A Comparison of Two Methods of Neuromuscular Electrical Stimulation Delivery on Pelvic Floor Muscle Contraction in Healthy Subjects

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PURPOSE/HYPOTHESIS

Pelvic floor exercises (PFE) are recommended as primary intervention for women with stress urinary incontinence (SUI). Since few women can volitionally perform PFE via verbal instruction transvaginal neuromuscular stimulation (NMES) is frequently used adjunctively. To the knowledge of the authors, no prior research has examined the effects of subject position during NMES on PFM contraction. The purpose of this study was to compare the effects of two different methods of NMES delivery to PFM.

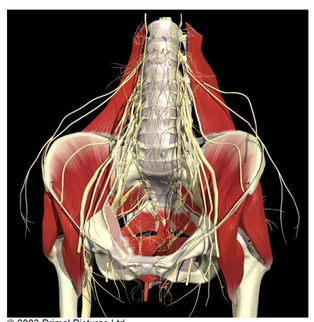
SUBJECTS

Seven healthy nulliparous female participants aged 23-30 were recruited for this study. The protocol order was randomly assigned and participants were tested on two separate occasions with a minimum of a 24 hour wash-out period between sessions. Prior to testing, each participant completed a bladder filling protocol to allow for delineation of the bladder from the pelvic floor fascia and associated PFM.

Inclusion	Exclusion
English speaking	History of abnormal papanicolaou smear or
20-45 years of age	hysterectomy
Nulliparous	Current or past pregnancy
female	Current smoker
	Current or prior history of cancer
	Current infection
	Recurrent urinary tract infections
	Diabetes
	Implanted metal device (e.g. pacemaker)

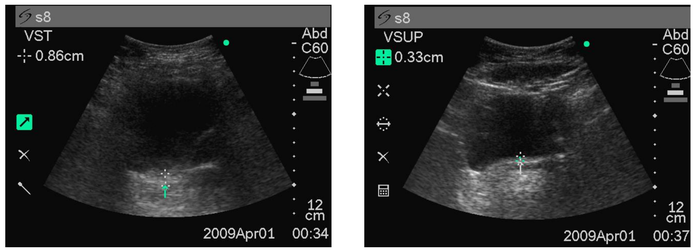
MATERIALS/METHODS

Two methods of NMES delivery were used. One method used a conventional unit and a vaginal electrode with a stimulation area of 2.31cm2. The other method used a novel investigational device using external electrodes with a stimulation area of 1526cm2. PFM contraction was assessed with sonography using a 3.5MHz curvilinear array transducer in the transverse plane. The amount and direction of bladder displacement was assessed during volitional contractions and NMES to the PFM in supine and standing

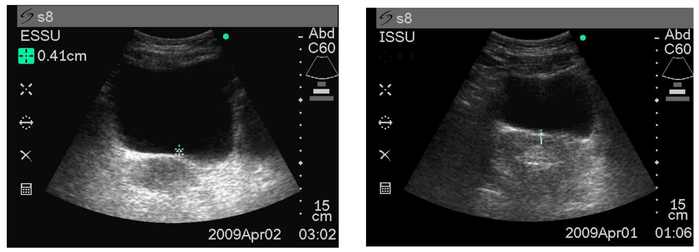


RESULTS

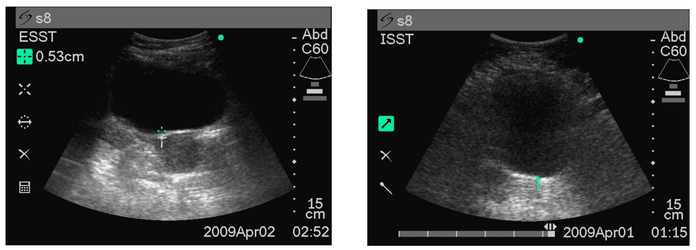
During volitional contractions, participants were found to have greater cranial displacements while in standing when compared to supine. In the standing and supine positions, greater cranial displacements were seen for the externally delivered NMES versus the transvaginal NMES. Sonographic imaging showed that only one participant displayed a PFM contraction with transvaginal NMES despite all subjects describing the sensation of a contraction. When comparing the external NMES in supine and standing positions, a statistically significant difference favored the standing position (p=.018).



Volitional pelvic floor contractions in standing (VST) and supine (VSUP). Arrow indicates start position and white crosshairs represent finish position. Cranial Displacement VST 0.86cm and VSUP 0.33cm



Neuromuscular electrical stimulation delivered in supine via external electrodes (ESSU) and internal (vaginal electrode) ISSU. Arrow indicates start position and crosshairs (if present) represent finish position. Caudal Displacement ESSU 0.41cm and no displacement ISSU 0.00cm



Neuromuscular electrical stimulation delivered in standing via external electrodes (ESSU) and internal (vaginal electrode) ISSU. Arrow indicates start position and crosshairs (if present) represent finish position. Cranial Displacement ESST 0.53cm and no displacement for ISST 0.00cm

RESULTS

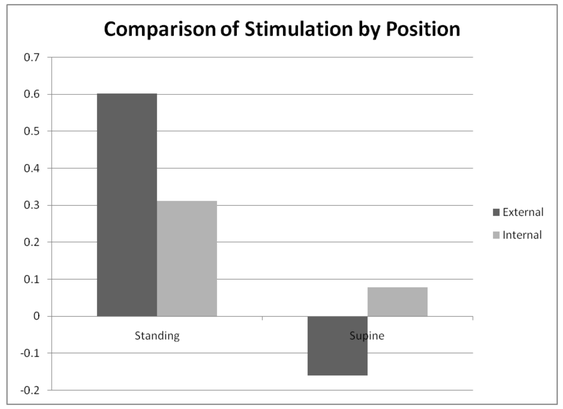


Chart compares the magnitude of displacement in centimeters of the pelvic floor muscle contraction elicited by externally and internally delivered NMES in standing and supine.

CONCLUSION

Previous studies have shown that NMES activates the pelvic floor muscles and inhibits detrusor contraction but have failed to describe how this was assessed. We are unaware of any study which used transabdominal sonography during NMES to assess the effect on the PFM. Given the outcome of this pilot study it behooves clinicians to verify appropriate muscle contractions are occurring with NMES of the PFM.

CLINICAL RELAVENCE

The clinical use of neuromuscular electrical stimulation (NMES) in promotion of muscle strengthening is long established with many devices specifically manufactured for the treatment of pelvic muscle weakness. Many studies have shown NMES to be effective in decreasing symptoms associated with SUI, however few if any studies have assessed if an appropriate PFM contraction is occurring. Furthermore, failure to mention the location, and size of the electrodes in addition to the current density makes it difficult for clinicians to replicate study outcomes.

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