Abdominal Muscle EMG Enables Single Catheter Urodynamics without the Rectal Catheter

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Multichannel urodynamics (UDS) is the gold standard for objectively evaluating lower urinary tract symptoms (LUTS) but requires two catheters.

Problem: The rectal catheter adds discomfort, increases procedural complexity, and introduces artifacts into detrusor pressure (Pdet) measurements

Innovative Solution: A novel real-time signal processing method to estimate Pdet using only vesical pressure (Pves) and surface abdominal muscle electromyography (AEMG)

Goal: Enhance patient comfort and diagnostic accuracy for vulnerable populations such as elderly and pediatric patients

METHODS

Study Population & Design

- 40 consecutive UDS studies (11 male, 29 female)
- Single-center prospective evaluation of single-catheter approach
- Applied uniformly to entire patient cohort

Technical Framework (Fig. 1)

Signal acquisition: Pves, Pabd & surface AEMG

Processing features:

- Variable delay compensation for AEMG-to-Pabd latency
- Multiresolution wavelet decomposition of Pves
- Tunable event-dependent weighted sum for Pdet estimation

Pre-UDS assessment performed on all patients **(Fig. 2)**

- Series of coughs & Valsalva efforts
- AEMG-Pves correlation check
- Quality validation for signal integrity assessment. Used to decide feasibility (Go/No Go) for single catheter-based UDS

Validation & Analysis

- Event-based scoring metric compares estimated Pdet vs. estimated Pabd
- Correlation analysis validates signal quality & estimation accuracy

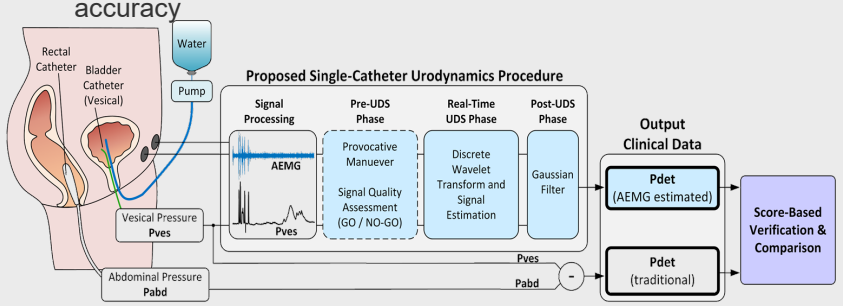

Figure 1. Single-Catheter Urodynamics Procedure with GO/NO-GO Decision

RESULTS

Clinical Feasibility

- Real-time decision point enabled "Go/No-Go" assessment prior to UDS testing **(Fig. 2)**
- 75% of cases (30/40) qualified for single-catheter urodynamics after the provocative maneuver

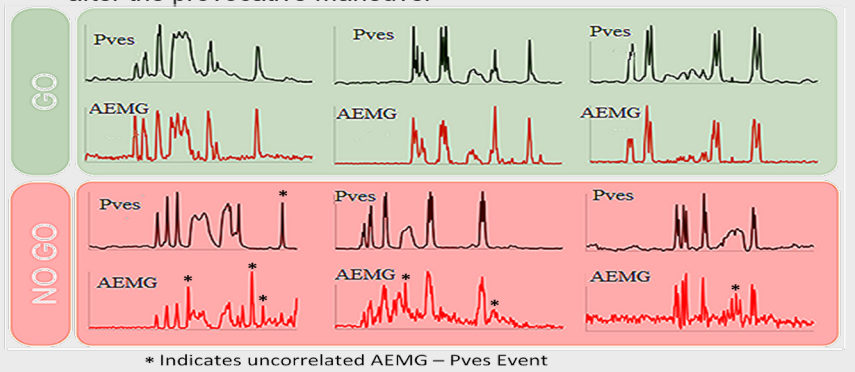

Figure 2. AEMG-Pves Correlation Distinguishing GO vs. NO-GO Cases

Estimation Accuracy (Fig. 3)

- Detrusor pressure estimation accuracy of 85–95% (median 93%)
- Outperformed standard subtraction method in signal clarity and artifact reduction
- High correlation between estimated and measured Pdet pressure

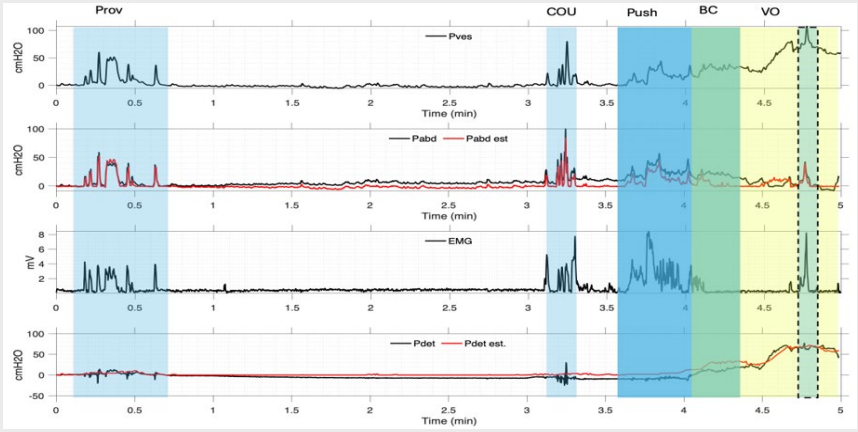

Figure 3. Example Urodynamic data with AEMG and estimated Pdet & Pabd

Conflict of Interest Statement

Funding for this study provided in part from SRS Medical. Mr. Brody is CEO of SRS Medical. Dr. Abdelhady was a consultant for SRS Medical.
Drs. Damaser, Majerus, and Abdelhady and Mr. Brody are inventors on intellectual property licensed to SRS Medical.