Urodynamics and Incontinence I: The Need for Pressure Flow Studies

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Abstract: The voiding pattern and detrusor contractility of patients with objective stress incontinence were compared with those of controls without abnormalities. The voiding pattern of a patient was qualified by estimating the detrusor pressure and the pressure generated by abdominal straining at maximum flow during voiding. Detrusor contractility was represented by the maximum detrusor pressure built up during a successful attempt to interrupt flow during voiding. It appeared that the contribution of abdominal straining during voiding was significantly higher in the stress-incontinent group compared with the continent group. Also detrusor contractility was significantly lower in the stress-incontinent group. In light of the higher incidence of inefficient voiding patterns seen in the stress-incontinent population and the low detrusor contractility in this group, preoperative urodynamic evaluation including cystometry with pressure flow studies is important for excluding or at least being aware of the possibility of postoperative bladder emptying problems, apart from the need to exclude underlying motor instability.

Keywords: Abdominal straining; Detrusor contractility; Detrusor pressure; Pressure flow studies; Stress incontinence; Voiding pattern

Introduction

Urodynamic investigations of clinically incontinent patients are important and focus on the detection of detrusor instabilities. In motor urge incontinence conservative treatment (e.g. drug treatment, bladder training) is indicated. If underlying motor instability is excluded, a wide variety of surgical procedures to cure stress incontinence have been proposed. Most operative corrections for urinary incontinence restore the urethra to the intra-abdominal pressure environment and may introduce some kind of urethral compression with obstruction. This will interfere with pressure flow relationships during voiding. While the creation of such an obstruction increases the success of restoring continence, it also increases the incidence of complications resulting from postoperative voiding insufficiency due to pre-existing underactive detrusor function [1]. Therefore, it seemed worthwhile to investigate the voiding patterns of stress-incontinent patients and to estimate their bladder contractility in order to exclude or at least be aware of the possibility of postoperative bladder emptying problems. Voiding dysfunction in the female is a more frequent occurrence than is commonly recognized [2]. Even if there is no long-term deliterious effect of postoperative bladder emptying problems it is important – from a planning standpoint and with regard to emotional tolerance of patients following surgery – to be able to inform them of the likelihood of postoperative bladder dysfunction.

The aim of this study was to analyze the voiding patterns and detrusor contractility of stress-incontinent females and to compare the results with those found in continent females, with emphasis on the relevance of preoperative pressure flow studies in the clinical evaluation of stress-incontinent patients.

Materials and Methods

Urodynamic investigations were performed by filling cystometry or by diuresis cystometry and by pressure flow studies during the evacuation phase. Bladder and
rectal pressures were recorded with external stand-mounted pressure transducers. During voiding, the flow rate was recorded by using rotating disc equipment.

From 1750 consecutive patients who were evaluated in the urodynamic department the results of two groups of patients were analyzed:

Group A: 108 females (average age 46.7 years) in whom during the investigation no abnormalities were detected.

Group S: 250 females (average age 49.9 years) in whom genuine stress incontinence was objectified. Women who also showed motor urge with or without incontinence were not included in this group.

All urodynamic investigations were performed by the same person. For both groups the following parameters were collected and studied:

1. The contribution of the abdominal pressure measured by the rectal catheter ($P_r$) and the detrusor pressure ($P_d$) = bladder pressure ($P_b$) - rectal pressure ($P_r$), at maximum flow rate ($F_{max}$) during voiding, in order to quantify the voiding pattern. Data were available of 58 women of group A and 171 patients of group S. The females were classified in one of four categories:

   - Detrusor activity only during voiding (no straining) ($P_r = 0 \text{ cm H}_2\text{O}$). An example is given in Fig. 1.
   - Detrusor pressure during voiding higher than or equal to elevated abdominal pressure caused by straining ($P_d \geq P_r$): voiding is governed for the major part by detrusor contractions. An example is given in Fig. 2.
   - Abdominal pressure during voiding higher than elevated detrusor pressure ($P_d < P_r$): voiding is governed for the major part by abdominal straining. An example is given in Fig. 3.
   - Only abdominal straining during voiding ($P_d = 0 \text{ cm H}_2\text{O}$): voiding is completely governed by abdominal straining. An example is given in Fig. 4.

2. The maximum detrusor pressure ($P_{d,\,max}$) during a successful attempt to interrupt flow during voiding. Data were available of 55 women of group A and 115 of group S. $P_{d,\,max}$ is a measure for detrusor contractility. Patients who showed no detrusor contractions during voiding were excluded.

Statistical analysis of the voiding patterns was carried out by the Fisher–Irwin test for two-by-two tables [3]. Because the distribution of $P_{d,\,max}$ does not resemble normal curves, we estimated the median value of $P_{d,\,max}$ for both groups. The number of patients of group S with values of $P_{d,\,max}$ lower than the median value of group A was estimated. Statistical analysis was carried out by the Fisher–Irwin test for two-by-two tables [3]. The minimum level of significance ($P$-value) was set at 0.05.

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**Fig. 1.** Bladder pressure ($P_b$), rectal pressure ($P_r$), detrusor pressure ($P_d$) and flow ($F$) as a function of time ($T$) during voiding in a 52-year-old woman. Voiding takes place without abdominal straining.

**Fig. 2.** Bladder pressure ($P_b$), rectal pressure ($P_r$), detrusor pressure ($P_d$) and flow ($F$) as a function of time ($T$) during voiding in a 36-year-old woman. Voiding is governed to a major extent by detrusor pressure.