



The ureter actively compensates as the bladder fills.

Ureteral contractile work rose during filling in every subject, most where the ureterovesical junction contracted weakest.

Assessment of intramural and upper ureteral pressure-time activity during urodynamics

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Background

Upper tract risk in neurogenic lower urinary tract dysfunction (NLUTD) is inferred from bladder pressure alone. The ureter is treated as a passive conduit, and its contractile response to bladder filling has not been measured in humans.

Methods

- Adults undergoing clinically indicated fluoroscopic urodynamics (IRB HUM00266429)
- Pressure-sensing catheters (Mikro-Cath, Millar) placed retrograde by flexible cystoscopy, **without anesthesia**
- Phase 1:** ureterovesical junction (UVJ) tunnel: baseline tone and peristaltic amplitude
- Phase 2:** proximal ureter (5 cm above UVJ) and bladder, recorded simultaneously during filling
- UCPI measured at start vs. end of filling; ATRI calculated from paired UVJ and bladder pressures (definitions below)
- Wilcoxon signed-rank and Spearman tests

Ureteral contractile pressure index (UCPI)

UCPI = amplitude $\times$ pulse width $\times$ frequency: mean peristaltic pressure above baseline

Antegrade Transport Reserve Index (ATRI)

ATRI = (UVJ baseline tone + peristaltic amplitude) $\div$ intravesical pressure
Predicted a priori: below 1.0, ureteral driving force is less than bladder resistance

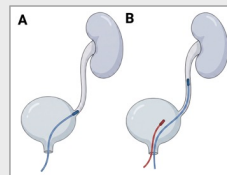


Figure 1: Pressure wire placement protocol. A schematic depiction of the left kidney (top right of panels) and the bladder (bottom of panels) is shown

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catheter
placements
successful

0

complications

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UCPI rose with
filling

Results

- UVJ baseline tone (6.1–27.2 cmH₂O) and peristaltic amplitude (5.4–35.2 cmH₂O) were resolvable in all 10 Phase 1 subjects
- UCPI rose from start to end of filling in **every subject** (n=7; Wilcoxon W=28, p=0.008)
- Weaker UVJ amplitude, greater escalation:** UVJ amplitude vs. UCPI fold-change p=-0.886, p=0.019 (n=6); total UVJ peak pressure was weaker (p=-0.771, p=0.072)
- Exploratory:** ATRI below 1.0 in both NLUTD subjects (0.95, 0.60) and above 1.20 in all 4 non-NLUTD subjects

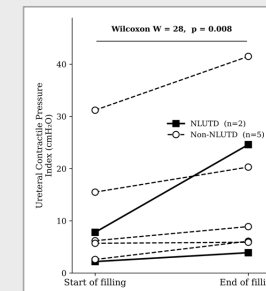


Figure 2: Ureteral contractile pressure index (UCPI) at the start and end of bladder filling.

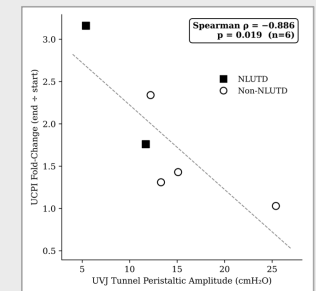


Figure 3: Association between UVJ tunnel peristaltic amplitude and UCPI fold-change during bladder filling

Conclusions Direct ureteral pressure measurement during urodynamics is feasible without anesthesia. The ureter escalates contractile work as bladder pressure rises, most in the weakest UVJs. ATRI findings are hypothesis-generating.