Urodynamic Interpretation in Children with Spina Bifida: Pitfalls and Disagreements

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Introduction

- Detrusor sphincter dyssynergia and DLPP > 40 cm H2O associated with renal deterioration
- Videourodynamics can have low interrater reliability
- How do we optimize videourodynamics from multi-center studies?
- Critical assessment of how/why pediatric urologists disagreed on whether a bladder was hostile
Methods

• UMPIRE: Urologic Management to Preserve Initial Renal Function for Young Children with Spina Bifida
• Baseline urodynamics <4 mo
• Initial studies: 5/2015 to 9/2017
Methods

9 clinical sites

Outside review:
Chris Austin
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John Wiener
Elizabeth Yerkes

Outcome measured: agreement on overall bladder classification
Methods

i. Normal
The bladder should have normal capacity and compliance and empty to near completion at a relatively low detrusor pressure. Leakage before voiding, detrusor overactivity, and DSD are not seen.

ii. Safe (but not normal)
Bladder capacity can be normal, low, or high. Compliance is normal or mildly decreased, but the end filling pressure or DLPP must be < 25 cm H$_2$O. If bladder capacity and compliance are normal, emptying is poor or absent. (This factor should not be sole reason to choose abnormal in infants as many do not empty completely.) Leakage may be present. Definitive evidence of DSD is not present on either EMG or fluoroscopy. Detrusor overactivity should not be present on CMG.

iii. Intermediate
This category is a grey zone for bladders that are neither safe nor hostile (see below). Bladder capacity may be low, normal, or high. Compliance is reduced with end filling pressure (measured prior to DO or voiding contraction, if present) or DLPP of 25-39 cm H$_2$O. Detrusor overactivity (≥ 2 contractions of ≥ 15 cm H$_2$O over baseline) or voiding contractions may be present but are not accompanied by DSD.

iv. Hostile
This pattern should be obvious and is noted if one or both of the following criteria are present:
  a. The bladder has poor compliance with an end filling pressure or DLPP ≥ 40 cm H$_2$O.
  b. Bladder contractions or detrusor overactivity, if present, are accompanied by DSD.

Definitions:
1. Detrusor Overactivity – ≥ 2 contractions of ≥ 15 cm H$_2$O over baseline
2. DSD – may be present on EMG, fluoroscopy, or both
3. End filling pressure – should be measured immediately prior to a voiding or NDO contraction, if present; alternatively this may be measured at the end of filling if the study is terminated due to discomfort or other cause
4. Fill rate – as per ICCS recommendations, slow fill cystometry (5-10% of EBC per min, or <10 ml/min) is recommended
Results

• 158 newborn studies from 9 clinical sites underwent review
• All 3 reviewers independently agreed on 58% (92/158)
Results – bladder classification

Original
• Characterized as hostile: 35/158

After review
- 18 hostile
- 15 intermediate
- 1 safe
- 1 normal
Results – bladder classification

Original

• Characterized as normal: 5/158

• Characterized as safe: 52/158

• Characterized as intermediate: 66/158
Results – Next Steps/ Lessons Learned

• Feedback review results to original sites
• Problems of technique
• Problems of interpretation
  • What counts as NDO?
  • What counts as DSD?
  • Where to measure the pressure in the presence of contractions?
  • Is it a voiding contraction or NDO?
  • What is a normal infant bladder?
Conclusions

• Ability to reliably identify hostile bladders is low even among high volume specialized centers
• Problem areas for improvement identified
• Importance of continued efforts to standardize urodynamics