Scandinavian Journal of Urology and Nephrology, 2007; 41: 329–334

informa
healthcare

ORIGINAL ARTICLE

Pelvic floor muscle training before transurethral resection of the prostate: A randomized, controlled, blinded study

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Abstract

Objective. To evaluate the effect of preoperative pelvic floor muscle training (PFMT) in men scheduled for transurethral resection of the prostate (TURP) in a randomized, single-blind study. *Material and methods.* Fifty-eight men with benign prostatic obstruction were included, and 49 completed the study (training group, $n=26$; control group, $n=23$). The preoperative training included a 1-h individual lesson, three 1-h group lessons and a home training programme. Postoperatively and before discharge from hospital both groups received verbal instructions regarding PFMT. Pelvic floor muscle function was assessed by anal examination before and 4 weeks after surgery by one physiotherapist who was blinded to the randomization. The primary outcome parameter was the total score on the Danish Prostatic Symptom Score questionnaire. Secondary outcome measures were other subjective and objective voiding and incontinence parameters and four tests of the pelvic floor muscle: function; strength; static endurance; and dynamic endurance. *Results.* Baseline characteristics were similar in the two groups. Improved static endurance occurred in the training group but not in the control group ($p=0.004$). Regarding dynamic endurance, a difference in favour of training developed between the groups ($p=0.049$). Many men produced results that were outside the test scales. At follow-up at 2 and 4 weeks and 3 months there were no differences between the groups in any of the lower urinary tract parameters. *Conclusions.* Preoperative PFMT produced a significant improvement in pelvic floor muscle endurance after TURP, but clinically relevant storage or voiding improvements did not occur. Pelvic floor muscle assessment tests need to be sex-specific.

Key Words: *Incontinence, lower urinary tract symptoms, pelvic floor muscle training, prostate, physical therapy, transurethral resection of the prostate*

Introduction

Transurethral resection of the prostate (TURP) is regarded as the gold standard for surgical treatment of lower urinary tract symptoms (LUTS) due to benign prostatic obstruction (BPO). Symptoms are often still bothersome on discharge from hospital, and symptom improvement may take weeks or months. One of the risks of the procedure is post-operative incontinence.

Pelvic floor muscle training (PFMT) may improve LUTS and incontinence in females [1,2] and post-prostatectomy incontinence in males [3,4]. In a randomized trial conducted in 2001 [5] a beneficial effect of early pelvic floor rehabilitation after TURP was reported. Subsequently it was shown that prophylactic PFMT during pregnancy or before radical prostatectomy could reduce urinary incontinence after delivery [6] and post-prostatectomy incontinence [3], respectively.

The aim of this study was to prospectively evaluate the effect of preoperative PFMT in men scheduled for elective TURP.

Material and methods

Subjects

Included in the study were fit, ambulatory men with uncomplicated BPO who were scheduled for TURP.

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(Received 29 June 2006; accepted 13 November 2006)

ISSN 0036-5599 print/ISSN 1651-2065 online
DOI: 10.1080/00365590601183584

Exclusion criteria were prostate cancer, previous lower urinary tract surgery and neurological disease. In all, 58 men were recruited between September 2001 and February 2004. Nine men dropped out before intervention, leaving 49 eligible subjects. Four withdrew because training was too time-consuming, one had second thoughts about TURP and four (of the last five randomized patients) were operated in another clinic for administrative reasons (temporarily unacceptably long waiting time). Age and other baseline characteristics are shown in Table I.

Design and randomization

The patients were included by a urologist after giving their informed consent, and randomized to either preoperative PFMT or no training (control group) by the physiotherapist, who also managed the PFMT. Randomization was based on a mathematical table, grouped in blocks of 10 and sealed in envelopes by a person who did not participate further in the study. Another specialized physiotherapist, who was blinded to the randomization, did all the pelvic floor assessment tests before intervention and 4 weeks after TURP. Urological study nurses assessed the subjective and objective voiding parameters preoperatively and at follow-up 2 and 4 weeks and 3 months after TURP. TURP was performed by a total of five urologists.

Intervention

The PFMT programme was modified [7] from a group treatment of stress incontinence in women [1]. Digital anal palpation of the anal sphincter was performed to gain a control correct contraction, ascertain the muscle grade and give feedback to the subjects. The programme was managed by one specialized physiotherapist, and lasted for four consecutive weeks. It consisted of an individual lesson, home exercises and three group treatments.

Individual information. This session lasted ≈1 h and included information on symptoms, duration and experiences of LUTS, anatomy, and physiology of the bladder and PFM, motivation and instruction in home exercises.

Home exercises. These comprised: (i) a PFM strength exercise, which involved performing close to a maximum contraction (6 s contraction/6 s rest); and (ii) a PFM endurance exercise, which involved performing 30% of a maximum contraction (max 30 s contraction/30 s rest) for as long a time as possible. Patients were instructed to repeat the exercise programme gradually six to 10 times in the supine, standing and sitting positions, once or twice daily. The subjects received a new progressive home exercises programme after the weekly lessons, and were motivated to continue home exercises until at least 4 weeks after surgery.

Group treatment. This comprised 1 h of (i) isolated PFM contractions (6 s contraction/6 s rest); (ii) strength exercises (3 s contraction/3 s rest, followed by 6 s contraction/6 s rest); (iii) endurance exercises (maximum 30 s contraction/30 s rest) (all

Table I. Baseline characteristics. Unless stated otherwise, the values are presented in the form median (range).

Characteristic	PFMT group	Control group	*p*
No. of eligible patients	26	23	–
Age (years)	70 (58–77)	68 (52–79)	0.245
DAN-PSS-1			
Symptom score	15 (7–24)	15 (6–22)	0.251
Bother score	17 (8–28)	15 (3–28)	0.482
Total score	28 (10–61)	26 (3–64)	0.476
Urine output per 24 h (ml)	1827 (1023–3187)	1650 (418–3180)	0.733
Voided volume (ml)	165 (50–350)	140 (50–350)	0.258
Frequency (no. of voidings per 24 h)	12 (5–21)	11.7 (5–21)	0.779
Maximum flow (ml/s)	7 (3–15)	7 (1.5–17)	0.871
Residual urine (ml)	116 (0–877)	108 (0–875)	0.912
First sensation (ml)	64 (10–270)	97 (13–238)	0.045
Maximum cystometric bladder capacity (ml)	131 (38–406)	174 (42–338)	–
Unstable detrusor; *n* (%)	22/26 (85)	19/23 (83)	–
Pressure–flow AG number (ml/s)	79.5 (33–170)	76 (22–228)	0.464
Weight of prostate specimen (g)	22 (4–61)	24 (10–58)	0.560
Histology; no. with prostatic cancer	2	2	–
Time from randomization to TURP (days)	42 (18–140)	35 (5–162)	0.325

AG = Pdet.Qmax − 2 Qmax (detrusor pressure at maximum flow rate minus the double maximum flow rate).

three techniques were repeated four to eight times in the supine, standing and sitting positions); and (iv) PFM contractions before and during provocative daily activities such as rising from a sitting position and walking.

The control group underwent no preoperative physiotherapy treatment. Both groups received brief information regarding the anatomy and physiology of the bladder and PFM, and were given verbal instructions about PFMT in the ward 2–3 days after TURP.

Effect parameters

The primary effect parameter was the total score on the Danish Prostatic Symptom Score (DAN-PSS-1) questionnaire after 2 and 4 weeks and 3 months. The total scores on the DAN-PSS-1 questionnaire range from zero to 108, being the sum of the scores for 12 symptoms multiplied by the corresponding bother score for each symptom [8]. The DAN-PSS-1 has been validated [9] and is powerful for assessing treatment results [10]. Secondary parameters were symptom score and bother score, voiding frequency and volume as recorded in a 3-day voiding diary, registration of incontinence and use of UI protection as recorded in the diary (at all follow-ups), leakage in a 24-h pad test (at Weeks 2 and 4) and the four PFM quantification tests.

PFM assessment tests

The test procedures were standardized and involved digital anal examination of the anal sphincter, which was performed by one experienced physiotherapist who was blinded to the randomization and the notes from the first test.

Function. Best of three attempts graded on a four-point ordinal scale [7]: 0 = no PFM contraction; 1 = partial PFM contraction; 2 = PFM contraction + co-contraction with other related muscles; 3 = isolated PFM contraction.

Strength. Best of three attempts graded from zero to five (nil, flicker, weak, moderate, good, strong) on a Danish version of the modified Oxford scale [11–13]. The subjects were instructed to perform a maximal voluntary contraction of the PFM without co-contraction of other related muscles.

Static endurance. This was measured in seconds using a stopwatch. The instruction was to maintain a contraction at 30% of the maximum level for as long as possible. The static endurance was defined as the point of isometric fatigue at which muscle contraction could no longer be maintained at this level.

Dynamic endurance. The maximum number of 6-s PFM contractions performed at 30% of maximum strength with 6-s relaxation periods in between. The dynamic endurance was defined as the number of contractions performed before contraction could no longer be sustained at this force level. The cut-off was 40 contractions.

Statistics

Medians, quartiles and ranges are given where appropriate and the Wilcoxon rank sum test was used to compare the groups. Calculations were done using SPSS version 12.0.1 (SPSS Inc, Chicago, IL). $p < 0.05$ was regarded as significant.

Standards

Terminology, methods, definitions, units and outcome measures conform to standards recommended by the International Continence Society, except where specifically noted [14–16].

Ethics

The study was approved by the ethical committee of Copenhagen County (approval No. KA 01100).

Results

Baseline characteristics were the same in the two groups (Table I and Figure 1).

PFM assessment

Attendance at PFMT sessions was 100% for 24/26 and 75% for 2/26 subjects. The results are presented in Figure 1. All men had good initial PFM function (minimum rating 2), but did not improve to optimal function post-test. Muscle strength was high initially and more than half the patients in both groups achieved the maximum score post-test. Regarding static endurance, a significant improvement of 86% occurred after training ($p = 0.004$). In the control group, there was an insignificant improvement of 12.5% ($p = 0.172$). Dynamic endurance showed a significant difference ($p = 0.049$) between the groups in favour of the training group, with the majority of subjects exceeding the maximum point of the scale.

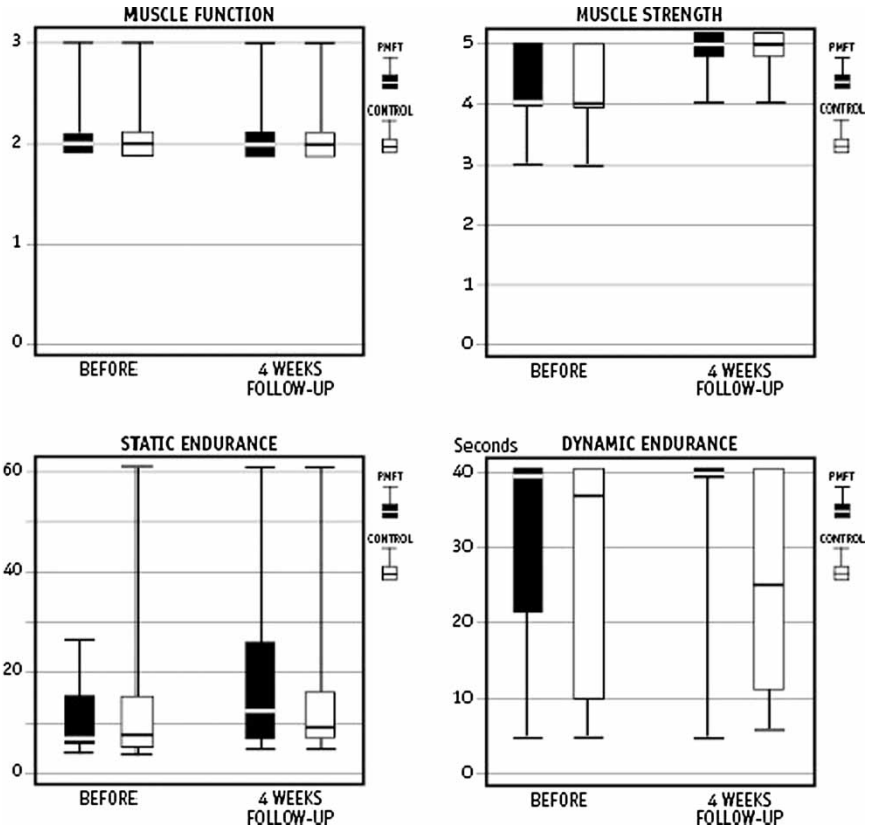

Figure 1. Changes in medians, quartiles and ranges of four digital rectal assessment tests of the PFM before intervention and 22–35 days after TURP.

LUTS

At follow-ups after surgery, no significant differences were found between the groups. Selected parameters are presented in Table II. The total DAN-PSS-1 scores were reduced equally (Figure 2). At 2 weeks, 41 men had improved, and eight were worse. At 3 months, three patients still had a higher score than before surgery.

Discussion

The groups were well balanced with regard to all parameters, and after intervention attendance was high for both treatment and testing.

LUTS

The study confirmed a substantial amount of LUTS in the first weeks after TURP. The frequency of LUTS was partly caused by high fluid intake, which was probably due to inappropriate instructions from the staff. We could not confirm the results reported by Porru et al. [5], who found more rapid improvements in urinary symptoms and quality of life for early PFMT in relation to TURP. Unless a completely different trend arose, enrolling a larger number of patients would not have made a difference in our study. Therefore, a clinically relevant beneficial effect is very unlikely with our preoperative training programme. Prophylactic PFMT has been tested before radical prostatectomy. Bales et al. [17] did not find an effect with biofeedback-assisted PFMT, while in another study Burgio et al. [3] found that a single preoperative session was effective for reducing post-prostatectomy incontinence. In pregnant women, no effect was found after one session [18], while a 12-week programme reduced incontinence 3 and 12 months postpartum [6]. In women with stress incontinence, intensive and supervised programmes have produced better results than self-training programmes [1]. However, for prophylactic purposes, we do not feel that a programme comprising more than four visits is justifiable.

Pelvic floor

This is one of two randomized, controlled, blinded studies evaluating the effect of digital anal-guided PFMT in men scheduled for TURP. The preoperative training programme had a significant effect on PFM endurance. A very large number of the men were at the top of or exceeded the scales used to determine dynamic endurance, function and strength. In 2004, Dorey [19] had the same

Table II. Selected voiding parameters at follow-up. Unless stated otherwise, the values are presented in the form median (range).

Parameter	PFMT group	Control group	*p*
DAN-PSS-1 total score			
After 2 weeks	16 (3–61)	13.5 (0–51)	0.927
After 4 weeks	11 (0–52)	6 (0–37)	0.452
After 3 months	3 (0–24)	4.5(0–51)	0.754
Urine output per 24 h (ml)			
After 2 weeks	1985 (1050–3415)	1887 (583–3557)	0.638
After 4 weeks	1694 (923–3003)	1903 (617–3803)	0.412
After 3 months	1875 (775–3387)	1820 (367–2716)	0.640
Voiding volume recorded in diary (ml)			
After 2 weeks	165.5 (40–250)	127.5 (50–350)	0.563
After 4 weeks	150 (30–250)	150 (50–350)	0.599
After 3 months	200 (50–300)	155 (50–360)	0.510
Frequency of voiding; no. per 24 h			
After 2 weeks	11.85 (7.5–28.3)	13.2 (5.7–20.7)	0.657
After 4 weeks	10.3 (4.3–26.3)	11.3 (6.7–17.3)	0.499
After 3 months	10.0 (6.0–17.3)	10.7 (4.3–19.0)	0.794
Patients who used pads per 24 h; *n* (%)			
After 2 weeks	9/25 (36)	6/21 (29)	–
After 4 weeks	4/26 (15)	4/21 (19)	–
After 3 months	3/26 (12)	5/22 (23)	–
Leakage in pad test (g per 24 h)[a]			
After 2 weeks	1 (0–188)	0 (0–23)	0.656
After 4 weeks	12 (0–374)	4 (0–56)	0.755
Maximum flow (ml/s) after 3 months	16.6 (4.1–47)	16.8 (5.3–36.5)	0.726
Residual urine (ml) after 3 months	22 (0–661)	1 (0–56)	0.127

[a]Only 12 patients in each group. The other patients were continent and refused to do the test.

experience in men with erectile dysfunction and suggested the use of a zero to six scale for digital anal assessment of PFM strength in men. The test scales were developed for vaginal examination in women, and may not translate to anal palpation [12] or to men. In general, men have stronger and better PFM function than women. However, digital anal assessment has been found to be reliable and to have good reproducibility in men [19,20]. In the study of Porru et al. [5] on early PFMT prior to TURP, a urologist with long experience of men assessed PFM strength on a scale of zero to four. He found that PFM strength improved from an average of 2.8 to 3.8 after 4 weeks of training following TURP [5]. In all other studies, the assessment has been made by physiotherapists, who mainly have experience of women.

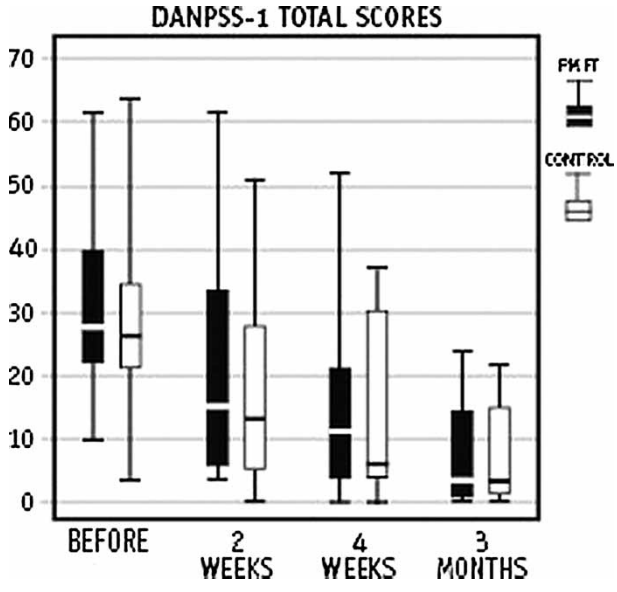

Figure 2. Changes in medians, quartiles and ranges for the total score on the DAN-PSS-1 questionnaire before intervention and at 2 weeks (range 13–21 days), 4 weeks (range 24–35 days) and 3 months (range 84–119 days) of follow-up.

Perspective

This study emphasizes the need for standardized scales for assessing the strength of PFM in men, studies on inter-observer variation and further research into PFMT in men with LUTS and incontinence.

Conclusions

Preoperative PFMT had a significant effect on PFM endurance after TURP, but clinically relevant

improvements in storage or voiding did not occur. PFM assessment tests need to be sex-specific.

Acknowledgements

The authors thank the staffs of our departments for valuable assistance. Financial support was provided by Professor Jens C. Christoffersen's Memory Fund, the Danish Physiotherapists Research Fund, the Aase and Einar Danielson Fund, SCA Hygiene Products A/S, Astra Tech Denmark and Coloplast. The funding sources were not involved in the conduct of the study.

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