Anorectal Diagnostic Overview

Anorectal Manometry Overview

- Measurement of pressures and the annotation of rectal sensation throughout the rectum and anal canal to determine:
  - Neural and physiological mechanisms for continence present
  - Neural and physiological mechanisms for defecation present
  - Pre-surgical evaluation
  - Anal pain

Patient Groups

- Adult
  - Fecal Incontinence
  - Chronic constipation
- Pediatric
  - Hirschsprung's screening
  - Encopresis

Fecal Incontinence

Inability to defer the elimination

Fecal Incontinence Demographics

- Prevalence increases with age
- 7 % of population has chronic soiling
  - Equal prevalence in older males & females
- 1 % of population has gross incontinence
  - Elderly people have 5 times greater prevalence than young
  - Women are twice as likely to have gross incontinence as men
  - 10-16% of women > 64 YOA have gross incontinence

Incontinence Demographics

- Females > 45 YOA are 8 times as likely to have gross fecal incontinence as males of equal age
- Females > 65 YOA are 12 times as likely to have gross fecal incontinence as younger females
- Over 30% of women reporting urinary incontinence also report fecal incontinence

Primary Physiologic Factors

- Pudendal nerve damage
- Injury during child birth
- Injury secondary to straining to defecate
- Muscle atrophy with age
- Rectal injury due to radiation, colorectal surgery
- Diabetic neuropathy

Fecal Incontinence Impact

- Primary factor triggering nursing home admission
- 45% of nursing home patients are incontinent
- Linked with skin breakdown & infection

Chronic Constipation

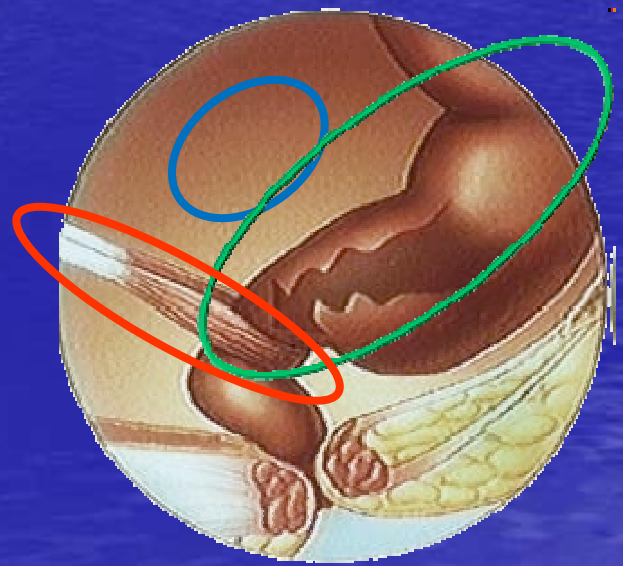
Inability to effectively eliminate

Chronic Constipation Demographics

- 2 % of the adult population
- Prevalence increases with age
- Highest incidence in older females
- 10 times as prevalent as fecal incontinence

Primary Anatomic Components

- Rectum (rectal vault)
- Puborectalis muscle
- Anal canal muscles



Puborectalis Sling Muscle

Contracted puborectalis prevents defecation

Relaxed puborectalis

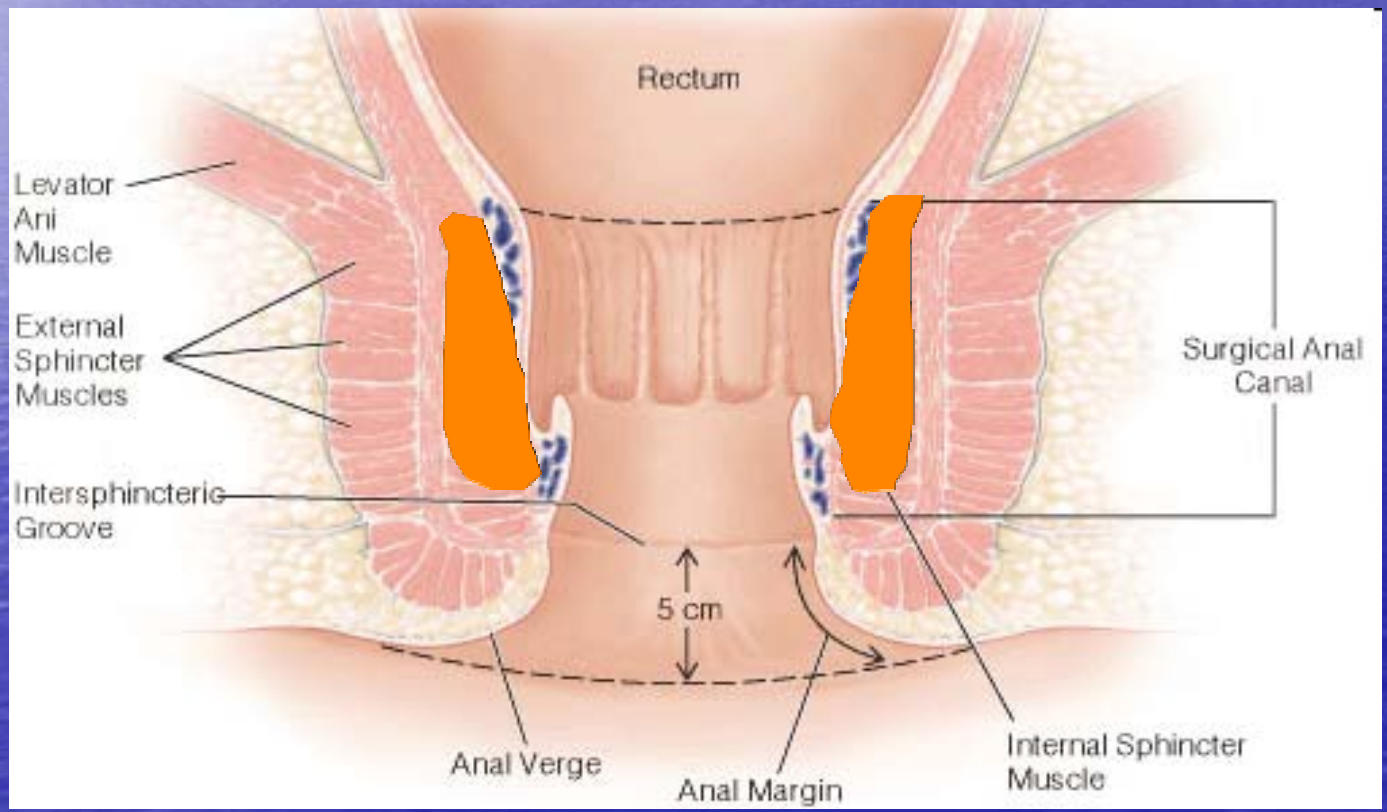
allows defecation

Muscle Control Types

- Involuntary
- Voluntary

Involuntary Muscle

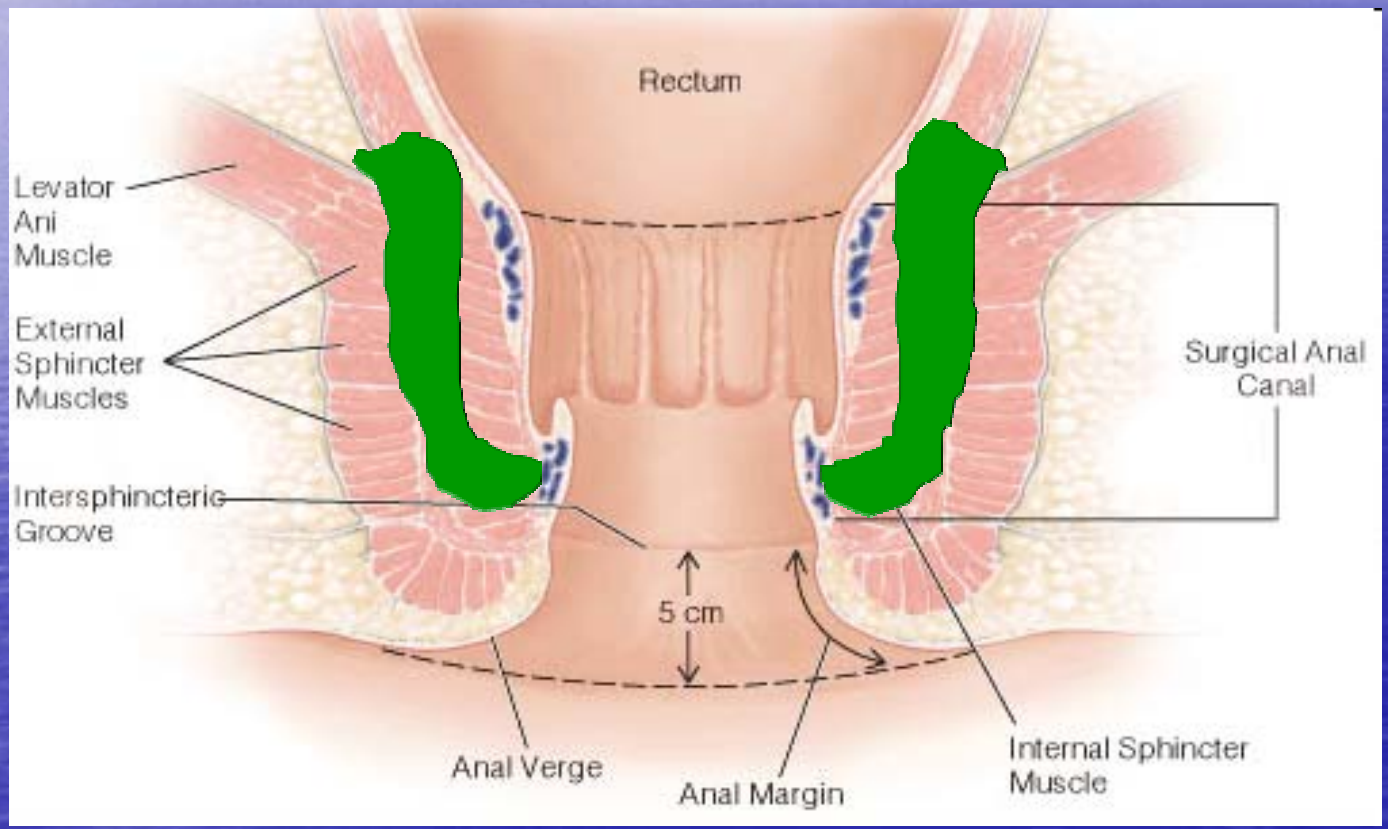
Internal Anal Sphincter



Provides 75 % of anal canal pressure

Voluntary Muscle

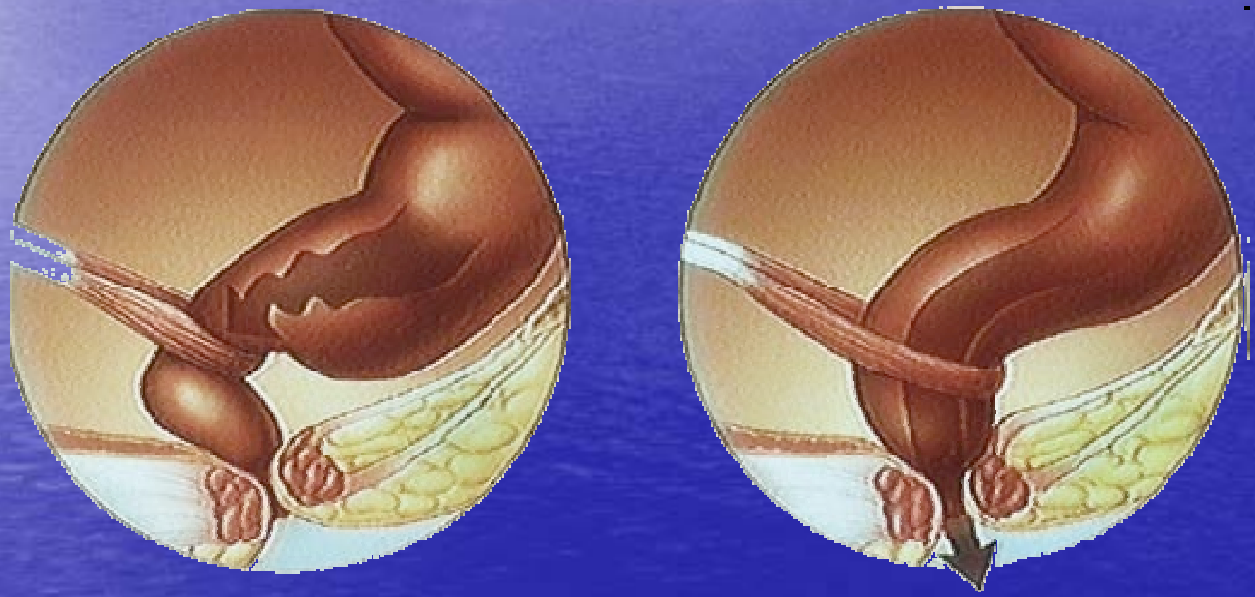
External Anal Sphincter



Provides 25 % of anal canal pressure

Involuntary/Voluntary Muscle

Puborectalis



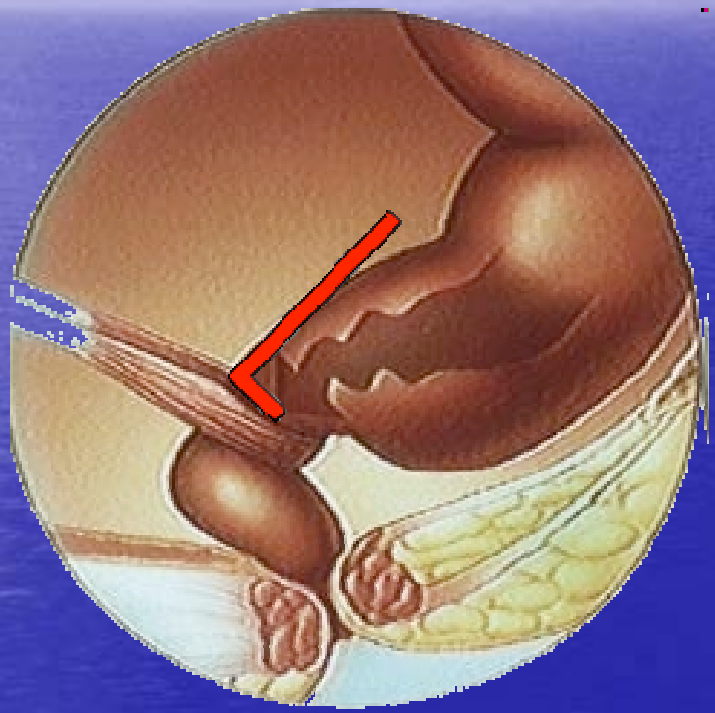
Contracted

Relaxed

The Continence Sequence

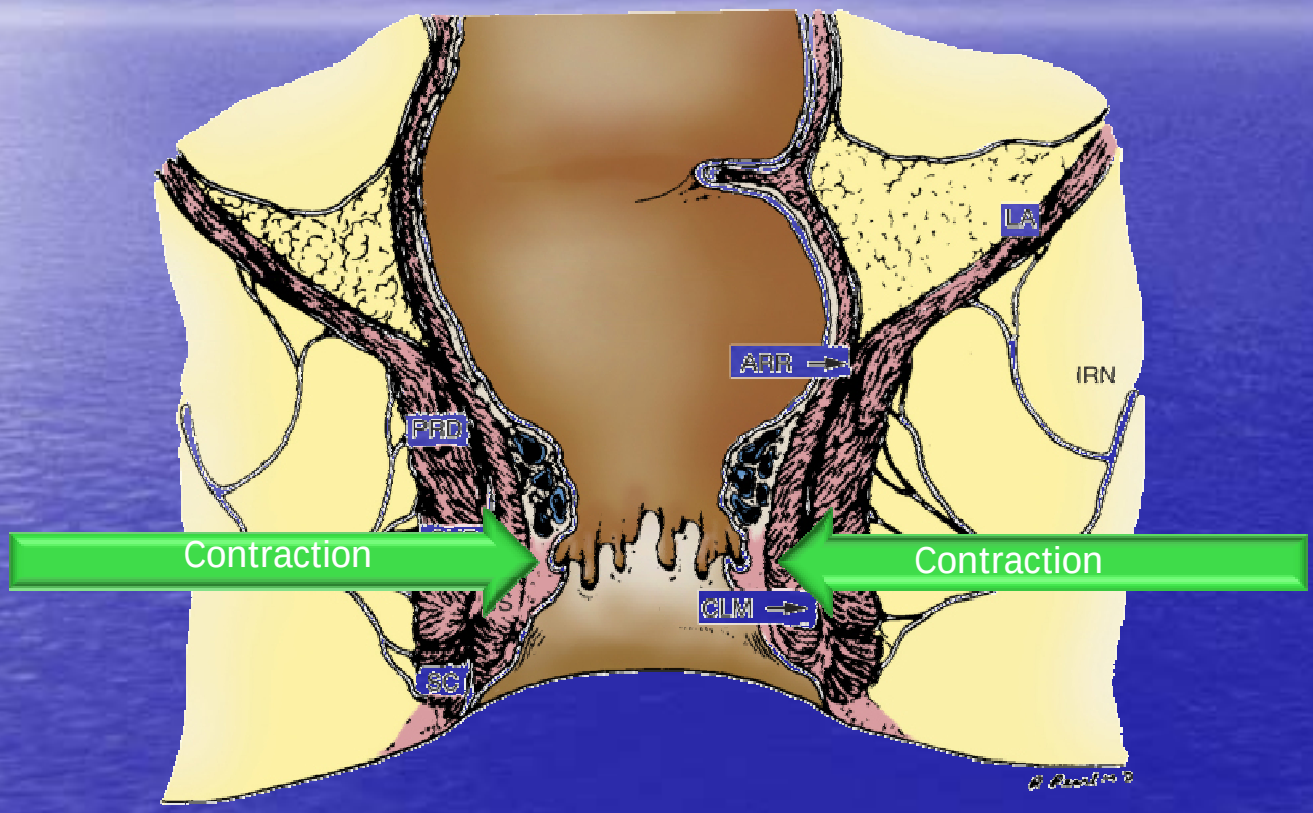
- Stool fills & distends rectal vault
- Puborectalis & internal anal sphincter relax (involuntary)
- Urge sensation perceived
- External sphincter & puborectalis contracted (voluntary)
- Conscience avoidance of increasing abdominal pressure
- Rectum wall expands to accommodate stool
- Sensation subsides, temporarily

Critical Factor 1



Rectal Angulation

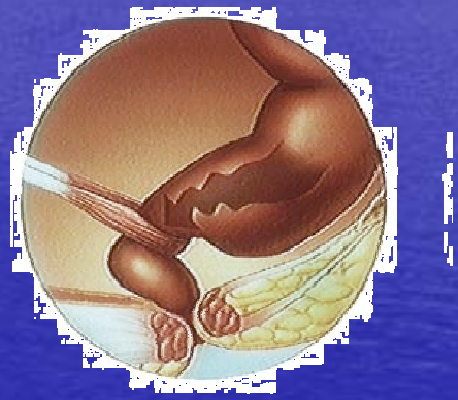
Critical Factor 2



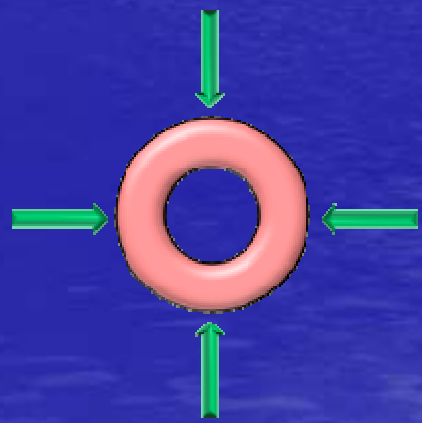
Effective Outlet Obstruction

What Can Go Wrong?

- Rectal filing not perceived, no warning of impending doom
  - External sphincter not contracted
  - No avoidance of abdominal pressure increases



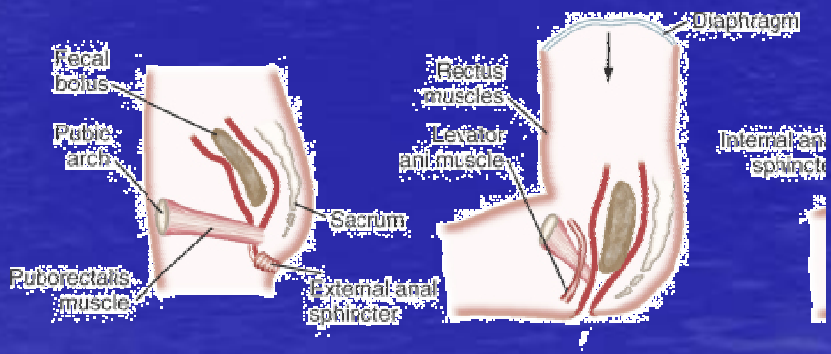
- Weak puborectalis muscle
  - Poor rectal angulation
- Weak sphincter muscles
  - Ineffective outlet obstruction



- Damaged / asymmetrical sphincter muscles
  - Ineffective outlet obstruction

The Defecation Sequence

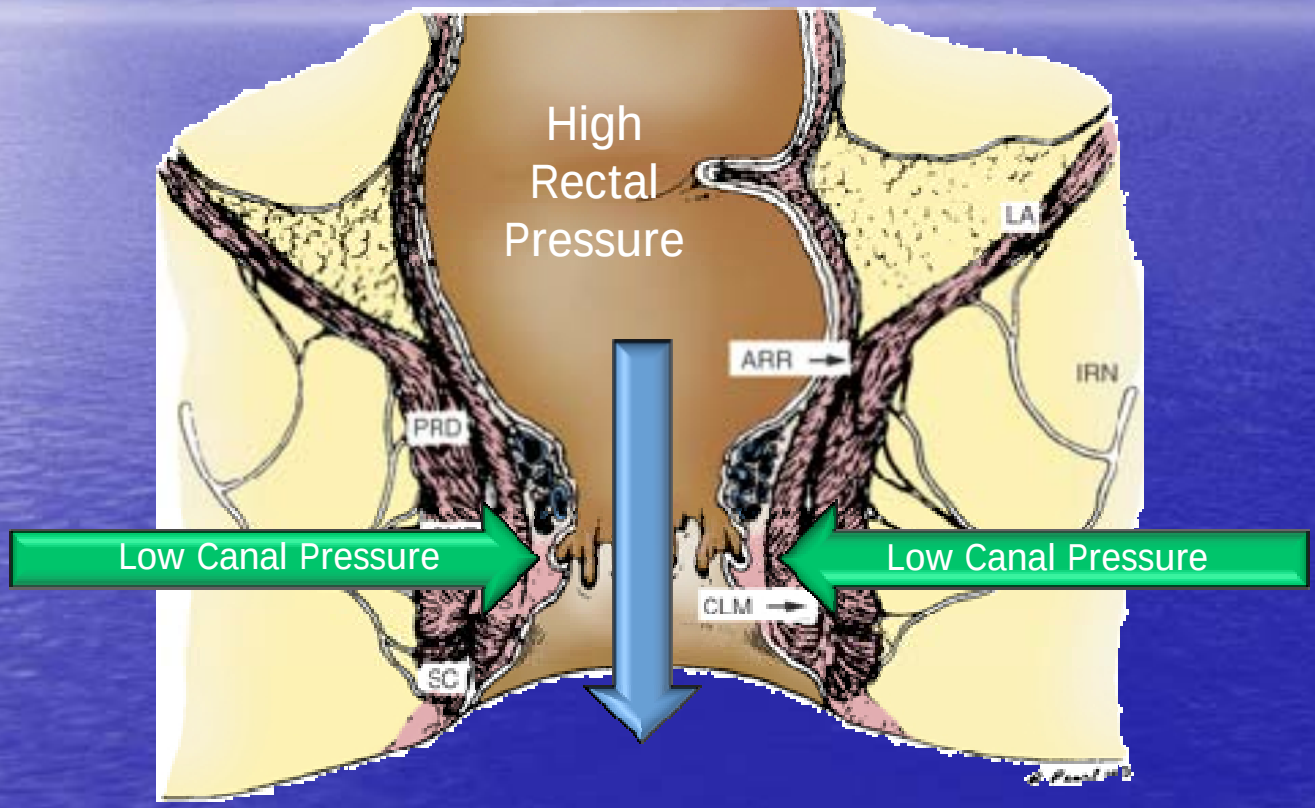
- Stool fills & distends rectal vault
- Puborectalis & internal anal sphincter relax (involuntary)
- Urge sensation perceived, toilet accessed
- Puborectalis & external sphincter relaxed (voluntary)
- Abdominal oblique & diaphragm muscle contractions increase intra-abdominal pressure
- Rectum contractions
- Defecation happens...



Critical Factor 1

No Rectal Angulation

Critical Factor 2



Incompetent Outlet Obstruction

What Can Go Wrong?

- External sphincter not relaxed (paradoxically contracted)
- Abdominal muscles not contracted, weakly contracted
- Puborectalis not relaxed, paradoxically contracted
  - Poor rectal angulation

The Testing Tools

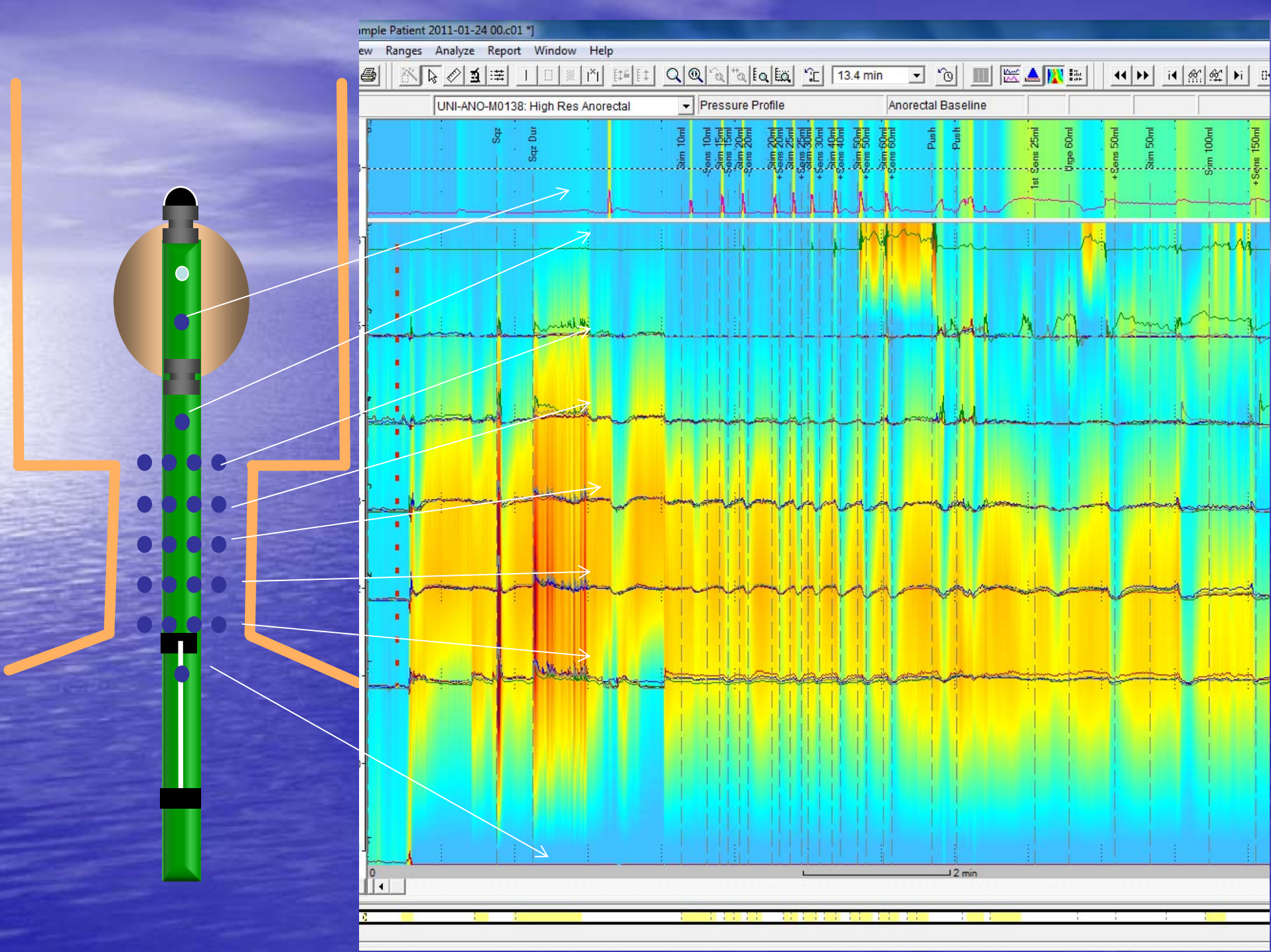
- Anorectal Manometry
  - Rectal vault sensation & compliance
  - Anal canal strength, symmetry & control
- EMG
  - Puborectalis control
- Pudendal Nerve Latency Testing (PNTL)
  - Motor nerve health to puborectalis & anal canal

Anorectal Manometry Testing

- Anal canal muscles
  - Strength
  - Length
  - Symmetry (damaged?)
- Sensory nerve function
- Patient control of continence & defecation sequences

Anorectal Motility Overview

- Anorectal manometry consist of several studies (sequences) which can include:
  - Resting Study
  - Squeeze Study
  - RAIR Study
  - Sensation Study
  - Push Maneuvar
  - Compliance Study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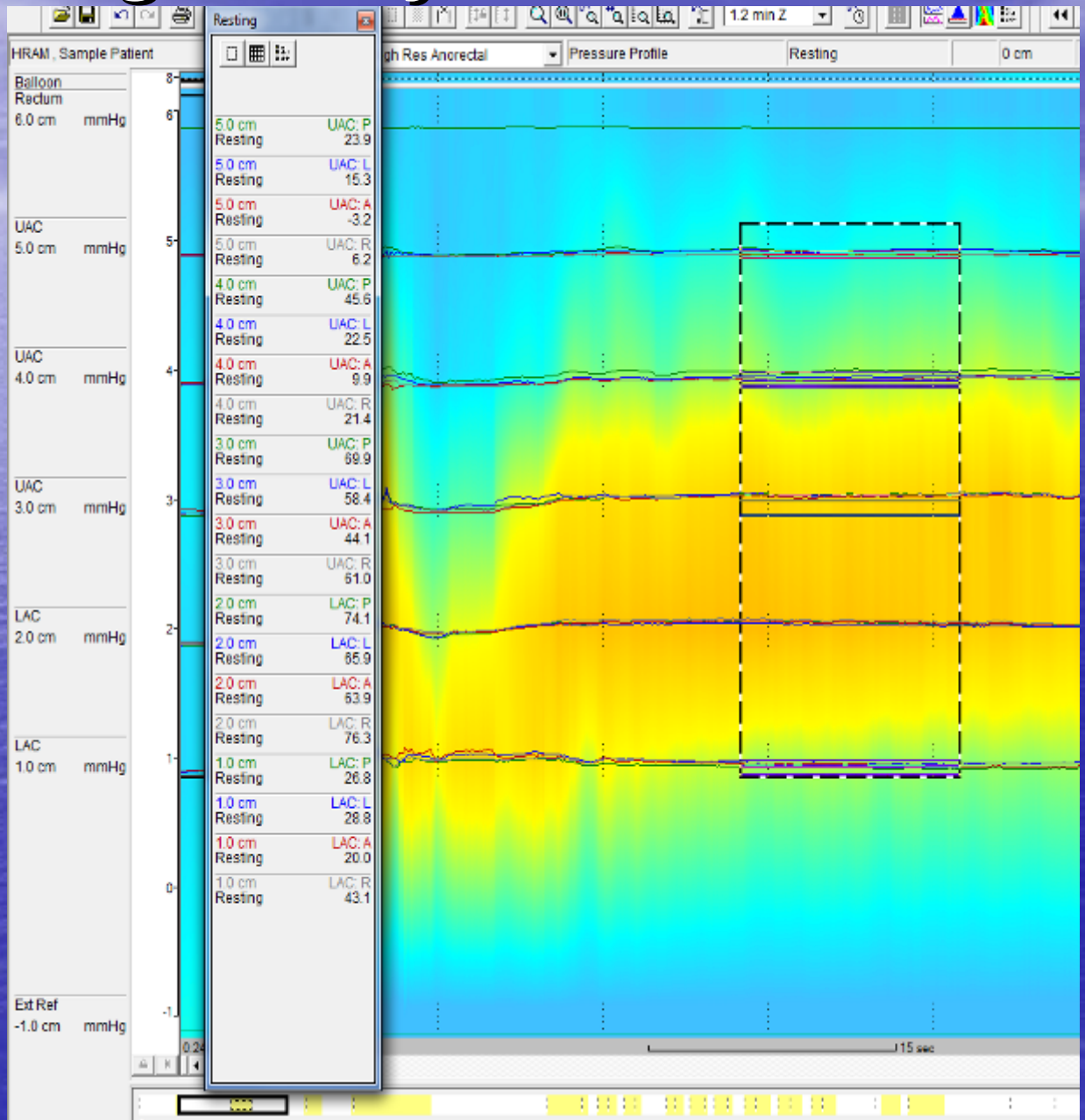
Resting Study

- Resting pressure
  - Measures the pressure throughout the anal canal exerted by the puborectalis muscle, internal anal sphincter, and external anal sphincter during periods of rest.
  - The majority of the tonic pressure is from IAS (80%)
  - Normal: 50-100 mmHg

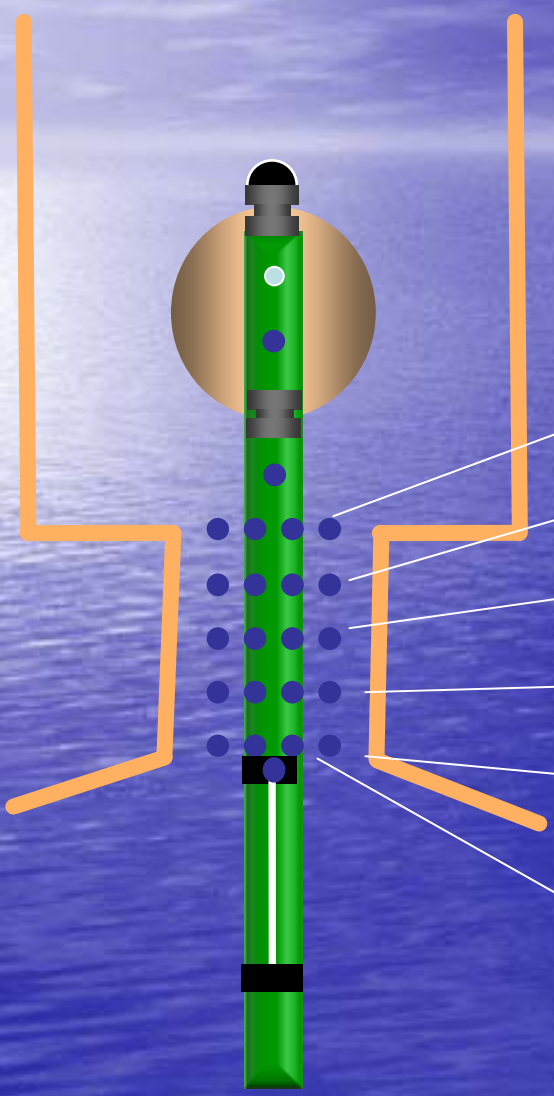
Resting Study

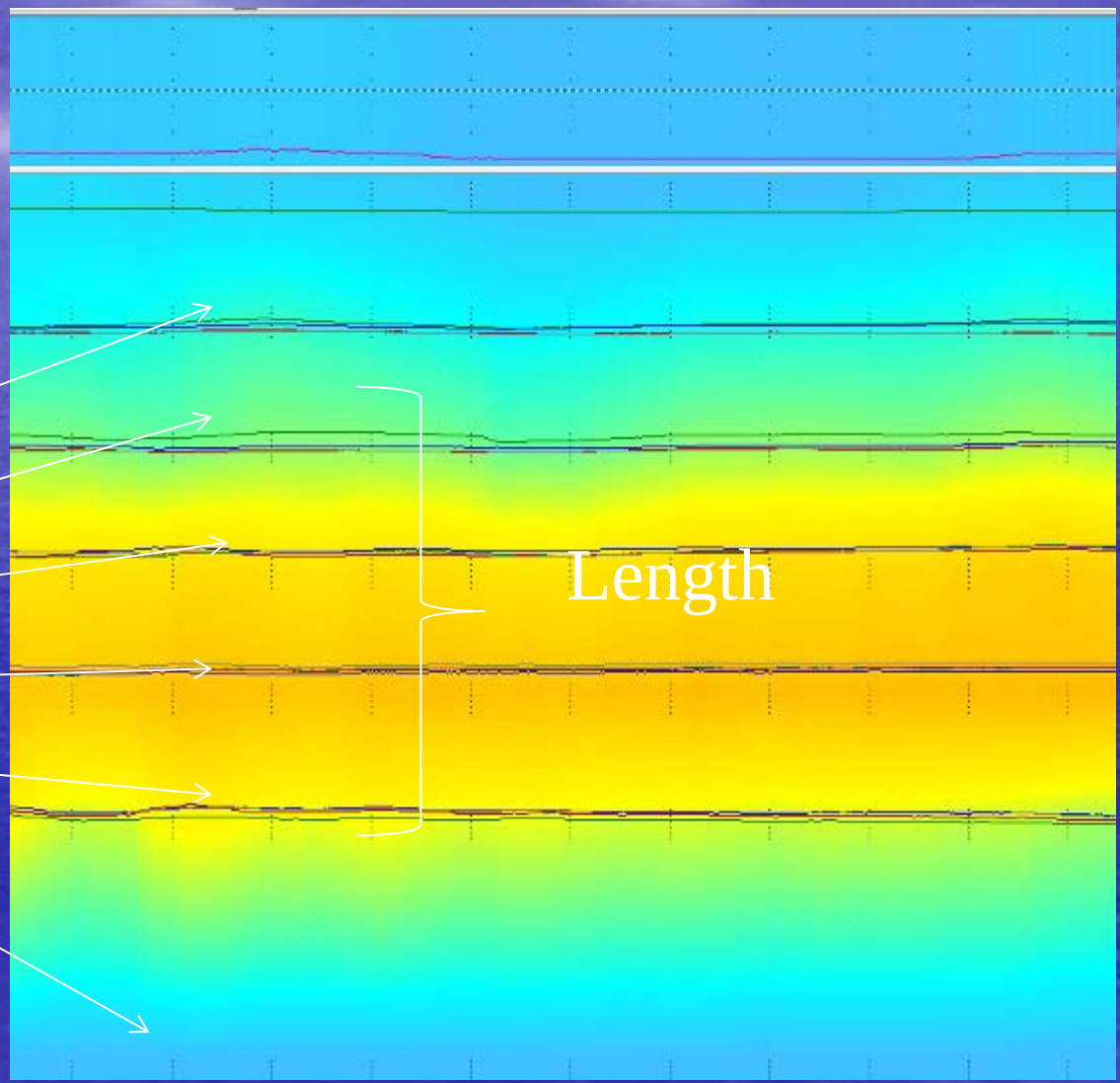


Resting Study

- Sphincter length
  - Measures the length in cm of the anal sphincter from where the pressure rises off baseline to where the pressure drops to baseline as the catheter is pulled through the sphincter.
  - Normal male: 3.5 cm
  - Normal female: 2.5-3 cm

Resting Study

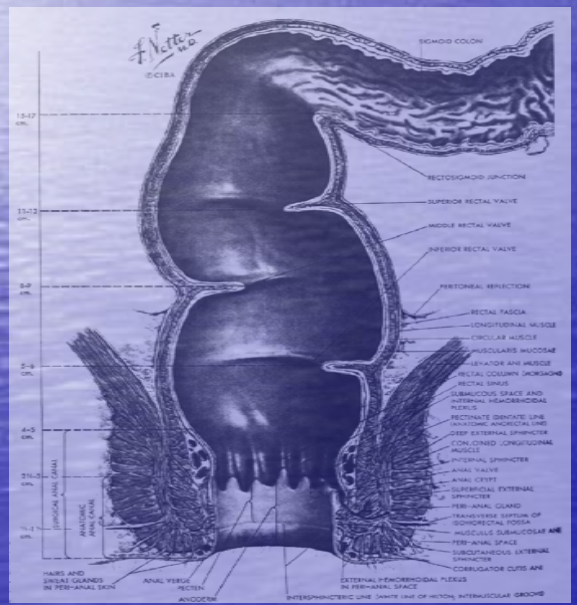


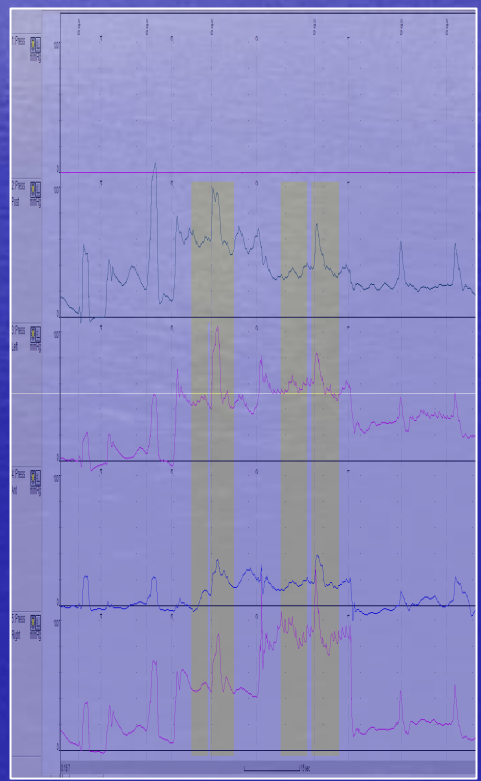


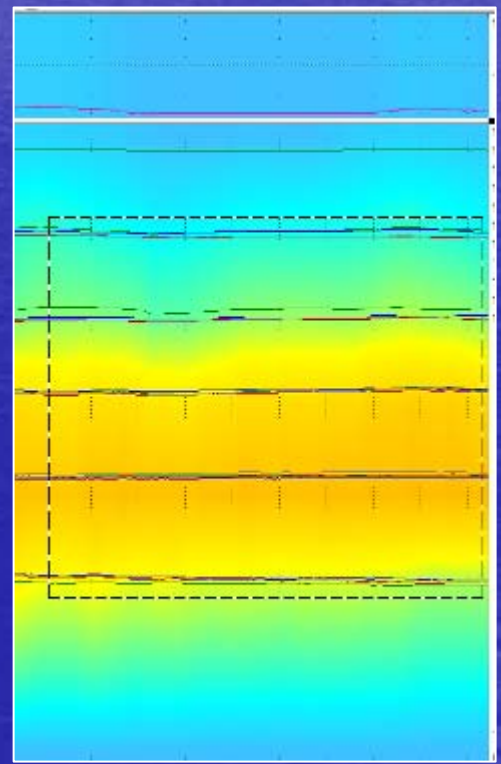
Resting Study

- Symmetry
  - A multidirectional catheter provides a 360 degree display of the anal sphincter to determine presence of defect in the resting state.

Resting Study





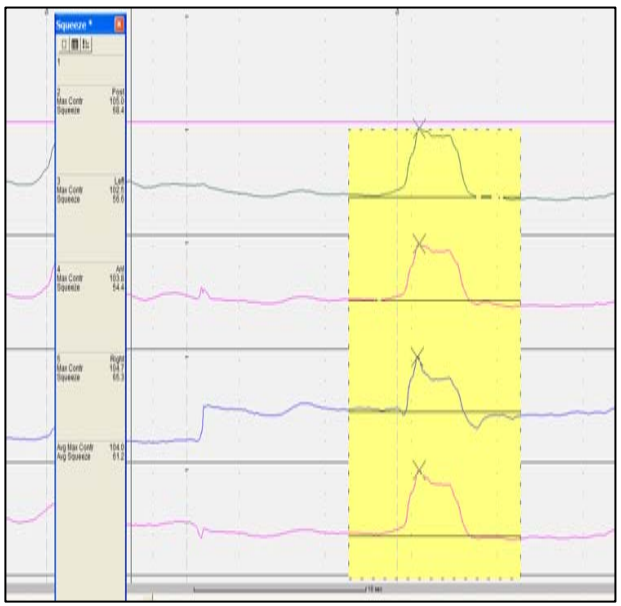


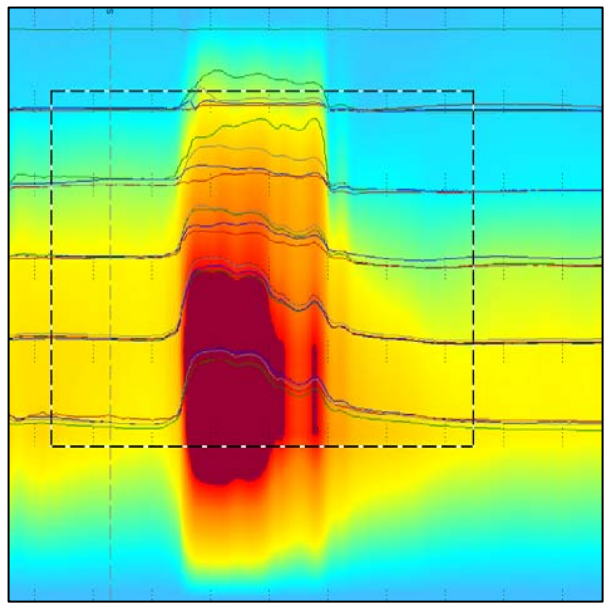
Resting Study

What did we learn?

- Competency of anal sphincter (disrupted or weak IAS)
  - Low resting pressure
    - Incontinence
  - Asymmetry
    - Incontinence
  - Short
    - May be seen in pts. with surgical or traumatic injuries
    - May contribute to incontinence
- High pressure
  - May be smooth or striated muscle spasm
    - Anal pain
    - Fissure

- Measures the increase in sphincter pressure with a voluntary squeeze
  - Puborectalis muscle and external anal sphincter contributes to the squeeze pressure
  - Continence success dependent on voluntary effort to overcome RAIR and increased intra-rectal pressure

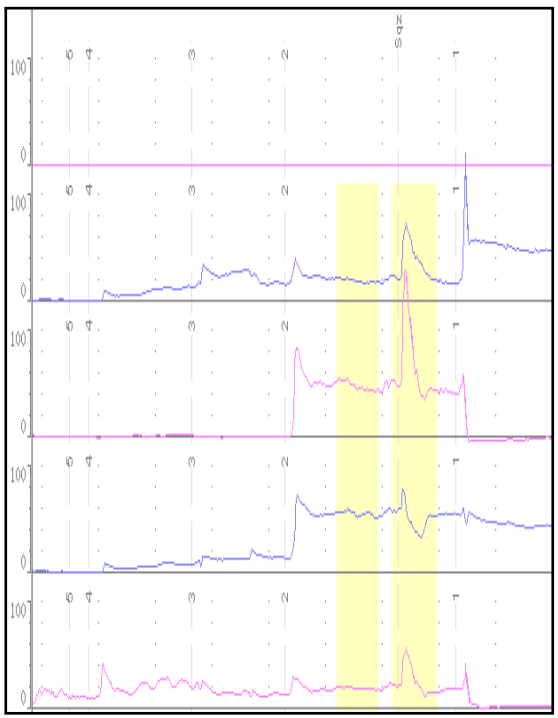


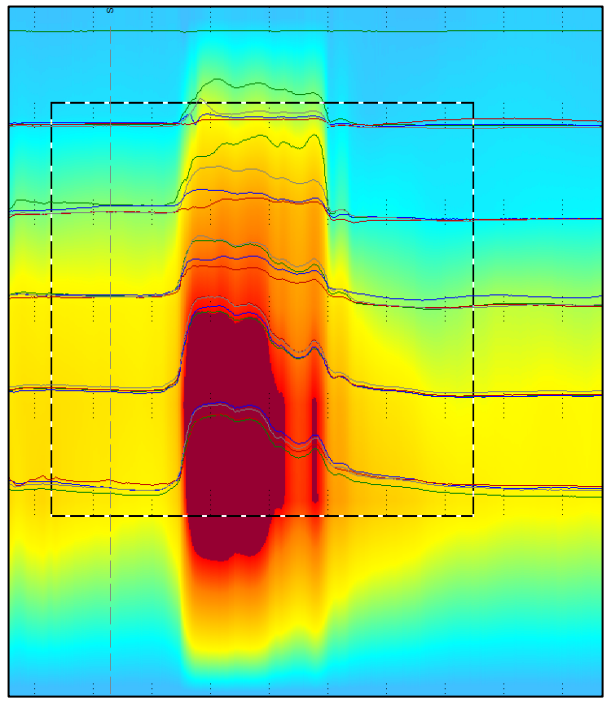


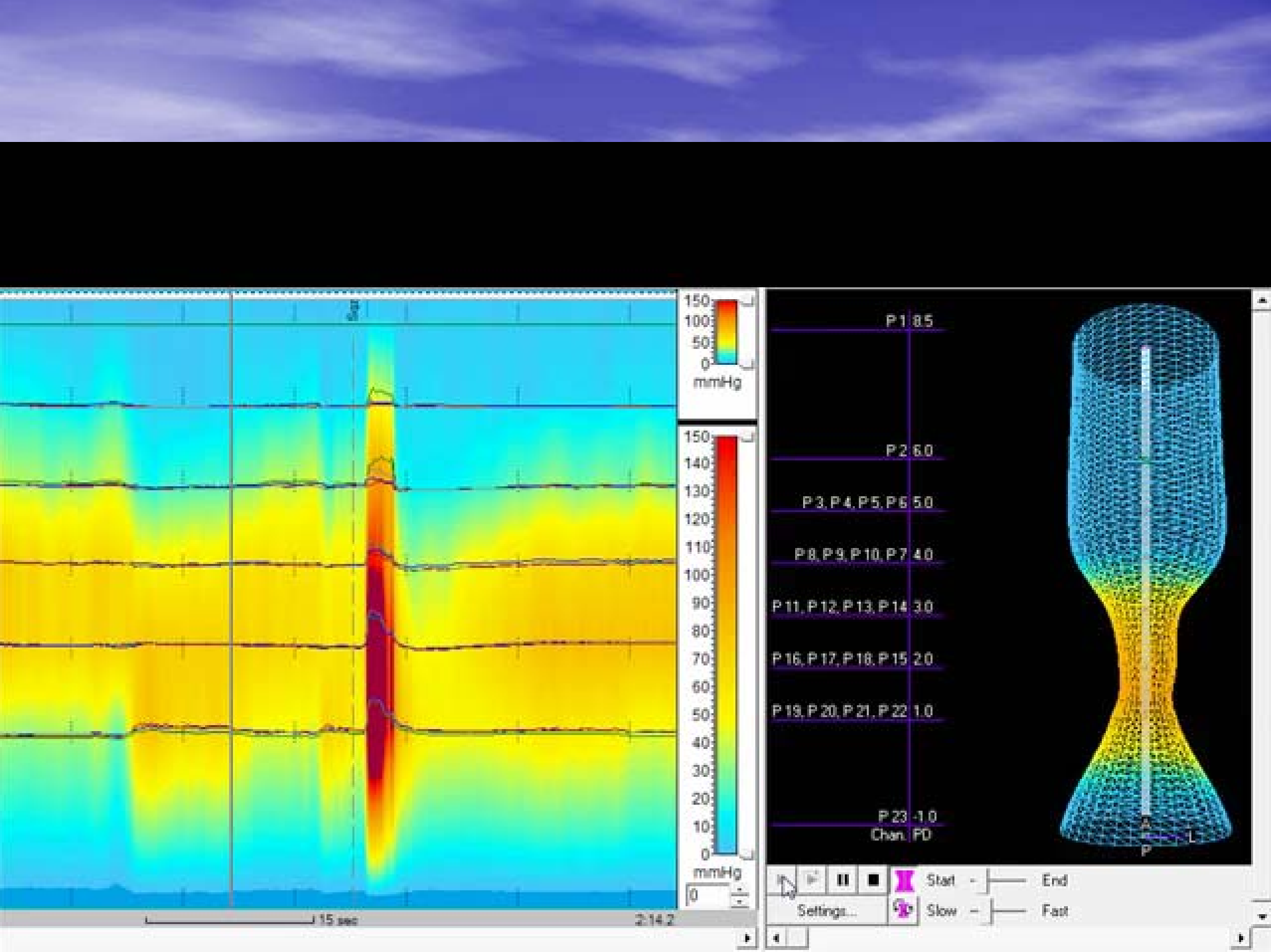
Squeeze Study

- Squeeze Pressure
  - Increase in pressure over resting pressure with a voluntary squeeze
    - Double basal
    - normal: 50-100 mmHg
- Maximum Voluntary Squeeze Pressure
  - Increase in pressure over rectal pressure with a voluntary squeeze
    - normal: >100 mmHg

- Symmetry
  - Multidirectional pressure sensors plot a 4 quadrant display to determine a defect during a voluntary squeeze



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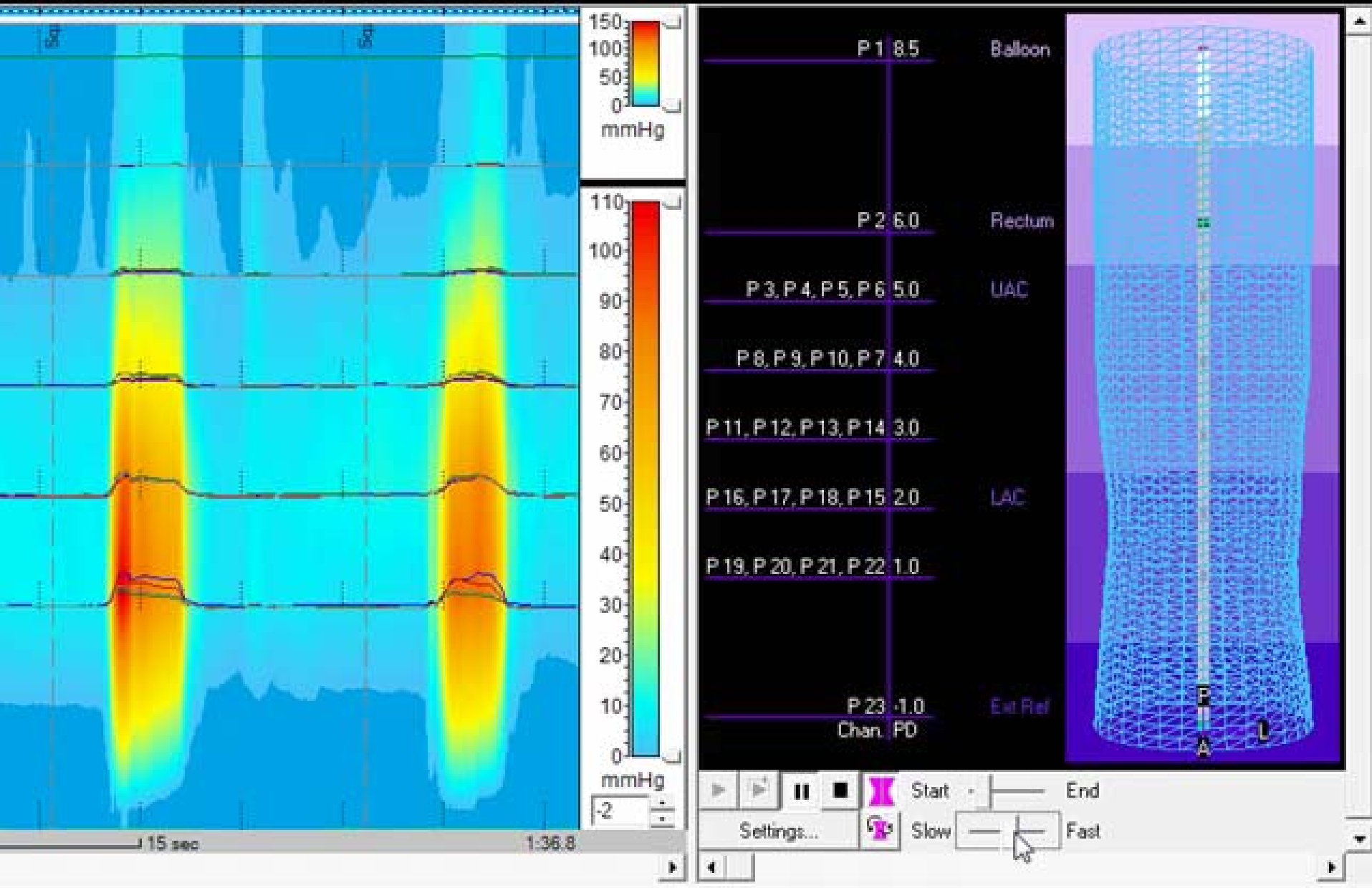
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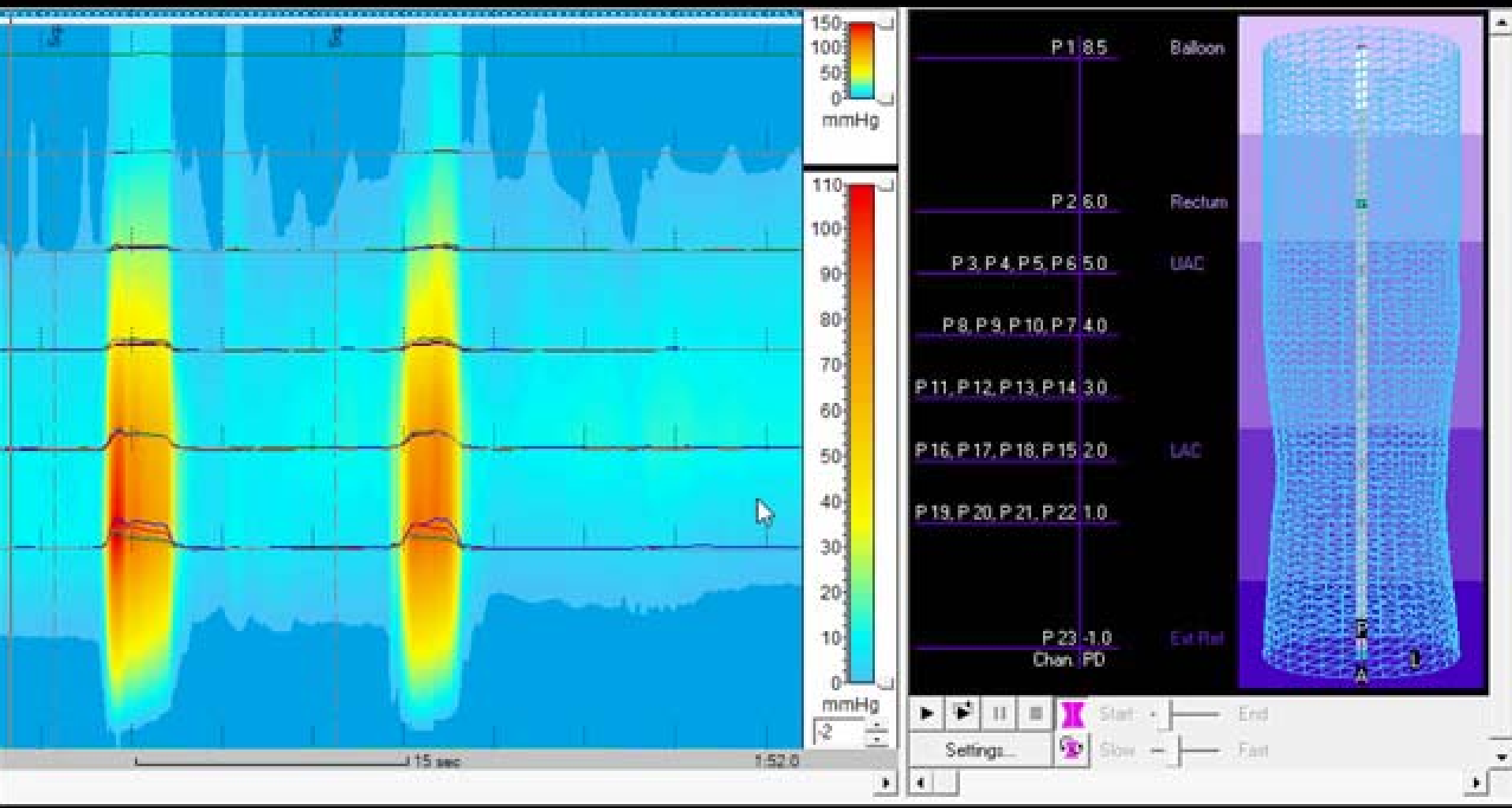
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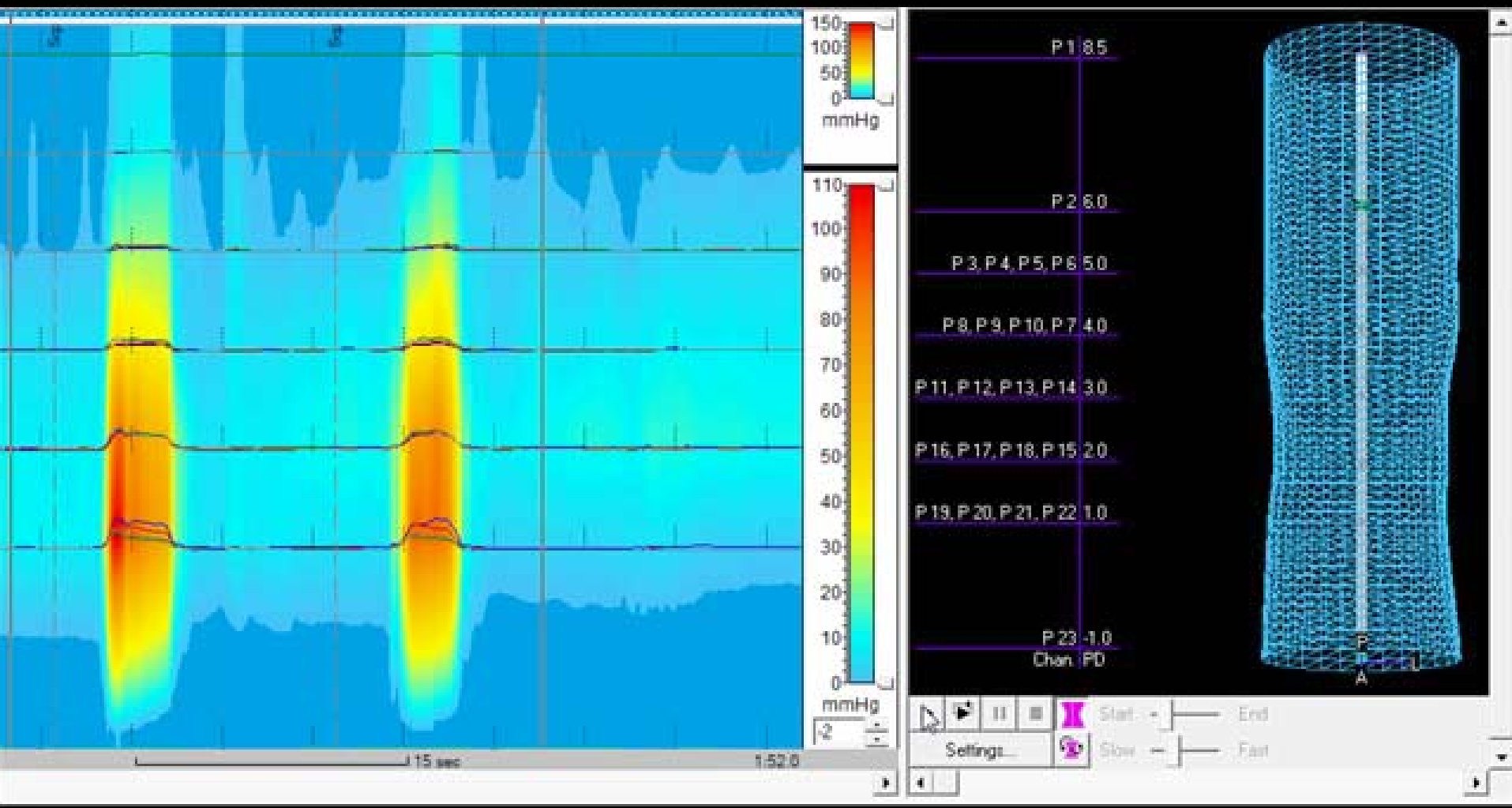
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Squeeze Study

- What do we learn?
  - Weak voluntary squeeze
    - Weak EAS from either muscular or neural damage
      - Muscular sphincter damage
      - Neurological damage of the motor pathways
      - Poorly compliant patient
        - -Incontinence
  - Early fatigue
    - Possible pudendal nerve damage
      - Incontinence
  - Asymmetry
    - Sphincter defect
      - Incontinence

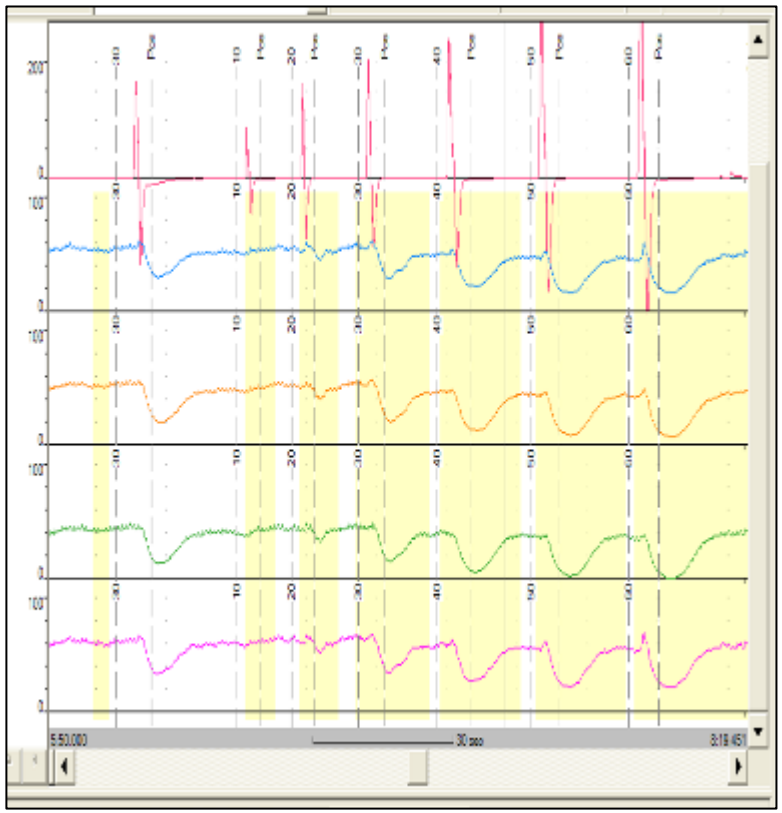
Squeeze Study

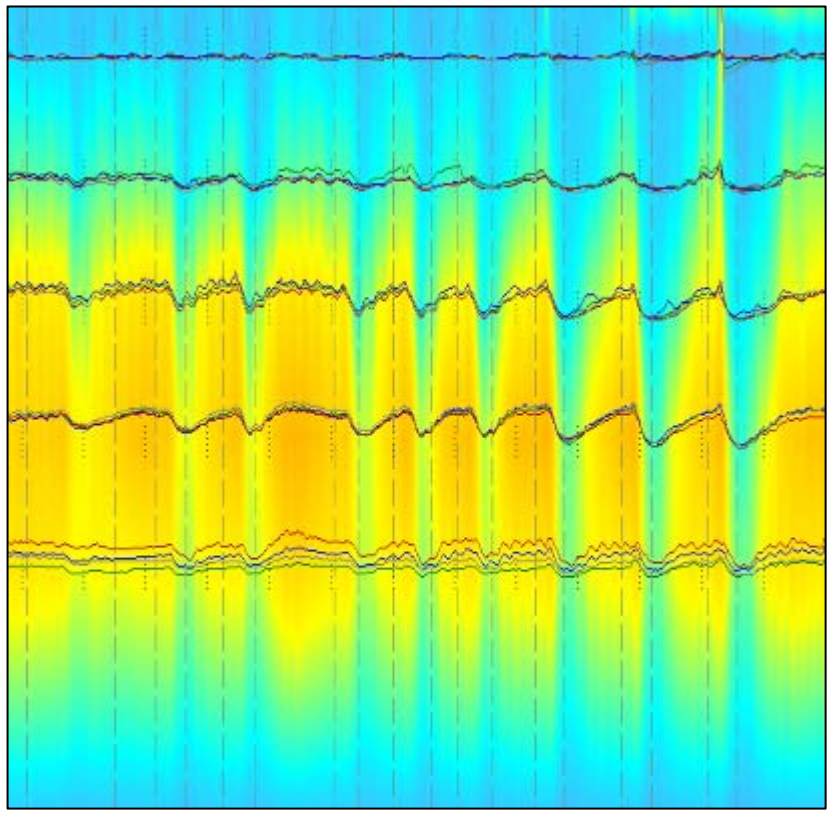
- What do we learn?
  - High squeeze pressures
    - Possible males with chronic pelvic pains

RAIR Study

- Determines if the internal anal sphincter pressure is inhibited in response to rectal distension
  - Normal: inhibition of pressure with rectal volumes >20 ml

- Internal anal sphincter relaxation in response to rectal distension
  - Volume incremental





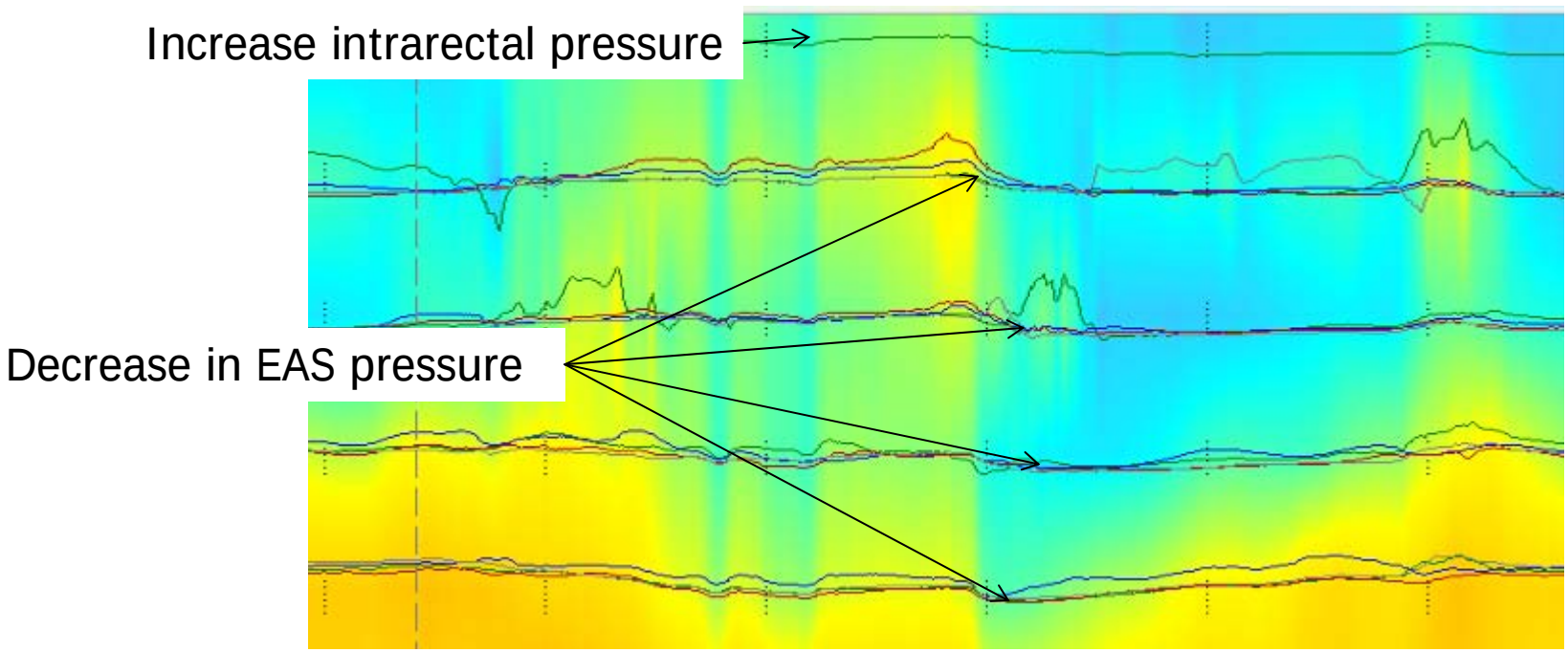
RAIR Study

- What do we learn?
  - A screen for Hirschsprung's disease
    - RAIR present then functioning myenteric plexus and the absence of Hirschsprung's
    - No inhibition of IAS
      - Hirschsprung's
      - Mega rectum
      - Tonically contracted EAS
  - Diminished rectal sensation
    - Incontinence
    - Mega rectum
  - Failure of EAS to contract
    - Fecal incontinence

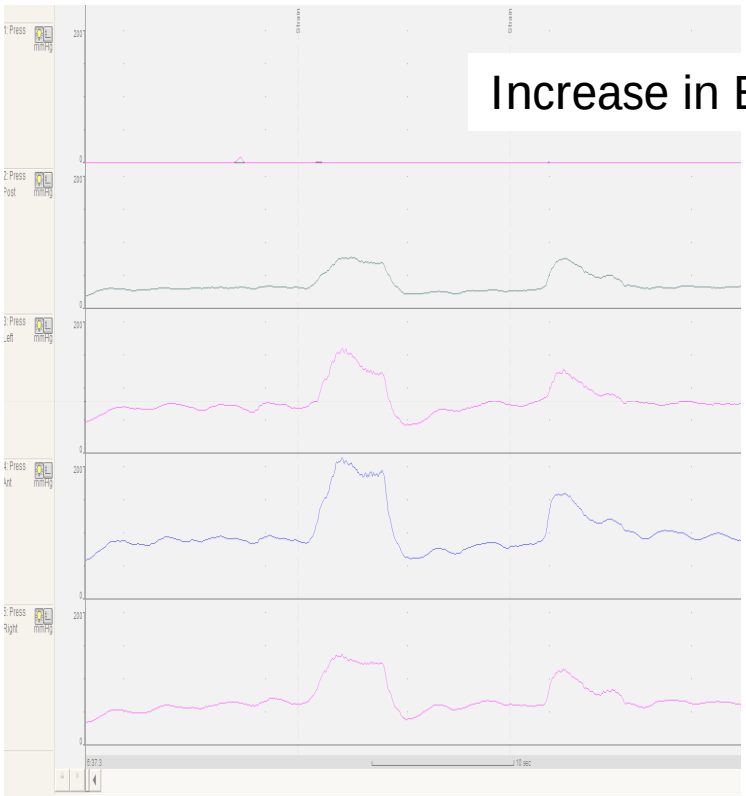
Push Study

- Assess puborectalis and external anal sphincter response to pushing as in an attempt to defecate. Pushing results in abd. compression, perineal descent and anal relaxation.
  - Normal: decrease pressure
    - The pressure should not increase which indicates a paradoxical response

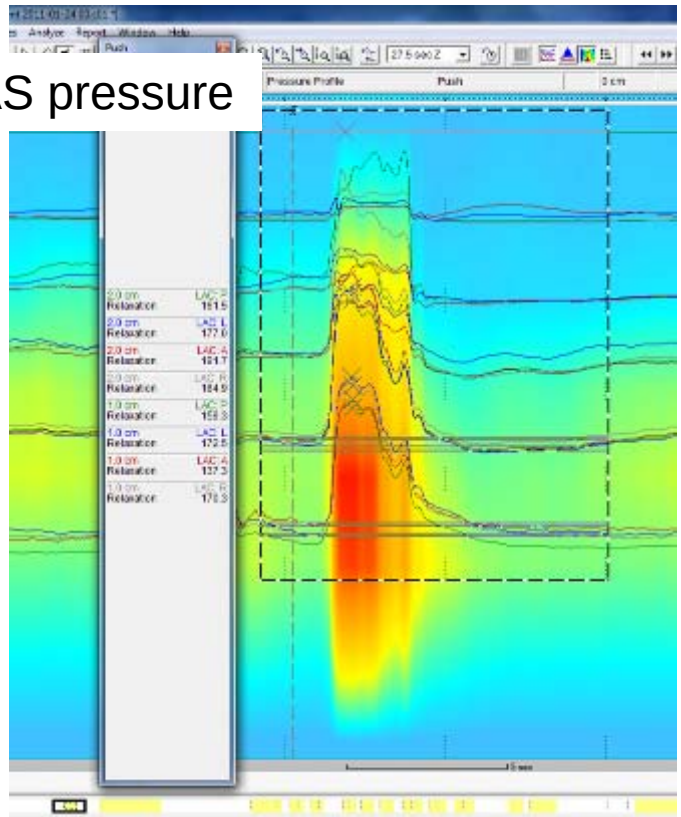
- Normal strain response

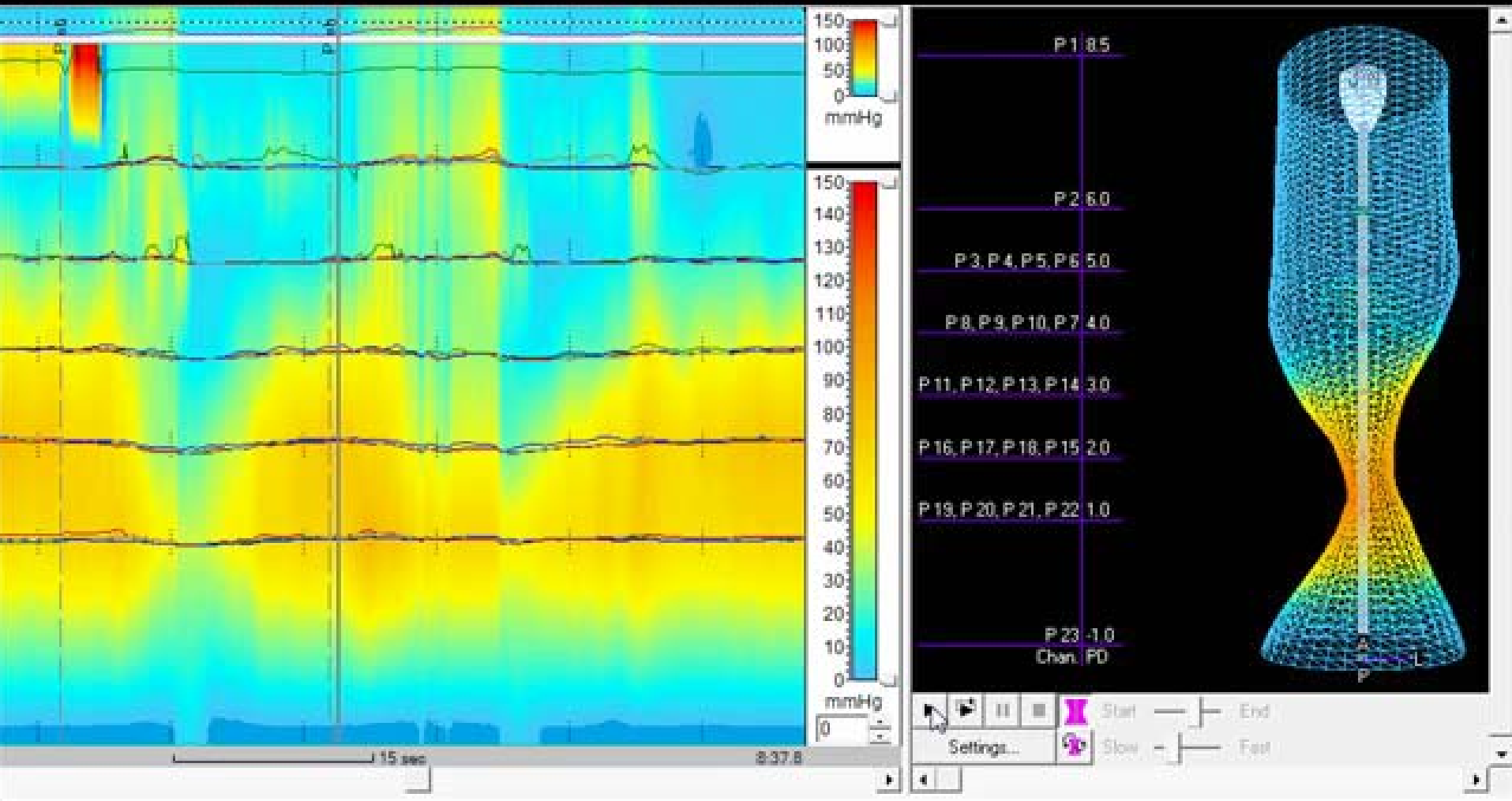


- Abnormal strain response



Increase in EAS pressure

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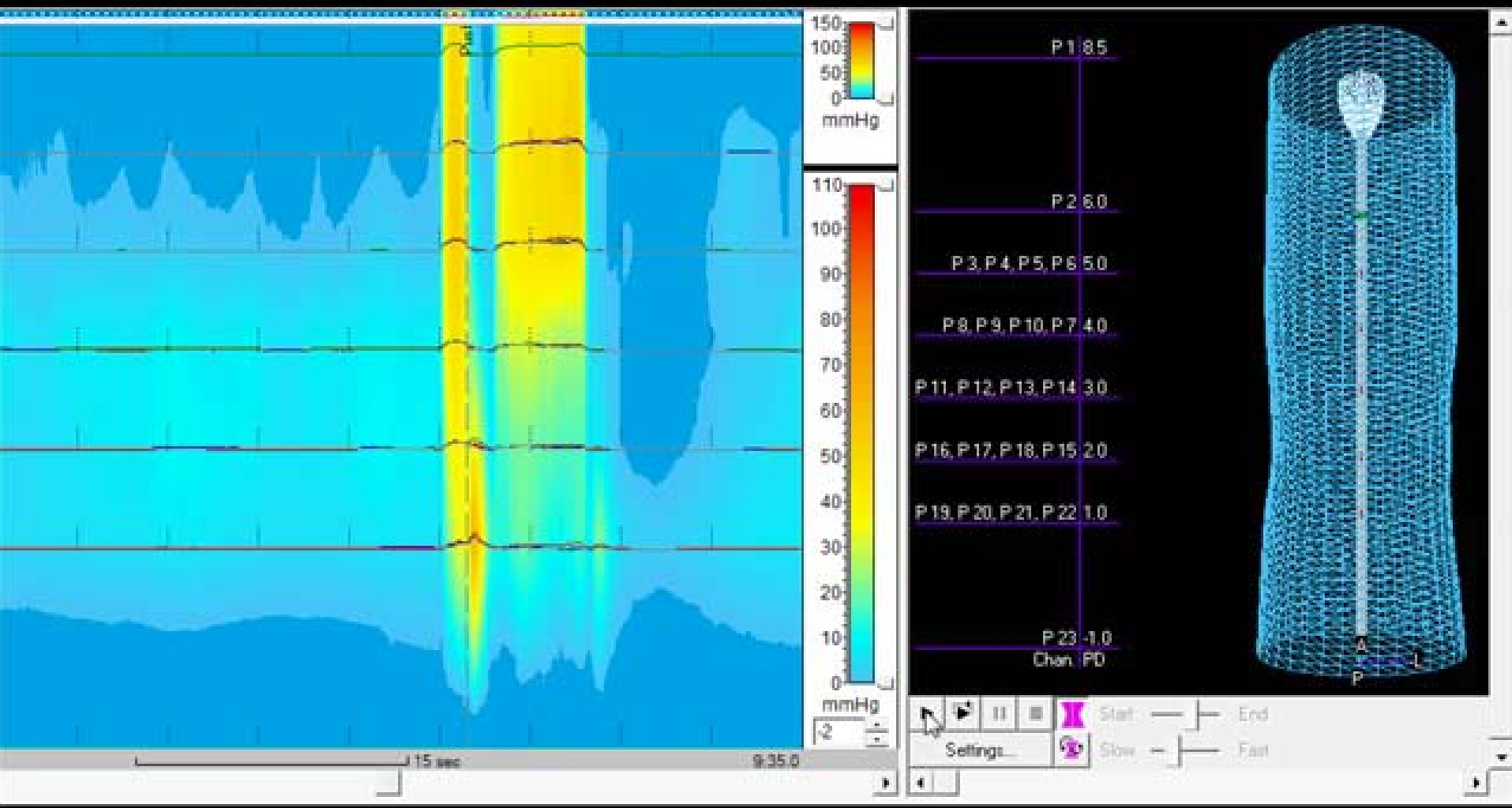
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Push Study

- What do we learn
  - Screen for functional outlet obstruction (FOO)
  - Paradoxical response
    - FOO, anismus, dyssynergia
    - Symptoms of
      - inability to pass stool
      - Excessive straining
      - Incomplete evacuation