
Bladder dysfunction leading to bilateral hydronephrosis

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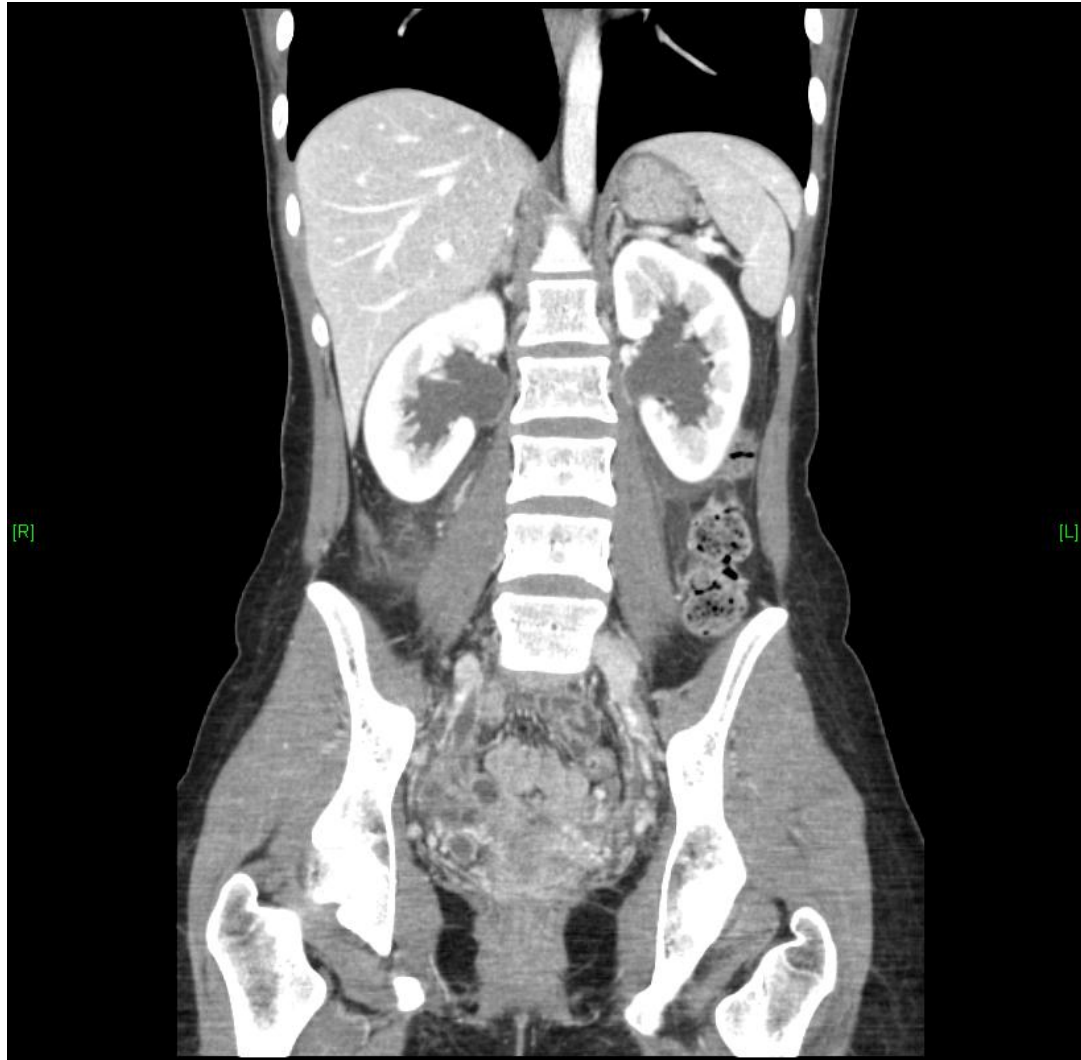
Normal conditions of urinary tract

- Baseline ureteral pressure ranges from 0 to 5 cm H₂O, increasing up to 80 cm H₂O when ureters propel urine to the bladder.
- The viscoelastic properties of the bladder inhibit the intravesical pressure rise during the filling phase and maintain the 1-way urine flow through the ureterovesical junction.

1. case

F/26

- 지난 2-3년간 심각한 방광통증으로 여러 병원에서 치료받았음.
- 받은 치료는 IC/BPS에 대한 standard treatment 였음.
- VAS 10
- Daily freq 20회, nocturia 6-8회,
- 최근 이알루릴 방광내 투여 1-2차례, 삽입시 통증 너무 심해 중단.





Ketamine intoxication induced cystitis

Ketamine Abuse

WHO 2021 – Expert peer review on critical review report

- **Ketamine abuse** is common in Hong Kong, Taiwan, UK, Australia and in the USA.
- In Hong Kong (Wong et al, 2010), it was the most commonly detected abusive substance in young drivers.
- In the national survey data (2004-2006) in Taiwan (Chen et al, 2009), ketamine was the second commonly used illegal drug among middle and high school students.

Ketamine Abuse

WHO 2021 – Expert peer review on critical review report

- Acutely transient central nervous system depression, abdominal pain, or **lower urinary tract symptoms** (Ng et al, 2010)
- Chronic ketamine self-administration at one year (Morgan et al, 2010), heavy use was found to be harmful to both cognitive function and psychological wellbeing (delusional and depressive symptoms).

Ketamine-induced Cystitis

- Ketamine abuse can affect the urinary system, causing LUTS : frequency, urgency, suprapubic pain, hematuria.
- Reduced bladder compliance, DO, and low bladder capacity, hydronephrosis and impaired renal function.
- Importantly, these severe pain and symptom may induce continued or even increased ketamine use due to the pain relief.

Mechanism

- The mechanism by which ketamine induces ulcerative cystitis **is not clear**.
- Ketamine is known to be metabolized to **nor-ketamine** by the hepatic microsomal system.
- Nor-ketamine has been shown to have 20% to 30% of the activity of ketamine.
- This is eventually hydroxlyated to hydroxynorketamine, conjugated with glucuronate, and **finally excreted in the urine**.
- It may result from the formation of an active metabolite of ketamine.

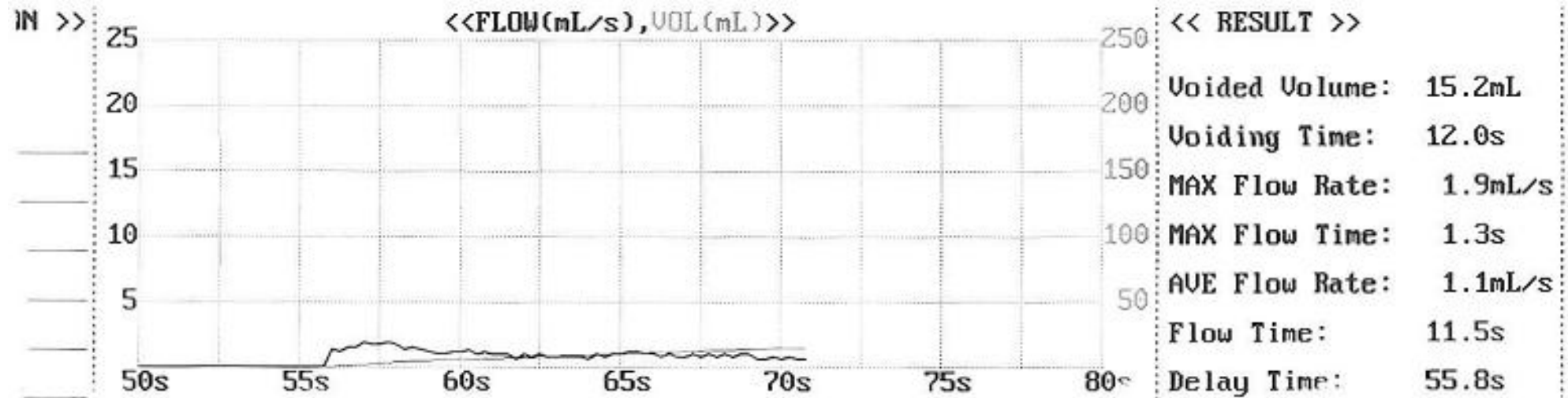
Fibrosis

- Collagen deposit develops (in mice) at an early stage of the disease
 - is correlated to overexpression of transforming growth factor β 1
- Ketamine can damage the kidney as well, causing interstitial nephritis and papillary necrosis.

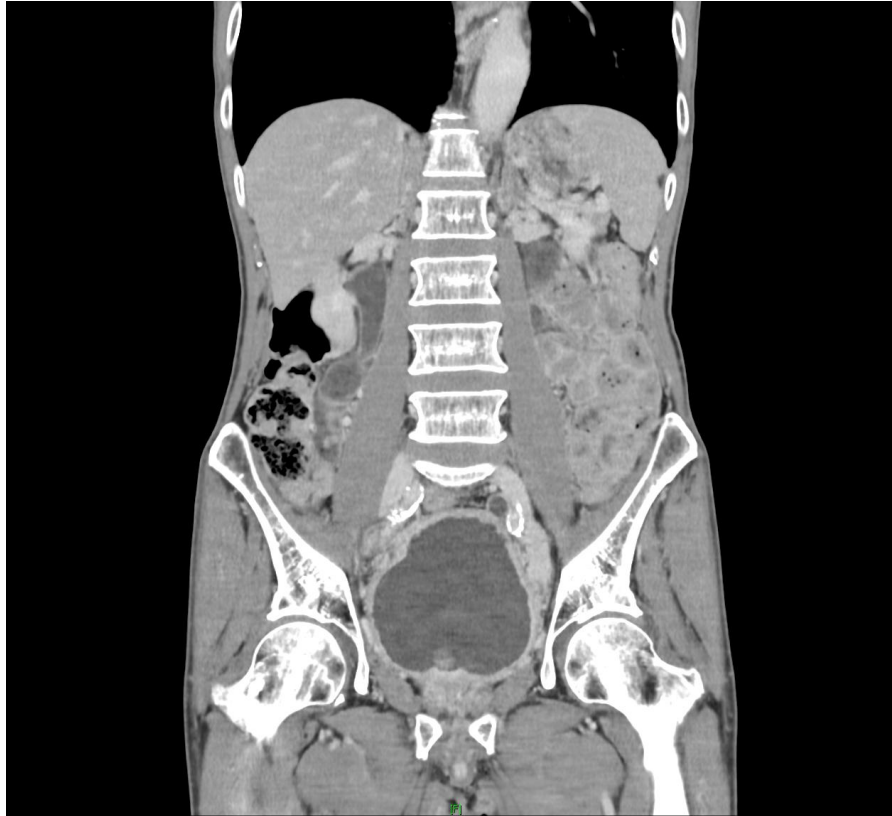
2. case

M/78

CC : weak stream, RU sense, gross hematuria



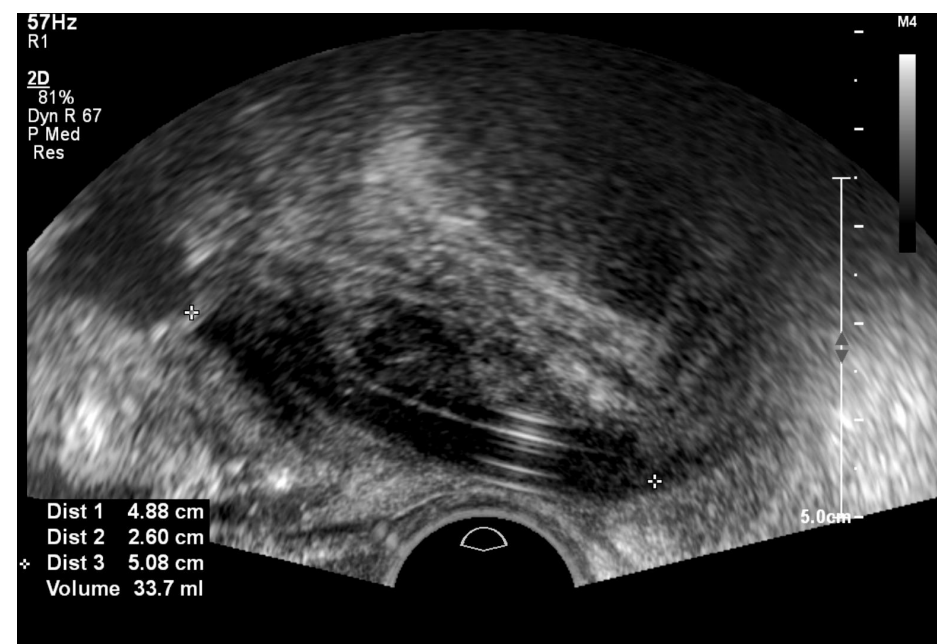
PVR 355cc

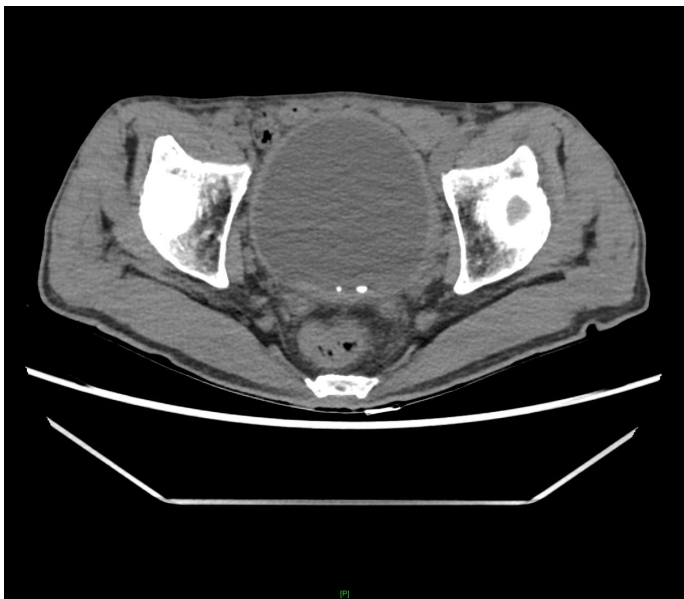


Serum Cr. 1.8

BOO in male

TRUS

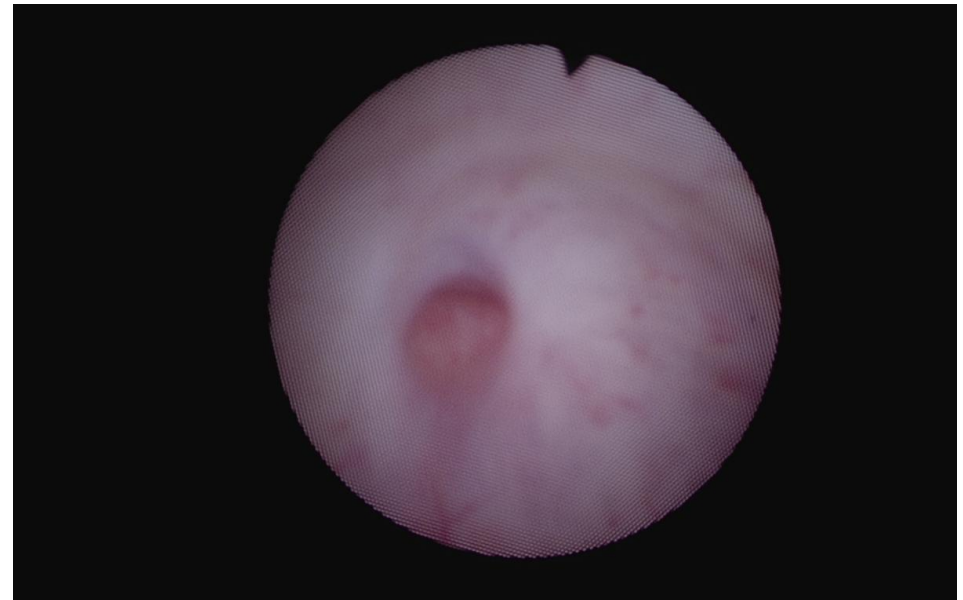
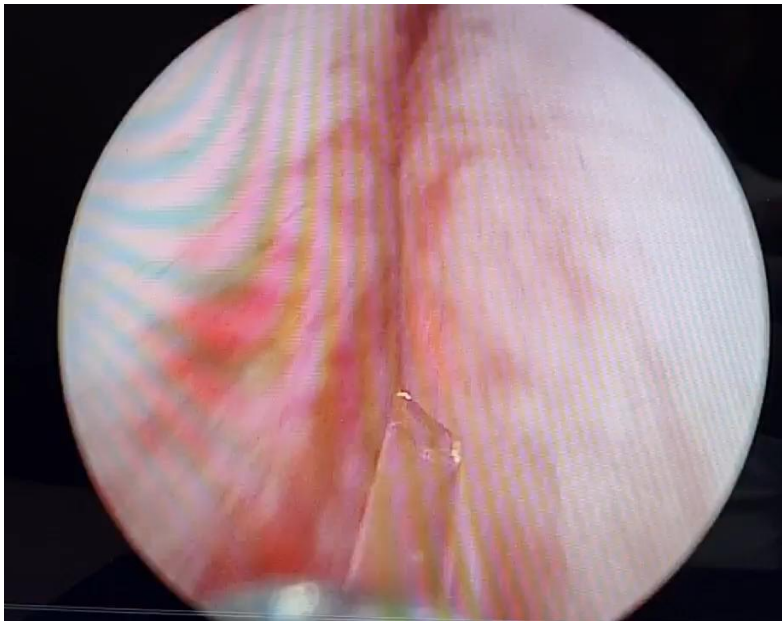




BOO? High $P_{det} Q_{max}$ & Low Q_{max}

$$BOOI = P_{det} Q_{max} - 2Q_{max}$$

BOOI > 40

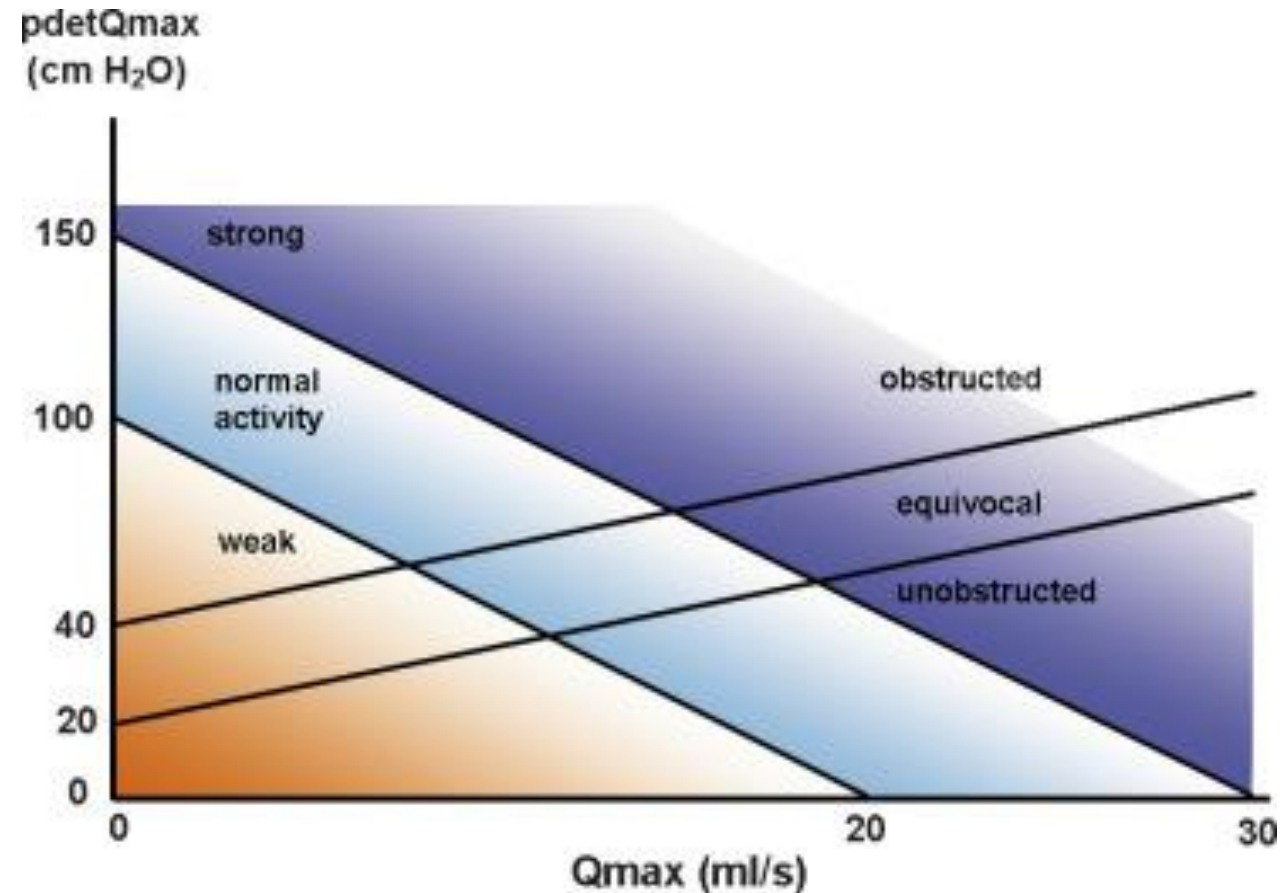


The AG number (also known as the BOO index [BOOI]) is derived from the equation for the slope of the line dividing the obstructed from the equivocal in the AG nomogram, which is the most simple and practical way in combined of the $P_{det}Q_{max}$ and Q_{max} .

$$BOOI = P_{det}Q_{max} - 2Q_{max}$$

Q_{max} is also affected by the abdominal pressure (straining) as well as by the detrusor pressure.

BOOI (>40).



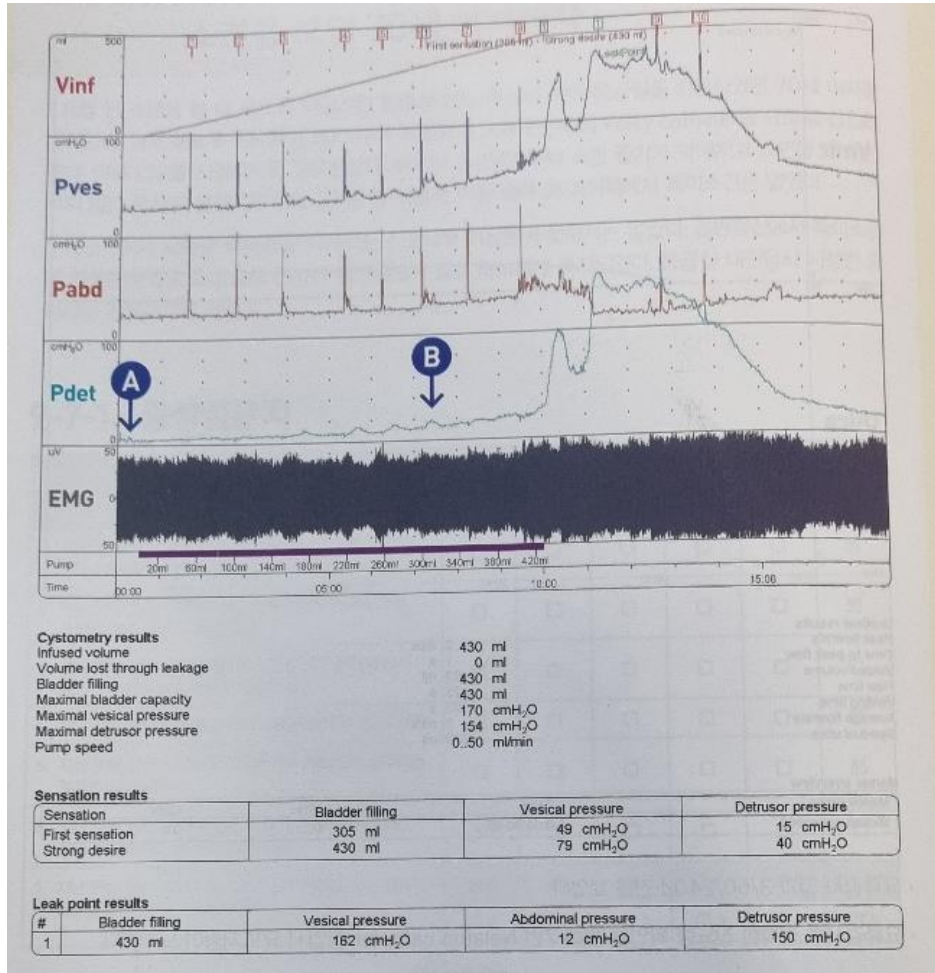
3. case

BOO in female I

F/71

CC : dysuria, RU sense로 응급실 내원. RU 500cc, foley cath. 삽입, 1-2년 전부터 소변 줄기가 약해졌다고 함.

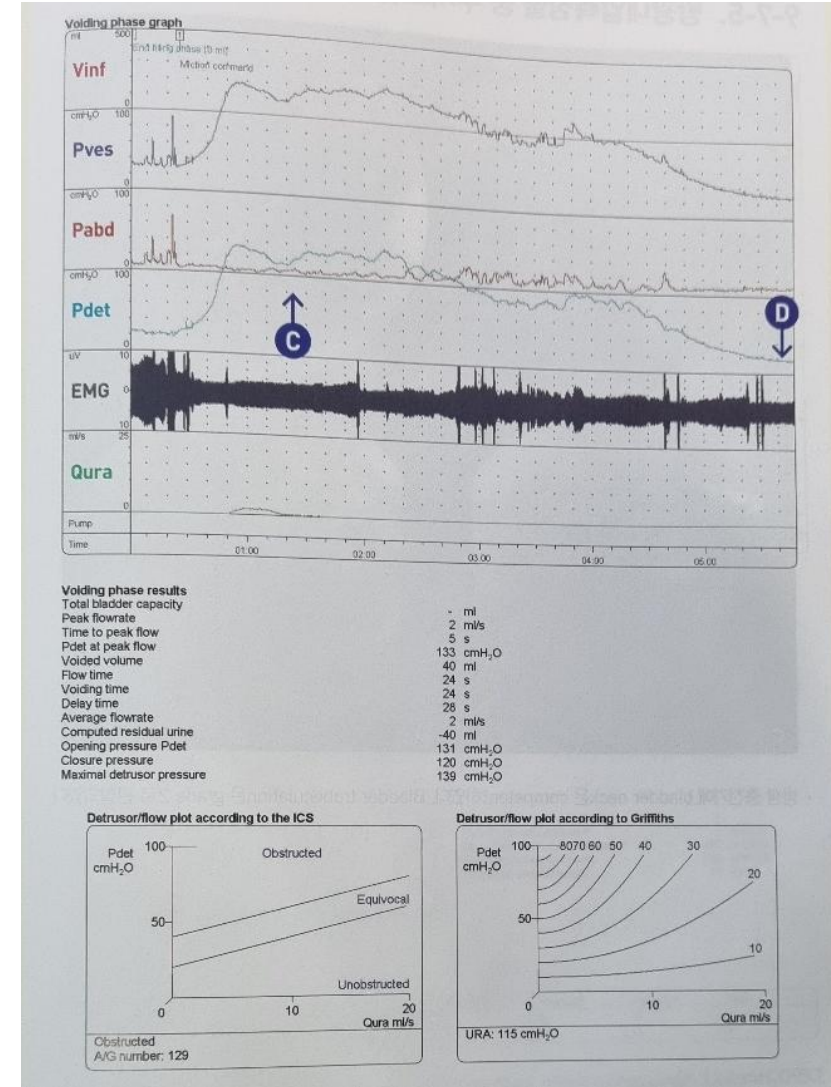
UFM : 3/50/240, 정확한 잔뇨 측정을 위해 8Fr. Nelaton 삽입시 저항 있음.



충전방광내압측정술

305cc 에서 최초 감각, 430cc 에서 강한 요의 호소.

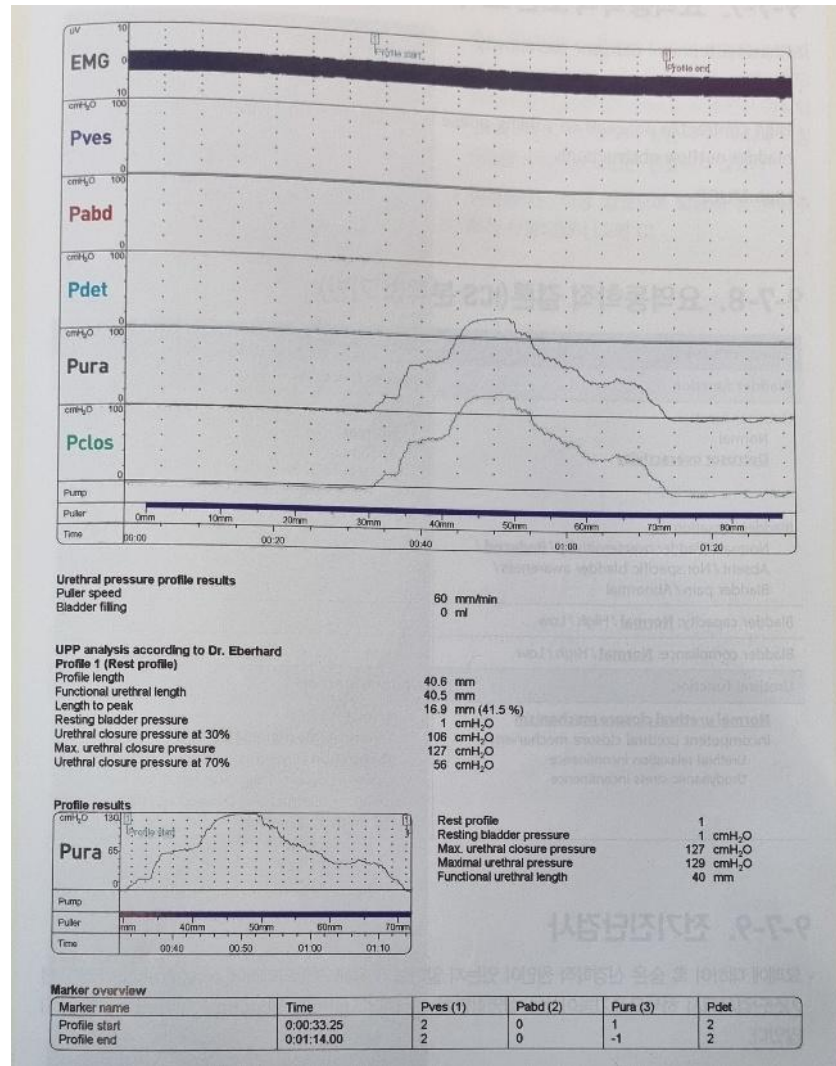
Multiple small phasic and big terminal DO -> leakage



압력요류검사

Detrusor voiding contraction이 관찰.

PdetQmax : 133cmH₂O



Max. urethral closure pressure 127cmH₂O



Bladder neck에 요도 점막 adhesion 관찰됨.
Severe trabecualtion 소견 있음.

BOO in female II

F/76

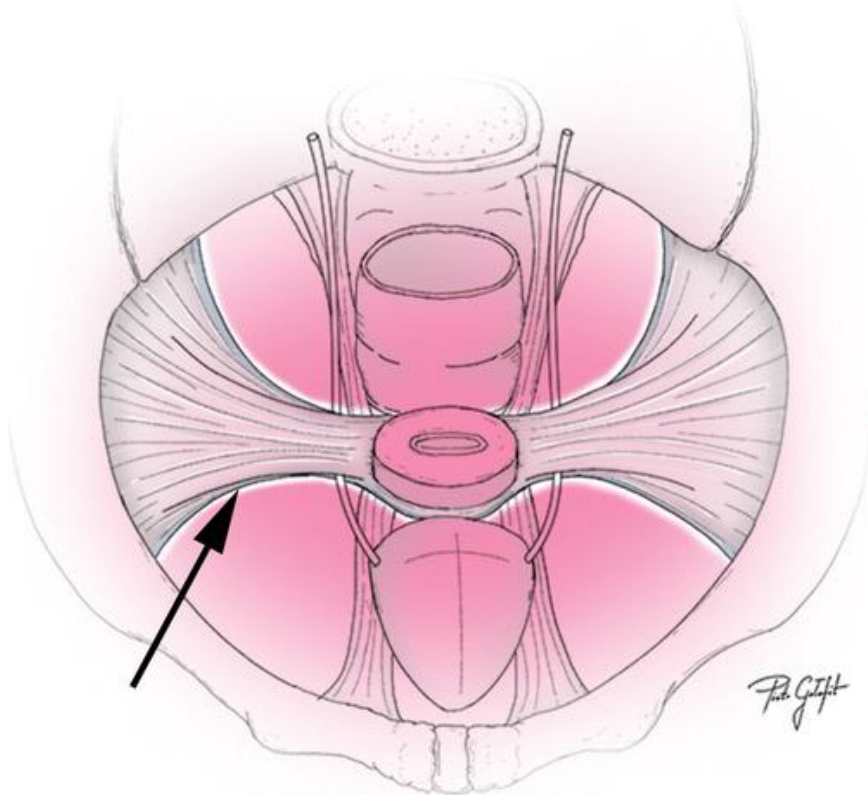
CC : 질을 통해 종물이 돌출. 팬티에 쓸리고 아프다. 저녁이 되면 소변이 안나온다. UUI+

P/E) grade III cystocele

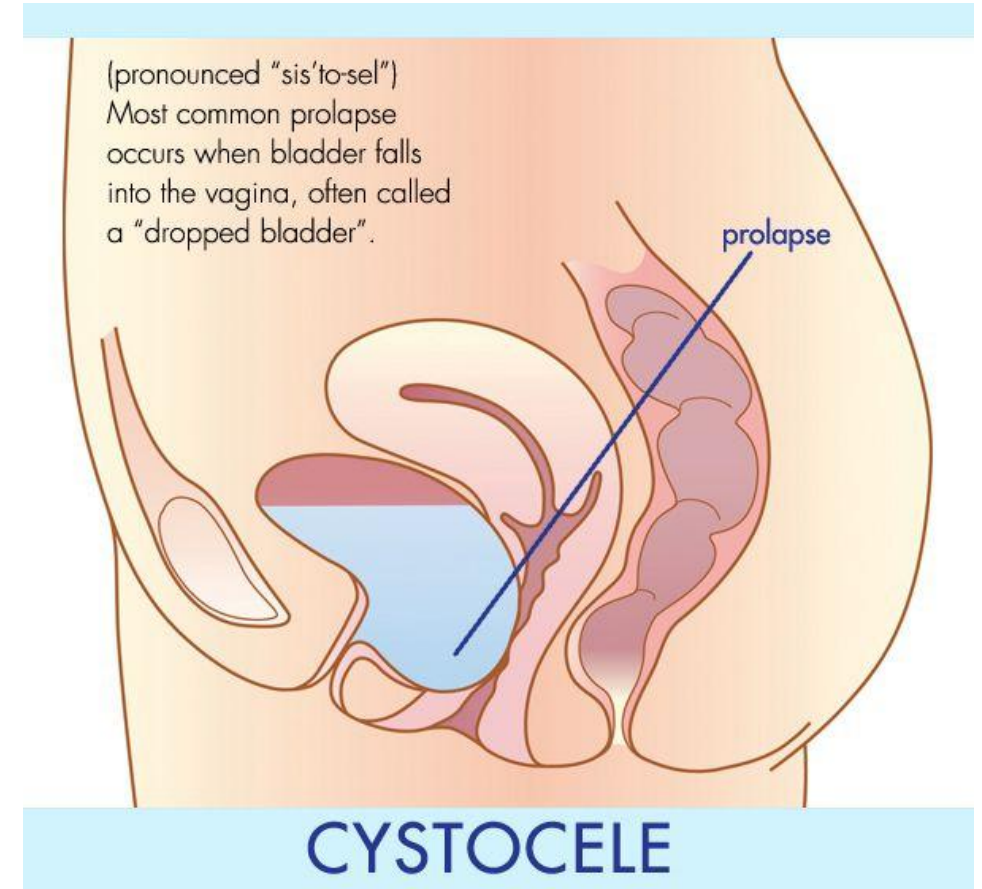
UFM) 38/340/20

Thirteen patients (4.0%) had mild hydronephrosis, nine (2.8%) had moderate hydronephrosis, and three (0.9%) had severe hydronephrosis.

The charts of 375 consecutive patients undergoing surgery for pelvic organ prolapse at the Cleveland Clinic Foundation between January 1, 1990, and December 31, 1993 were reviewed.



Cardinal ligament over distension and extrinsic compression of the ureters are the main postulated theories



Case 4

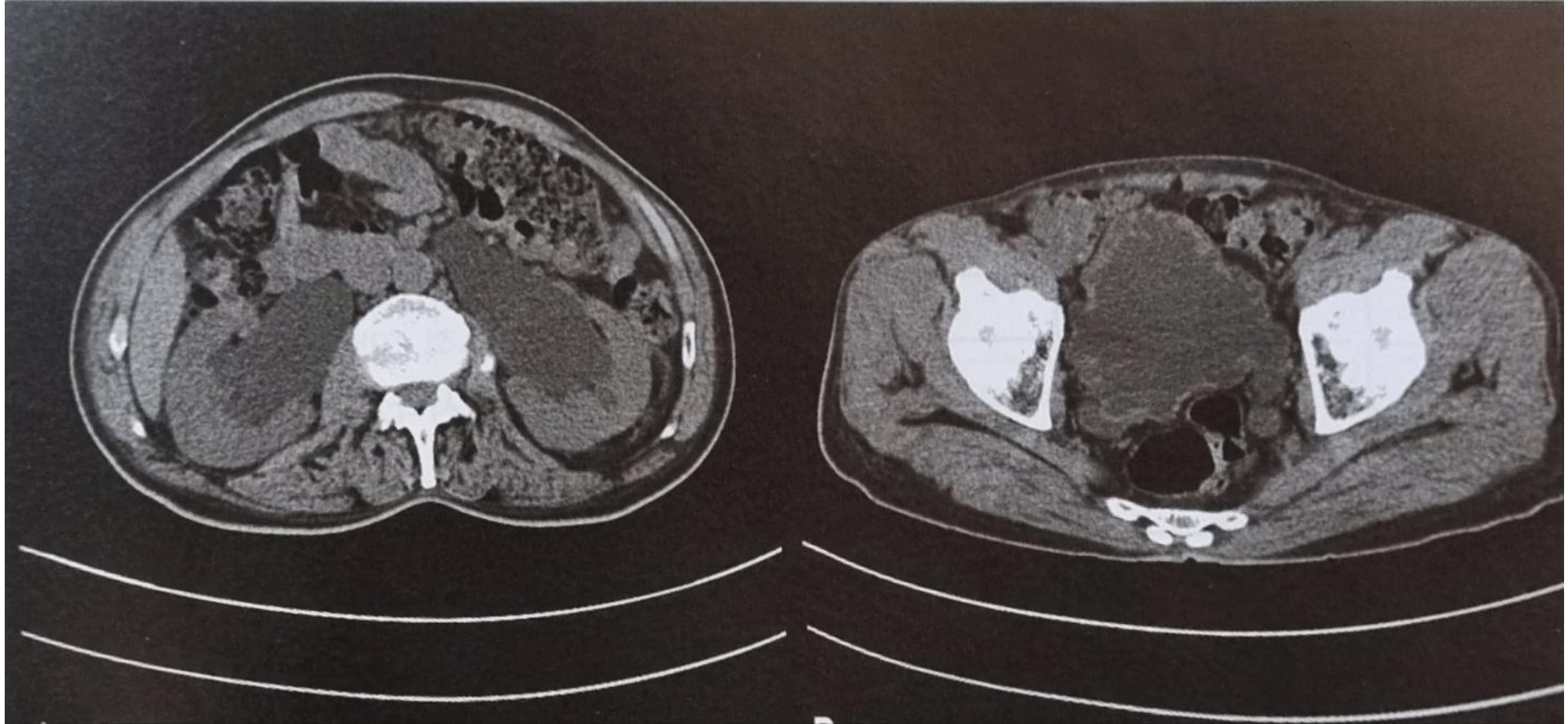
M/45

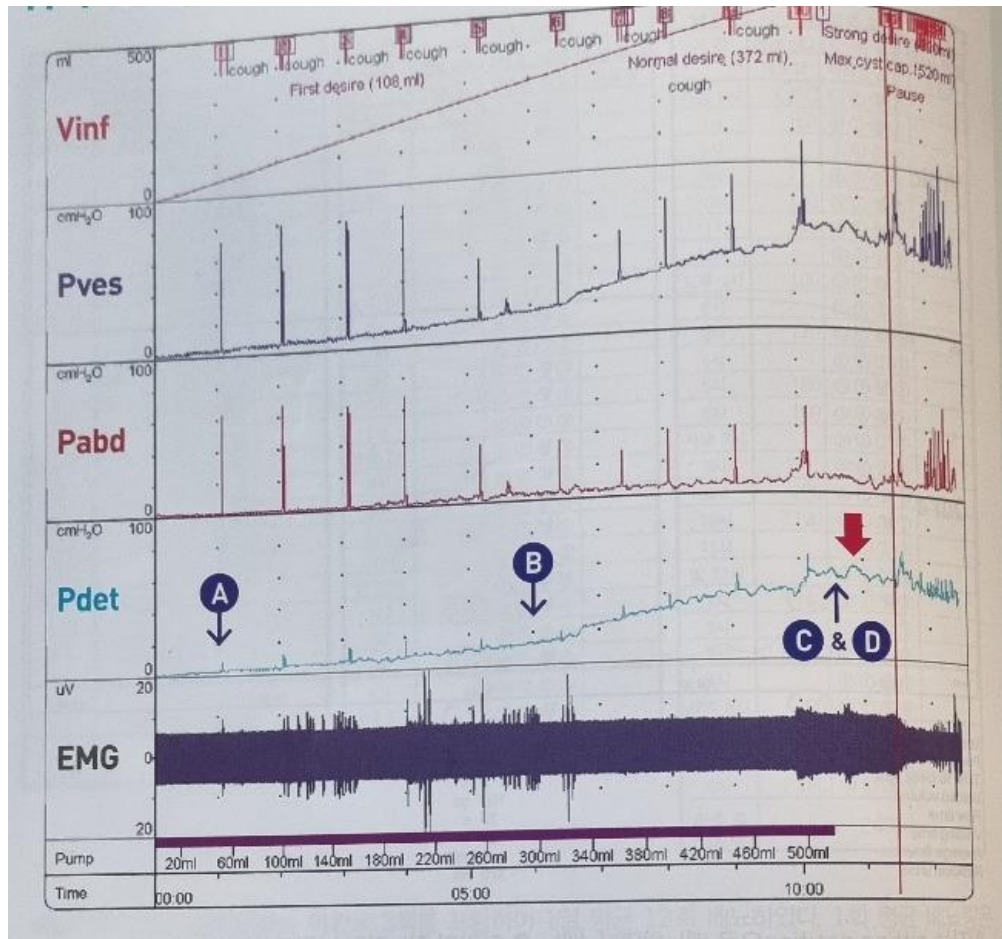
CC : 6년 전 교통사고로 T11-12 척수 손상. 자가보행 가능. 복압으로 배뇨
해오던 환자로 최근 연고지 병원에서 양측 hydronephrosis 발견되어 전
원됨. 하루 2-5회 야간뇨, 절박뇨, 요실금, 지연뇨 호소

외부 병원 자료에서 BPH normal size (22g)

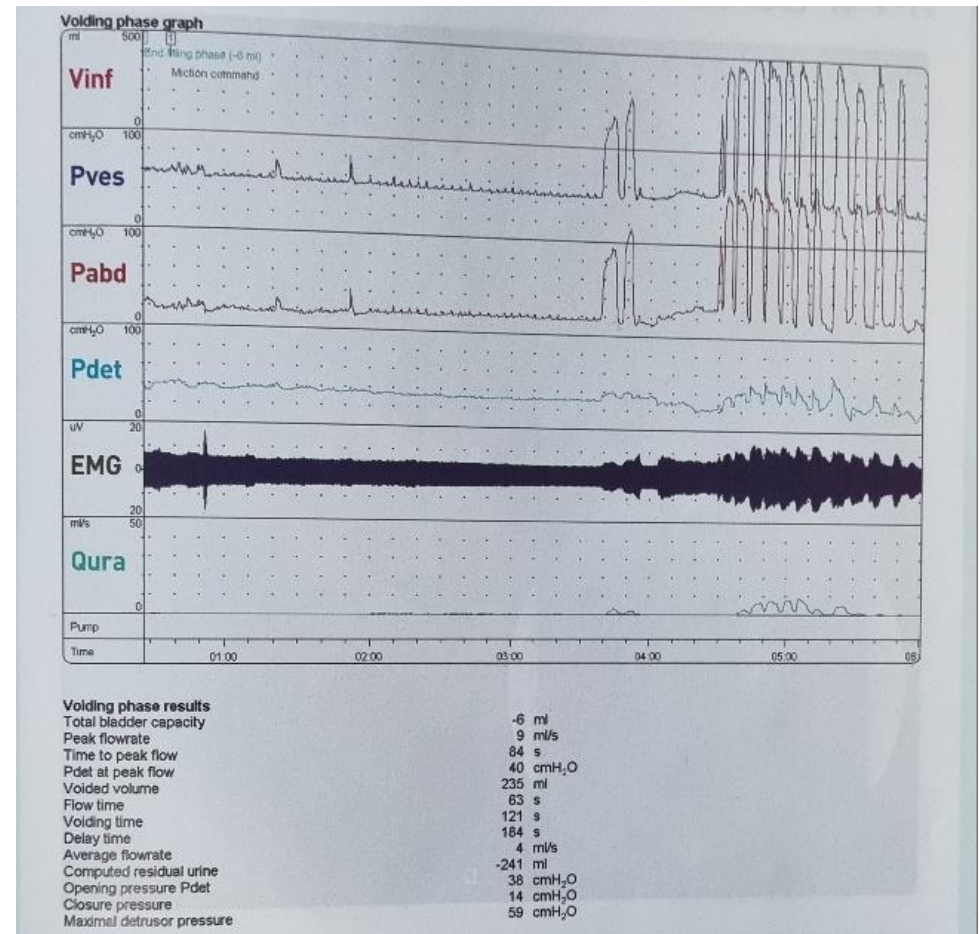
Serum Cr. 2.8 mg/dl

UFM : 11/110/370





Poor compliance
 Involuntary detrusor contraction



Straining voiding
 PVR 370cc

충전기에 심한 방광육주화 관찰

충전 초기에 Lt. VUR (Pves 3cmH2O)

370cc filling 시 Rt. VUR (Pves 32cm H2O)

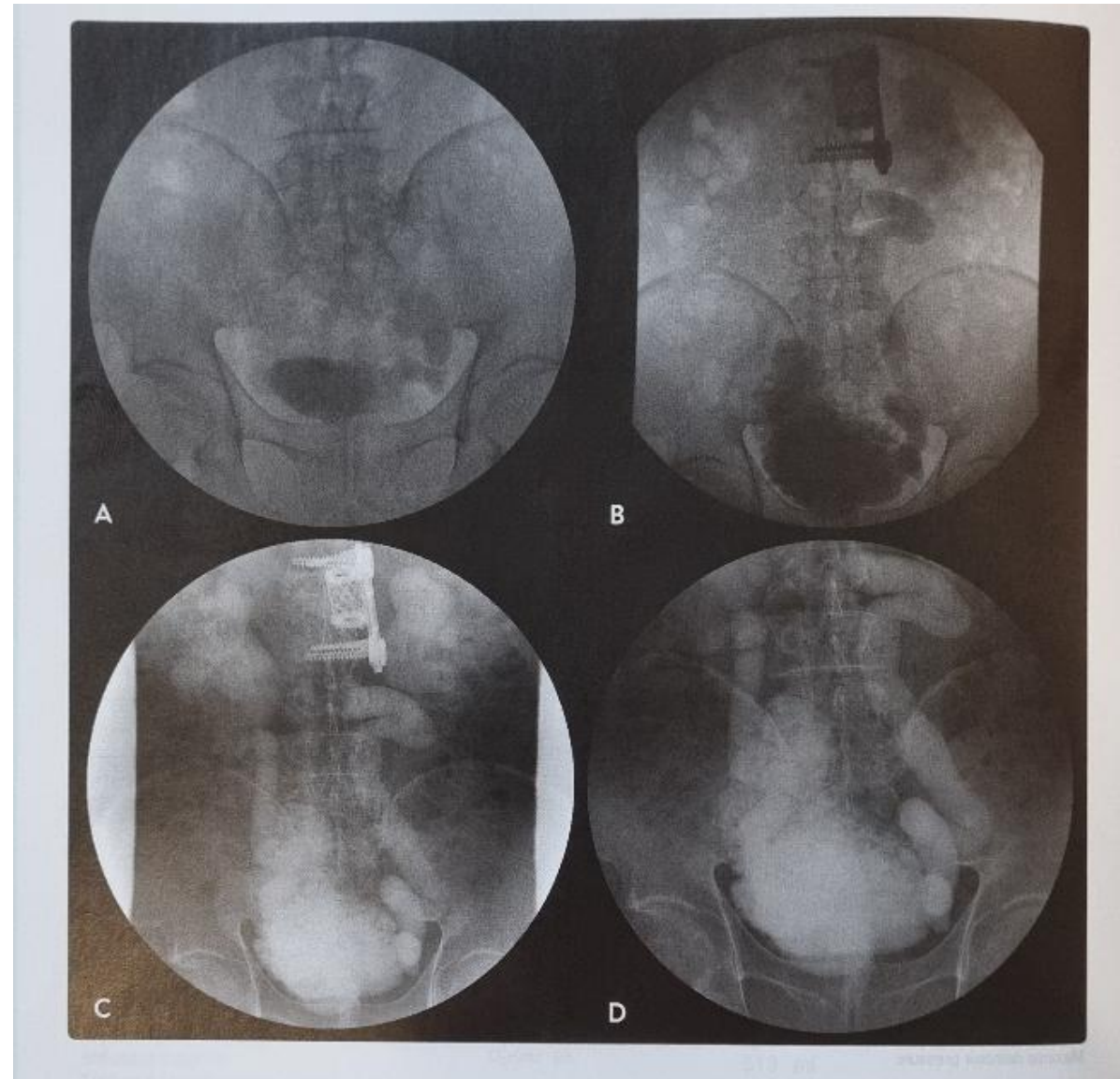
500cc filling시 bladder neck 열림 관찰.

Conclusions

1) Acontractile bladder

2) VUR

3) Delayed relaxation of the urethral sphincter



Case 5

M/49

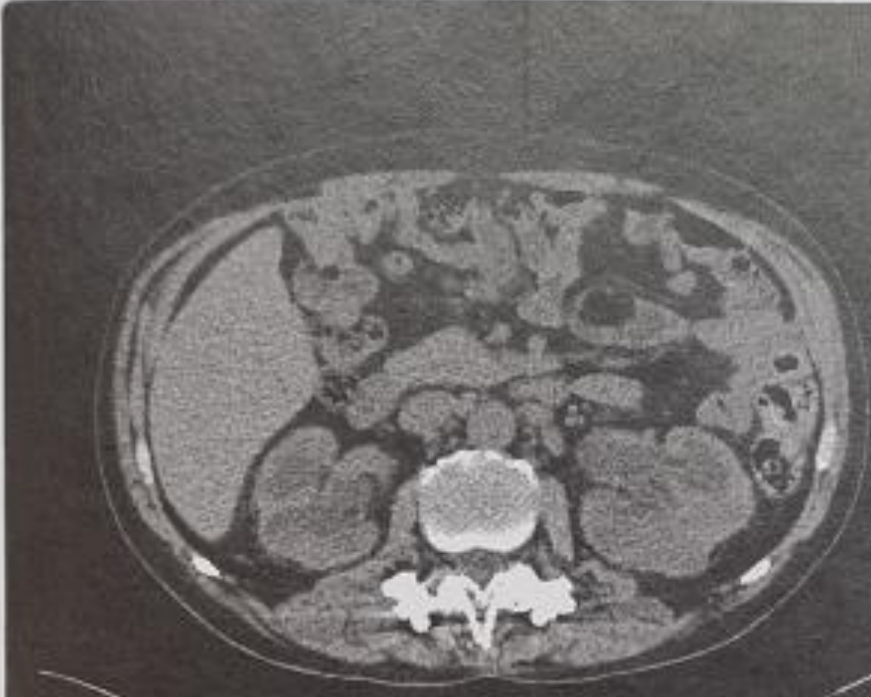
CC : 14년 전 등산길에서 낙상, L1 fracture, 이후 요의없음. 요실금 호소.
하루 1회 CIC하던 중 f/u loss. 보행 가능

계속되는 요실금으로 내원. 기저귀 차고 생활 (하루 10개).

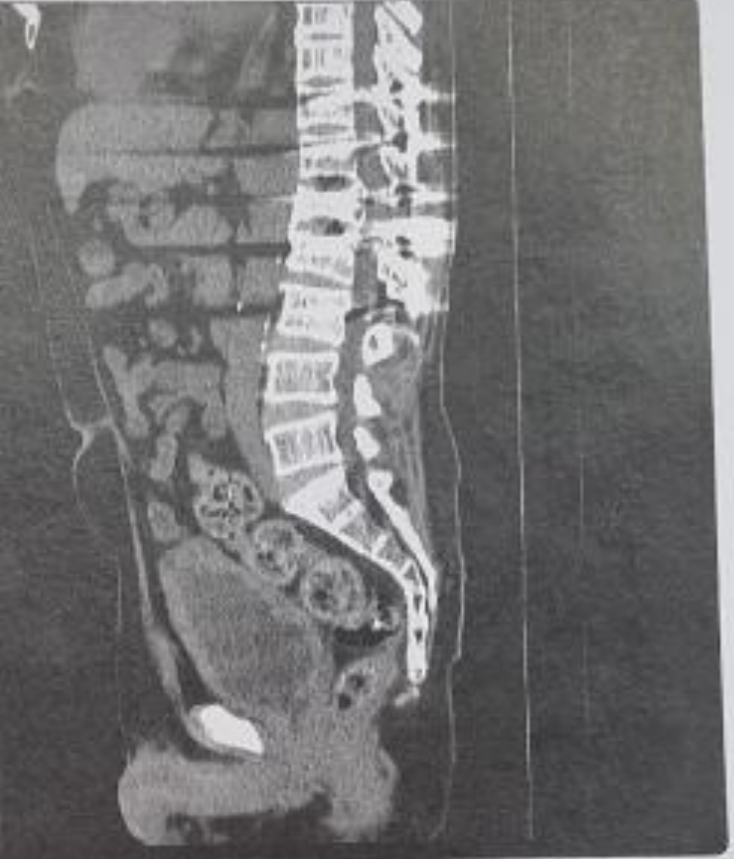
Serum Cr. 3.2mg/dl

배뇨일지 : 하루 6-8회 배뇨, voided vol. 80cc, UO 590cc

UFM : 8/60/190

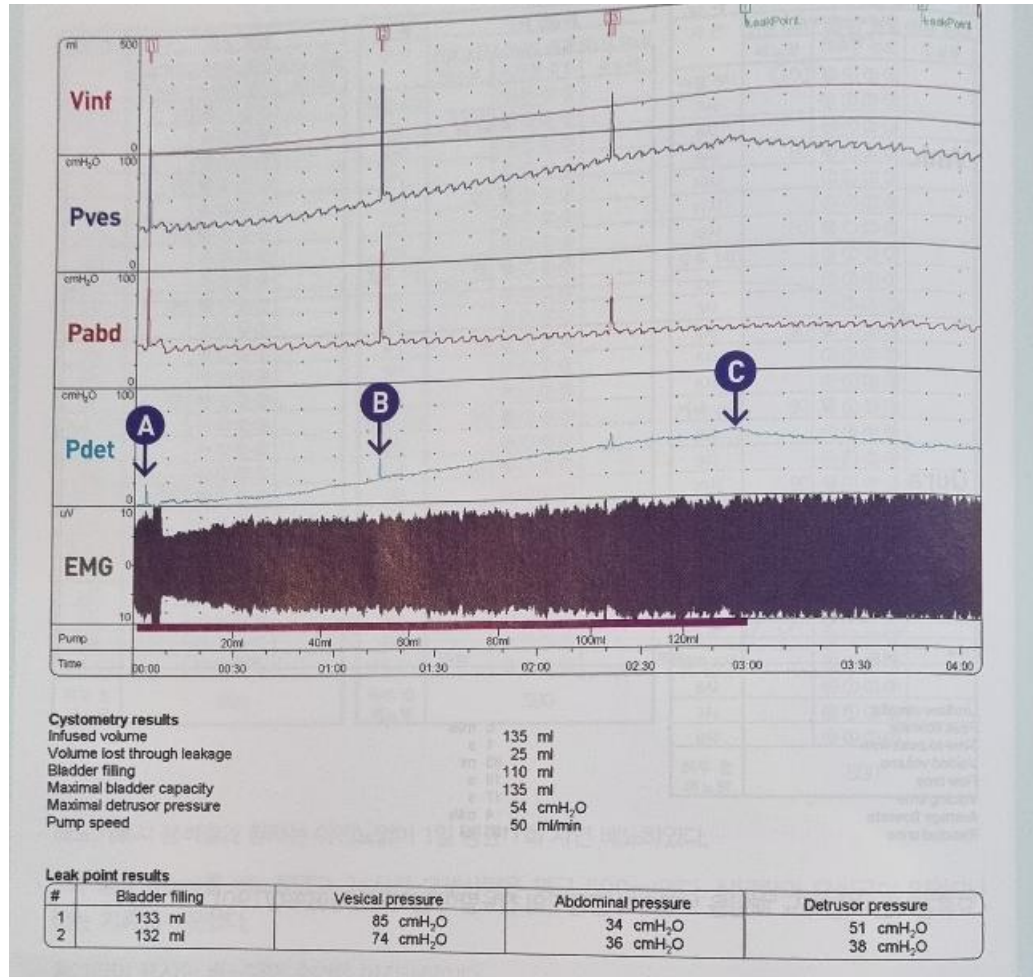


A



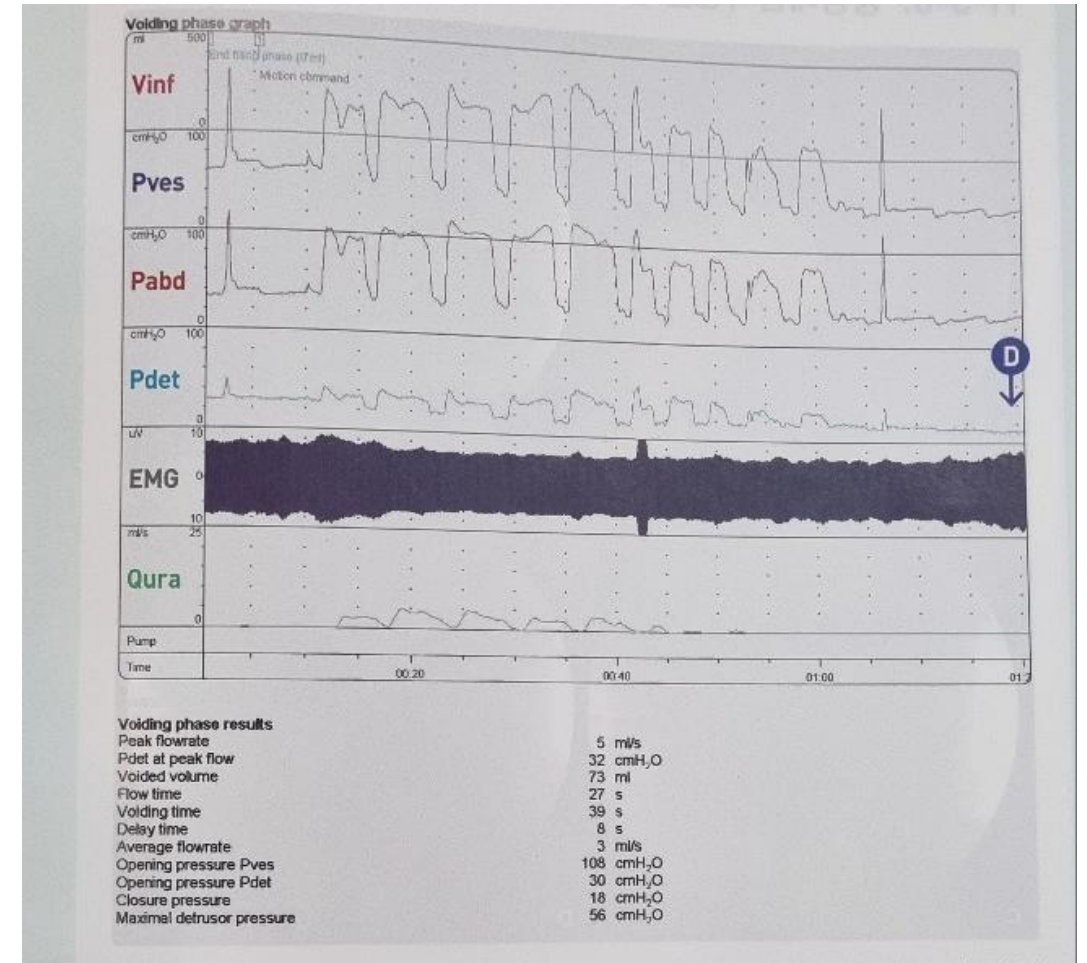
B

충전방광내압측정술

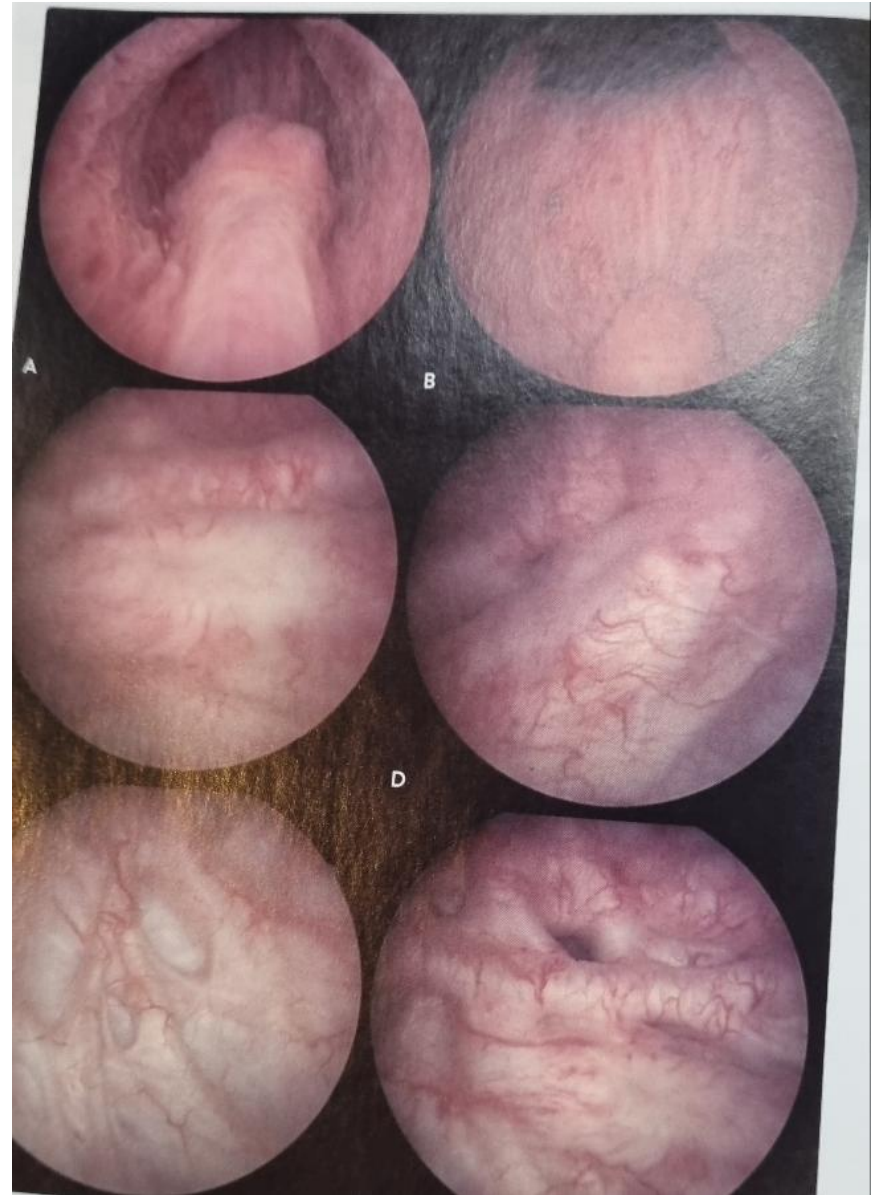
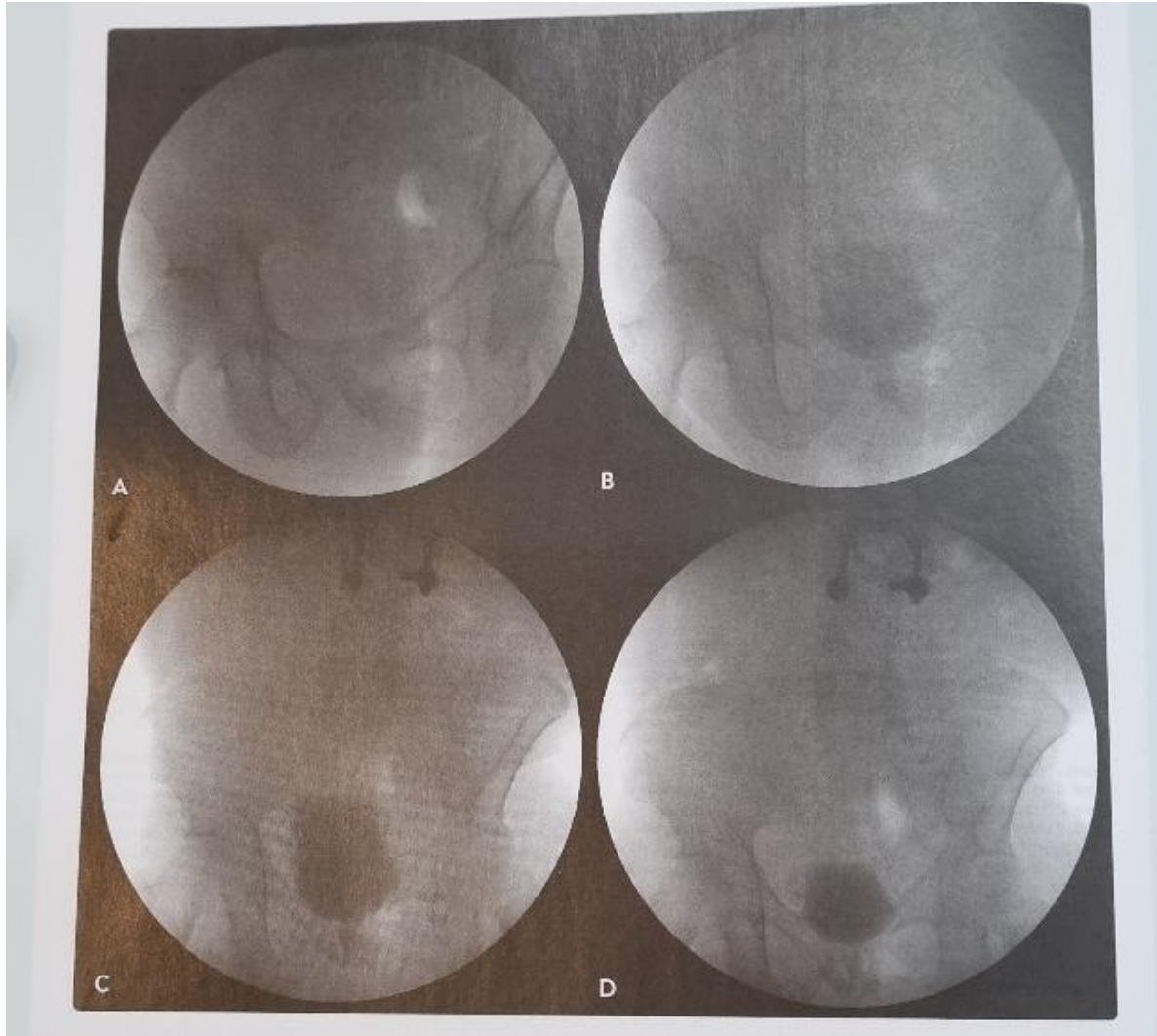


요의 호소 없음.
 Poor compliance
 Non-involuntary contraction

압력요류검사



Non-detrusor voiding contraction
 Straining voiding
 PVR 105
 Acontractile bladder



Cause 1

NB → 방광벽의 비후 → 하부요관이 눌림

Cause 2

NB → poor compliance → 배출장애 동반

→ high vesical pressure → Bilateral hydronephrosis

Alert !!

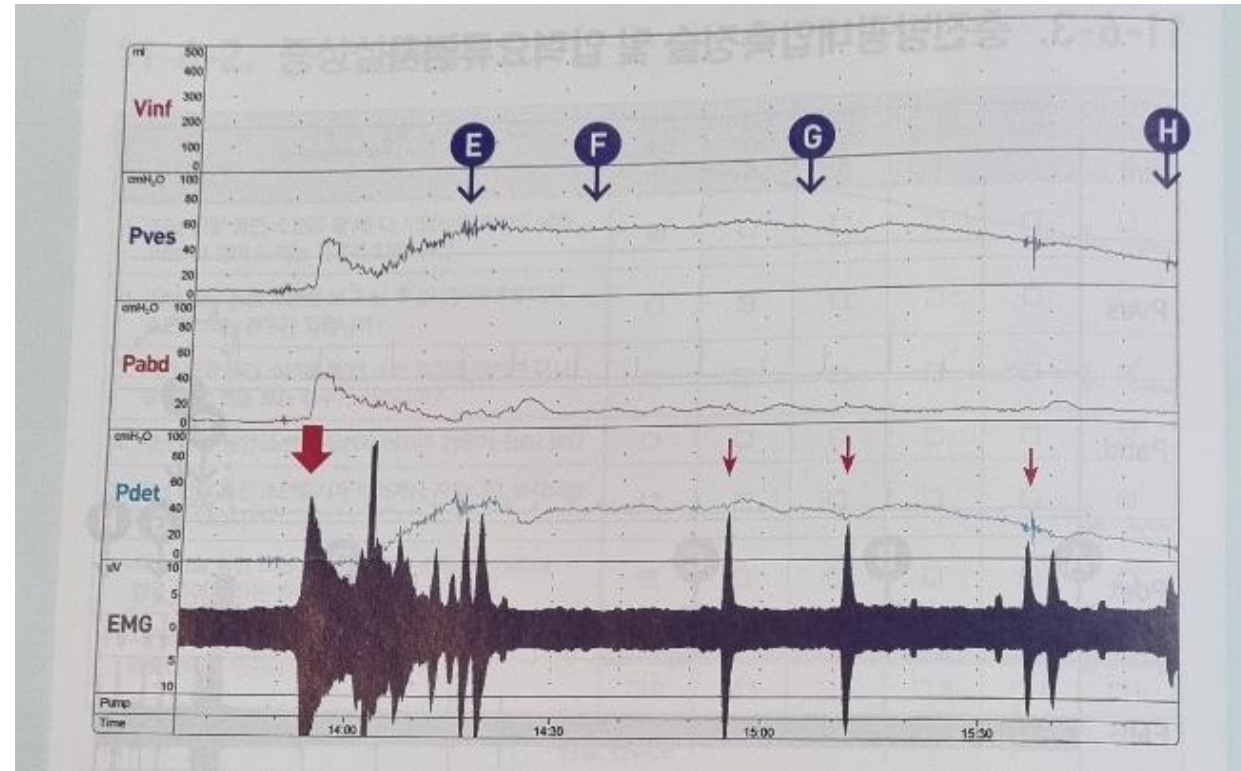
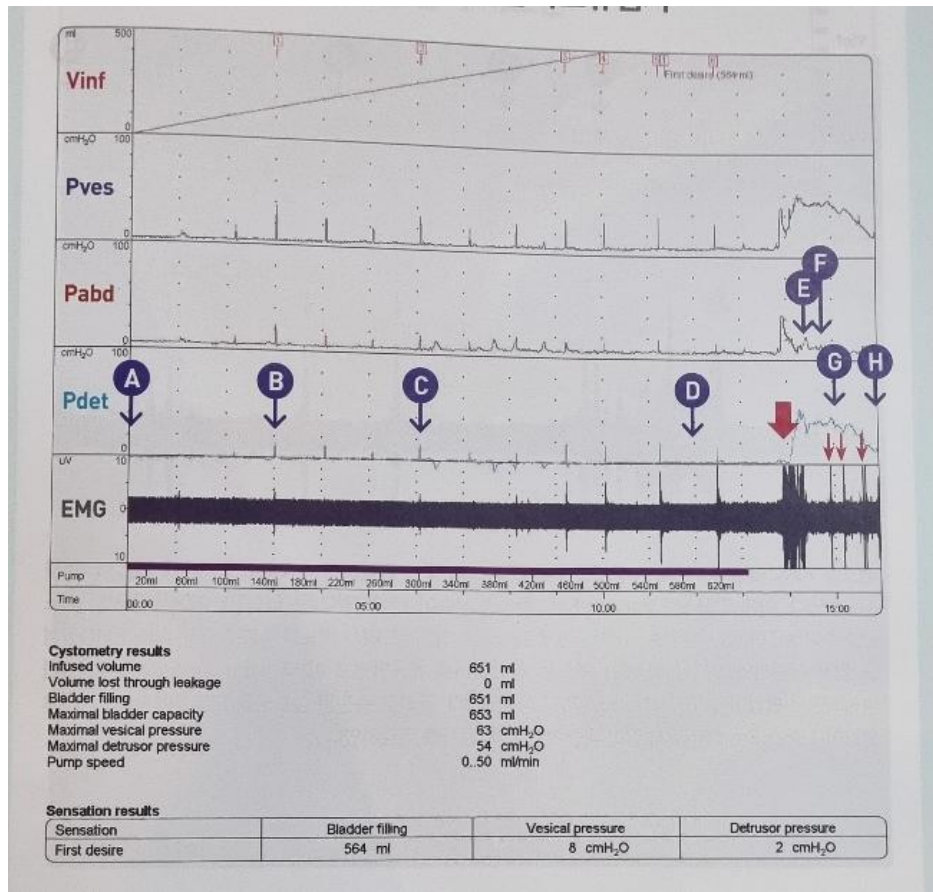
- 보행이 가능한 lower motor neuron disease 환자가 가장 위험!
 - Cauda equina syndrome
 - 환자도 의료진도 NB를 간과할 가능성이 아주 높다.
- 상부요로 손상 이후에 NB 진단될 가능성이 높다.

Case 6

M/60

CC : 30년 전 교통사고로 C4 level compression, paraplegia

- 손 쓸 수 있으나 정교한 동작은 안됨.
- 요의, 변의 있음.
- SP cystostomy recommended -> refuse, 배를 두드려 배뇨.
- 최근 잦은 APN있어 CIC 시작.
- 정기적으로 하지 못하였으며, CIC 시간 놓치면 진땀이 나고 두통 발생.
- TRUS : 20g, Serum Cr. 0.4, Ucx E.coli
- 배뇨일지 : 3-4회 배를 두드려 배뇨 (100cc), CIC 3-4 (100-700cc)

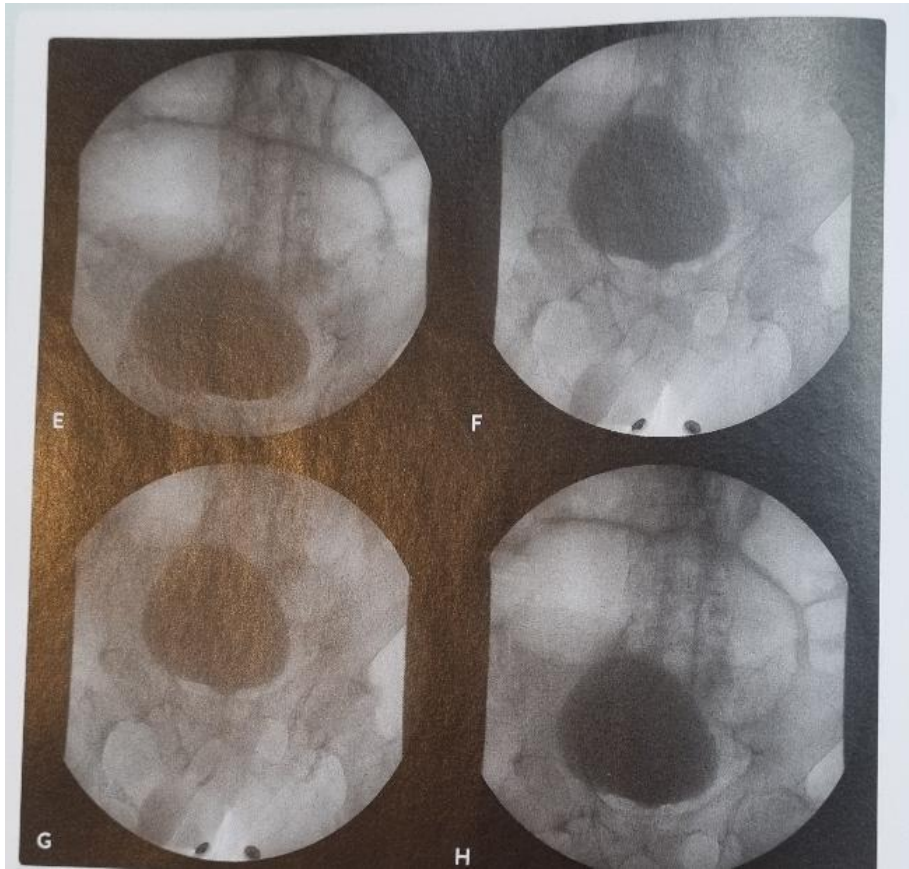


검사 전 facial flushing → BP 200/103

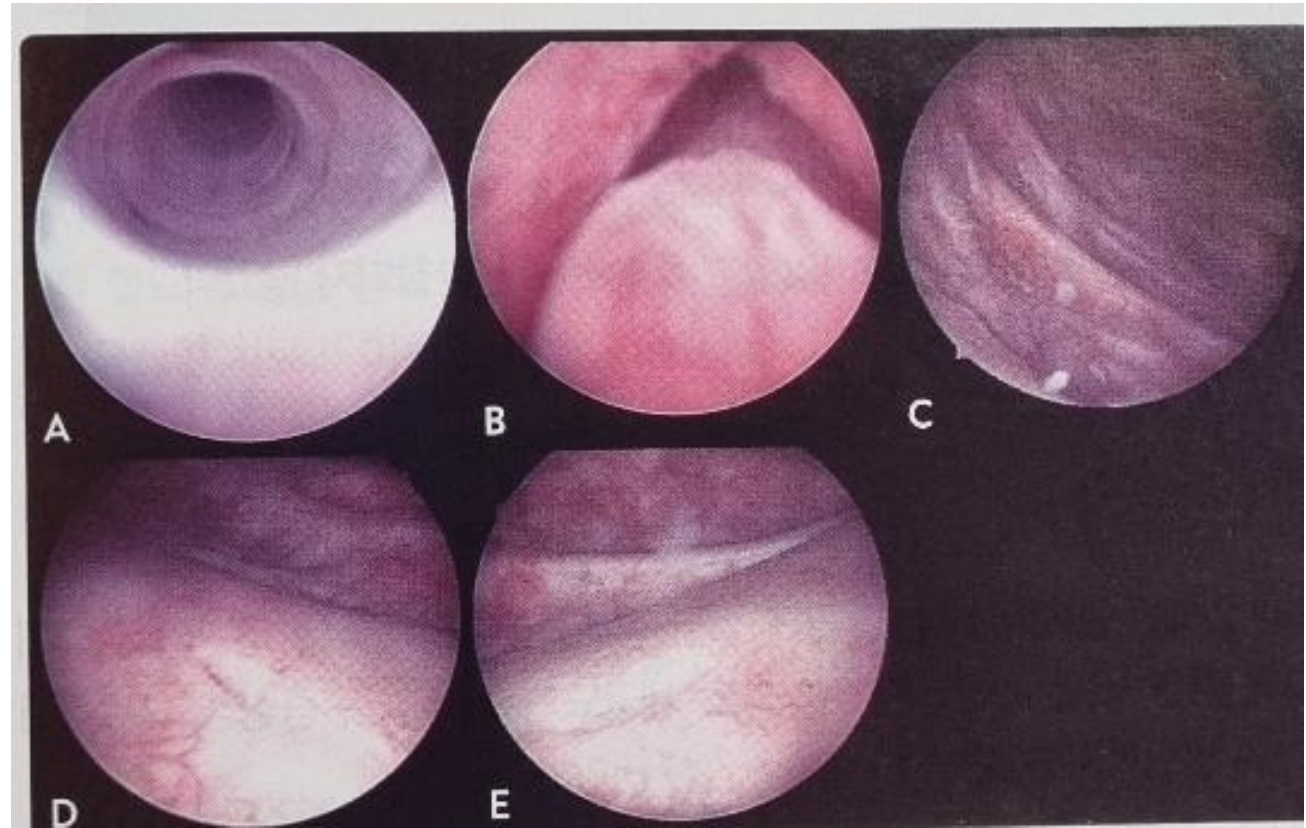
Nelaton bladder emptying : 420cc
→ BP 119/84

550cc filling 시 최초 요의, 650cc filling 시 요의 없음.

배뇨 지시 - 상치골 부위를 강하게 압박하면서 bladder reflexing triggering. (붉은 화살표)
이후 배뇨 시작됨. 80cc 배뇨 후 두통 발생, BP 198/101.
Bladder emptying → BP 135/88



Bladder reflex triggering 시
 방광 수축이 일어나지만
 방광 경부가 열리지 않음.



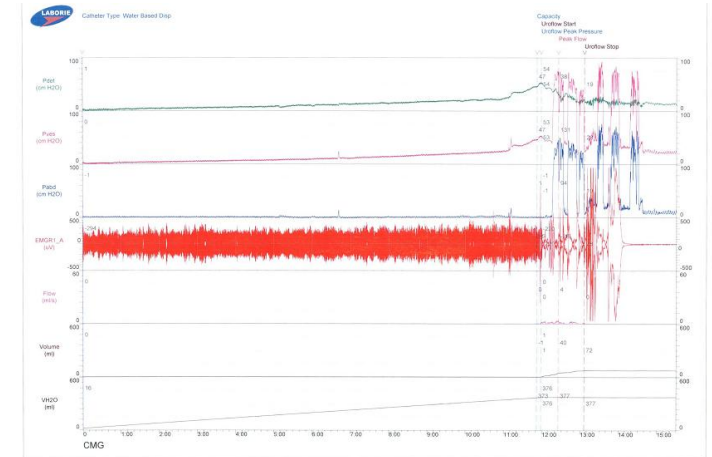
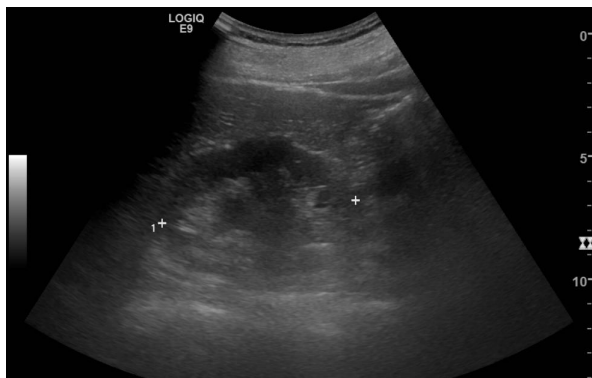
No BOO
 Mild trabeculation

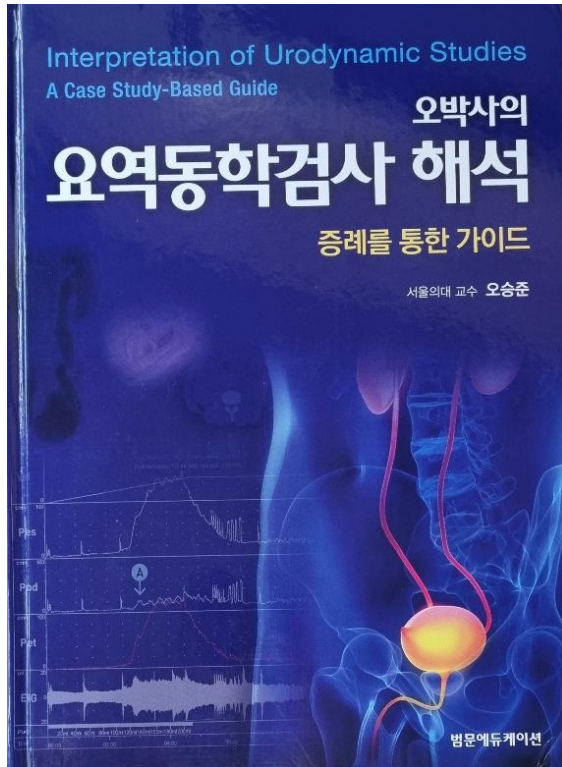
Conclusions

- Decreased bladder sensation
- Bladder reflex triggering
- Autonomic dysreflexia
- Detrusor sphincter dyssynergia

- **Autonomic dysreflexia** 환자에게는 거의 항상 DSD 동반
 - Exaggerated sympathetic activity 발생되므로, 교감 신경에 지배를 받는 방광경부는 닫히게 된다.
 - 이런 경우 심한 상부요로 손상이 초래된다.

- M/63
- 30년 전 교통사고, 손상 level 모름, 보행 가능
- 사고 이후 방광 관련 검사 받은 적 없다.
- UUI+, 복압으로 배 두드려 배뇨, 기스모차고 생활.
- Ucx : E.coli, serum Cr. 2.3





다. 그러나 신경이성 환자에서 이 두 가지가 균형적으로 달성되기는 실제 매우 어려운 일이다. 게다가 배뇨가 이루어지지 않은 시간인 소변 저장기에도 저압의 충분한 방광용량이 유지되어야 하므로 신경 이상 환자에서 저장기의 정상기능을 동시에 기대하기는 더더구나 힘든 일이다.

- 흔히 bladder reflex triggering을 해도 대부분 잔뇨량이 많은 불완전 배뇨행태를 보일뿐만 아니라 배뇨에 많은 시간이 걸린다. 특히 이 환자에서와 같이 방광반사촉발 배뇨는 위험한 AD를 수반하며 장기간 추적시 상부요로의 이상이 초래될 가능성이 높다. 따라서 일반적으로 방광반사촉발 배뇨는 배뇨 이상 환자에서 치료 또는 재활방법으로 권장하지 않는다. 환자들에게 이해시켜야 할 중요한 사항은 바로 '방광은 단련이나 훈련을 통한 재활의 대상이 아니다'는 점이다.
- 이 환자에서는 다행스럽게도 오랜 세월동안 방광이 방광유순도가 좋은 저압방광 상태로 유지되어 신장손상은 오지 않은 예외적 상태인 경우이다. 그러나 일반적인 척수손상 환자들에서는 매우 심한 배뇨 이상과 상부요로 손상이 초래될 수 있다.

... 환자에서 무증상세균뇨 (asymptomatic bacteriuria)는 임...

Take home message

- BOO / BPH / Urethral stricture / POP / AUS state
- Ketamine cystitis / Interstitial cystitis / Radiation cystitis
- Neurogenic bladder (Poor compliance, high vesical pressure, DSD)

→ These bladder problems can affect upper tract !!

Key Sx.? Recurrent UTI and high PVR, flank pain