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DYNAMOMETRIC EVALUATION OF PELVIC FLOOR MUSCLES FUNCTION IN CONTINENT AND STRESS URINARY INCONTINENT WOMEN

Aims of Study

It has been hypothesized that a strong, fast pelvic floor muscles (PFM) contraction helps to clamp the urethra, thus preventing urinary leakage during abrupt increases in intra-abdominal pressure [1]. Moreover, it has been suggested that PFM help to support the pelvic organs, allowing an optimal position of the urethra for continence [2]. Alterations in PFM seem to be associated with stress urinary incontinence (SUI). The purpose of the study was to compare the PFM function in continent and stress urinary incontinent women using an instrumented speculum [3].

Methods

Eighty-nine women, 25 primipara and 64 multipara, recruited at Ste-Justine Hospital in Montreal were asked if they experienced stress urinary leakage. A 20-minute pad test was performed to confirm continence in asymtomatic women and to appreciate the severity of incontinence in women who had reported leakage. A conventional urodynamic examination was also carried out in incontinent women in order to exclude women who demonstrated uninhibited detrusor contractions. During the measurements, women adopted a supine lying position with knees and hips flexed. Information about contracting their PFM was given and their ability to contract was verified by digital assessment. A physiotherapist using an instrumented speculum carried out the assessment. This reliable instrument has the characteristic of measuring the resultant force independently of its site of application on the branch of the speculum [3]. The dynamometric assessment of the pelvic floor was conducted at minimal opening (5 mm between the two speculum branches) corresponding to the same vaginal aperture as with digital palpation. Three unrecorded practice contractions were performed to ensure that the subjects were comfortable with the device. The PFM strength was evaluated in four different conditions. 1- Women were asked to relax their PFM in order to assess the passive force (baseline value) over a period of 15 s. 2- For the maximal strength trial, subjects were instructed to contract their PFM maximally for 10 s. The subjects were not instructed by the physiotherapist about the rapidity of contraction. 3- To evaluate the speed of contraction, women were instructed to contract maximally and relax as fast as possible during 15 s. The speed of contraction was quantified by the mean rate of force change of the first contraction (slope of the force curve) and the number of contractions they performed. 4- During the endurance measurements, the subjects were asked to maintain a maximal contraction for 90 s. The area under the force curve was utilized as the endurance parameter. Maximal force values were obtained during a maximal strength trial as well as during the conditions evaluating the speed of contraction and endurance. The maximal force value was calculated as the peak force value during the effort minus the baseline value recorded just before the beginning of contraction. Considering the significant differences between the two groups in age ($p<0.001$) and parity ($p<0.035$) at baseline, ANCOVAs were used to control for these confounding variables.

Results

The pad test results corroborated with the reported continence status in all women. Thus, 30 were continent and 59 were diagnosed with SUI. The mean ages were 31.9 years (±5.5 SD) and 36.1 years (±3.6 SD) for continent and incontinent women, respectively. Continent women had a mean parity of 1.7 (±0.8 SD) while incontinent women had 2.1 (±0.8 SD). Incontinent women had urinary leakages of 35.22 g (±55.4 SD) following the standardized pad test. Table 1 shows the PFM function in continent and incontinent women.

Table 1 – PFM function

Conditions	Parameters	Mean (SD)		Significance
		Continent	SUI	
Passive force	Force (N)	2.3 (1.0)	1.1 (1.1)	p < 0.001
Maximal strength	Maximal force (N)	4.5 (2.3)	3.7 (1.8)	p= 0.229
Speed of contraction	Rate of force (N/s)	8.7 (4.5)	5.6 (3.9)	p= 0.012
	Number of contractions (count)	10.3 (3.9)	8.5 (3.0)	p= 0.011
	Maximal force (N)	4.1 (2.6)	3.0 (1.7)	p= 0.058
Endurance	Endurance area under the force curve (N*s)	129.1 (75.3)	81.3 (52.8)	p= 0.001
	Maximal force (N)	4.3 (2.0)	3.2 (1.6)	p= 0.028

Incontinent women demonstrated lower values in passive force, endurance (area under the curve) and speed of contraction (rate of force and number of contractions performed) than continent women ($p<0.05$). Differences between the two groups for maximal force reach the statistically significant level only in the endurance condition.

Conclusions

The PFM function is impaired in incontinent women. Our results suggest that PFM assessments should not be limited to maximal strength. Other physiological parameters of the PFM significantly distinguish between continent and incontinent women. These measurements may prove useful for evaluating the efficacy of conservative treatment and define the underlying changes in PFM function following treatment.

References

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