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RAISING THE TONE: A PROSPECTIVE OBSERVATIONAL STUDY EVALUATING THE EFFECT OF PELVIC FLOOR MUSCLE TRAINING ON BLADDER NECK MOBILITY AND ASSOCIATED IMPROVEMENT IN STRESS URINARY INCONTINENCE

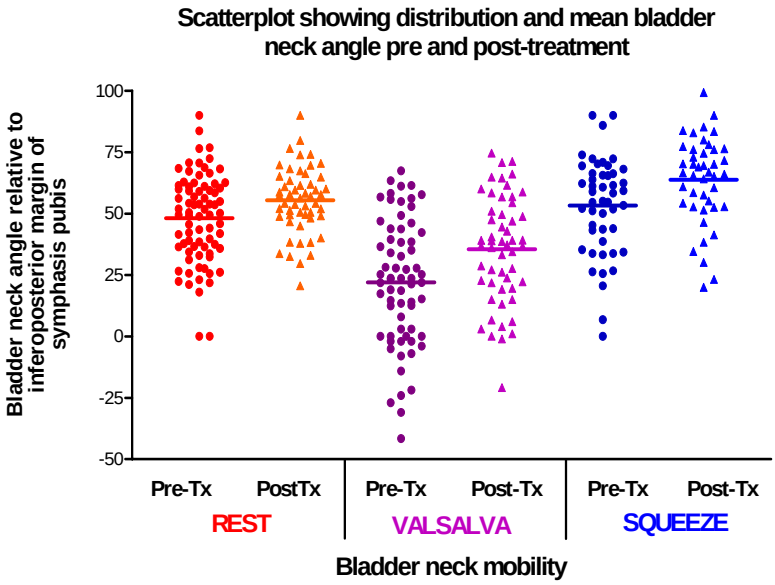
Hypothesis / aims of study

Pelvic floor muscle training (PFMT) has been demonstrated in a number of randomised controlled trials to be effective in the treatment of stress urinary incontinence. Several theoretical rationales have been proposed to explain the efficacy of PFMT [1]. The purpose of this study was to assess the impact of PFMT on bladder neck mobility and to correlate any observed changes to objective, standardised outcome measures of stress urinary incontinence severity.

Study design, materials and methods

Local ethics committee approval was obtained prior to commencing the study. Women were recruited prospectively over a three year period. The study population comprised 97 treatment naïve women (mean age=49.5, SD=10.6) drawn from patients referred to a tertiary centre with symptoms of stress urinary incontinence and subsequently diagnosed as having 'mild' to 'severe' urodynamic stress incontinence on videourodynamic assessment.
An intensive, 14 week programme of 'pelvic floor rehabilitation' consisting of an individualised PFMT programme and behavioural modification was taught, administered and monitored by an expert physiotherapist, as part of a large prospective trial evaluating PFMT.
Bladder neck mobility on perineal ultrasound was assessed immediately prior to, and on completion of the 14 week programme. Analysis was performed by using calliper tracing and an x-y coordinate system [2] to calculate the angle of bladder neck rotation, with 0 degrees defined from the inferoposterior margin of the pubic symphysis. An initial scan was performed at rest and several subsequent scans performed to measure maximum bladder neck displacement with valsalva and maximum elevation on pelvic floor squeeze. Maximum excursion and incursion were taught by use of biofeedback. Using the real-time ultrasound image, the women were coached to produce consistent maximum movement over several attempts.
Treatment outcome was assessed using a standardised pad test (bladder volume 250mls with a 30 min exercise programme) and a condition-specific validated Quality of Life questionnaire: The Kings Health Questionnaire (KHQ).

Results



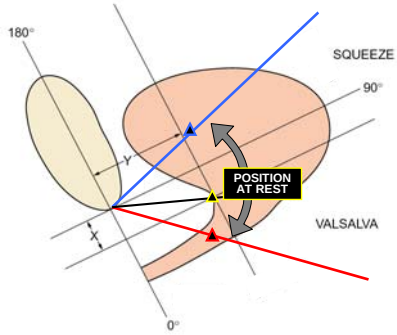


TABLE 1: Changes In Bladder Neck Angle Pre and Post-PFMT

Bladder neck angle (Relative to inferoposterio margin of symphysis pubis)	pre-PFMT		post-PFMT		Mean of diff.	P value *(Paired-t test)*
	Mean	95% CI	Mean	95% CI		
At Rest	48.1°	44.0 52.1	55.4°	51.7 59.1	-6.6	**0.009**
Maximum Valsalva	22.3°	16.1 28.5	35.2°	29.1 41.4	-11.7	**0.002**
Maximum Pelvic Squeeze	53.3°	47.6 58.9	63.7°	58.3 69.1	-8.4	**0.013**

TABLE 2: Changes in Pad test and KHQ Domains Pre and Post-PFMT

Parameter		pre-PFMT		post-PFMT		P value *(Wilcoxon Signed Rank)*
		Mean	95% CI	Mean	95% CI	
Pad test (g)		12.2	8.25 - 16.1	5.44	2.64 - 8.24	**<0.001**
KHQ DOMAINS	**GHP (%)**	27.7	24.3 - 31.0	26.8	22.7 - 30.9	0.413
	II (%)	57.4	51.9 - 62.8	43.8	38.0 - 49.6	**<0.001**
	RL (%)	37.6	31.1 - 44.0	19.6	14.4 - 24.7	**<0.001**
	PL (%)	42.7	37.3 - 48.1	30.5	25.2 - 35.7	**<0.001**
	SL (%)	18.2	12.9 - 23.6	10.7	6.76 - 14.6	**0.009**
	PR (%)	23.8	16.7 - 30.9	19.4	11.8 - 27.0	0.736
	E (%)	33.5	28.0 - 38.9	26.6	21.1 - 32.2	**0.006**
	SE (%)	35.2	30.2 - 40.1	30.5	25.8 - 35.1	**0.023**
	SM (%)	45.7	40.4 - 51.1	42.5	36.6 - 48.3	0.321

Interpretation of results

The position of the bladder neck was observed to be significantly elevated at rest, valsalva and squeeze on post-treatment assessment. Interestingly, the magnitude of the bladder neck incursion observed at 'maximum squeeze' and excursion at 'maximum valsalva' was found to increase and decrease respectively, compared to pre-treatment values. This suggests that PFMT brings about an increase in the resting tone of the pelvic floor in addition to improving elevation on voluntary contraction and reducing displacement on straining. Pad test leakage and six out of the nine KHQ domains were significantly improved, following treatment. However, there was no significant correlation between the reduction in individual women's pad loss and any of the ultrasound parameters measuring changes in bladder neck mobility. This perhaps reflects the likelihood that improved levator resting tone and increased support of pelvic viscera is not the only mechanism by which urinary leakage is reduced and QoL improved. There are several other potential factors that may be significant. These include, hypertrophy of the levators leading to modified muscle morphology, an improvement in neuromuscular function and behavioural adaptations leading to voluntary contraction of the pelvic floor before and during increases in intra abdominal pressure – "The Knack" [3].

Concluding message

Treatment with a 14 week intensive package of PFMT and behavioural modification resulted in a statistically significant elevation of the bladder neck at rest, maximum pelvic floor contraction and maximum valsalva. This is associated with a statistically and clinically significant reduction in urine loss and improvement in condition-specific Quality of Life. The results of this study reinforce previous published work showing that PFMT is an effective treatment for stress urinary incontinence and provide an important new insight into how functional pelvic anatomy may be modified by this widely used intervention.

References

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