459

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MOTOR SKILL TRAINING OF THE PELVIC FLOOR MUSCLES USING VISUAL VERSUS TACTILE FEEDBACK

Hypothesis / aims of study

Recent research has shown ultrasound imaging of the pelvic floor using transabdominal ultrasound to be a valid and reliable tool for visualising and measuring pelvic floor muscle activity (1). The aim of this study was to investigate the effectiveness of transabdominal ultrasound as a visual biofeedback tool in motor skill training of the pelvic floor muscles in older women with urinary incontinence.

Study design, materials and methods

Female subjects aged between 60 and 85 years with symptoms of urinary incontinence were recruited from an Aged Care Continence Service for this study. Ethics approval was gained from the participating institution and all subjects gave written consent. All subjects completed a general health and urinary symptoms questionnaire. Subjects (n=22) were randomly assigned to 4 visits over 10 weeks of either conventional physiotherapy using digital vaginal palpation (PV) or ultrasound biofeedback (US). Vaginal palpation is the standard method of assessing pelvic floor muscle function and providing feedback about a correct contraction. This method relies on the subject having intact sensation for maximum efficacy of feedback. Ultrasound visual feedback was provided through imaging the pelvic floor contraction using a Logiq Book ultrasound machine (GE Medical, USA). Ultrasound allows visualisation of pelvic floor muscle contraction. Feedback was provided to both groups at a level of 100% on the first occasion. Thereafter the PV group had no further tactile feedback via palpation. The US group were provided with visual feedback on subsequent occasions in a decreasing schedule, fading to 0% by the fourth session.

The outcomes measures were 1) the volume of urine lost using a 24 hour pad weigh test, 2) total leakage episodes per week using an accident dairy, 3) displacement of the pelvic floor as imaged on transabdominal ultrasound 4) and at baseline and follow-up only, quality of life using King Health Questionnaire. Compliance with the exercise program and treatment advice was recorded using an exercise diary. Outcomes were measured pre-intervention, post- intervention and at 3 month follow-up. Results are presented as median (range) as the data were not normally distributed. Wilcoxon signed rank test was used to examine the data within each group and Mann Whitney *U* test for between group analysis.

Results

Both groups were similar at baseline on all measures. There were no significant differences between the vaginal palpation and ultrasound groups on all outcome measures at the end of the intervention or at the 3 month follow-up (Table 1). However the ultrasound group had a significant reduction in the median number of leakage episodes reported per week from baseline to the 3 month post-intervention follow-up assessment {9 (2-18) to 4 (0-8), p=0.002}.

Table 1.

	US group (n=11) T3		**PV group (n=11) T3**		**Significance**
	Median	**Range**	**Median**	**Range**	**Mann Whitney *U***
PWT (gm)	0.3	0.0 – 20.2	0.5	0.0 –102.0	NS, p=0.428
AD (number)	4.0	0.0 - 8.0	2.0	1.0 - 15.0	NS, p=0.868
US (cm)	0.71	-0.27 -1.38	0.68	-0.31–1.30	NS, p=0.921

PWT= pad weight, **AD**=accident diary, **USD**= ultrasound displacement
T3= 3 months follow-up

There were no significant differences in all domains of Kings Health questionnaire between PV and US groups at baseline or 3 month post-intervention follow-up. No significant differences were found in compliance to the home exercise routine between the two groups (PV 63.4% vs US 76.8%, p=0.28). Neither were significant differences found in the self-reported application of home advice (mean PV 7.2 vs US 8.5, p= 0.50) or in home PFM exercise intensity (mean PV 8.0 vs US 9.4, p = 0.10), measured using a VAS.

Ultrasound was accepted by the participants at each consultation, whereas those in the PV group declined further vaginal palpation after the first consultation.

Interpretation of results

The participants in this study had more severe incontinence that that reported in younger cohorts. These participants were characterised by smaller ultrasound displacements during pelvic floor muscle contractions compared to those in younger parous women, indicating that they had compromised pelvic floor muscle function. Factors such as a lifetime of poor voiding habits, lack of education regarding pelvic floor muscle function, and pelvic neuropathy following childbirth and surgery, can lead to a poor internal representation of these muscles in the brain and lack of awareness of their function. Visual feedback can provide important information using a different feedback pathway than tactile feedback, to complement the sensory information arising from pelvic floor muscle contraction. Using this visual feedback, participants in the US group were able to 'get the idea' of the movement more easily than those given only tactile feedback. Ultrasound biofeedback may therefore be a very useful tool for retraining pelvic floor muscle function in those with severe incontinence and deficient sensation in particular. Because it is non-invasive and therefore very

well accepted by patients, ultrasound could be used more frequently to aid motor learning of pelvic floor muscle function.

Concluding message

The results of this study show that ultrasound visual feedback was as effective as vaginal palpation tactile feedback in motor skill training of pelvic floor muscles in older women with urinary incontinence.

1. 2005 Australian Journal of Physiotherapy 51:3 167-170

FUNDING: NONE
DISCLOSURES: NONE
CLINICAL TRIAL REGISTRATION: This clinical trial has not yet been registered in a public clinical trials registry.
HUMAN SUBJECTS: This study was approved by the Austin Health, Bundoora Extended Care and followed the Declaration of Helsinki Informed consent was obtained from the patients.