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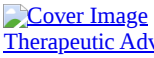
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ARTICLE

Efficacy of magnetic stimulation for female stress urinary incontinence: a meta-analysis

View article page
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Abstract

Aim:

This meta-analysis aimed to evaluate the efficacy of magnetic stimulation (MS) in treating female stress urinary incontinence (SUI) and providing an alternative treatment for patients who are unwilling to undergo surgery.

Methods:

Randomized controlled trials (RCTs) that evaluated MS as a remedy for female SUI were retrieved from various electronic databases, including MEDLINE, EMBASE, and the Cochrane Controlled Trial Registry system. Moreover, reference lists for related papers were carefully screened for relevant studies.

Results:

A total of six RCTs evaluating the effect of MS in treating female SUI were included in this study. Compared with the placebo group, the MS group exhibited higher quality-of-life scores [mean difference (MD) 0.59, 95% credibility interval (CI) 0.23–0.95; $p = 0.001$] and lower International Consultation on Incontinence Questionnaire scores (MD −3.93, 95% CI −5.85 to −2.01; $p < 0.0001$). Moreover, they exhibited a higher objective cure rate (odds ratio 8.49, 95% CI 3.08–23.37). In addition, MS treatment reduced the number of episodes of urinary incontinence (MD −1.42, 95% CI −2.24 to −0.59; $p = 0.0007$) and urine loss on pad test (MD −4.67, 95% CI −8.05 to −1.28; $p = 0.007$). There were no significant treatment-related adverse reactions.

Conclusion:

This study evaluated the efficacy and safety of MS in the treatment of female SUI. The results have important implications for patients who do not wish to undergo surgical therapy. We found that MS treatment for SUI has positive outcomes, however, future studies should aim at establishing the best protocol for optimizing the therapeutic effect.

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Outline

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Materials

Figure 1.
Flowchart of the study selection process.
RCT, randomized controlled trial.
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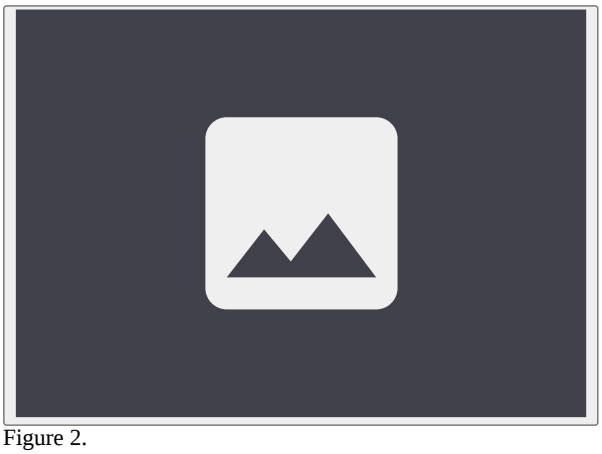

Figure 2.
(a) Risk of bias summary: review authors' judgements about each risk of bias item for each included study. (b) Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.
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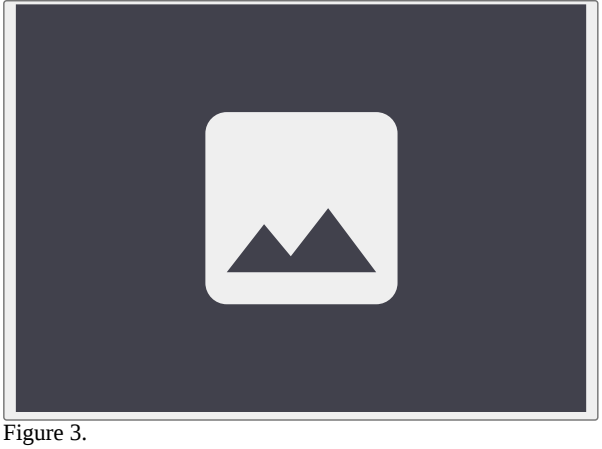

Figure 3.
Forest plot comparing the change in (a) QoL scores, (b) QoL scores after omitting study, (c) QoL scores in subgroup analysis of the location of MS between active and sham groups.
CI, confidence interval; df, degrees of freedom; MS, magnetic stimulation; SD, standard deviation.
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Figure 4.
(a) Forest plot comparing the change in (a) pad test, (b) pad test after the omitting study, (c) number of leaks, (d) ICIQ scores, (e) objective cure rate between the active and sham groups.
CI, confidence interval; df, degrees of freedom; ICIQ, International Consultation on Incontinence Questionnaire; MS, magnetic stimulation; SD, standard deviation.
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subtitles Table 1.

Study, country	**Sample size (*n*) MS/sham**	**Age, years (median)**	**Inclusion criteria**	**Exclusion criteria**	**MS**				**Length of intervention period**	**Follow-up period**	**Outcome measures**	**Quality assessment**
					Location	**Intensity**	**Frequency**	**Duration**				
Fujishiro *et al.*,[26] Japan	31/31	58	⩾1 episode of leakage recorded in a voiding diary; ⩾2 g urine loss in 1-h pad test	Disorders causing any LUTS; ongoing treatment for SUI	Sacral roots (S3)	50% of maximum output	15 Hz 5 S/min	30 min	Once only	1 week	1. Maximum urethral closure pressure and cytometry; 2. No. of leakages; 3. Pad test/g (24 h); 4. QoL scores	High risk
Manganotti *et al.*,[27] Italy	10/10	50.1	⩾1 leakage recorded in a 3-day voiding diary; ⩾2 g urine loss in a 1-h pad test or a positive standardized stress test	Disorders causing LUTS; severe cardiac or cerebrovascular disorders; receiving treatment for SUI	Sacral roots (S2–S4)	60% of maximum output	15 Hz 3 S/min	15 min	Three sessions per week for 2 weeks	1 month	1. QoL scores; 2. Pad test/g (24 h); 3. Standardized stress test	Low risk
Gilling *et al.*[28], New Zealand	35/35	54.4	Symptoms of SUI; genuine SUI by pad-testing and urodynamics; neurologically normal; stable detrusor	Previous incontinence or pelvic floor surgery; grade 3 or 4 POP; pregnant; drugs for bladder dysfunction;	Pelvic floor	Maximum level tolerated by the patient	10 Hz; 50 Hz	A 10-min stimulation at 10 Hz; a 3-min rest; a 10-min stimulation at 50 Hz.	Three treatment sessions per week for a total of 6 weeks	6 months	1. 20-min pad test; 2. 3-day bladder diary; 3. 24-h pad test; 4. No. of	Low risk

Study, country	Sample size (*n*) MS/sham	Age, years (median)	Inclusion criteria	Exclusion criteria	MS				Length of intervention period	Follow-up period	Outcome measures	Quality assessment
					Location	Intensity	Frequency	Duration				
			function on urodynamics with cystometric capacity of >200 ml, PFR >10 ml/s, PVR <100 ml	internal devices with electrical or magnetic component; pelvic or lower limb metallic prosthesis							pads used; 5. PFM strength	
Tsai *et al*.[29], Taipei China	14/10	63.1	A diagnosis of SUI, with or without detrusor overactivity, confirmed by urodynamic results; a SUI history of at least 6 months, which remained refractory after at least 1 month of first-line management	History of surgery or hormone replacement therapy for SUI; severe pelvic prolapse (>grade 3 prolapse or *Qmax* <15 ml/s); contraindications for SMS; received anticholinergic medication	Sacral roots (S3)	Maximum level tolerated by the patient	5 Hz; in 10-s on/20-s off cycles	20 min	12 consecutive week days	18 weeks	1. Cystometric; 2. UPP; 3. U-UDI; 4. OAB-Q	Low risk
Lim *et al*.[30], Malaysia	60/60	52.5	Female aged 21 or older with urine leak upon coughing; a ICIQ-UI SF score of 6 points or greater; can perform the 1-h pad test	Other subtypes of UI; pelvic irradiation; contraindications for MS; previous surgery for SUI; previous treatment with PMS; prolapse stage III or IV; severe urethral sphincter weakness or urethral/vesical fistula; post-void residual volume greater than 200 ml; pregnancy	Pelvic floor	Maximum level tolerated by the patient	50 Hz; in 8-s on/4-s off cycles	20 min	Two sessions per week for 2 months	14 months	1. ICIQ scores; 2. Pad test/g (1 h); 3. No. of leakages; 4. 1-h pad test; 5. PFM function; 6. PGI-I; 7. ICIQ-LUTS QoL	Low risk
Yamanishi[32], Japan	18/12	NA	Women with urodynamic SUI refractory to PFMT for more than 12 weeks and who did not want to undergo surgery	UI due to detrusor overactivity; complications after pelvic surgery or trauma; wearing a pacemaker; complicated by malignancy; with a residual urine volume ⩾200 ml	Pelvic floor	Maximum level tolerated by the patient	50 Hz; in 5-s on/5-s off cycles	20 min	One session per week for 10 weeks	10 weeks	1. No. of leakages; 2. Pad test/g (24 h); 3. QoL scores; 4. ICIQ scores; 5. ALPP	Low risk

Details of included studies.

ALPP, abdominal leak point pressure; ICIQ, International Consultation on Incontinence Questionnaire; ICIQ-LUTS QoL, ICIQ-lower urinary tract symptoms quality of life; ICIQ-UI SF, ICIQ-urinary incontinence-short form; LUTS, lower urinary tract symptoms; MS, magnetic stimulation; NA, not available; PFMT, pelvic floor muscle training; OAB-Q, overactive bladder questionnaire; PFM, pelvic floor muscle; PFR, peak flow rate; PGI-I, patient global impression of improvement; PMS, pulsed magnetic stimulation; POP, pelvic organ prolapse; PVR, post-void residual; QoL, quality of life; SMS, simultaneous multislice imaging; SUI, stress urinary incontinence; UI, urinary incontinence; UPP, urethral pressure profile; U-UDI, urge-urinary distress inventory.

Table 1.

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