399 Extracorporal magnetic stimulation in the detrusor underactivity treatment

Amdii R[1], Kuzmin I[1], Al-shukri S[1], Krotova N[1], Moscaleva J[1], Giorgobiani T[1], Sozdanov P[1]

[1]First Saint-Petersburg State Pavlov Medical University, Saint-Petersburg, Russia

Introduction

As much as 23%-48% of patients undergoing evaluation for lower urinary tract symptoms (LUTS) show evidence of detrusor underactivity (DU).

DU is the low detrusor pressure or short detrusor contraction time, usually in combination with a low urine flow rate resulting in prolonged bladder emptying and/or a failure to achieve complete bladder emptying within a normal time span.

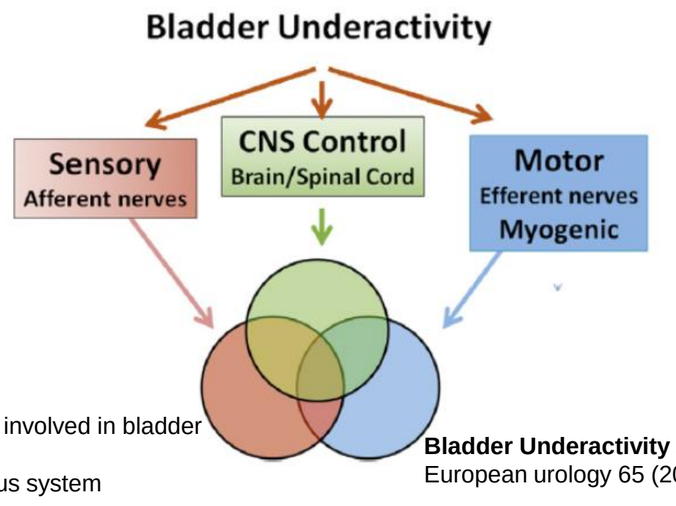
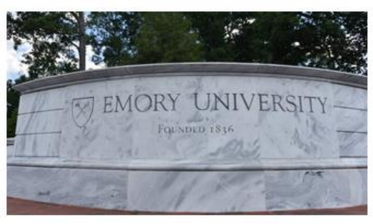


Fig. 1 – Mechanisms involved in bladder underactivity.
CNS = Central nervous system

Bladder Underactivity *Karl-Erik Anderson*
European urology 65 (2014) 399-401

Risk factors for underactivity are damage of the spinal cord, especially lumbal and sacral portion, diabetes mellitus, decompensation as result of the bladder outlet obstruction. The diagnosis of DU is established on the basis of pressure-flow study results. Currently, there are several approaches to the treatment of patients with detrusor underactivity such as sacral nerve stimulation, tibial nerve stimulation, alpha-blockers, acetylcholinesterase inhibitors and intermittent catheterization but all of them are contradictory and overall effectiveness of therapy is insufficient. One of the causes of DU is the impairment of the innervation of the detrusor. Extracorporeal magnetic stimulation of the pelvis (EXMS) improves innervation and contraction pelvic muscles. It was firstly proposed for clinical use in 1998 in the United States by N. T. M. Galloway (Neocontrol, Neotonus, Inc,. USA) for treatment stress urinary incontinence. Above mentioned authors named this procedures as extracorporal magnetic stimulation to emphasize innervation improving.



Neotonus

Emory founders: neurologist Charles Epstein, urologist Niall Galloway
Location: Marietta
Emory benefits: royalties and equity

Developing technology to deliver magnetic stimulation to muscles and neurons. The Neocontrol Pelvic Floor Therapy System for incontinence was approved by the FDA in 1998, and rapid rate transcranial magnetic stimulation (rTMS) is now being tested in clinical trials on patients with medication-resistant early-onset depression.

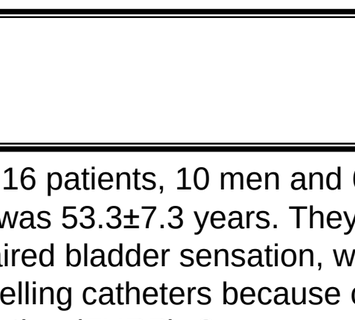
Urologist Niall Galloway uses electromagnetic stimulation to treat urinary incontinence, a problem experienced by 15 million Americans.

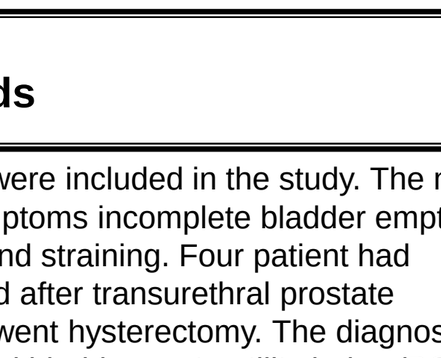
There are the data presented about effectiveness of extracorporal magnetic stimulation in women with stress urinary incontinence, urgency and mixed urinary incontinence, postprostatectomy incontinence, chronic prostatitis/chronic pelvic pain syndrome. The aim of the our pilot study was to determine application possibility and the effectiveness of EXMS in the treatment of detrusor underactivity.

Methods

16 patients, 10 men and 6 women were included in the study. The mean age was 53.3±7.3 years. They have symptoms incomplete bladder emptying, impaired bladder sensation, weak flow and straining. Four patient had indwelling catheters because cannot void after transurethral prostate resection (TURP). 2 women were underwent hysterectomy. The diagnosis DU was established by urodynamic study and bladder contractility index (BCI) was used to define detrusor underactivity (BCI less than 100). Patient with neurogenic origin of DU were not included.

EXMS was performed by a system extracorporal magnetic stimulation of the pelvis "Avantron", manufacturer "Rehabilitation technologies", Russia. During the procedures patients seat on chair with magnetic field generator. Stimulation was carried out continuously at a frequency of 23 Hertz for 20 minutes, 2-3 times a week, the course of treatment was 12 procedures, intensity of magnetic field was selected individually to avoid unpleasant sensation during procedure. The effectiveness was evaluated by IPSS questionnaire, therapy saticfaction questionnaire, voiding diary, uroflowmetry and residual urine volume measurement.

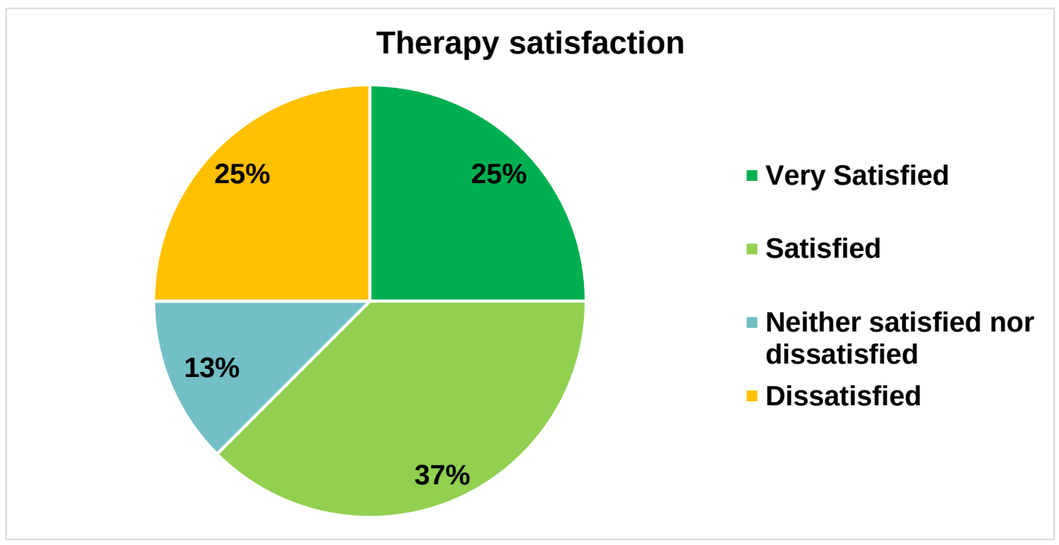


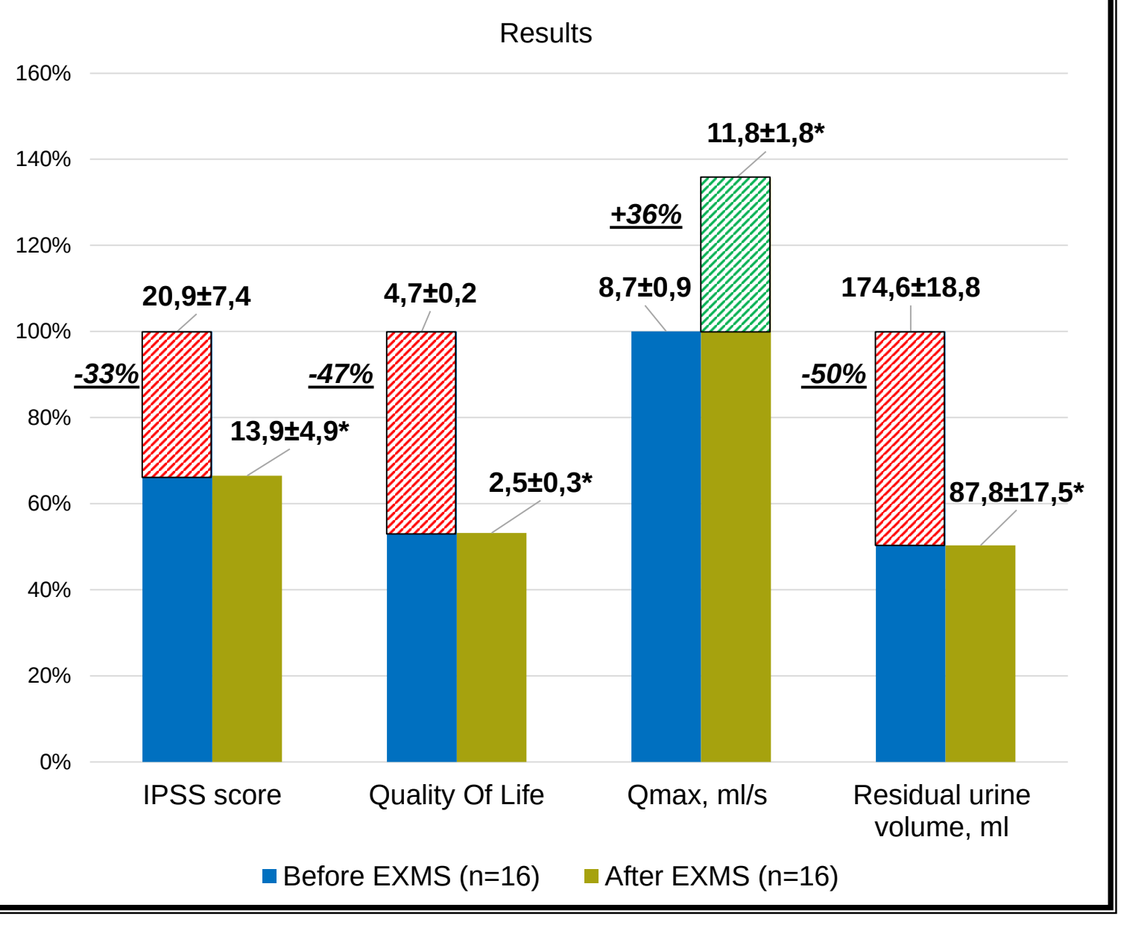


Results

After extracorporal magnetic stimulation, 4 patients (25%) were very satisfied by the service they received, 6 patients (37,5%) were satisfied, 2 patients (12,5%) were neither satisfied nor dissatisfied, 3 patients (18,75%) were dissatisfied and 1 patient (6,25%) was very dissatisfied according to therapy satisfaction questionnaire. Overall improvement was noted in 11 (68.7%) patients with DU, the severity of symptoms significantly decreased and the quality of life improved. The severity of symptoms by IPSS questionnaire decreased from 20,9±7,4 to 13.9±4.9 ($p<0.05$). The quality of life has improved from 4,7±0,2 to 2,5±0,3.

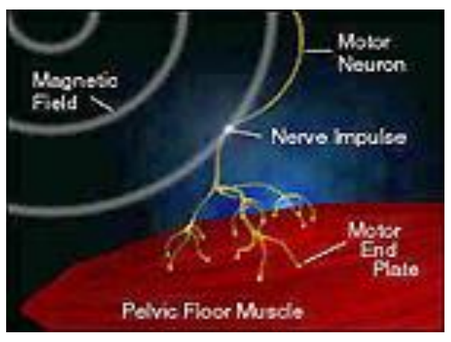
Noteworthy is the significant increase in the maximum flow by 26%: from 8.7 ± 0.9 ml/s to 11.8 ± 1.8 ml/s ($p<0.05$) and a significant decrease in the residual urine volume from 174.6±18.8 ml to 87.8±17.5 ml ($p<0.05$). At two non-voiders after TURP urination become compensated (maximal flow in uroflowmetry more than 10 ml/s, postvoid residual less than 100 ml) and a indwelling catheter was successfully removed

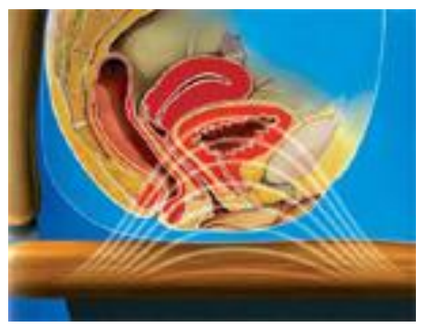




Interpretation of results

Our results shows some improvement in symptoms and objective parameters in patient with DU. The procedure was well tolerated, there were no any adverse events. The therapeutic effect, in our opinion, was caused by excitation of peripheral nerve fibers, contractions and training of striated muscles of the pelvic floor, smooth muscle elements of the bladder, urethra, blood vessels and improvement of microcirculation





Conclusions

Our pilot study showed that EXMS of the neuromuscular portion of the pelvis can be one of the options for the treatment of patients with detrusor underactivity. The further research EXMS in DU is necessary to determine the mode of the stimulation, indications, to define the effectiveness, to obtain and prove the information on the mechanisms of action.

References

- D'Ancona C, Haylen B, Oelke M et al. The International Continence Society (ICS) report on the terminology for adult male lower urinary tract and pelvic floor symptoms and dysfunction. Neurourology and Urodynamics. 2019;1–45.
- Chapple CR, Osman NI, Birder L et al. The Underactive Bladder: A New Clinical Concept? European Urology 68, 2015, 351-353
- N.T.M. Galloway et al. Update on extracorporeal magnetic innervation (ExMI) therapy for stress urinary incontinence. Urology. Supplement. 2000.№ 6A. P. 82-85.