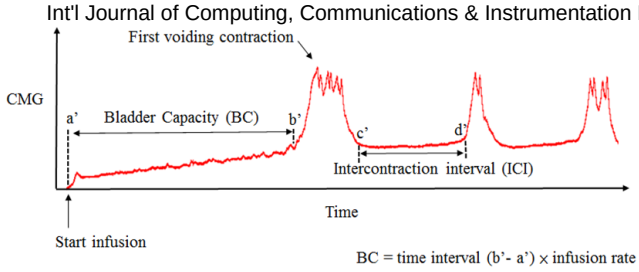

Fig. 4. Typical cystometrography (CMG) measurement at a constant infusion rate of 0.2 mL/min. CMG parameters include bladder capacity (BC; the time interval [point b′ − point a′] multiplied by the infusion rate [0.2 mL/min])

III. Results

Effects of PRF Stimulation Pretreatment of the Pelvic Nerve

Fig 5 presents a striking effect of BC after AA irritation. The BC was significantly decreased when detrusor overactivity was induced. Compared to the saline control (Fig. 6), the BC of AA group reduced to a mean of 65% ± 7% of control BC (15 rats) during saline infusion. Then, after 5 min PRF electrical stimulation on pelvic nerve, the CMGs would be measured for 4 fours, and BC would be increased by 107% ± 2%, 105% ± 3%, 110% ± 7%, and 102% ± 2% in following first, second, third, and fourth hours respectively.

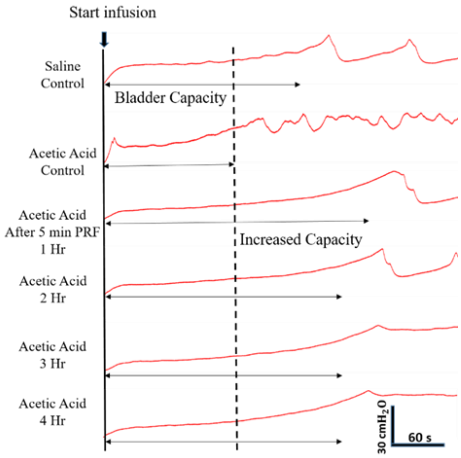

Fig. 5. Effects of pulsed radiofrequency (PRF) stimulation pretreatment of the pelvic nerve on bladder activity with repeated transvesical AA infusion at 1-h intervals. The cystometric parameters were quantized in the rats (n = 15).

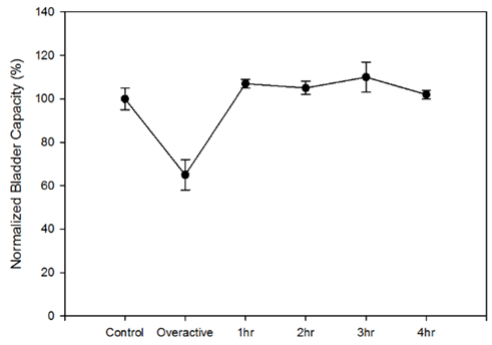

Fig. 6. Comparison of normalized bladder capacity

IV. Conclusion

The present study quantified the effects of PRF electrical stimulation on the pelvic nerve of rats with detrusor overactivity. PRF electrical stimulation of the pelvic nerve significantly suppressed AA-induced detrusor overactivity. In the clinic, the standard therapy for an detrusor overactivity involves a drug regimen of anticholinergics, such as oxybutynin, tolterodine, solifenacin, fesoterodine, and trospium; however, the usefulness of these regimens are limited due to potential side effects, the route of administration, differences in release rates, dosing, and the specificity of cholinergic receptor on which the drugs act. Functional electrical stimulation (FES) circumvents these problems by acting directly on the micturition reflex. Research using ES to treat detrusor overactivity has increased in recent years, while another minimally invasive technique, percutaneous tibial nerve stimulation, is currently being tested on rats with detrusor overactivity. Percutaneous tibial nerve stimulation is more technically difficult to perform resulting in reduced trial numbers and less statistically significant outcomes compared with trials using pelvic floor electrical stimulation. Nevertheless, only a temporary improvement may be achieved in some rats, and recurrence of symptoms is encountered after a few weeks or months [10].

PRF stimulation is widely used to efficiently treat chronic pain, while reducing paraesthesia and other potential side effects; however, the mechanism of its analgesic action is not well understood. The pain pathway is a more complex sensory nerve transmission than simply relaying sensory information from nociceptors to the brain. Although traditional ES treatment for detrusor overactivity does usually restore control, it involves repeat stimulation during voiding and the required frequency of these treatments are demanding, which is not readily acceptable to all patients. According to our results, a 5 min PRF on the pelvic nerve induced a long-lasting inhibition and significantly increased bladder capacity from 65% to 106%. These results provide alternative PRF conditions (500 KHz) and frequencies (2.5 Hz~10 KHz) to achieve the desired inhibition, thus providing valuable information for understanding the clinical application of PRF neuromodulation in the treatment of detrusor overactivity. The present study is just the first step in exploring the effect of PRF electrical stimulation on the lower urinary tract. These findings lead us to believe that PRF neuromodulation on the lower urinary tract shows great potential for treating patients with detrusor overactivity.

Acknowledgment

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