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Urodynamics & LUTs

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Classification of LUTS

Storage	Voiding	Post-micturition
• Urgency • Urinary incontinence • Increased day-time frequency • Nocturia	• Slow stream •Splitting/spraying • Intermittency • Hesitancy • Straining • Terminal dribbling	• Post-micturition dribbling • Feeling of incomplete emptying

Abrams P et al. *Neurourol Urodyn* 2002;21:167–78

OAB vs DO

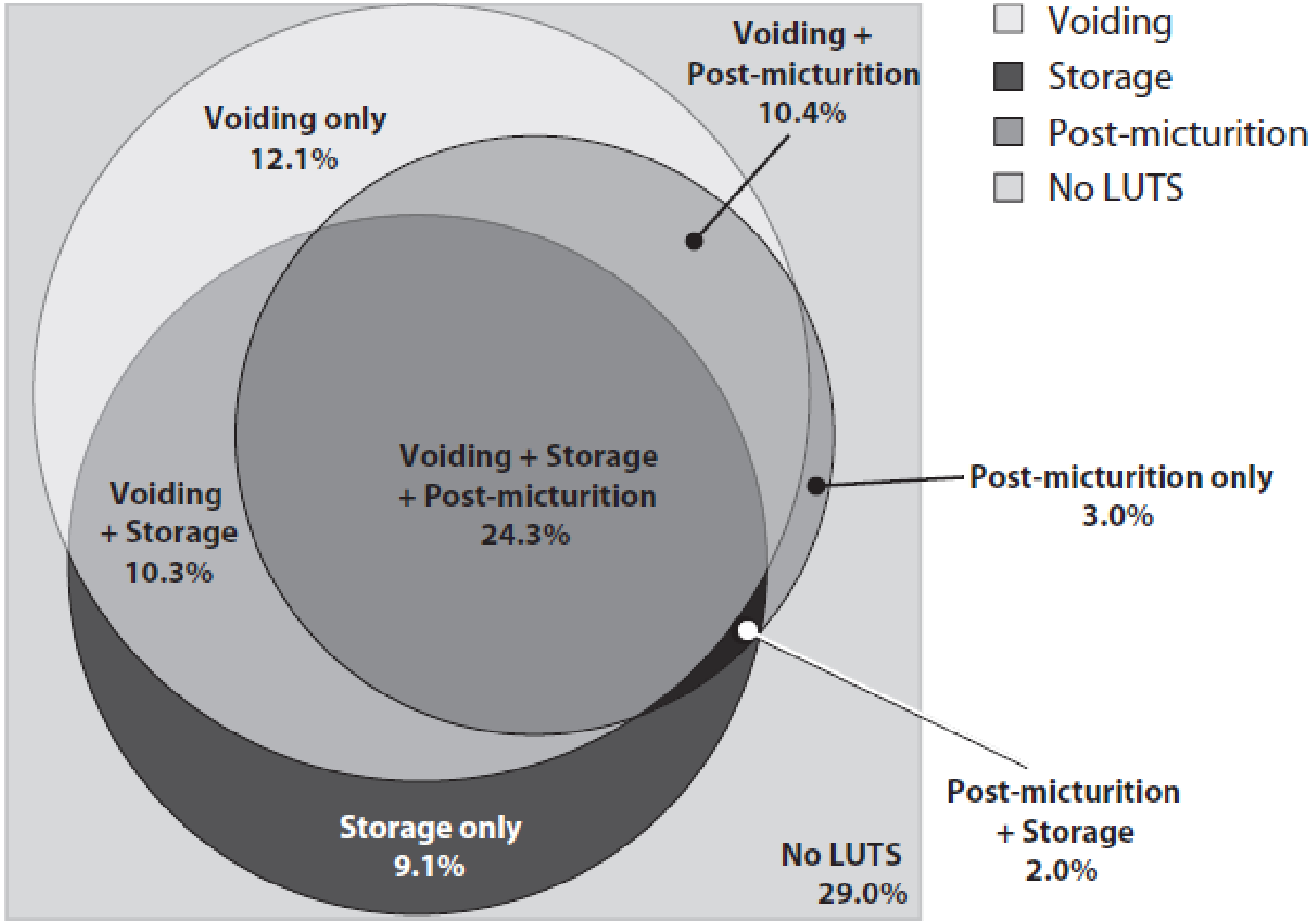
- OAB: Clinical symptomatic diagnosis
- DO: Urodynamic diagnosis

- 82% of men with OAB have DO
- 58% of women with OAB have DO

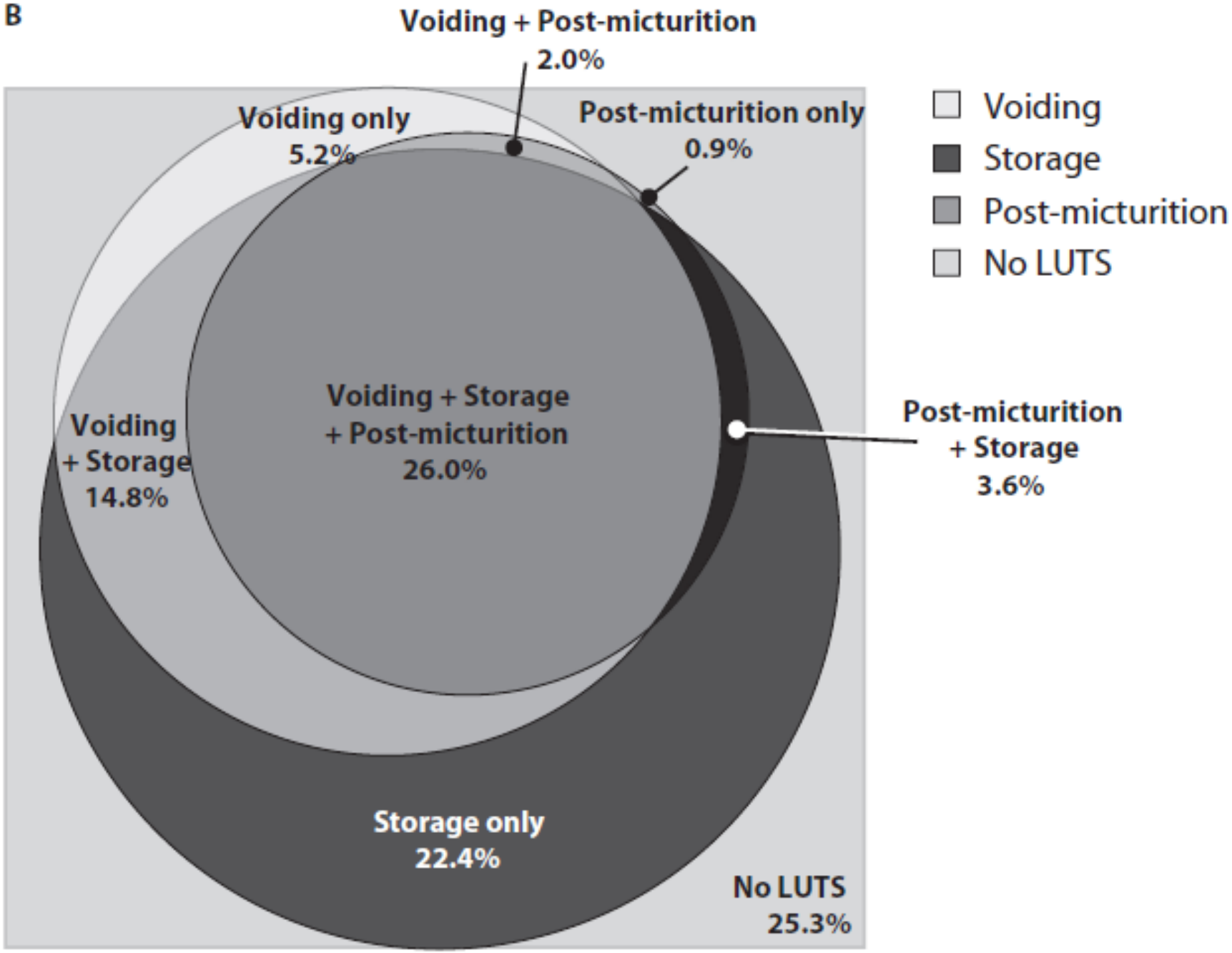
Hashim H et al. J Urol; 175 (1): 191-4 (2006)

SUI Definitions

- The symptom – the complaint of involuntary leakage on effort or exertion, for example, on sneezing or coughing.
- The sign – involuntary leakage from the urethra, synchronous with exertion/effort, or sneezing or coughing.
- The condition – urodynamic stress incontinence is noted during filling cystometry, and is defined as the involuntary leakage or urine during increased abdominal pressure, in the absence of a detrusor contraction.

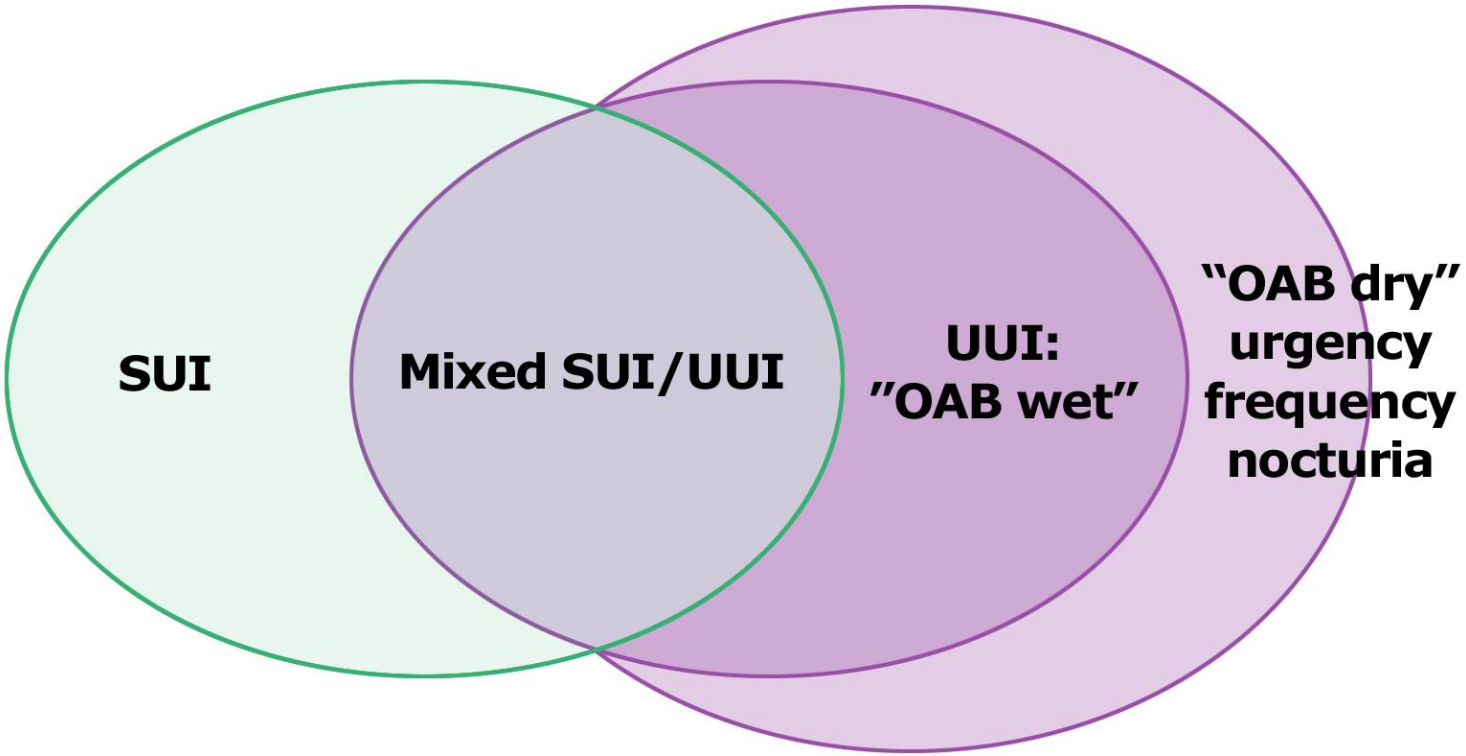


Sexton CC et al. BJUI 2009; 103 (Suppl 3): 12-23

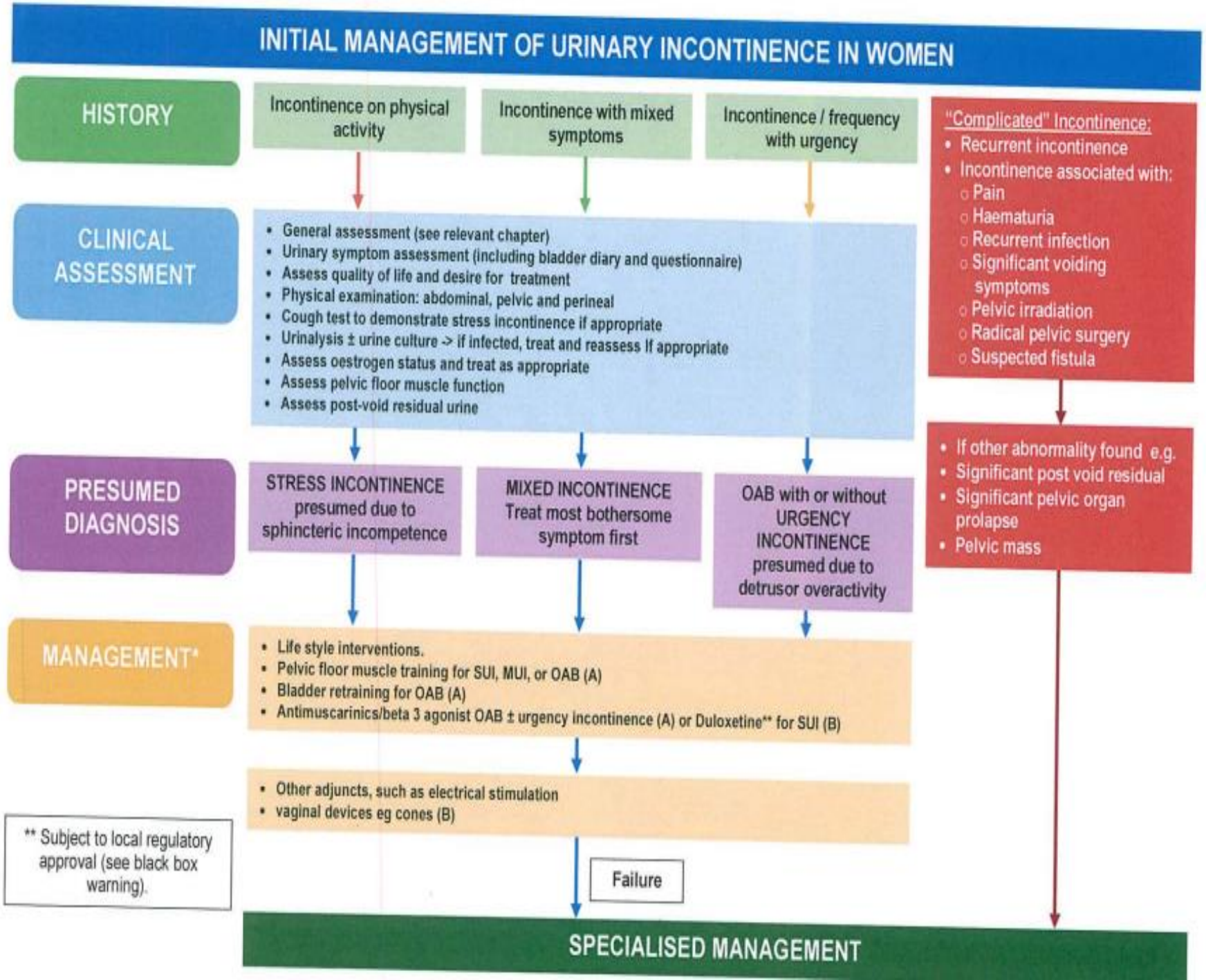


Sexton CC et al. BJUI 2009; 103 (Suppl 3): 12-23

Storage Symptoms and Incontinence.



SUI : stress urinary incontinence
UUI : urge urinary incontinence


INITIAL MANAGEMENT OF URINARY INCONTINENCE IN WOMEN
HISTORY
Incontinence on physical activity
Incontinence with mixed symptoms
Incontinence / frequency with urgency
"Complicated" Incontinence:
• Recurrent incontinence
• Incontinence associated with:
o Pain
o Haematuria
o Recurrent infection
o Significant voiding symptoms
o Pelvic irradiation
o Radical pelvic surgery
o Suspected fistula
CLINICAL ASSESSMENT
• General assessment (see relevant chapter)
• Urinary symptom assessment (including bladder diary and questionnaire)
• Assess quality of life and desire for treatment
• Physical examination: abdominal, pelvic and perineal
• Cough test to demonstrate stress incontinence if appropriate
• Urinalysis ± urine culture -> if infected, treat and reassess If appropriate
• Assess oestrogen status and treat as appropriate
• Assess pelvic floor muscle function
• Assess post-void residual urine
• If other abnormality found e.g.
• Significant post void residual
• Significant pelvic organ prolapse
• Pelvic mass
PRESUMED DIAGNOSIS
STRESS INCONTINENCE presumed due to sphincteric incompetence
MIXED INCONTINENCE Treat most bothersome symptom first
OAB with or without URGENCY INCONTINENCE presumed due to detrusor overactivity
MANAGEMENT*
• Life style interventions.
• Pelvic floor muscle training for SUI, MUI, or OAB (A)
• Bladder retraining for OAB (A)
• Antimuscarinics/beta 3 agonist OAB ± urgency incontinence (A) or Duloxetine** for SUI (B)
• Other adjuncts, such as electrical stimulation
• vaginal devices eg cones (B)
** Subject to local regulatory approval (see black box warning).
Failure
SPECIALISED MANAGEMENT

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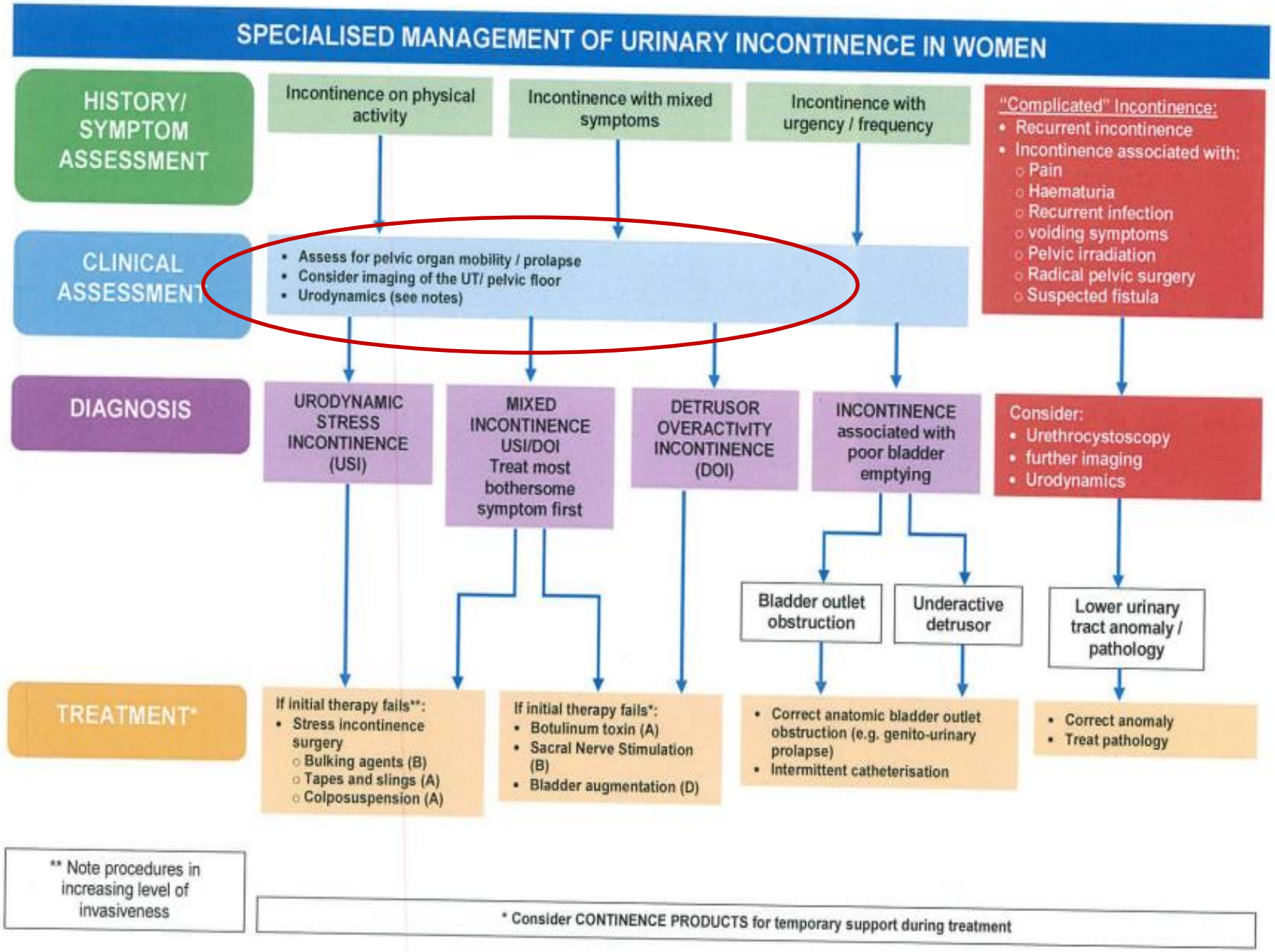

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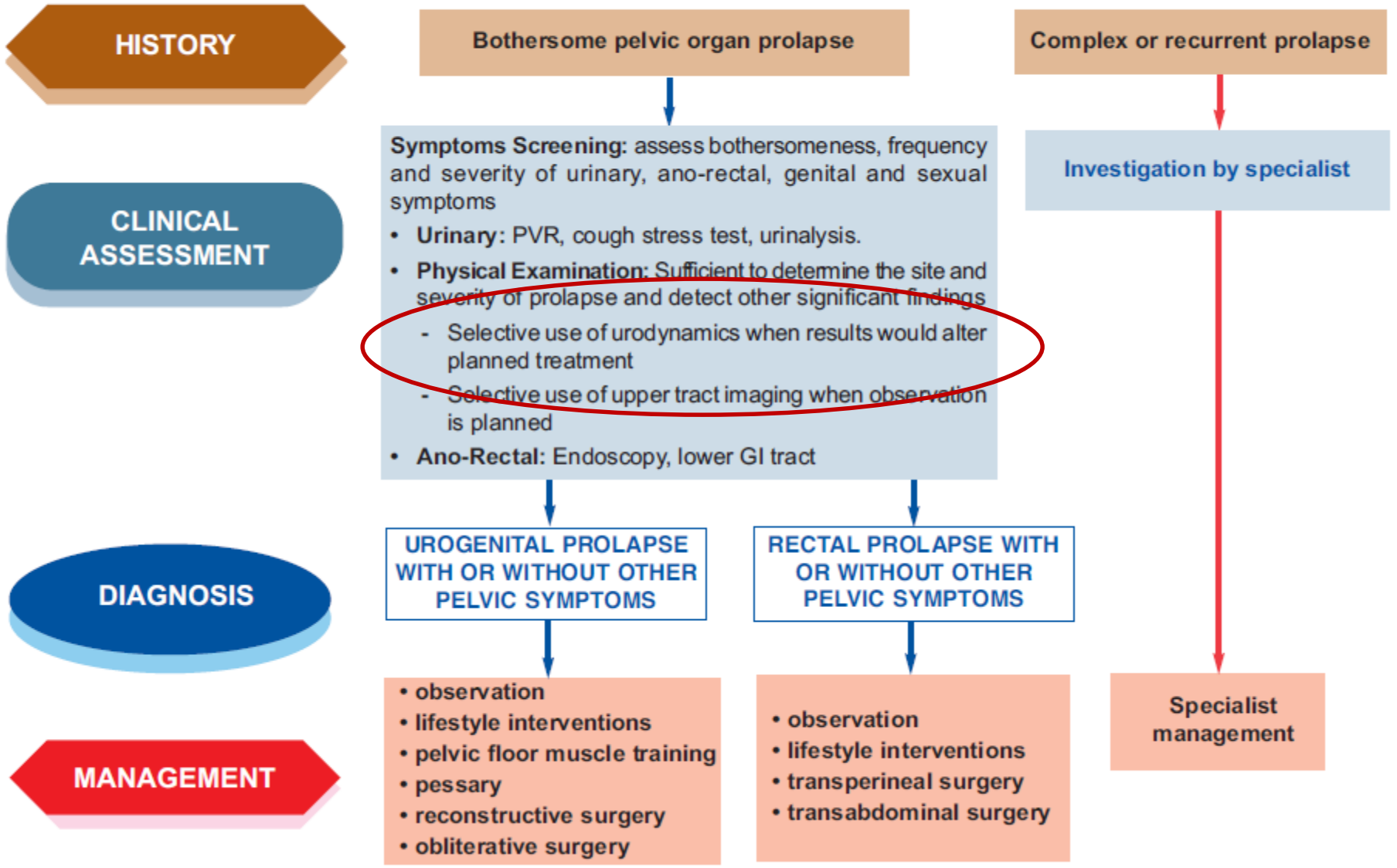
Management of Pelvic Organ Prolapse
(including urogenital prolapse, and recta prolapse)



Clinical Assessment

- Quality of life e.g. ICIQ-OAB
- Frequency-volume chart
- Physical examination: abdominal, rectal, sacral, neurological, pelvic floor muscle function and vaginal (in women)

- Urinalysis using ‘dipsticks’: if infected, send for culture, treat and reassess

- Free flow rate and post-void residual urine

پرسشنامه ICIQ-OAB

بسیاری از مردم از علایم ادراری تحتانی رنج می برند. این پرسشنامه طراحی شده است تا شما وضعیت علایم خود را در چهار هفته گذشته بادآور شوید و بیان نمایید که این مسئله چقدر برای شما ازار دهنده است. از همکاری شما متشکریم.

تاریخ تولد: سال ماه روز

1- طی روز چند وقت یکبار برای دفع ادرار به دستشویی می روید؟

پرسشنامه ICIQ-UI-S F

بسیاری از مردم از علایم ادراری تحتانی رنج می برند. این پرسشنامه طراحی شده است تا شما وضعیت علایم خود را در چهار هفته گذشته بادآور شوید و بیان نمایید که این مسئله چقدر برای شما ازار دهنده است. از همکاری شما متشکریم.

تاریخ تولد: سال ماه روز

Evidence summary	LE
Frequency volume charts of 3-7 days duration are a reliable tool for the objective measurement of mean voided volume, daytime and night-time frequency and incontinence episode frequency.	2b
Frequency volume charts are sensitive to change and are a reliable measure of outcome.	2b

Recommendations	GR
Use a frequency volume chart to evaluate co-existing storage and voiding dysfunction in patients with urinary incontinence.	A
Use a diary duration of between 3 and 7 days.	B

Types of voiding diaries

- ***Micturition time chart:*** records only the times of micturitions, D&N, ≥ 24 hrs.
- ***Frequency volume chart (FVC):*** this records the volume and time of each micturition, D&N, ≥ 24 hrs.
- ***Bladder diary:*** records the times of micturitions and voided volumes, incontinence episodes, pad usage and other information e.g. fluid intake, degree of urgency, degree of incontinence.

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ثبت روزانه فعالیت مثانه

لطفا برای سه روز مقدار نوشیدنی خود و هنگامیکه دفع ادرار دارید، مقدار ادراری که تولید کرده اید ونیز اینکه آیا نیاز فوری برای دفع ادرار داشتید و تعداد دفعات رخ دادن بی اختیاری را ثبت کنید. از همکاری شما متشکریم.

	زمان حجم روزانه	ساعت خواب	شبانه	اتفاقات
روز اول				
روز دوم				
روز سوم				

مثال:

روز اول	6:30 8 9:30 1 لیوان 1/2 1/4	12	2 3:30 5 1 1/4 1/2	2 بار بی اختیاری ادرار در روز

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BLADDER DIARY

NAME:_____

Please complete this **3 day** bladder diary. Enter the following in each column against the time. You can change the specified times if you need to.

1. Drinks
Write the amount you had to drink and the type of drink you had.

2. Urine output
Enter the amount of urine you passed in millilitres (mls) in the urine output column, day and night. Any measuring jug will do. If you passed urine but couldn't measure it, put a tick in the urine output column.
If you leaked urine at any time write **LEAK** in the urine output column.

3. Bladder sensation
Write a description of how your bladder felt when you went to the toilet using the codes listed at the bottom of the page.

4. Write **BED** when you went to bed and **WOKE** when you woke up in the time column.

Here is an example of how to complete the diary:

Time	Drinks		Urine Output (mls)	Bladder sensation
	Amount	Type		
6am WOKE			350ml	2
7am	Cup	Tea		
8am			✓	
9am				
10am	300ml	Water	Leak	
11am			Leak	3

DAY 1 DATE: ____/____/_____

Time	Drinks		Urine Output (mls)	Bladder sensation
	Amount	Type		
6am				
7am				
8am				
9am				
10am				
11am				
Midday				
1pm				
2pm				
3pm				
4pm				
5pm				
6pm				
7pm				
8pm				
9pm				
10pm				
11pm				
Midnight				
1am				
2am				
3am				
4am				
5am				

DAY 2 DATE: ____/____/_____

Time	Drinks		Urine Output (mls)	Bladder sensation
	Amount	Type		
6am				
7am				
8am				
9am				
10am				
11am				
Midday				
1pm				
2pm				
3pm				
4pm				
5pm				
6pm				
7pm				
8pm				
9pm				
10pm				
11pm				
Midnight				
1am				
2am				
3am				
4am				
5am				

DAY 3 DATE: ____/____/_____

Time	Drinks		Urine output (mls)	Bladder sensation
	Amount	Type		
6am				
7am				
8am				
9am				
10am				
11am				
Midday				
1pm				
2pm				
3pm				
4pm				
5pm				
6pm				
7pm				
8pm				
9pm				
10pm				
11pm				
Midnight				
1am				
2am				
3am				
4am				
5am				

Bladder sensation codes

0 - if you had no sensation of needing to pass urine, but passed urine for "social reasons", for example, just before going out, or unsure where the next toilet is.
1 - if you had a normal desire to pass urine and no urgency. Urgency is different from normal bladder feelings and is the sudden compelling desire to pass urine which is difficult to defer, or a sudden feeling that you need to pass urine and if you don't you will have an accident.
2 - if you had urgency but it passed away before you had to visit the toilet.
3 - if you had urgency but managed to get to the toilet, still with urgency but did not leak urine.
4 - if you had urgency and could not get to the toilet in time so you leaked urine.

0 - did not need to go, went just in case
1 – normal desire to pass urine
2 – had urgency but it passed away
3 – had urgency but got to the toilet before leaking
4 – had urgency and leaked

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Urodynamic Studies

Urodynamic Testing

Urodynamic evaluation is recommended :

- prior to *invasive treatments*
- after *treatment failure*
- as part of a *long-term surveillance* programme in neurogenic lower urinary tract dysfunction
- in *"complicated incontinence"*.

What are the indications for UDS?

1. Previous surgery for stress incontinence
2. Clinical suspicion of detrussor overactivity
3. Voiding dysfunction
4. Unclear clinical diagnosis before surgery
5. Presence of neurological clinical features

- I will perform UDS in all pt before surgery because 10% of pt with SI with have DO and 20% of pt with DO with SI

The aim of urodynamic studies

To REPRODUCE the patient's symptoms, and by doing so, to provide a pathophysiological basis for future management

Full urodynamics are essential prior to invasive therapy:

- to make a precise diagnosis
- to allow selection of an appropriate technique
- to warn the patient of possible problems
- to allow properly informed consent

UDS Armamentarium

- ***Noninvasive UDS:***
  - Uroflowmetry
  - Post-void residuals (PVR)
- ***Invasive UDS:***
  - Filling Cystometry
  - Pressure-flow micturition studies
  - Electrophysiological studies
  - Urethral pressure studies
  - Video-urodynamic studies

Uroflowmetry

- Non invasive study
- An estimate of effectiveness of the act of voiding along with PVR.
- Influenced by
  - effectiveness of detrusor contraction
  - completeness of sphincteric relaxation
  - patency of the urethra

Uroflowmetry(cont.)

- Recorded variables during uroflowmetry study:

-flow pattern

-voided volume

-maximum flow rate(Q max)

-flow time

-average flow rate(Q mean)

-time to maximum flow

-voiding time

-hesitancy

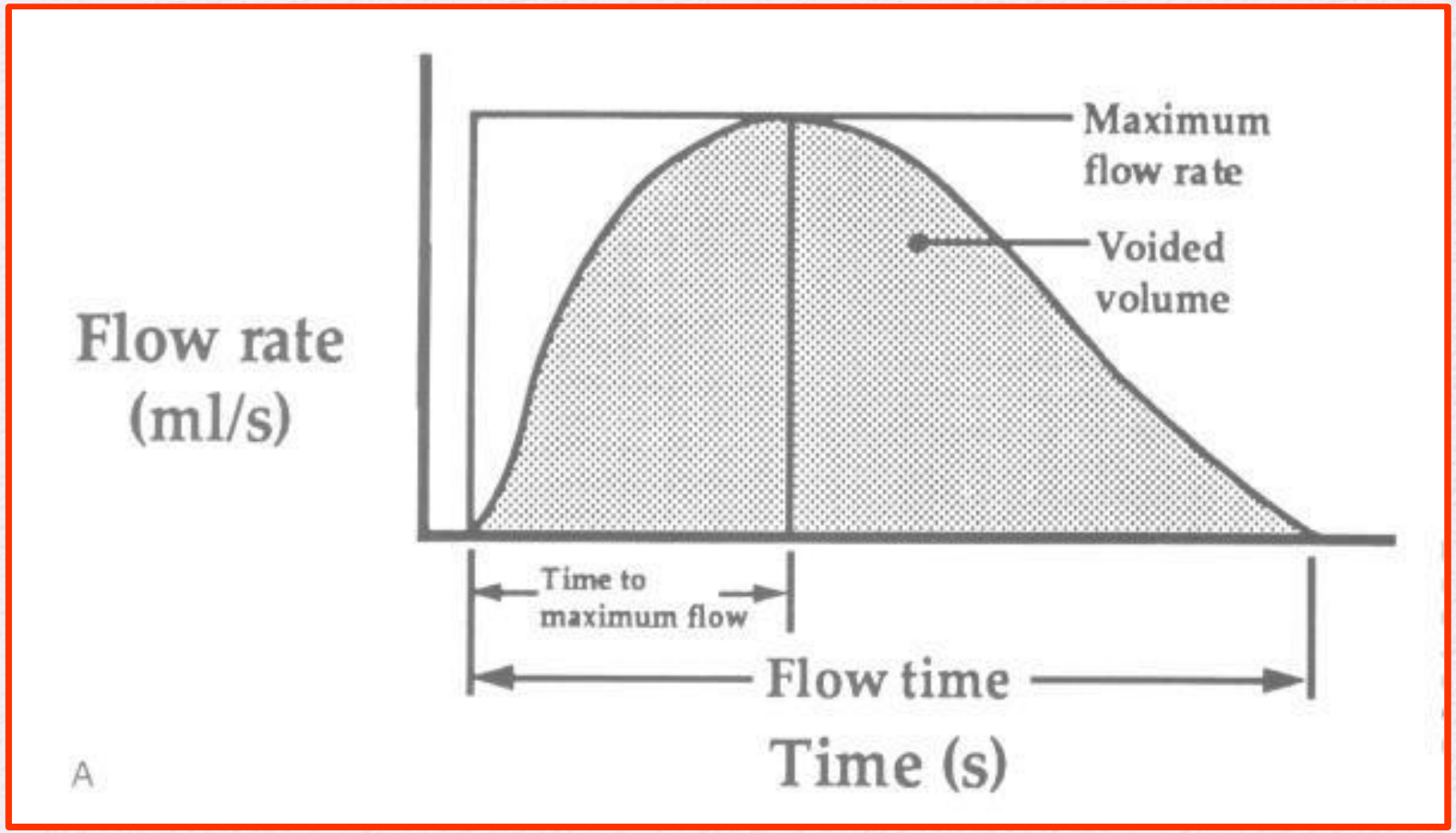

Flow rate
(ml/s)
Maximum
flow rate
Voided
volume
Time to
maximum flow
Flow time
Time (s)
A

Figure 1.
Model flow.

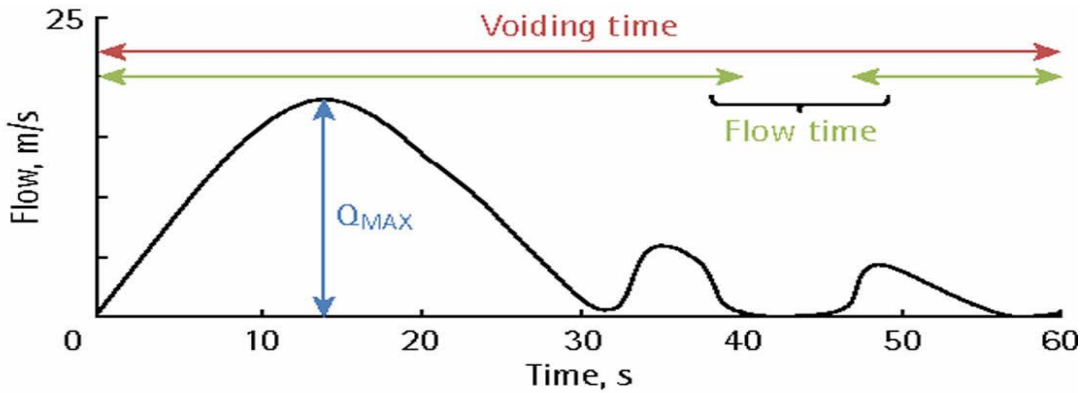
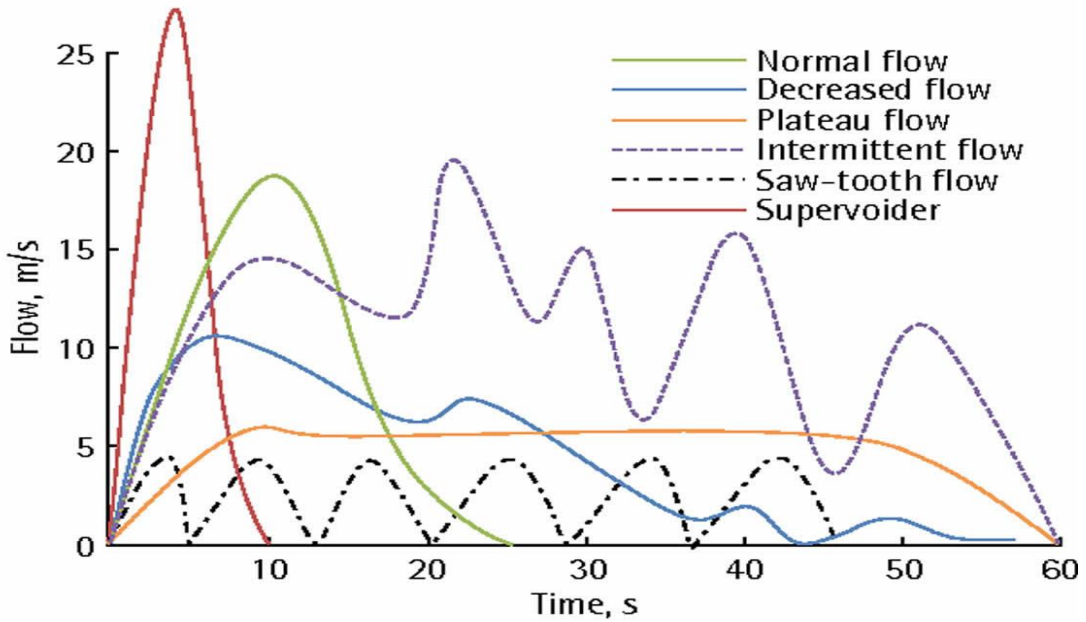


Figure 2.
Common flow patterns.



Flow rate (Q): Volume of fluid expelled via the urethra per unit time (mL/s).
Voided volume (V_{void}): Total volume expelled via the urethra (mL).

Invasive UDS

Indications

- Incontinence:

  -recurrent incontinence in whom surgery is planned

  -mixed urge and stress symptoms

  -associated voiding problems

  -pt. with neurologic disorders

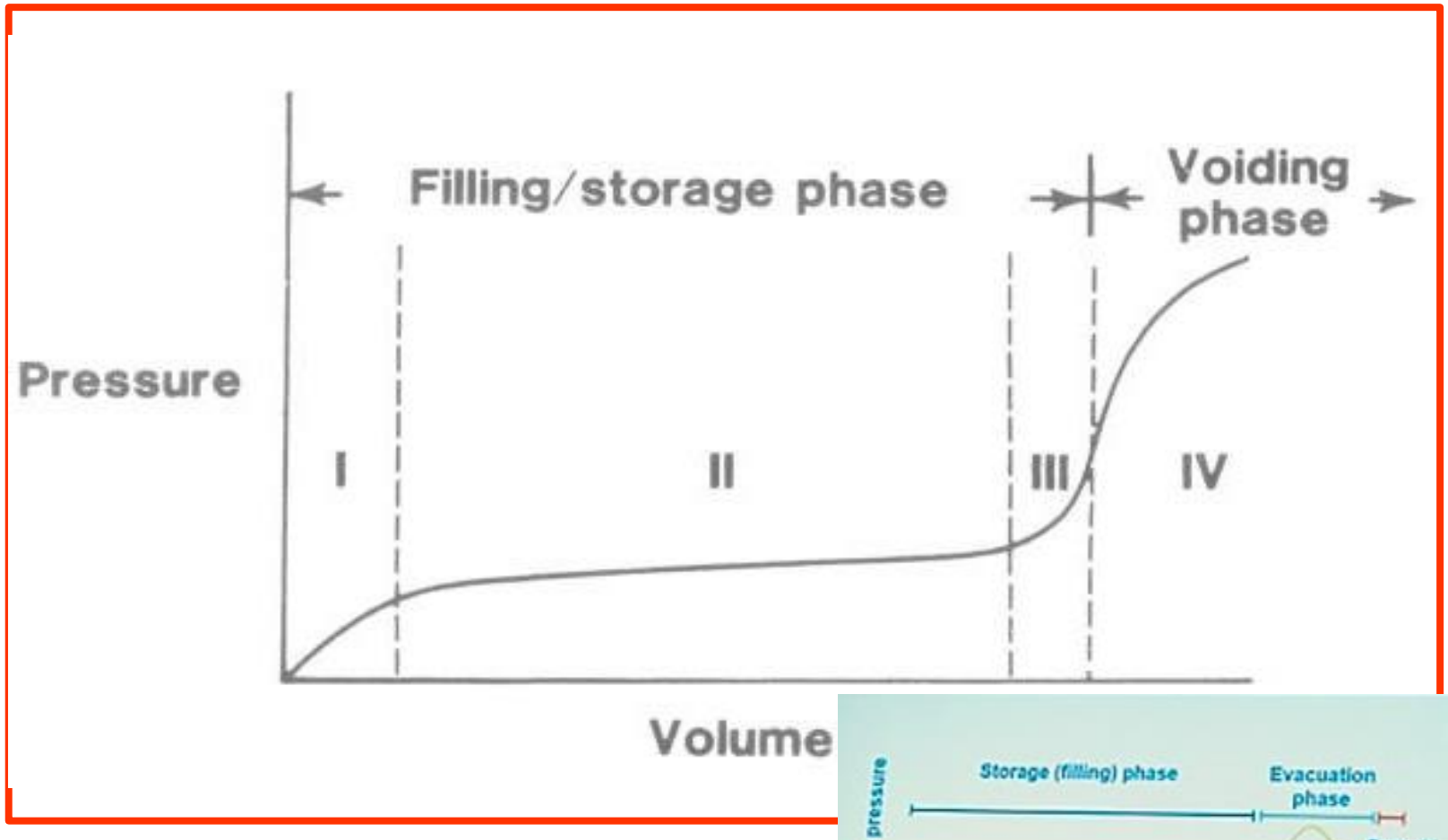
  -pt. with mismatch between signs and symptoms

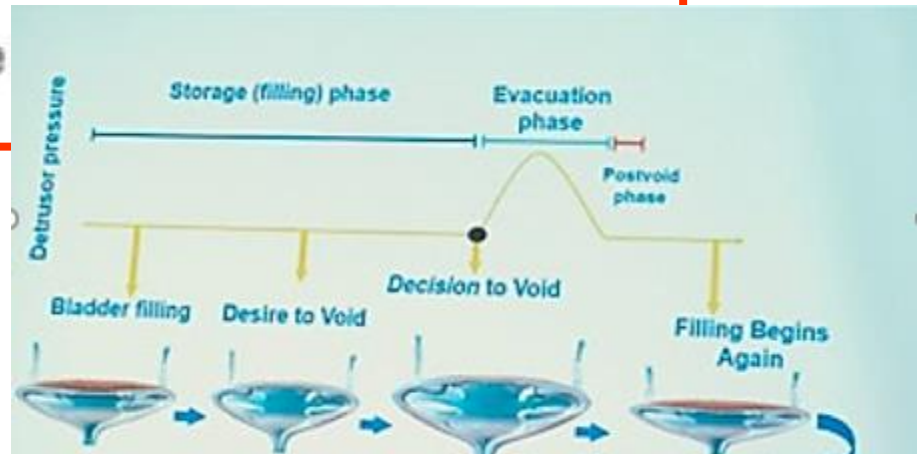
Clinical role

- Characterization of detrusor function
- Evaluation of bladder outlet
- Evaluation of voiding function
- Diagnosis and characterization of neuropathy.

Possible detrusor and urethral activity during storage and voiding							
Storage phase				Voiding phase			
Detrusor		Urethra		Detrusor		Urethra	
Underactive	Active	Underactive	Active	Underactive	Active	Underactive	Active
Normal	Abnormal	Abnormal (incompetent)	Normal	Abnormal	Normal	Normal	Abnormal (obstructive)
Bladder relaxation to allow filling	Detrusor overactivity, often associated with OAB* and urgency incontinence	Associated with stress incontinence	Maintains continence	Hypocontractile or acontractile bladder. Associated with chronic detrusor muscle damage or abnormal neurology	Contraction allows forceful expulsion of urine	Opening of urethra allows voiding with minimal resistance from the urethra	Overactive urethral sphincter may be associated with abnormal neurology. Prostatic BOO** increases outlet resistance

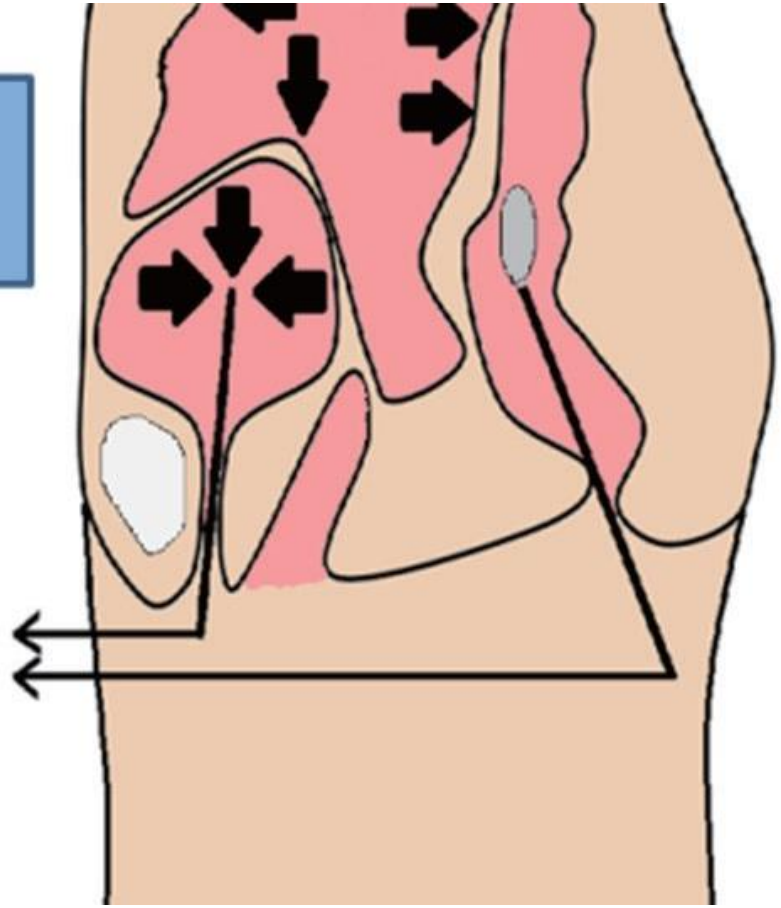
Phases of cystometrogram





Detrusor pressure

$$P_{det} = P_{ves} - P_{abd}$$



The 9 “C’s” of Pressure-Flow Urodynamics

Filling and storage

Contractions (involuntary detrusor)

Compliance

Coarse sensation

Continence

Cystometric capacity

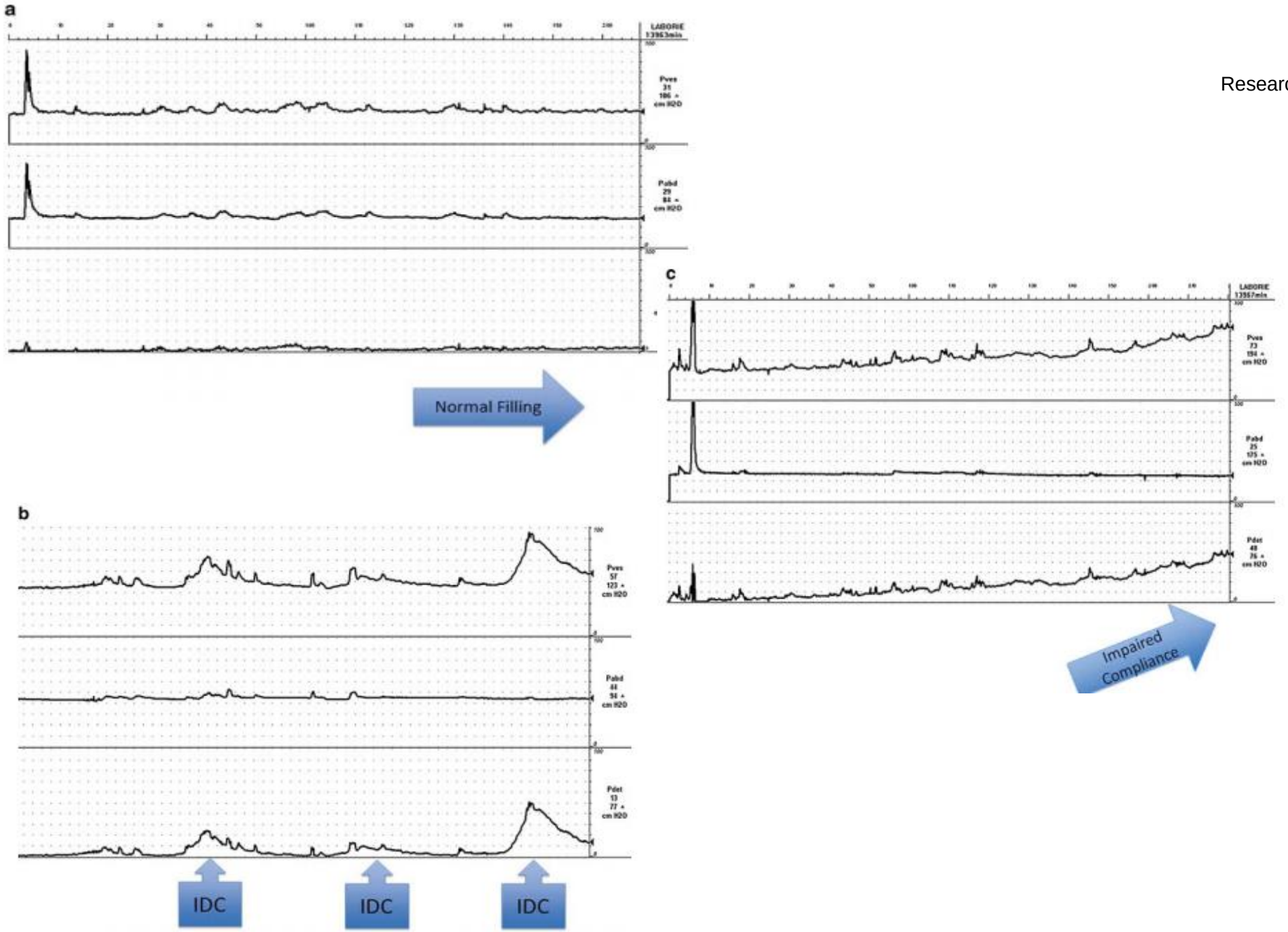
Emptying Contractility

Complete emptying

Coordination

Clinical obstruction

- Detrusor overactivity
  - Is a UDS observation characterized by involuntary ***detrusor*** contractions during the filling phase which may be spontaneous or provoked
- Neurogenic detrusor overactivity
  - Detrusor overactivity accompanied by a neurologic condition.
  - This term replaces detrusor hyperreflexia


a
Normal Filling
b
IDC
IDC
IDC
c
Impaired Compliance

Pressure Flow Studies

- Simultaneous measurement of bladder pressure and flow rate throughout the micturation cycle.
- The best method of quantitatively analyzing voiding function.
- Access to bladder via transurethral or s/p.

PFS(cont.)

- Role of pressure-flow studies:

- to differentiate between pts. with a low Q max sec. to obstruction, from those sec. to poor contractility.

- Identify pts. with normal flow rates but high pressure obstruction.

PFS (cont.)

- Abrams-Griffiths number: BOOI:

  - Divides obstructed from equivocal from unobstructed pattern.
  - plot of $P_{det}Q_{max}$ vs. Q_{max}

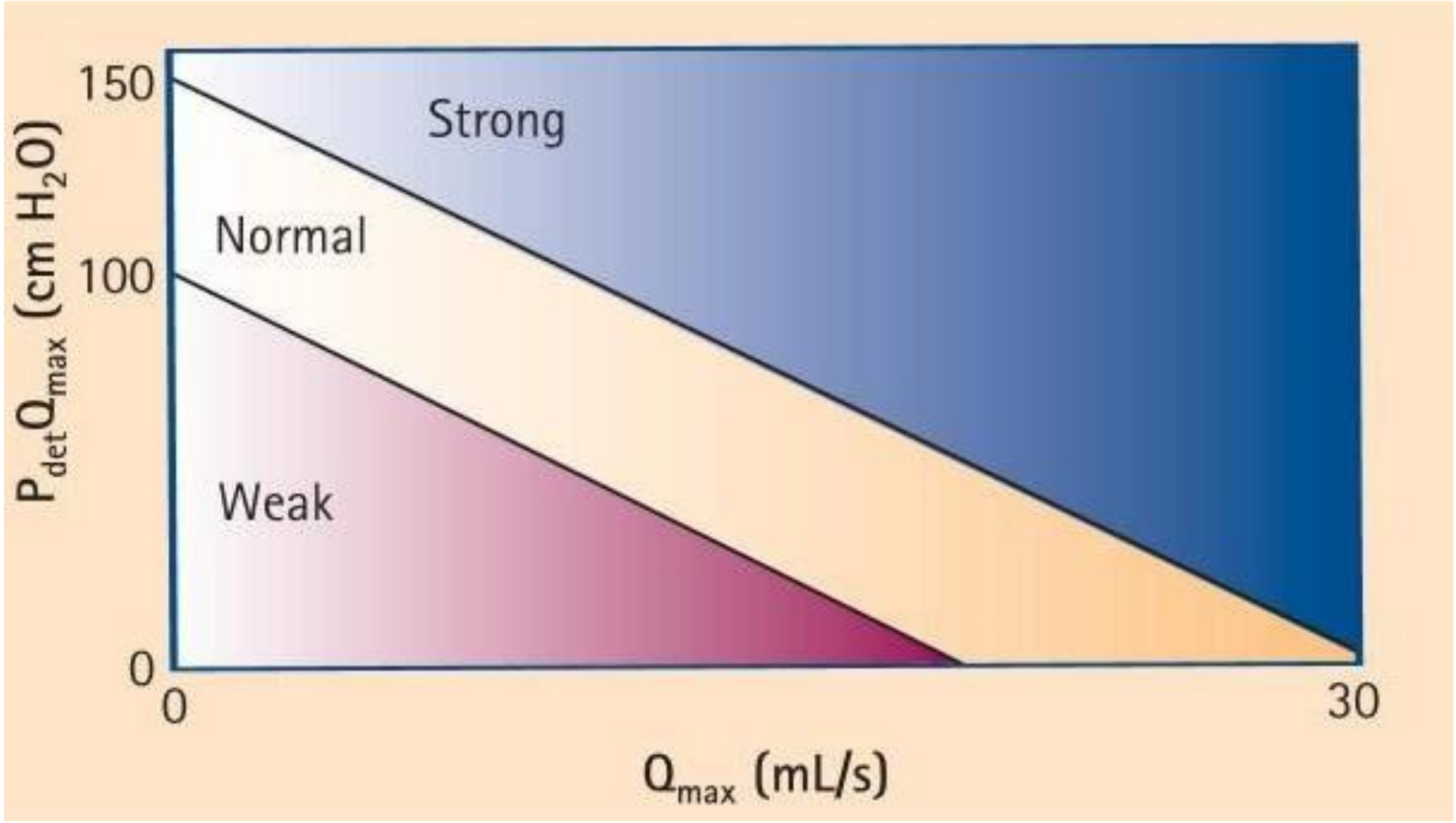
    - AG number = $P_{det}Q_{max} - 2 \times Q_{max}$
    - Can grade the degree of obstruction before and after treatment.

    - BOOI > 40 = obstructed;
    - BOOI 20–40 = equivocal; and
    - BOOI < 20 = unobstructed

Bladder Contractility Index: BCI

- Schaefer described the formula for BCI:
- BCI= Pdet @ Qmax + 5 (Qmax) .
- strong contractility is a BCI of >150,
- normal contractility —BCI of 100–150
- weak contractility — BCI of < 100.

Bladder Contractility Index: BCI



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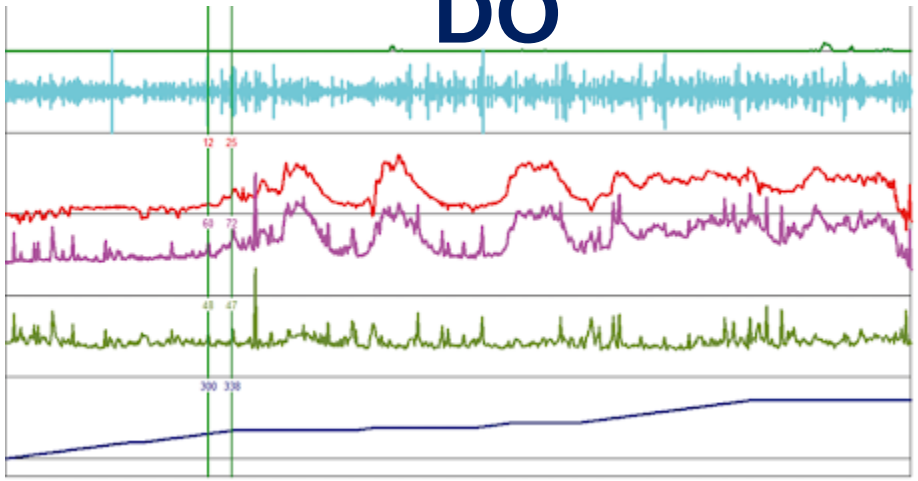
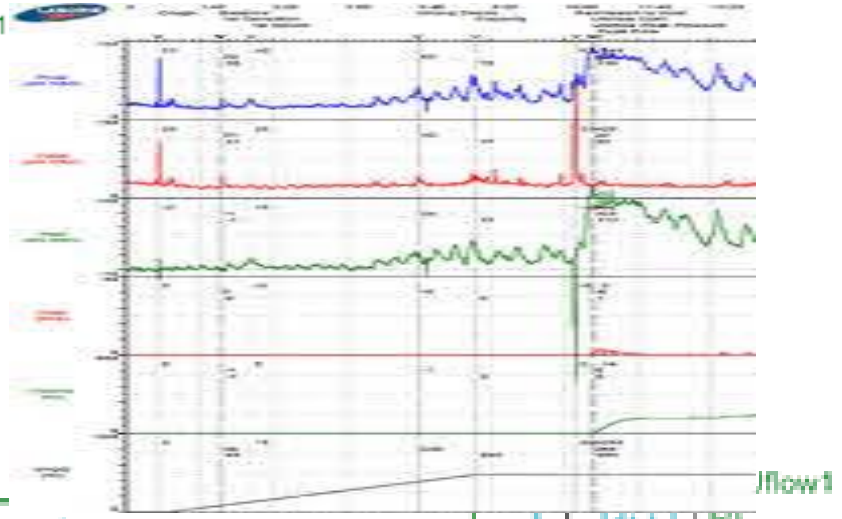
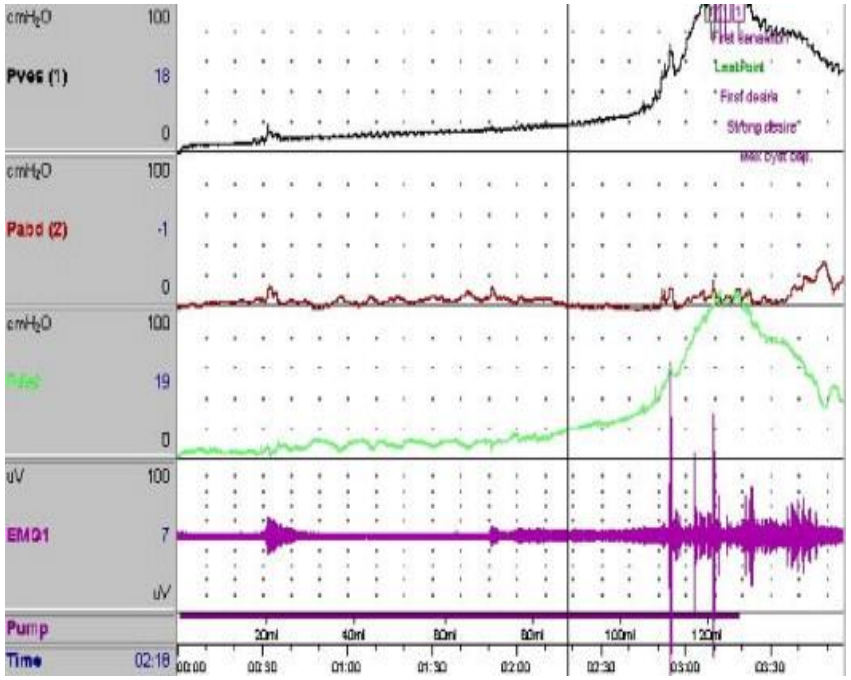
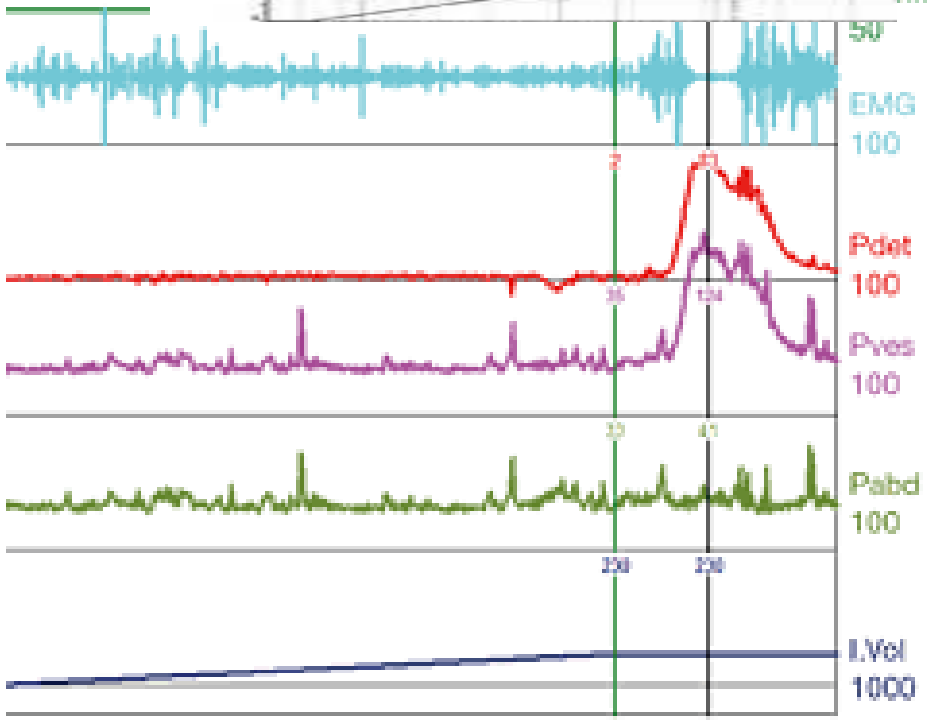
Urodynamics pattern of DO









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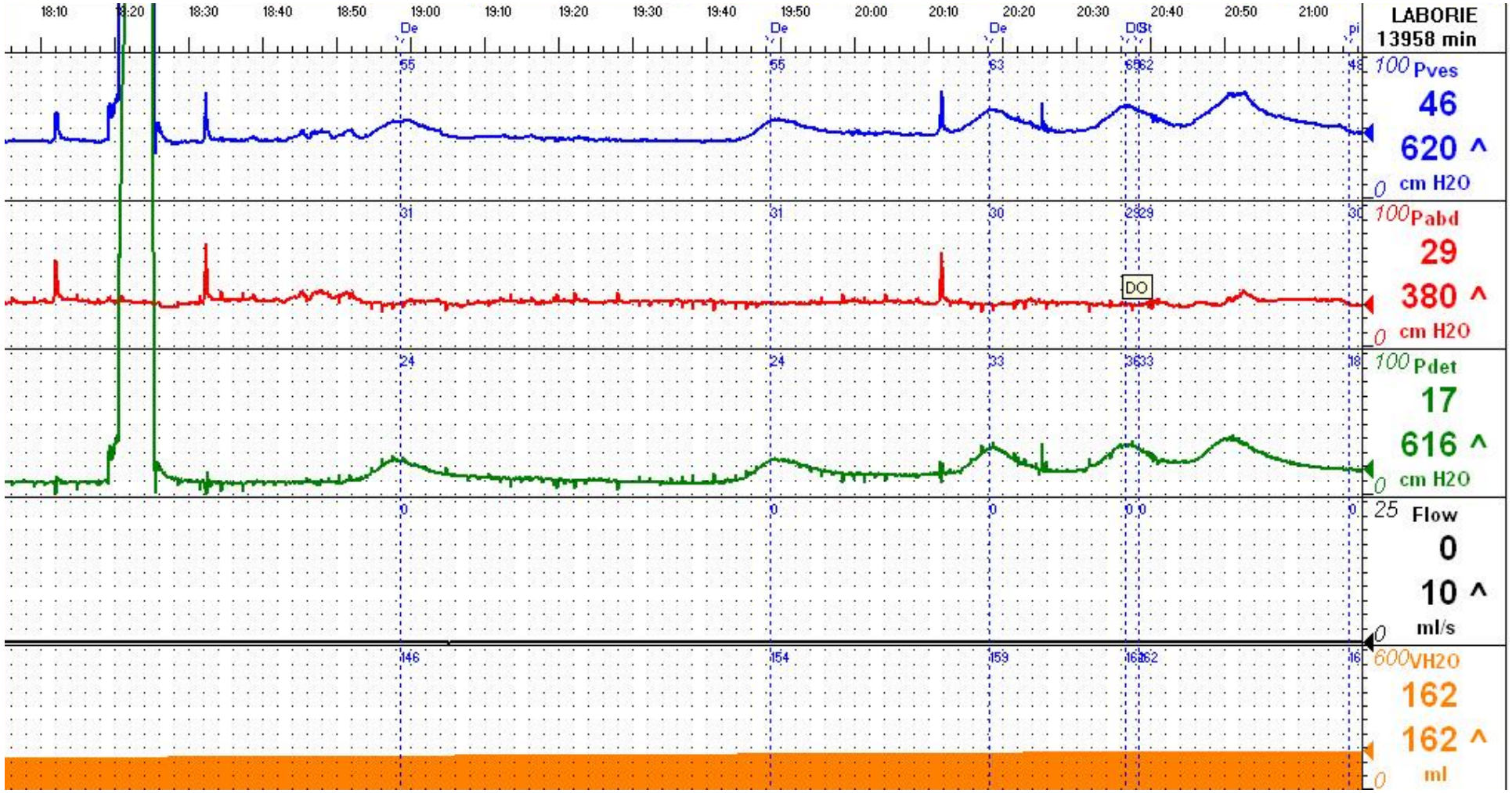
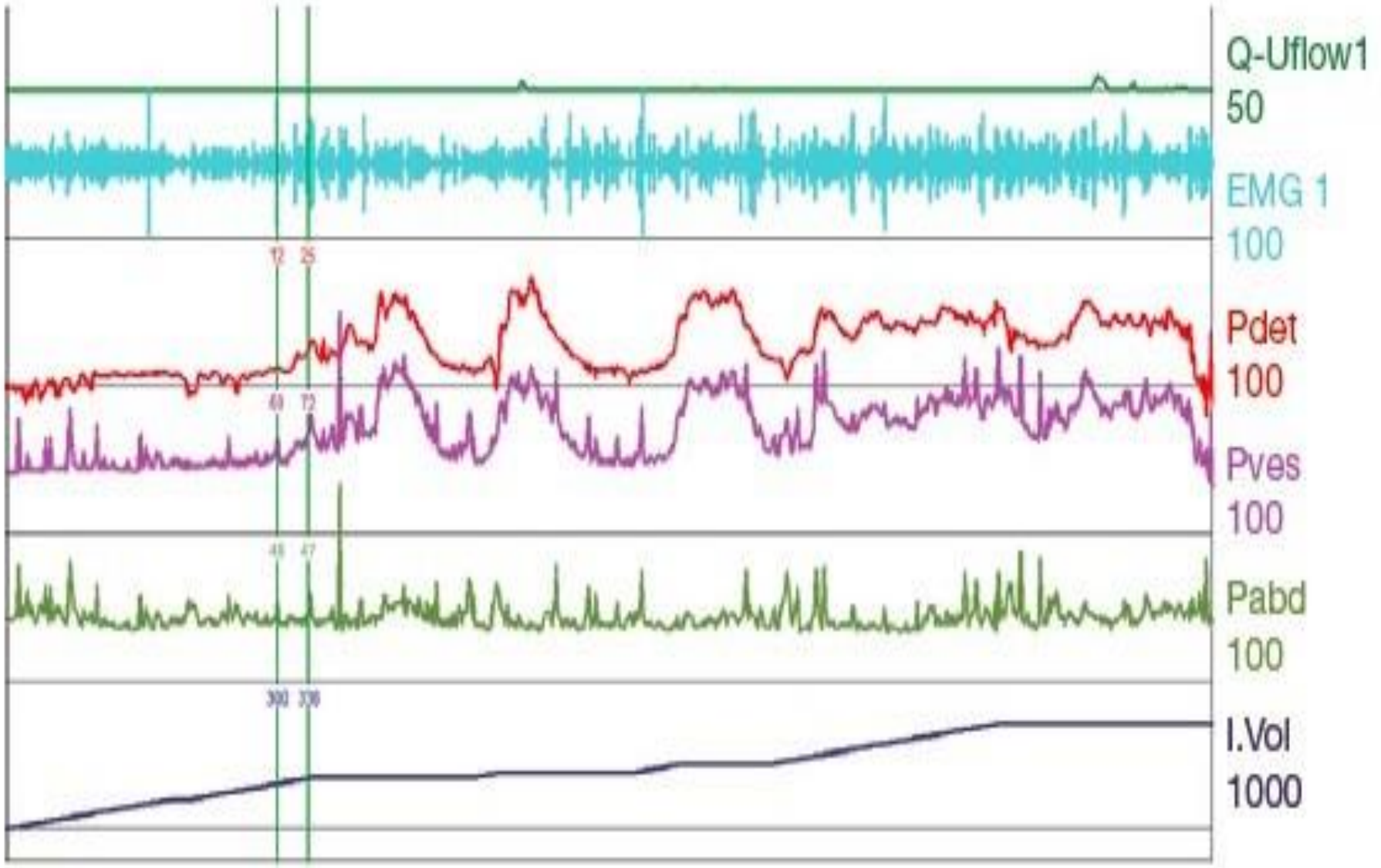
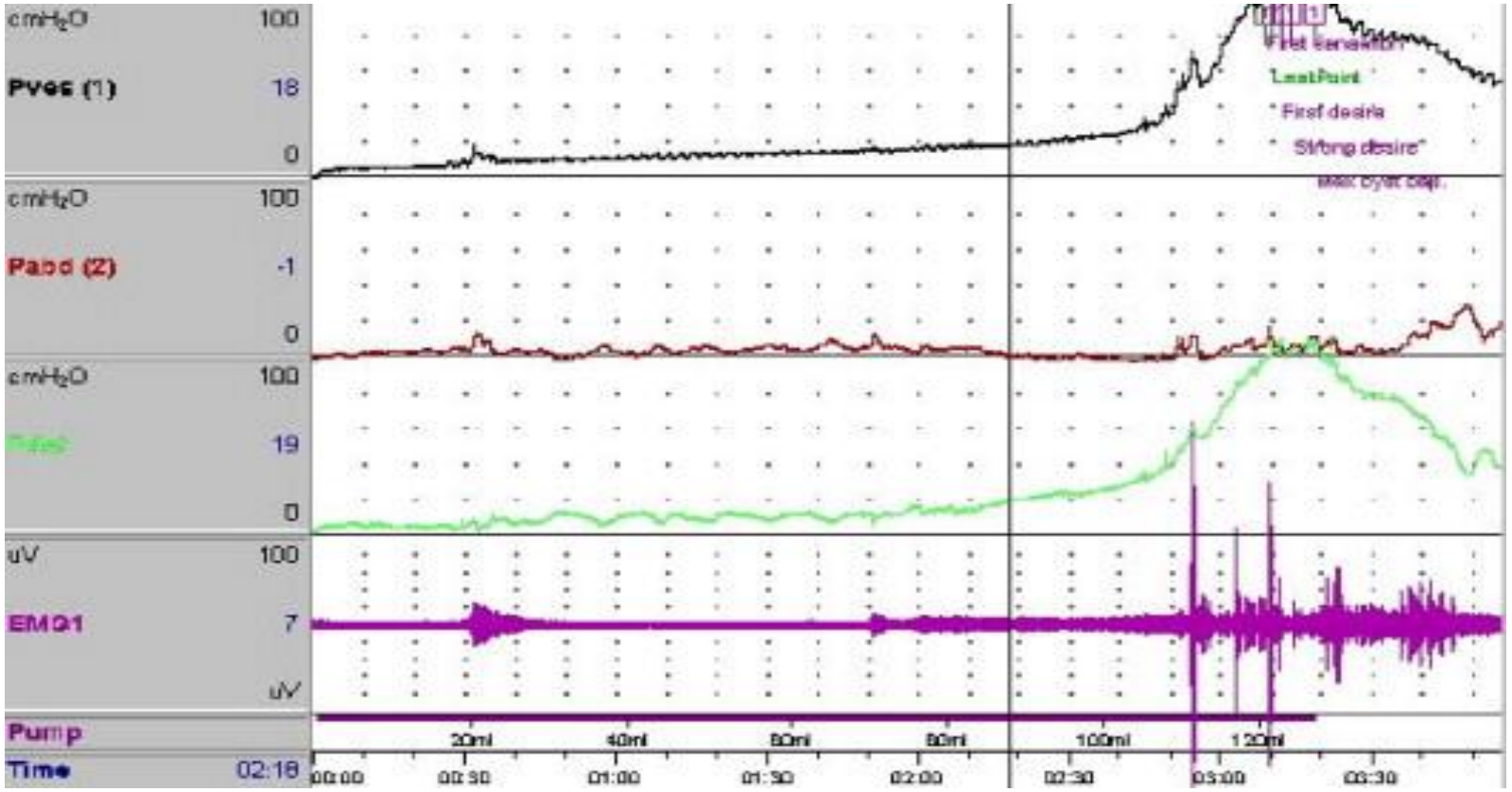
DO: phasic pattern



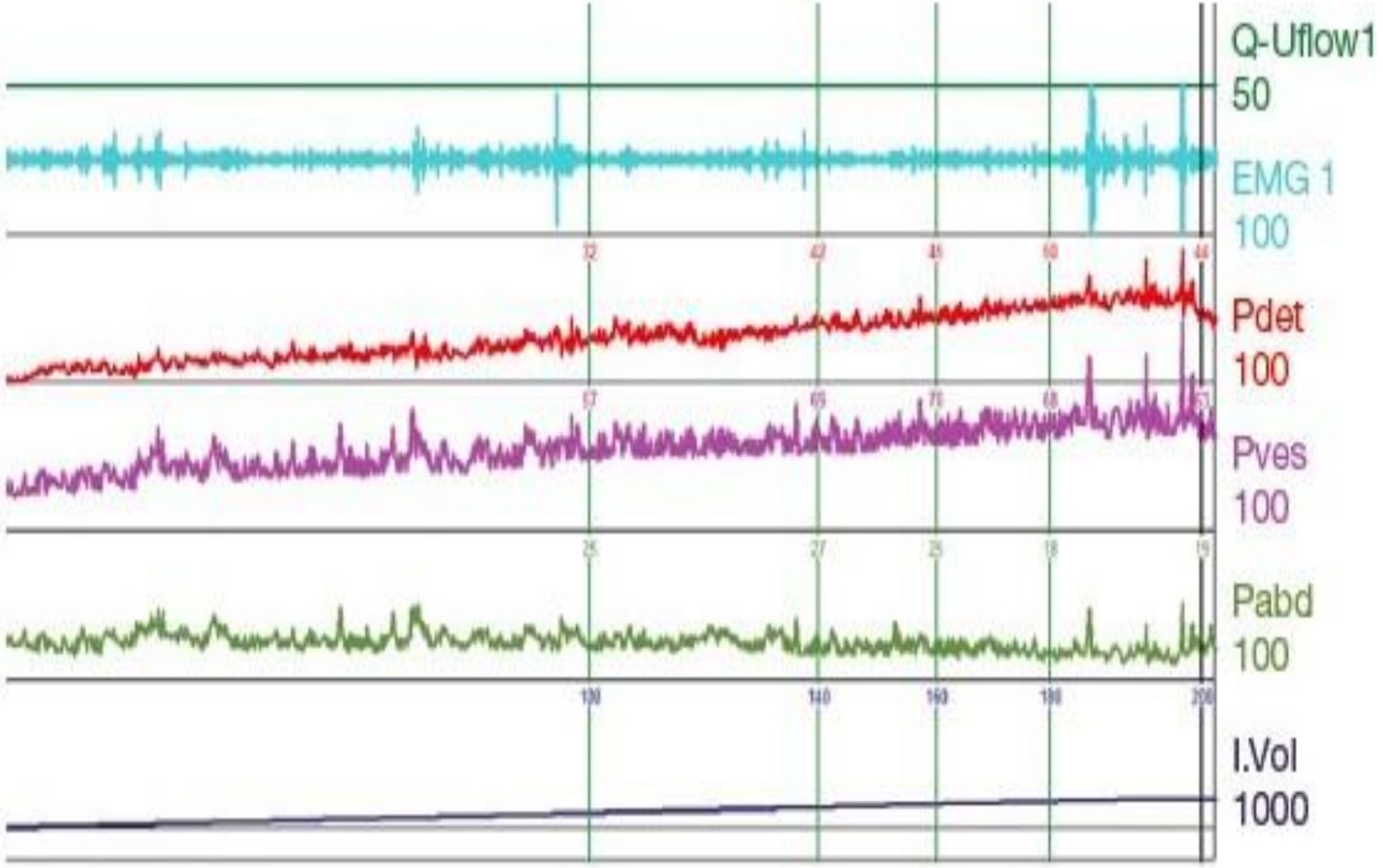
Phasic pattern low compliance



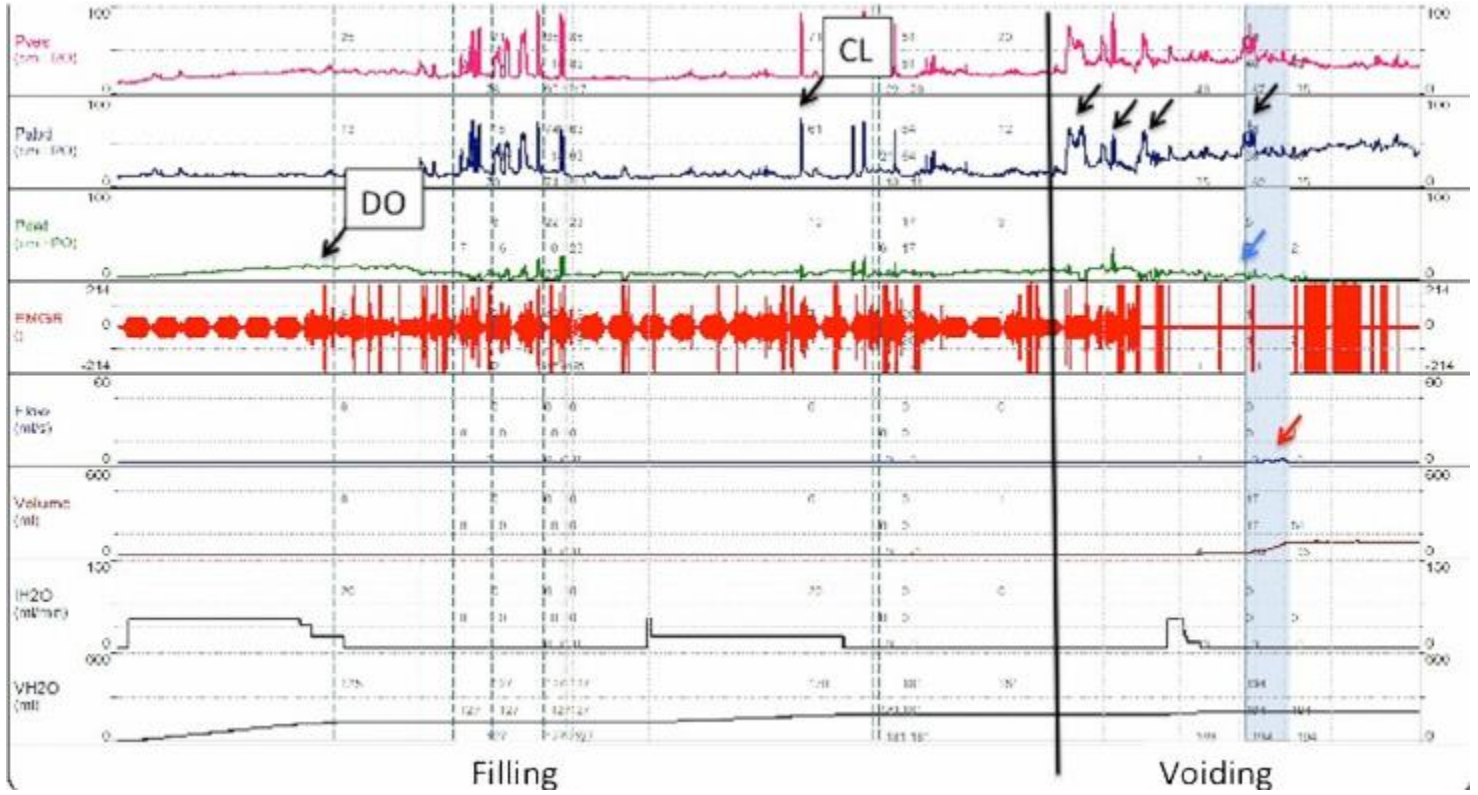
DO: Terminal pattern



Neurogenic DO



DO-DU



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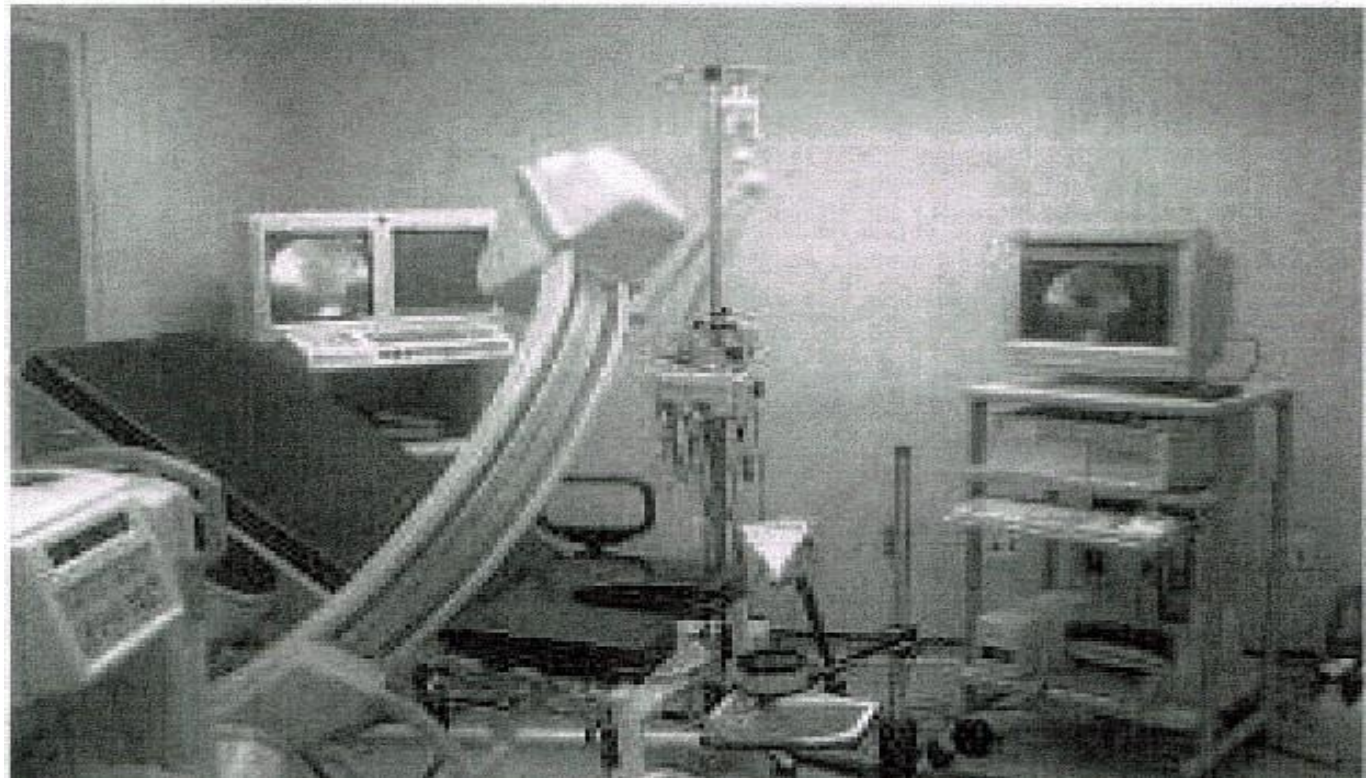
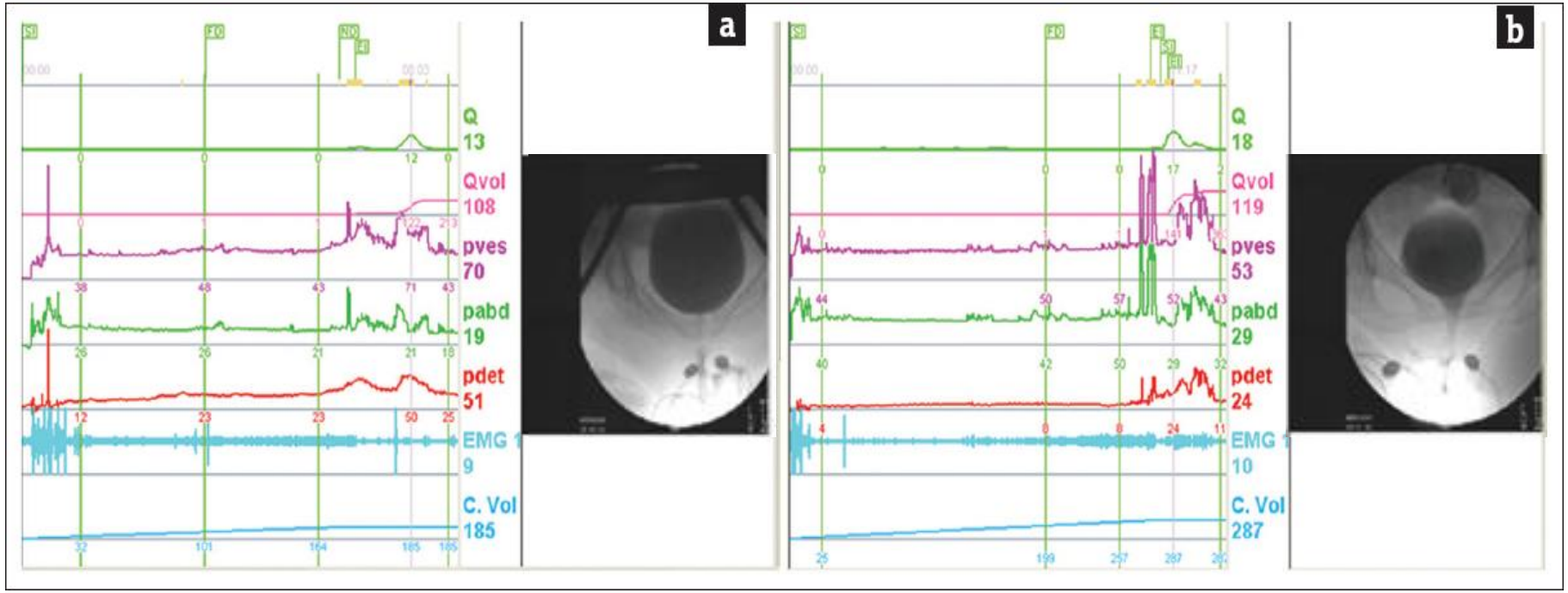
Video-Urodynamics

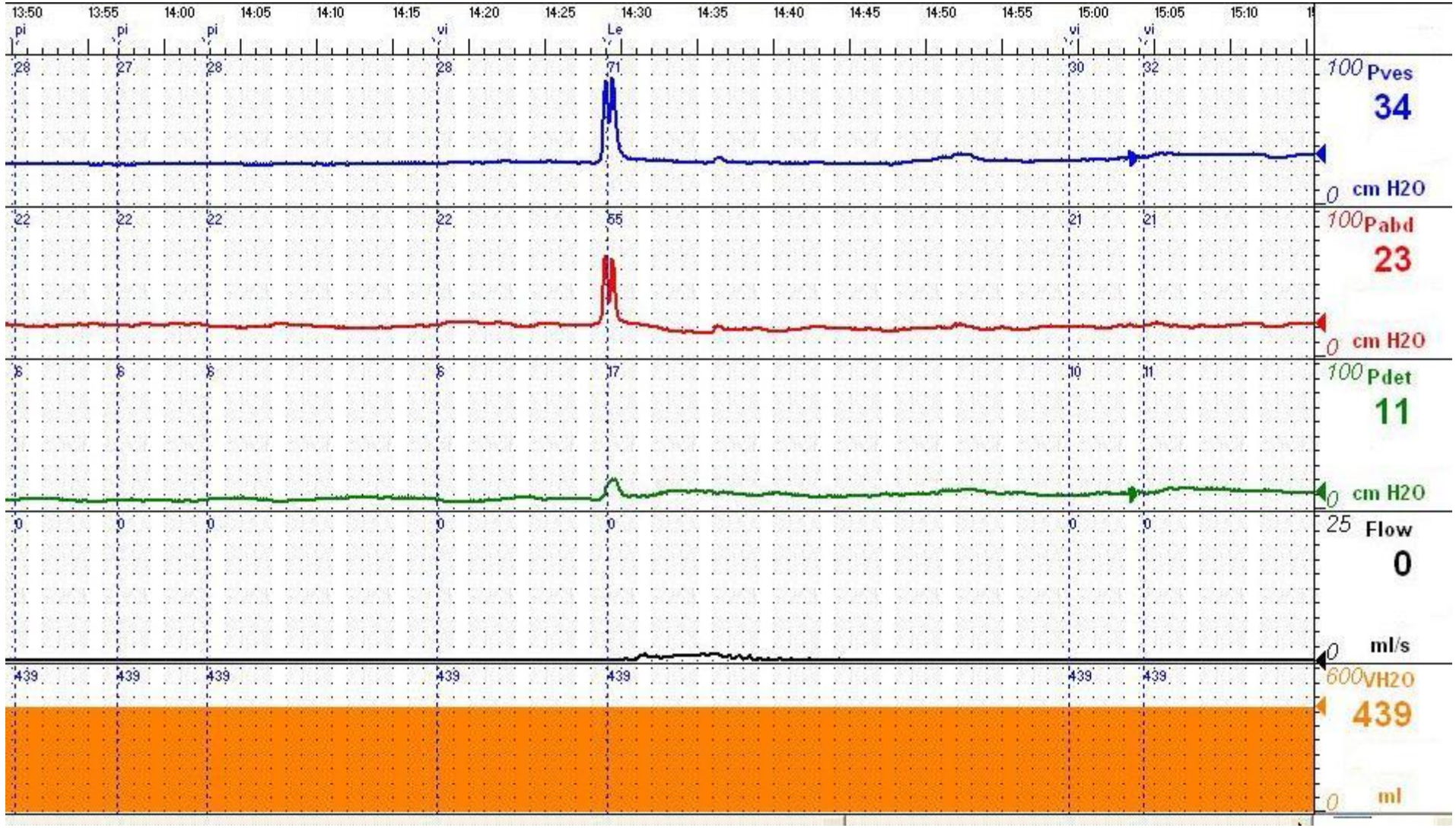


DO in VUDS



The detrusor overactivity occurs: (a) spontaneously during the end of bladder filling phase and spontaneous urination, and (b) provoked during coughs while urine leaks into the proximal urethra

Stress incontinence



Filling phase. Cough at 14:30; small leak, not change in bladder pressure

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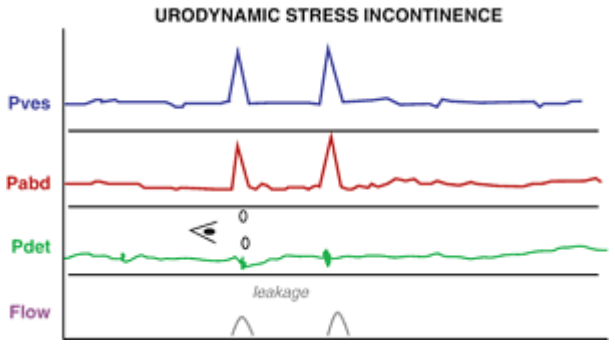
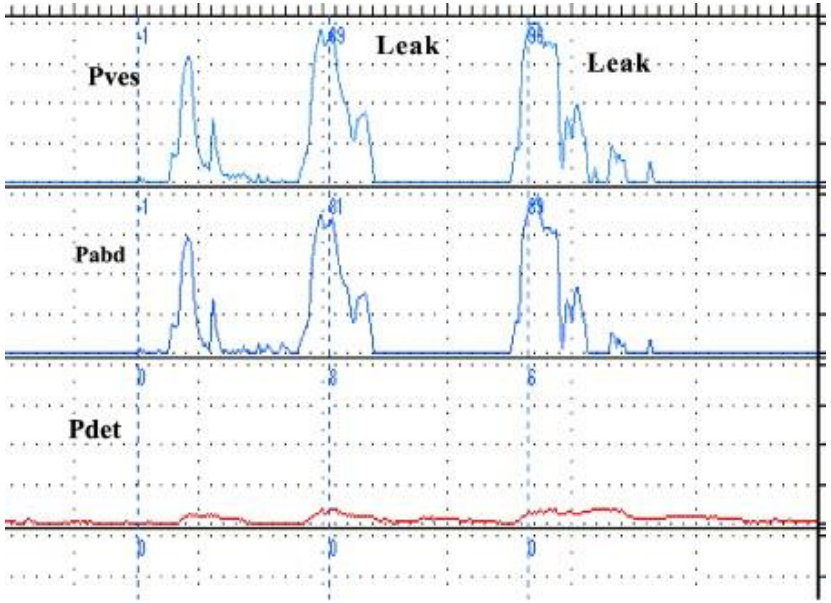
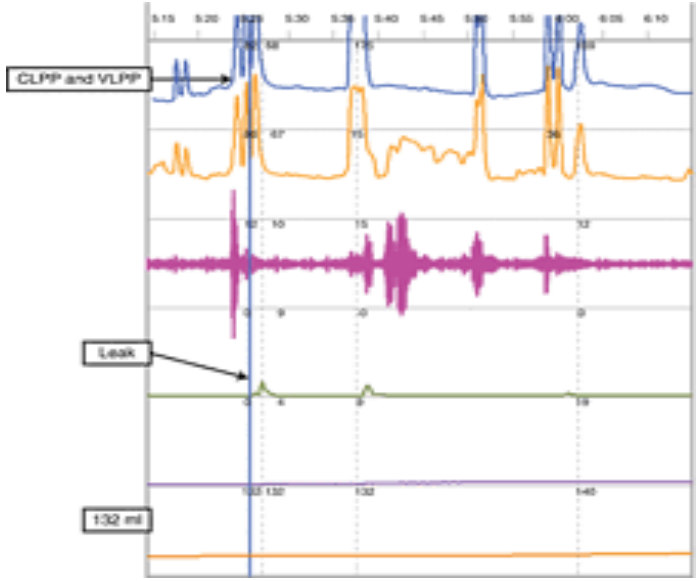
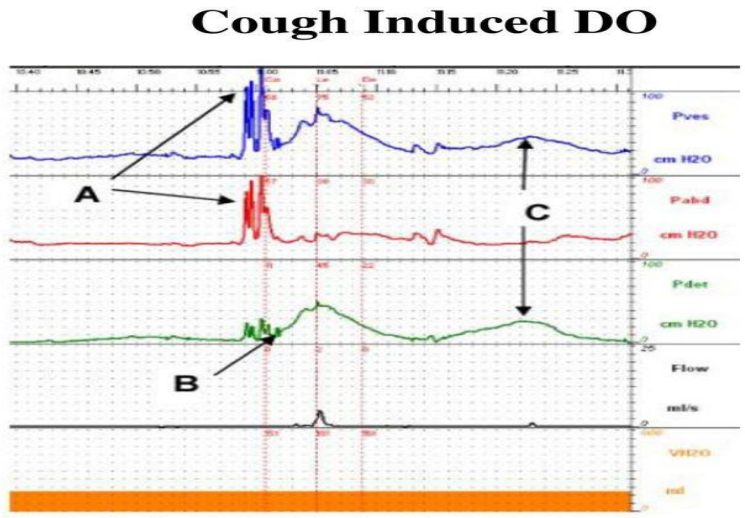
SUI

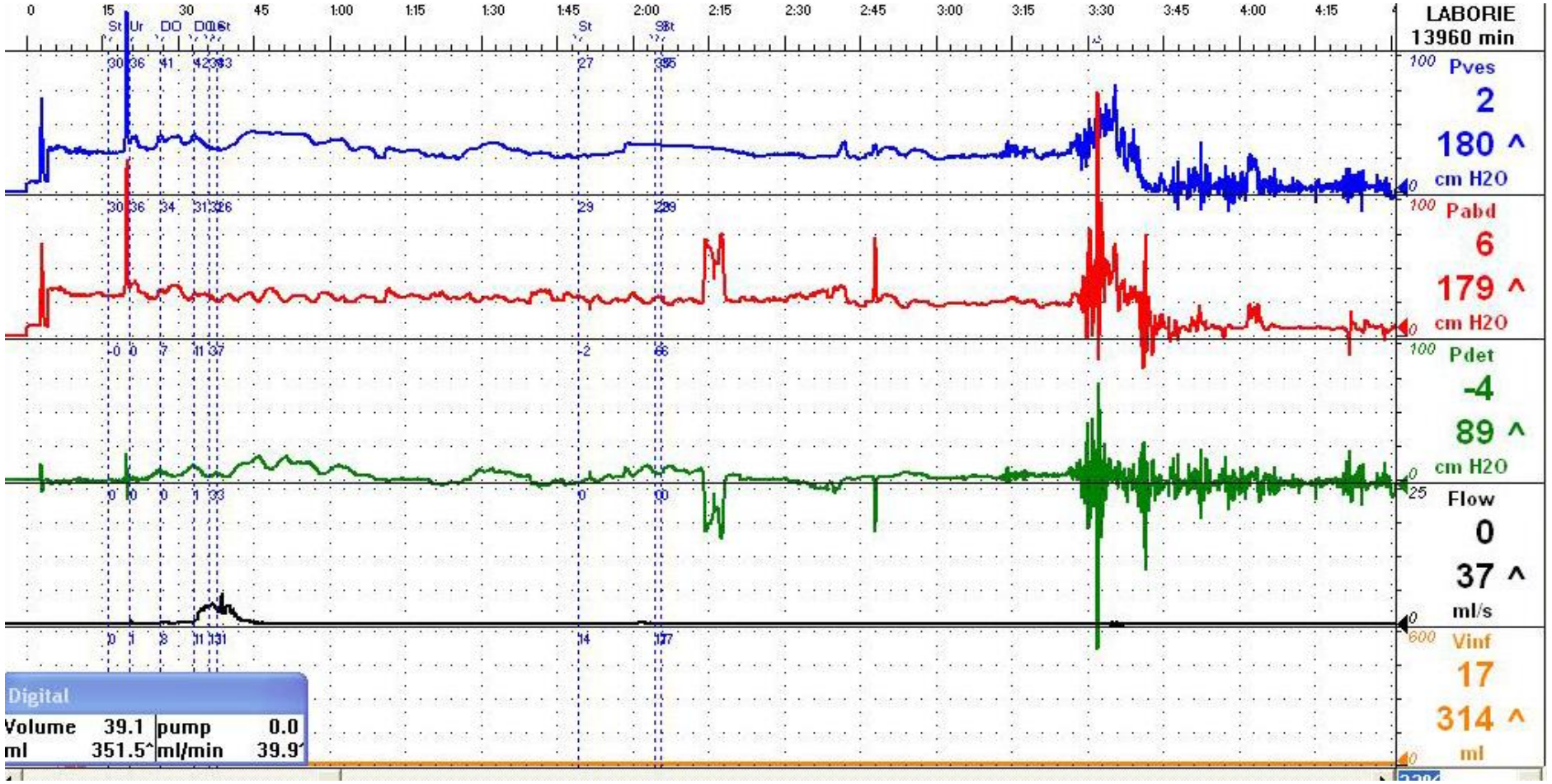






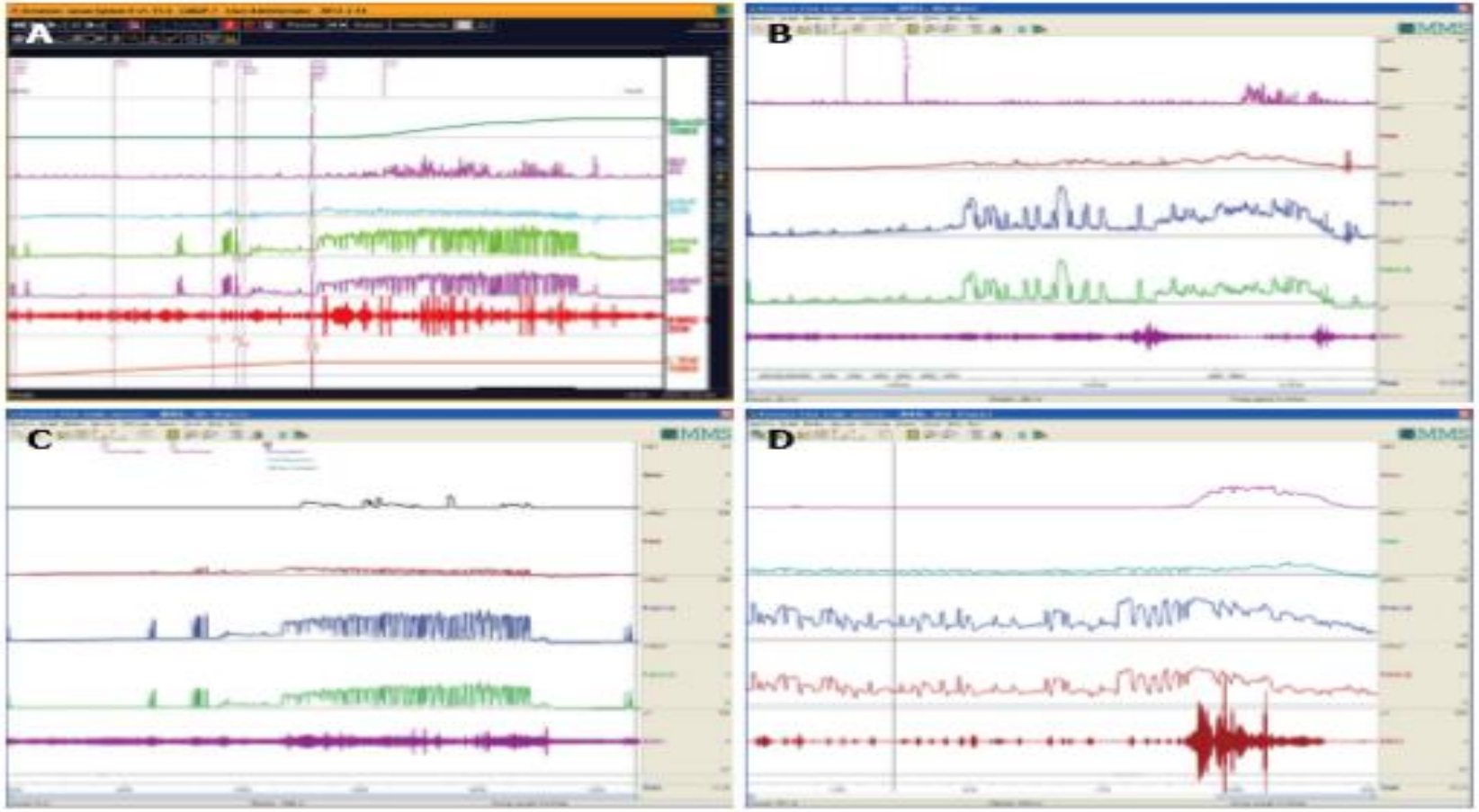


Female with previous TVT, still has SUI



Filling phase; filled seated position, obvious DO incontinence

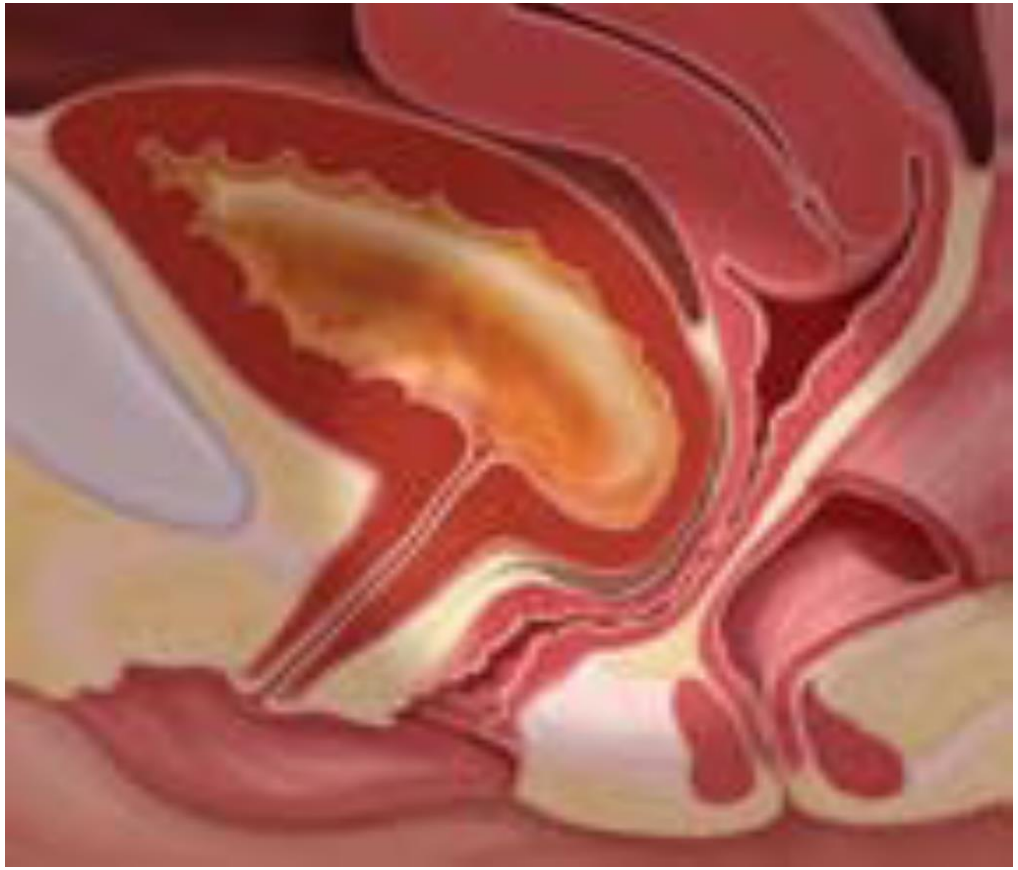
Detrusor Underactivity



Various detrusor underactivity manifestations coupled with idiopathic sphincter overactivity and abdominal straining. A: A woman complaining of urinary incontinence was confirmed with detrusor underactivity (DUA) and idiopathic sphincter overactivity (ISO); B: A male patient aged 86 years complaining of poorweak flow after benign prostatic hyperplasia (BPH) operation was confirmed with DUA and abdominal straining with detrusor-sphincter synergia; C: A female patient suffering from bladder overdistention was confirmed with DUA and ISO; D: A female aged 55 years suffering from incontinence was proved with DUA, ISO and nearly normal Qmax.

A

Value of UDS with prolapse ?



Prolapse & Occult USI

- SUI absent in 60% women with prolapse
- 30-60% women at risk of SUI post op
  - Identified by performing a barrier test
- Barrier test
  - Full bladder
  - Manual / pessary / pack / speculum
  - Pack seemed not to cause BOO but only 6% occult SUI demonstrated

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Tabriz University of Medical Sciences

Research center for EBM

Therapeutic Value of UDS

Prolapse and Occult SUI

Barrier test negative

- ? Low risk of post-op SUI
- If UDS ignored still appears low risk (Raz, Cross)
- No change in UDS parameters (Roovers 2007)

Barrier test Positive

- Combined or wait and see?
- Studies show 80 – 90% continence rates
- Sacrocolpopexy and colpo (Fatton 2009 In J Uro)
- DO increased 30% v 5% (Klute 2000)
- SUI between 12 -30% in prolapse only surgery but low rates of bladder dysfunction (laing 2004, de Tayrac 2004)

Full urodynamics are essential prior to invasive therapy:

- to make a precise diagnosis
- to allow selection of an appropriate technique
- to warn the patient of possible problems
- to allow properly informed consent