

# Spatial Identification of Dominant Bladder Motion Regions using Pressure Volume Catheters: an ex-vivo study

## Background

Conventional urodynamics primarily detects global changes in intravesical pressure. Localised bladder wall motions may redistribute intravesical volume without producing a detectable global increase in pressure. These micromotions may therefore remain undetected during conventional urodynamic assessment.

**Hypothesis:** bladder micromotions may originate from localised “epicenters”.

**Aim:** detect and localise these events using spatially resolved intravesical volume measurements.

## Methods

### Ex-vivo bladder model

Viable porcine bladders harvested post-euthanasia. Spontaneous localised micromotions observed following removal of central neural inhibition.

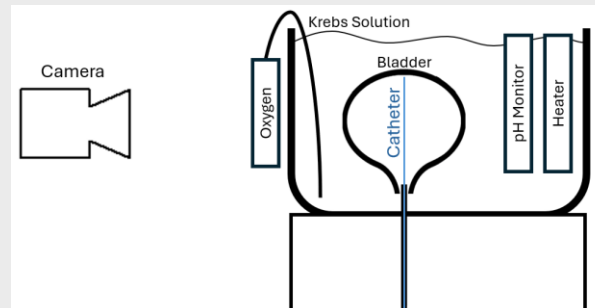
### Pressure-volume catheter

Multi-electrode pressure-volume catheter (Ventri-Cath 512, Millar, USA) adapted for intravesical use.

### Optical validation

Surface fiducial markers tracked using video.

Figure 1: Schematic of viable porcine bladder maintained in Krebs solution with a catheter recording pressure-volume data and a camera recording the surface movements of the bladder.

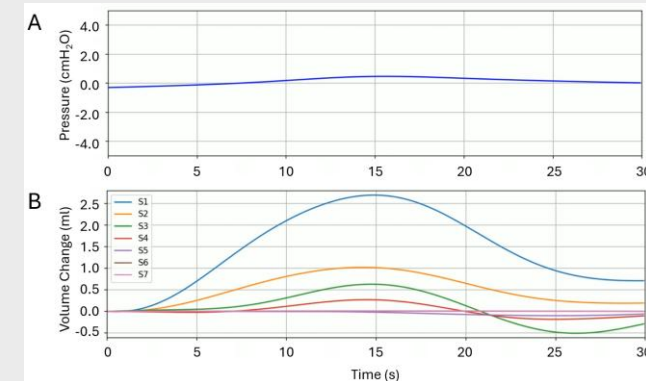


## Results

Figure 2: Ex-vivo viable porcine bladder with surface markers; maximum displacement directions (white lines) which converge at the micromotion epicenter (green).



Figure 3: A: Intravesical pressure in the viable bladder measured by the PV catheter. B: Intravesical volume changes for the S1-S7 segments of the PV-catheter.



## Conclusions

Spatially resolved PV measurements detected micromotions not apparent from pressure measurements alone.

A reproducible micromotion epicenter was identified. Spatial PV measurement could provide a new approach for detecting and localising bladder activity in OAB.

## Discussion

Bladder micromotions can be detected and localised through regional volume redistribution, despite minimal changes in global intravesical pressure.

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