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HIGH FREQUENCY DEEP BRAIN STIMULATION AND THE URINE STORAGE FUNCTION IN AWAKE PIGS

Aims of Study
The aim with the this study was to investigate the effect of subthalamic high frequency deep brain stimulation on urine storage function in awake pigs by performing cystometries with stimulation on and off.

Methods
In 6 female Goettingen minipigs (weight 22–47 kg), 5 of which had been intoxicated with 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP), a unilateral electrode for chronic stimulation was placed in the subthalamic area. Correct localization of the electrode was verified by peroperative MRI-scan and examined by autopsy at study-termination after 12-14 months of stimulation-treatment. The electrode was connected to a subcutaneous battery unit (Itrel® II quadripolar implantable pulse generator, Medtronic®, Minneapolis, Minnesota, USA). Stimulation mode and -parameters were controlled telemetrically and set to unipolar pulses, 160 pulses/s, 3 V, pulsewidth 60 s, continuous stimulation, thus corresponding to the settings used in humans treated for Parkinsonism.
In the awake pig a transurethral catheter was placed and cystometries were performed as a continuous infusion of room temperature saline with a rate of 60 ml/minute. Four cystometries were compared: Cystometry 1, stimulation on for six months; Cystometry 2, stimulation off for less than 45 minutes; Cystometry 3, stimulation off for two days; Cystometry 4, stimulation on for less than 25 minutes.
Data on cystometric capacity and on intravesical pressure rise on filling were evaluated.

Results
Transurethral catheterization was possible in 22 of 24 planned cystometry-sessions.

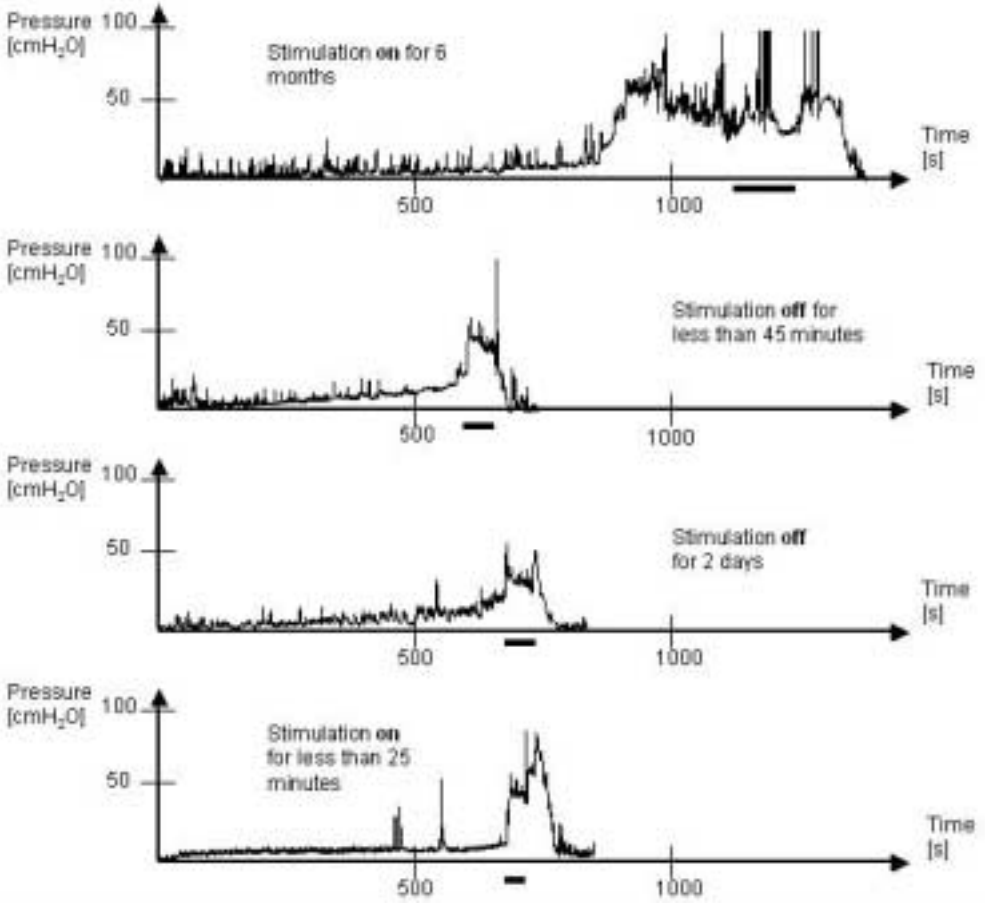

Figure: The four cystometric recordings from one pig. Infusiontime in seconds is equal to infused volume in ml. Infusion stopped at pressure rise and squatting. Black bar below the graphs mark the voiding.

Capacity: With the stimulation in on-mode, cystometric capacity in the MPTP-intoxicated pigs was a mean of 30 ml/kg-bodyweight (range 19-39 ml/kg, Cystometry 1). Within 45 min after stimulation was switched off cystometric capacity had decreased to a mean of 24 ml/kg (range 11-35 ml/kg, Cystometry 2). Two days later, with the stimulator still in off mode, cystometric capacity was unchanged a mean of 26 ml/kg (range 17-37 ml/kg, Cystometry 3). The stimulation was switched on again, which within 25 min caused no change in cystometric capacity: a mean value of 27 ml/kg (range 14-40 ml/kg, Cystometry 4).
Pressure-rise on filling: When the stimulation was on, intravesical pressure at cystometric capacity in the MPTP-intoxicated pigs was a mean of 7 cmH_2O (range 5-9 cmH_2O, Cystometry 1). After the stimulation had been switched off less than 45 min earlier, pressure at cystometric capacity had increased to a mean of 13 cmH_2O (range 9-18 cmH_2O, Cystometry 2). Two days later, with the stimulator still in off mode, pressure at cystometric capacity had increased further to a mean of 21 cmH_2O (range 17-28 cmH_2O, Cystometry 3). The stimulation was switched on again, and less than 25 min after this the pressure at cystometric capacity was markedly lower: a mean of 11 cmH_2O (range 6-21 cmH_2O, Cystometry 4).

Conclusions

It was concluded that conventional cystometry in awake pigs was a feasible examination technique.
It was further concluded that unilateral high frequency deep brain stimulation seemed to cause an immediate and reversible reduction in intravesical pressure rise on filling. An effect of the stimulation on cystometric capacity was not demonstrated.
Since pressure and capacity responded differently to interruption of stimulation distinct neural mechanisms may be involved in the modulation of sensory information on bladder tension and stretch.

Reference

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Ref Type: Abstract

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