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RELATIONSHIP BETWEEN ANKLE INCLINATION IN STANDING POSITION AND PELVIC FLOOR MUSCLE ACTIVITY IN CONTINENT AND INCONTINENT WOMEN: PRELIMINARY RESULT FROM A PILOT STUDY

Hypothesis / aims of study

A standing posture including various ankle positions might effectively facilitate pelvic floor muscle (PFM) activity through enhanced pelvic tilt in women with stress urinary incontinence (SUI), and an ankles dorsiflexion at 15° could be the best position to increase PFM activity (PFMa) (1), although it is very uncomfortable. No data are available on healthy female population. We carried out this study aiming at identifying the smallest ankles slant able to significantly affect PFM activity in continent and incontinent women without any subject discomfort.

Study design, materials and methods

A total of 40 women were selected: 20 (mean age 40 years, range 28-49) complained of SUI, and 20 (mean age 26, range 18-35) were healthy volunteers. Exclusion criteria were: musculoskeletal problems; previous major abdominal or pelvic surgery; severe diseases; diabetes mellitus, a body mass index >30 kg/m2; intraureterine device implantation; pelvic organ prolapse, menopause. An electromyographic (EMG) biofeedback instrument using surface electrodes was employed to measure changes in PFMa. During EMG recordings, each subject was asked to perform PFM 5s-contractions while assuming the following different positions: horizontal standing (HS), ankles dorsiflexion standing (DS) at 5° (5DS), 10° (10DS) and 15° (15DS), and ankles plantar flexion standing (PS) at 5° (5PS), 10° (10PS) and 15° (15PS). An adjustable basculant platform was used to passively set the ankle in each position. None of the patients had never been instructed to perform PFM exercises before the enrolment. Resting and maximal PFMa (μV) was recorded as median values and interquartile range (IQR). The Wilcoxon signed-ranks test and the Mann-Whitney test were used to perform comparisons of the different procedures conducted on each subject and between continent and incontinent groups, respectively (P value ≤0.05) .

Results

Continent women were younger than incontinent (p<0.001). Table I shows median values and IQR of resting and maximal PFMa in the different analysed positions in all the selected subjects. Resting PFMa in 15DS showed the greatest value The maximal PFMa in any posture was greater than that during the rest periods (P<0.001). Table II shows the P values of differences in PFMa among the various postures of resting and maximal contractions in both the analysed groups. Concerning the resting PFMa no EMG differences were found in both groups between HS and PS, and between 10DS and 15DS. In SIU women resting PFMa in DS at whatever angle was significantly greater than in both HS (P<0.020) and plantar flexion (P<0.040). Similar results were found in the healthy group, except for 5DS. Concerning the maximal PFMa, no EMG differences were found in continent women changing ankles inclination. In contrast, in SUI women maximal PFMa was significantly higher in 5PS than in both 5DS (P=0.006) and 15DS (P=0.010); and in 10DS than in 15DS (P=0.010).No EMG differences were found between 5PS and 10DS. Median maximal PFMa was always higher in continent women in all the positions, although a statistical significance was reached only in 5DS ans 15DS (Table III).

Table I. median values and IQR of resting and maximal PFM activity (PFMa) in the different analysed positions.

Position	Resting PFMa (IQR)	Maximal PFMa (IQR)	P value
Incontinent women			
HS	32.5 (27.8-39.3) μV	277.8 (148.8-441.0) μV	<0.001
5PS	34.0 (28.0-39.5) μV	315.0 (163.0-454.5) μV	<0.001
10PS	34.0 (25.8-38.3) μV	300.8 (174.3-421.8) μV	<0.001
15PS	35.0 (31.5-45.3) μV	315.0 (184.1-387.3) μV	<0.001
5DS	41.5 (34.0-54.8) μV	273.3 (154.0-331.3) μV	<0.001
10DS	45.5 (35.3-58.3) μV	261.0 (191.6-351.9) μV	<0.001
15DS	51.5 (37.0-66.5) μV	232.3 (155.1-305.0) μV	<0.001
Continent women			
HS	26.0 (20.0-37.8) μV	371.8 (279.3-522.0) μV	<0.001
5PS	27.5 (20.5-32.3) μV	414 (261.9-671.6) μV	<0.001
10PS	28.0 (20.8-30.8) μV	351.3 (320.3-571.0) μV	<0.001
15PS	27.0 (23.0-43.0) μV	377.5 (291.0-504.8) μV	<0.001
5DS	34.5 (25.8-44.0) μV	376.3 (303.8-534.5) μV	<0.001
10DS	42.0 (34.0-53.3) μV	353.5 (257.8-436.0) μV	<0.001
15DS	45.5 (37.5-52.0) μV	331.0 (288.6-510.5) μV	<0.001

Table II. P values of differences in median resting and maximal PFMa among the various postures in both the analysed groups. *Statistical significance

Incontinent group	Resting PFMa	Maximal PFMa	Continent group	Resting PFMa	Maximal PFMa
HS-5PS	0.80	0.60	HS-5PS	0.80	0.50
HS-10PS	0.80	0.50	HS-10PS	0.80	0.70
HS-15PS	0.40	0.80	HS-15PS	0.60	0.50
HS-5DS	**0.020***	**0.050***	HS-5DS	0.10	0.90
HS-10DS	**0.020***	0.30	**HS-10DS**	**0.002***	0.20
HS-15DS	**0.006***	0.060	**HS-15DS**	**0.002***	0.60
5PS-10PS	0.70	0.80	5PS-10PS	1.00	0.20
5PS-15PS	0.40	0.50	5PS-15PS	0.50	0.09
10PS-15PS	0.10	0.10	10PS-15PS	0.09	0.90
5DS-10DS	0,50	0.060	5DS-10DS	0.07	0.40
5DS-15DS	**0.030***	0.70	5DS-15DS	0.10	0.90
10DS-15DS	0.10	**0.010***	10DS-15DS	0.40	0.40
5PS-10DS	**0.004***	0.40	**5PS-10DS**	**0.004***	0.10
5PS-5DS	**0.007***	**0.006***	5PS-5DS	0.09	0.20
5PS-15DS	**0.001***	**0.010***	**5PS-15DS**	**0.002***	0.20
10PS-5DS	**0.040***	0.070	**10PS-5DS**	**0.02***	0.60
10PS-10DS	**0.002***	0.40	**10PS-10DS**	**0.006***	0.40
10PS-15DS	**0.001***	0.060	**10PS-15DS**	**0.001***	0.40
15PS-5DS	0.080	**0.050***	15PS-5DS	0.06	0.70
15PS-10DS	**0.050***	0.20	**15PS-10DS**	**0.03***	0.30
15PS-15DS	**0.006***	**0.004***	**15PS-15DS**	**0.008***	0.60

Table III. Significant differences in median resting and maximal PFM activity among continent and incontinent groups.

	5PS median resting PFMa (IQR)	5DS median maximal PFMa (IQR)	15DS median maximal PFMa (IQR)
Incontinent	34.0 (28.0-39.5) μV	273.3 (154.0-331.3) μV	232.3 (155.1-305.0) μV
Continent	27.5 (20.5-32.3) μV	376.3 (303.8-534.5) μV	331.0 (288.6-510.5) μV
P value	0.050	0.020	0.020

Interpretation of results

In DS the pelvis tilts anteriorly, resulting in the pelvic outlet increasing, the coccyx movement in a backward and upward direction, and the closure of the urethra, bladder neck, and suburethral vaginal wall, with urethral support elevation. This pelvic statics modification might explain a greater resting PFMa in DS. In PS, the pelvis tilts posteriorly, the promontory moves superiorly and posteriorly, and the tip of the coccyx moves anteriorly resulting in a weakening of vaginal wall lateral attachments with a reduction only of the resting PFMa.

Concluding message

These preliminary results show that 10DS has comparable effects on resting PFMa than 15DS with same effectiveness and less patient's discomfort, facilitating a better maximal contraction. Moreover in incontinent women a slight ankles plantar flexion might effectively facilitate maximal PFMa.

References

1. Urology (2005) 66; 288-292.

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