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URODYNAMIC CHANGES DURING INTRA VAGINAL ELECTRO STIMULATION WITH A FREQUENCY OF 8 HZ

Hypothesis / aims of study:
Overactive bladder (OAB) symptoms, like urgency and frequency are best characterized by urodynamic parameters such as an early first sensation of bladder filling and a small bladder capacity. Electrical stimulation has been reported as an effective treatment option of OAB. However, the mode of action of intravaginal stimulation on bladder function in OAB remains unclear. Hence, we studied the ad hoc impact of intravaginal electrostimulation (ES) on overactive bladder parameters, using urodynamic evaluations.
Study design, materials and methods:
Twenty female patients diagnosed with urgency/frequency and / or urge incontinence were included in this study. In all patients two urodynamic evaluations were performed, one prior to intravaginal ES and one during ES. We applied a frequency of 8 Hz, pulse duration of 1000 µsec and no pulse- to- rest. Intravaginal ES was applied during urodynamic evaluation until the patient had a strong desire to void.
Urodynamic evaluations were performed according to ICS standards. We documented: intravesical pressure, abdominal pressure, detrusor pressure, first sensation of bladder filling, cystometric capacity, urethral pressure, the abdominal leak point pressure, peak flow and presence or absence of urethral instability. The resttone of the pelvic floor was measured as well using myofeedback equipment with a vaginal probe.
Results:
The mean age of patients was 45 years (22-67). By comparing the 2 urodynamic evaluations, first sensation of bladder filling, cystometric capacity, intra vesical pressure and peak flow showed statistical significant improvement ($p<0.05$). Other urodynamic parameters improved but not significant. Prior to ES, urethral instability was seen in 15 patients. In all 15 patients this phenomenon disappeared during electro stimulation (Table).
Based on our previous observations, a resttone of > 2 µV (the basal amplitude registered on EMG) indicated an overactive pelvic floor resttone. This over activity was found in 17 of 20 patients.
Interpretation of results:
The most important observation of this study was that intravaginal ES, with a frequency of 8 Hz, pulse duration of 1000 µsec and no pulse-to-rest, significantly improved relevant urodynamic parameters related to OAB. To our knowledge this observation has never been published before. Perhaps this observation could contribute to the explanation of the mode of action of ES.
Literature is scarce on the topic of optimizing electrical parameters, like frequency, pulse duration, pulse-to-rest ratio and duration of treatment, including well documented success rates. Based on our experience we have chosen a frequency of 8 Hz. A frequency of 5 Hz induced more painful sensations intravaginal and a frequency of 10 Hz gave less relieve in patients symptoms. In pelvic floor practice the pulse duration variates from 20 - 1000 µ sec, representing the technical limitation of the equipment. In combination with a frequency of 8 HZ, pulse duration of 1000 µsec appeared to be most comfortable for patients. The final combination in frequency of 8 Hz, pulse duration of 1000 µsec and no pulse- to- rest proved to be optimal in respect to urodynamic changes and relieving patient's symptoms. In our opinion the rationale of intra vaginal ES is not direct stimulation of pelvic floor musculature, but stimulation of afferent nerves innervating organs as the bladder, urethra, vagina , rectum and pelvic floor musculature.
Besides the impact of intravaginal ES on the well accepted OAB-parameters like FSF and bladder capacity, we also observed a striking impact on urethral instability, defined as fluctuation in urethral pressure. In many patients we observe the co-existence of over activity of the pelvic floor and urethral instability. The clinical relevance of this entity needs to be clarified.

Concluding message:
By comparing urodynamic parameters evaluations prior to and during intravaginal ES we observed significant improvement of first sensation of bladder filling, cystometric capacity, intravesical pressure and peak flow. All other urodynamic parameters improved as well, but not significant. Urethral instability present In 17 patients disappeared during intravaginal ES. Further investigations should be done on the long term effect of intravaginal ES on urethral instability

Table. Change in urodynamic parameters during electro stimulation (significant if $P < 0.05$).

Parameter	**Before stimulation (± SEM)**	**After Stimulation (± SEM)**	**P- value**
intravesical pressure (cm H2O)	63,0 ± 3,8	48,4 ± 2,9	0,01

abdominal pressure (cm H2O)	43,2 ± 2,8	33,8 ± 5,8	0,14
detrusor pressure (cm H2O)	37,2 ± 36,8	24,4 ± 24,4	0,26
first sensation of bladder filling (ml)	164,5 ± 31,6	321,0 ± 38,7	0,001
cystometric capacity (ml)	337,3 ± 40,0	491,4 ± 34,1	0,0001
micturation volume (ml)	197,6 ± 42,6	252,1 ± 42,3	0,05
urethral pressure (cm H2O)	169,1 ± 165,0	160,2 ± 134,0	0,8
peak flow (ml/s)	11,0 ± 2,0	15,7 ± 2,3	0,008
urethra instability	17	0	0.0001

FUNDING: NONE
DISCLOSURES: NONE
HUMAN SUBJECTS: This study did not need ethical approval because Biofeedback registration and electrostimulation are standard patient care and did not follow the Declaration of Helsinki - with approval by the ethics committee - in the sense that registration and electrostimulation are standard patient care Informed consent was not obtained from the patients.