundoplication at Cleveland Clinic, 2001/03-2013/12

**Pre- and post-operative gastric emptying scintigraphy :**

→ oral ingestion of 1 millicuries of 99m technetium sulfur colloid mixed with a standardized egg meal followed by imaging at 0, 1, 2 and 4 hours post ingestion.

**Rapid gastric emptying :** < 30% gastric retention at 1 hour

**Gastroparesis :** retention of >10% at four hours

[1226\_B] Change in gastric emptying post Nissen Fundoplication

	pre-operative GES	Postoperative GES
Normal, n (%) 97	70 (72.65)	56 (57.73)
Gastroparesis	22 (22.7)	31 (32.0)
Rapid	5 (5.154)	10 (10.3)

## Prolonged complications of laparoscopic fundoplication :

### 1. Structural complications (laxity) of fundoplication :

- **30% hiatal hernia** are often related to surgical positioning or construction of the wrap.
- Durability weakens due to mechanical stress of GE pressure gradient and dynamic axial movement during swallowing and reflux.
- Exacerbated by intermittent abdominal strain such as from coughing, abdominal exercises, heavy lifting.

### 1-1. Recurrence of or persistent GERD symptoms :

- primary indication for reoperation
- common among **females, elders or comorbidities**

### 1. Functional abnormalities.

- Dysphagia due to esophageal dysmotility
- Gas-bloat syndrome.

**Table 2** Rates of complications following antireflux surgery

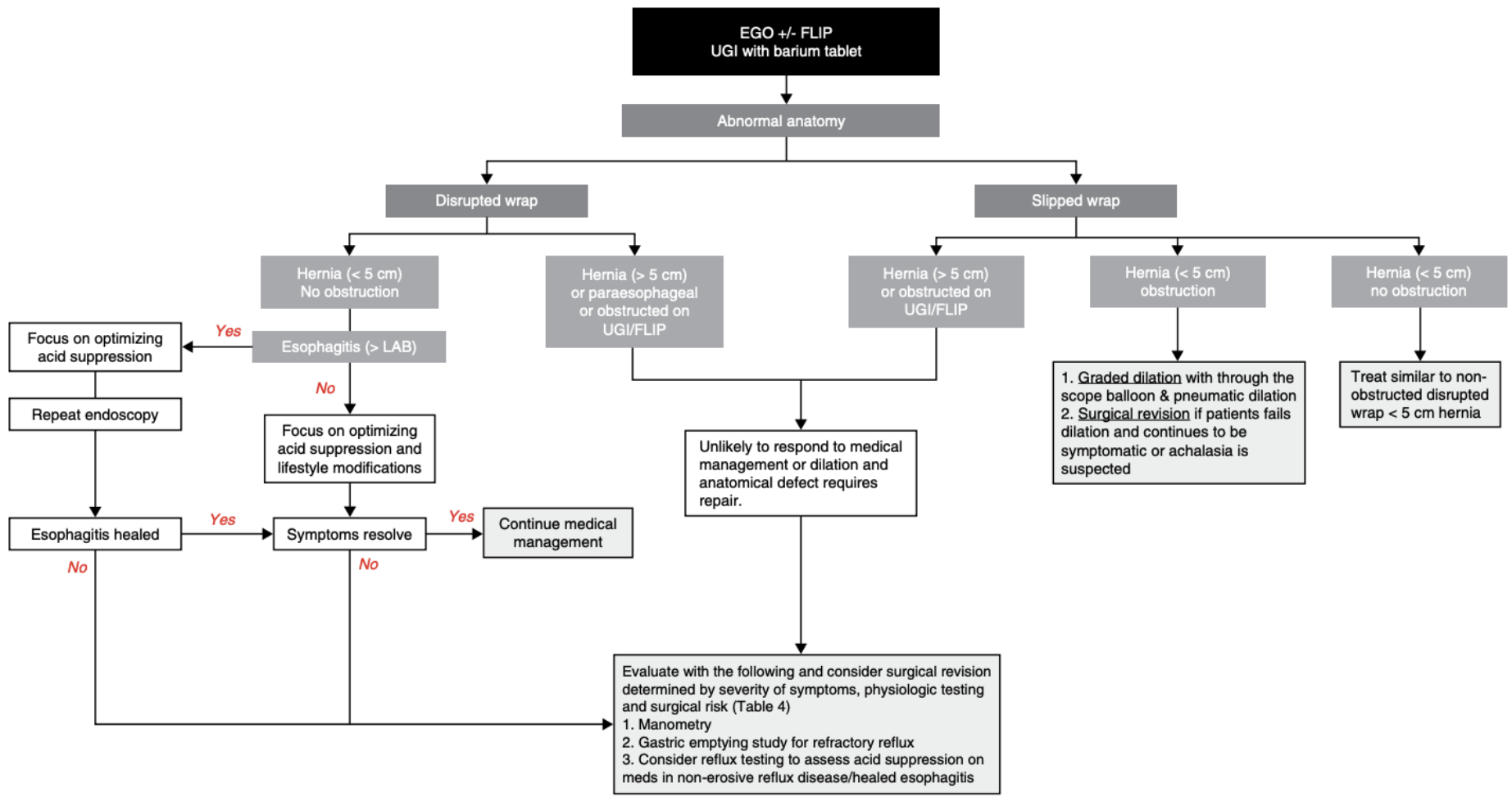
Complication	Reported rates
<b>Primary fundoplication</b>	NIS database 2010 <i>n</i> = 18,780
Acute postoperative complications (within 30 days)	4.1% [27] ( <i>n</i> = 769)
30-Day surgical mortality	0.1 to 0.2% [26, 27] ( <i>n</i> = 19 to 38)
Infection	1.1% [27] ( <i>n</i> = 207)
Bleeding	0.9% [27] ( <i>n</i> = 169)
Esophageal perforation	0.9% [27] ( <i>n</i> = 169)
Acute postoperative dysphagia	50% [28, 30] ( <i>n</i> = 9390)
Failure of fundoplication: wrap herniation, pouch formation, paraesophageal herniation	2 to 23% [23, 27] ( <i>n</i> = 376 to 4319)
Post-fundoplication stenosis	10% ( <i>n</i> = 1878)
Post-fundoplication dilation rate	2.8% [23] ( <i>n</i> = 530)
Gas-bloat syndrome	10 to 32% [23, 42, 43] ( <i>n</i> = 1878 to 6010)
Esophageal dysmotility	
Chest pain	
Diarrhea	18 to 33% [40, 44] ( <i>n</i> = 3380 to 6197)

**Table 3 Mechanisms of post-fundoplication symptoms**

Mechanism	Post-fundoplication symptoms						
	Dysphagia	Regurgitation	Heartburn	Esophagitis stricture	Chest pain	Dyspepsia/ Gas-bloat	IBS/Diarrhea
<b>Mechanical</b>							
Tight fundoplication; no hernia	++	+	–	–	++	++	–
Disrupted fundoplication/laxity; no hernia	+	++	++	++	+	–	–
Slipped wrap with/without hernia	++	++	+	++	++	+	–
Paraesophageal herniation type II/III/IV (new/recurrent)	++	++	++	++	+	+	–
<b>Esophageal dysmotility</b>							
Primary or pseudo-achalasia	++	++	+	–	++	+	–
Hypercontractility/esophageal spasm	+	+	+	–	+	–	–
Reduced preoperative esophageal peristaltic vigor	+	+	+*	+*	+*	–	–
<b>Functional</b>							
Hypersensitivity/functional esophageal syndrome	+	+	+	–	+	+	+
Vagal nerve injury	–	+*	+*	+*	+*	++	+
Accelerated gastric emptying	–	–	–	–	–	+	++

Association of mechanism with symptom if present: ++ strongly associated, + may be associated, – likely not associated

\*May be associated if abnormal reflux is occurring due to a disrupted wrap, but if abnormal reflux is not occurring likely not associated





# Back to out patient

1. Refractory GERD, r/o fundoplication related, complicated with functional heartburn.
  - Pro-kinetics agent could be beneficial in this case for possible explanation of gastroparesis after fundoplication surgery.
  - Re-operation could be limited efficacy due to normal HRIM result.
  - Manometry, MII-PH assessment of refractory GERD is important for etiology confirmation.

**Thank you for  
your listening**