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ORIGINAL CLINICAL ARTICLE

External electrical stimulation compared with intravaginal electrical stimulation for the treatment of stress urinary incontinence in women: A randomized controlled noninferiority trial

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Aims: To compare the efficacy and safety of a neuromuscular external electrical stimulation device (INNOVO; "NMES") with an FDA-approved intravaginal device (iTouch sure; "comparator device") for the treatment of stress urinary incontinence (SUI).

Methods: This prospective, single-blind, multicenter, noninferiority study randomized women with SUI to treatment with the NMES or the comparator device for 12 weeks. The primary endpoint was the proportion achieving >50% reduction in pad weight from baseline to 12 weeks in the provocative pad weight test.

Results: Most subjects in both groups achieved >50% reduction in pad weight in the provocative pad test at week 12 (NMES 56.3%; comparator 63.0%), although noninferiority was not established. Significant improvements in pad tests, number of incontinence episodes, and pads used per day, and incontinence quality of life score were seen with both devices at week 12, with no clinically relevant between-group differences. Adverse events were predominantly mild/moderate and there were few discontinuations due to adverse events. The incidence of urinary tract/vaginal infections was higher with the comparator device than the NMES (7.7% versus 0%). The most common device-related adverse effect with the NMES was device discomfort (9.0%), which was generally manageable by modifying the stimulation intensity.

Conclusions: The NMES significantly improved objective and subjective measures of SUI, although statistical noninferiority was not established. The NMES was well tolerated and associated with fewer urinary tract infections than the comparator. The NMES provides a safe, clinically effective, conservative treatment option for female SUI and a low-risk alternative to intravaginal devices.

KEYWORDS
bladder control, electrical stimulation, pelvic floor, stress incontinence, urinary incontinence.

1 | INTRODUCTION

Stress urinary incontinence (SUI) is the most common type of urinary incontinence among women,[1] affecting more than 30% of women aged 40 years or older.[2] Urinary incontinence can have an adverse effect on physical and social activities and quality of life.[3]

First-line treatment for SUI generally involves physical therapy, specifically pelvic floor muscle training (PFMT; Kegel exercises) to increase pelvic floor muscle strength to support the bladder neck and increase urethral pressure.[2,4] PFMT can be effective at improving SUI,[4] although more than 30% of women do not contract the muscles correctly despite instruction.[5] Several methods to augment PFMT are available, including biofeedback, vaginal weights, and electrical stimulation.[2,6,7]

Most electrical devices for treating SUI use transvaginal electrical stimulation.[8] Disadvantages of such devices include discomfort, embarrassment, the need to clean the probe, risk of vaginal or urinary tract infections, difficulty with using the device, and unwillingness to use it.[9-11] An alternative, noninvasive, approach that may be easier and less embarrassing for users is to administer external electrical stimulation via surface electrodes placed on the skin.

A novel neuromuscular external stimulator (INNOVO®; hereafter "NMES") has been developed that is a garment holding a set of skin contact electrodes in place around the pelvic area to ensure satisfactory recruitment of the pelvic floor muscles. Ultrasound studies showed that the device facilitated appropriate pelvic floor muscle contractions.[12-14] Pilot studies in women with SUI found significant reductions in urine leakage after 8 or 12 weeks' treatment.[14-16] Improvements were maintained at 6 months.[16] The current study compared the efficacy and safety of the NMES with an FDA-cleared intravaginal device (itouch sure; hereafter "comparator device") for the treatment of SUI.

2 | MATERIALS AND METHODS

2.1 | Study design

This prospective, randomized, single-blind, multicenter study, conducted at 12 urology clinics in the USA, compared 12 weeks' treatment with the NMES (external electrical stimulation) or the comparator device (intravaginal electrical stimulation) in women with SUI.

2.2 | Study population

Participants were women aged 18 to 65 years with a body mass index of $\leq 35\ kg/m^2$ and clinically diagnosed SUI that had not improved with formal pretrial Kegel exercises taught by a physical therapist. They had to score ≤9 out of 18 on the urge incontinence questions and have predominant SUI according to the Medical, Epidemiologic, and Social Aspects of Aging Urinary Incontinence (MESA) Questionnaire at screening and have urine leakage of 3 to 90 g in a 1-hour provocative pad weight test (office-based stress test exercises following standardized bladder-filling protocol) at baseline.[17] Other SUI treatments, including new PFMT exercises, were not allowed during the study.

The main exclusion criteria were: medical/physical conditions that could compromise participation (eg, reduced sensory perception in electrode contact areas); bladder abnormalities affecting lower urinary tract urinary flow; other urogynecological disorders or prior treatments that could affect outcomes (eg, previous SUI therapy with injectable bulking agents or vaginal probes within 6 months; urogynecological surgery; pelvic radiation); metal/conductive implants/devices or conditions that could be adversely affected by electrical stimulation.

2.3 | Treatments

Subjects were randomized 1:1 to 12 weeks' treatment with the NMES or the comparator device. Treatment was self-administered by subjects at home after appropriate training in the clinic. Devices were used in accordance with the manufacturers' device instructions for use, including adjustment of stimulation intensity, treatment session frequency, and duration, and overall treatment period. The NMES was used for 30 minutes once daily for 5 days per week. The comparator device was used for 20 minutes once daily. Both devices turned themselves off at the end of each treatment session. Compliance was assessed using the device's internal memory and patient diaries.

The INNOVO® (Atlantic Therapeutics, Galway, Ireland), formerly Vital Compact (Bio-Medical Research Ltd), is CE mark-approved as a Class IIa device in Europe. It comprises a handheld, portable, battery-powered controller connected to a 2-part wrap-around garment that holds hydrogel adhesive electrodes in place on the buttocks/thighs. Controller specifications include 50 Hz frequency, 620 μs pulse width, 0.5-second ramp-up and ramp-down times, 5-second contraction time, and 5-second relaxation time. The maximum electrode current density is $<0.05\ mA/cm^2$.

The comparator device (iTouch sure, TensCare Ltd, Epsom, Surrey, UK) is classified as a Class II device in the USA and a Class IIa device in Europe. It consists of a battery-powered controller connected to a vaginal probe with electrodes on either side. The probe is inserted with

a lubricating gel to assist with electrical contact and for comfort. Controller specifications for SUI are: 50 Hz frequency, 300 μs pulse width, 1-second ramp-up and down, 5-second plateau, and 10-second rest.[18]

Treatment was assigned according to a randomization schedule using a permuted block-format, stratified by study site. Designated unblinded study personnel trained subjects in device use. Investigators and staff performing assessments were blinded to treatment assignment.

2.4 | Assessments

Participants were evaluated at study sites at screening, baseline, and at 4 and 12 weeks during the treatment period. At 12 weeks, subjects were instructed in PFMT and asked to perform the exercises daily until the final visit at 26 weeks. This paper presents results up to week 12 (the time of assessment of the primary endpoint).

Efficacy assessments (baseline, weeks 4, 12, and 26) included: provocative pad weight test following a standardized bladder-filling protocol (ultrasound-confirmed pretest bladder volume >250 ml); 3-day 24-hour pad weight test; number of incontinence episodes/day and number of pads used/day (7-day voiding diary); incontinence quality of life (I-QOL) questionnaire score; pelvic organ prolapse incontinence sexual questionnaire – IUGA revised (PISQ-IR) (baseline, week 12); and patient global assessment of improvement (PGI-I) (week 12).

Adverse events (AEs) were assessed at all visits. Adverse device effects (ADEs) were defined as AEs considered related to the use of the device. Device deficiencies (eg malfunctions, user errors, and inadequate labeling) were also evaluated.

2.5 | Statistical matters

The primary endpoint was the proportion of subjects achieving "significant improvement" in the provocative pad weight test (>50% reduction in pad weight from baseline) at 12 weeks. The difference in the proportion of responders and a 95% confidence interval (CI) were calculated using the normal approximation to the binomial distribution. Noninferiority was established if the lower bound of the 95% CI for the treatment difference for the primary endpoint did not exceed the −5% noninferiority margin.

Key secondary efficacy endpoints included: mean change from baseline to week 12 for urine leakage (provocative pad weight test and 24-hour pad weight test), number of incontinence episodes/day, I-QOL score, number of pads used/day, and proportion of patients achieving dryness (<1 g on provocative pad weight test). These would be analyzed in hierarchical fashion provided the primary endpoint was met. Data were summarized using descriptive statistics. Efficacy analyses were performed on the intent-to-treat population and safety analyses on the safety population (randomized patients who used the device at least once).

The study sample size was 180 patients. Assuming a comparator device success rate of 52%[10,19] and an NMES success rate of 71%,[19] a sample size of 87 subjects/group provided 90% power using a one-sided type I error rate of 0.025 and a noninferiority margin of 5%.

2.6 | Ethical and regulatory matters

The study was conducted in accordance with the Declaration of Helsinki, and US and international standards of Good Clinical Practice and the FDA abbreviated Investigational Device Exemption requirements set forth in 21 CFR 812.2(b). Approval was obtained from the relevant Institutional Review Boards. Patients provided written informed consent.

3 | RESULTS

Between April 2015 and April 2017 a total of 180 women were randomized (89 to the NMES and 91 to the comparator device). Similar numbers in each group completed the 12-week treatment period (NMES 88.8%; comparator 87.9%; Figure 1). The most common reason for early withdrawal from the study was subject request (NMES 6.7%; comparator 5.5%).

There were no significant differences in demographics/general characteristics between the groups at baseline (Table 1). The mean age of participants was 46.9 years. Most (67.2%) had had SUI symptoms for >3 years, and most had mild (57.6%)/moderate (36.7%) SUI (Table 1). Baseline values for efficacy parameters were similar in both groups (Table 2).

3.1 | Efficacy

Most subjects in both groups achieved "significant improvement" in the provocative pad weight test at week 12 (NMES 56.3%; comparator 63.0%). However, noninferiority was not established for the NMES because the lower bound of the 95% CI for the treatment difference exceeded the −5% noninferiority margin (difference −6.7%, 95% CI, −21.7% to 8.4%).

At week 12, significant improvements from baseline were seen in both groups for secondary endpoints including mean urine leakage (provocative pad weight test and 24-hour pad weight test), a number of incontinence episodes and number of pads used per day, and

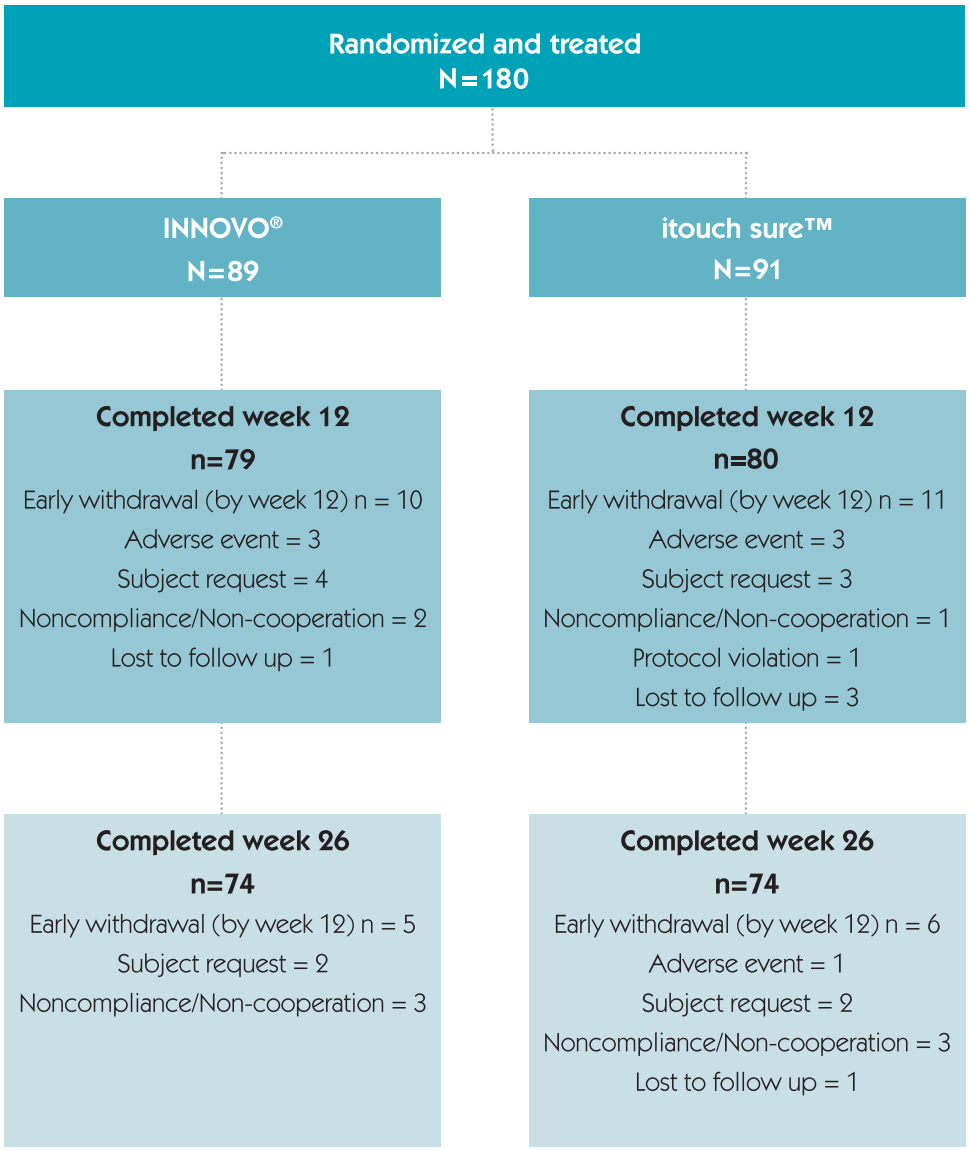

FIGURE 1 Disposition of subjects

I-QOL score (Table 2). Between-group differences were not tested statistically (in accordance with the prespecified hierarchical statistical analysis plan), but there were no clinically relevant differences between the groups.

At week 12, 87.2% of the NMES group and 86.8% of the comparator group were in the dry/mild categories of SUI severity versus 54.5% and 60.7% at baseline (all mild category), representing an improvement of 32.7% for the NMES and 26.1% for the comparator. Overall, 70.7% of the NMES group indicated their SUI symptoms had improved (PGI-I score of 1, 2, or 3) at week 12 vs 63.0% of the comparator group. Improvements in a number of incontinence episodes and pads per day, I-QOL score, and proportions categorized as dry/mild severity persisted to week 26 in both groups.

A trend towards improved sexual function was observed in both groups at 12 weeks (PISQ-IR). Improvements were observed across all subscales in the NMES group, whereas in the comparator group some subscale scores improved while others worsened. Mean (SD) baseline-adjusted domain scores at week 12 ranged from 0.28 (13.89) to 5.00 (10.65) in the NMES group and from −2.34 (11.45) to 5.21 (20.93) in the comparator group among sexually active subjects, and from 0.00 (21.08) to 11.11 (21.66) with the NMES and from −10.12 (23.09) to 9.26 (23.61) with the comparator device among nonsexually active subjects.

3.2 | Safety

Device usage (exposure) is summarized in Table 3. The median number of sessions for the NMES (4.75) was close to the target of 5/week, whereas that for the comparator (5.92) was slightly below the target of 7/week. Mean and median average durations of use were close to or

TABLE 1 Demographics and baseline characteristics

Parameter	NMES (N = 89)	Comparator device (N = 91)
Age (years), mean (SD)	45.9 (8.86)	47.8 (9.27)
Postmenopausal, n (%)	30 (33.7)	40 (44.0)
Ethnicity, n (%)		
Hispanic/Latino	20 (22.5%)	20 (22.0%)
Not Hispanic/Latino	69 (77.5%)	71 (78.0%)
Race, n (%)		
Asian	4 (4.5)	2 (2.2)
Black or African American	11 (12.4)	11 (12.1)
White or Caucasian	72 (80.9)	75 (82.4)
Other	2 (2.2)	3 (3.3)
Body mass index (kg/m^2), mean (SD)	27.28 (4.343)	27.76 (4.058)
Duration of stress incontinence symptoms, n (%)		
<1 y	3 (3.4)	2 (2.2)
1–3 y	28 (31.5)	26 (28.6)
>3 y	58 (65.2)	63 (69.2)
Severity of stress incontinence[a], n (%)		
Dry (<1.3 g)	0	0
Mild (1.3 to <20 g)	48 (54.5)	54 (60.7)
Moderate (20 to <75 g)	35 (39.8)	30 (33.7)
Severe (≥75 g)	5 (5.7)	5 (5.6)
Missing	1 (1.1)	2 (2.2)

[a]Based on an average of three consecutive 24-h pad weight test periods.

matched target durations for both devices. A greater proportion of the NMES group than the comparator group used the device for ≥75% of the target use (81.6% versus 67.0%). Mean ± SD percent target use was higher in the NMES group (86.25 ± 28.75%) than in the comparator group (76.50 ± 25.029%), suggesting better overall compliance.

Device deficiencies were reported by 10 (11.2%) NMES users and 15 (16.5%) comparator device users. None led to an ADE and replacement devices were provided in most cases.

Both devices were generally well tolerated. Similar proportions of the NMES (49.4%) and comparator (47.3%) groups experienced AEs. The nature and severity of AEs were as expected for patients with SUI treated with electrical stimulation. Most were mild or moderate; only 9.0% of NMES users and 8.8% of the comparator group reported severe AEs. Serious AEs occurred in 2 (2.2%) subjects in the NMES group and 5 (5.5%) in the comparator group; none were considered treatment-related. A similar proportion of each group discontinued the study due to AEs (3.4% NMES, 4.4% comparator).

Overall, 17 (19.1%) subjects experienced 24 ADEs in the NMES group and 11 (13.1%) subjects experienced 13 ADEs in the comparator group (Table 4). Most were mild or moderate in severity. Two subjects, both in the NMES group, discontinued because of ADEs (device discomfort and skin irritation).

The most common ADEs in the NMES group were medical device discomfort (9.0%), medical device pain (4.5%), and skin irritation (3.4%). The most common ADEs in the comparator group were urinary tract infection (3.3%), vaginal infection (2.2%), and vulvovaginal mycotic infection (2.2%). The overall incidence of medical device discomfort/pain was higher in the NMES group than the comparator group (13.5% versus 2.2%). Discomfort/pain was generally managed by modifying the stimulation intensity. The overall incidence of device-related infections was higher in the comparator group than the NMES group (7.7% versus 0%).

4 | DISCUSSION

The NMES was effective at reducing symptoms associated with SUI in women, although noninferiority was not established compared with the intravaginal comparator device for the primary endpoint. The NMES was safe and well tolerated.

Urinary incontinence adversely affects the quality of life,[3] and imposes a cost burden for the individual (eg, absorbent products and laundry) and healthcare systems.[20] Hence, effective management is important. Physical therapy is recommended as first-line treatment for most women with SUI because it is effective, low risk, and low cost.[2] PFMT can improve female SUI.[4] However, approximately 30% of women are unable to perform voluntary pelvic floor muscle contractions correctly despite instruction.[5] Performance can be improved by using biofeedback to indicate when correct contractions are performed[7] or by using electrical stimulation to improve pelvic floor muscle function and mass.[8]

Electrical stimulation is a long-established modality for treating SUI; however, many studies have been small, and results have been conflicting. A systematic review reported that intravaginal electrical stimulation was effective for treating urge urinary incontinence but not SUI.[11] However, a meta-analysis found that electrical stimulation was better than no treatment in terms of improvement rate (odds ratio 3.93, 95% CI, 1.43-10.80, $P = 0.008$), although not cure rate, in women with SUI.[2] A more recent meta-analysis found that electrical stimulation was better than no treatment in terms of

TABLE 2 Key secondary endpoints

Parameter		NMES (N = 89)	Comparator device (N = 91)
Provocative pad weight test - urine leakage	Baseline	24.33 (20.063)	23.21 (20.448)
	Week 12	15.85 (24.487)	13.55 (23.187)
	Change from baseline	−8.48 (25.053)*	−9.66 (22.876)***
	Treatment difference[a], mean (SE)	1.18 (3.575)	
	95% CI	(−5.88, 8.23)	
24-h pad weight test - urine leakage	Baseline	26.37 (32.204)	24.74 (28.869)
	Week 12	13.30 (19.584)	14.85 (25.622)
	Change from baseline	−13.07 (21.531)***	−9.89 (19.989)***
	Treatment difference[a], mean (SE)	−3.18 (3.122)	
	95% CI	(−9.34, 2.99)	
Incontinence episodes per day	Baseline	2.98 (2.341)	2.93 (4.987)
	Week 12	1.74 (2.183)	1.51 (2.062)
	Change from baseline	−1.24 (1.564)***	−1.43 (4.120)***
	Treatment difference[a], mean (SE)	0.18 (0.469)	
	95% CI	(−0.74, 1.11)	
Incontinence Quality of Life questionnaire (total score)	Baseline	58.55 (19.798)	59.47 (19.464)
	Week 12	71.97 (21.602)	74.89 (18.140)
	Change from baseline	13.42 (16.463)***	15.42 (18.376)***
	Treatment difference[a], mean (SE)	−2.01 (2.611)	
	95% CI	(−7.16, 3.15)	
Pads used per day	Baseline	2.05 (1.417)	1.96 (1.232)
	Week 12	1.75 (1.237)	1.52 (1.240)
	Change from baseline	−0.30 (0.998)**	−0.44 (0.984)***
	Treatment difference[a], mean (SE)	0.14 (0.149)	
	95% CI	(−0.15, 0.44)	
Dryness (<1g leakage on provocative pad weight test)	Baseline, n (%)	0 (0)	0 (0)
	Week 12, n (%)	17 (19.1)	29 (31.9)
	Change from baseline	na	na
	Treatment difference[b], % points	−12.8	
	95% CI	(−25.4, −0.2)	

Note: Data are mean (standard deviation) unless indicated otherwise.
Abbreviations: CI = confidence interval, na = not applicable, SE = standard error.
[a]Difference in mean change from baseline (NMES, comparator device).
[b]Difference in proportion of subjects achieving dryness at week 12 (NMES, comparator device).
*$P = 0.002$.
**$P = 0.006$.
***$P \leq 0.001$.

subjective cure (risk ratio [RR] 2.31, 95% CI, 1.06-5.02), cure or improvement (RR 1.73, 95% CI, 1.41-2.11), and incontinence-specific quality of life (mean score 0.72 SDs lower, 95% CI −0.99 to −0.45), and was better than sham treatment for subjective cure/improvement (RR 2.03, 95% CI, 1.02–4.07).[8] Adding electrical stimulation to PFMT did not increase the cure/improvement rate versus exercises alone (RR 1.10, 95% CI, 0.95–1.28).

TABLE 3 Device usage (exposure) during the treatment period

Parameter		NMES (N = 89)	Comparator device (N = 91)
Average number of sessions per week	Mean (SD)	4.55 (1.113)	5.63 (1.257)
	Median (min, max)	4.75 (0.6, 6.9)	5.92 (1.4, 7.1)
Average duration of session, minutes	Mean (SD)	29.21 (2.738)	19.88 (0.651)
	Median (min, max)	30.00 (7.9, 31.4)	20.00 (16.2, 22.9)
Average intensity per session[a]	Mean (SD)	52.98 (19.241)	56.29 (24.594)
	Median (min, max)	53.75 (11.4, 91.5)	57.88 (6.2, 99.2)
Devise use category (actual use), n (%)	<25%	1 (1.1)	2 (2.3)
	25% to <50%	3 (3.4)	5 (5.7)
	50% to <75%	12 (13.8)	22 (25.0)
	≥75%	71 (81.6)	59 (67.0)
Device use – percent of target use, %	Mean (SD)	86.25 (28.715)	76.50 (25.029)
	Median (min, max)	91.67 (6.7, 148.3)	85.12 (8.3, 115.5)

Note: The NMES was scheduled to be used for 5 × 30-min sessions per week and the comparator device for 7 × 20-min sessions per week.
[a]Available intensity range, 0-120 for NMES and 0-99 for the comparator device.

Only one previous study has evaluated both intravaginal and external electrical stimulation in women with SUI.[21] Both treatments significantly improved 1-hour pad test urine leakage, contraction pressure, and quality of life compared with baseline while intravaginal stimulation also improved pelvic floor muscle strength. Direct statistical comparison of the active-treatment groups was not performed but both methods improved urine leakage and quality of life significantly versus a no-treatment control group.[21]

In the current study, both the NMES and the comparator device provided significant improvements from baseline in a range of objective and subjective measures of efficacy in women with SUI, including mean urine leakage (provocative pad weight test and 24-hour pad weight test), number of incontinence episodes and pads used per day, and I-QOL score. There were no clinically relevant between-group differences for these measures, although there was a trend in favor of the NMES for the 24-hour pad test. The percentage of subjects in the dry/mild SUI category increased substantially by week 12 in both groups.

Noninferiority could not be claimed for the NMES for the primary endpoint (proportion with >50% reduction in pad weight in the provocative pad weight test). Nonetheless, more than half of the women in each group achieved this level of improvement (NMES 56.3%; comparator 63.0%). The inability to demonstrate noninferiority may in part have been due to underpowering of the study. The NMES response rate was lower than the predicted rate (71%) used in the power calculation. The latter was based on a European pilot study.[19] Pilot study participants may have received more personal coaching, and the lower performance level in the current study could be due to the multicenter design providing better control of bias and a more objective efficacy assessment for both treatments. In addition, clinicians were unfamiliar with the NMES at the start of the study whereas the intravaginal approach is well-established in the USA.

Differences in study methodology make it difficult to compare the results of the current study with studies involving other devices. Nonetheless, the 56% and 63% treatment success rates with the NMES and the comparator device compare well with the rates of 15% and 46% reported previously for FDA-cleared intravaginal devices using a similar frequency.[10,22] This could be due to advances in probe design, with associated improvements in treatment adherence. In the current study, mean percent target use was 86% for the NMES and 77% for the comparator device, compared with 61% in one of the earlier studies.[10]

Quality of life improved in both groups during the study, and the mean changes in I-QOL score (NMES 13.42; comparator 15.42) were more than double the minimal clinically important difference for this measure (6 points).[23] Most subjects in both groups reported an improvement in their symptoms based on the PGI-I. European patient registries support the positive effect of the NMES on quality of life in real-life clinical practice[24-27] and showed that most subjects were satisfied/very satisfied with the treatment modality.[26,27]

In the current study, both devices were well tolerated. Most AEs were mild/moderate, few patients discontinued because of AEs and no serious ADEs occurred. ADEs were consistent with those expected for the type of device. Skin irritation and discomfort were more frequent with the NMES than the comparator, which is consistent with the use of hydrogel-coated cutaneous electrodes.

TABLE 4 Device-related adverse events (adverse device effects)

	NMES (N = 89)		Comparator device (N = 91)	
Adverse event	**Number of subjects (%)[a]**	**Number of events**	**Number of subjects (%)**	**Number of events**
Total adverse events	17 (19.1)	24	11 (12.1)	13
Gastrointestinal disorders, total	0 (0)	0	1 (1.1)	1
Abdominal pain	0 (0)	0	1 (1.1)	1
General disorders/Administration site conditions, total	12 (13.5)	15	2 (2.2)	2
Medical device discomfort	8 (9.0)	10	1 (1.1)	1
Medical device pain	4 (4.5)	4	1 (1.1)	1
Pain	1 (1.10)	1	0 (0)	0
Infections and infestations, total	0 (0)	0	7 (7.7)	7
Urinary tract infection	0 (0)	0	3 (3.3)	3
Vaginal infection	0 (0)	0	2 (2.2)	2
Vulvovaginal infection	0 (0)	0	2 (2.2)	2
Musculoskeletal and connective tissue disorders, total	2 (2.2)	2	0 (0)	0
Arthralgia	1 (1.1)	1	0 (0)	0
Myalgia	1 (1.1)	1	0 (0)	0
Renal and urinary disorders, total	2 (2.2)	2	0 (0)	0
Dysuria	1 (1.1)	1	0 (0)	0
Micturition urgency	1 (1.1)	1	0 (0)	0
Reproductive system and breast disorders, total	0 (0)	0	1 (1.1)	1
Vaginal discharge	0 (0)	0	1 (1.1)	1
Skin and subcutaneous tissue disorders, total	5 (5.5)	5	2 (2.2)	2
Erythema	1 (1.1)	1	0 (0)	0
Pruritus	0 (0)	0	1 (1.1)	1
Rash	1 (1.1)	1	0 (0)	0
Skin irritation	3 (3.4)	3	1 (1.1)	1

[a]Subjects experiencing more than one adverse event are counted only once within each category.

In most cases, discomfort occurring during device use could be managed by reducing the intensity of the electrical stimulation.

Vaginal and urinary tract infections were reported only with the comparator device, which is consistent with previous reports of vaginal infections and irritation with intravaginal devices.[10] The NMES does not pose the same risk of genitourinary infections. Overall, the tolerability data indicate that both the NMES and comparator device are low-risk devices.

The main limitation of the study is the possibility that it was underpowered for the evaluation of the primary endpoint. In addition, the study used a single-blind design because of the differences between the devices (external versus intravaginal). However, steps were taken to ensure that the personnel involved in study assessments were blinded to treatment assignment.

5 | CONCLUSIONS

Although noninferiority was not established for the NMES versus the intravaginal comparator device based on the primary endpoint, the two devices provided broadly similar, clinically meaningful, improvements in a range of subjective and objective measures of SUI. The NMES was well tolerated and associated with fewer vaginal and urinary tract infections than the comparator. The NMES provides a safe, clinically effective, conservative treatment option for female SUI, and a low-risk alternative to intravaginal devices.

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