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Continuous Telemetric Monitoring of Bladder Function

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Summary. Preliminary investigations with telemetric urodynamic equipment permit us to describe the following indications for this technique: (1) repeated pressure/flow studies, both in obstruction and in experimental work; (2) when urge incontinence is expected on the grounds of the patient's history but standard cystometry reveals a stable bladder; (3) enuresis nocturna and psychogenic voiding dysfunctions; (4) in the therapy of incontinence. Some examples are presented.

Key words: Urodynamics, Telemetry, Cystometry.

Introduction

Cystometry is an essential tool in the evaluation of incontinence or other voiding disorders. In a consecutive series of 450 cystometries we repeated 53 cystometries at 3 to 12 month intervals. No change in the normal or pathological pattern was observed except changes explained by an intervening factor (e.g. medications). Therefore, usually classical cystometry is reliable enough for diagnosis and does not need to be replaced or complimented by more complicated telemetric measurements. However, in some cases a discrepancy exists between the clinical findings and the cystometry. In such cases a prolonged recording of bladder pressure and urine loss in particular circumstances such as walking or jumping or sleeping is required. Since the patients' mobility is hindered during classical cystometry by the numerous recording wires, telemetric measurements become indicated. In this paper we will give some examples of the indications for this technique.

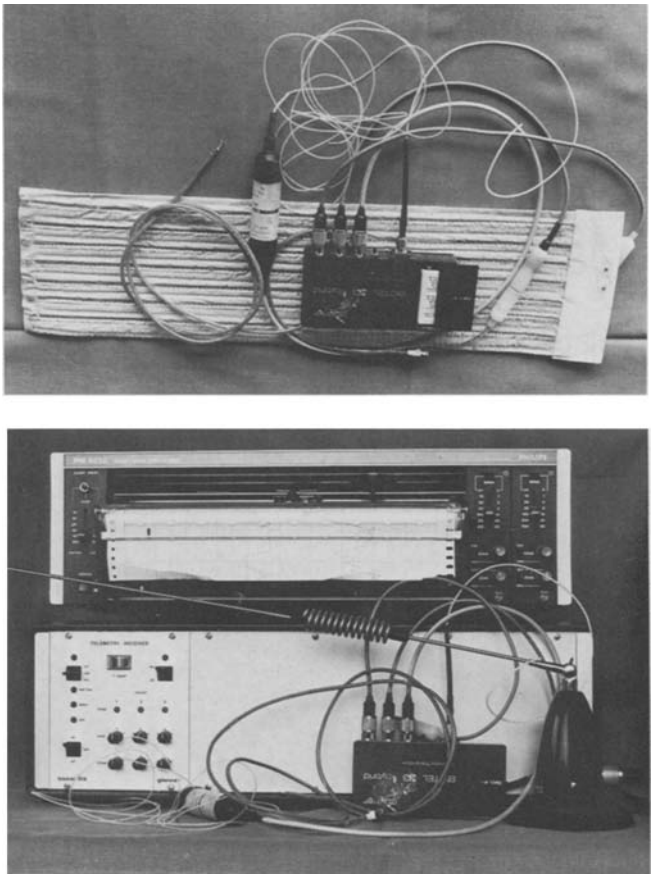

Fig. 1. A Telemetric equipment: two pressure microtransducers and the Urilos napkin connected to the emitter system. **B** Receiver unit and recorder

Methods

A Gaeltec or Philips microtip pressure transducer Charrière 5 is introduced in the bladder through the needle of a cystofix® drainage set. An identical pressure sensor is introduced into the rectum through the anus. The urine loss is monitored by a Urilos napkin connected to a home-made amplifier. The three sensors are connected to a Biotel 33 hybrid telemetric three channel system (Fig. 1). In the voiding studies the Elema flow apparatus is used by which the volume of voided urine is weighed and a calculation per second is performed automatically. The telemetric signals are recorded on a Philips or Goertz recorder running at 12 cm per hour. By a home-made apparatus the speed of the recorder is augmented as soon as a pressure increase of more than 10 cm of water occurs. This permits better analysis of the pressure event.

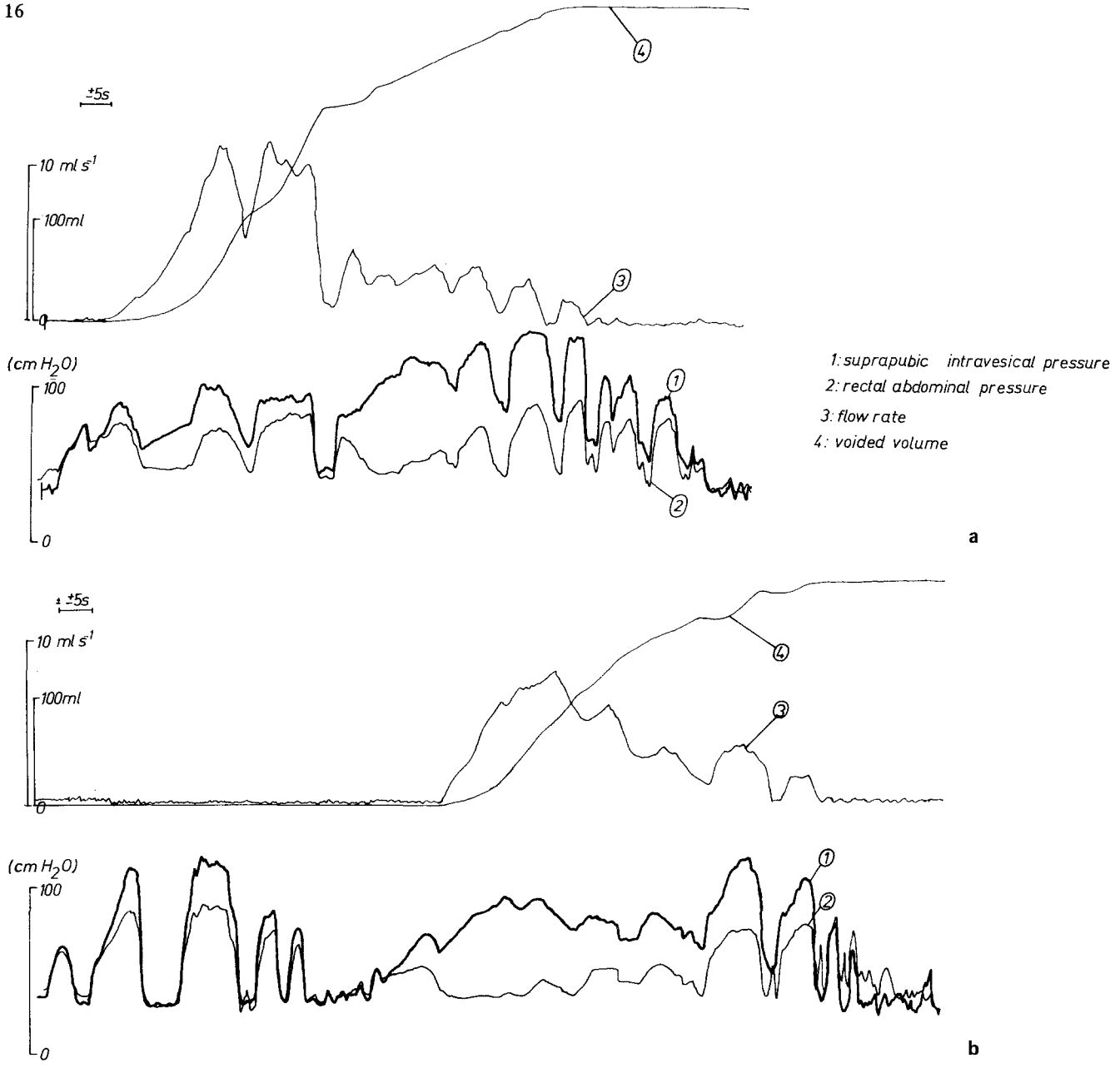

Fig. 2. Example 1. Telemetric recording of total bladder pressure and rectal pressure during two micturitions of nearly the same volumes. a just after bladder neck incision, b 2 days after BN incision

Case Reports

Example 1. A woman 44 years old was intermittently catheterised for more than 2 months because of retention after surgery for stress incontinence. Finally a bladder neck incision at 12 o'clock was made with success. Figure 2a gives the flow curve the first day after this intervention: for a voided volume of about 300 ml, the maximum flow occurs when the total bladder pressure only slightly exceeds the rectal pressure. On the contrary, on the second day, nearly the same volume of urine was voided (Fig. 2b) but this time by a true bladder contraction, while abdominal pressure only helped somewhat at the end of the micturition. Mechanisms involved during micturition may therefore be very variable and repeated examinations in different circumstances are needed.

Example 2. A girl 8 years old with day and night wetting showed the particular custom of sitting on her heels several times a day without obvious reason. Telemetric recording of urine loss (Urilos napkin), bladder and rectal pressure clearly demonstrated that each time she sat on her heels, an uninhibited bladder contraction with urine leakage occurred, which she tried to prevent by vigorous adductor contraction and mechanical perineum compression (Fig. 3).

Example 3 (Fig. 4). A patient 60 years old had major complaints of frequency urgency, rectal tenesmus and dizziness. Classical cystometry revealed bladder overactivity. A continuous telemetric monitoring revealed uninhibited bladder contractions with urgency and urge incontinence, occurring every 1 to $1^1/2$ h, and resulting in voiding (and urine loss) of 30 to 50 ml urine. Furthermore about twice and hour bursts of rectal contractions occurred with a frequency of four to six per minute and an amplitude of 80 cm of water. Further investigations showed that the patient was suffering from Shydräger's syndrome.

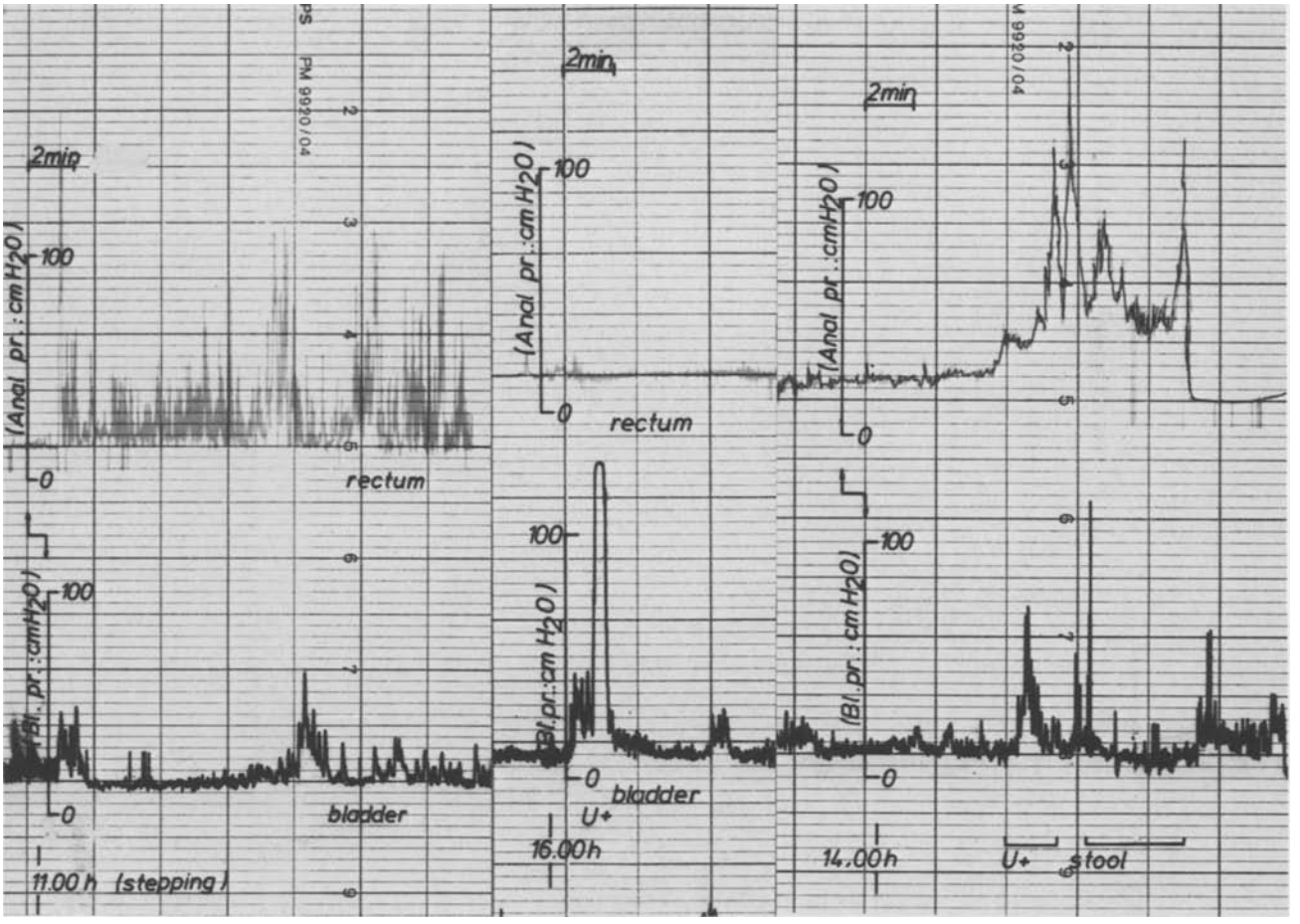

Fig. 3. Example 2. Total bladder pressure and rectal pressure in the same child. a during walking, b during an uninhibited bladder contraction, which it tries to stop by sitting on its heels, c during normal voiding and stool at the toilet

Discussion

The idea of bladder pressure telemetry is not new. Fifteen years ago in a series of papers [2, 3], Gleason and co-workers described electronic devices and indications for this technique. In the gastro-intestinal tract telemetric pH, pressure and temperature pills have already been used in clinical practice [1]. The equipment used in this study is not yet miniaturised enough to be described as a simple device; however, it already allows delineation of the indications for telemetry in urodynamic disorders. Our telemetric transmission of signals to a recorder at a distance from the patient permits reduction in the volume of batteries the patient has to carry, since the power consumption is lower. Another solution can be the use of crystal-controlled pulsed excitation of the transducers as proposed by Wanner et al. [6].

A first indication for the telemetric system are flow studies. In experimental work and in some patients with obstruction it is desirable to calculate urethral resistance from bladder pressure and flow at different volumes, voided without disturbing catheters in the urethra. It is known that many patients cannot void during cystometry because of psychological inhibition. It also permits differentiation of the relative contribution of intrinsic detrusor contraction and externally applied strain for voiding at different bladder volumes and situations (first case report). We found that patients with stress incontinence need little detrusor contraction at volumes above 200 ml to obtain high flow rates.

A second indication for telemetry are certain cases of urge incontinence. It is known that uninhibited bladder contractions characteristic of bladder instability may be absent in the supine position but occur in the sitting or upright position. A still more provocative test is walking or jumping with a full bladder. These provocative situations can be fulfilled by telemetry, which allows plenty of mobility to the patient.

A third specific indication is enuresis nocturna. In some children and young adults cystometry may show a stable bladder with eventually only a slight reduction of capacity. Deep sleeping or epileptiform attacks are often thought to be the cause of the nocturnal incontinence. This situation can be defined by simultaneous measurement of one or two EEG derivations, bladder pressure and urine leakage.

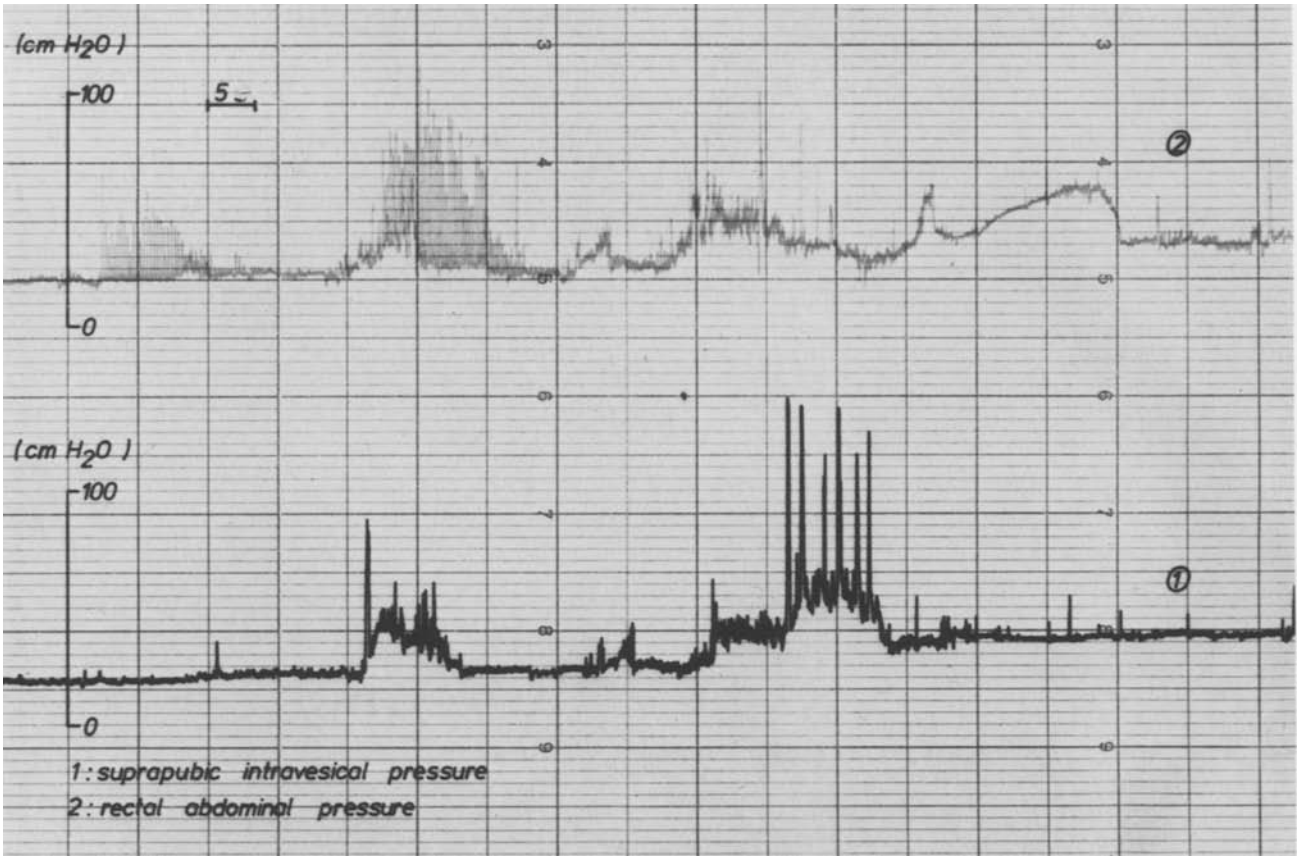

Fig. 4. Example 3. Abnormal rectal contraction, arriving independently from unstable bladder contraction in a patient with Shydräger syndrome

In general a lot of psychogenic voiding problems can be detected by this complex registration technique [4].

A fourth indication is a therapeutic one, which in the near future will become of interest because of the miniaturising of the telemetric equipment. For more than one decade it has been observed that perineal stimulation has only a limited effect because of the rapid fatigue of these muscles. When, however, a maximal electrical stimulus can be applied at the beginning of the upstroke of the pressure, a reflex inhibition of the bladder contraction can be obtained (reflex 6 of Mahony). This allows further bladder filling and sufficient time is gained to reach the toilet before leaking occurs.

A fifth indication is the diagnosis of particular voiding customs. The second case report is a typical example. In the same way it permits differentiation in patients who void very small quantities: urge incontinence or simple bad habits because of the fear of losing urine; the day-time voiding profile gives a precise diagnosis. Similarly, nocturia can also be induced either by pathological factors or by simple insomnia [4].

References

1. Dance B (1981) Inductive loop telemetry from within the body. Electronics Industry 37–39
2. Gleason DM (1964) A study of micturition with electronic measuring devices. Ann NY Acad Sci 118:17–25
3. Gleason DM, Lattimer JK, Bauxbaum C (1951) Bladder pressure telemetry. J Urol 94:252–256
4. Langenkamp O, Steyer M, Heidenreich J (1979) Erste Erfahrungen mit telemetrischer Cystometrie. Fortschr Geburtshilfe Gynaekol 49–52
5. Mahony DT, Laferte RO, Blais DJ (1977) Integral storage and voiding reflexes. Urology 9:95–100
6. Wanner K, Haeussermann G, Eisenberger F, Faust U (1981) 24 hour-monitoring of patients with bladder voiding disturbances. Urol Res 9:187–191

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