

Detrusor Activity at Rest in Patients with Idiopathic Detrusor Hyperreflexia

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Summary. The detrusor activity of the bladder at rest was investigated in the supine position for one hour following instillation of 100 cc of saline in 8 patients with idiopathic hyperreflexia. During the investigation, 5 patients showed bladder hyperreflexia. In 4 cases the activity was accompanied by an increase in the anal sphincter activity, while 1 case showed decreasing sphincteric activity prior to contractions. An analysis of the distribution of the contractions revealed a predominant frequency. The frequency and the amplitude of the detrusor contractions were independent of the bladder volume. Low provocation prolonged cystometry might be a future method of studying bladder activity and bladder pharmacology.

Key words: Bladder activity, Long term cystometry, Hyperreflexia.

Introduction

Cystometry is performed with a tremendous variation in investigational technique from center to center. Accordingly, data obtained during cystometry are conflicting. It is known that the prevalence of uninhibited detrusor contractions depends on the position of the patient during the cystometry [2].

A standardized technique for cystometry has until now not been accepted. This makes it difficult to compare data from center to center. Standardization has on the other hand been established in terms of defining uninhibited detrusor contractions [4].

The questions put forward in the present paper are: to what extent are uninhibited detrusor contractions present at rest in patients with idiopathic detrusor hyperreflexia and what is the nature of contractions and the possible relation to volume and wall tension?

Material and Methods

Eight patients, 6 women and 2 men, mean age 31.8 years (19–50), comprised the material. Prior to the present investigation the diagnosis of the detrusor hyperreflexia according to the ICS standards was established during a full urodynamic investigation where cystometry was performed with water at a filling rate of 60 cc/min.

The study was done with the patients in the supine position. After bladder emptying, 100 cc of saline was instilled into the bladder. The subtracted detrusor pressure and the electromyographic activity from the anal sphincter were then monitored for 1 h. After the measurements, the bladder was emptied for estimation of diuresis.

All bladder contractions above an amplitude of 5 cm H₂O were registered. An analysis was performed of frequency, time relation and relation to baseline bladder pressure.

Results

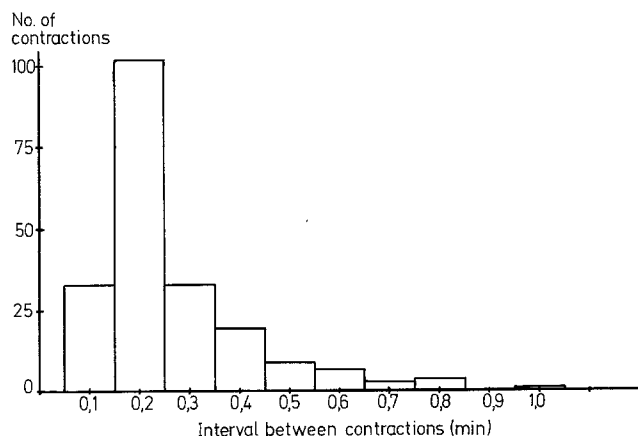
The bladder volume increased during the one hour observation period 100–300% due to urine production (Table 1). The baseline pressure in the bladder was constant in 4 patients, whereas 5 showed a slight pressure increase of 3 to 10 cm H₂O.

Table 1. The changes in volume and baseline pressure in the bladder during the 1 h observation

Patient No.	Volume start ml	Baseline pressure start cm H ₂ O	Baseline pressure end cm H ₂ O	Volume end ml
1	100	10	10	220
2	100	12	17	230
3	100	12	15	360
4	100	5	5	200
5	100	20	30	400
6	100	0	0	200
7	100	2	2	230
8	100	5	10	250

Table 2. Total number and frequency of spontaneous contractions in the bladder

Patient No.	Total number of contractions	Predominant frequency
1	217	5.0
2	53	3.3
3	65	2.5
4	28	2.0
5	16	0.5
6	0	—
7	0	—
8	0	—

**Fig. 1.** Distribution of time interval between contractions in one patient

In 5 patients, detrusor contractions were registered during the observation. They varied in amplitude and duration whereas the configuration was consistent. The onset of the spontaneous contractions showed no significant relation to the bladder baseline pressure. Nevertheless, it was found that in 5 patients an increase in baseline pressure was accompanied by an increase in the frequency of contractions.

No relation was found between bladder volume and frequency of the spontaneous contractions.

Histographic analysis of the distribution of time intervals between the contractions revealed a predominant frequency in each particular patient. This predominant frequency ranged from 0.5 to 5/min (Table 2). An example of the frequency distribution is shown in Fig. 1.

The contractions in 4 patients were accompanied by an increase in the electromyographic activity of the anal sphincter leading to elimination of the contractions (Fig. 2).

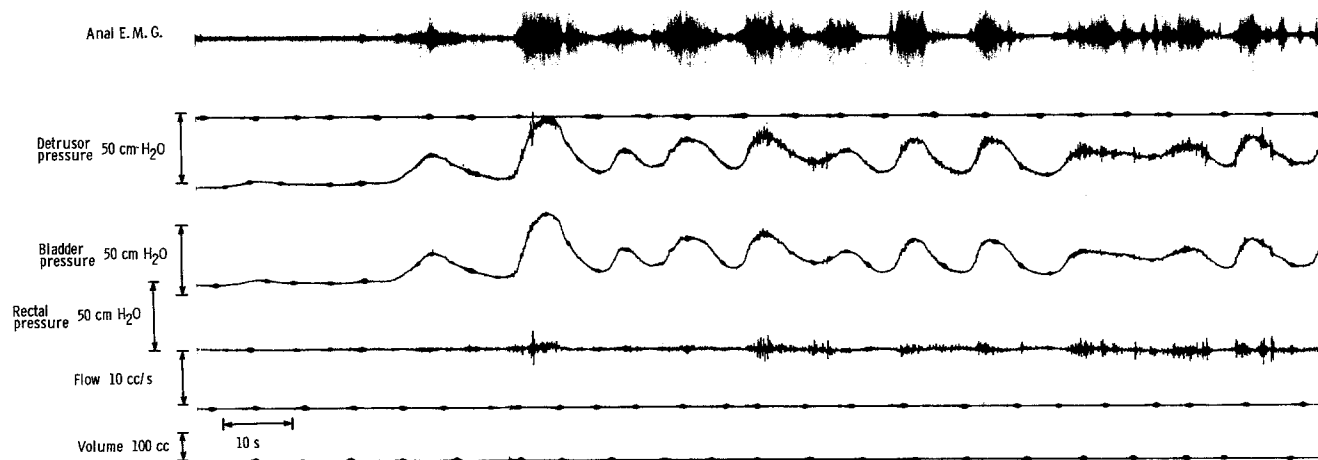
In one patient we found that the electromyographic activity diminished prior to contraction (Fig. 3), apparently giving rise to the contraction.

Discussion

Detrusor hyperreflexia (DH) is a frequent finding in patients referred for voiding abnormalities. Often it can be ascribed to a neurological disease or obstruction, but in many cases the cause is unknown. The incidence is very dependent upon the selection of patients and the diagnostic procedure. It has been shown that the position of the patients during cystometry has a major influence, since an increase in the frequency of hyperreflexia is the resultant of more provocative methods [5].

In the present study the provocation was minimal, solely urine production. The urine production showed great variation in spite of efforts to standardize the patients. The contractions were not found especially in patients with high urine outputs.

International search for standardized terminology has led to the definition of DH limited to detrusor contractions of an amplitude exceeding 15 cm H₂O [4]. In the present investigation contractions showed specific local features in the sense that there was a predominant frequency, a mode. All contractions were similar except for the amplitude and duration, suggesting that the 15 cm H₂O limit will not incorporate all relevant contractions.

**Fig. 2.** The spontaneous activity accompanied by an increase in anal sphincter electromyographic activity

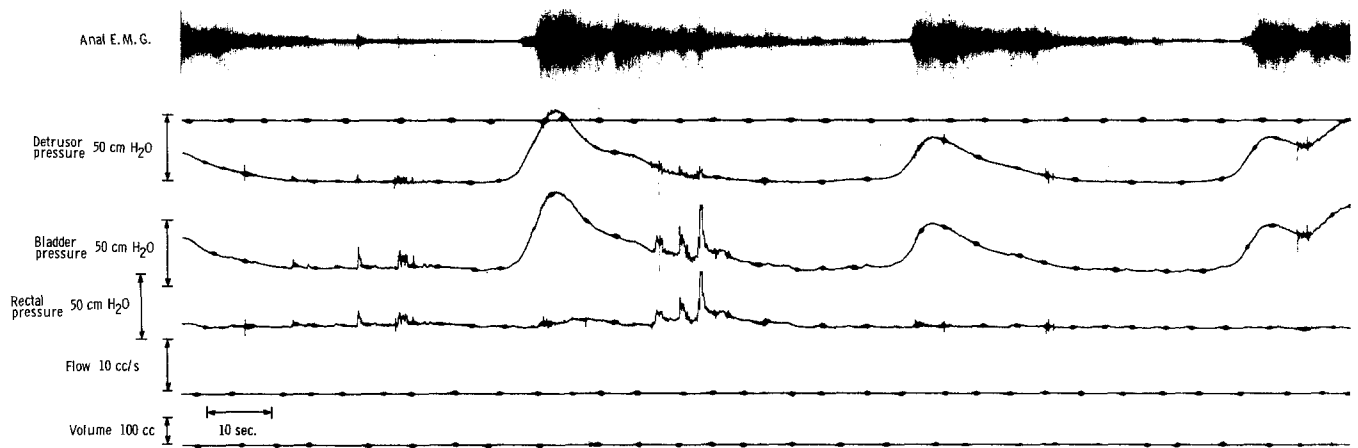


Fig. 3. Diminishing electromyographic activity of anal sphincter prior to spontaneous bladder contraction

The different patterns of pelvic floor activity showed two different ways of favouring continence. In 4 patients with rhythmic contractions, sphincteric activity was found to inhibit detrusor contractility as described by Ostergaard as the urethro-sphincteric guarding reflex.

The finding of cessation of pelvic floor activity prior to bladder contraction in one case is probably an interruption in the continence reflexes.

Some increase in frequency of contractions was observed during increased baseline pressure, i.e. increased bladder wall tension, but no firm correlation was found. This might be due to the slow increase in bladder distension and due to nervous control. The presence of DH has been and is disclosed in patients with supranuclear lesions. Recent investigations of material from bladders exposed to obstruction have shown enzyme defects [3]. It is known that obstruction leads to reversible DH [1], but a relation between DH and enzyme defects has hitherto not been established.

The long-term observation of the patient under stable conditions used in this investigation seems to be a beneficial method of investigating the spontaneous activity of the bladder and might be a future method of investigating bladder pharmacodynamics.

References

1. Andersen JT (1974) Detrusor hyperreflexia in benign infra-vesical obstruction. A cystometric study. *J Urol* 115:532–534
2. Arnold EP (1974) Cystometry – Postural effects in incontinent women. *Urol Int* 29:185–187
3. Gosling JA, Dixon JS (1979) The structure and innervation of trabeculated detrusor smooth muscle. *Proc IX Annual Meeting of ICS* 9:9–13
4. International continence society committee for standardization of terminology of lower urinary tract function. The standardization of terminology of lower urinary tract function (1979) *J Urol* 121:551–554
5. Mayo ME (1978) Detrusor hyperreflexia, the effect of posture and pelvic floor activity. *J Urol* 119:635–638
6. Ostergaard D (1980) *Gynecologic urology and urodynamics. Theory and practice*. Williams and Wilkins, Baltimore London

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