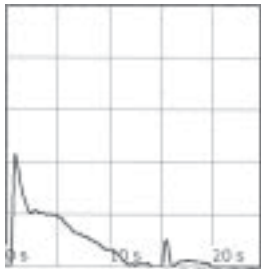


Interpretation of Uroflowmetry

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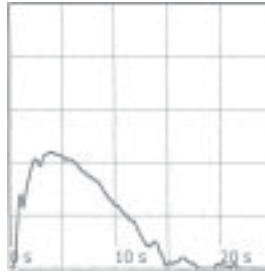
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Urination is a complex interaction between detrusor contraction and relaxation of the bladder outlet components. An intact neurological connection from the cerebral cortex through the spinal cord to the bladder and urethra is essential for normal bladder sensation and emptying. Although uroflowmetry can be the first window in the tentative diagnosis of lower urinary tract symptoms, physicians should also remember that urination can be affected by several conditions including emotions, bladder volume, anatomical obstruction and pelvic floor dysfunction. Therefore, interpretation of uroflowmetry should thoroughly consider all possible affecting conditions. The following uroflowmetry figures were collected from 34 patients in a urological outpatient department. The readers may try to interpret the uroflowmetry according to the clinical information. The proposed interpretation for each case is presented following the uroflowmetry.



Case 1: Male, 70 years old. Nocturia, urgency and urge incontinence for 1 year; TPV= 27 mL, TZI=0.2, Qmax= 21.5 mL/s, Vol= 95 mL, PVR= 10 mL.

Normal Qmax and terminal dribble flow pattern. The high Qmax occurred at the initial voiding suggesting holding urine and terminal detrusor contraction occurred before initiation of urination.



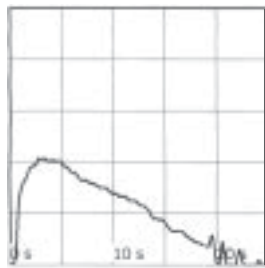
Case 2: Male, 78 years old. Nocturia, urge incontinence and frequency treated for 6 months; TPV= 21.3 mL, TZI= 0.47, Qmax= 22 mL/s, Vol= 207 mL, PVR=38.5 mL.

Normal flow rate and normal flow pattern, OAR without BOO is likely.



Case 3: Male, 75 years old. Severe frequency, nocturia 3-4/N and urgency incontinence; TPV= 37.8 mL; TZI= 0.36, Qmax= 12.5 mL/s, Vol= 99 mL, PVR= 132 mL.

Subnormal Qmax, normal flow pattern, compatible with OAB without BOO.



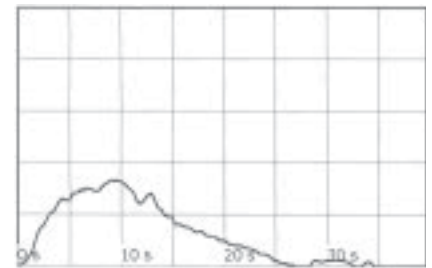
Case 4: Male, 88 years old. Frequency urgency, no dysuria for 1 year; TPV= 19 mL, TZI= 0.23, Qmax= 20.8 mL/s, Vol= 266 mL, PVR= 36 mL.

Normal Qmax and normal flow pattern, compatible with OAB without BOO.



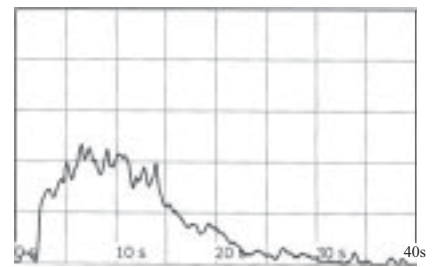
Case 5: Male, 82 years old. Urge incontinence, small urine caliber, frequency and nocturia 5-6/N; TPV= 48.3 mL, TZI=0.58, Qmax= 8.0 mL/s, Vol= 21 mL, PVR= 8 mL.

Low Qmax at small voided volume, normal flow pattern, compatible with contracted bladder, OAB without BOO.



Case 6: Male, 75 years old. Frequency, nocturia 4-5/N, no dysuria nor residual urine sensation; TPV= 21.3 mL, TZI= 0.5, Qmax= 16.6 mL/s, Vol= 231 mL, PVR= 70 mL.

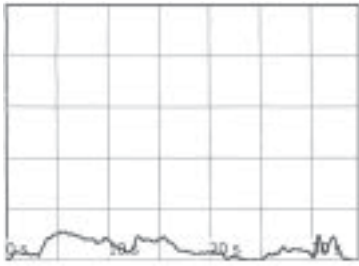
Normal Qmax with normal flow pattern, compatible with OAB without BOO.



Case 7: Female, 71 years old. Frequency urgency and urge incontinence; Qmax= 23.4 mL/s, Vol= 300 mL, PVR= 122 mL.

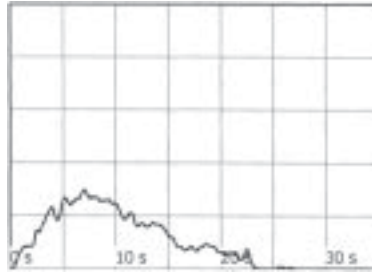
Normal Qmax, normal flow pattern, compatible with OAB without BOO.

Clinical pearls — Urodynamics



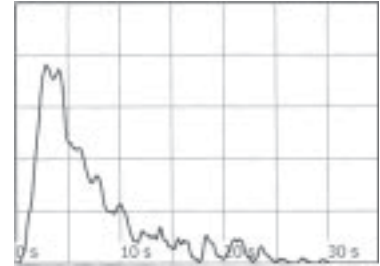
Case 8: Male, 79 years old. Minor stroke with frequency urgency and small urine volume, no dysuria for 3 years; TPV= 29.2 mL, TZI= 0.4, Qmax= 5.5 mL/s, Vol= 79 mL, PVR= 86 mL.

Low Qmax, intermittent flow pattern, compatible with low detrusor contractility, BOO is not likely.



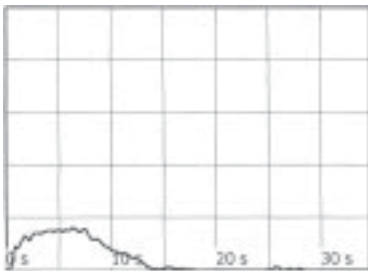
Case 9: Male, 81 years old. BPH s/p TURP 5 years ago, frequency urgency and urge incontinence after TURP; TPV= 27.2 mL, TZI= 0.44, Qmax= 14.9 mL/s, Vol= 173 mL, PVR= 55 mL.

Subnormal Qmax, normal flow pattern, compatible with mild BPH with normal detrusor contractility.



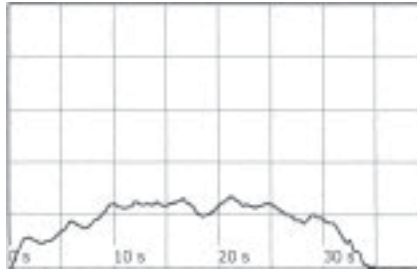
Case 10: Female, 47 years old. Frequency urgency and urge incontinence for 2 years, refractory to antimuscarinic therapy; Qmax= 38.2 mL/s, Vol= 250 mL, PVR= 10 mL.

High Qmax and normal flow pattern but a terminal dribble flow, compatible with idiopathic detrusor overactivity with a guarding urethral sphincter.



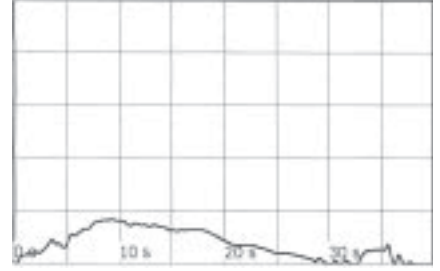
Case 11: Male, 70 years old. Severe frequency urgency and urge incontinence noted for 1 year; TPV= 57.5 mL, TZI= 0.52, Qmax= 8 mL/s, Vol= 72 mL, PVR= 16 mL.

Low Qmax at small voided volume, normal flow pattern, compatible with OAB without BOO.



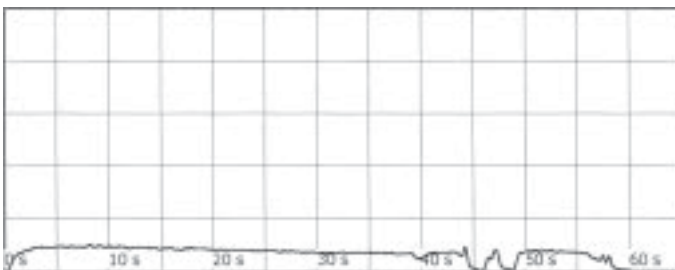
Case 12: Male, 24 years old. Frequency urgency and nocturia 0-1/N noted for 5-6 years; History of holding urine and constipation; Qmax= 13.5 mL/s, Vol= 318 mL, PVR= 96 mL.

Subnormal Qmax, obstructive flow pattern, compatible with a bladder neck dysfunction or poorly relaxed urethral sphincter in young man.



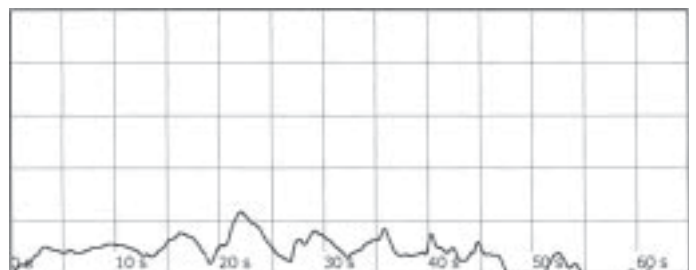
Case 13: Male, 77 years old. Hesitancy, nocturia 1-2/N, small urine amount and dysuria for 5 years; TPV= 42.7 mL, TZI= 0.55, Qmax= 8.4 mL/s, Vol= 147 mL, PVR= 42 mL.

Low Qmax, compressive obstructive flow pattern, compatible with BPH with possible BOO or low detrusor contractility.



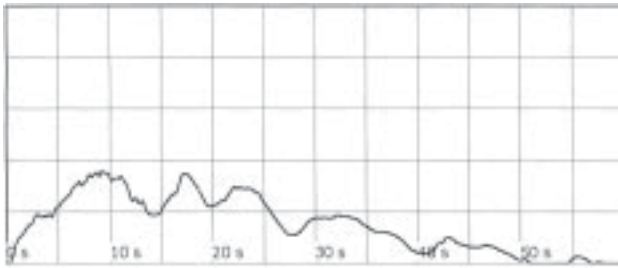
Case 14: Female, 83 years old. Frequency urgency and small caliber urine for 3 years, no urgency incontinence nor stress incontinence; Qmax= 5.0 mL/s, Vol= 210 mL, PVR= 105 mL.

Low Qmax and constrictive obstructive flow pattern, compatible with urethral stricture and OAB in an old lady.



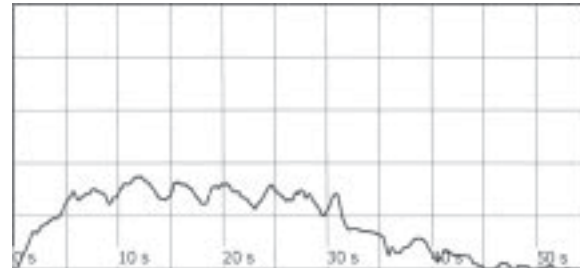
Case 15: Male, 60 years old. Frequency, terminal dribble and residual urine sensation; TPV= 38.2 mL, TZI= 0.2, Qmax= 11.8 mL/s, Vol= 250 mL, PVR= 69 mL.

Subnormal Qmax, intermittent flow pattern, compatible with poor relaxation of urethral sphincter without BOO.



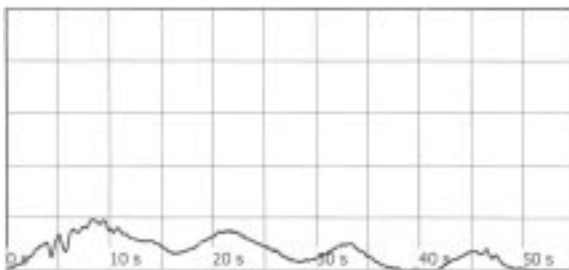
Case 16: Male, 53 years old. Small caliber of urine noted for 6 months. No dysuria nor miction pain, nocturia 1-2/N, terminal dribble; TPV= 37.5 mL, TZI= 0.28, Qmax= 17.9 mL/s, Vol= 454 mL, PVR= 140 mL.

Normal Qmax with compressive obstructive flow pattern, compatible with BPH with normal detrusor contractility.



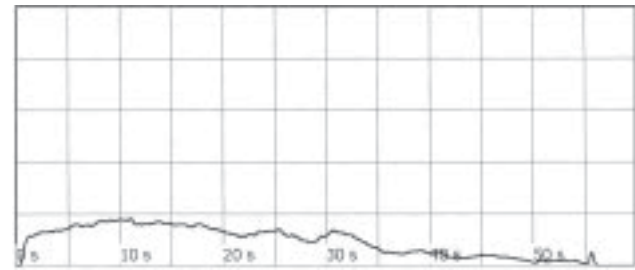
Case 17: Male, 57 years old. Hesitancy, small caliber of urine and dysuria for 1 year; Qmax= 17.5 mL/s, Vol= 471 mL, PVR= 92 mL, urinalysis: WBC 25-30/HPF.

Normal flow rate with mildly obstructive flow pattern, compatible with no BOO but an incomplete relaxed urethral sphincter.



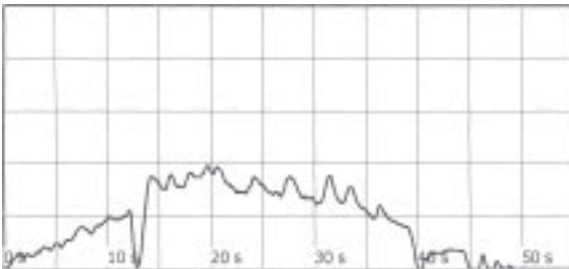
Case 18: Female, 51 years old. Frequency urgency and bladder pain for 1 year; Qmax= 9.7 mL/s, Vol= 191 mL, PVR= 190 mL.

Low Qmax with intermittent flow pattern, compatible with low detrusor contractility and poor pelvic floor relaxation.



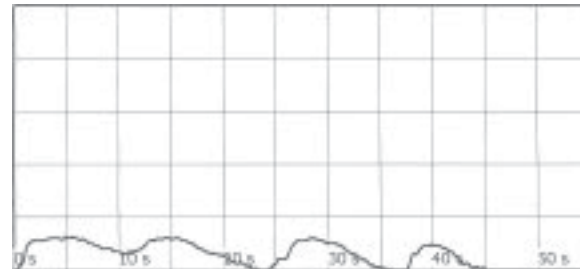
Case 19: Male, 80 years old. Frequency, dysuria, nocturia 3-4/N, small caliber urine; TPV= 28.6 mL, TZI= 0.45, Qmax= 9.2 mL/s, Vol= 275 mL, PVR= 27.5 mL.

Low Qmax and obstructive flow pattern, compatible with BPH with BOO.



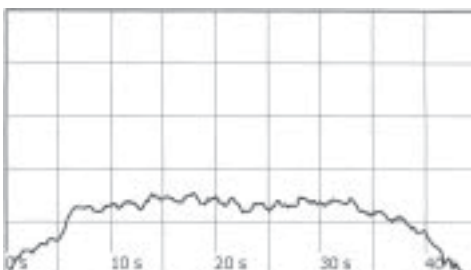
Case 20: Male, 53 years old. Hesitancy, intermittency, terminal dribble for 1 year; TPV= 32 mL, TZI=0.24, Qmax= 19.5 mL/s, Vol= 468 mL, PVR= 75 mL.

Normal Qmax and increasing flow rate from initiation of urination, intermittent flow and mild abdominal straining suggesting a poor relaxation of urethral sphincter during voiding.



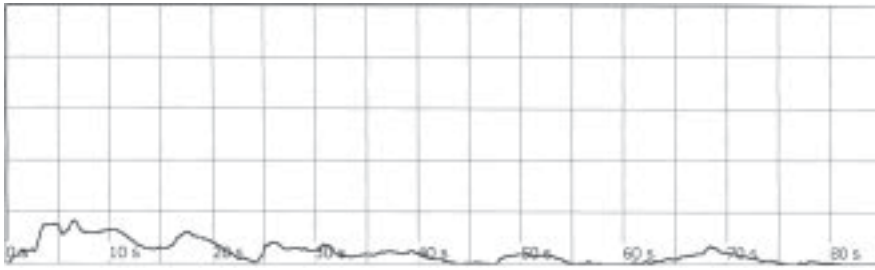
Case 21: Male, 78 years old. Post-TURP for 5 years, frequency nocturia slow stream and intermittency for 1 year, TPV= 15 mL, wide open bladder neck and prostatic urethra; Qmax= 6.3 mL/s, Vol= 155 mL, PVR= 27 mL.

Low Qmax and intermittent flow but normal flow pattern in each episode of urination, suggesting low detrusor contractility without bladder outlet obstruction.



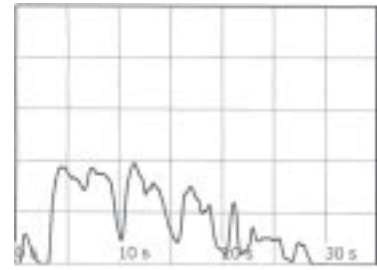
Case 22: Male, 18 years old. Hesitancy, slow stream, residual urine sensation for 6 months; Qmax= 15.4 mL/s, Vol= 484 mL, PVR= 127 mL.

Although Qmax is normal, the flow pattern is obstructive and suggestive of a poor relaxation of urethral sphincter during voiding.



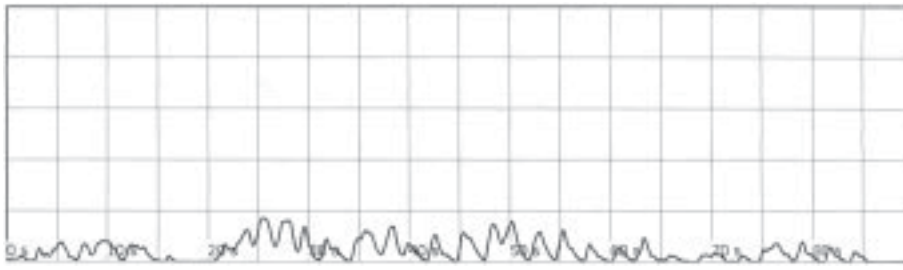
Case 23: Male, 62 years old. Difficult urination, slow stream, frequency nocturia for 3 years; TPV= 47 mL, TZI= 0.54, Qmax= 8.3 mL/s, Vol= 182 mL, PVR= 75 mL.

Low Qmax with intermittent and terminal dribble flow pattern, suggestive of bladder outlet obstruction with low detrusor contractility.



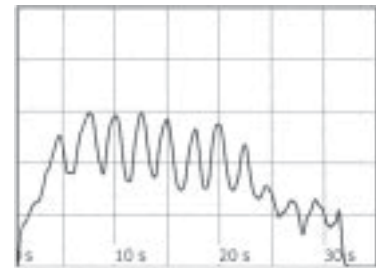
Case 27: Female, 75 years old. Hip fracture operated with urinary retention 3 months ago, dysuria and constipation, no urge incontinence; Qmax= 19.5 mL/s, Vol= 260 mL, PVR= 45 mL.

Normal Qmax, intermittent straining flow pattern, compatible with low detrusor contractility with low urethral resistance.



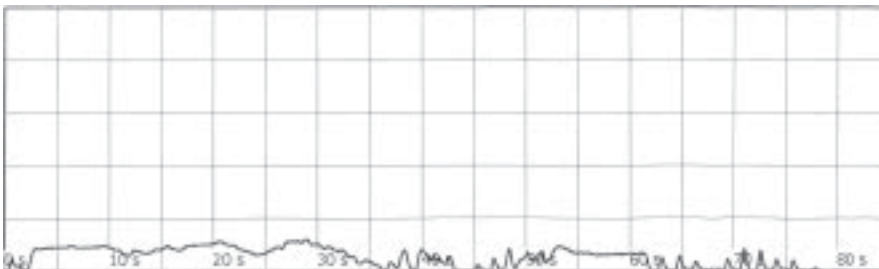
Case 24: Male, 84 years old. Frequency dysuria and small caliber urine for 10 years; TPV= 33.4 mL, TZI= 0.5, Qmax= 8.5 mL/s, Vol= 185 mL, PVR= 8 mL.

Low Qmax with obstructive and straining flow pattern, compatible with BPH with BOO and low detrusor contractility.



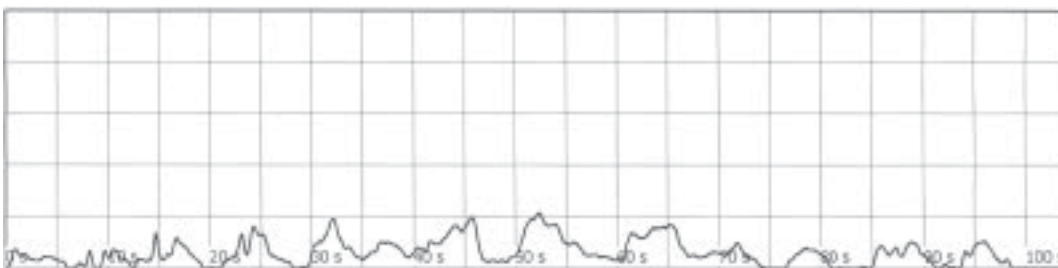
Case 28: Male, 48 years old. Dysuria frequency, frequent urinary retention in recent months; no constipation; Qmax= 29.7 mL/s, Vol= 565 mL, PVR= 175 mL.

Normal Qmax, intermittent straining flow pattern, compatible with poor relaxation of urethral sphincter without BOO.



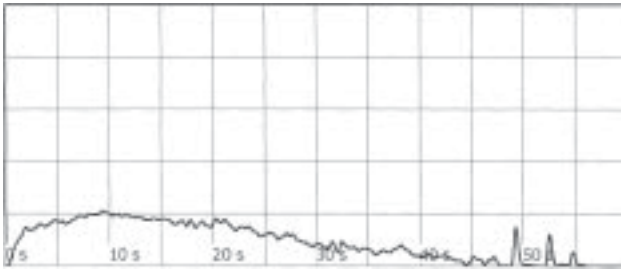
Case 25: Female, 58 years old. Dysuria and frequency nocturia for 1 year, has had TVT procedure for stress incontinence; Qmax= 6.1 mL/s, Vol= 213 mL, PVR= 65 mL.

Low Qmax and obstructive flow pattern, compatible with bladder outlet obstruction, possibly due to previous anti-incontinence surgery.



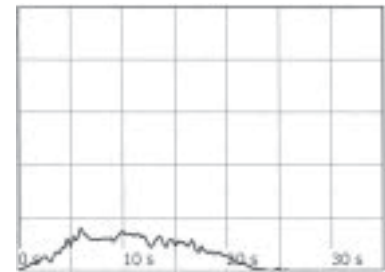
Case 26: Male 70 years old. Dysuria, hesitancy, nocturia 1-2/N and residual urine sensation; TPV= 39 mL, TZI= 0.53, Qmax= 10.8 mL/s, Vol= 310 mL, PVR= 80 mL.

Low Qmax with intermittent straining flow pattern, compatible with BPH with low detrusor contractility or poorly relaxed urethral sphincter.



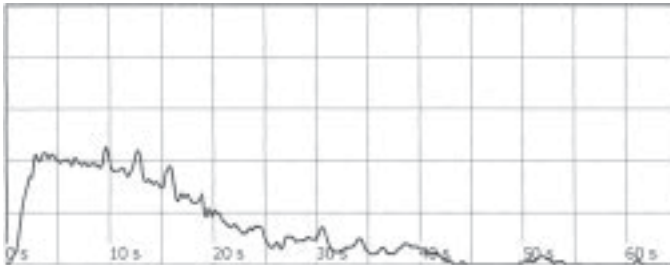
Case 29: Male, 79 years old. Frequency nocturia and small caliber urine for 5 years; TPV= 38.3 mL, TZI= 0.56, Qmax= 10.5 mL/s, Vol= 281 mL, PVR= 73 mL.

Low Qmax, obstructive flow pattern, compatible with BPH with BOO.



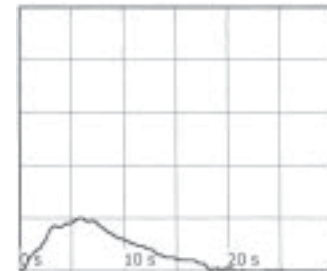
Case 33: Female, 74 years old. Dysuria frequency nocturia and frequent retention; Qmax= 8 mL/s, Vol= 100 mL, PVR= 210mL.

Low flow rate with obstructive flow pattern, compatible with BOO and low detrusor contractility.



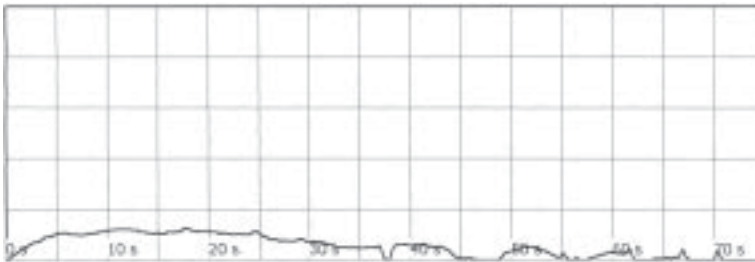
Case 30: Male, 70 years old. Frequency, urgency, nocturia 2/N and hesitancy; TPV= 27 mL, TZI= 0.28, Qmax= 22.7 mL/s, Vol= 431 mL, PVR= 42 mL.

Normal Qmax with terminal dribble flow pattern, compatible with OAB without BOO.



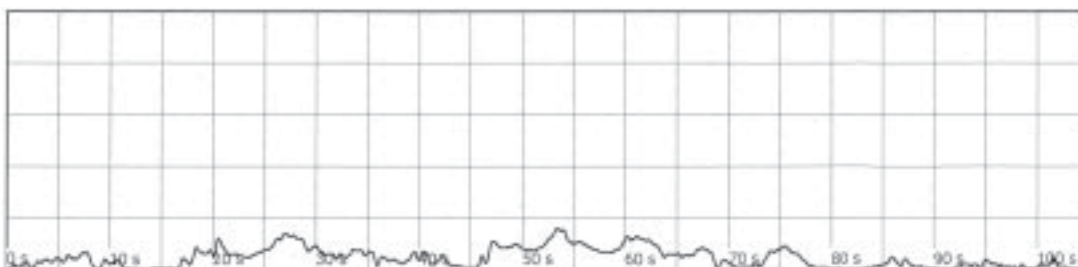
Case 34: Male, 82 years old. Frequency urgency and urge incontinence noted for several months; Qmax= 10.1 mL/s, Vol= 97 mL, PVR= 34 mL.

Low Qmax at small voided volume and normal flow pattern, compatible with OAB without BOO.



Case 31: Male, 83 years old. Dysuria and frequency urgency nocturia 2-3/N, with constipation; TPV= 23.4 mL, TZI= 0.45, Qmax= 6.3 mL/s, Vol= 203 mL, PVR= 60 mL.

Low Qmax, constrictive obstructive flow pattern, compatible with BPH with BOO.



Case 32: Male, 88 years old. Frequency, nocturia, small caliber urine and mild dysuria; TPV= 21 mL, TZI= 0.39, Qmax= 8 mL/s, Vol= 249 mL, PVR= 22 mL.

Low Qmax and obstructive and mild straining flow pattern, compatible with BPH with BOO and low detrusor contractility.