

THE EFFECTS OF SACRAL ACUPUNCTURE ON ACETIC ACID-INDUCED BLADDER IRRITATION IN CONSCIOUS RATS

Hypothesis / aims of study

Acupuncture is one of the neuromodulatory therapies available. We have investigated and reported the effects of sacral acupuncture on urinary dysfunction, including urgency and urge incontinence, as well as on chronic pelvic pain syndrome (1, 2). However, the mechanisms of action of sacral acupuncture have not been fully elucidated. The aim of this study was to investigate the effects of sacral acupuncture on acetic acid-induced bladder irritation using cystometry in conscious rats, with particular focus on effects on afferent fibers of the bladder.

Study design, materials and methods

A total of 40 female Sprague-Dawley rats weighing 200-270 g were used. The animals were divided into five groups: 1) 8 rats with bladder overactivity induced by acetic acid without sacral acupuncture stimulation (irritated bladder group), 2) 8 rats treated with sacral acupuncture stimulation after induction of bladder overactivity by acetic acid (acupuncture stimulation group), 3) 8 rats treated with sacral acupuncture stimulation after capsaicin desensitization (capsaicin-desensitization group), 4) 8 rats treated with atropine (atropine injection group), and 5) 8 rats treated with sacral acupuncture stimulation after non-acetic acid infusion (non-irritated bladder group). A polyethylene catheter (PE-50) was inserted into the bladder from the dome and secured with a purse-string suture. Four days after surgery, cystometry was performed with room-temperature saline at 6 ml/hr without anesthesia. The following variables were measured during micturition cycles: the intercontraction interval (ICI), basal pressure (BP), threshold pressure (TP), and micturition pressure (MP). Baseline cystometry was performed under saline infusion. After obtaining baseline cystometrograms, 0.25% acetic acid was infused at a constant infusion rate for 60 min, followed by another 60-min saline infusion. Then the rats underwent one of the following interventions: sacral acupuncture, atropine injection (1 mg/kg, iv), or observation (no stimulation). After the intervention, cystometrograms were recorded by continuous saline infusion for 60 min.

Results

In the irritated bladder group, the ICI significantly decreased after acetic acid infusion ($P=0.006$). This significant decrease continued during saline infusion after acetic acid infusion ($P=0.004$). Additionally, the decrease in ICI ($97.9\pm 4.2\%$, $P=0.637$) was observed in the irritated bladder group after saline infusion. In the acupuncture stimulation group, sacral acupuncture stimulation after acetic acid infusion changed prolongation of ICI ($137.4\pm 5.9\%$) to a level similar to that of baseline ($P=0.072$). The difference in percent change in ICI between the acupuncture stimulation and irritated bladder groups was statistically significant ($P=0.0004$). In the non-irritated bladder group, the ICI significantly increased after sacral acupuncture stimulation ($122.2\pm 4.8\%$, $P=0.002$) (Figure 1). In the capsaicin-desensitized group, no irritative bladder responses were observed. Furthermore, sacral acupuncture stimulation did not result in a statistically significant increasing ICI ($100.2\pm 6.5\%$, $p=0.972$). In atropine injection rats, injection of atropine resulted in prolongation in ICI ($116.4\pm 10.5\%$). However, this difference was not significant ($P=0.162$). In contrast, atropine injection significantly reduced MP ($P=0.03$).

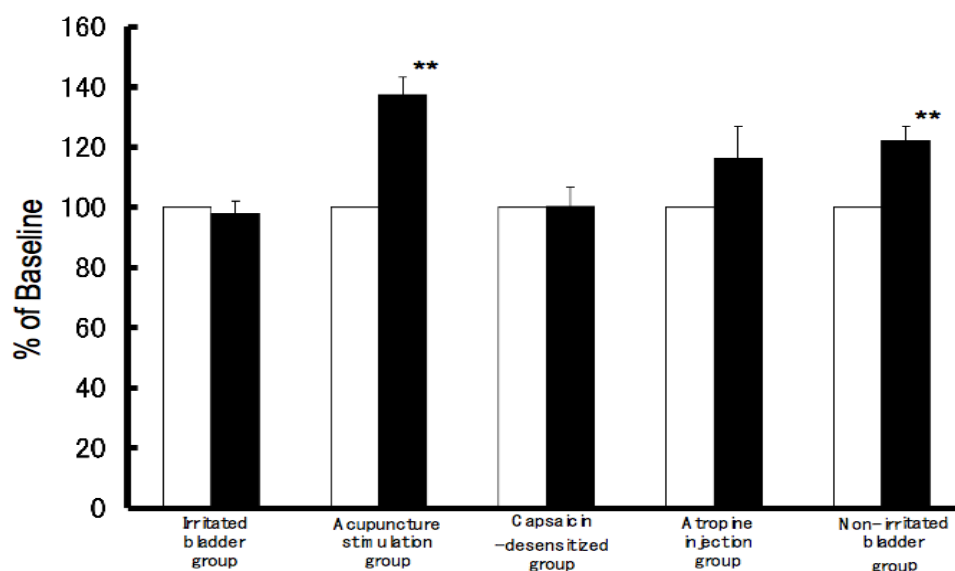


Figure 1 Changes in the intercontraction interval between baseline and the following interventions: sacral acupuncture, atropine injection (1 mg/kg, iv), or no stimulation in the five experimental groups.

Interpretation of results

The results of this study suggest that the effects of sacral acupuncture on bladder inhibition might act upon nociceptive afferent C-fibers, which are thought to cause abnormal bladder sensation due to acetic acid-induced inflammation of the bladder epithelium. MP decreased significantly after injection of atropine, although it did not change significantly after sacral acupuncture. In light of these results, it is suggested that the combination of sacral acupuncture and antimuscarinics therapy may have additive effects in the treatment of OAB.

Concluding message

The results of our experiments using conscious rats suggest that sacral acupuncture may contribute to the improvement of acetic acid-induced bladder irritation through inhibition of capsaicin-sensitive C-fiber activation.

References

1. Urol Int 65: 190-195, 2000
2. Int J Urol 11: 607-612, 2004

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<i>Is this a clinical trial?</i>	No
<i>What were the subjects in the study?</i>	ANIMAL
<i>Were guidelines for care and use of laboratory animals followed or ethical committee approval obtained?</i>	Yes
<i>Name of ethics committee</i>	The ethics committee of Meiji University of Integrative Medicine