Oesophagus
Fysiologi, pH-måling, manometri

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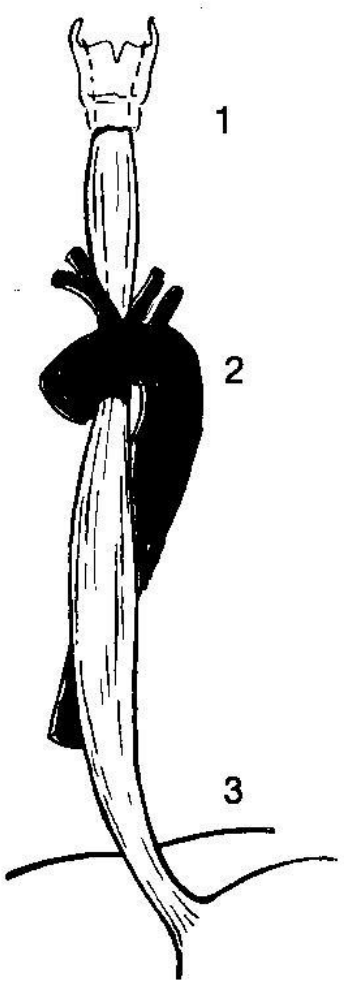
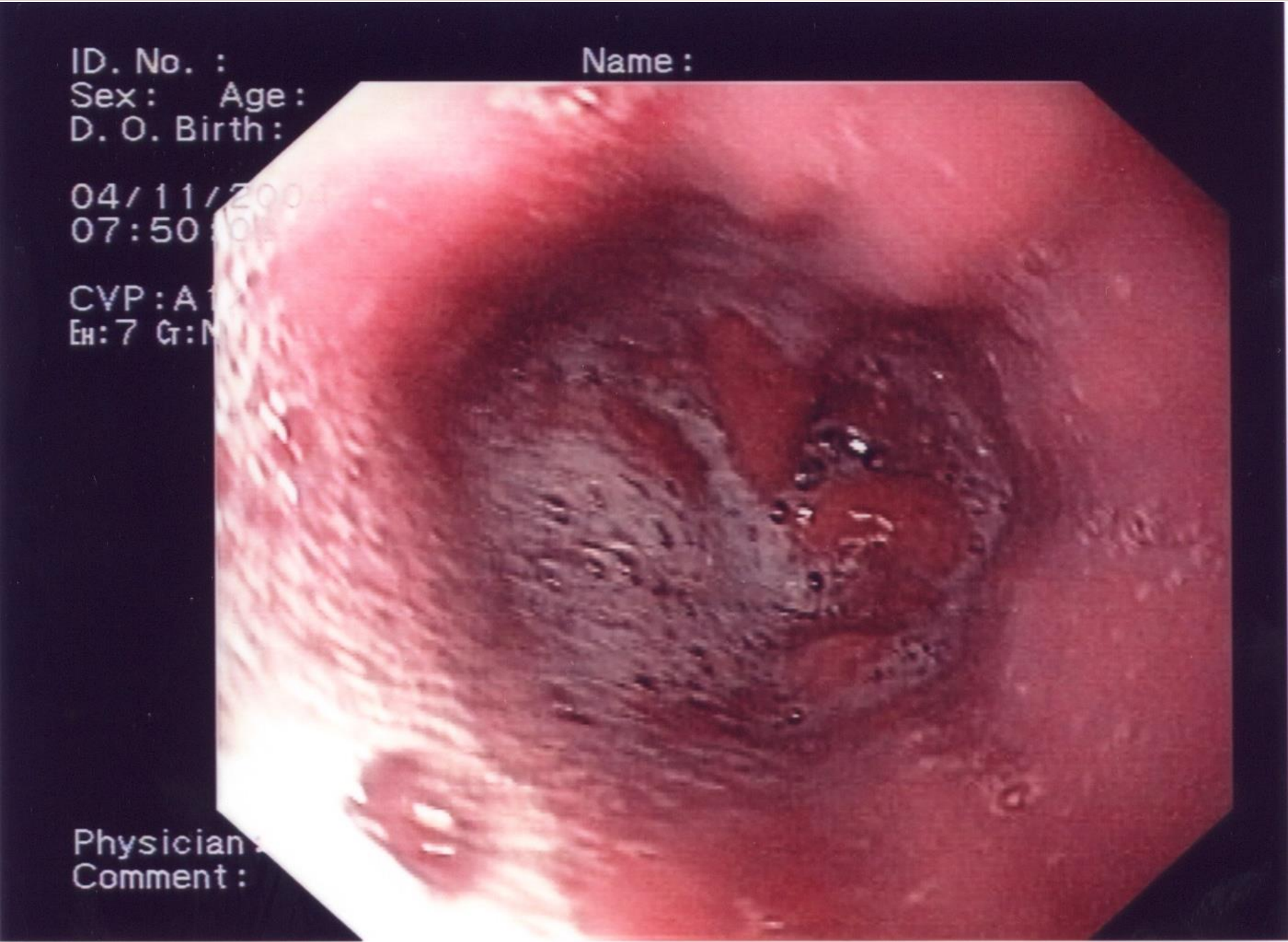
02.05.22

Anatomi



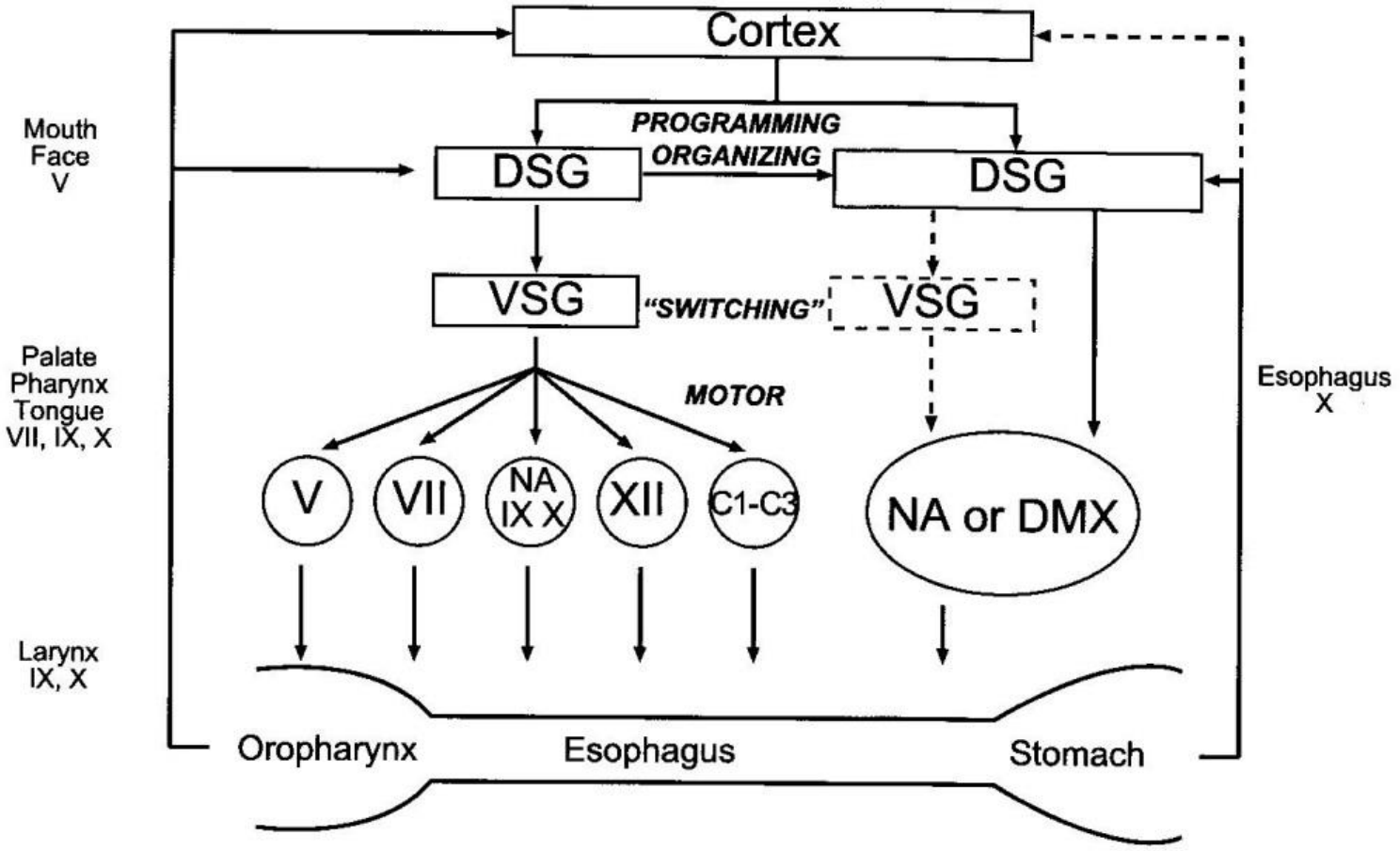
- Begrenset av proksimale og distale sfinktre
- 3 trange steder:
  - UES
  - LES
  - Aortabuen


ID. No. :
Name :
Sex : Age :
D. O. Birth :
CVP : A
Physician :
Comment :

Funksjoner

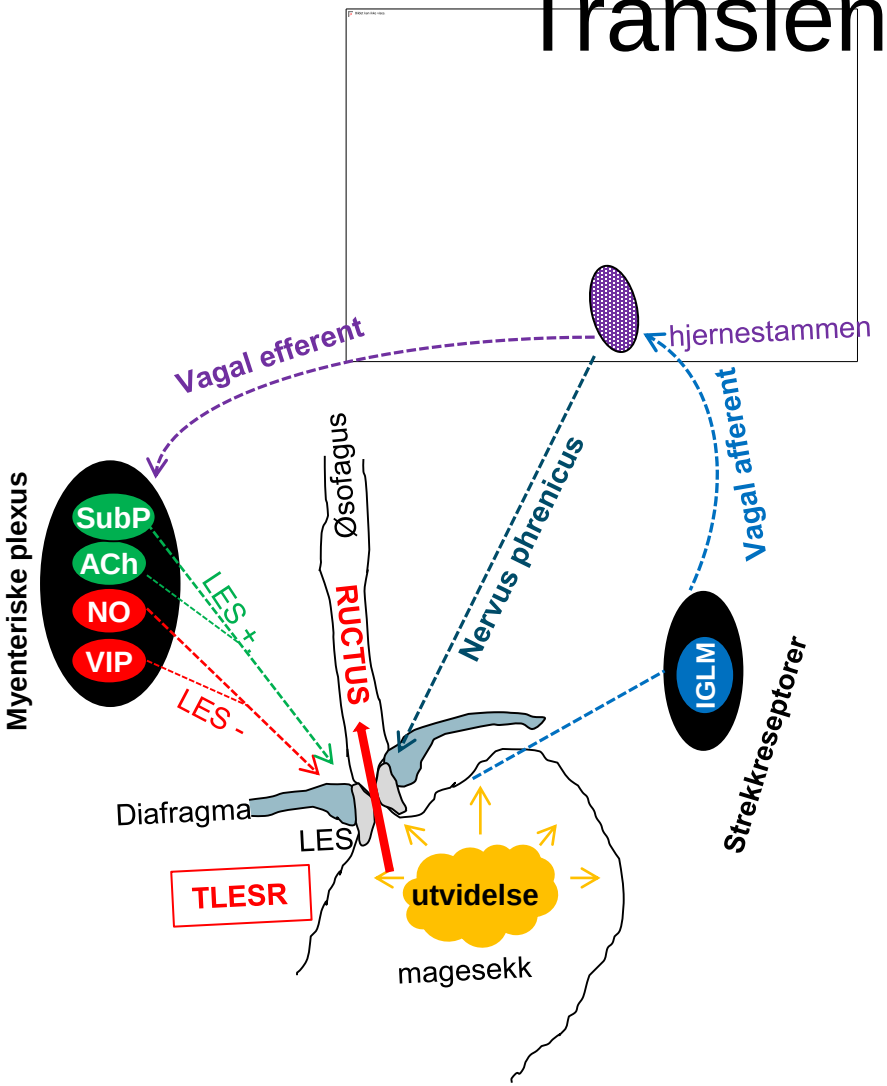
- Motilitet
  - transport
    - peristaltikk med relaksasjon av sfinktre
    - retroperistaltikk
    - tillate ructus
  - forsvar
    - sfinktre mot refluks / aspirasjon
    - drenasje av refluksat
    - slimdannelse, nøytralisering ved spytt

Kontroll av svelgmekanismene

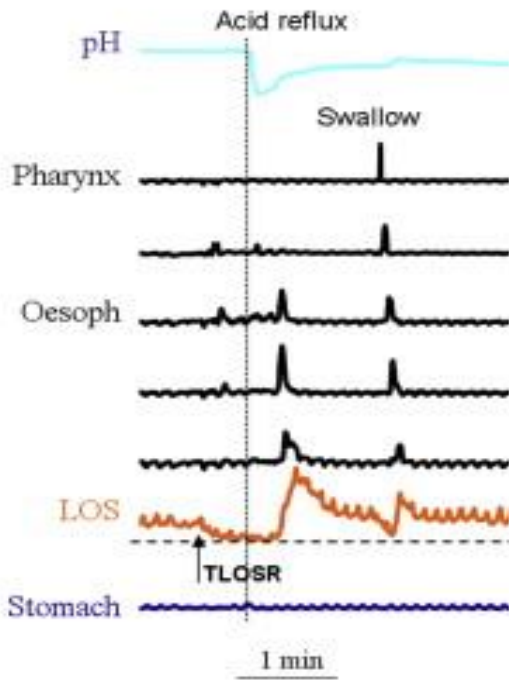


Fra: Richter og Castell, The Esophagus, 2011

Transient LES Relaxations



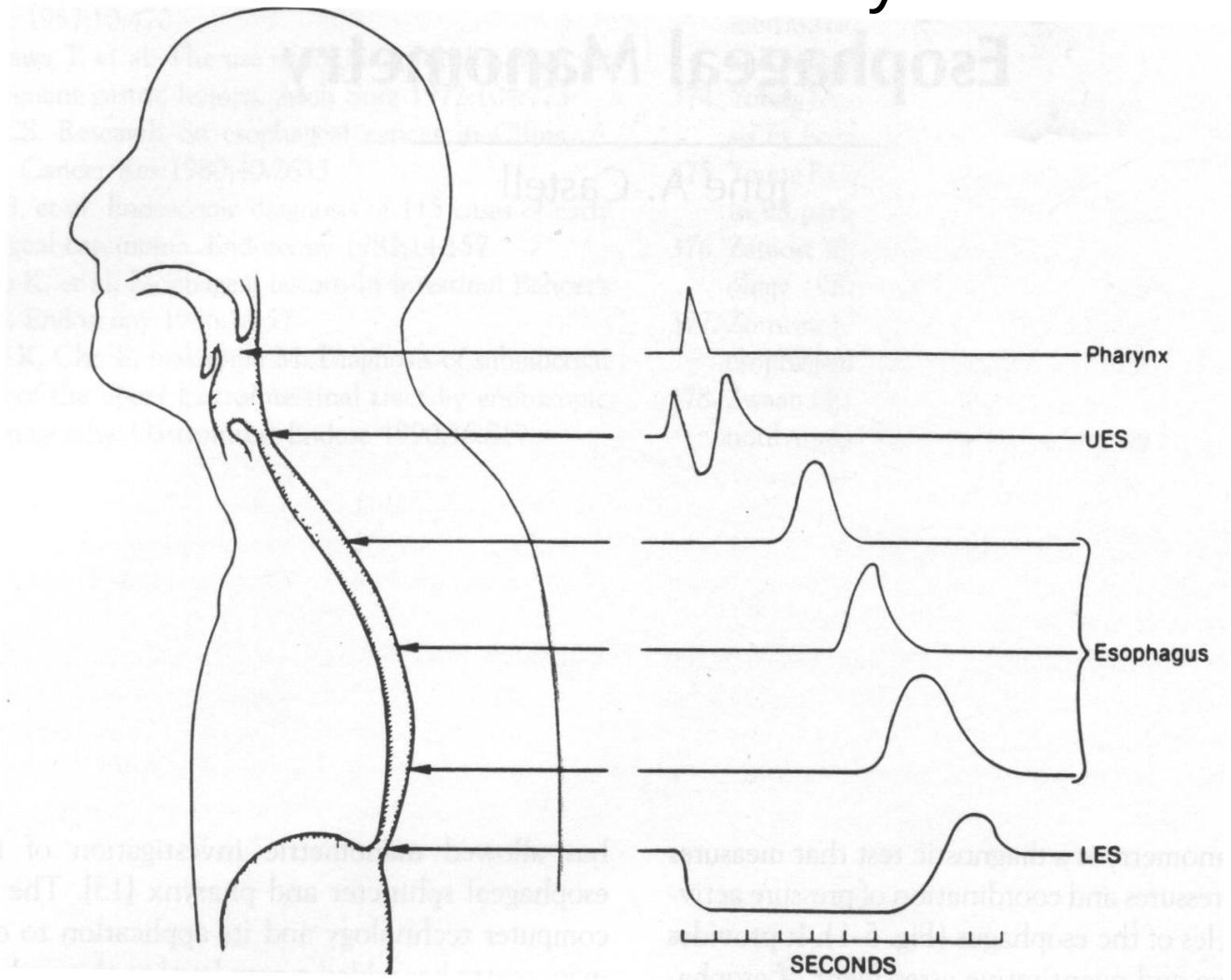
- Overgående relaksasjon av LES, som ikke er svelging
- Normal fysiologisk prosess – ventilere luft
- CNS mediert vaso-vagal refleks, som utløses av utvidelse av magesekk



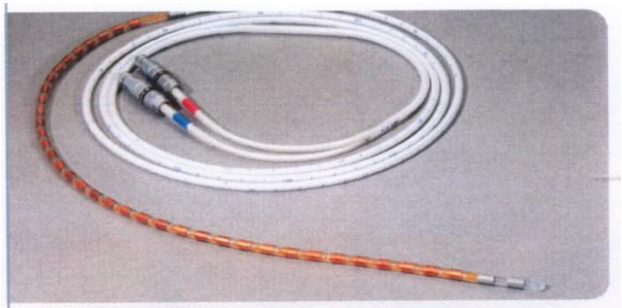
Videortg av pharynx / oesophagus

Dynamisk svelgundersøkelse

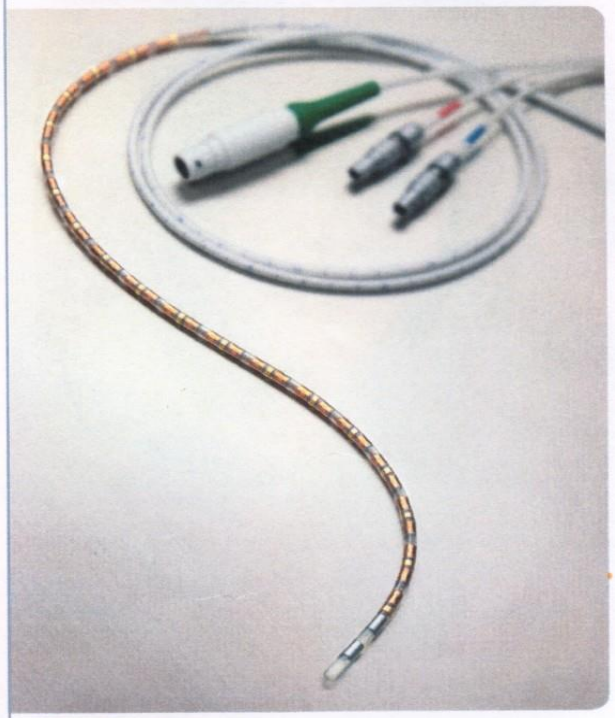
Manometry of the Oesophagus



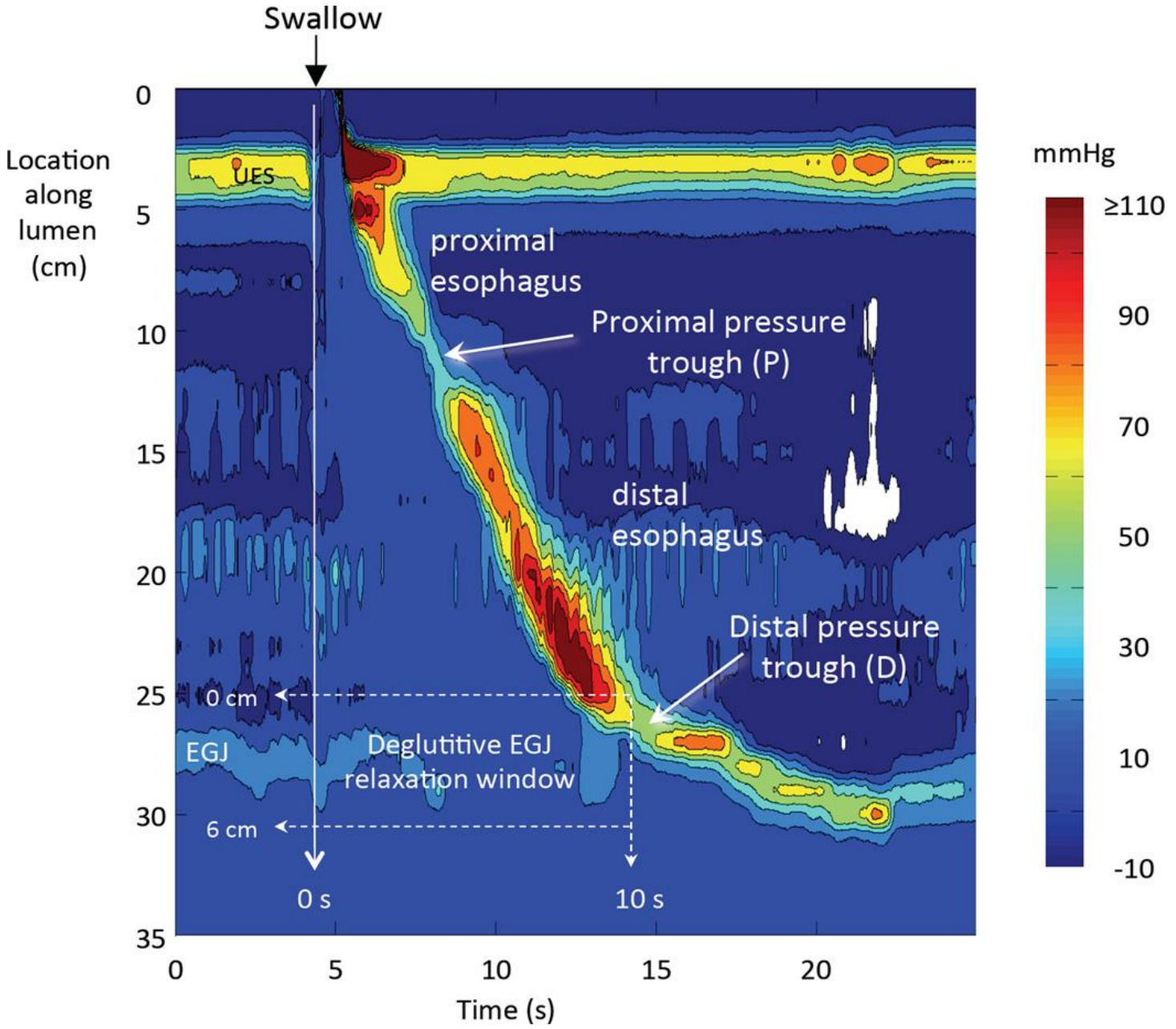
Utstyr for HR manometri



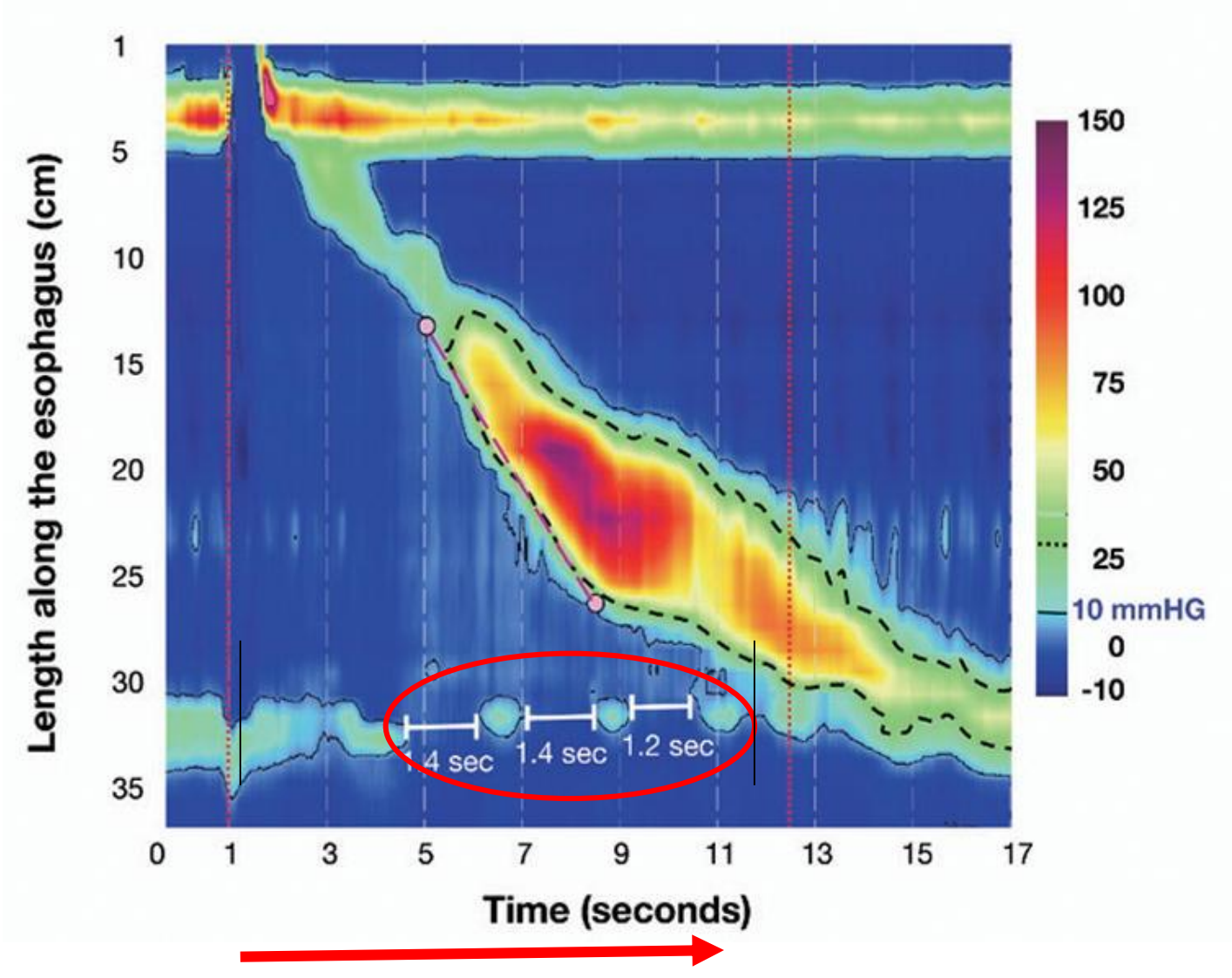
ManoScan Catheter



ManoScan Z Catheter


Swallow
Location along lumen (cm)
0
5
10
15
20
25
30
35
UES
proximal esophagus
Proximal pressure trough (P)
distal esophagus
Distal pressure trough (D)
0 cm
EGJ
Deglutitive EGJ relaxation window
6 cm
0 s
10 s
0
5
10
15
20
Time (s)
mmHg
≥110
90
70
50
30
10
-10

IRP – integrated relaxation pressure
The electronic ”sleeve” - eSleeve



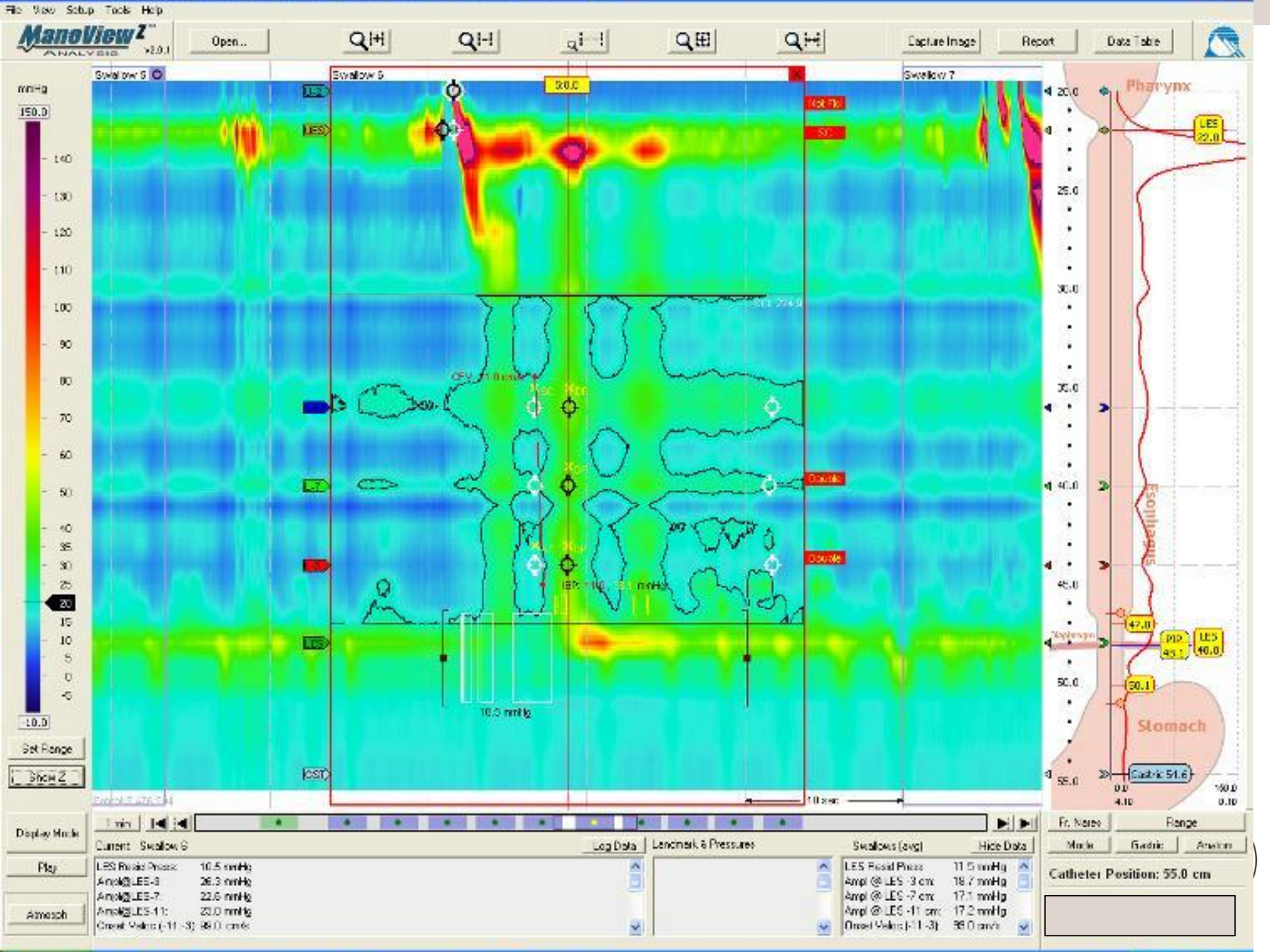
The average pressure within the 4 sec with the lowest pressure during a 10 sec period, starting at the UES relaxation.

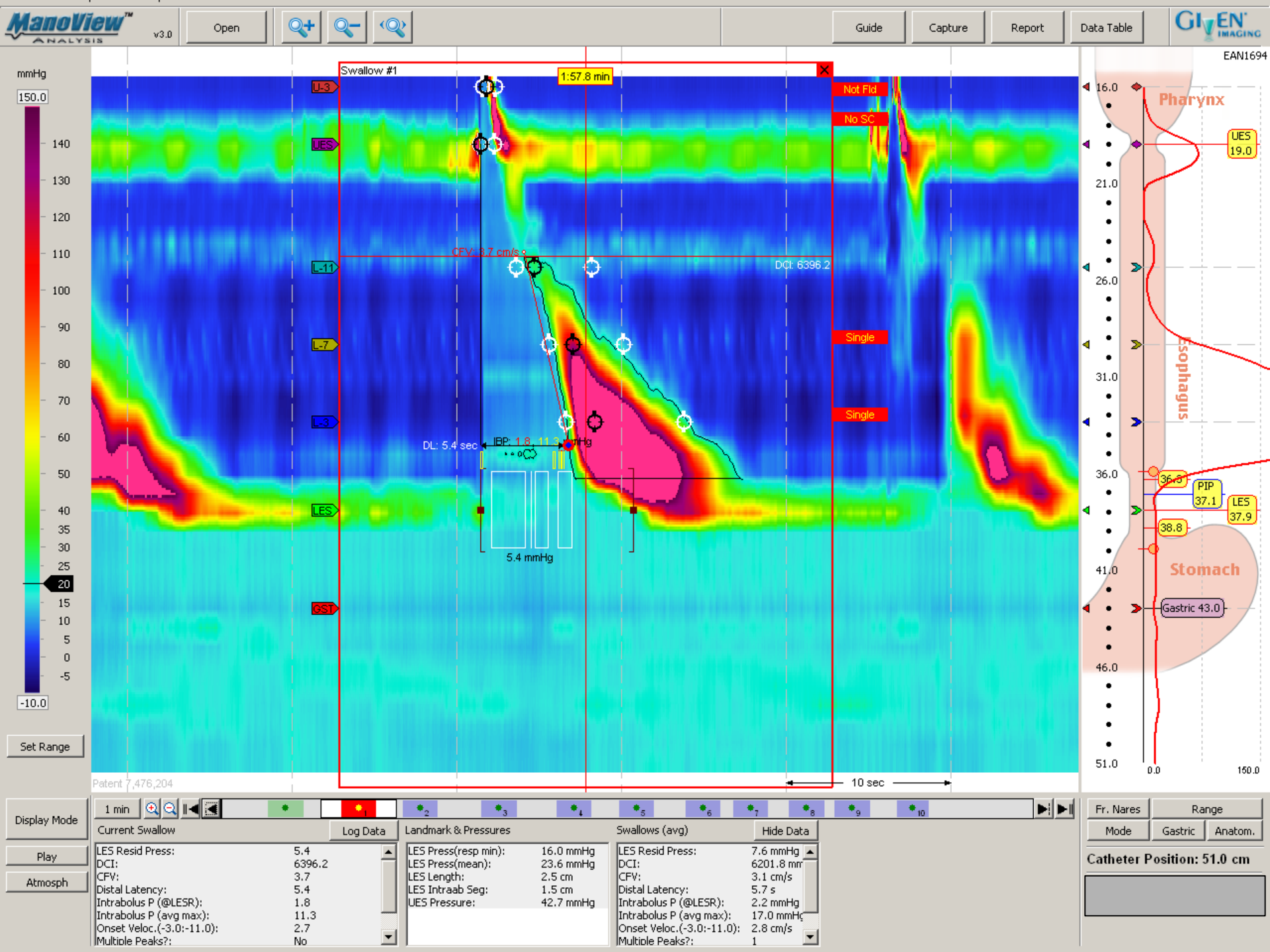
The axial extent is defined by setting the landmarks, but must include the crus as well

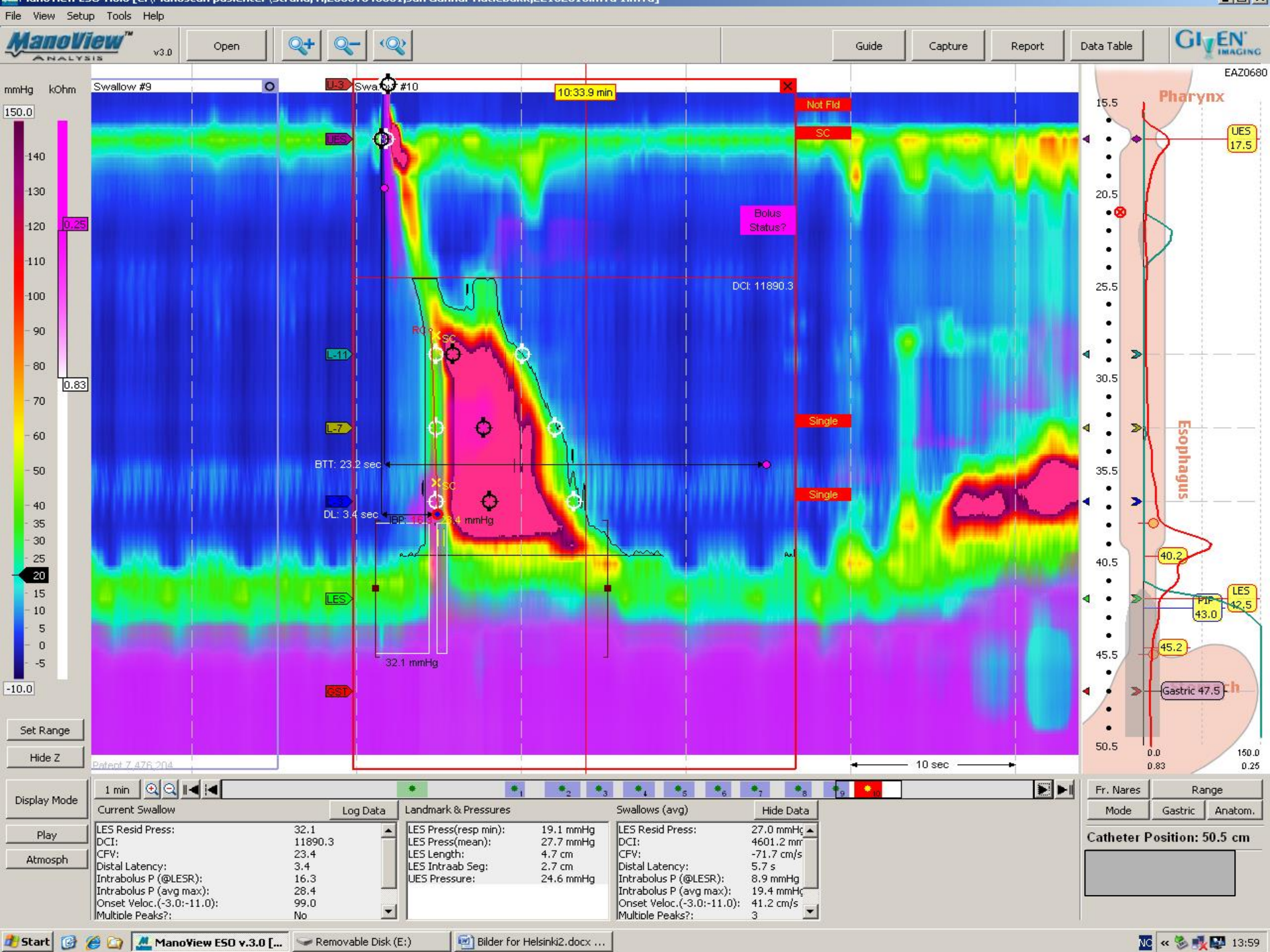
Indikasjoner for manometri:

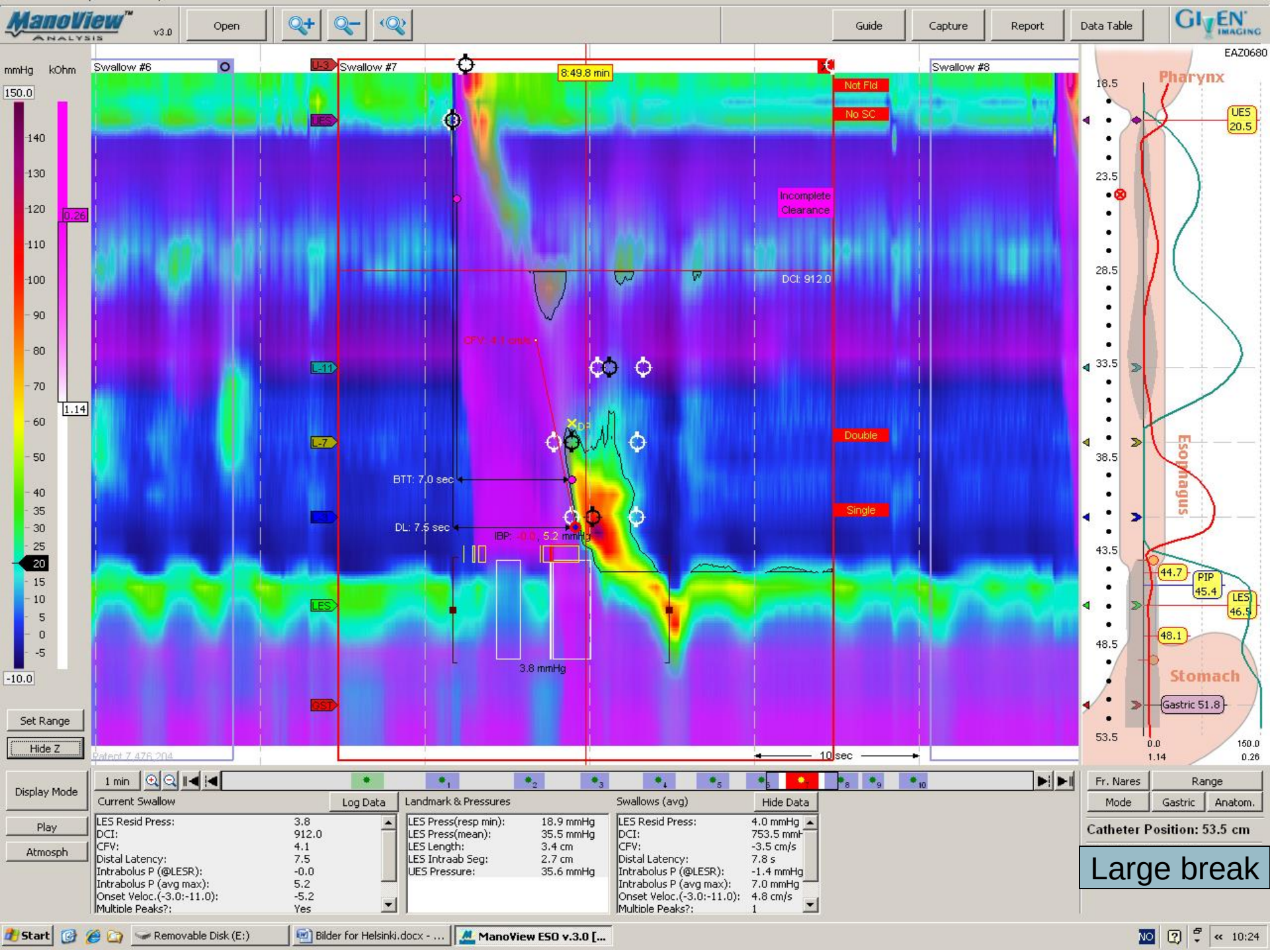
- Dysphagi (ved normal endoskopi)
  - UES-evaluering
  - Peristaltikk
  - LES relaksasjon
- Refluksykdom
  - pH-kateterplassering
  - ved terapisvikt
  - før antirefluksskirurgi
  - mistanke om sclerodermi / MCTD

- Brystsmerter av ukjent årsak
- Primære motilitetsforstyrrelser
  - provokasjon med medikamenter / syre
- Utelukke systemsykdom
  - Pseudoobstruksjon
  - sclerodermi / MCTD
- Diff.diagnose ved anorexi/bulemi?


File View Setup Tools Help
ManoView Z
ANALYSIS
Open...
Capture Image
Report
Data Table
Swallow 6
Swallow 8
Swallow 7
mmHg
150.0
140
130
120
110
100
90
80
70
60
50
40
35
30
25
20
15
10
5
0
-5
-10.0
UES
LES
GST
Set Range
Show 2
Display Mode
Play
Atmosph
Pharynx
LES
22.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
Esophagus
47.0
PIP
45.1
LES
40.0
50.1
Stomach
Cardia 54.6
10.0 mmHg
1 min
Current: Swallow 6
Log Data
Landmark & Pressures
Swallows (avg)
Hide Data
LES Resid Press: 10.5 mmHg
Ampl@LES-3: 26.3 mmHg
Ampl@LES-7: 22.6 mmHg
Ampl@LES-11: 23.0 mmHg
Onset Velocity (-11 -3): 84.0 cm/s
LES Resid Press 11.5 mmHg
Ampl @ LES -3 cm: 18.7 mmHg
Ampl @ LES -7 cm: 17.1 mmHg
Ampl @ LES -11 cm: 17.2 mmHg
Onset Velocity (-11 -3): 99.0 cm/s
Fr. Notes
Range
Mode
Guide
Analysis
Catheter Position: 55.0 cm


ManoView™ ANALYSIS
v3.0
Open
Guide
Capture
Report
Data Table
GIVEN IMAGING
EAN1694
mmHg
150.0
-10.0
Set Range
Swallow #1
1:57.8 min
U-3
UES
L-11
L-7
L-3
LES
GST
Not Fld
No SC
Single
Single
CFV: 3.7 cm/s
DCI: 6396.2
DL: 5.4 sec
IBP: 1.8, 11.3 mmHg
5.4 mmHg
10 sec
Patent 7,476,204
Pharynx
Esophagus
Stomach
UES 19.0
PIP 37.1
LES 37.9
38.8
Gastric 43.0
Display Mode
Play
Atmosph
1 min
Current Swallow
Log Data
LES Resid Press: 5.4
DCI: 6396.2
CFV: 3.7
Distal Latency: 5.4
Intrabolus P (@LESR): 1.8
Intrabolus P (avg max): 11.3
Onset Veloc.(-3.0:-11.0): 2.7
Multiple Peaks?: No
Landmark & Pressures
LES Press(resp min): 16.0 mmHg
LES Press(mean): 23.6 mmHg
LES Length: 2.5 cm
LES Intraab Seg: 1.5 cm
UES Pressure: 42.7 mmHg
Swallows (avg)
Hide Data
LES Resid Press: 7.6 mmHg
DCI: 6201.8 mm
CFV: 3.1 cm/s
Distal Latency: 5.7 s
Intrabolus P (@LESR): 2.2 mmHg
Intrabolus P (avg max): 17.0 mmHg
Onset Veloc.(-3.0:-11.0): 2.8 cm/s
Multiple Peaks?: 1
Fr. Nares
Range
Mode
Gastric
Anatom.
Catheter Position: 51.0 cm

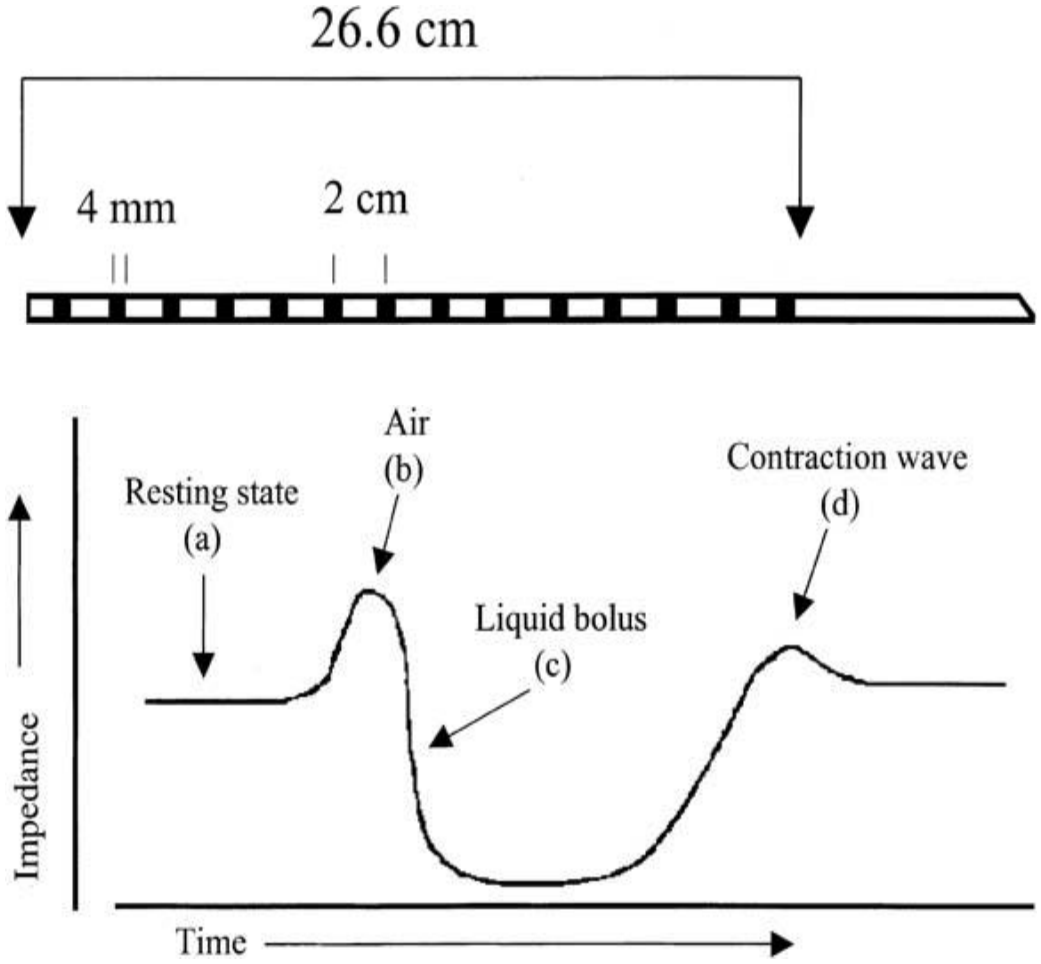

File View Setup Tools Help
ManoView ANALYSIS v3.0
Open
Guide
Capture
Report
Data Table
GIVEN IMAGING
mmHg kOhm
150.0
140
130
120
110
100
90
80
70
60
50
40
35
30
25
20
15
10
5
0
-5
-10.0
0.25
0.83
Swallow #9
Swallow #10
10:33.9 min
Not Fld
SC
Bolus Status?
DCI: 11890.3
RC
SC
Single
Single
BTT: 23.2 sec
DL: 3.4 sec
3.4 mmHg
32.1 mmHg
10 sec
EAZ0680
Pharynx
Esophagus
15.5
20.5
25.5
30.5
35.5
40.5
45.5
50.5
UES 17.5
40.2
PIP 43.0
LES 42.5
45.2
Gastric 47.5
0.0
150.0
0.83
0.25
Set Range
Hide Z
Display Mode
Play
Atmosph
1 min
Current Swallow
Log Data
LES Resid Press: 32.1
DCI: 11890.3
CFV: 23.4
Distal Latency: 3.4
Intrabolus P (@LESR): 16.3
Intrabolus P (avg max): 28.4
Onset Veloc.(-3.0:-11.0): 99.0
Multiple Peaks?: No
Landmark & Pressures
LES Press(resp min): 19.1 mmHg
LES Press(mean): 27.7 mmHg
LES Length: 4.7 cm
LES Intraab Seg: 2.7 cm
UES Pressure: 24.6 mmHg
Swallows (avg)
Hide Data
LES Resid Press: 27.0 mmHg
DCI: 4601.2 mm
CFV: -71.7 cm/s
Distal Latency: 5.7 s
Intrabolus P (@LESR): 8.9 mmHg
Intrabolus P (avg max): 19.4 mmHg
Onset Veloc.(-3.0:-11.0): 41.2 cm/s
Multiple Peaks?: 3
Fr. Nares
Range
Mode
Gastric
Anatom.
Catheter Position: 50.5 cm
Start
ManoView ESO v.3.0 [...
Removable Disk (E:)
Bilder for Helsinki2.docx ...
13:59


ManoView™ ANALYSIS v3.0
Open
Guide
Capture
Report
Data Table
GIVEN IMAGING
EAZ0680
mmHg kOhm
150.0
140
130
120
110
100
90
80
70
60
50
40
35
30
25
20
15
10
5
0
-5
-10.0
0.26
1.14
Swallow #6
Swallow #7
Swallow #8
8:49.8 min
UES
LES
Not Fld
No SC
Incomplete Clearance
DCI: 912.0
Double
Single
BTT: 7.0 sec
DL: 7.5 sec
IBP: -0.0, 5.2 mmHg
3.8 mmHg
10 sec
Pharynx
Esophagus
Stomach
18.5
23.5
28.5
33.5
38.5
43.5
48.5
53.5
UES 20.5
44.7
PIP 45.4
LES 46.5
48.1
Gastric 51.8
0.0
150.0
1.14
0.26
Set Range
Hide Z
Display Mode
Play
Atmosph
1 min
Fr. Nares
Range
Mode
Gastric
Anatom.
Catheter Position: 53.5 cm
Large break
Current Swallow
Log Data
LES Resid Press: 3.8
DCI: 912.0
CFV: 4.1
Distal Latency: 7.5
Intrabolus P (@LESR): -0.0
Intrabolus P (avg max): 5.2
Onset Veloc.(-3.0:-11.0): -5.2
Multiple Peaks?: Yes
Landmark & Pressures
LES Press(resp min): 18.9 mmHg
LES Press(mean): 35.5 mmHg
LES Length: 3.4 cm
LES Intraab Seg: 2.7 cm
UES Pressure: 35.6 mmHg
Swallows (avg)
Hide Data
LES Resid Press: 4.0 mmHg
DCI: 753.5 mmH
CFV: -3.5 cm/s
Distal Latency: 7.8 s
Intrabolus P (@LESR): -1.4 mmHg
Intrabolus P (avg max): 7.0 mmHg
Onset Veloc.(-3.0:-11.0): 4.8 cm/s
Multiple Peaks?: 1
Start
Removable Disk (E:)
Bilder for Helsinki.docx - ...
ManoView ESO v.3.0 [...
NO
10:24

Prinsipper:

- Væske senker impedans
- Luft øker impedans
- Dilatasjon senker impedans i et hulorgan

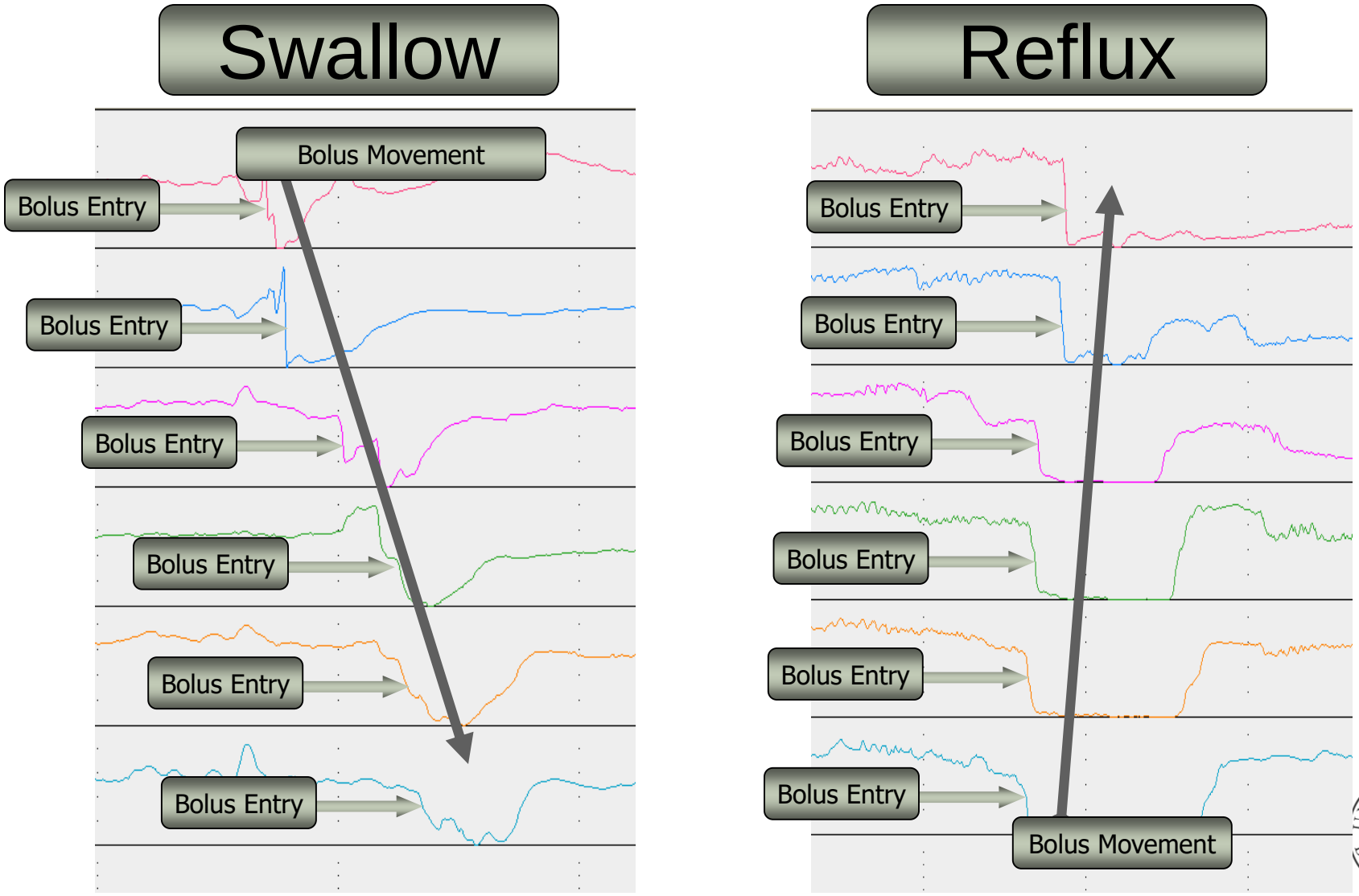
Impedance measurements

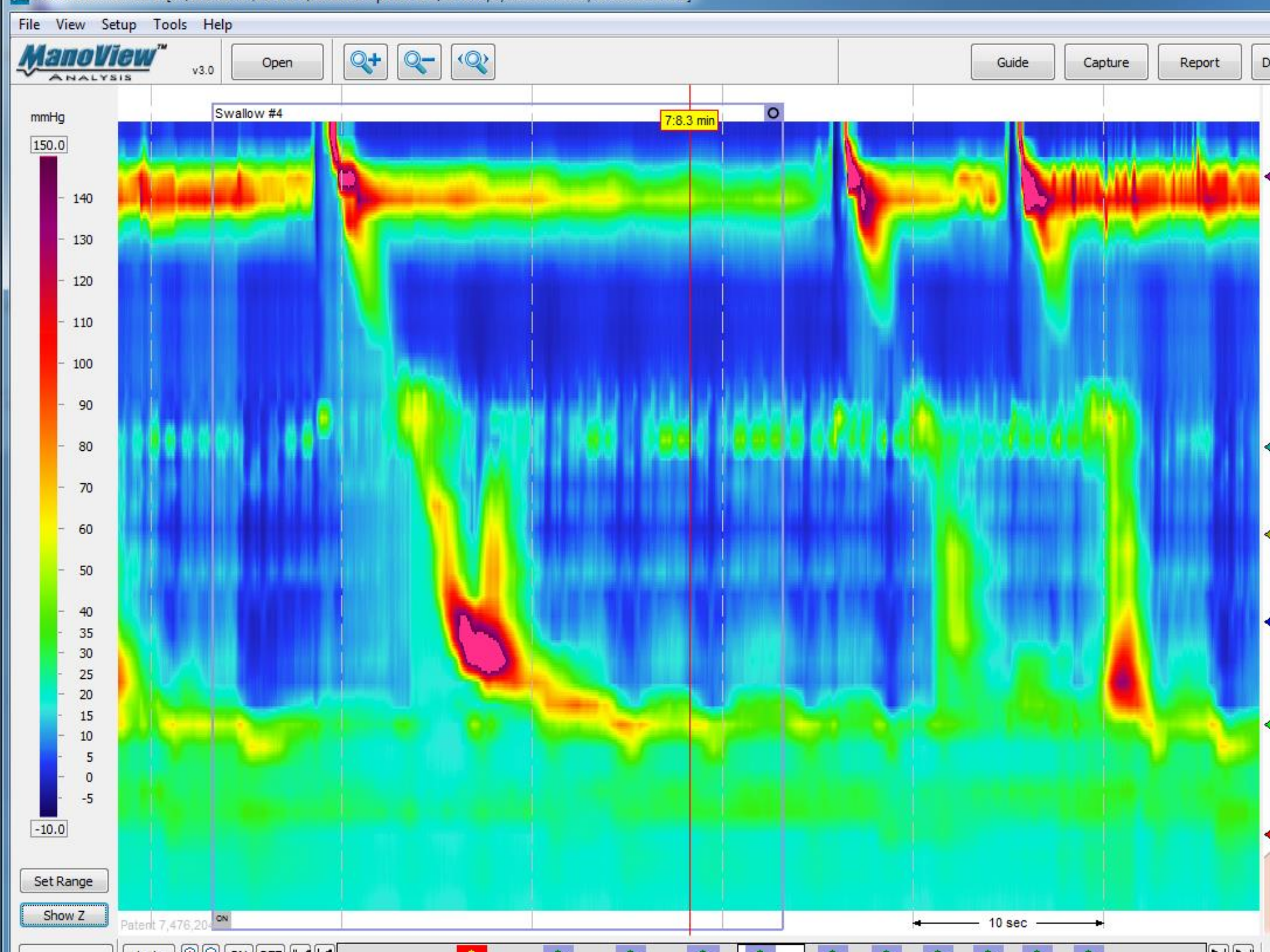


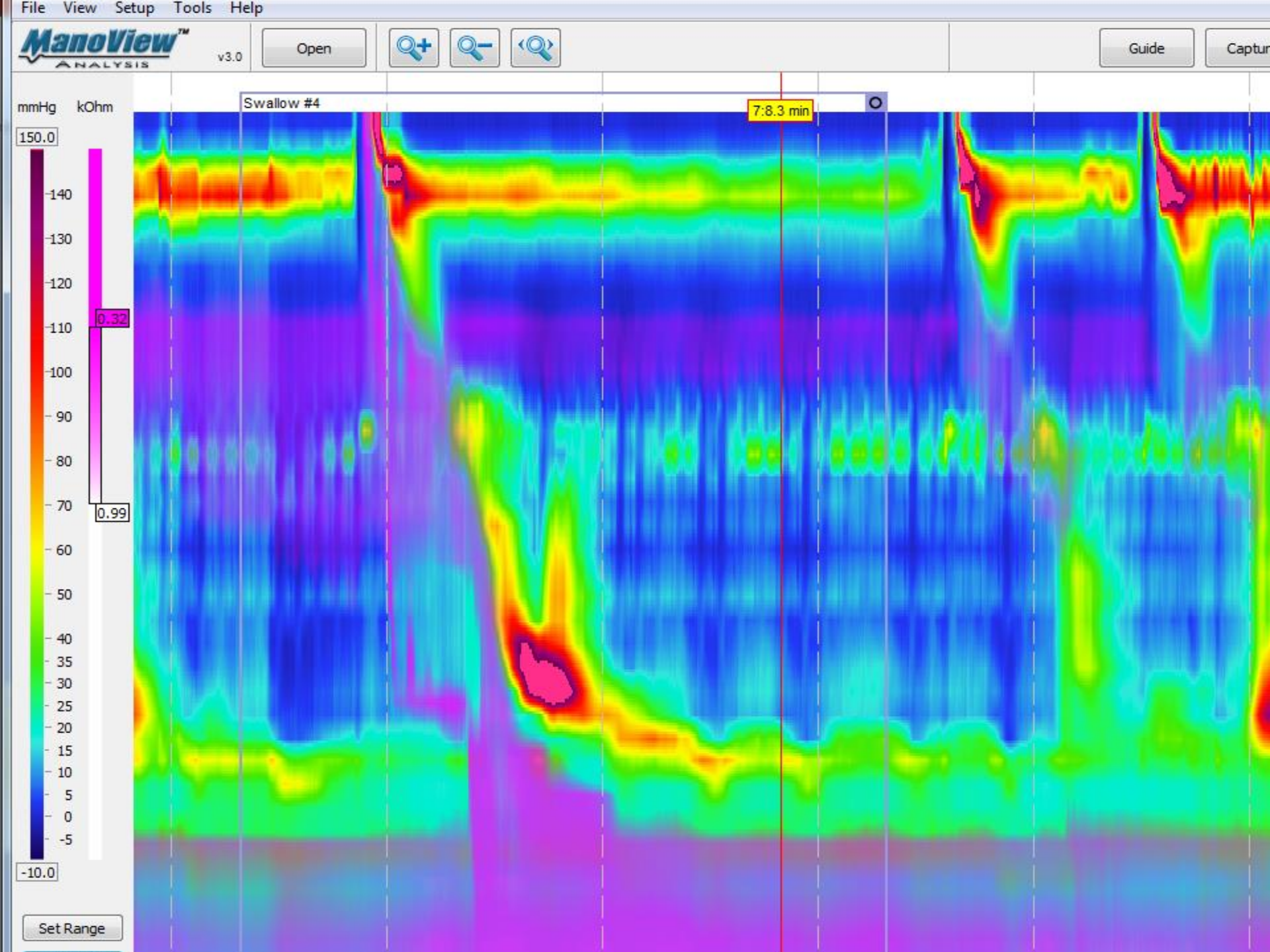
- Records segmentally the resistance to an electric current
- Separately detects air and liquid reflux
- Seems relatively independent of food consistency and type

Vela M et al. Gastroenterology 2001;120:1599-1606

Impedance Technology Fundamentals




File View Setup Tools Help
ManoView ANALYSIS
v3.0
Open
Guide
Capture
Report
mmHg
150.0
140
130
120
110
100
90
80
70
60
50
40
35
30
25
20
15
10
5
0
-5
-10.0
Swallow #4
7:8.3 min
Set Range
Show Z
10 sec


File View Setup Tools Help
ManoView™ ANALYSIS
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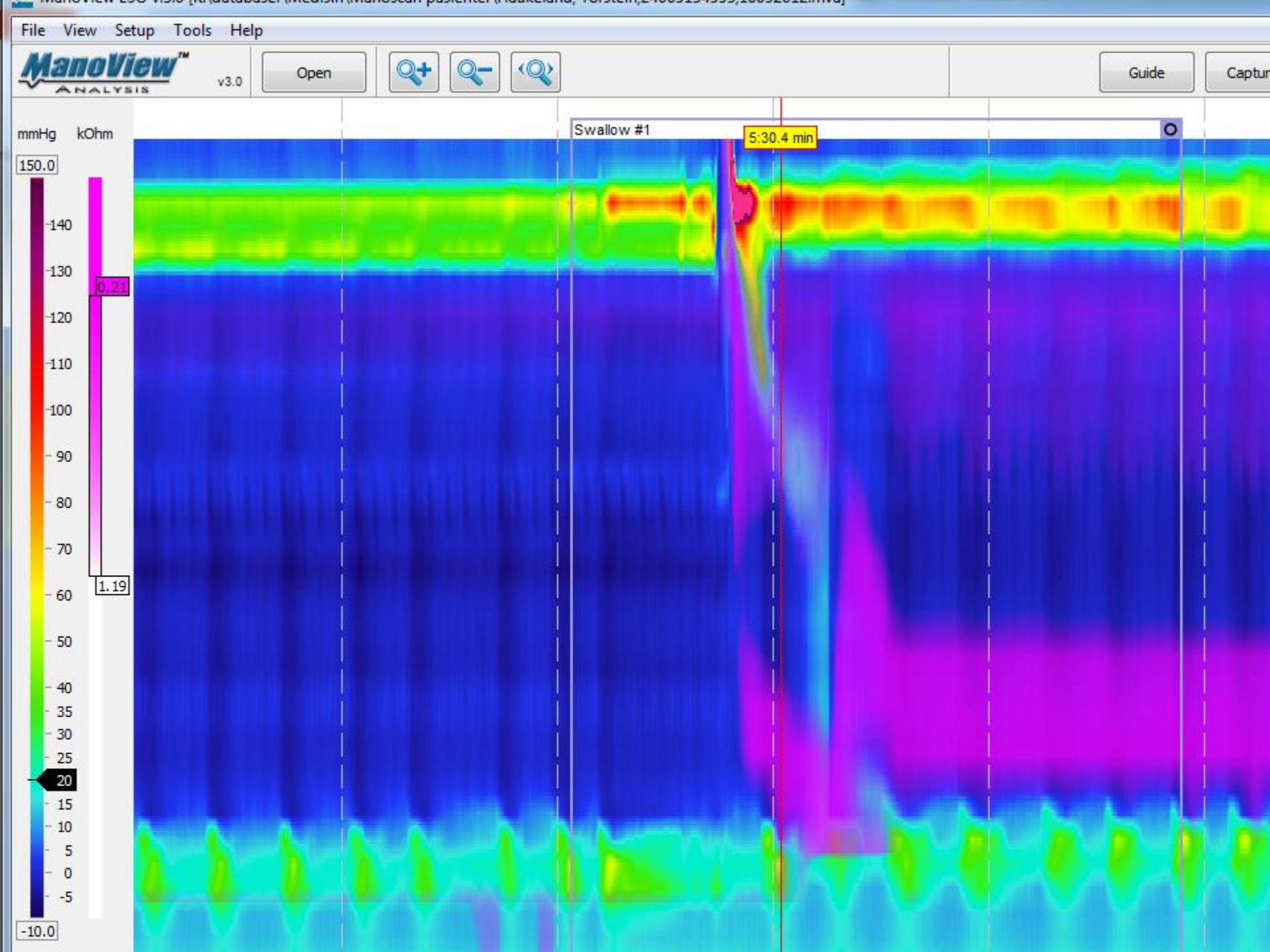
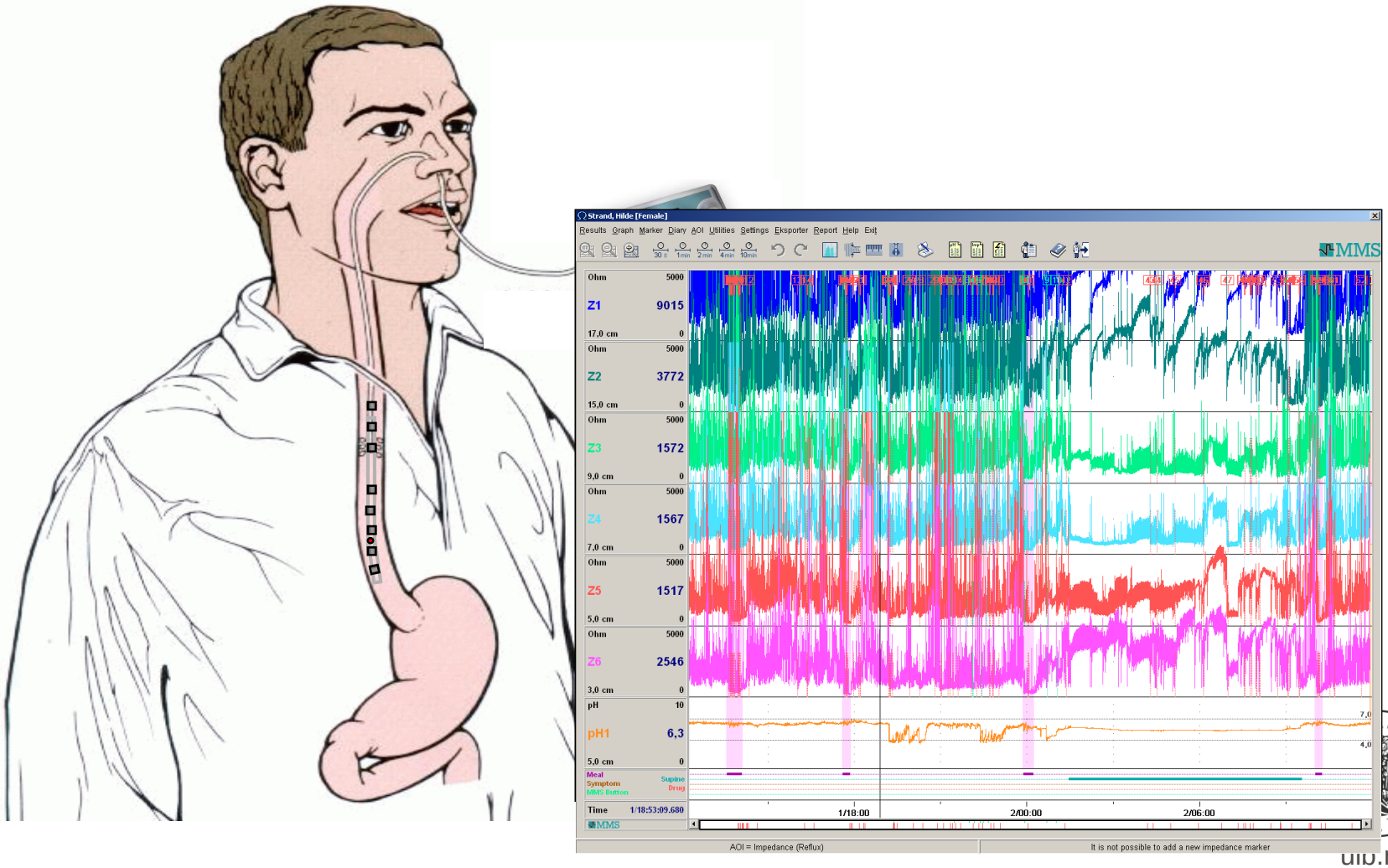
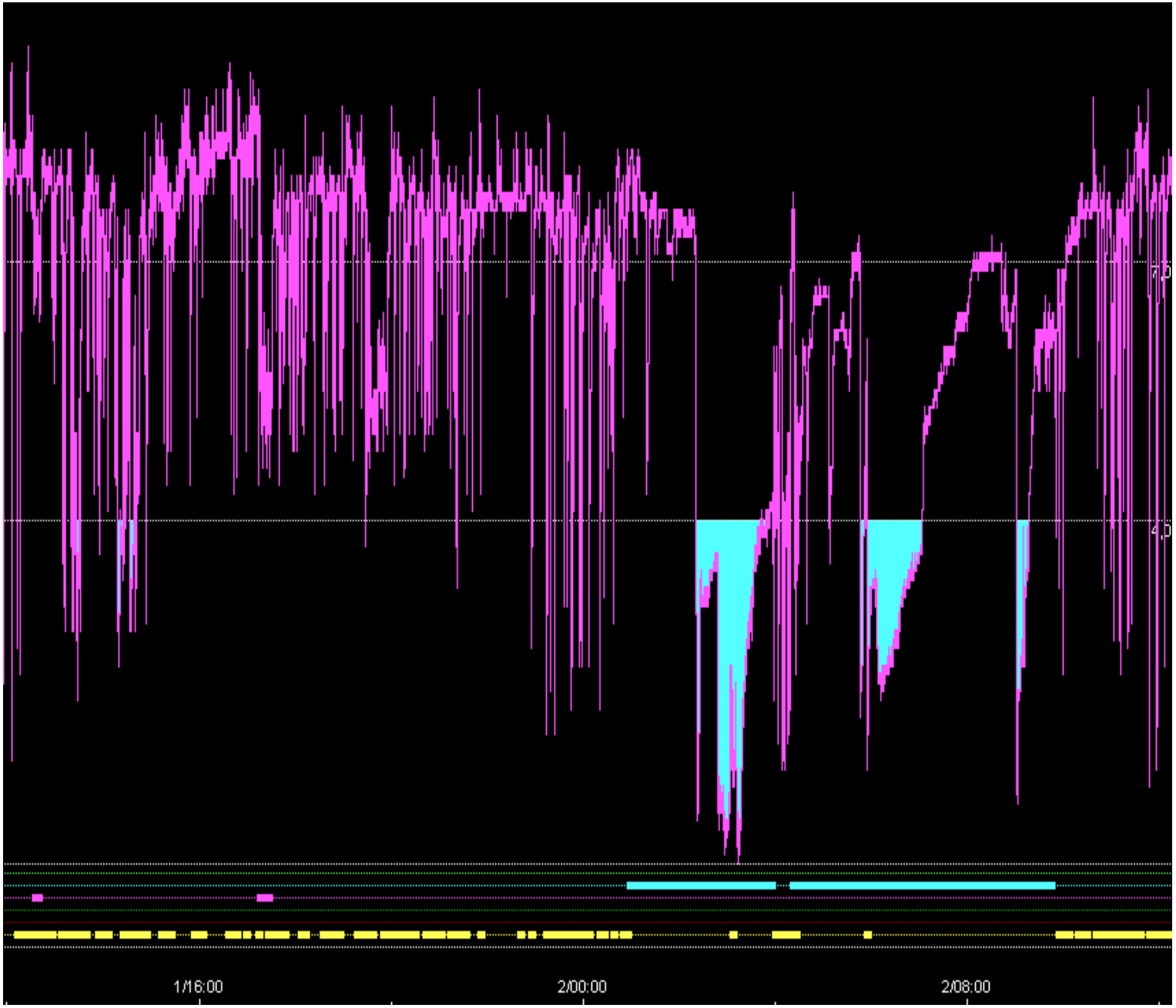
Open
Guide
Captur
mmHg
kOhm
150.0
140
130
120
110
100
90
80
70
60
50
40
35
30
25
20
15
10
5
0
-5
-10.0
0.32
0.99
Swallow #4
7:8.3 min
Set Range


File View Setup Tools Help
ManoView™ ANALYSIS
v3.0
Open
Guide
mmHg
kOhm
150.0
140
130
120
110
100
90
80
70
60
50
40
35
30
25
20
15
10
5
0
-5
-10.0
0.21
1.19
Swallow #1
5:30.4 min

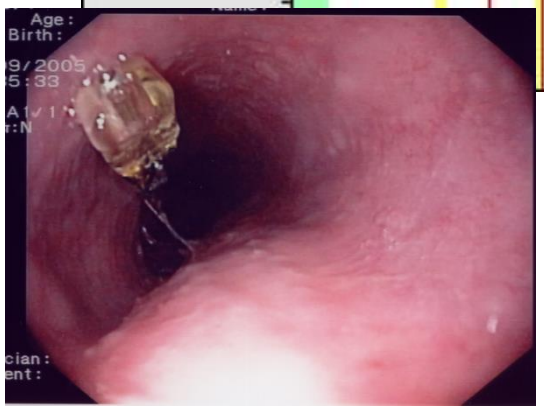
Impedance and pH-monitoring in the oesophagus

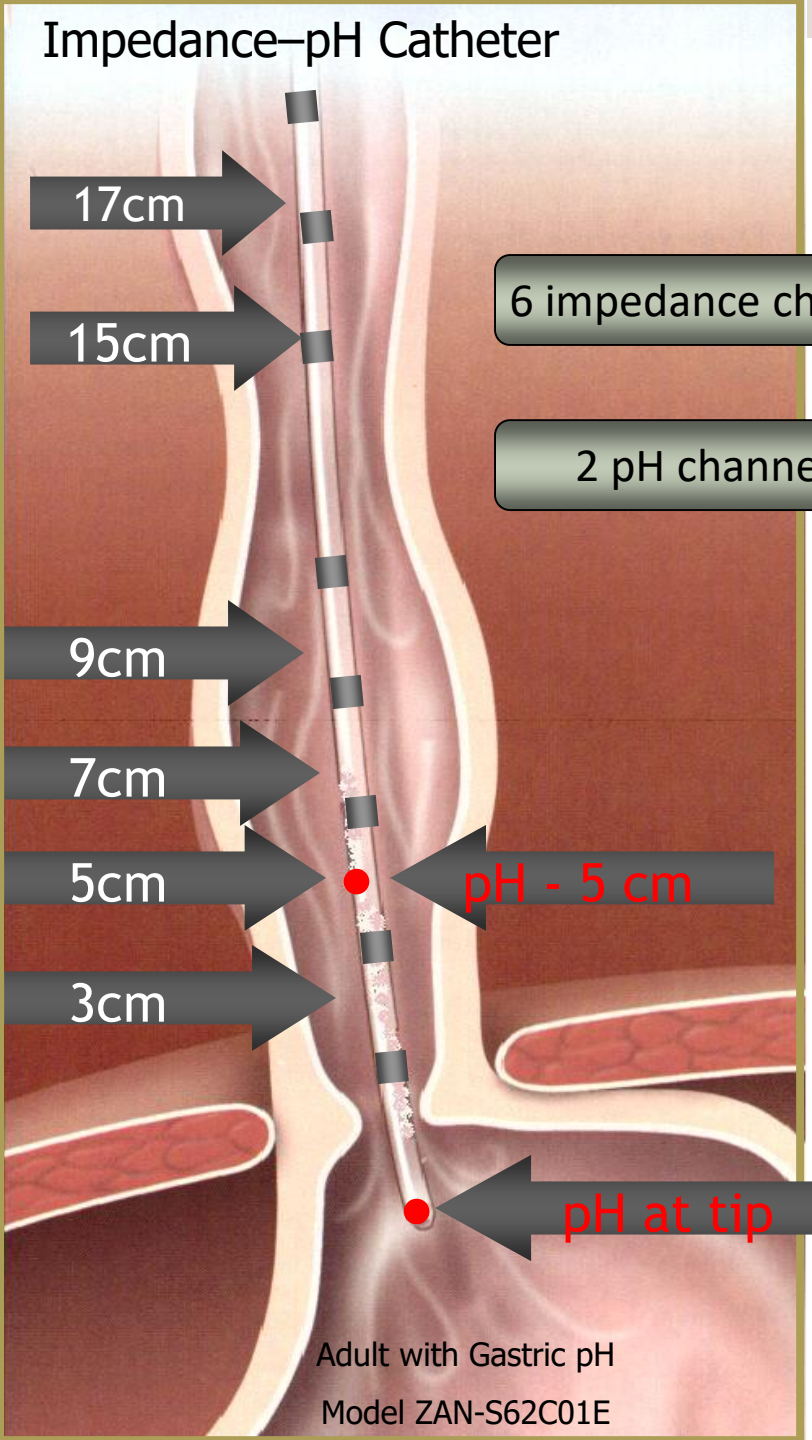



1/16:00
2/00:00
2/08:00

Bravo 48t pH


HrtBrn
Meal
Supine
Ignore
pH
Esophageal
8
6
4
2
06:00
16:00
02:00
t

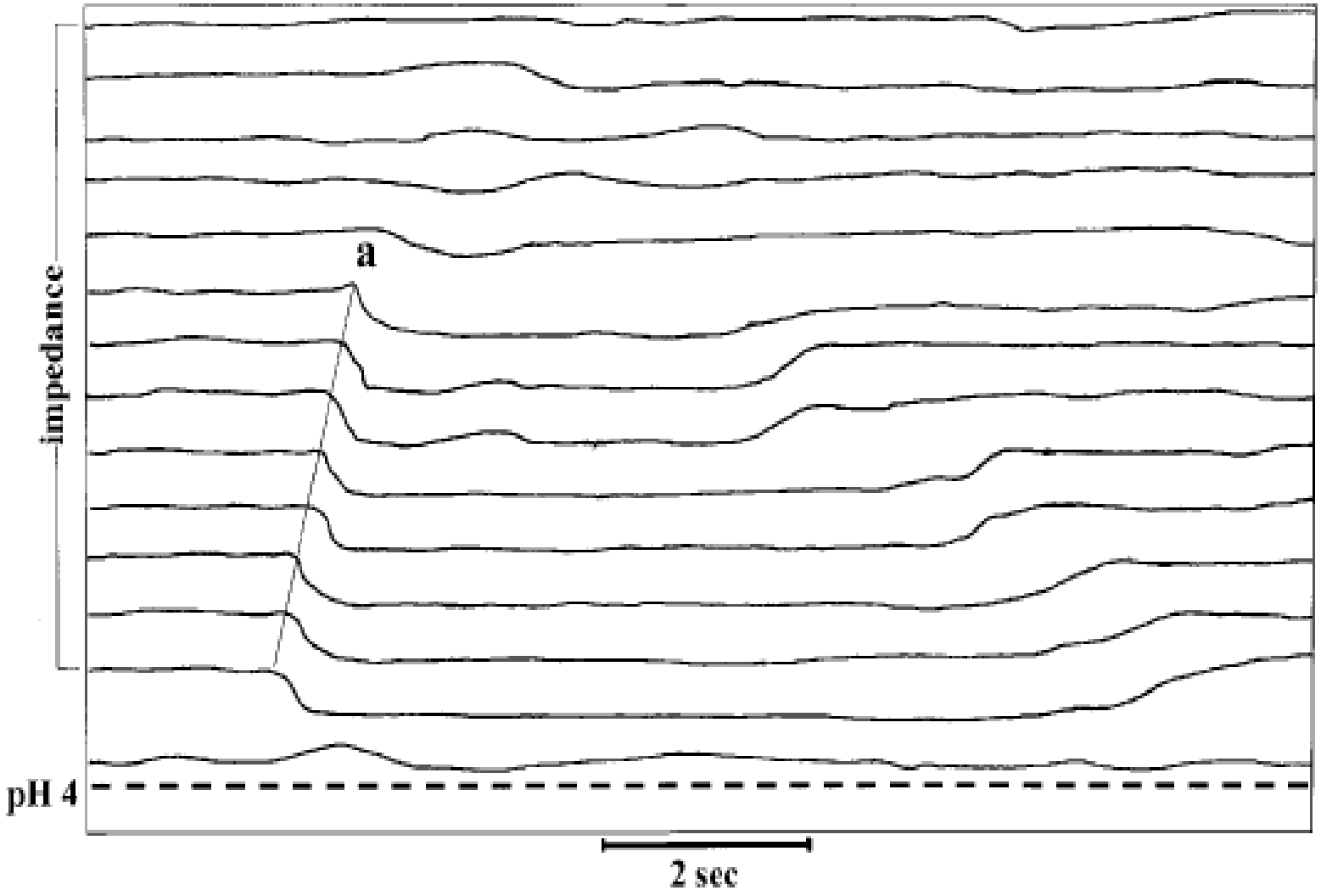

Age :
Birth :

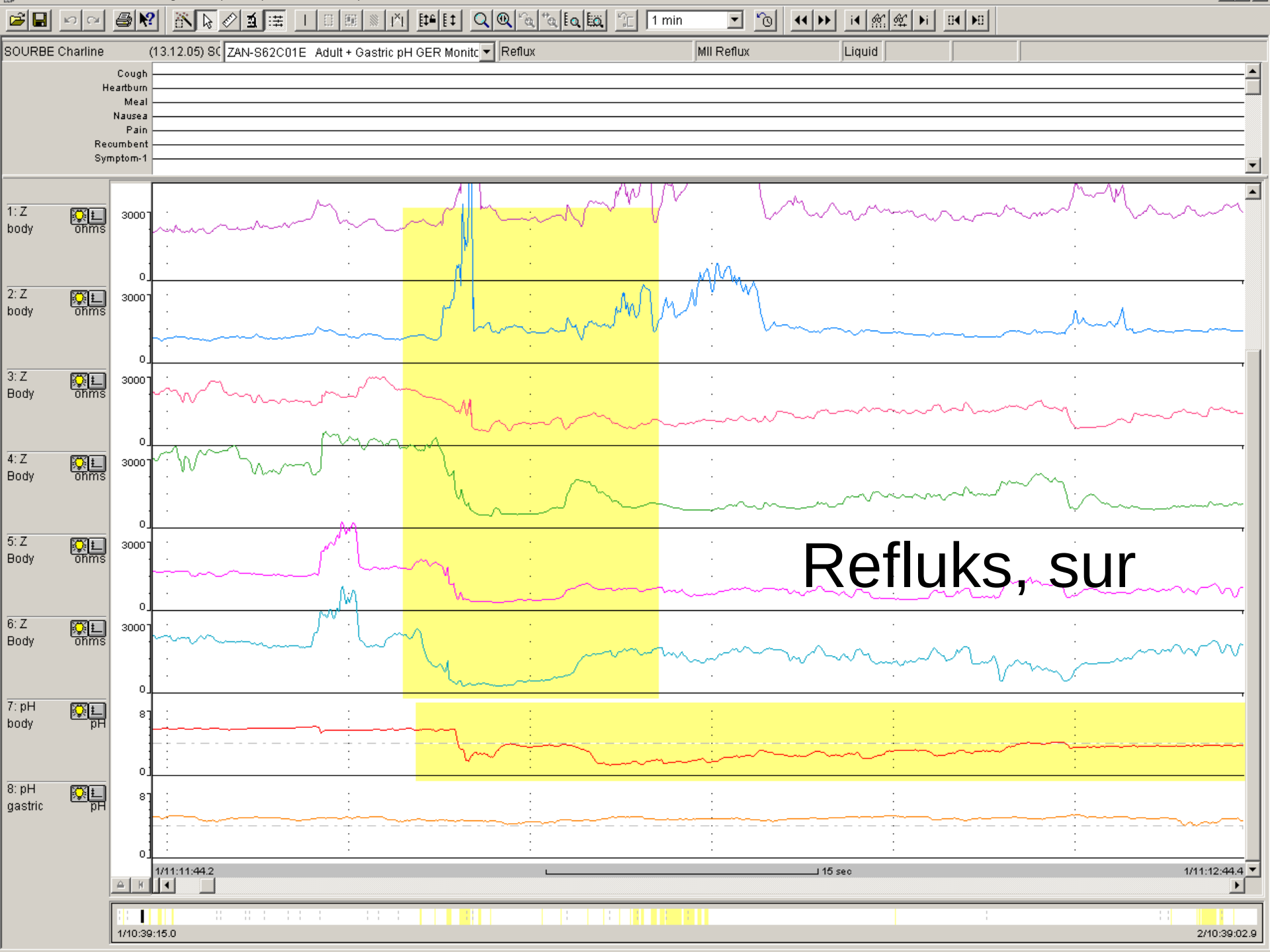


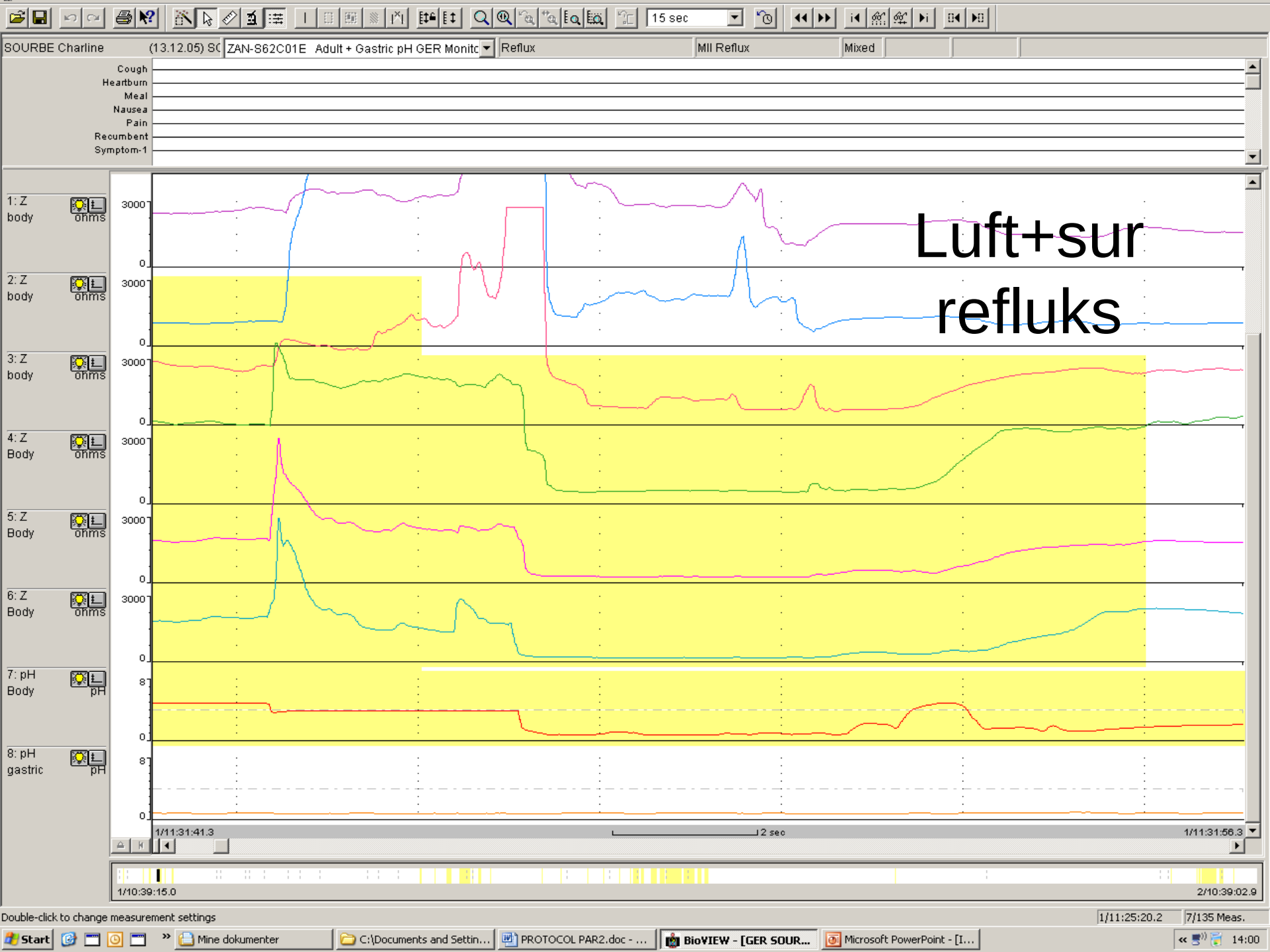
Impedans / pH-måling i oesophagus

- pH-måling i ventrikkel og distale øsofagus
- Impedans-måling i 6 kanaler i øsofagus
- Symptom Association Probability (SAP) beregnet fra begge målinger

Refluksepisode, mildt sur



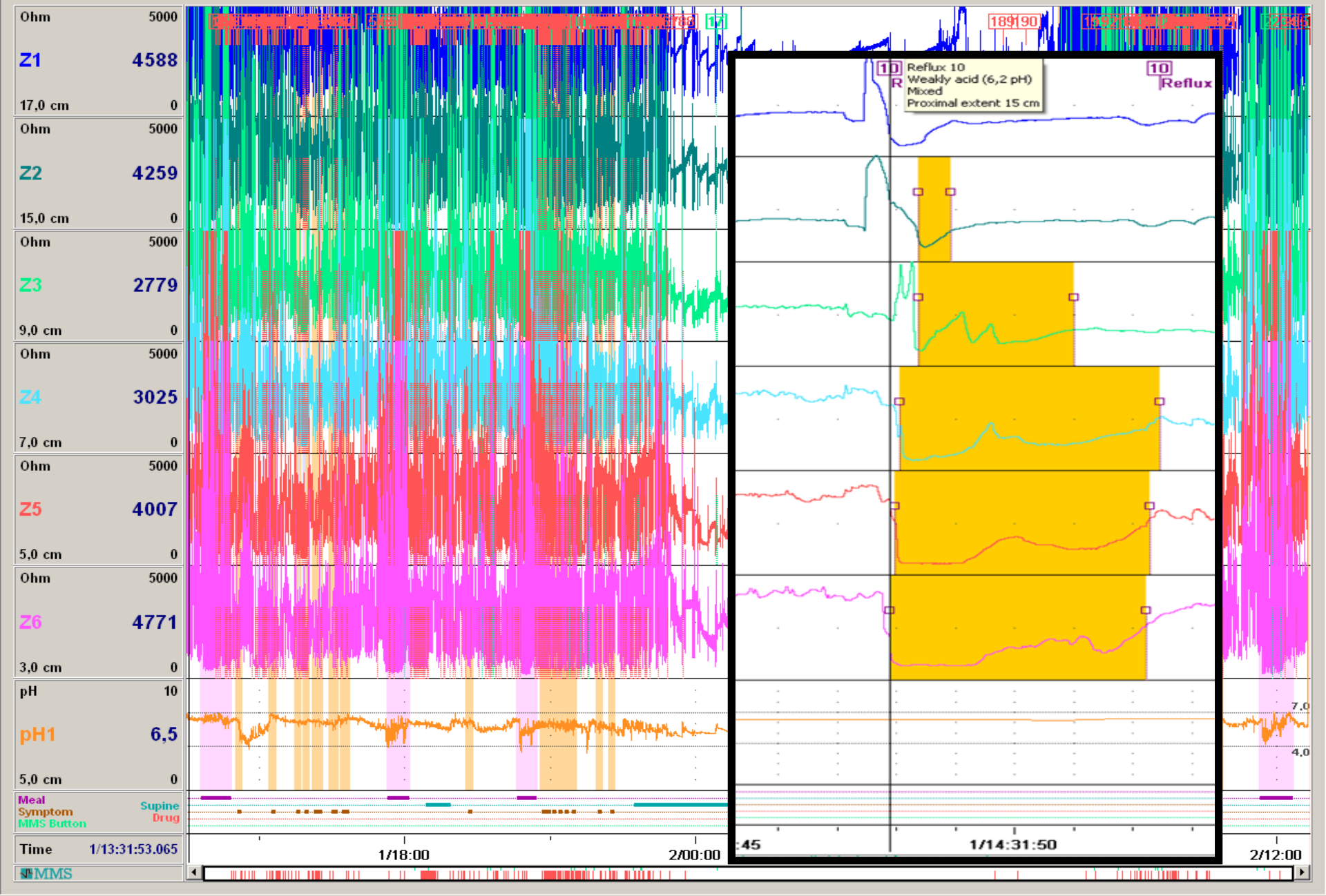

SOURBE Charline
(13.12.05) SC
ZAN-S62C01E Adult + Gastric pH GER Monitc
Reflux
MII Reflux
Liquid
1 min
Cough
Heartburn
Meal
Nausea
Pain
Recumbent
Symptom-1
1: Z body ohms
2: Z body ohms
3: Z Body ohms
4: Z Body ohms
5: Z Body ohms
6: Z Body ohms
7: pH body pH
8: pH gastric pH
3000
0
8
1/11:11:44.2
15 sec
1/11:12:44.4
Refluks, sur
1/10:39:15.0
2/10:39:02.9


15 sec
SOURBE Charline
(13.12.05) SC
ZAN-S62C01E Adult + Gastric pH GER Monitc
Reflux
MII Reflux
Mixed
Cough
Heartburn
Meal
Nausea
Pain
Recumbent
Symptom-1
1: Z body ohms
2: Z body ohms
3: Z body ohms
4: Z Body ohms
5: Z Body ohms
6: Z Body ohms
7: pH Body pH
8: pH gastric pH
3000
0
8
Luft+sur refluks
1/11:31:41.3
2 sec
1/11:31:56.3
1/10:39:15.0
2/10:39:02.9
Double-click to change measurement settings
1/11:25:20.2
7/135 Meas.
Start
Mine dokumenter
C:\Documents and Settin...
PROTOCOL PAR2.doc - ...
BioVIEW - [GER SOUR...
Microsoft PowerPoint - [I...
14:00

Results Graph Marker Diary AOI Utilities Settings Eksporter Report Help Exit

30 s 1 min 2 min 4 min 10 min

MMS



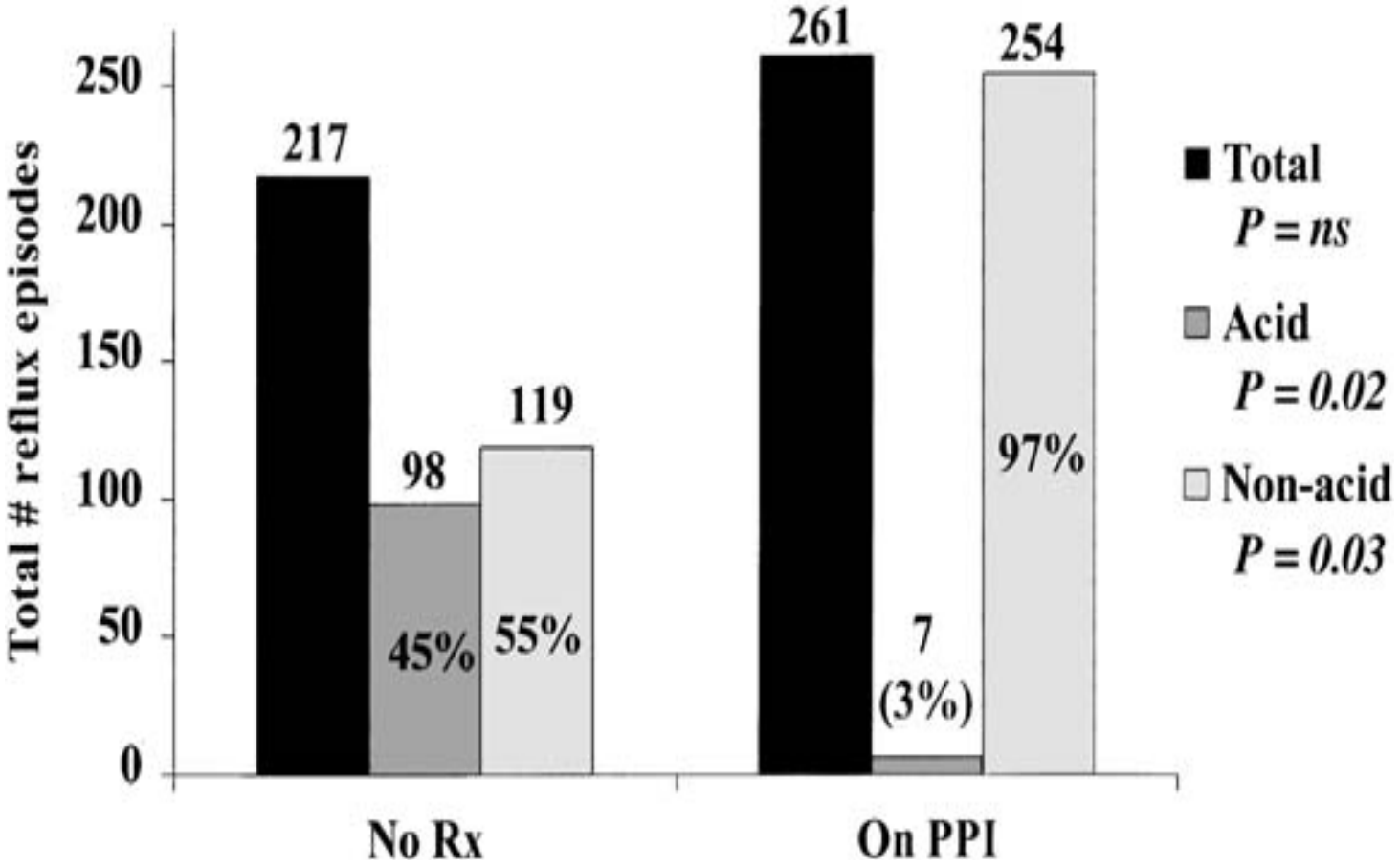
AOI = Impedance (Reflux)

Anvendelse i oesophagus:

- Refluksdiagnostikk
  - pH-måling er utilfredsstillende i enkelte situasjoner
    - achlorhydri
    - postprandialfasen
    - spebarn
    - utredning av terapisvikt ved reflukssykdommen
    - SAP-vurderinger
    - Hva er signifikansen av pH-fall uten impedansfall??

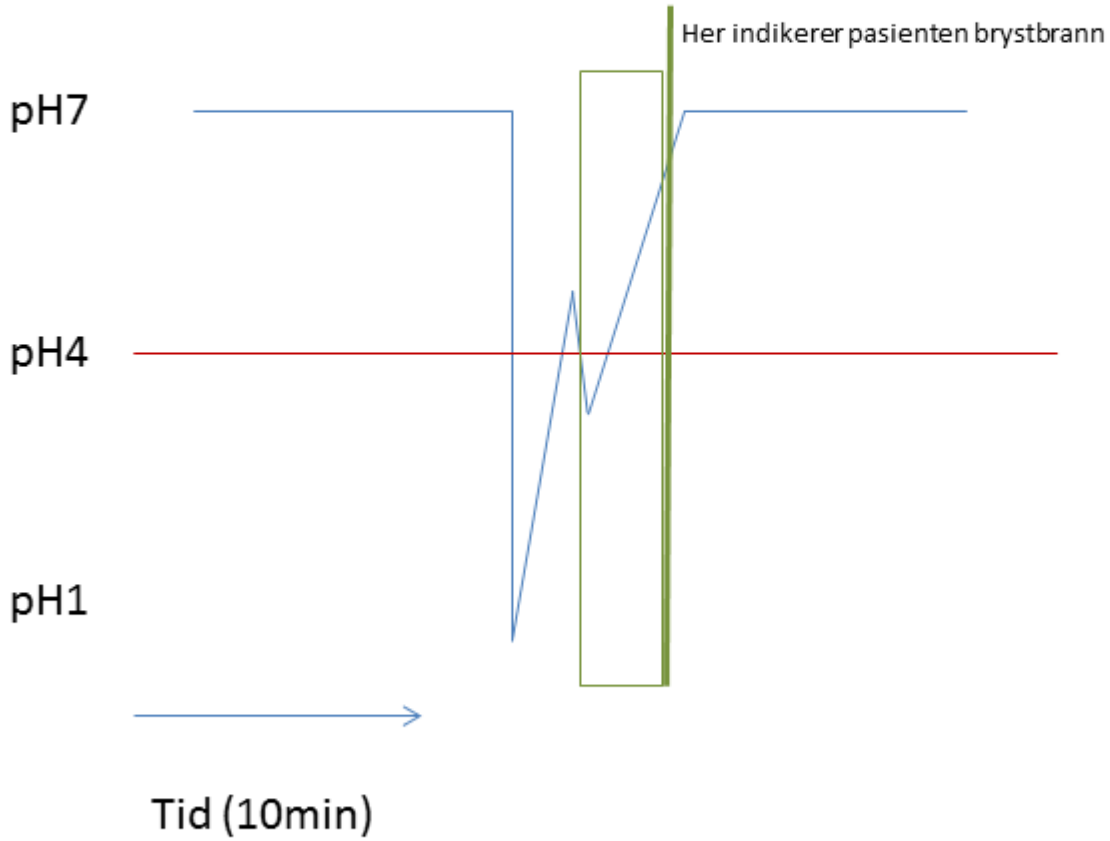
    - Baseline impedance
      - Slimhinneskade ved eosonofil øsofagitt og refluks

Detection of non-acid reflux by impedance



Vela M et al. Gastroenterology 2001;120:1599-1606

Relasjon mellom symptom og refluks



SI and SAP

169	2/11:47:37	*	*	
170	2/11:51:57			
171	2/11:56:57		*	
172	2/11:57:07	*	*	
173	2/12:00:37			
174	2/12:03:57			
175	2/12:06:47	*	*	
176	2/12:06:57	*	*	
177	2/12:11:27			

Nr of symptoms analyzed	177
Nr of symptoms related to reflux	120
Nr of symptoms not related to reflux	57
Nr of reflux periods	50
Symptom index for reflux (SI)	67,8 %
Symptom sensitivity index (SSI)	240,0 %
Symptom association probability (SAP)	100,0 %

SAP

	S+	S-	Total
R+	108	165	273
R-	69	565	634
Total	177	730	907

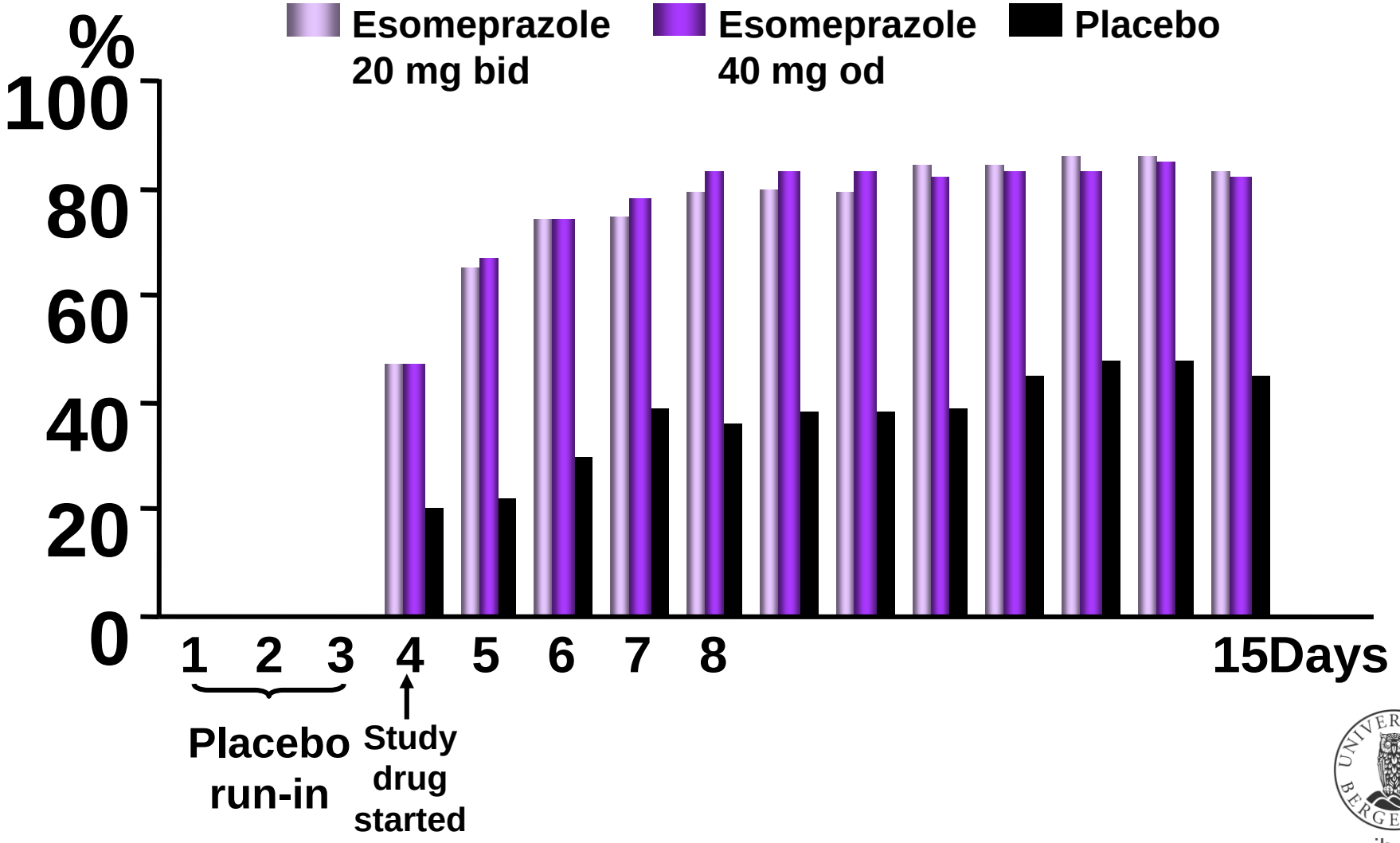
p = 0,0000

SAP = 100 – p = 100%

SAP 95 – 100% viser økt sensitivitet

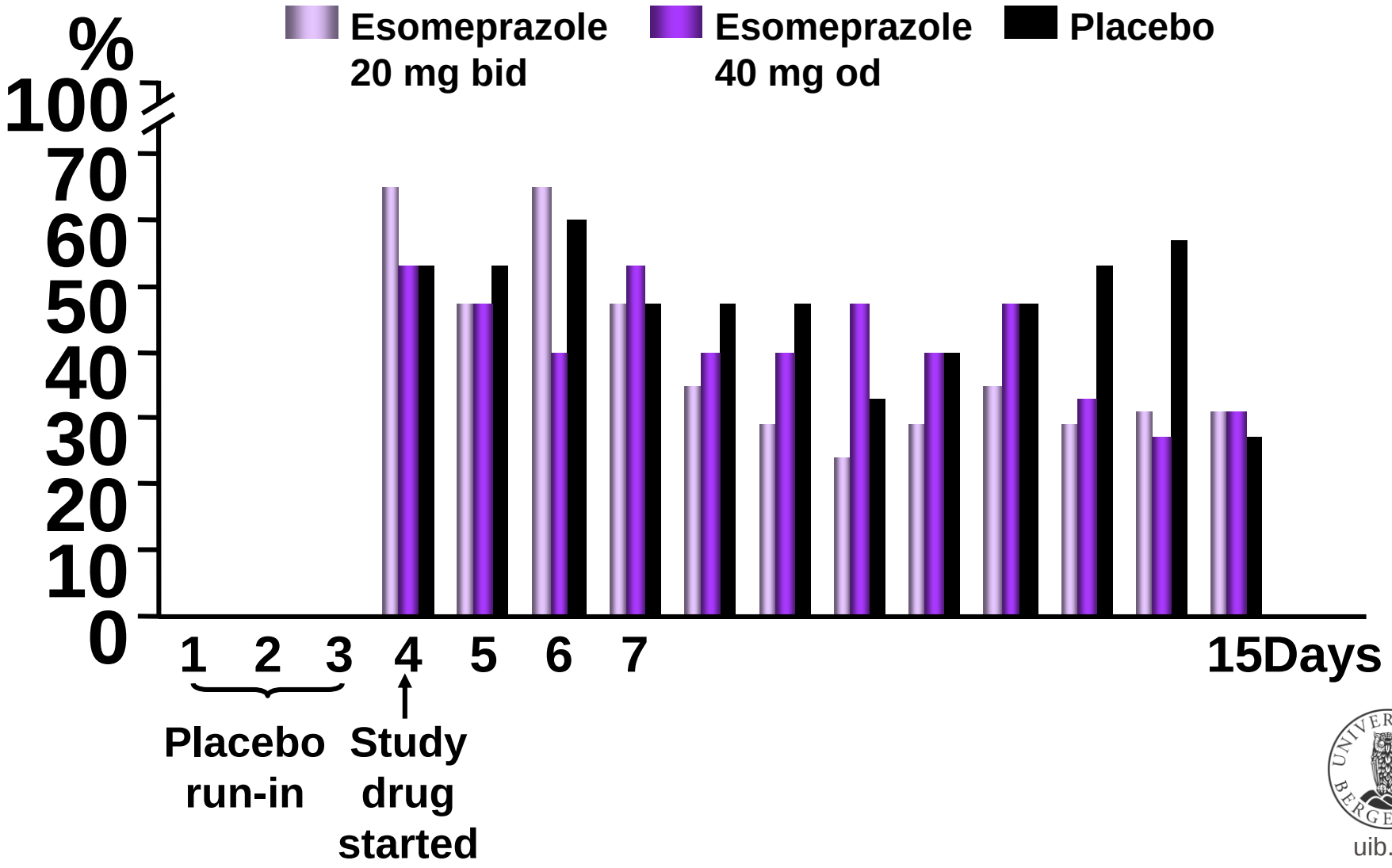
PPI test - Sensitivity

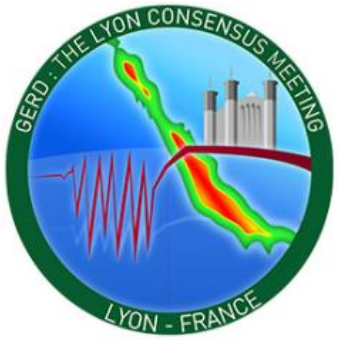
Proportion with GERD with positive test



PPI test - Specificity

Proportion without GERD with negative test





Guidelines on Esophageal Function Testing and Interpretation

THE LYON CONSENSUS MEETING

November 10, 2017

- Duration of >16 hours (48h?)
- Limits of physiological gastro-oesophageal reflux is not well established;
  - Proposal: <4% time pH<4.0 is normal, 4-6% is «borderline abnormal», >6% is abnormal
- Interpretation of impedancemetry is controversial (except for total number of episodes)
- Manometry should include calculating the EGJ contractile integral

Savarino E et al. Nature 2017, Gut 2018 (in press))

Manometri og 24t pH-(impedans)-måling:

- Ressurskrevende prosedyrer
- Gir unike opplysninger om funksjon
- Essensiell i utredning av dysphagi og brystsmerter
- Essensiell før antirefluksкirurgi!
- Obligat med manometri for korrekt plassering av pH-elektroder!
- Impedans måler refluks i form av væsketransport og karakteriserer denne i sur (pH<4) og mildt sur (pH 4-7)

- Impedans-pH-måling gir forbedret diagnostikk mtp refluks i enkelte klinisk situasjoner, spesielt hos pasienter med terapisvikt på syresekresjonshemming
- Impedans-manometri gir forbedret vurdering av svelgfunksjon, spesielt i kombinasjon med HR-manometri. Sparer rtg-stråling.

UNIVERSITETET I BERGEN

Klinisk institutt 1