

## THE PONTINE MICTURITION CENTRE IN THE PIG.

### Hypothesis / aims of study

Fluoroscopy and MRI can be used without modifications in chronic studies in pigs enabling monitoring of the positioning of equipment implanted by stereotactic procedures. In order to advance the use of pigs in the neurophysiology we aimed at localising a pontine micturition center by recording of pressures in the lower urinary tract during stereotactic stimulation by a needle-electrode in the pontine region.

### Study design, materials and methods

The pigs were intubated and placed in a prone position and kept on an isoflurane inhalation anesthesia. The head of the pig was fixated in a stereotactic frame by bilateral bone-screws inserted into the zygomatic arc directly below the lateral margin of the eye. A 3 by 5 cm hole was made in the skull giving access to the sinus frontalis, which in adult pigs is a 2 to 5 mm cavity that stretches almost to the line where the trapezoid muscle inserts. A 2 by 3 cm hole made in the floor of the sinus frontalis, giving access to the dura, which was cut open, and the brain. A tungsten needle electrode was inserted for the stimulations. For pressure recording in the urethra independent from the bladder a transurethral separation catheter was inserted.

### Results

A total of 10 pigs with a weight of 30 to 70 kg were examined. Repeated fluoroscopic visualization of the needle electrode relative to the rete mirabilis was performed in the early 3 pigs until stereotactic coordinates were established. Stereotactic mapping was performed in 1 mm steps in all 3 planes.

In 8 pigs one or two types of pressure responses in the lower urinary tract to stimulation of the brainstem were recorded. The responses were: a) changes similar to voiding, i.e. urethral pressure decrease followed within less than 1 s by a bladder pressure increase, or b) changes similar to a continence response, i.e. urethral pressure increase and no change in bladder pressure. These responses could be evoked from distinct areas in the pontine region, in few cases directly adjacent to one-another.

Fluoroscopy, MRI-scans and histological specimens demonstrated the electrode-tip positioned in the pons.

### Interpretation of results

In this study in the pig we reproducibly demonstrated areas in the pontine region capable of evoking either voiding or continence responses in the lower urinary tract. The brain of the pig is much larger than that of cats and rats, and the pathways involved in the regulation are formed by larger numbers of neurons and therefore studies in pigs may lead to more accurate information on neurotransmitters and pathways.

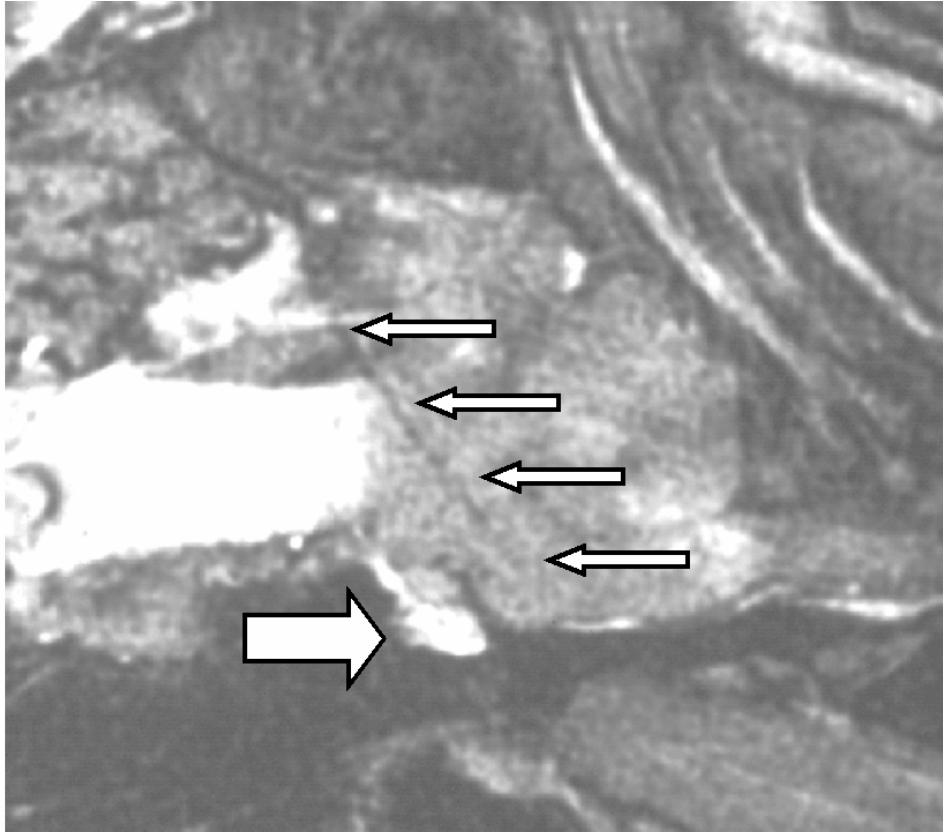
The needle location in areas responsible for voiding and continence responses could be visualized by MRI and fluoroscopy, and accordingly the pig appears to be feasible also for chronic stereotactic studies.

### Concluding message

Demonstration of a pontine micturition centre in the pig has interesting advantages as information of high accuracy about the neuro-regulation and information from chronic studies can be obtained.

Figure 1.

MRI-scan, sagittal view (the spine going caudally to the right at the bottom of the picture), of a pig brain. Four thin arrows mark the electrode; fat arrow marks the vascular formation rete mirabilis anterior to the pons. (Whitening of the anterior part of the brain and the distortion of the upper part of the electrode are artefacts).



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