

# Concurrent Benign Prostatic Obstruction and Huge Bladder Diverticulum

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## BRIEF HISTORY

A 65-year-old man presented with voiding difficulty and a severe incomplete voiding sensation for 6 months. He had received transrectal ultrasound of the prostate, magnetic resonance imaging, and urodynamic study at another hospital, and was diagnosed with benign prostatic hyperplasia. Medical therapy with an alpha-blocker (tamsulosin, 0.4 mg per day) was not effective in relieving his lower urinary tract symptoms (LUTS). A urinalysis showed no abnormalities, and a digital rectal examination revealed a moderately enlarged prostate. Uroflowmetry (Fig. 1) showed an intermittent voiding pattern, with a voided volume of 140 mL and a post-void residual of 232 mL. An indwelling urethral catheter was inserted and the patient felt much improvement of LUTS.

## URODYNAMIC STUDY

A videourodynamic study (VUDS) revealed a hypersensitive bladder with increased bladder sensation. During the filling phase, a bladder diverticulum over the bladder dome was noted on fluoroscopy. The diverticulum enlarged as the infusion volume reached bladder capacity (Fig. 2). The voiding phase showed a low voiding pressure (detrusor pressure at maximal flow rate, PdetQmax: 36 cmH<sub>2</sub>O) and a

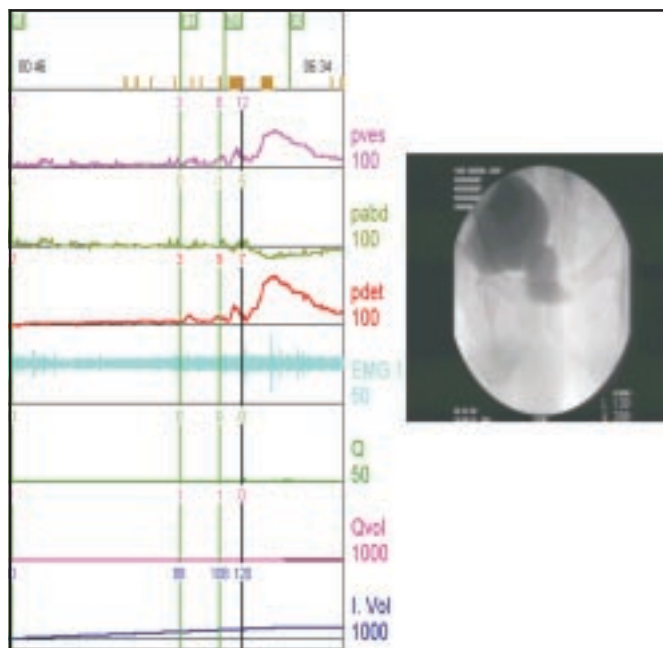


Fig. 2. VUDS at the volume of bladder capacity shows a huge bladder diverticulum over the bladder dome.

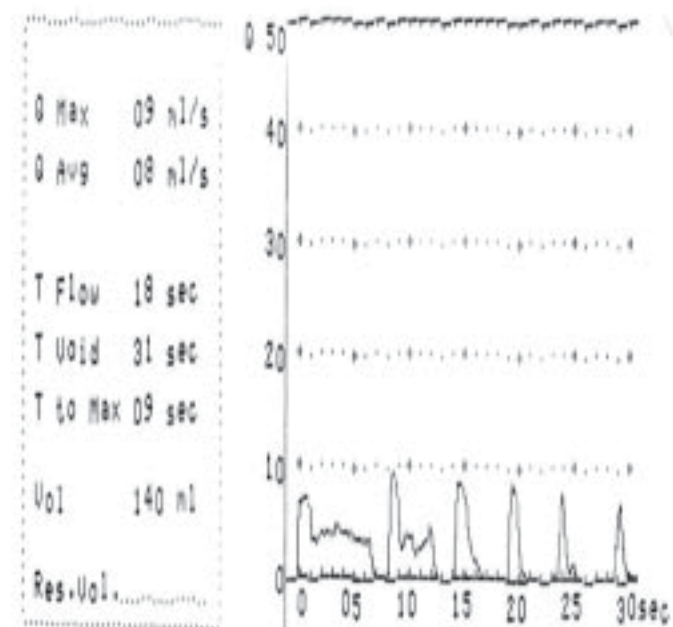


Fig. 1. Uroflowmetry shows an intermittent voiding pattern.

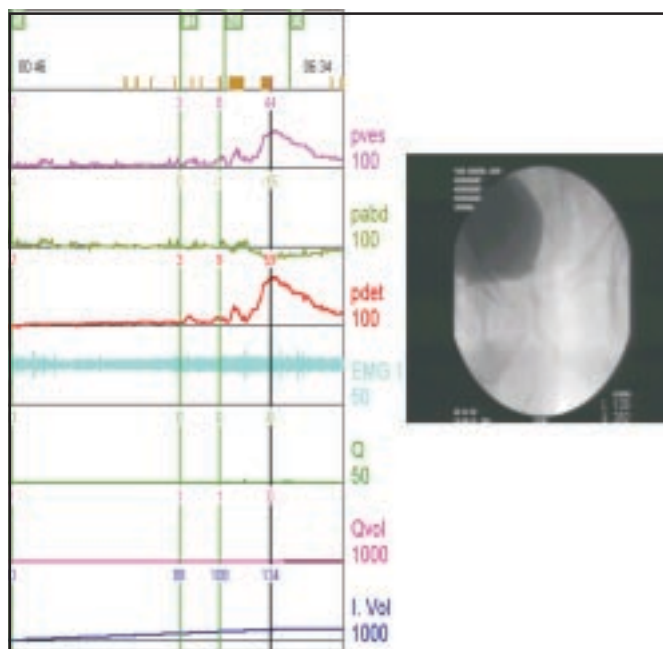
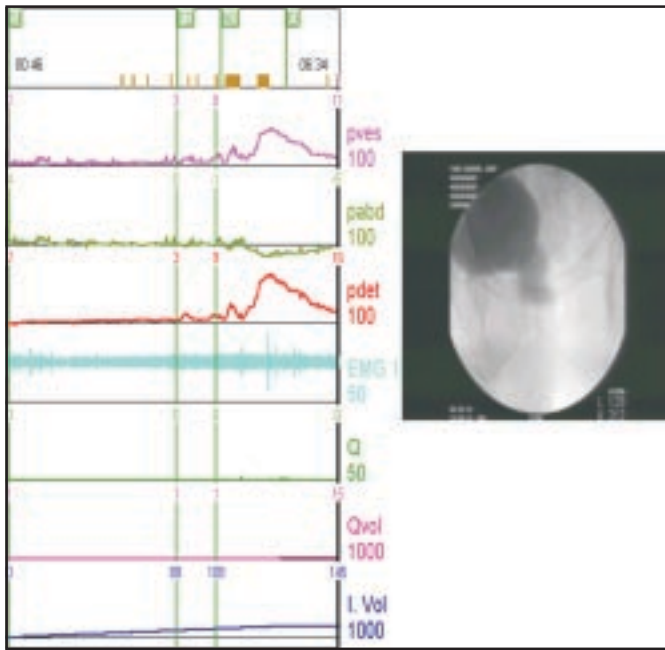


Fig. 3. VUDS at the voiding phase shows the bladder diverticulum has enlarged, and a small amount of urine has been voided from the urethra.

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low flow (maximal flow rate,  $Q_{max}$ : 1 mL /sec) pattern. The Abrams-Griffiths number ( $P_{det}Q_{max}-2*Q_{max}$ ) was 34, which falls into the equivocal class of bladder outlet obstruction (BOO) on the Abrams-Griffiths nomogram. A small amount of urine (15 mL) was voided from the urethra during urination, and most of the urine flowed into the bladder diverticulum (Fig. 3). After completion of detrusor phasic contraction, redistribution of urine between the diverticulum and bladder was noted, with the urine flowing back to bladder from the bladder diverticulum (Fig. 4).



**Fig. 4.** VUDS before completion of the examination shows redistribution of urine between the diverticulum and bladder.

## DISCUSSION

A huge bladder diverticulum, defined as one with a volume greater than the volume of the bladder at bladder capacity, is usually associated with BOO [1]. We found only one retrospective study discussing the urodynamic findings of concurrent benign prostatic obstruction (BPO) and bladder diverticula [2]. It may be difficult to diagnose BOO by pressure flow study in men with huge bladder diverticula. A pressure flow study evaluates the relationship between bladder contractility and bladder outlet resistance. In a man with a huge bladder diverticulum and BOO, the equilibrium between bladder contractility and bladder outlet resistance is disturbed by the reservoir of the bladder, i. e. the huge bladder diverticulum. The bladder diverticulum offset the elevated intravesical pressure during detrusor contraction. Most urine in the bladder flowed into the bladder diverticulum because the resistance of the diverticulum was lower than the bladder outlet resistance. The  $P_{det}Q_{max}$  measured reflects the combined resistance of the urethra and bladder diverticulum, instead of urethral resistance alone. In this patient the Abrams-Griffiths number was 34, and was considered equivocal for obstruction according to the Abrams-Griffiths nomogram. However, cinefluoroscopy during urination showed a narrow prostatic urethra, which suggested a diagnosis of BPO. Not all bladder diverticula require surgical intervention. For men with BPO and bladder diverticula, transurethral prostatectomy could be performed first with VUDS afterwards to determine if the bladder diverticula impair bladder emptying. A bladder diverticulectomy should be performed if lower urinary tract dysfunction persists after prostatectomy.

## REFERENCES

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