

## **INHIBITORY EFFECT OF TIBIAL NERVE STIMULATION ON THE MICTURITION REFLEX IN THE RAT**

### **Aims of Study**

Several observations suggest that bladder overactivity is associated with subnormal central inhibition of the micturition reflex. The overactivity can be abolished by regional or general anaesthesia and suppressed by activation of ano-genital afferents with known inhibitory effect on the micturition reflex. Artificial electrical stimulation of such afferents forms the basis for various neuromodulatory procedures as applied to patients with urge incontinence. Experimental studies in anaesthetised or decorticated animals have shown that brief periods of stimulation of these afferents induce a prolonged increase in the volume threshold of the micturition reflex (1). Recently, tibial nerve stimulation has been explored as an alternative treatment in patients with urgency-frequency syndrome (2). The present experimental study was intended to determine if stimulation of tibial nerve afferents might induce a similar prolonged modulation of the micturition reflex.

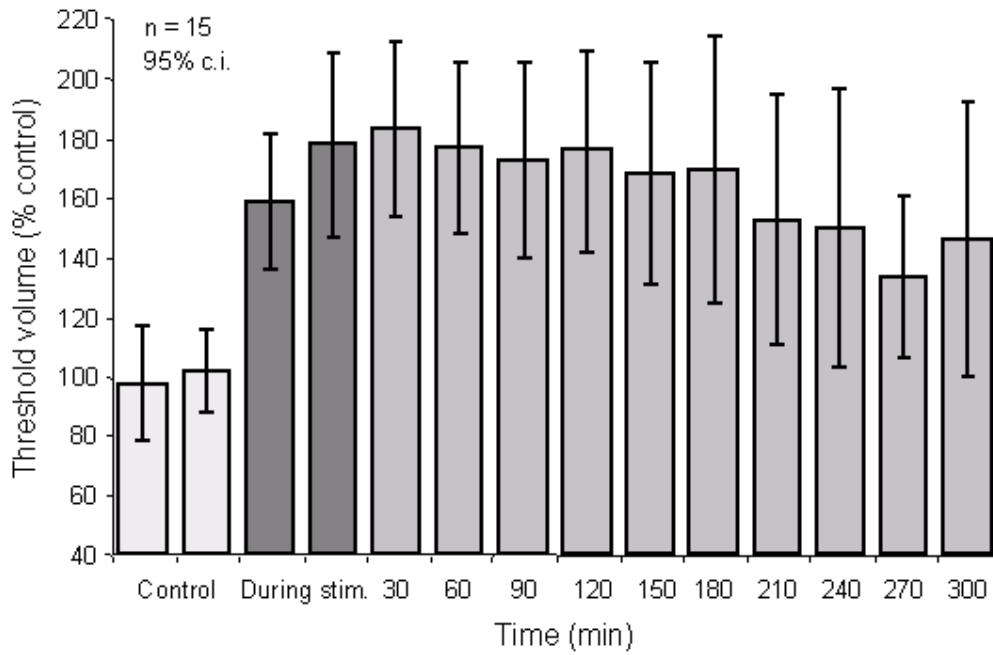
### **Methods**

Fifteen adult female Sprague Dawley rats (250-350 g) were used for the study. Under methohexital anaesthesia (50 mg/kg i.p.), the animals were fully decorticated by gentle suction, sparing most of the diencephalon. This procedure rendered the animals unconscious so no further anaesthesia was required. For recordings, the animals were paralysed by a continuous i.v. infusion of pancurone bromide (0.3 mg/kg.h) and artificially ventilated. Their body temperature was maintained at about 38 °C by a feed-back controlled heating lamp.

Bilateral tibial nerve stimulation was performed by inserting two pairs of needle electrodes (1 cm apart) close to the nerve at the level of the medial malleolus. Repeated constant flow cystometries were performed with body-warm saline (0.07 ml/min) at about 10 minutes interval. When a bladder contraction occurred the infusion was immediately stopped and the catheter opened. Care was taken to empty the bladder completely after each cystometry. The threshold volume of the micturition reflex was used as the dependent variable. After four to six stable control recordings, both sides of tibial nerve were stimulated continuously for 5 minutes at 10 Hz, at two times threshold for  $\alpha$ -motor axons. The same stimulation was repeated 6 times with a pause of 5 minutes between the stimulations. To evaluate the effect of stimulation, the mean threshold volume was compiled from several cystometries during half hour periods before, during and after the tibial nerve stimulation.

### **Results**

After decorticating, all animal survived in good condition with reasonably stable micturition reflexes. Tibial nerve stimulation induced a significant increase in the threshold volume in all animals, starting from the first stimulation period. The best effect (mean 170%) occurred during the first 3 hours after the last stimulation period. A clear threshold increase remained for at least 5 hours, our longest observation period.



### **Conclusions**

Repeated short periods of tibial nerve stimulation induced a prolonged increase in the micturition threshold volume. The modulatory effect was similar to that earlier reported for ano-genital afferent stimulation. This finding offer a theoretical explanation for the clinical beneficial effect of tibial nerve stimulation in patients with urgency or urgency incontinence (2).

### **References**

1. J Urol. 155:1477-1481, 1996
3. J Urol. 166(3):914-918, 2001