Urodynamic Studies

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Topics

- Types of urodynamic studies
- How to perform a urodynamic study
- How to interpret a urodynamic study
- UDS in management of BPH
- UDS in management of female urinary incontinence
- UDS for neurogenic bladder
- Uroflowmetry in children

Uro + Dynamics

- The term urodynamics encompasses any investigation of LUTD from the simple to the sophisticated, including:
  - Frequency/volume chart (FVC)
  - Bladder diary
  - Pad testing
  - Uroflowmetry +/- ultrasound PVR estimation
  - Pressure/flow studies:
    - Cystometry
    - Video cystometry
    - Ambulatory urodynamics
  - Urethral pressure studies
  - Other studies:
    - Intravenous urodynamogra
    - Ultrasound cystodynamogram.

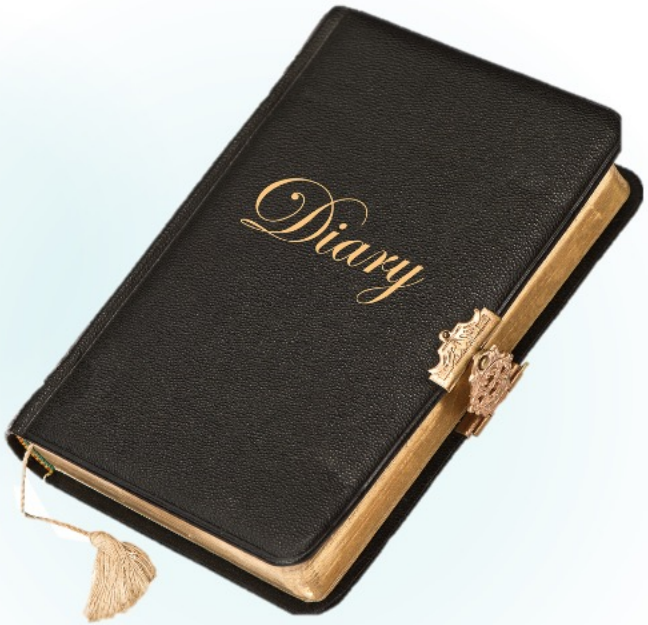
Why to perform a UDS?

- The information can be used to:
  - Diagnose the underlying cause of the lower urinary tract dysfunction
  - Characterize the lower urinary tract dysfunction
  - Formulate treatment strategies
  - Improve therapeutic outcomes
  - Educate patients regarding their condition.

Questions before the study

- Is there a clear indication for the chosen test?
  - Will it aid in diagnosis?
  - Will it aid in making management decisions or assist in patient counselling?
- Is this the most appropriate test?
  - Would a simpler test answer the clinical questions?
  - Is a more complex test more likely to answer all clinical questions?
- Are there appropriate local facilities and expertise to perform the chosen test?

Bladder diary



Bladder diary

Week commencing:

	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
6 am	300				350						200		190	
7 am			200				250		350		100			170
8 am		50				150				250		190		
9 am	250	150		100			150							
10 am					150			200					100	
11 am	175	100			175				200		180			
12.00			250			100						150		130
1 pm							200			200				
2 pm	190	W		130	150			175				270		
3 pm						W			100	W	270			
4 pm								W						
5 pm	300	200				150	200			150		W		W
6 pm			190		200									
7 pm		75		W				150			100		180	
8 pm					100				200	175				
9 pm	150	100											120	
10 pm			150						175		190			175
11 pm							100			100				
12.00				50		W		100			100			
1 am													100	
2 am		W								W		W		120
3 am						120								
4 am														
5 am			150											
Waking	6 am		7.45 am		7.30 am		7.00 am		6.30 am		7.45 am		7.40 am	
Retiring	12.30 am		11.30 pm		12.51 am		Midnight		Midnight		12.30 am		11.30 pm	
Pad usage	3		1		2		4		3		5		2	

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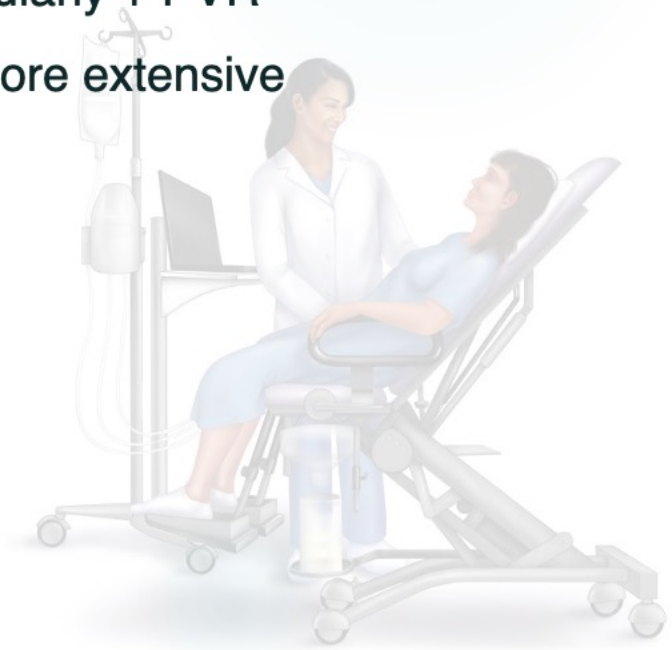
Pad testing

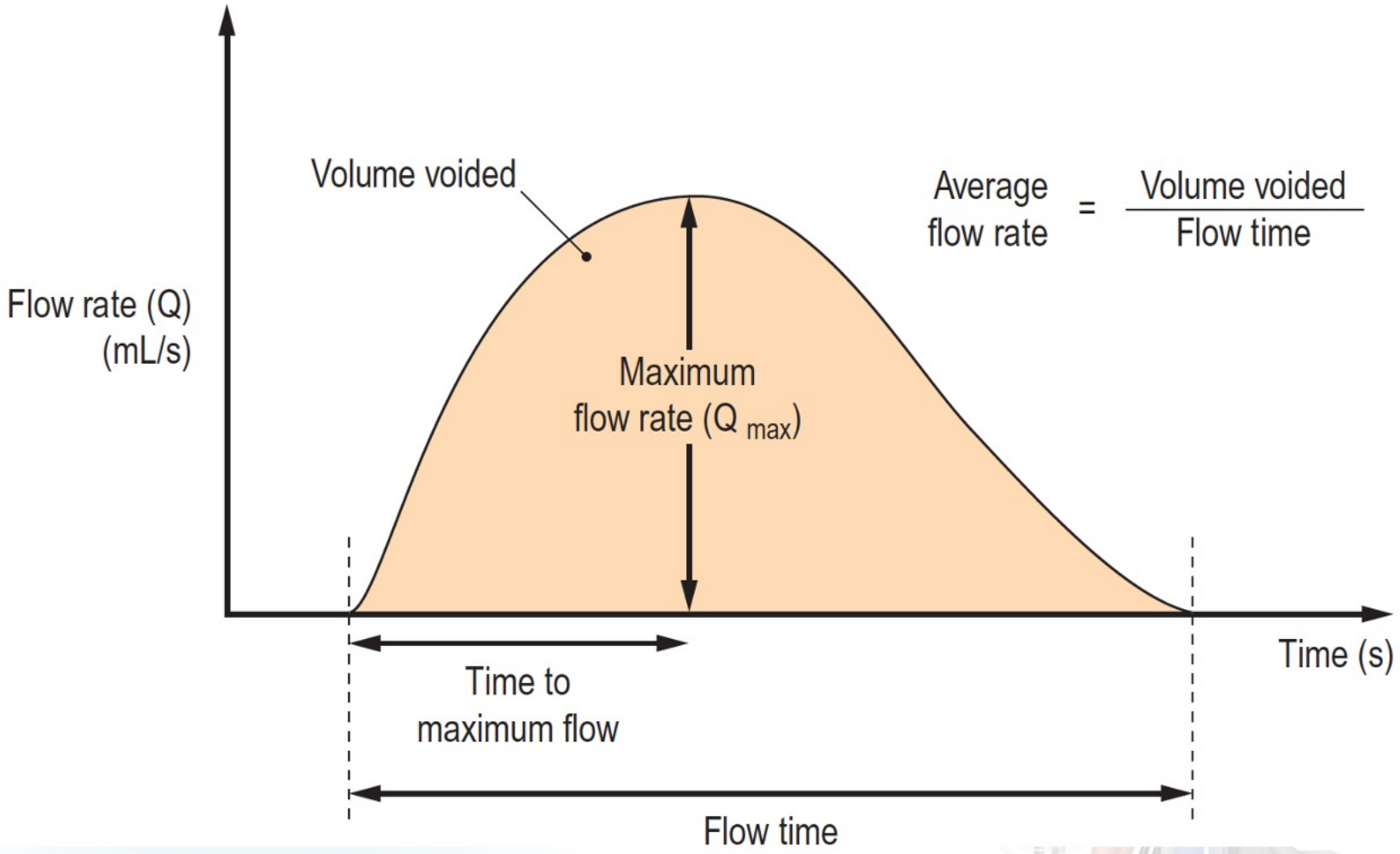
Uroflowmetry

- Uroflowmetry is the simplest and often most useful investigation in the assessment of patients with predominantly voiding symptoms
  - Support the diagnosis of BOO or DUA
  - Excellent screening tool for BOO, particularly + PVR
  - Identifying those patients who require more extensive UDS

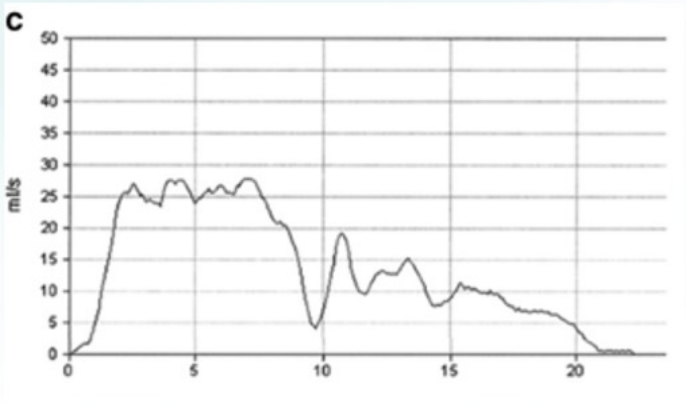


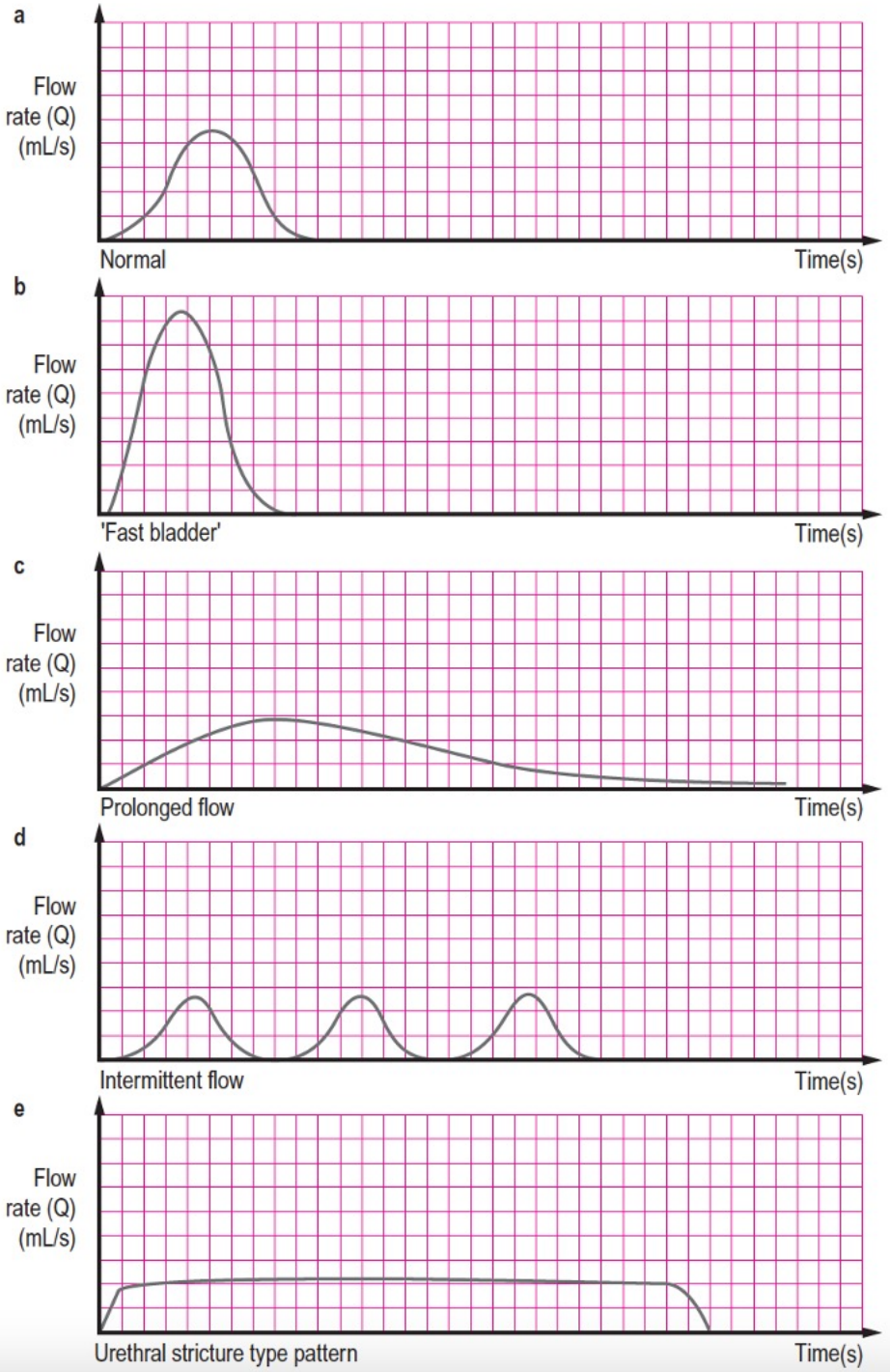
Flowmeter


DPU-414
NORMAL PNEUMOTACHS NOT AVAILABLE FOR
VOLUMES BELOW 55 ML OR ABOVE 554 ML

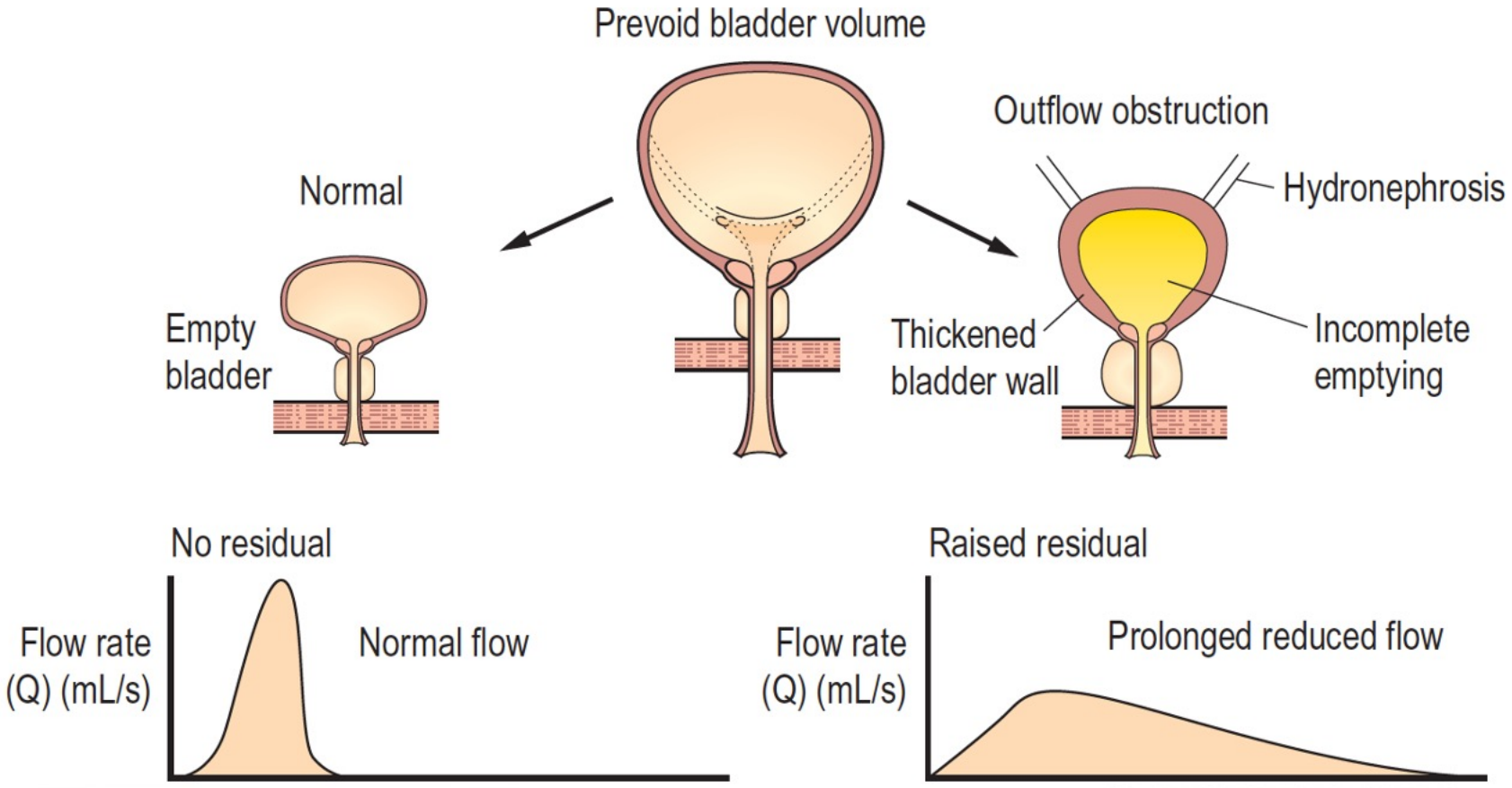

Volume voided
Average flow rate = Volume voided / Flow time
Flow rate (Q) (mL/s)
Maximum flow rate (Q_{max})
Time (s)
Time to maximum flow
Flow time

Flow patterns

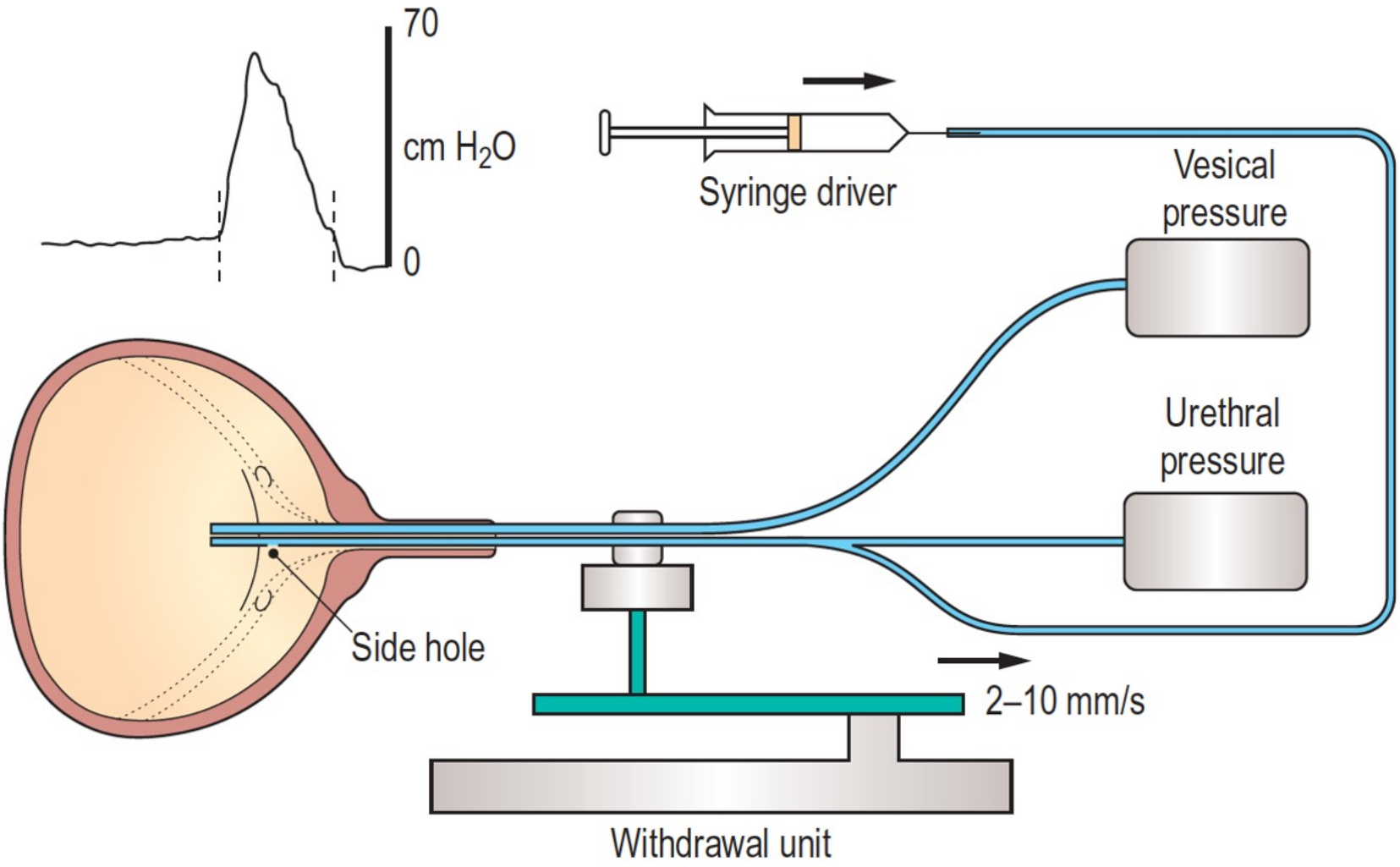




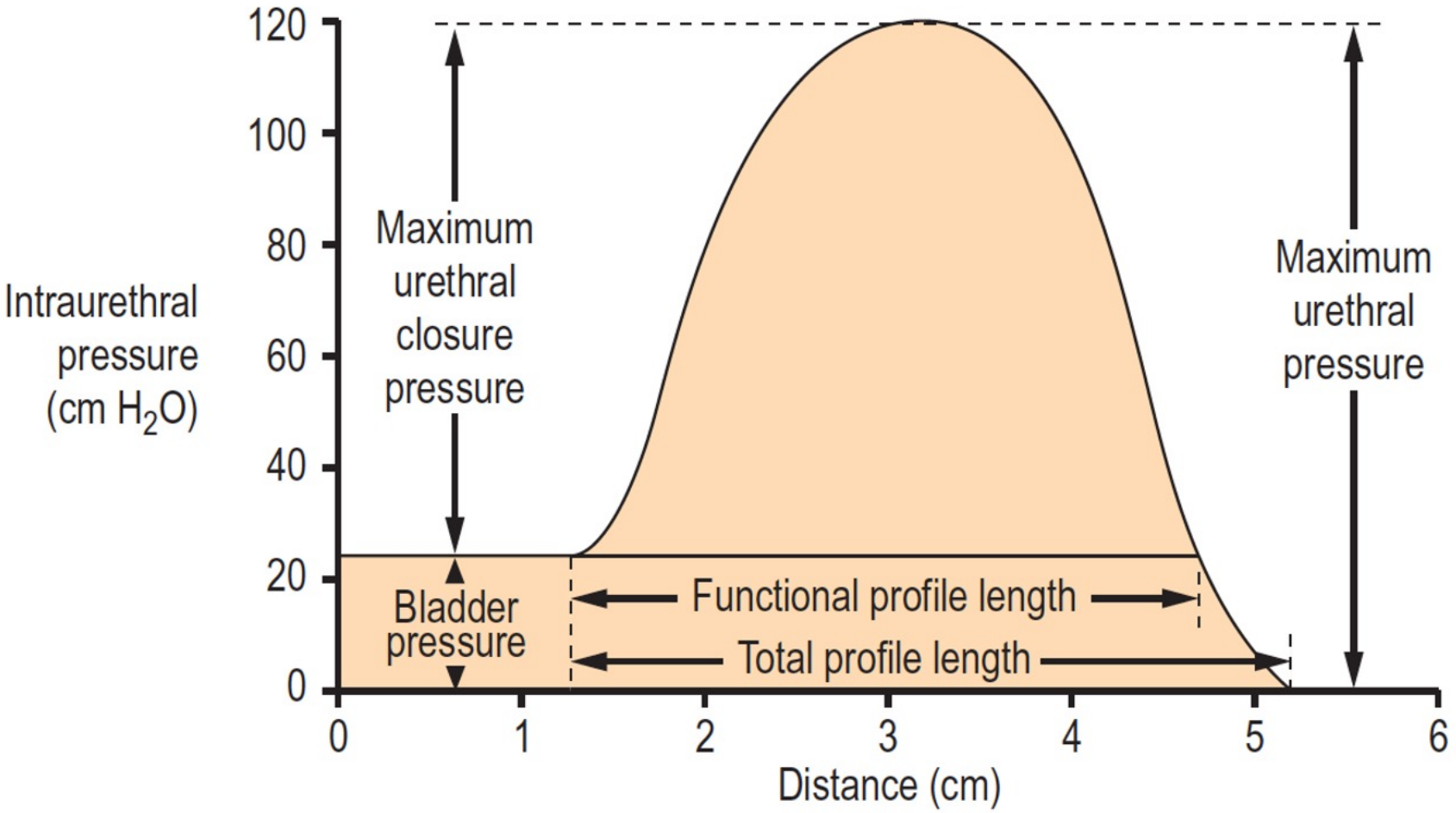
Ultrasound cystodynamogram



Urethral pressure profilometry

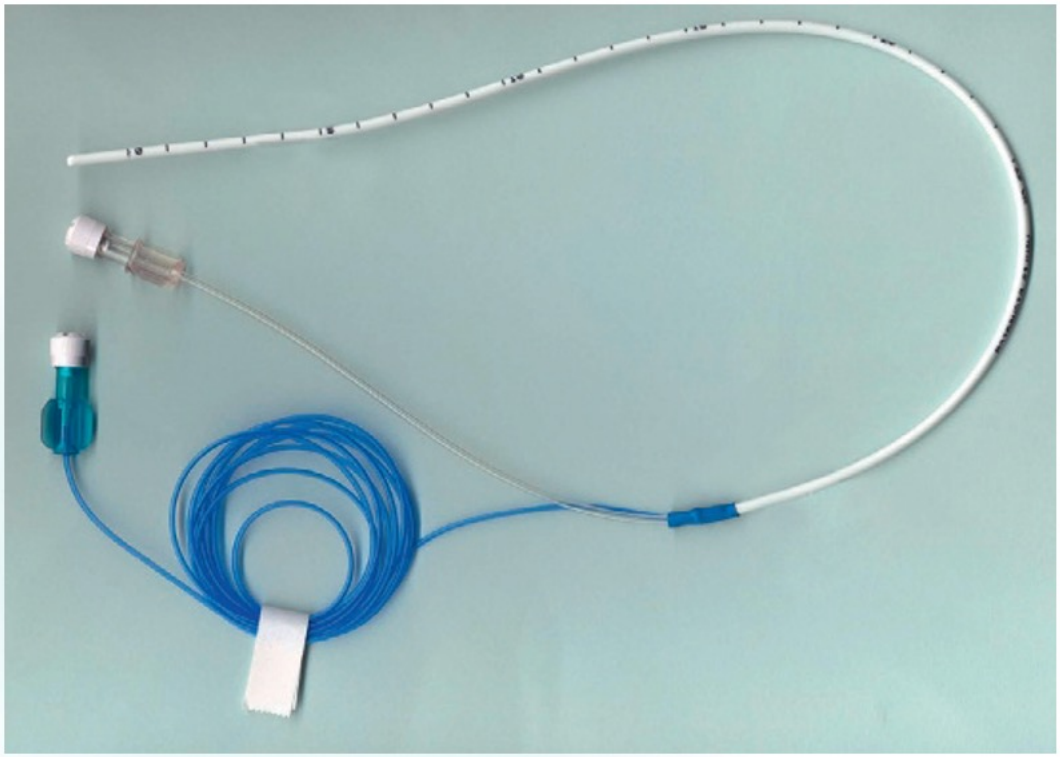


UPP


Intraurethral pressure (cm H_2O)
120
100
80
60
40
20
0
Maximum urethral closure pressure
Bladder pressure
Functional profile length
Total profile length
Maximum urethral pressure
0
1
2
3
4
5
6
Distance (cm)

Pressure/flow cystometry

Fig. 4.2 ***Typical pressure flow workstation.*** *The workstation comprises transducers on an adjustable-height stand (**a**); a pump for bladder filling (**b**); a display, in this case with a superimposed screening image (**c**); and a uroflowmeter for use during the voiding phase of the study (**d**).*

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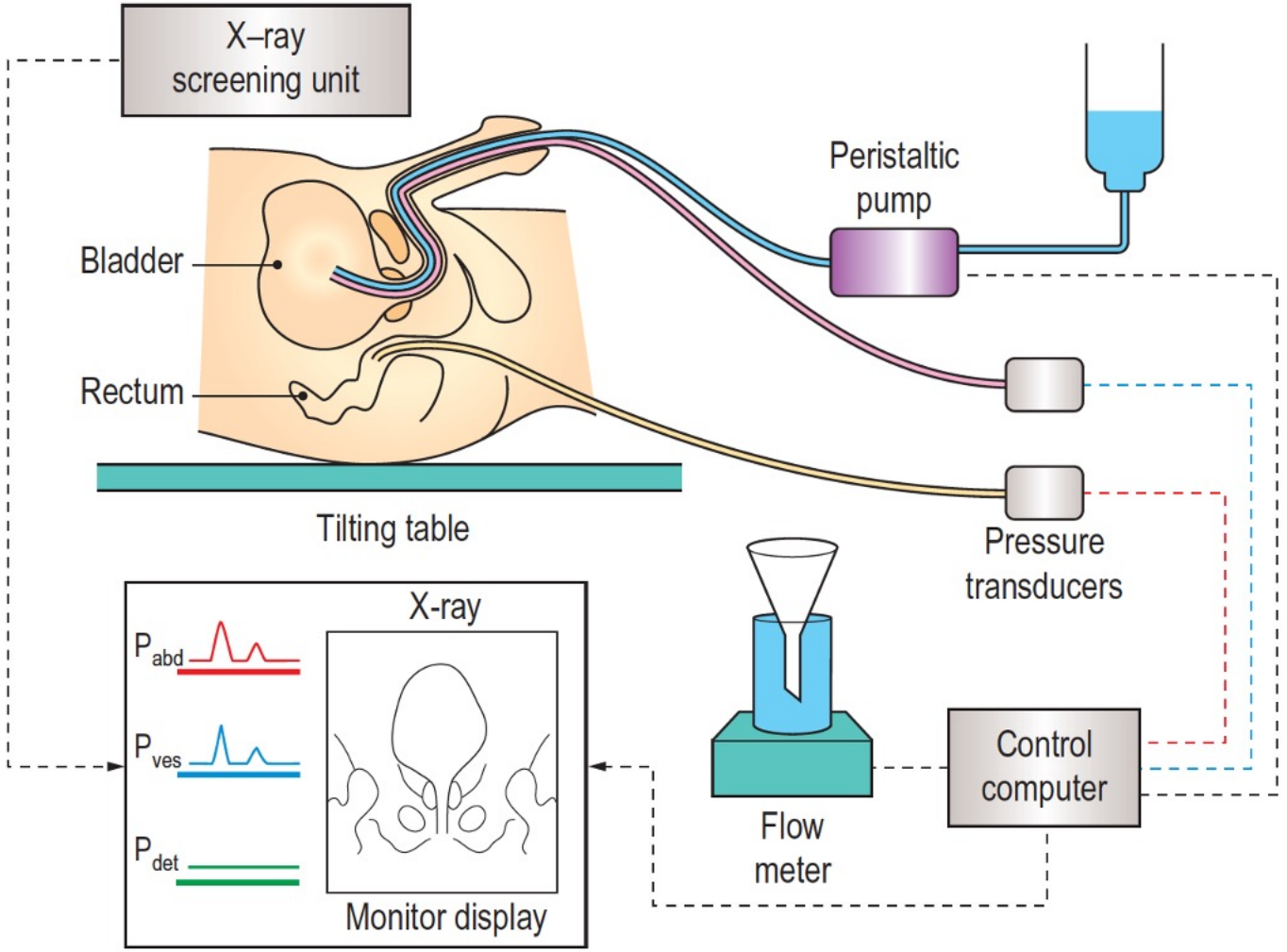
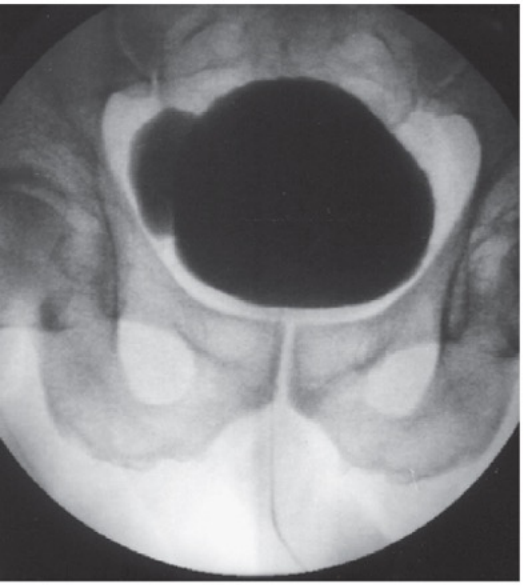
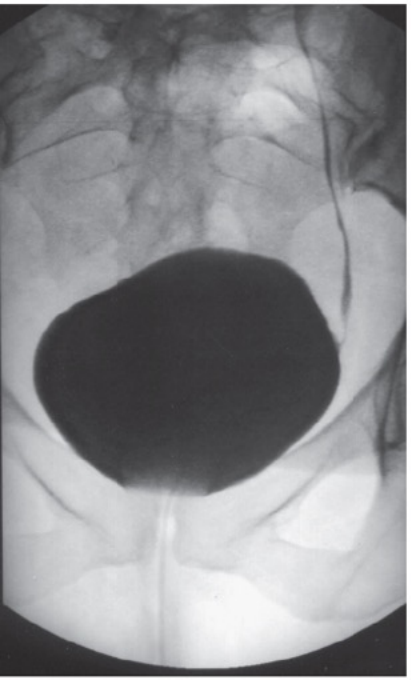
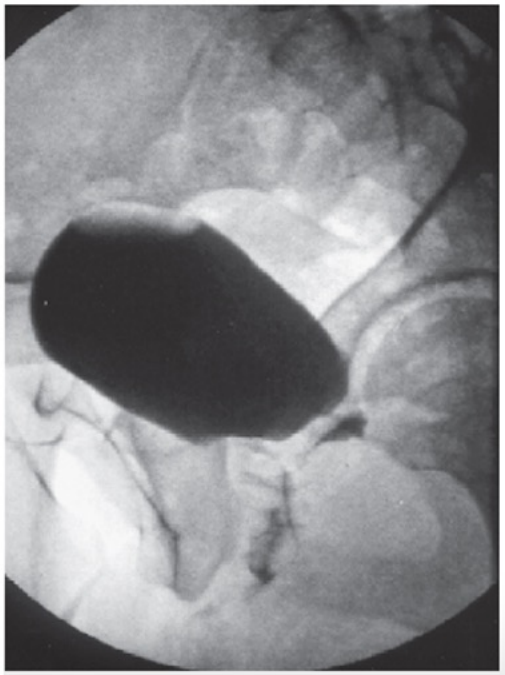
Video urodynamic



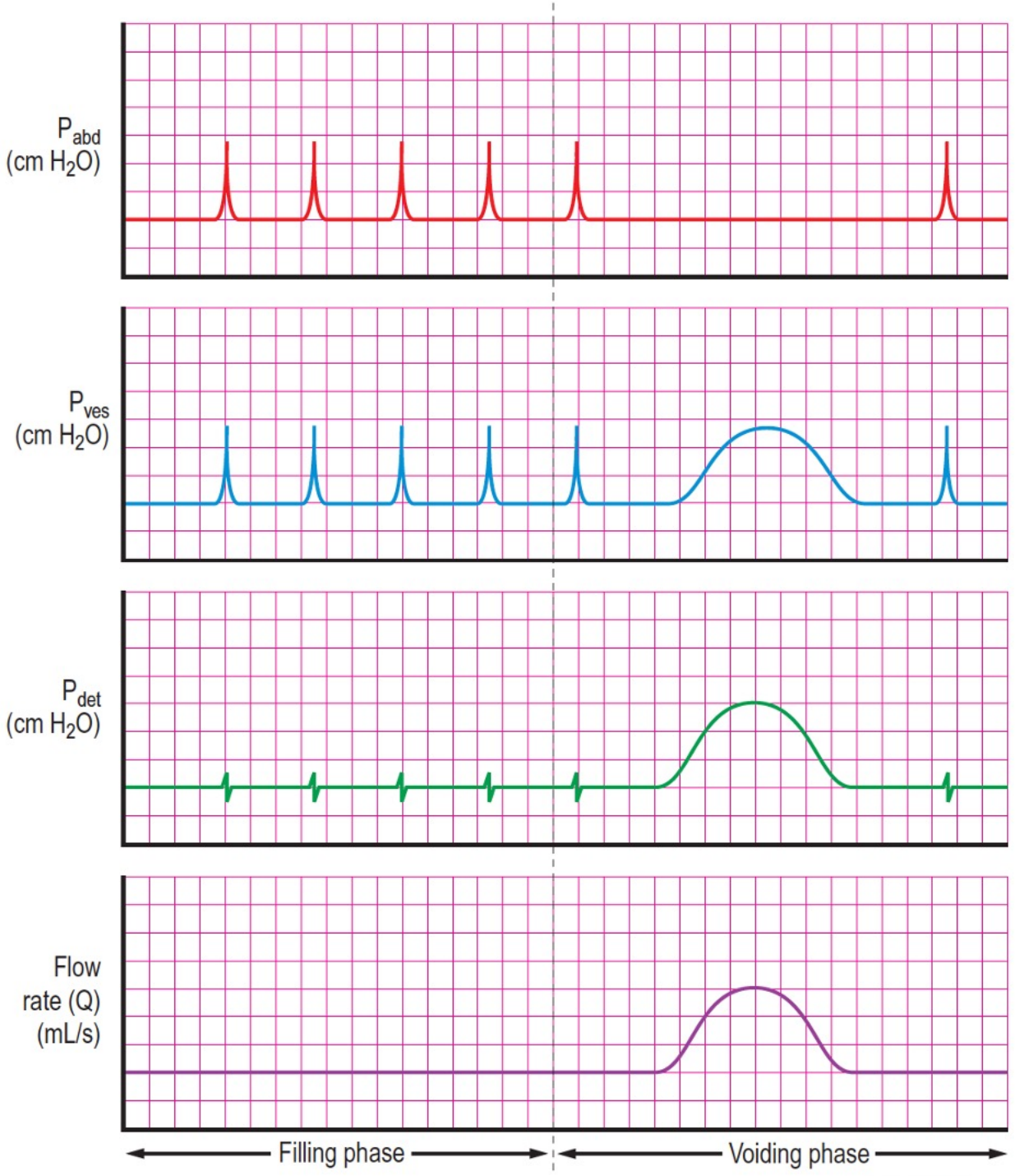
VUDS



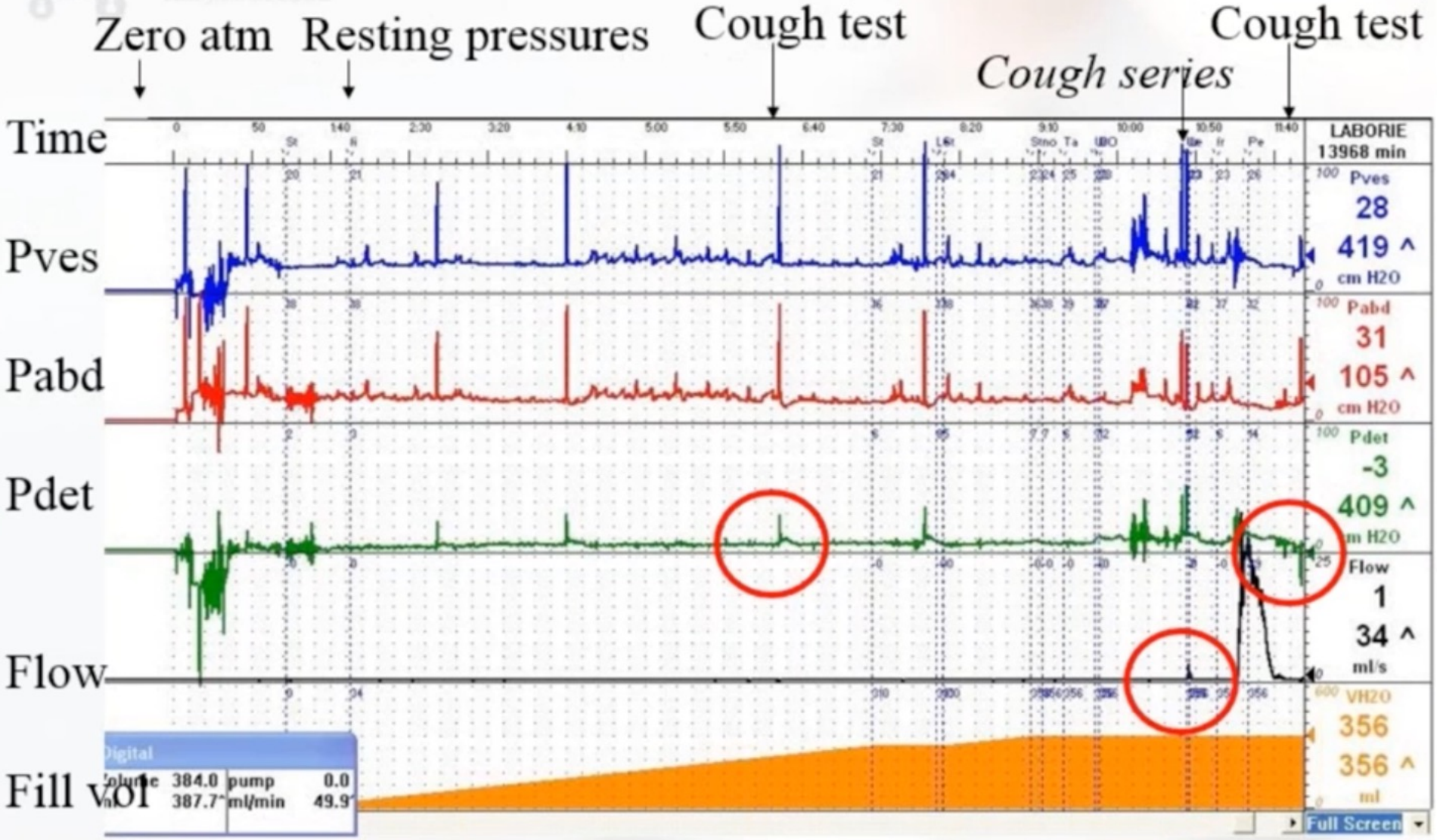




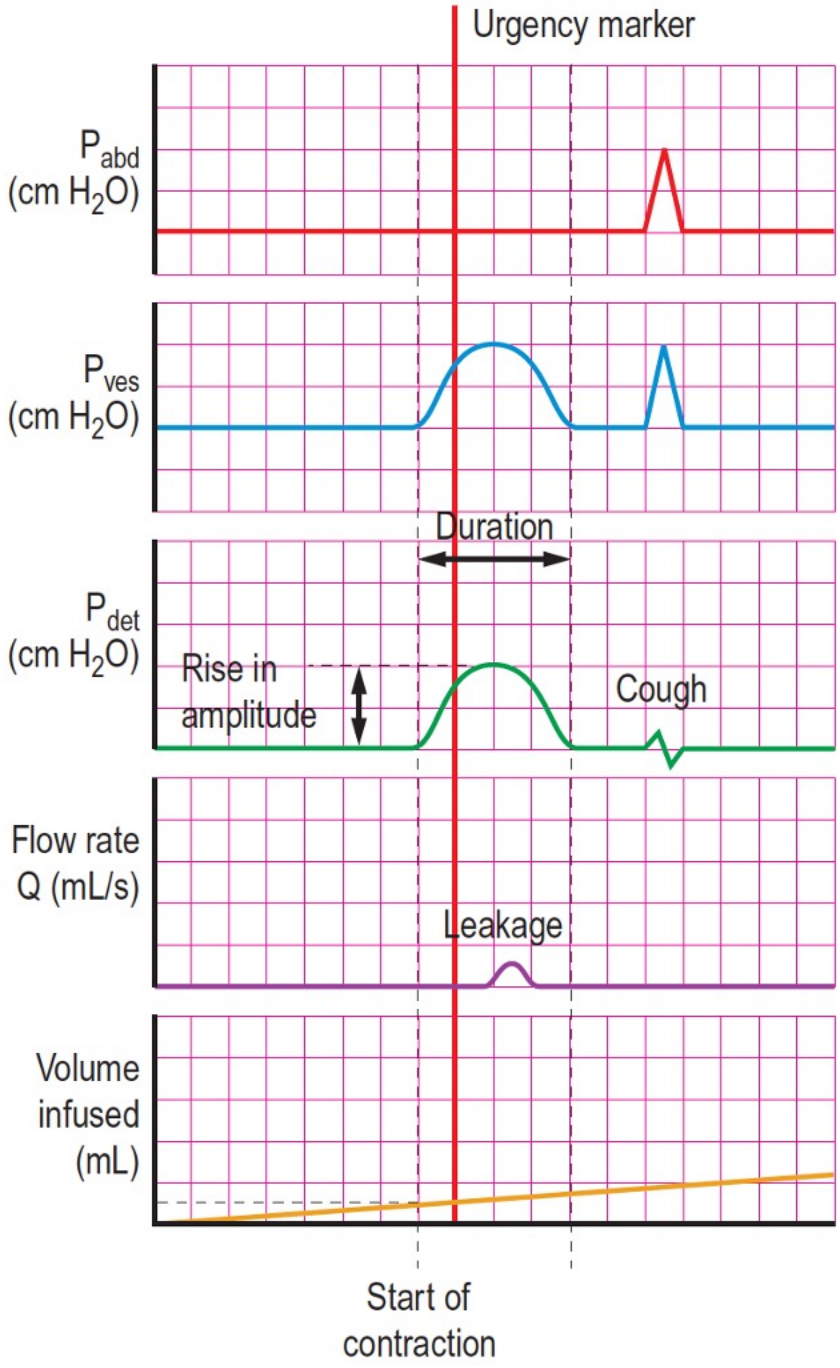

Ambulatory Urodynamic Monitoring (AUM)


P_{abd} (cm H_2O)
P_{ves} (cm H_2O)
P_{det} (cm H_2O)
Flow rate (Q) (mL/s)
Filling phase
Voiding phase

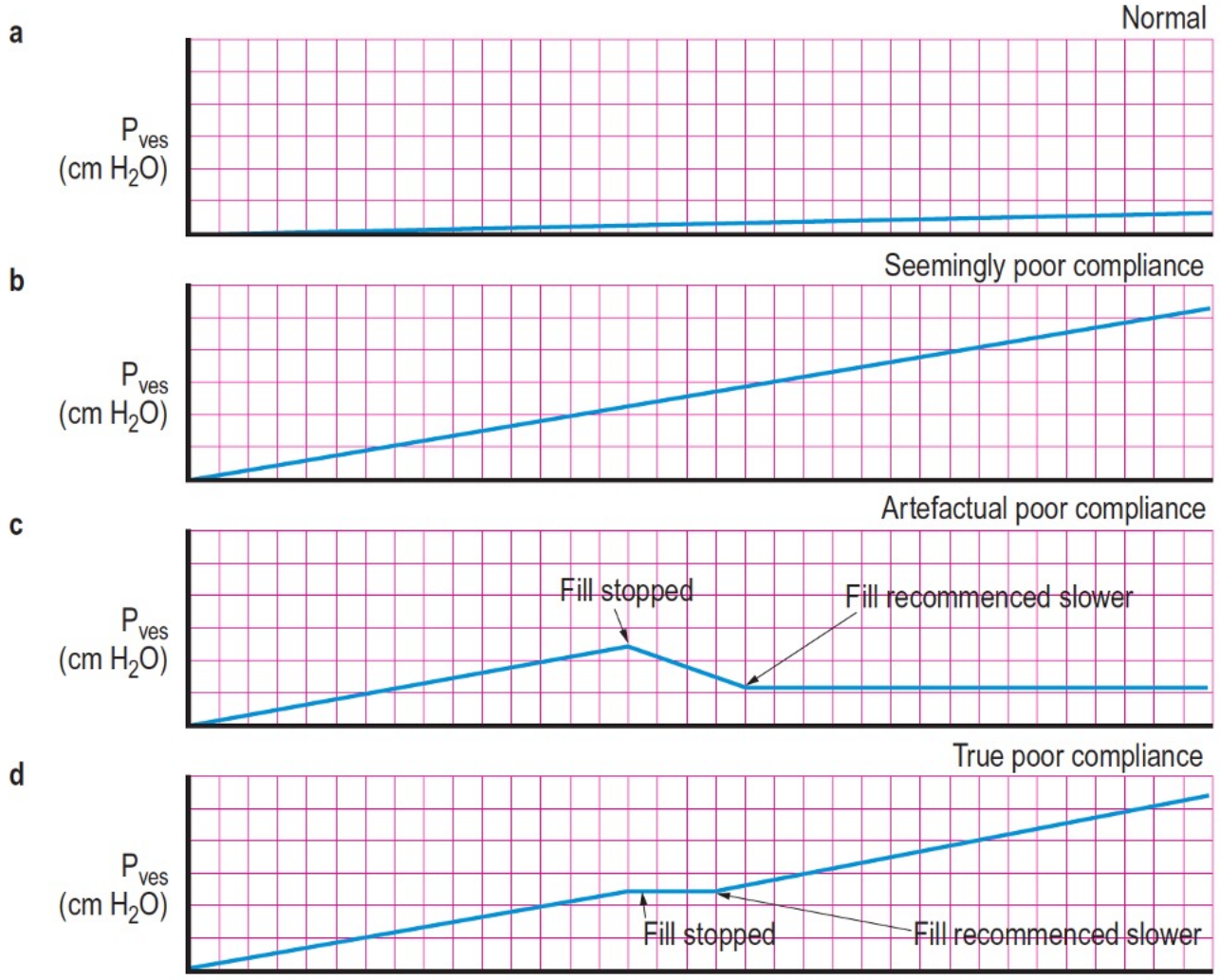
Checking recording quality



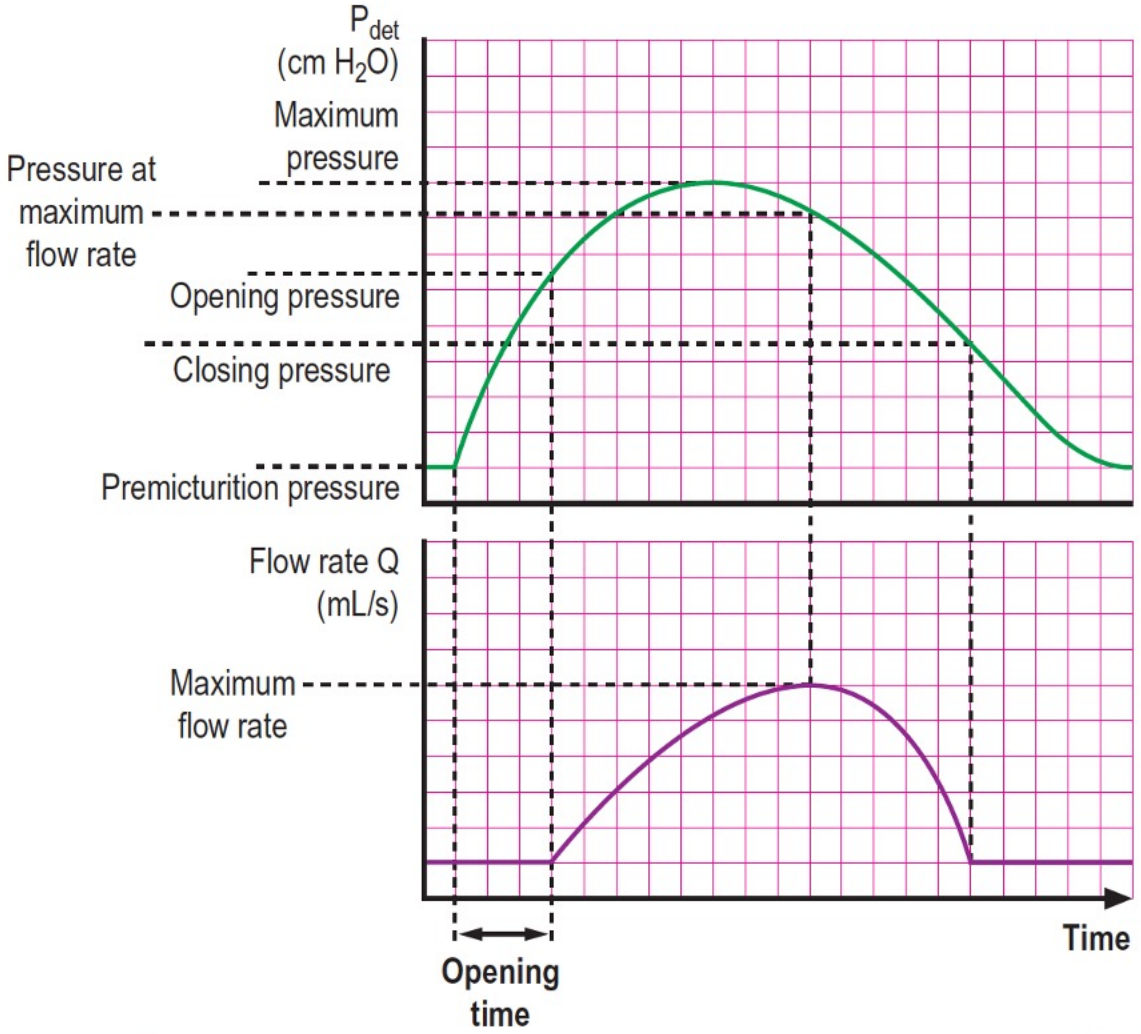
DO


Urgency marker
P_{abd} (cm H_2O)
P_{ves} (cm H_2O)
Duration
P_{det} (cm H_2O)
Rise in amplitude
Cough
Flow rate Q (mL/s)
Leakage
Volume infused (mL)
Start of contraction

Compliance


a
Normal
P_{ves} (cm H_2O)
b
Seemingly poor compliance
P_{ves} (cm H_2O)
c
Artefactual poor compliance
Fill stopped
Fill recommenced slower
P_{ves} (cm H_2O)
d
True poor compliance
P_{ves} (cm H_2O)
Fill stopped
Fill recommenced slower

PFS


P_{det}
(cm H_2O)
Maximum
pressure
Pressure at
maximum
flow rate
Opening pressure
Closing pressure
Premicturition pressure
Flow rate Q
(mL/s)
Maximum
flow rate
Time
Opening
time

Conventional urodynamic report

Patient Details *Date of study: / /*

		Fill Number 1	Fill Number 2
Filling	Fill rate (mL/min)	☐☐☐	☐☐☐
	Baseline P_{det} (cm H_2O)	☐☐☐	☐☐☐
	First sensation filling (mL)*	☐☐☐	☐☐☐
	Cystometric capacity (mL)*	☐☐☐	☐☐☐
	Compliance (0 = normal; 1 = reduced)	☐	☐
	Overactivity		
	Fill (0 = nil; 1 = phasic; 2 = nonphasic)	☐	☐
	Cough	☐	☐
	Posture	☐	☐

Contraction no.	1	2	3	4	5
Vol. at contraction					
Max. rise in P_{det}					

Contraction no.	1	2	3	4	5
Vol. at contraction					
Max. rise in P_{det}					

Pre-micturition pressure (cm H_2O) ☐☐☐ ☐☐☐

*Filling volume (need to add initial residual in formal data recording)

Voiding	Opening P_{det} (cm H_2O)	☐☐☐	☐☐☐
	$P_{det.max}$ (cm H_2O) (Not $P_{det.iso}$)	☐☐☐	☐☐☐
	P_{det} at peak flow (mL/s)	☐☐☐	☐☐☐
	Peak flow rate (mL/s)	☐☐.☐	☐☐.☐
	$P_{det.iso}$ (cm H_2O)	☐☐☐	☐☐☐
	After contraction (0 = no; 1 = yes)	☐	☐
	P_{det} (cm H_2O)	☐☐☐	☐☐☐
	Volume voided (mL)	☐☐☐	☐☐☐
	Residual urine (mL)	☐☐☐	☐☐☐
	Calculated initial residual urine (mL)	☐☐☐	☐☐☐

		R	L
Video	Bladder outline ☐ VUR Grade	☐	☐

1 = normal; 2 = trabeculated; 3 = sacculated; 4 = multiple diverticula

Grade as defined by International Reflux Study Group (Grades 1–5)

	Males	Females
Bladder neck	☐	☐

In men: 1 = normal opening with void; 2 = poor opening
In women: 1 = closed; 2 = open with fill; 3 = open with standing; 4 = open with stress

Stop test (M)/position (F)	☐	☐

In men: 1 = normal; 2 = trapping present; 3 = equivocal; 9 = not done
In women: 4 = well supported; 5 = descent on stress; 6 = prolapse

Prostatic urethra ☐ 1 = normal opening; 2 = attenuated; 3 = DSD; 4 = indeterminate

Anterior urethra ☐ 1 = normal; 2 = stricture; 3 = unsure

Comments/Report

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Thank you!

Urodynamics in BPH (LUTS)

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August 5, 2021

the AUA/SUFU Urodynamics Guideline

- states that “Clinicians should perform pressure-flow studies in men

when it is important to determine if urodynamic obstruction is present in men with LUTS, particularly when invasive, potentially morbid, or irreversible treatments are considered (Standard; Evidence Strength: grade B)

The EAU Guidelines

- Pressure-flow studies should be performed only in individual patients for specific indications before surgery or when evaluation of the underlying pathophysiology of LUTS is warranted (level 3, grade B recommendation).

  History of unsuccessful (invasive) treatment for LUTS (GR B)

  age> 80 (GR C)

  age<50 (GR B)

  Pvr>300 cc (GR C)

  Voided volume<150 cc (GR C)

The EAU Guidelines

- • “Clinicians may perform multichannel filling cystometry when it is important to determine if altered compliance, DO or other urodynamic abnormalities are present (or not) in patients with urgency incontinence in whom invasive, potentially morbid, or irreversible treatments are considered. (Option; Evidence Strength: Grade C)” .

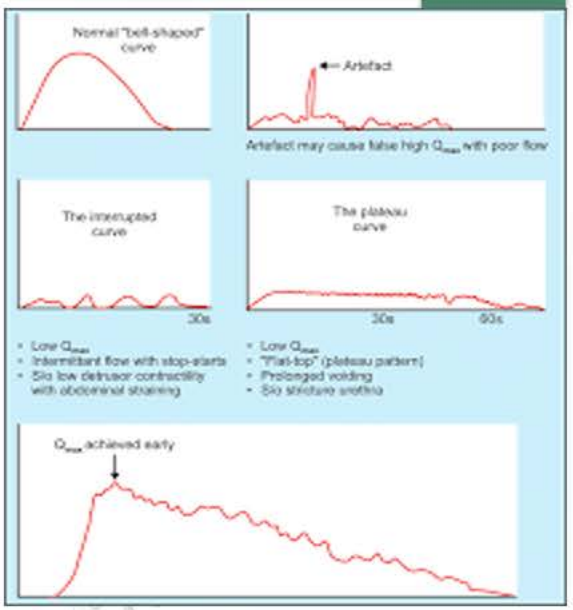
Uroflowmetry

- max flow rate and shape of curve may produce more reliable indicators of BOO
- Q max is the most reliable variable in detecting abnormal voiding, and influenced by several factors:

-age & sex: decreases with age in men.

-chance: multiple trials increases accuracy.

-volume of voided urine: 150 cc or more.



Uroflowmetry

- Uroflow and BOO:

-in general the test alone is insufficient to diagnose BOO.

-McLoughlin (1990) demonstrated that Qmax < **12cc/s** was a good indicator for obstruction.

-concept of high flow obstruction:

Qmax < 15ml/sec,detrusor pressure > 100cmH2O in symptomatic patient.

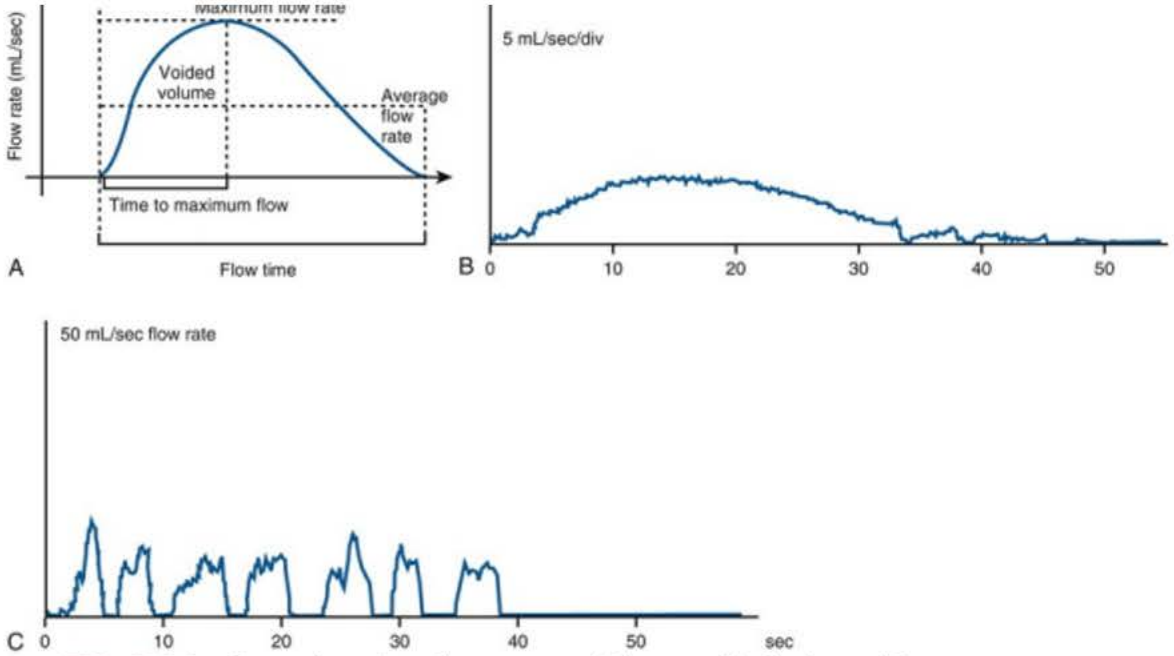
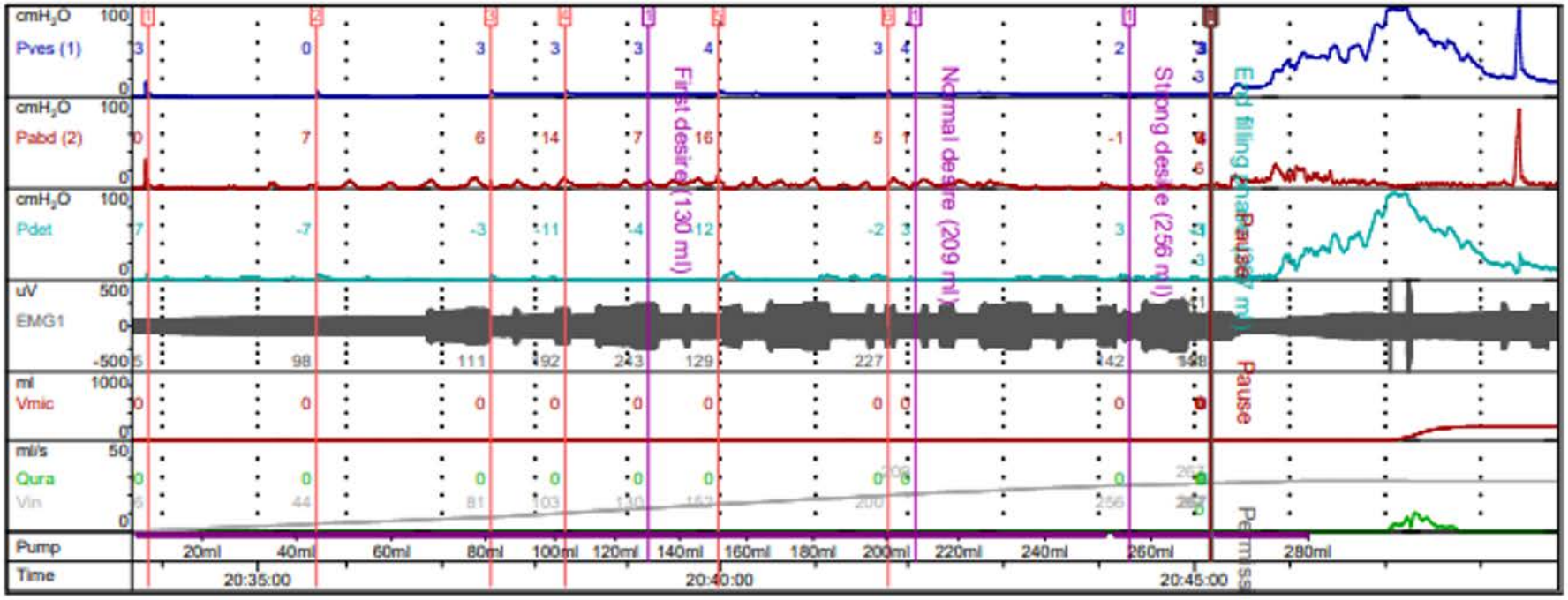


FIG. 114.1 Examples of uroflow curves. (A) normal bell-shaped flow curve of flow rate versus time. (B) flattened pattern usually indicative of obstruction. (C) An interrupted or straining pattern that can be seen with impaired bladder contractility, obstruction, or voiding with or by abdominal straining. (A, from Wein AJ, English WS, Whitemore KE. Office

PFS (pressure flow study)

Graph



PFS (pressure flow study)

- ***Indications for pressure-flow studies:***

- LUTS in pt with hx of neurologic disease (CVA, Parkinson's).
- LUTS with normal flow rates (Qmax > 15cc/min).
- younger men with LUTS.
- men whom LUTS sx of bladder instability rather than flow disorder.
- men with little endoscopic evidence of prostate occlusion.

Indications for pressure-flow studies:

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

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

PFS

- Terminology:

- *the detrusor opening pressure*:

Pdet recorded at the onset of measured flow.

- *the detrusor pressure at maximal flow*:

the magnitude of micturation contraction at the time when the flow rate is at its maximum.

Pdet more accurately measures bladder wall contractions

PFS

- Normal male generally voids with Pdet 40-60 cmH2O, and woman with lower pressure.
- Detrusor opening pressure > 80cm may indicate outflow obstruction.
- detrusor pressure at Qmax > 100cm implies outlet obstruction even if flow rate is normal.

PFS

- Pressure-flow plots:

- for PFS equivocal results.
- Many models available.

1- Abrams-Griffiths nomogram.

2- Schafer method.

3- ICS provisional nomogram

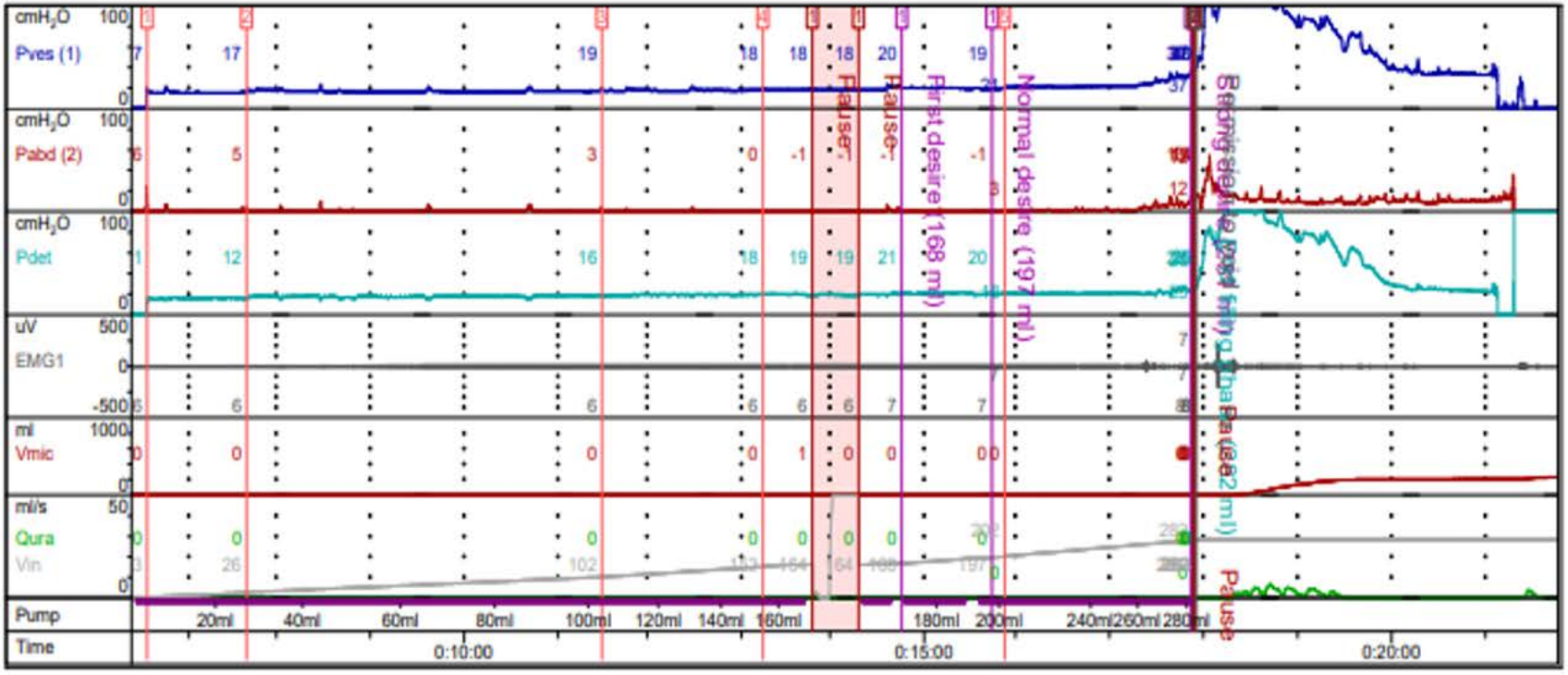
BLADDER OUTLET OBSTRUCTION INDEX(BOOI)

- Abrams-Griffiths nomogram
  - Divides obstructed from equivocal from unobstructed pattern.
  - AG number(BOOI) = $(P_{det}Q_{max)} - 2(Q_{max)})$
  - Men are considered obstructed if BOOI ≥40, unobstructed if BOO ≤20, and equivocal if BOOI is 20 to 40.

AG(BOOI) number?

- Pdet/Qmax=100cmH2
- Qmax=7cm H2o

Graph



ICS nomogram

- described the ICS provisional nomogram which is now suggested for use for the diagnosis of obstruction in men with LUTS suggestive of BPH.

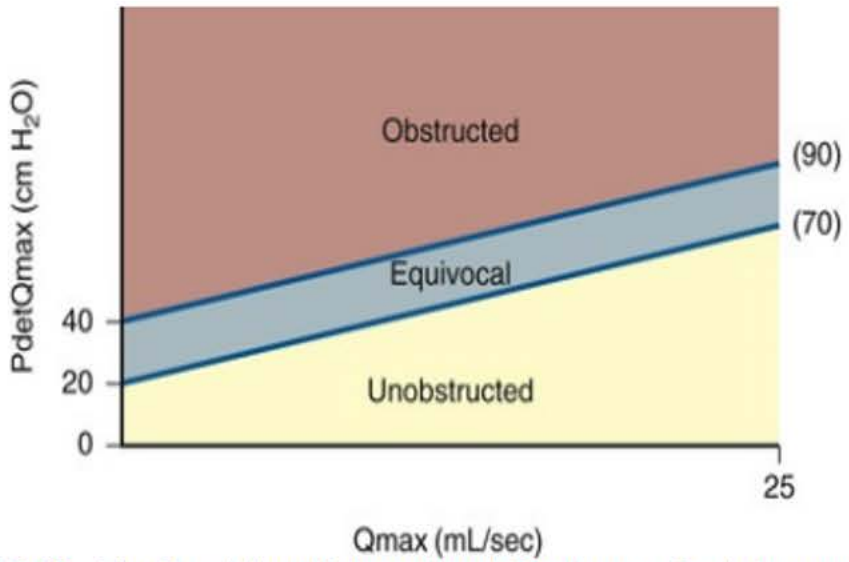
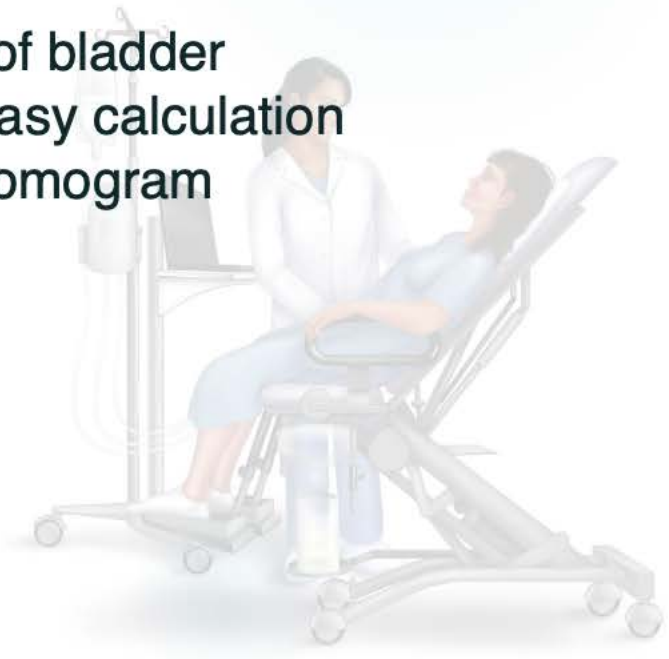


FIG. 114.15 The Provisional International Continence Society nomogram. See text for details.

BLADDER CONTRACTILITY INDEX

- Pdet/Qmax + 5(Qmax)
- Strong contractility is a BCI greater than 150
- normal contractility is a BCI of 100 to 150
- weak contractility is a BCI less than 100 .
- The BCI is the most common measure of bladder contractility used today because of its easy calculation and relationship to the BOOI and ICS nomogram



Schafer method

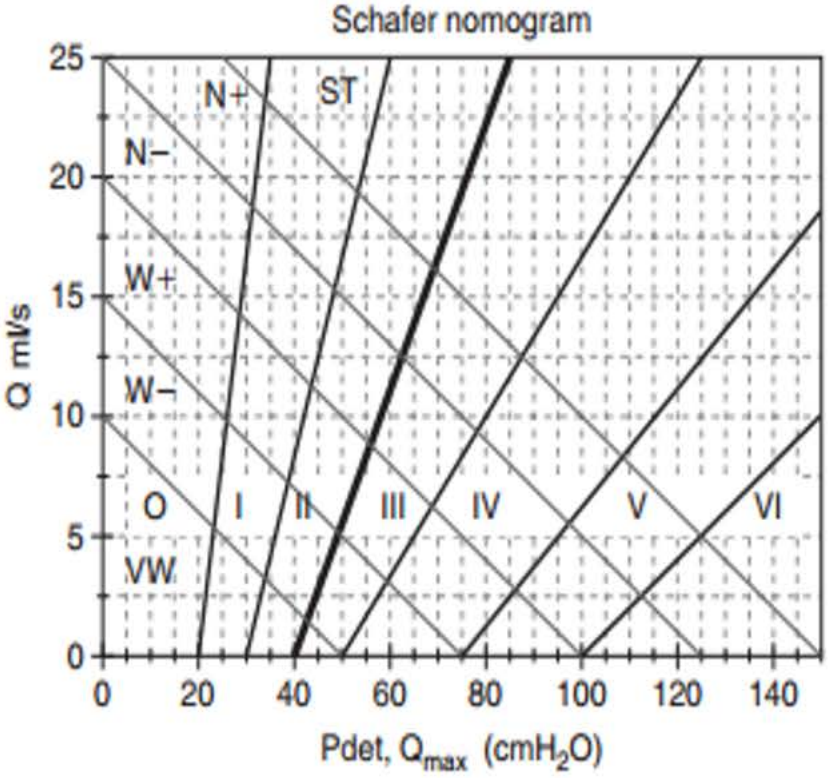


Fig. 10.4 Schafer nomogram showing 6 point obstruction scale and 5 point detrusor contractility. O–VI refers to increasing grades of obstructions. VW to ST refer to increasing detrusor strength. VW = very weak; W− + W+ = weak; N− and N + normal; ST very strong.

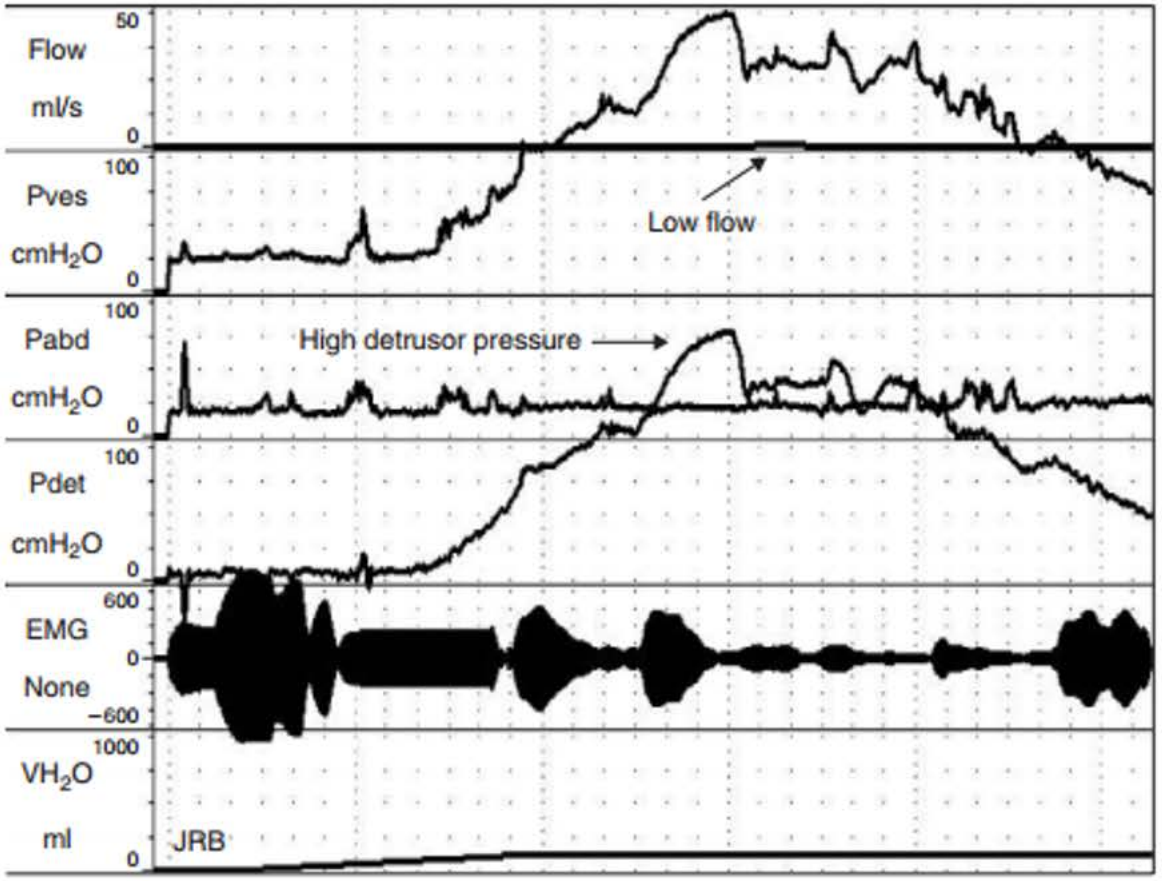


Fig. 10.2 Urethral obstruction. Prostatic obstruction in a 73-year-old man with Parkinson's disease. Urodynamic study. Q_{max} = 1 ml/s, Pdet@Q_{max} = 150 cmH_2O, Pdetmax = 187 cmH_2O, voided volume = 33 ml, and PVR = 88 ml.

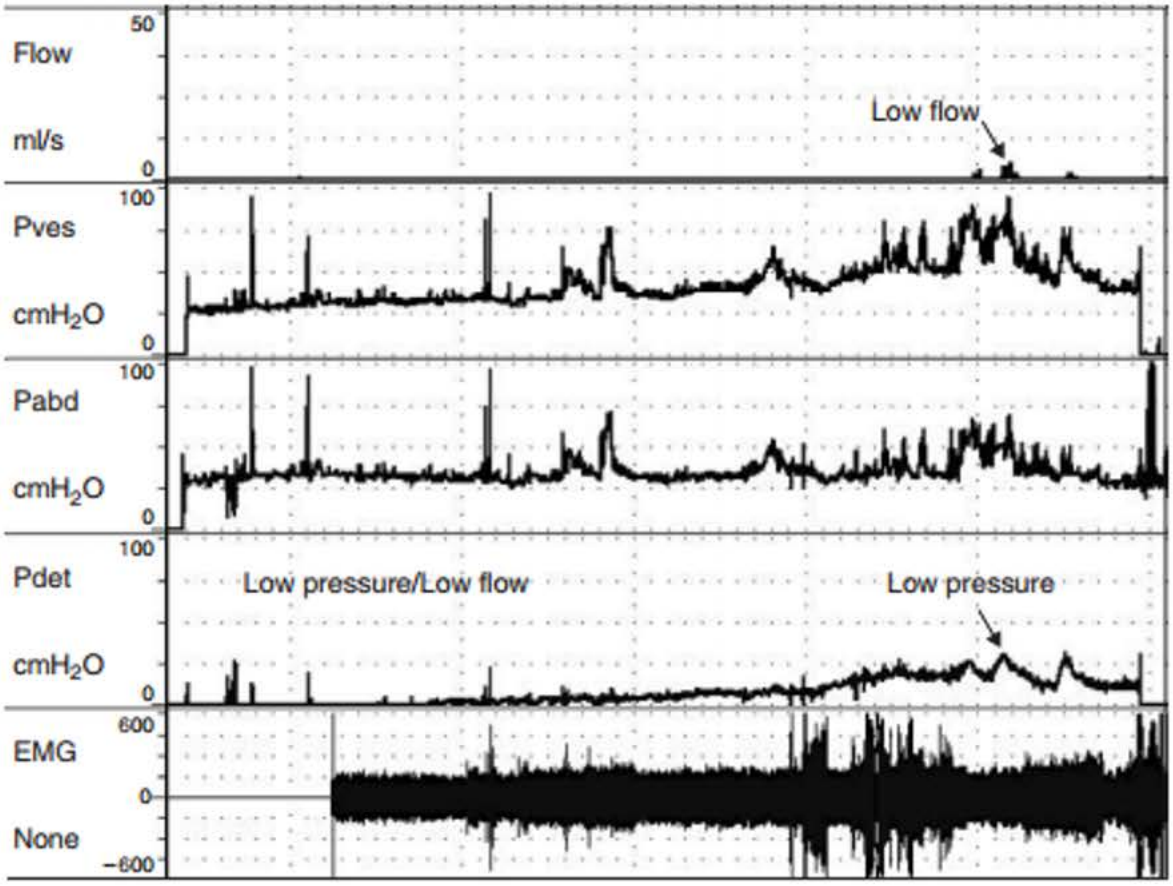
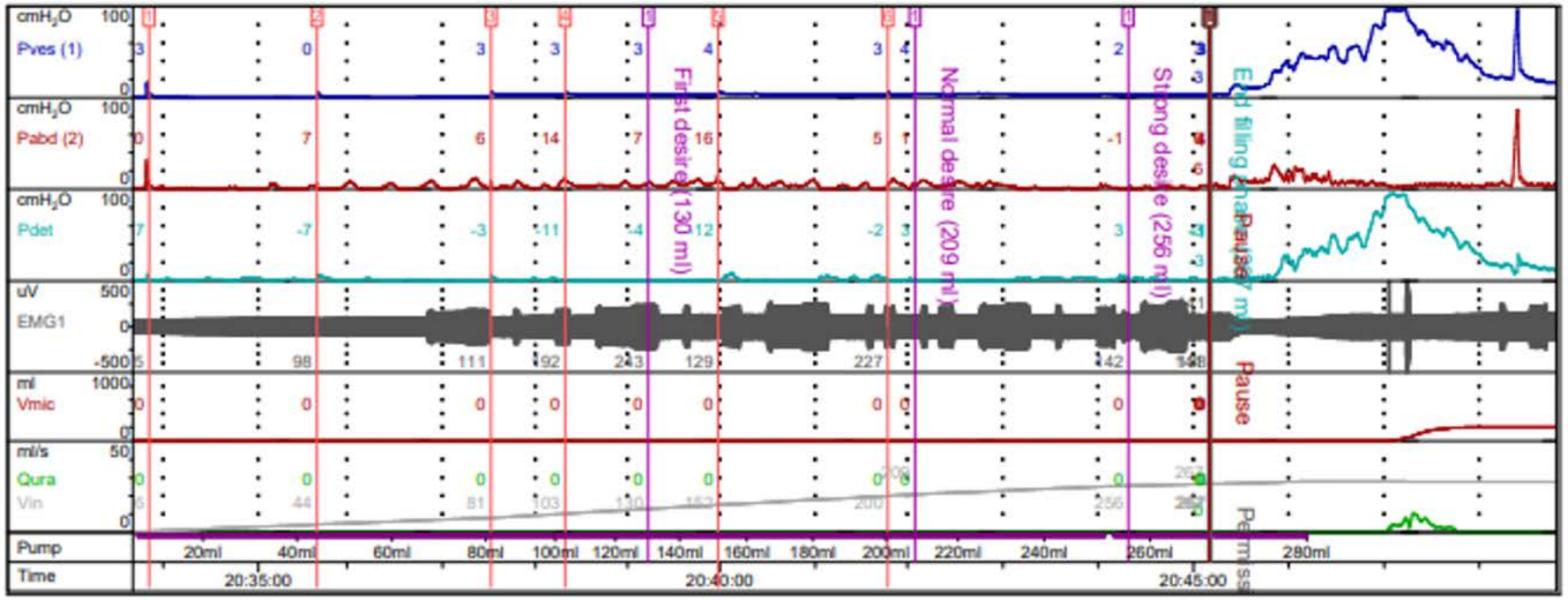


Fig. 10.3 Impaired detrusor contractility (low pressure, low flow). Pdet@ Q_{max} = 28 cmH_2O, Q_{max} = 2 ml/s, and Pdet@P_{max} = 28 cmH_2O.

BOOI?
BCI?

Graph

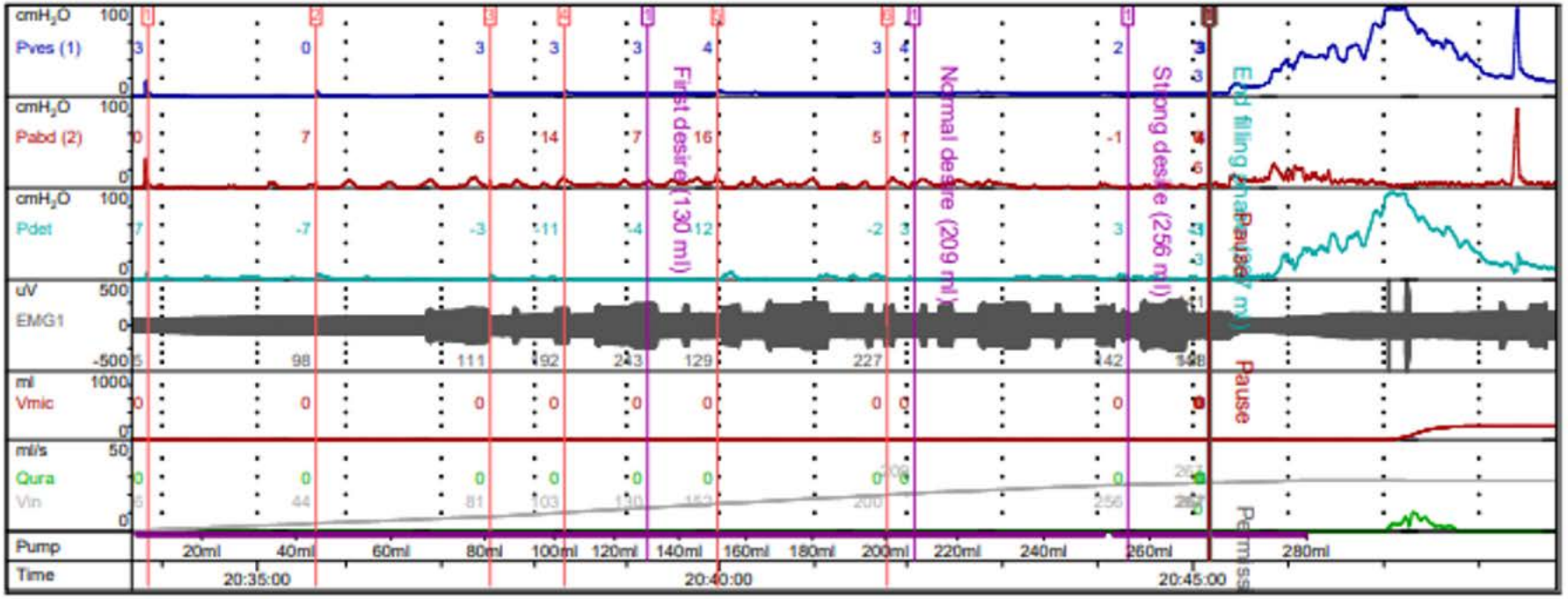


Pdet/Qmax=100

Qmax=10

BOOI=80 BCI=150 OBSTRUCTION

Graph




Thank You !

Urogynecology and Urodynamic study indications

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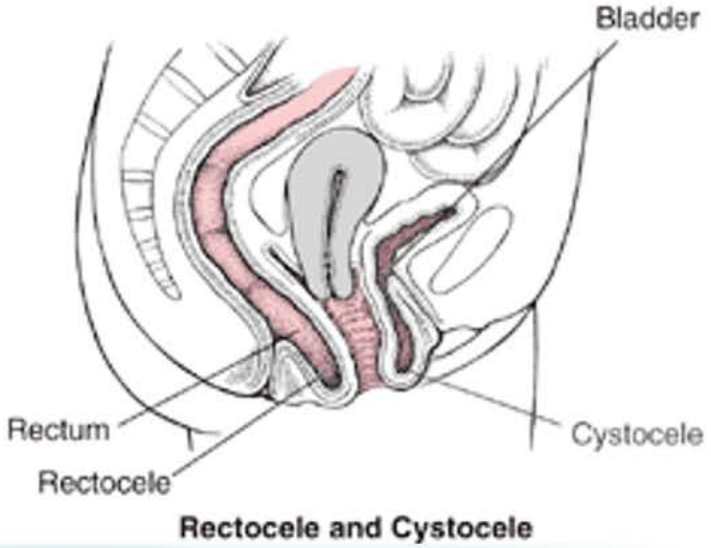
August 5, 2021

The reliability and clinical impact of urodynamics (UDS) remains one of the most debated issues in urogynecology.



Rectocele and Cystocele

First Case:

Difficult voiding
Failed colprrhaphy & antiincontinence surgery

Vaginal exam;
positive cough test,,
no atrophy, cystocele grade:3 and
rectocele grade 2 ,no

Table 4 Urodynamic studies.

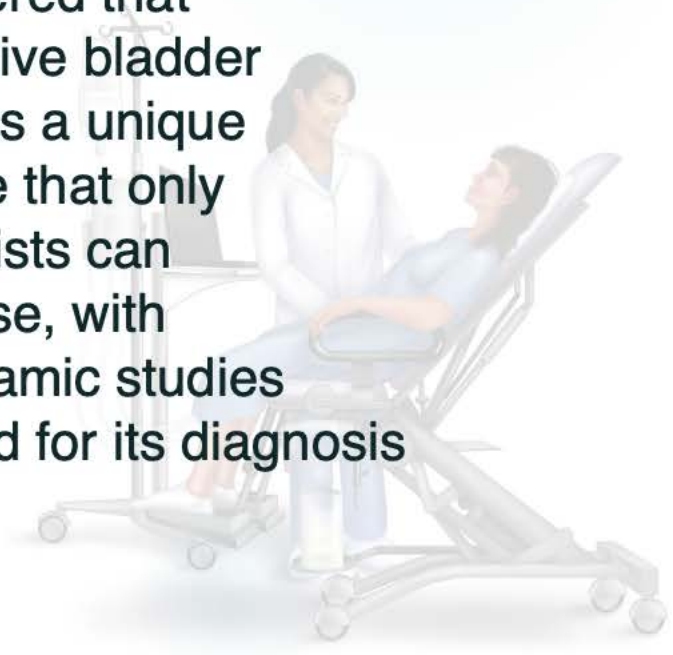
Guideline	Recommendation
EAU	Do not perform if pursuing conservative treatment (Grade B) Counsel that UDS does not predict treatment outcome (Grade C) Use UDS if results will alter treatment recommendation and management
ICI	Use UDS if results will alter treatment recommendation and management
AUA/SUFU UDS guideline	Option: perform in patients with UUI if considering invasive treatment
NICE	Consider if diagnosis unclear, history of prior surgery for SUI, or for symptoms suspicious for detrusor overactivity or voiding dysfunction (Level 4)
All guidelines reviewed	Use UDS if there is recurrent UI after failure of invasive treatments

Second Case: 38 yr old with history of MS presented with over active bladder and mixed UI

Clinical guidelines for overactive bladder

International Journal of Urology (2009) **16**, 126–142

- To date, it has been considered that overactive bladder (OAB) is a unique disease that only specialists can diagnose, with urodynamic studies required for its diagnosis



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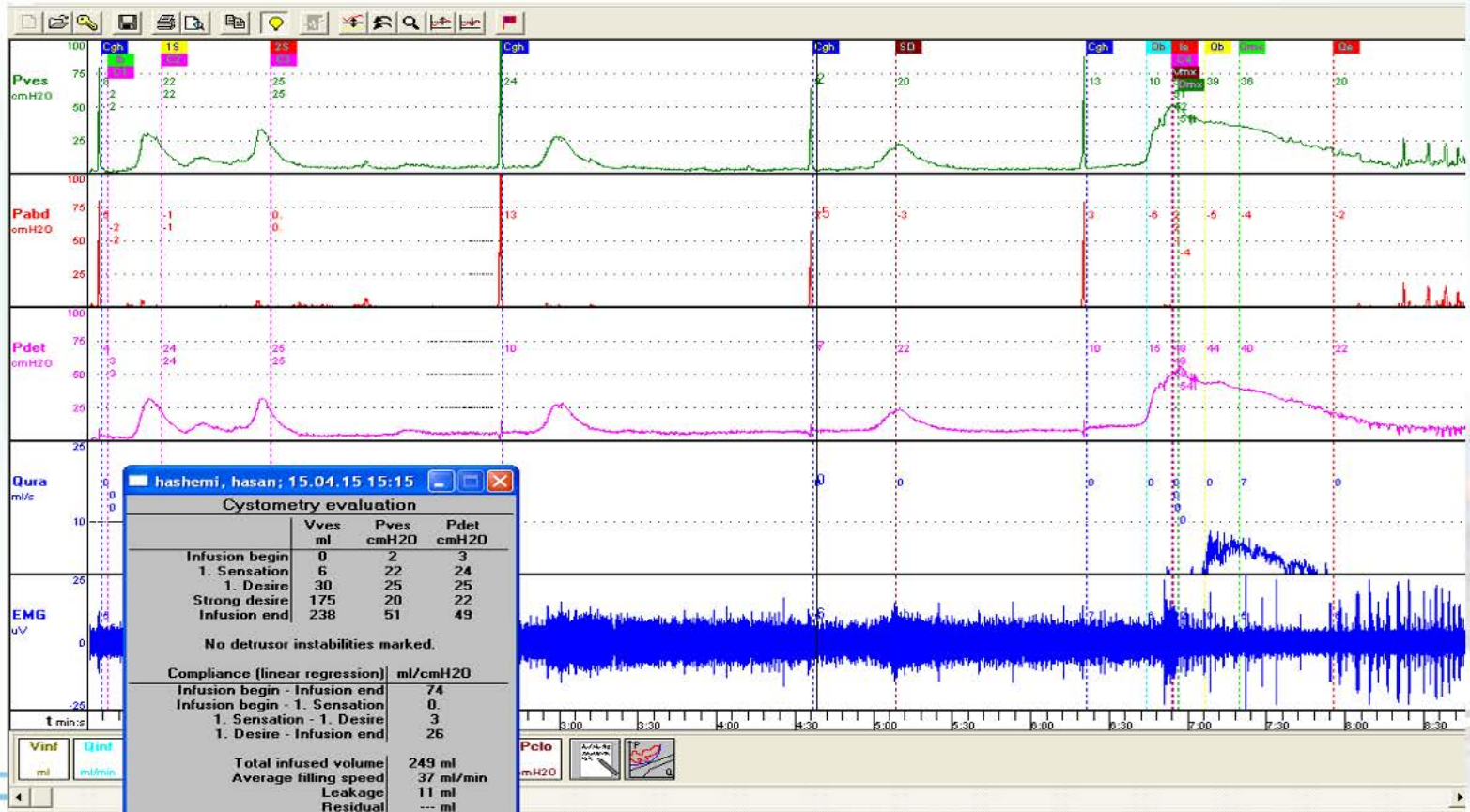
36-year-old women/cystometery:Urodynamic studies are useful for elucidating the pathological picture of OAB, but are not always necessary for diagnosis or starting treatment.



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J Res Med Sci. 2012 Apr; 17(4): 382–385.

PMCID: PMC3526134
PMID: 23267402

Association of urodynamic findings in new onset multiple sclerosis with subsequent occurrence of urinary symptoms and acute episode of disease in females

Farhad Tadayyon,[1] Masoud Etemadifar,[2] Hussein Bzeih,[3] Mahtab Zargham,[4] Kia Nouri-Mahdavi,[5] Mojtaba Akbari,[6] and Borna Tadayyon[7]

According to this study, 62% of all new MS patients had an abnormal urodynamic test.

Third Case : Unreliable women!

OCD patients

UI after accident and trauma

SUI and UDS

- In cases of female SUI, the evidence (although not overwhelming) pointed to the utility of UDS in diagnosis, preoperative planning, severity assessment, and prognosis of surgery .

- Patel AK, Chapple CR.
- Urodynamics in the management of female stress incontinence–which test and when? Curr Opin Urol 2008;18: 359–64.

SUI: Complicated or Uncomplicated?

- Rachaneni S, Latthe P. Does preoperative urodynamics improve outcomes for women undergoing surgery for stress urinary incontinence? A systematic review and meta-analysis. BJOG 2015;122: 8–16.

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EAU GUIDELINES ON NON-NEUROGENIC FEMALE LUTS

Recommendations	Strength rating
Management of complicated SUI should only be offered in centres with appropriate experience.	Strong
Base the choice of surgery for recurrent SUI on careful evaluation, including individual patient factors and considering further investigations such as cystoscopy, multichannel urodynamics, as appropriate.	Strong
Inform women with recurrent SUI that the outcome of a surgical procedure, when used as a second-line treatment, is generally inferior to its use as a first-line treatment, both in terms of reduced efficacy and increased risk of complications.	Weak
Only offer adjustable mid-urethral sling as a primary surgical treatment for SUI as part of a structured research programme.	Strong

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available at www.sciencedirect.com
journal homepage: www.europeanurology.com/eufocus

Point of Focus Debate: For

Urodynamics Before Surgery for Stress Urinary Incontinence: The Urodynamic Examination Is Still One of the Best Friends of the Surgeon and of Patients with Stress Urinary Incontinence

Maurizio Serati[a,*], *Enrico Finazzi Agrò*[b]

[a] *Department of Obstetrics and Gynecology, University of Insubria, Varese, Italy;* [b] *Department of Experimental Medicine and Surgery, University Tor Vergata, Rome, Italy*

Best Friends!

SUI and UDS

Urodynamics Before Stress Urinary Incontinence Surgery in Modern Functional Urology

Bárbara Padilla-Fernández [a,*,†], *Gina M. Ramírez-Castillo* [b,†], *David Hernández-Hernández* [a], *David M. Castro-Díaz* [a]

[a] *Department of Urology, Complejo Hospitalario Universitario de Canarias, Universidad de La Laguna, La Laguna, Tenerife, Spain;* [b] *Department of Urology, Hospital San José, Bogotá, Colombia*

15 REFERENCES OF BEST FRIENDS! the majority of the analyzed patients came from the Value of UrodynamicEvaluation (ValUE) study

.

:

We describe the PROS and CONS for this situation.

performed only when it can have therapeutic consequences, will change the patient's management, and/or when part of a surveillance or research programme [3,5,6].

According to the ICS recommendations, the role of UDS from a broad clinical perspective can be s follows [3]:

1 To identify all factors that contribute to lower urinary tract dysfunction (LUTD) signs and/or are the origin of symptoms and to assess their relative importance;
2 To obtain information about all other aspects of lower urinary tract function or dysfunction, whether or not expressed as a symptom or recognisable as a sign;
3 To allow prediction of the possible consequences of LUTD for the upper urinary tract;
4 To allow prediction of the outcome, including undesirable side effects, of a contemplated treatment;
5 To confirm the effects of an intervention or understand the mode of action of a particular type of treatment for a LUTD, especially for a new and/or experimental (not routine) treatment; and
6 To understand the reasons for failure of previous treatments for UI or for LUTD in general (after unsatisfactory treatment).

Original Article

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pISSN 2093-4777 · eISSN 2093-6931

INJ
OPEN ACCESS

Efficacy and Safety of Tension-Free Vaginal Tape-Secur Mini-Sling Versus Standard Midurethral Slings for Female Stress Urinary Incontinence: A Systematic Review and Meta-Analysis

Wei Huang[1,2], Tao Wang[1,2], Huantao Zong[1,2], Yong Zhang[1,2]

stics

up	Therapy in control group	Country	Sample size: Experimental	Sample size: Control	Duration of treatment (mo)	Inclusion population
	TVT-O	Italy	38	37	12	SUI lasting for at least 2 yr as diagnosed by clinical evaluation and urodynamics and age > 40 yr
	TVT-O	Belgium, the Netherlands	97	98	12	All patients in whom SUI could be objectified during clinical and/or urodynamic examination
	TVT-O	China	34	36	12	Women with SUI as diagnosed by clinical evaluation and urodynamics
Wang et al. (2011) [18]	TVT-Secur	TVT	China	34	32	12	Women with SUI as diagnosed by clinical evaluation and urodynamics
Masata et al. (2012) [19]	TVT-Secur	TVT-O	Czech Republic	129	68	24	Women with urodynamic SUI, failed conservative therapy, > 18 yr and agreed to postoperative follow-up
Hota et al. (2012) [20]	TVT-Secur	TVT-O	USA	43	44	12	Women with SUI with an impact on QoL, positive CST during urodynamics
Barber et al. (2012) [21]	TVT-Secur	TVT	USA	136	127	12	Women at least 21 yr of age with SUI on multichannel urodynamics, desire for surgical treatment, concurrent surgical treatment of prolapse
Andrada Hamer et al. (2013) [22]	TVT-Secur	TVT	Sweden	64	69	12	Primary SUI or MUI with predominant stress, > 18 yr of age and no wish for further pregnancy, ≥ 3-mL leakage on pad test, positive CST
Tommaselli et al. (2013) [11]	TVT-Secur	TVT-O	Italy	77	77	36	Women with SUI, diagnosed clinically and by urodynamics, age > 30 yr, failed PFMT
Tommaselli et al. (2015) [23]	TVT-Secur	TVT-O	Italy	77	77	63	Women with SUI, diagnosed clinically and by urodynamics, age > 30 yr, failed PFMT
Maslow et al. (2014) [24]	TVT-Secur	TVT-O	Canada	56	50	12	Women with symptoms of SUI and a positive cough test, which required surgical management
Oliveira et al. (2011) [25]	TVT-Secur	TVT-O	Portugal	30	30	12	Women with clinically and urodynamically proven SUI associated with urethral hypermobility
Ross et al. (2014) [26]	TVT-Secur	TVT	Canada	40	34	12	Women leaked urine with increased abdominal pressure, and were suitable for either type of surgery
Bianchi-Ferraro et al. (2013) [27]	TVT-Secur	TVT-O	Brazil	66	56	12	Women presenting SUI symptoms demonstrated by stress test and urodynamics
Bianchi-Ferraro et al. (2014) [12]	TVT-Secur	TVT-O	Brazil	66	56	24	Women presenting SUI symptoms demonstrated by stress test and urodynamics
Jeong et al. (2010) [28]	TVT-Secur	TVT-O	Korea	31	33	12	Women presenting SUI symptoms demonstrated by stress test and urodynamics
Neuman et al. (2011) [13]	TVT-Secur	TVT-O	Israel	79	73	36	A diagnosis of SUI based on the patient's personal history and a positive cough test with the bladder holding 300 to 400 mL
Pushkar et al. (2011) [29]	TVT-Secur	TVT-O	Russia	45	50	12	Women with primary SUI or MUI with predominant stress, age > 18 yr, positive CST

TVT, tension-free vaginal tape; TVT-O, tension-free obturator tape; SUI, stress urinary incontinence; QoL, quality of life; CST, cough stress test; MUI, mixed urinary incontinence; PFMT, pelvic floor muscle training.

Urodynamically proven SUI

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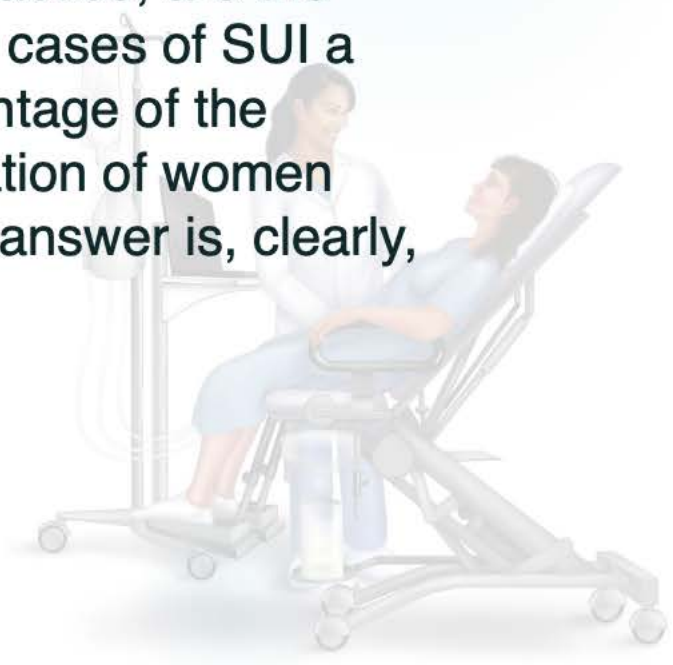
For these women, conservative therapies, such as antimuscarinic treatment, appear to have good cure rates and avoid unnecessary surgical procedures In more than 20% of women with apparently pure SUI

Serati M, Cattoni E, Siesto G, et al. Urodynamic evaluation: Can it prevent the need for surgical intervention in women with apparent pure stress urinary incontinence? BJU Int 2013;112:E344–50.

500/2700 PATIENTS INCLUDED!

thus the vast majority of patients are complicated.

- Unfortunately, this famous study presents several methodological biases; in particular, it is remarkable that the authors included only uncomplicated cases of SUI. The real question is, in clinical practice, are the uncomplicated cases of SUI a relevant percentage of the general population of women with SUI? The answer is, clearly, **not at all.**



- آیا برای شما مهمتر این است که
  - با معاینه و آزمونی کمی تهاجمی بیمار را آزار ندهید
  - یا اینکه با یک جراحی و هزینه های عمل و بستری او را نا امید کنید؟

Spinal cord injury:

a proper urological management

MEHRDAD MOHAMMADI, MD
Endourologist
Associate Professor Of Urology
Isfahan University Of Medical Sciences

Patterns of lower urinary tract dysfunction following neurological disease

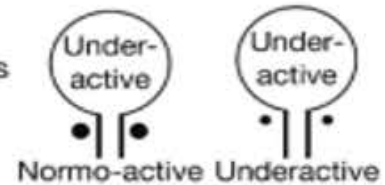
Suprapontine lesion
- **History:** predominantly storage symptoms
- **Ultrasound:** insignificant PVR urine volume
- **Urodynamics:** detrusor overactivity

Alzheimer's disease /CVA/head trauma/ parkinsonism/brain tumor

Spinal (infrapontine–suprasacral) lesion
- **History:** both storage and voiding symptoms
- **Ultrasound:** PVR urine volume usually raised
- **Urodynamics:** detrusor overactivity, detrusor–sphincter dyssynergia

Spinal cord injury (SCI)
Spina bifida

Sacral/infrasacral lesion
- **History:** predominantly voiding symptoms
- **Ultrasound:** PVR urine volume raised
- **Urodynamics:** hypocontractile or acontractile detrusor



Lumbar spine
Degenerative disease
Disk prolapse
Lumbar canal stenosis/ DM/ GBS/ZONA/herpes

primary goal of the bladder management

- The ultimate goal of a urologic long-term management of NLUTD is the protection of renal function.
- An elevated detrusor pressure during storage phase, either due to low bladder compliance or because of detrusor overactivity combined with DSD, is the major risk factor for degradation of renal function
- Therefore, the primary goal of the bladder management in these patients is to keep the detrusor pressure low during urine storage and emptying of the bladder

secondary goal of the bladder management

- In addition, prevention of secondary morphologic alterations of the lower urinary tract, voluntary bladder emptying at physiologic intervals, continence, and the best possible preservation of quality of life are other important goals of NLUTD treatment.

History taking

- Special attention should be paid to possible warning signs and symptoms (e.g. pain, infection,haematuria and fever) requiring further investigation.

- Patients with SCI usually find it **difficult to report** urinary tract infection (UTI)-related symptoms accurately.

Sign and symptoms of UTI(SCI)

- Cloudy and/or foul smelling urine
- Increase in mucous or sediment
- Increase in bladder or **general spasms**
- Pain or burning with urination
- Increase in frequency or incontinence
- Low back or flank pain
- Blood in urine
- Elevated temp/fever or chills
- Nausea/vomiting
- **Just not feeling well**

- Even in chronic patients, the type of LUTs is likely to change over time, and clinical symptoms may not reflect the presence of risk factors. As a consequence, urodynamic assessment is mandatory for treatment adaption and risk assessment.
- A treatment should never be initiated or adapted exclusively only on the basis of clinical symptoms.

Bladder diaries

Bladder diaries provide data on the number of voids, voided volume, pad weight and incontinence and urgency episodes..

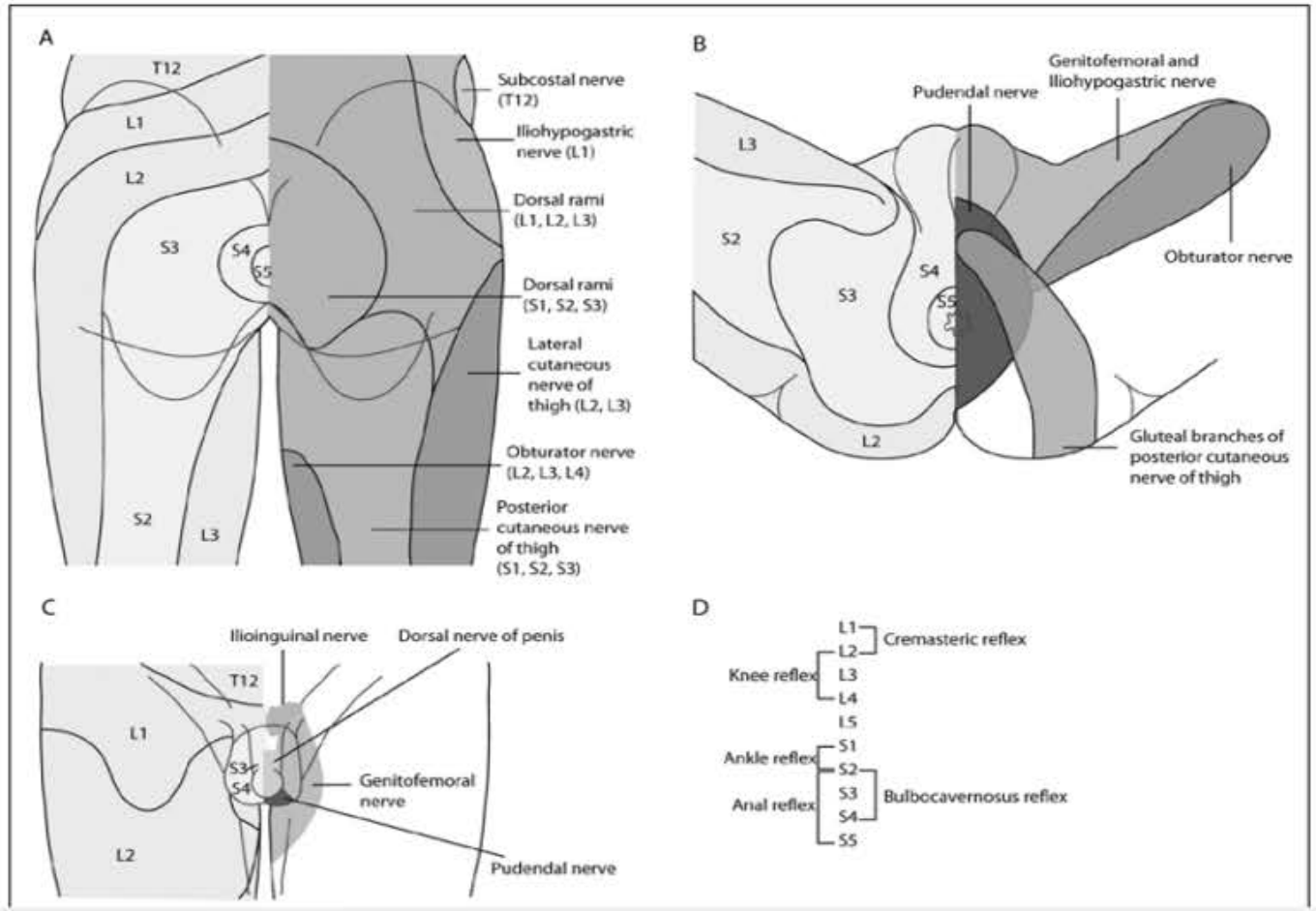
An assessment of the patient's present and expected future quality of life (QoL) is important to evaluate the effect of any therapy

Questionnaire	Underlying neurological disorder	Bladder	Bowel	Sexual function
FAMS [86]	MS	X		X
FILMS [87]	MS	X	X	
HAQUAMS [88]	MS	X	X	X
I-QOL [84]	MS, SCI	X		X
MDS [89]	MS	X	X	
MSISQ-15 / MSISQ-19 [90, 91]	MS	X	X	X
MSQLI [92]	MS	X	X	X
MSQoL-54 [93]	MS	X	X	X
MSWDQ [94]	MS	X	X	
NBSS [95]	MS, SCI, Congenital neurogenic bladder	X		
QoL-BM [81]	SCI		X	
Qualiveen/SF-Qualiveen [71, 96]	MS, SCI	X		X
RAYS [97]	MS	X		X
RHSCIR [98]	SCI	X	X	X
Fransceschini [97]	SCI	X	X	X

Patient quality of life questionnaires

- No evidence was found for which validated questionnaires are the most appropriate for use, since no quality criteria for validated questionnaires have been assessed.

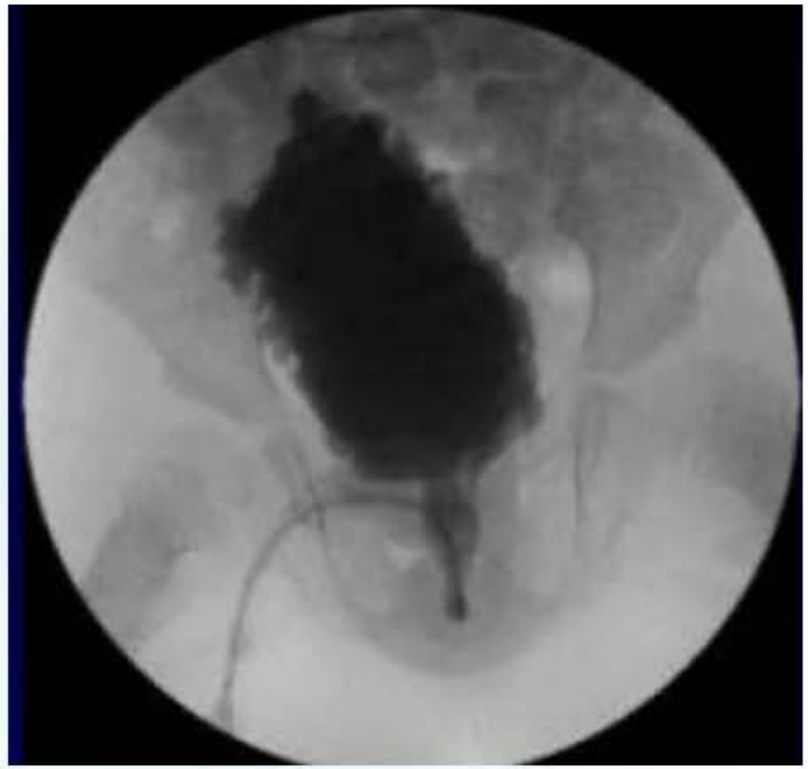
Physical examination



Initial or basic manaement

- History
- Bladder diary
- Questionnaire
- Physical exam
- U/A U/C BUN/Cr
- Uroflowmetry & PVR
- Ultrasonography

Advanced evaluation: video-urodynamic



Initial Management of Neurogenic Urinary Incontinence

HISTORY, level of lesion

- Suprapontine cerebral lesion (e.g. Parkinson s disease, stroke, multiple sclerosis
- Suprasacral infrapontine spinal cord lesion (e.g. trauma, multiple sclerosis)
- Peripheral nerve lesion (e.g. radical pelvic surgery) Conus/cauda equina lesion (e.g. lumbar disc prolapse)

CLINICAL ASSESSMENT

- Further history
- General assessment including home assessment
- Urinary diary and symptom score
- Assessment of functional level, quality of life and desire for treatment
- Physical examination: assessment of sensation in lumbosacral dermatomes, anal tone and voluntary contraction of anal sphincter, bulbocavernosus and anal reflexes, gait
- Urine analysis + culture (if infected: treat as necessary)
- Urinary tract imaging, serum creatinine : if abnormal : specialised management
- Post void residual (PVR) by abdominal examination or optional by ultrasound

This assessment will give basic information, but does not permit a precise neurourological diagnosis

PRESUMED DIAGNOSIS

- Stress urinary incontinence due to sphincter incompetence
- Urinary incontinence due to detrusor overactivity
  - With Poor bladder emptying (Significant PVR)
  - With Negligible PVR

MANAGEMENT

- Behavioural modification
- External appliances

Failure

- Intermittent catheterisation with or without
- Antimuscarinics

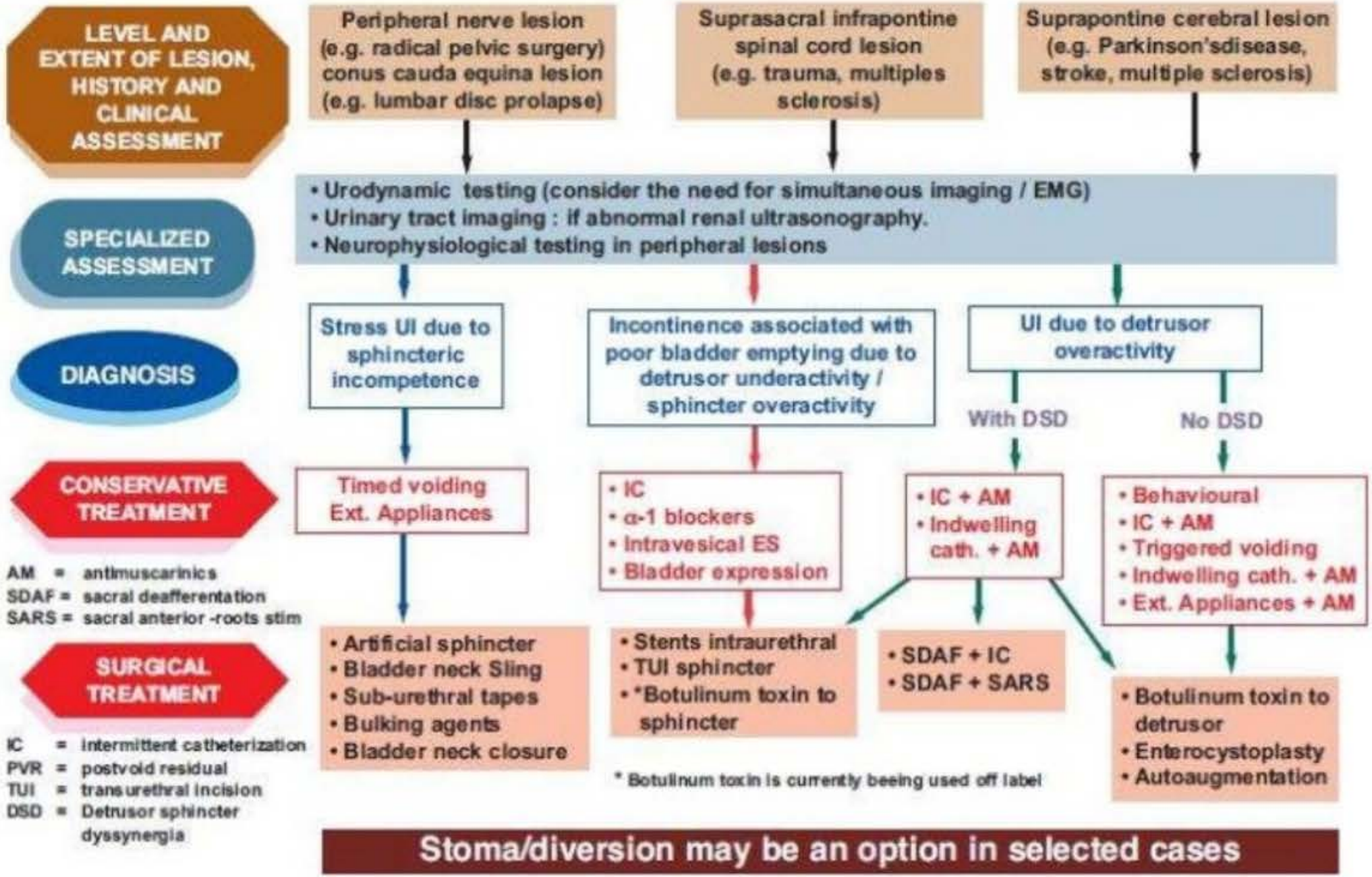
Failure

- Depending on cooperation and mobility :
- Behavioural modification,
- Antimuscarinics,
- External appliances,
- Indwelling catheter

Failure

Specialised management preferable for more " tailored " treatment

Specialized Management of Neurogenic Urinary Incontinence



When to Perform UDT After SCI

- One should aim to get information after the period of spinal shock of the LUT, but it is not seldom uncertain when this period has ended .

- 4 to 6 months after trauma

Spinal shock

- Immediately after SCI, there is usually a period of spinal shock during which there is a flaccid paralysis and absence of reflex activity below the level of the lesion with the single exception of the bulbocavernosus reflex which usually remains intact.

Spinal shock

- The duration of spinal shock is very variable. In most instances, reflex detrusor activity reappears after 2–12 weeks, but in some cases it may not return for as long as 6–12 months.

Spinal shock

- During the period of spinal shock the bladder is areflexic and the patient develops urinary retention. Urodynamic evaluation is generally not necessary at this stage and optimal management is intermittent catheterization

When to Repeat UDT

- If the UDT shows that spinal shock is still present in supraspinal lesions, a new test can be scheduled 6 weeks to 2 months later.
- The UDT can be repeated if the first test is inconclusive, outcome of urological management not successful.
- If treatment has been started or changed, a control UDT, to evaluate the treatment effect, can be scheduled some weeks later, when the effect of the changes would probably be visible

When to Repeat UDT

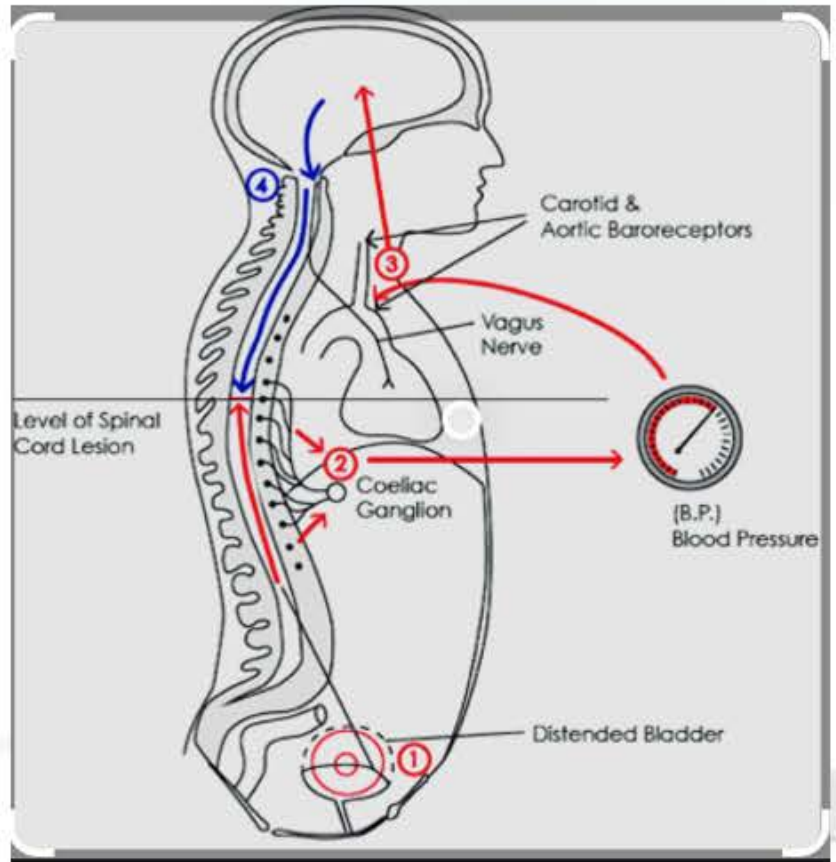
- a yearly UDT is not advocated.
- In the longterm, the UDT tests done **every 2–3 years in a symptom free SCI individual** would permit to follow the urodynamic function well, but is not often performed due to practical reasons, the fear of complications or the lack of clinical value.
- Children form a special group. They will have regular changes in the urodynamic situation when growing up. They need UDT at regular interval (yearly, and certainly at specific moments as when puberty starts, when they grow into adulthood)

Complications of UDS

- autonomic dysreflexia attack
- The risk for symptomatic urinary tract infection (UTI) warrants antibiotic prophylaxis when UDT is done.
- urethral trauma

Autonomic dysreflexia

- Autonomic dysreflexia is an exaggerated sympathetic neural response to afferent stimulation that is unique to patients with spinal injury above the level of the level of sympathetic outflow
- (approximately T6)



Autonomic dysreflexia

The symptoms include

- headache,
- sweating,
- flushing,
- sudden and severe hypertension,
- and reflex bradycardia

Autonomic dysreflexia precipitating event

- Bladder or bowel distension is the most common precipitating event but a number of other noxious stimuli may precipitate the condition including
- urinary tract infection,
- bladder stones,
- bedsores,
- ingrown toenails,
- osteomyelitis,
- and even micturition itself (particularly in patients with bladder neck obstruction)

Autonomic dysreflexia

- Patients whose injury is at or above T6 level and those with a history of autonomic dysreflexia should have their blood pressure monitored during lower urinary tract instrumentation .

Autonomic dysreflexia

- If during bladder filling or manipulation the patient complains of dysreflexia symptoms and the blood pressure is dangerously high,
- the bladder should be emptied immediately.
- If the patient does not state that the symptoms are subsiding within about 30–60
  seconds, the catheters should be removed and
- if there is still no response, one of the medications should be administered.

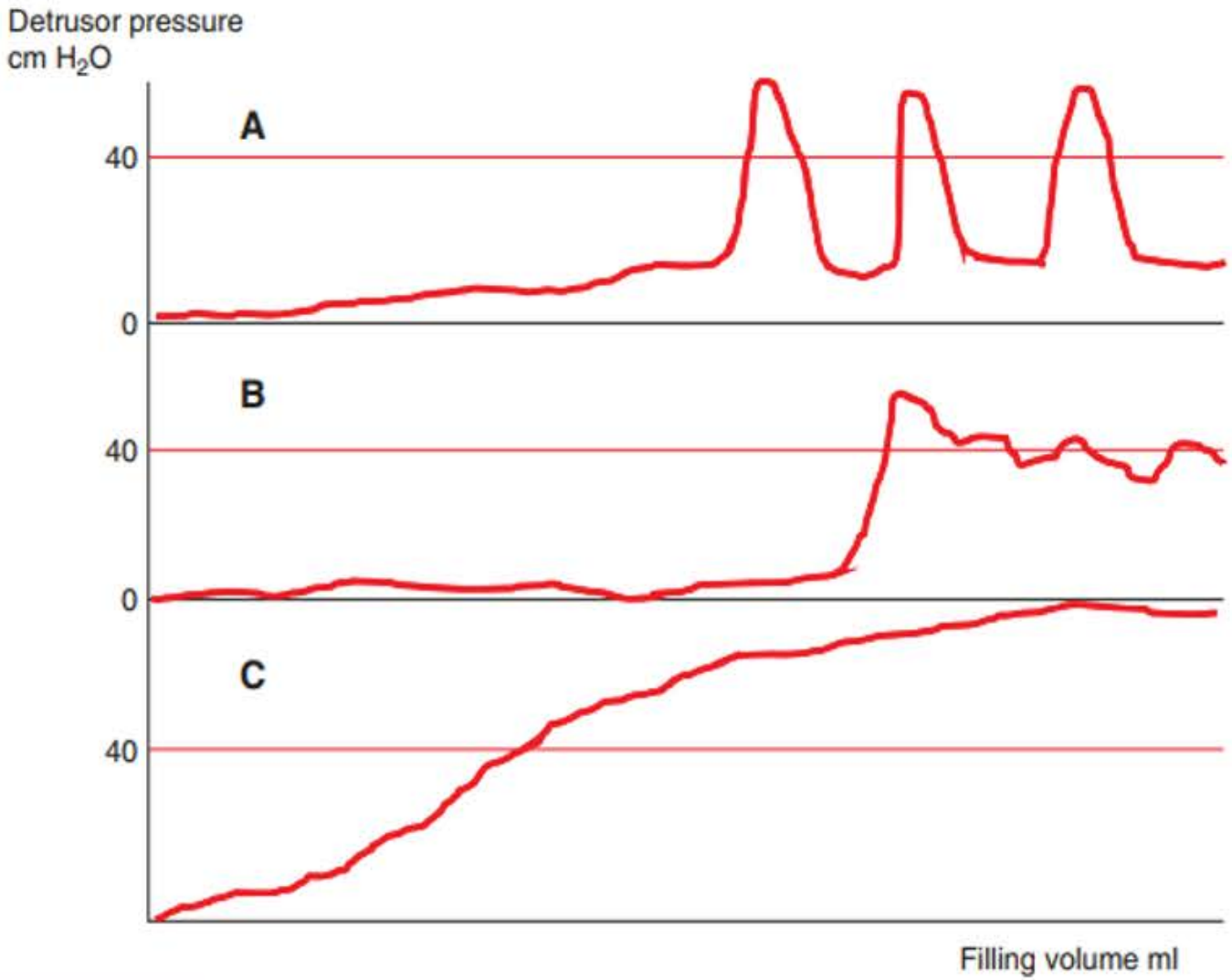
Autonomic dysreflexia

Emergency medication should be available if autonomic dysreflexia persists after emptying the bladder and removing the catheters such as

- nifedipine 10mg sublingually,
- chlorpromazine 1mg IV,
- and phentolamine 5mg IV

may be needed to abort a life-threatening autonomic dysreflexia episode.

- Over the years, the development of a detrusor pressure above 40 cm H2O has been accepted as dangerous for the upper urinary tract
  It is uncertain which is the most dangerous, though one may assume the danger C > B > A. This has however not been studied.

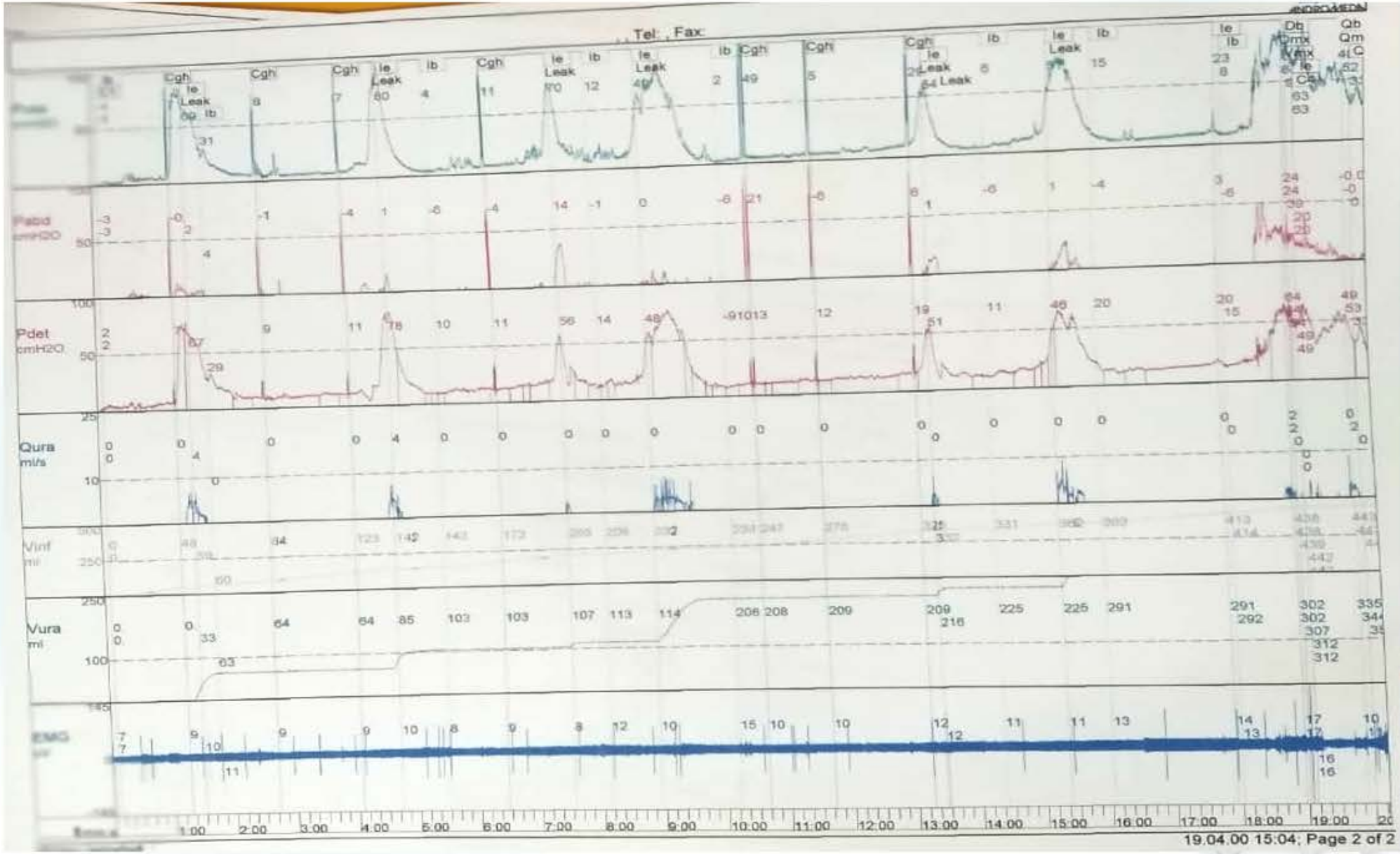

Detrusor pressure
cm H_2O
A
40
0
B
40
0
C
40
Filling volume ml

Rules to Get Proper Results of UDT

- Defaecation or bowel evacuation should be done the night before the UDT
- Use slow filling rate, preferably 10–30 ml/min
- Administer antibacterial prophylaxis because there is a clear risk of UTI

LUT Function Basic Data Set before UDS

- **1.Urinary tract impairment unrelated to spinal cord injury:**
  2.**Awareness of the need to empty the bladder:**
  3.**Bladder emptying:eg..** Straining (abdominal straining, Valsalva's manoeuvre) 2 times a day, intermittent catheterization 2 times a day
  4.**Average number of voluntary bladder-emptyings per day during the last week:**
  5.**Any involuntary urine leakage (incontinence) within the last three months:**
  6.**Collecting appliances for urinary incontinence:**
  7.**Any drugs for the urinary tract within the last year:**
  8.**Surgical procedures on the urinary tract?**
  9.**Any change in urinary symptoms within the last year:**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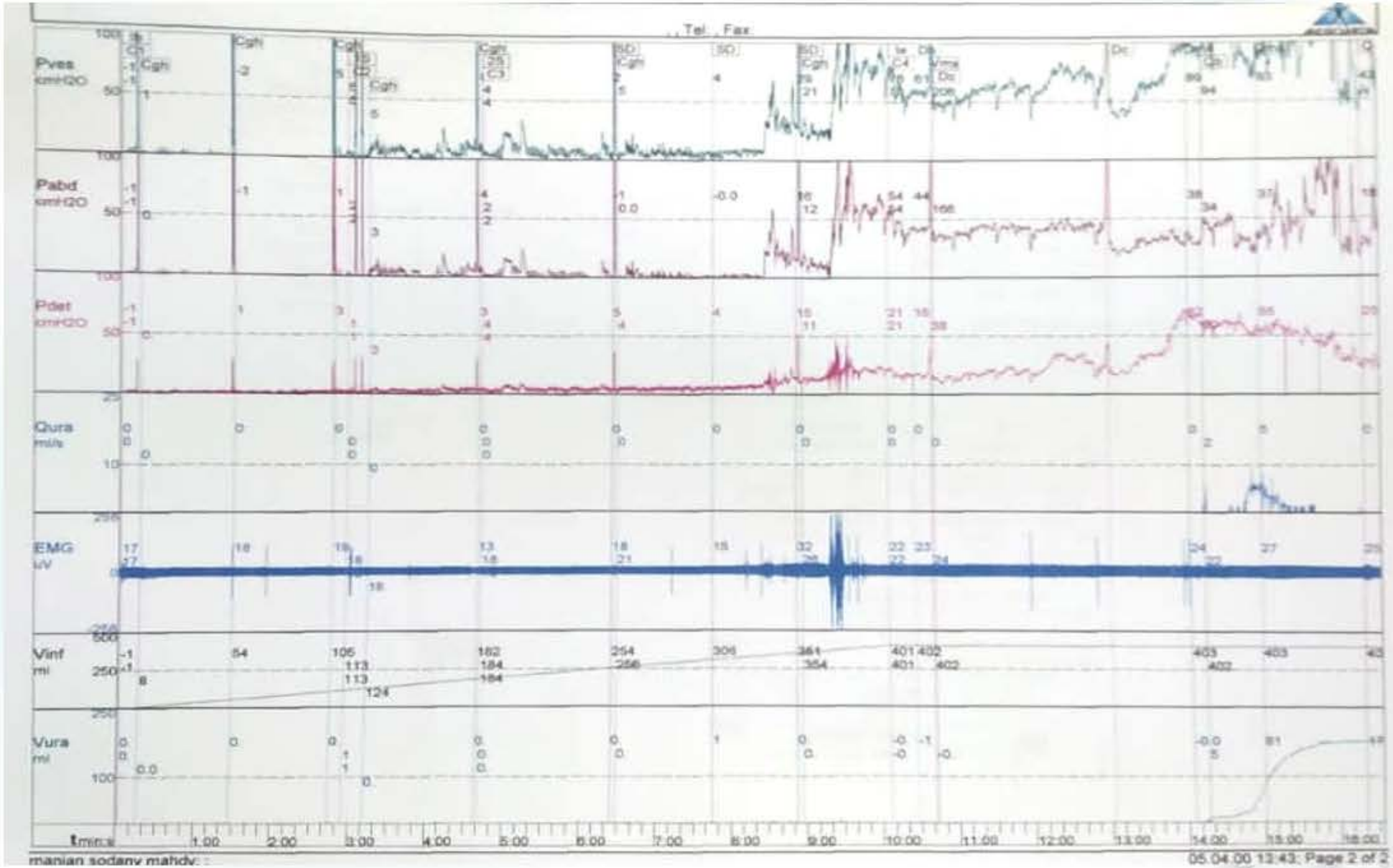
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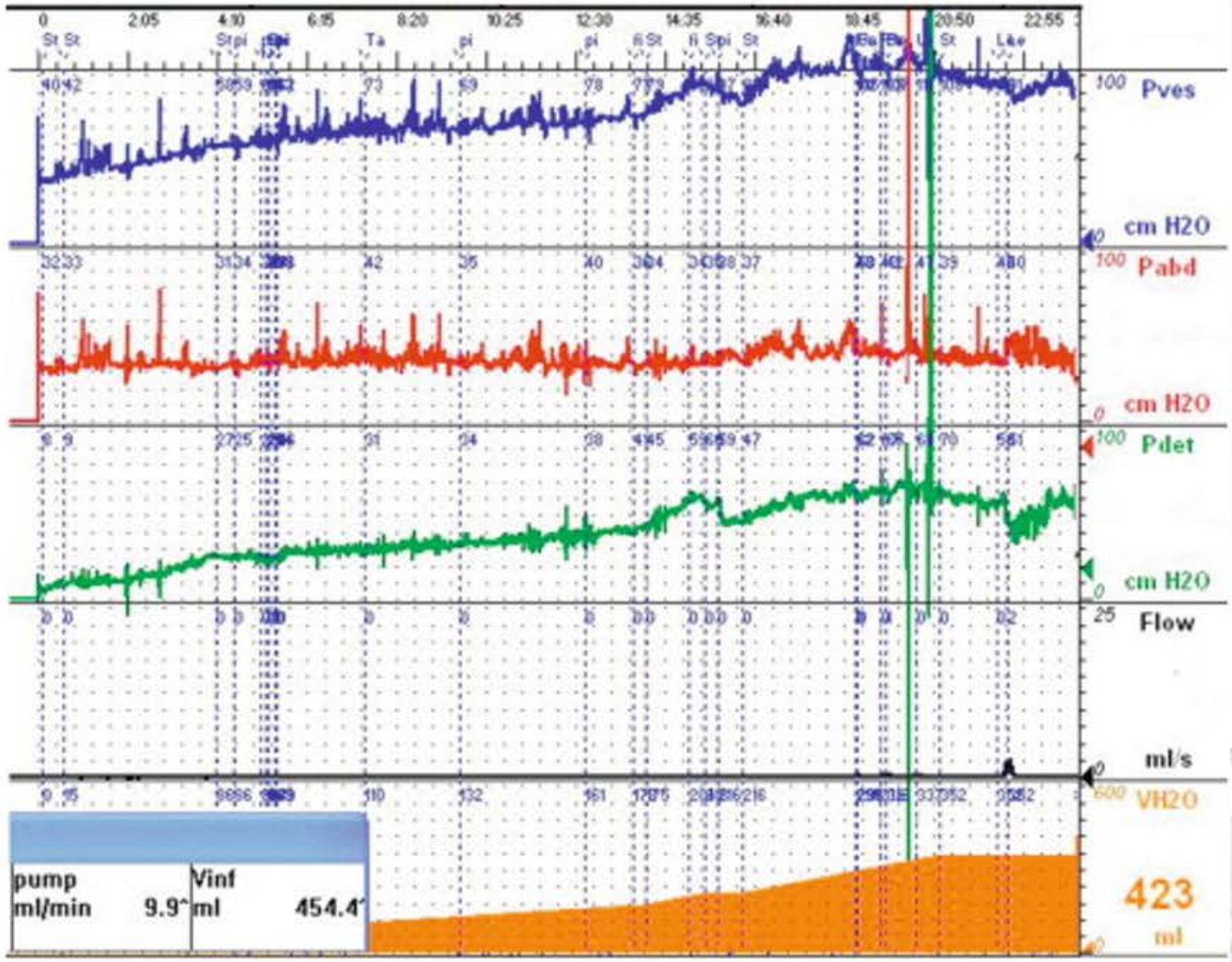
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ml/min
Vinf
ml

(b)

Flowmetry in children

FARSHID ALIZADEH, MD

PEDIATRIC UROLOGIST

Associate Professor of Urology at Isfahan University of Medical Sciences

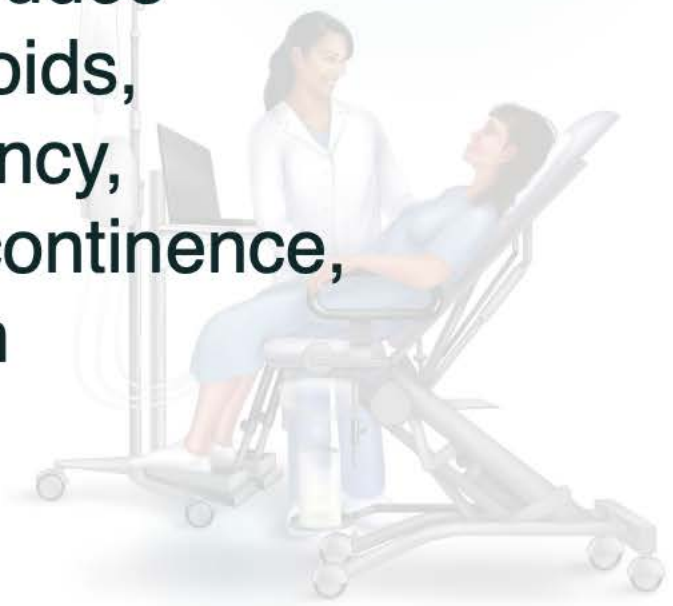
August 5, 2021

Prevalence

- Non-neurogenic LUTD and the symptoms of LUTD including urinary incontinence, urgency, and frequency ➔ the most common reasons for referral to the pediatric urologist.
- The prevalence ➔ 17–22% in all school-aged children

Evaluation

- voiding/bowel habits,
- abdomen, lower back, and external genitalia.
- complete voiding history includes asking about frequency of voids, sensation of urgency, hesitancy, daytime and/or nighttime incontinence, and quality of urinary stream



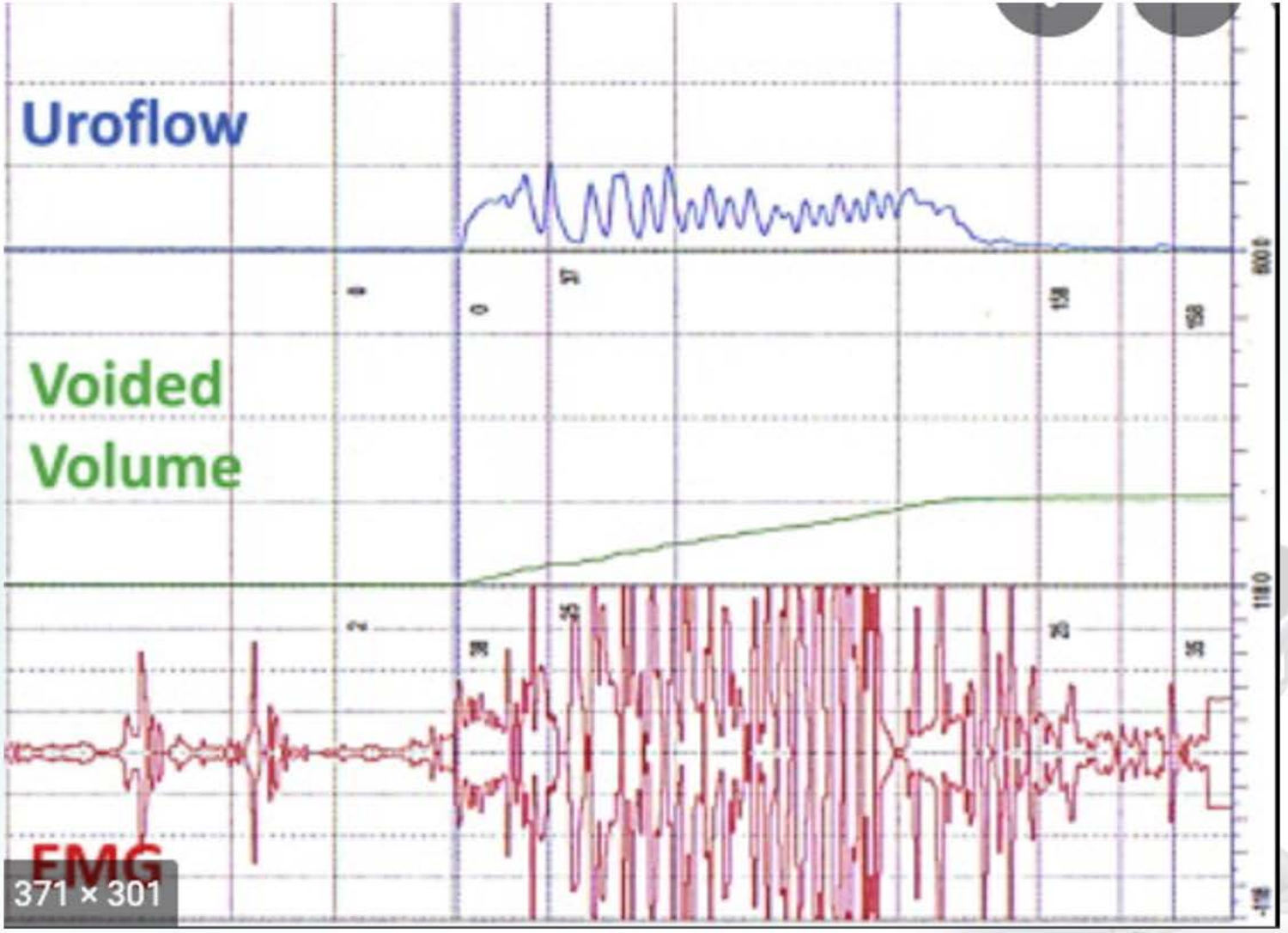
Classification

- Dysfunctional voiding (DV)
- Idiopathic detrusor overactivity disorder (IDOD)
- Detrusor underutilization disorder (DUD)
- Primary bladder neck dysfunction (PBND)

Dysfunctional voiding (DV)

- active pelvic floor EMG during voiding (intermittent or continuous), may have associated detrusor overactivity

Dysfunctional voiding (DV)

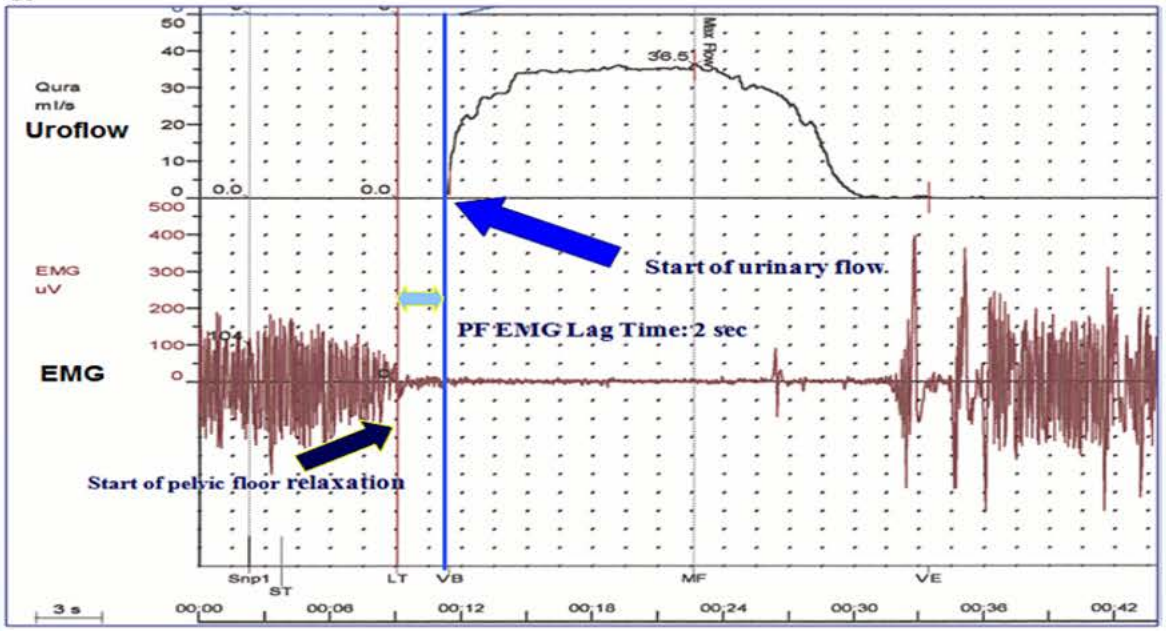


Idiopathic detrusor overactivity disorder

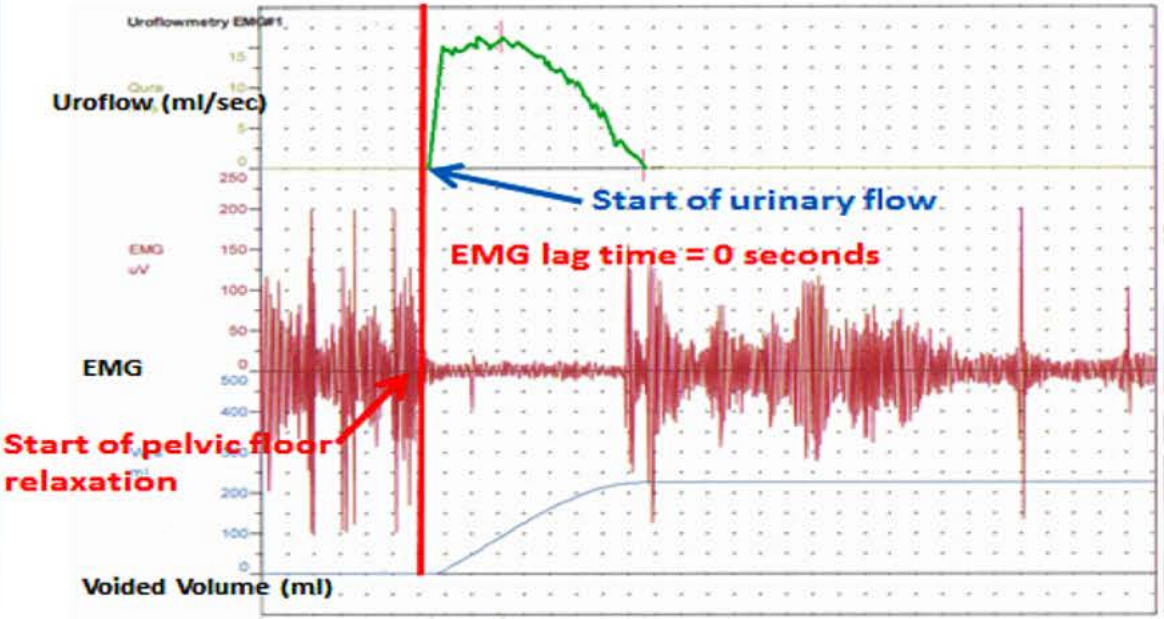
- shortened EMG lag time (i.e., < 2 s) on uroflowmetry with EMG, quiet EMG during voiding

Idiopathic detrusor overactivity disorder

a



b



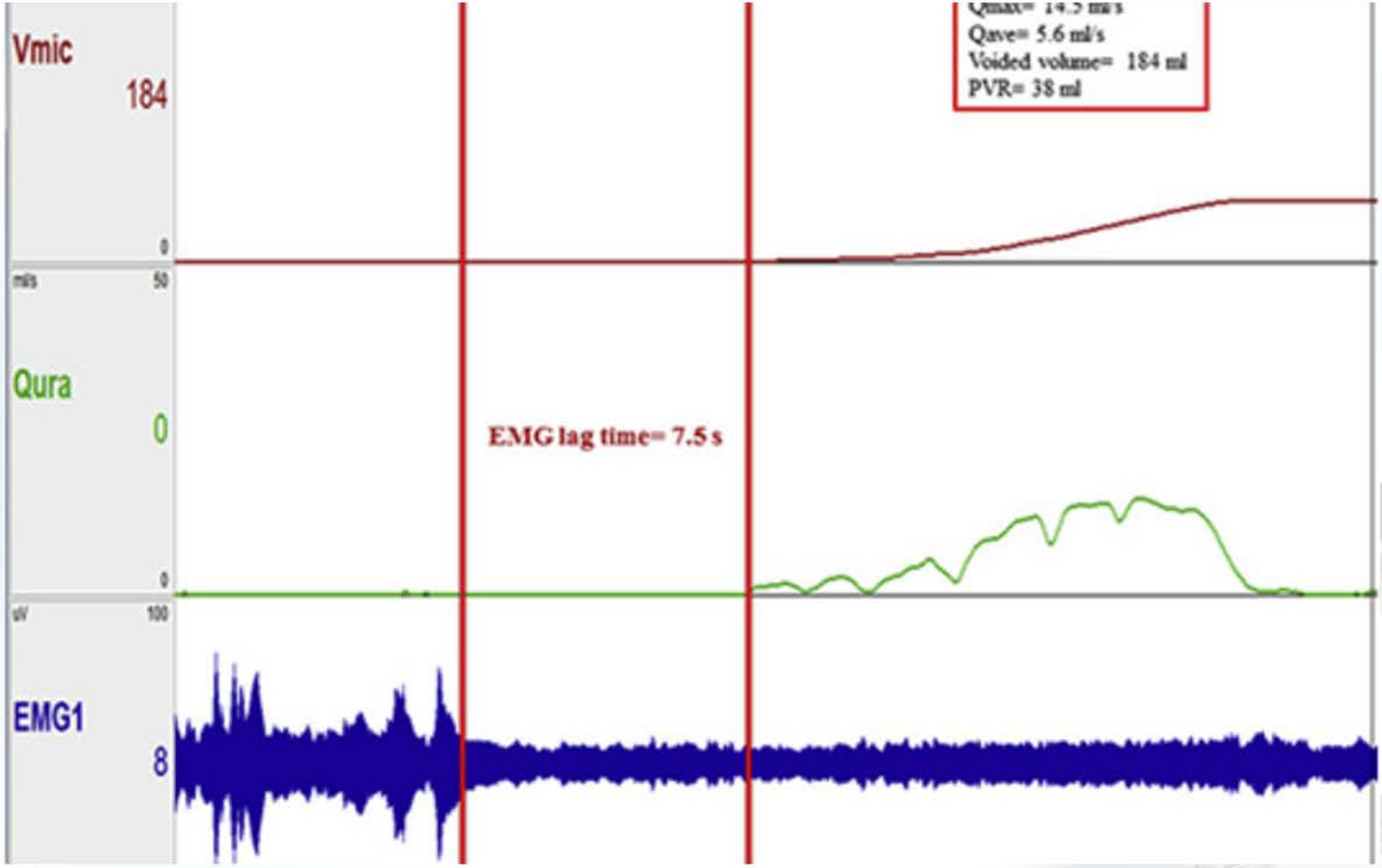
Detrusor underutilization disorder

- volitional infrequent voiding,
- documentation of large bladder capacity (> 125%expected bladder capacity for age)
- quiet EMG during voiding with normal EMG lag time (i.e., 2–6 s)

Primary bladder neck dysfunction

- hesitancy as predominant LUT symptom;
- prolonged EMG lag time (i.e., > 6 s),
- quiet EMG during voiding,
- an abnormal uroflow pattern, typically depressed and often staccato or intermittent with the maximum flow rate skewed towards the later part of voiding

Primary bladder neck dysfunction



TX

Dysfunctional voiding (DV)	Biofeedback ± antimuscarinics
Idiopathic detrusor overactivity disorder (IDOD) (i.e., OAB with qualifiers)	Antimuscarinics
Detrusor underutilization disorder (DUD) (voiding postponement with qualifiers)	Timed voiding
Primary bladder neck dysfunction (PBND)	Alpha-blocker