

## SUBMAXIMAL PELVIC FLOOR CONTRACTIONS SUPPORT THE BLADDER NECK AND CAN BE MAINTAINED LONGER THAN MAXIMAL PELVIC FLOOR CONTRACTIONS IN HEALTHY AND INCONTINENT WOMEN

### Hypothesis / aims of study

It has been shown that already gentle pelvic floor muscle contractions (PFMC) can elevate the BN and that maximal PFMC excessively increase the intraabdominal pressure (IAP). (1). Theoretically, a submaximal PFMC may support the BN longer e.g. in urgency situations or during lengthy IAP increases and might therefore be helpful in pelvic floor re-education.

The aim of this study was to measure how long submaximal and maximal pelvic floor muscle (PFM) contractions (PFMC) can be maintained with adequate bladder neck (BN) support.

### Study design, materials and methods

We recruited 68 consecutive stress urinary incontinent women (median age 47 years, range (R) 28-77; parity 1, R 0-8). Fourteen continent women served as a control group (median age 31 years, R 21-52; parity 1.5, R 0-3). Exclusion criteria were inability to contract the PFM, previous pelvic floor surgery and prolapse beyond the hymen on POPQ staging.

To evaluate the PFM, a surface EMG electrode was attached to a small soaked sponge and placed intravaginally at the level of the puborectalis muscle. Perineal ultrasound was performed to assess bladder neck and puborectalis muscle elevation which was measured on-screen with the pubic symphysis as the reference point. Surface EMG-electrodes were placed medial to the anterior superior iliac spine to examine the oblique and transverse abdominal muscles. A Microtip transducer was inserted urethrally to measure urethral and vesical/abdominal (IAP) pressures.

Measurements were taken standing with a comfortably full bladder after the first sensation to void had subsided at maximal 300 ml and assembled on one screen with one timeline (Noraxon Tele Myo software). EMG signals were band pass filtered between 30 and 1000 Hz and root mean squares were calculated for the duration of the contraction and averaged over 50 ms for maximal peaks. Women were asked to stand relaxed and then perform a maximum PFMC and maintain it as long as possible. After an appropriate rest, women were asked to perform a submaximal PFMC of about 50% of the maximal PFMC and hold it for as long as they could. Measurements were stopped when PFM-EMG decreased by 50%.

We considered a difference of 30 s between maximal and submaximal PFMC as clinically significant and calculated that 20 women are necessary with a power of 80% and  $\alpha=0.05$ .

### Results

BN position at rest was significantly lower in incontinent women (by 6.5mm;  $p=0.001$ ). A submaximal PFMC was maintained significantly longer than a maximal PFMC in both patients and controls with no differences between groups. Abdominal muscles were significantly more active with a maximal PFMC resulting in significantly higher IAP in continent and incontinent women. The BN descended during a maximal PFMC in 19/64 (28%) of incontinent women and in 4/14 (29%) controls. Data are summarised in Table 1. Fig. 1 shows a recorded example.

### Interpretation of results

When incontinent women and continent controls perform a submaximal PFMC, adequate BN elevation can be maintained for approximately half a minute. In contrast, a maximal PFMC lasts for only 10 s with significant increase in IAP and subsequent BN descent in nearly a third of continent and incontinent women.

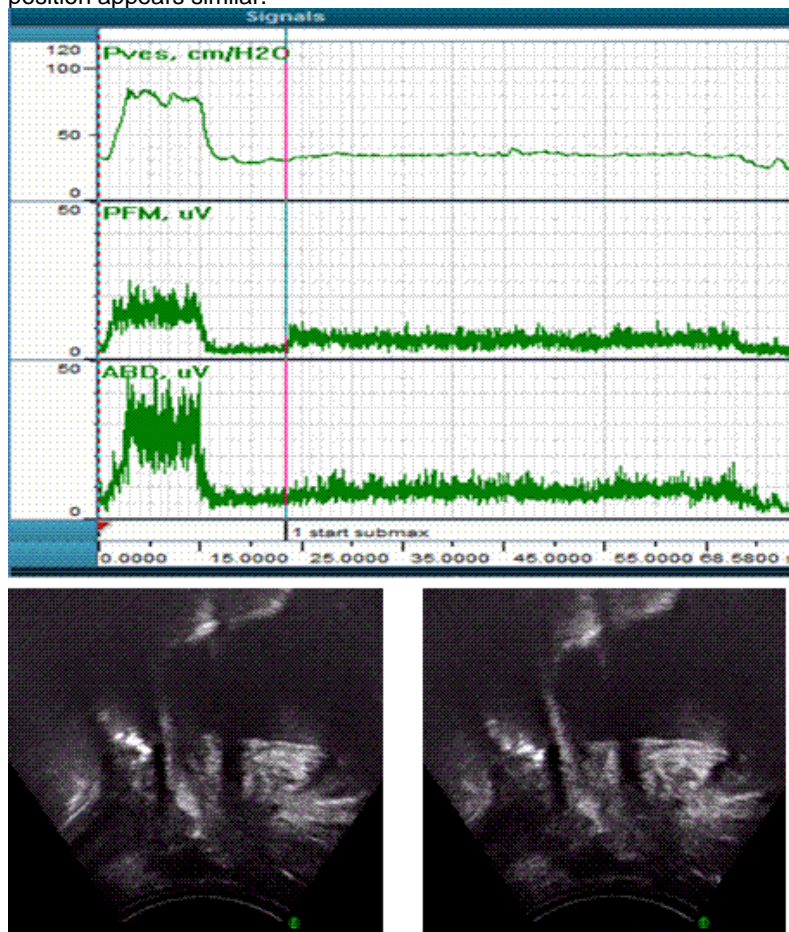
### Concluding message

Training of submaximal PFMC should be helpful in order to oppose longer IAP increases and urgency.

Table 1 Measurements taken at maximal and submaximal PFMC: median (range)

	Continent Controls			Incontinent women			Continent vs. incontinent women	
	Max. PFMC	Submax. PFMC	P	Max. PFMC	Submax. PFMC	P	Max. PFMC P	Submax. PFMC P
<b>Duration of PFMC (s)</b>	10 (2-34)	46 (11-76)	0.002	11 (1-29)	33 (2-73)	<0.001	0.844	0.218
<b>BN Elevation (mm)</b>	4.5 (2.0-12)	4 (2-8)	0.243	5 (0-56)	4 (0-28)	<0.001	0.655	0.528
<b>BN change in height (mm)</b>	3 (1-6)	2 (1-5)	0.031	4 (-7-11)	3 (-1-8)	0.015	0.304	0.127
<b>PR elevation (mm)</b>	8 (3-19)	6 (4-9)	0.024	7 (0-36)	6 (1-46)	0.002	0.594	0.901
<b>PFM-EMG increase (<math>\mu</math>V)</b>	11 (5-95)	7 (2-144)	0.033	11 (1-50)	6 (1-50)	<0.001	0.562	0.220
<b>Abd. -EMG increase (<math>\mu</math>V)</b>	4 (0-51)	0.5 (-2-23)	0.001	9 (-1-157)	3 (-3-106)	<0.001	0.362	0.119
<b>IAP increase (cmH<sub>2</sub>O)</b>	24 (0-110)	9.6 (0-35)	0.002	17 (0-113)	9 (8-68)	<0.001	0.467	0.907

**Fig. 1** Record of vesical pressure, PF and abdominal EMG activity and perineal ultrasound during maximal and submaximal PFMC. Note the PRM muscle behind the rectum. The symphysis-PR-distance is shorter with a maximal PFMC but the BN position appears similar.



#### References

1. Int Urogynecol J. 2010 Jan;21(1):69-77

#### Disclosures

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