

THE NOVEL USE OF TELEMETRY TO MONITOR BLADDER FUNCTION IN THE CONSCIOUS RAT.

Hypothesis / aims of study

Cystometry methods (CMG) in rat have historically been performed under anaesthesia or restraint. The use of anaesthesia may be inappropriate when investigating the neural mechanisms of bladder/urethral function. Furthermore, the potential influence of the voluntary regulation of micturition can only be studied in the conscious state. CMG studies in the rat employ permanent catheters, which fill the bladder artificially. These studies are of short duration and impose immobility. Thus, the behaviour of the bladder during filling, storage and voiding phases of the micturition cycle is interpreted under non-physiological conditions. These confounding factors have inspired us to seek alternative techniques aimed at obtaining natural CMG measurements and micturition behaviours in a stress-free and physiological environment.

Study design, materials and methods

Studies were performed with female CD rats (200 – 300g) and were conducted in accordance with United Kingdom legislation. Female rats (n=6) were each prepared with a Data Sciences Instruments C50-PXT telemetry transmitter implanted intra-peritoneally. Bladder pressure was measured with the aid of a pressure catheter inserted through the dome of the bladder. Heart rate was derived from the ECG signal and both activity and temperature were determined from the transmitter body. Comparisons between conventional urethane anaesthetised CMG (n = 6; bladder infused at 45µl min⁻¹) and telemetered rats on bladder function (opening and closing pressures) were evaluated. In addition, the effects of the non-selective muscarinic antagonist, oxybutynin (30µg kg⁻¹ subcutaneously) on bladder pressure, heart rate, activity and core body temperature in the telemetered rat were studied.

Results

Table 1: Opening and closing pressures of anaesthetised cystometry and conscious telemetry in rats

	Anaesthetised	Conscious
Opening Pressure	19.8±0.83	19.4±0.84
Closing Pressure	16.2±1.88	34.4±1.91

Table 2: The effect of Oxybutynin (30µg kg⁻¹) on bladder pressure, activity, Heart Rate and core body temperature in the telemetered rat.

	Vehicle	Oxybutynin (30µg kg ⁻¹)
Bladder pressure	383±152.4	187±91.1
Animal activity	183±29.2	205±26.4
Heart Rate	378±15.2	383±14.5
Core Body Temperature	38.24±0.06	38.65±0.06

(p<0.05 denoted *)

Interpretation of results

The above demonstrates that the closing pressure, a key component of the micturition reflex is masked by methods of CMG involving anaesthetic agents due to afferent and efferent trafficking. In addition, oxybutynin significantly reduces the non-voiding contractions in the telemetered animals, without affecting animal activity, which remained the same; therefore we can be assured that this decrease is not due to abdominal pressure interfering with the pressure probe.

Concluding message

It is evident from the present study that bladder function, assessed with the aid of telemetry, can be investigated in the non-tethered rat. Moreover, other key biological parameters e.g. temperature, heart rate and activity can be monitored simultaneously in a stress-free

environment. It is concluded that the use of bladder telemetry will have significant impact on urological research.