

## Urodynamic Challenges in Pediatrics

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## Abstract

**Purpose:** To list and comment urodynamic studies in several Pediatric urological diseases and mention possible improvements.

**Methods:** Give a Pediatric Urologist opinion and review recent selected literature.

**Results:** The type of urodynamic investigation has a different purpose depending on the urological pathology we want to study and treat. The following are listed and commented: Vesicoureteral Reflux (VUR), Posterior Urethral Valves (PUV), sacral agenesis, occult spinal dysraphism, exstrophy epispadias complex, Prune-Belly syndrome, anorectal or cloacal malformations, dysfunctional voiding and enuresis

**Conclusions:** Currently urodynamic studies still require research in different ways such as clinical relevance, methodological and interpretational aspects. Nowadays is necessary determine the role, indication, predictive value, and effect on treatment outcomes of urodynamic in the pediatric population.

## Editorial

Most urological diseases that appear in childhood carry or are caused by a dysfunction of the lower urinary tract. Such dysfunction can be diagnosed in a neurological patient (myelomeningocele or acquired neurological injury) or in a patient who has had posterior urethral valves or vesicoureteral reflux, as well as in patients with a functional cause like voiding dysfunction, or even syndromes such as Ochoa or Hinman.

The type of urodynamic investigation has a different purpose depending on the urological pathology we want to study and treat. Therefore, in order to decide the properly one to perform, it is important to distinguish whether we have a primarily functional etiology, neurogenic or a urinary tract structural pathology.

Broadly, urodynamic investigations can be classified in noninvasive urodynamic such a frequency-volume diary, uroflowmetry with or without electromyography (perinatal patch electromyography) and ultrasound post void residual measurement and invasive urodynamic like cystometry and videourodynamics [1].

Noninvasive urodynamic tests not only provide information on voiding dysfunctions but also can clarify or even guide if there is also an associated filling dysfunction that we have to investigate. There are working groups that are able to classify all types of voiding dysfunction, using uroflowmetry with electromyography and incorporating lag time measurement [2,3].

A full evaluation incorporating invasive urodynamic will define the pressure-volume relationships within the container in order to ascertain, for example, at what pressures does the bladder store urine and assessment of the compliance of this organ. The filling study would also try to ascertain whether or not there are any abnormal dynamics, over-activity or poor compliance that could be potentially detrimental to renal function and may be treated to reduce morbidity, for example in neurogenic bladder. Finally, it can be studied the emptying phase, the detrusor profiles and pressures during voiding, the relationship between detrusor contraction and sphincter function and the emptying efficiency of the container [1,4]

Video urodynamic can provide additional information that may contribute to a further understanding of the problem under investigation, though generates a lot of radiation in children [4].

Regarding Vesicoureteral Reflux (VUR) at least 20% of patients diagnosed at early ages have voiding dysfunction and / or bladder over activity reaching voluntary urination. In VUR patients there is no consensus on the use of noninvasive urodynamic tests in isolation without incorporating invasive examinations or when it is necessary to perform an invasive evaluation. Nowadays the published studies that examining urodynamic risk factors predictors of surgical correction of VUR treatment with the endoscopic procedure are rare and more infrequent. It would be interesting to study the usefulness of urodynamic study as a predictive value with respect to the endoscopic correction of VUR [5,6].

Posterior Urethral Valves (PUV) is the commonest cause of lower urinary tract outflow obstruction in male infants with an estimated incidence of 1:5000 male infants and 1:25.000 live births. Bladder function is abnormal in up to 70% of older children and adolescents. Bladder dysfunction causes morbidity e.g. urinary incontinence or myogenic failure and has been implicated in the late deterioration of renal function in this population. A poor understanding and inappropriate management of bladder dysfunction can result in unnecessary morbidity, which can handicap a child for life.

Urodynamic evaluation becomes very important in the clinical management of PUV. For this reason it is important to investigate protocols to establish the indications for performing invasive or non-invasive studies by age and clinical of these patients, studying the usefulness of urodynamic profile findings to predict future myogenic failure or incontinence [1,4].

Children with sacral agenesis involving partial or complete absence of vertebral bodies or infants with occult spinal dysraphism can remain silent until late childhood when incontinence. With increasing age, symptoms become more evident and include bowel and bladder dysfunction. Urodynamic tests should be useful to prevent upper urinary tract damage, as they guide when to apply prevention treatments. Once established the chosen preventive treatment, urodynamic studies should be able to monitor the effectiveness achieved [4].

Pediatric structural syndromes such as exstrophy epispadias complex, Prune-Belly syndrome, anorectal or cloacal malformations a lower urinary tract functional assessment (including invasive urodynamic evaluation) should be included. Anorectal malformations may have genitourinary and spinal abnormalities, including tethered cord or iatrogenic injury, but may also have a neurogenic bladder disorder without obvious etiology [4].

Uroflowmetry with electromyography can be useful in children with dysfunctional voiding who contract their external sphincters or pelvic floor muscles during micturition. It can lead to perform as a previous condition to decide whether biofeedback treatment could be useful. Values determined such as a lag time must be validated by various working groups to settle their reproducibility and usefulness [2,3].

Regarding enuresis, urodynamic tests are less used. Noninvasive urodynamic tests are of choice to study only enuretic syndrome. There are a number of children who reach adolescence with persistent enuresis and also, primary nocturnal enuresis may persist into adulthood associating with abnormal urodynamic findings. These adolescent patients may benefit from urodynamic studies (including filling urodynamic profiles and even ambulatory urodynamic monitoring), because if the findings are abnormal, they might have the best chance of successful treatment [7].

The Ochoa urofacial syndrome could be associated with enuresis and incontinence and also bladder dysentery. The Hinman syndrome is called the non-neurogenic bladder with neurogenic behaviour. Because all of them could developed end-stage renal disease, the urodynamic evaluation during clinical outcome are mandatory [8,9].

After listing certain diseases where urodynamic evaluation is necessary, it is interesting to mention another major challenge in invasive urodynamic test, as is improving acceptance within the pediatric population. Because bladder and rectal catheterization can be uncomfortable and painful and each test requires great dedication. Studies to determine the characteristics of children (type of pathology and age) who can benefit most from the use of techniques that reduce the pain threshold and nervousness would be very important today.

Currently urodynamic studies still require research in different ways such as clinical relevance, methodological and interpretational aspects. To remedy the paucity of high-quality evidence for or against the utility of urodynamic in the investigation of incontinence, properly conducted, large scale randomized controlled trials and precise determination of physiological, technical and interpretation variability of urodynamic results. All of them are needed to determine the role, indication, predictive value, and effect on treatment outcomes of urodynamic in the pediatric population.

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