63

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VALSALVA VERSUS STRAINING: THERE IS A DIFFERENCE IN RESULTING BLADDER NECK DESCENT AND PELVIC FLOOR ACTIVATION

Hypothesis / aims of study
The originally described Valsalva manoeuvre is performed as a patency test of the Eustachian tubes with forcible exhalation against a closed mouth and nose. Presumably, people trying to equalize pressure in a plane activate a different pattern compared with people straining for defaecation. These different activations have recently been described using MRI in a small number of women showing activation of the PF during Valsalva but PF descent during straining. (1)
The aim of this study was to assess the effects of the classical Valsalva manoeuvre and straining on bladder neck (BN) and puborectalis (PR) position, BN stiffness and pelvic floor (PF) activation in healthy continent and urinary incontinent women.

Study design, materials and methods
We recruited 17 healthy continent women and 67 women with urinary incontinence, predominantly stress urinary incontinence. All completed a validated Pelvic Floor Questionnaire and underwent POPQ-staging. Women with previous PF surgery and those with prolapse beyond the hymen were excluded.
A Microtip transducer was inserted urethrally to measure urethral and vesical/abdominal pressures. To record PF activity, an electrode attached to a small sponge was placed intravaginally at the level of the puborectalis muscle. Perineal ultrasound was performed to assess BN and PR muscle movements and measured on-screen. Ventrocranial changes in position were labelled as a positive vector, dorsocaudal displacements as negative. Position and height of the BN and PR were measured from a horizontal line with the dorsal edge of the pubic symphysis as the reference point. Stiffness of the BN and the PR was calculated by dividing the increase in vesical pressure by the descent of BN and PR during Valsalva and straining.
All measurements were taken with a comfortably full bladder at 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. Women were standing and asked to perform a Valsalva against a closed mouth and glottis. After a short break, women were instructed to relax the pelvic floor and strain or push as if defaecating.
Based on data from (1), our power calculation showed that 24 women were necessary to demonstrate a difference of 5 mm in pelvic floor descent between Valsalva and straining with a power of 80% and $\alpha=0.05$.

Results
Continent women were aged 21 - 52 (median 33), incontinent women 28 - 83 (median 49). Parity ranged between 0 - 3 (median 2) in continent and 0 - 8 (median 2) in incontinent women.
All women understood the tasks, although 7% of continent and 28% of incontinent women were unable to relax the pelvic floor during straining (p <.001). During Valsalva, 53% of continent and 41% of incontinent women demonstrated a PF activation (p=.418), whereas during straining only 30% and 28%, respectively, activated the PFM (p=0.52).
Table 1 summarises data and Fig. 1 shows an example. With a Valsalva, the puborectalis muscle was stiffer, the distance to the pubic symphysis shorter and the position higher in relation to the symphysis. Especially in incontinent women, the bladder neck descended more with straining.

Interpretation of results
Valsalva and straining are different tasks with different PF activation patterns. The PF is stiffer with Valsalva resulting in better BN support whereas straining leads to more PF and BN descent.

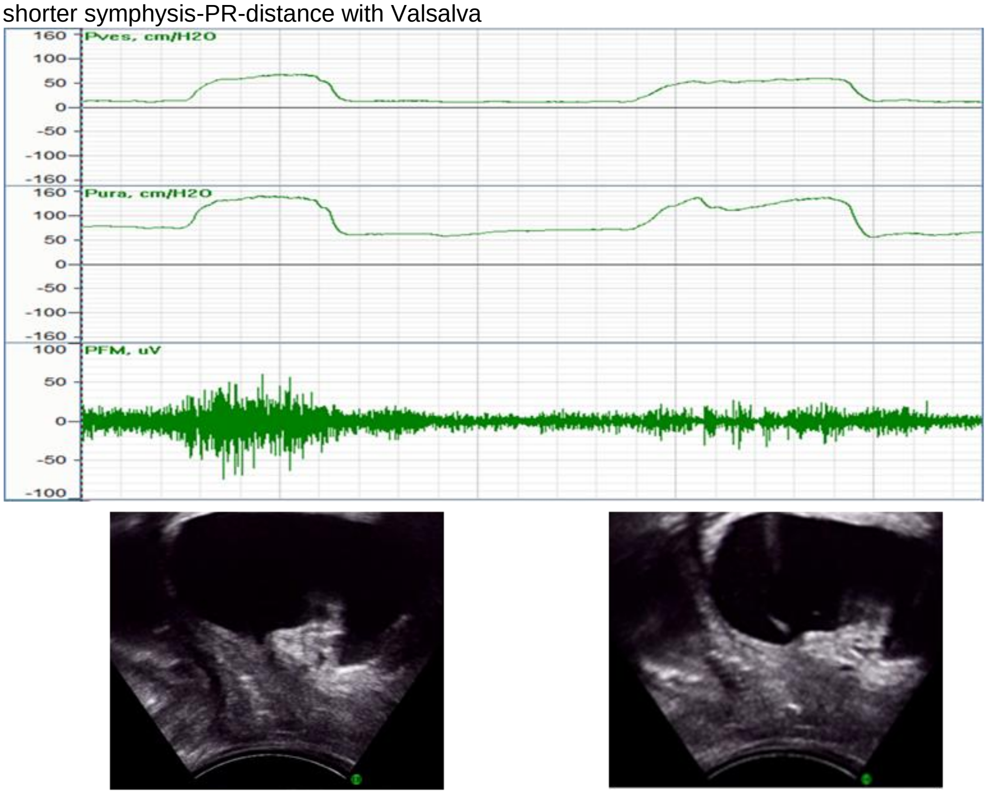
Concluding message
The terms “Valsalva” and “straining” should not be used interchangeably and patients have to be instructed carefully during urogynaecological or physiotherapeutic assessment.

Table 1: Measurements during Valsalva and straining in continent and incontinent women: median (range). Statistics: Wilcoxon or Mann-Whitney-U test as appropriate

	Continent women			Incontinent women			Continent vs. incontinent women	
	Valsalva	**Strain**	**P**	**Valsalva**	**Strain**	**P**	**Valsalva P**	**Strain P**
BN Stiffness (mm)	10.5 (3.1, 56.0)	4.9 (1.8, 43.0)	.149	7.0 (1.0, 69.0)	5.4 (0.2, 67.0)	<.001	.269	.954
PR Stiffness (mm)	14.0 (2.4, 67)	4.8 (1.7, 79,0)	.015	10.2 (2.5, 100)	5.4 (0.5, 73.0)	<.001	.656	.664
BN height diff (mm)	-2 (-21, 4)	-7 (-14, 1)	.009	-4 (-2, 6)	-9 (-32, 9)	<.001	.075	.084
PR height diff (mm)	-2 (-13, 12)	-8 (-18, 3)	.002	-4 (-24, 9)	-8 (-26, 11)	<.001	.298	.958
BN vector (mm)	4 (1, 19)	8 (1, 19)	.043	5 (1, 21)	11 (1, 6)	<.001	.247	.097
PR vector (mm)	3 (1, 17)	8 (1, 24)	.002	4 (1, 24)	9 (1, 34)	<.001	.656	.589

PF EMG diff (□v)	4 (1, 23)	3 (-5, 45)	.345	3 (-6, 54)	1 (-14, 39)	.002	.367	.332

Fig. 1 Record of urethral and vesical pressures, PF-EMG and perineal ultrasound during Valsalva and straining. Note the shorter symphysis-PR-distance with Valsalva



References
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