Leak Point Pressures

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Leak point pressures are commonly confused when we are learning urodynamics

Abdominal Leak Point pressures

- Think “stress incontinence”
- Also think ”Valsalva” and ”cough” LPPs
- measures the lowest abdominal pressure (generated by coughing or Valsalva) that causes urinary leakage through a weak urethral sphincter

Detrusor Leak Point Pressures

- Think low bladder compliance and high risk bladders
- measures the bladder pressure at which urine leaks passively due to poor bladder compliance or high storage pressures in the absence of abdominal straining

Key Differences in What they Measure

Abdominal Leak Point Pressure

- assesses urethral sphincter function and competence
- it quantifies the degree of urethral sphincter dysfunction in stress urinary incontinence

Detrusor Leak Point Pressure

- assesses bladder storage pressure and compliance
- it reflects the pressure the bladder generates during filling that overcomes urethral resistance

How they are measured

Abdominal Leak Point Pressure

- measured during active patient effort (Valsalva maneuver or coughing) that increases intra-abdominal pressure

Detrusor Leak Point Pressure

- measured passively during bladder filling without any abdominal straining, recording the detrusor pressure at the moment leakage occurs

Clinical Applications

Abdominal Leak Point Pressure

- primarily used in evaluating stress urinary incontinence to help select appropriate treatment

Detrusor Leak Point Pressure

- primarily used in neurogenic bladder dysfunction to assess risk of upper urinary tract damage
- higher DLPP (traditionally >40 cm H_2O) is associated with greater risk of upper tract deterioration

Clinical context

Abdominal Leak Point Pressure

- Values <60 cm H_2O suggest intrinsic sphincter deficiency,
- Higher values >60cm H2O suggest urethral hypermobility as the primary mechanism of stress incontinence

Detrusor Leak Point Pressure

- helps guide management in neurogenic lower urinary tract dysfunction
- should not be used as the sole urodynamic parameter since bladder compliance and other factors also influence upper tract risk

Measurement Techniques and Considerations - ALPP

- ALPP is measured during multichannel urodynamics with simultaneous measurement of bladder (vesical) and abdominal (typically rectal) pressures.
- The bladder is filled to a standardized volume
- typically 200 mL or half capacity if functional capacity is less than 200 mL.
- The patient is positioned semi-upright, and pressure transducers are maintained at the level of the symphysis pubis.
- The patient then performs either a gradual Valsalva maneuver or coughs with increasing intensity until urinary leakage is directly observed.
- The lowest abdominal pressure at which leakage occurs is recorded as the ALPP.

- Catheter effect: The presence of a transurethral catheter significantly increases measured ALPP values. Studies show that removing the catheter results in substantially lower ALPP measurements
- The catheter can cause false-negative stress tests in approximately 15% of patients
- Maneuver type: Cough-induced ALPP is significantly more sensitive than Valsalva maneuver for demonstrating leakage in stress incontinence.
- All women with stress incontinence leak with cough, but 66% may not leak with Valsalva.
- Baseline abdominal pressure: Baseline abdominal pressure varies considerably (10-55 cm H_2O) and correlates with patient weight and BMI.
- Whether to report total ALPP or the change from baseline (ΔALPP) remains controversial, as these can categorize patients differently.

Measurement Techniques and Considerations: Detrusor Leak Point Pressure

- DLPP is measured during passive bladder filling without any abdominal straining or detrusor contraction.
- The bladder is filled at a standardized rate while continuously monitoring detrusor pressure (calculated by subtracting abdominal pressure from vesical pressure).
- The detrusor pressure at the moment leakage occurs is recorded as the DLPP.

- Catheter effect: urethral catheter can artificially elevate DLPP.
- Avoiding confusion: True DLPP occurs during passive filling without detrusor contraction and without abdominal contraction
- Lack of standardization: DLPP measurement lacks standardization across centers, making comparison of values difficult.

Clinical utility in predicting treatment outcomes:

Abdominal Leak Point Pressure

- Traditional interpretation: ALPP <60 cm H_2O suggests intrinsic sphincter deficiency (ISD), while higher values suggest urethral hypermobility as the primary mechanism. Historically, this distinction was thought to guide surgical selection.
- Modern evidence challenges this: Large randomized trials demonstrate that ALPP does not reliably predict surgical success or failure after midurethral sling procedures. The landmark VALUE trial showed that preoperative urodynamic findings, including ALPP, did not predict outcomes and did not change surgical management in ways that improved results.
- Weak correlation with severity: ALPP correlates weakly with subjective incontinence severity and pad test results, but this correlation does not translate to predictive value for surgical outcomes.

Detrusor Leak Point Pressure

- DLPP has greater clinical utility in neurogenic lower urinary tract dysfunction (NLUTD) for predicting upper urinary tract deterioration, though with important limitations:
- Traditional cutoff: DLPP >40 cm H_2O has been traditionally associated with increased risk of hydronephrosis and upper tract damage. However, this cutoff originated from retrospective studies with low level of evidence.
- No reliable safe cutoff: Recent systematic reviews and expert consensus conclude there is no reliable "safe/unsafe" cutoff for DLPP, including the traditional 40 cm H_2O threshold. Some studies suggest even lower pressures (≥15 cm H_2O storage pressure) may be associated with UUTD.
- Association confirmed but not absolute: Patients with lower DLPP consistently do better than those with higher DLPP regarding upper tract preservation. However, DLPP should not be used as the sole urodynamic parameter because bladder compliance and other factors also influence UUTD risk
- Guideline recommendations: The AUA/SUFU guidelines recommend repeat urodynamic studies at appropriate intervals (≤2 years) in high-risk NLUTD patients with impaired storage parameters to assess treatment effectiveness and guide ongoing management

Summary of predictive utility

- ALPP has limited value for predicting stress incontinence surgical outcomes in the modern era of midurethral slings
- DLPP provides useful risk stratification in neurogenic bladder but must be interpreted alongside bladder compliance, imaging findings, and clinical context
- Both measurements suffer from lack of standardization and significant technical variability BUT are consistently used in testing and should be part of your fund of knowledge!

1. Leak-Point Pressures. McGuire EJ, Cespedes RD, O'Connell HE. The Urologic Clinics of North America. 1996;23(2):253-62. doi:10.1016/s0094-0143(05)70309-8.
2. The Urethra (UPP, MUPP, Instability, LPP). Khullar V, Cardozo L. European Urology. 1998;34 Suppl 1:20-2. doi:10.1159/000052270.
3. The Presence of Transurethral Cystometry Catheter and Type of Stress Test Affect the Measurement of Abdominal Leak Point Pressure (ALPP) in Women With Stress Urinary Incontinence (SUI). Türker P, Kilic G, Tarcan T. Neurourology and Urodynamics. 2010;29(4):536-9. doi:10.1002/nau.20801.
4. A New Technique for Assessing Detrusor Leak Point Pressure in Patients With Spina Bifida. Combs AJ, Horowitz M. The Journal of Urology. 1996;156(2 Pt 2):757-60. doi:10.1097/00005392-199608001-00054.
5. ACOG Practice Bulletin No. 155: Urinary Incontinence in Women. Obstetrics and Gynecology. 2015;126(5):e66-e81. doi:10.1097/AOG.0000000000001148.
6. ICS Teaching Module: Detrusor Leak Point Pressures in Patients With Relevant Neurological Abnormalities. Tarcan T, Demirkesen O, Plata M, Castro-Diaz D. Neurourology and Urodynamics. 2017;36(2):259-262. doi:10.1002/nau.22947.
7. The AUA/SUFU Guideline on Adult Neurogenic Lower Urinary Tract Dysfunction: Diagnosis and Evaluation. Ginsberg DA, Boone TB, Cameron AP, et al. The Journal of Urology. 2021;206(5):1097-1105. doi:10.1097/JU.0000000000002235.
8. Baseline Abdominal Pressure and Valsalva Leak Point Pressures-Correlation With Clinical and Urodynamic Data. Madjar S, Balzarro M, Appell RA, Tchetgen MB, Nelson D. Neurourology and Urodynamics. 2003;22(1):2-6. doi:10.1002/nau.10073.