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A modified device to facilitate flow measurements during voiding cystometry studies in infants

M. Fernández-Ibieta, G. Zambudio-Carmona, M.J. Guirao-Piñera, I. Martínez-Castaño, A. García-López, J.I. Ruiz-Jiménez

Urology Unit, Pediatric Surgery Department, Hospital CUV Arrixaca, Murcia, Spain

Correspondence to:
M. Fernández-Ibieta, Servicio de Cirugía Pediátrica, Hospital CUV Arrixaca, El Palmar s/n, 30012, Murcia, Spain,
Tel.: +34 968 369693

mfndezibieta@hotmail.com (M. Fernández-Ibieta)
gzambudio@uropediatria.com (G. Zambudio-Carmona)
mjs_gpinera@hotmail.com (M.J. Guirao-Piñera)
imtezcastano@gmail.com (I. Martínez-Castaño)
ascensiongarcial@hotmail.com (A. García-López)
pepecambil@yahoo.es (J.I. Ruiz-Jiménez)

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Summary

Introduction
Urodynamic studies (UDS) in infants are traditionally hampered by technique and flow collection; both are difficult and have not yet been standardized.

Methods
A very simple device has been developed to collect urine during the voiding phase in UDS. It is based on a urine-collection adhesive bag, which is connected to a tube that conducts the urine to a flowmeter.

Results
Eleven infants (4—23 months) were selected and a complete UDS was performed on all of them. A diagnosis was obtained for all of the infants.

Discussion
This device is easily available in every pediatric clinic; it is also disposable and inexpensive. It enables UDS in infants to be complete and achievable.

Introduction

Pressure-flow studies or voiding cystometry (VC) can be difficult to perform and evaluate in infants, as they are not yet toilet trained. Concomitant distress, numerous crying-induced artifacts, and the impossibility of voiding measurements make VC in infants disappointing and often useless. Nevertheless, the data from VC and all information provided by electromyography (EMG) testing of the perineal muscles should never be dismissed or ignored. In brief: flow curve shapes, cystometric capacity, detrusor voiding maximum pressure, maximum and average flows, post-voiding residual, postcontraction events and the presence of dysfunctional voiding can only be defined if a VC study and EMG are performed concomitantly.

In addition, infants present with unique urodynamic patterns [1]: it is acknowledged that the average maximum detrusor voiding pressure might be high (over 90 cmH2O in neonates and young infants) [2—5], and that dysfunctional voiding patterns on the EMG can be also considered to be physiological. Nevertheless, several reports have confirmed that any significant detrusor activity during the filling phase is pathological [2—5].

The present study aimed to develop a simple method with which to collect urine flow in infants, in order to perform complete urodynamics such as a cystomanometry (filling phase) and a pressure-flow study (voiding phase).

Methods

The following urine-collection system was developed to overcome the above-mentioned difficulties: a simple, sterile urine-collection bag (usually employed for urine culture in infants, and available in every pediatric department) is connected to a large probe (0.9 cm aspiration tube) that reaches the flowmeter (Fig. 1). Once the infant's meatus is gently cleaned, a urologic lubricant is applied for a few minutes. Meanwhile, a thin (Ch 6), sterile, polyethylene catheter is passed through a perforation in the upper part of the urine bag, secured with tape and connected to the pressure transducers. The other end of the catheter is introduced into the infant's urethra (up to 15—20 cm deep into the male utrethra, and 10 cm into the female urethra) and fixed with adhesive skin-protective tape. The bag is finally attached to the perineum, using its specific adhesives (Figs. 2 and 3), plus spray adhesive in females. A schematic picture is provided in Fig. 4.

In order to avoid pain, discomfort and perform an accurate urodynamic study without frequent crying-induced artifacts, the authors' currently support sedation for infants

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Figure 1 An aspiration tube is inserted into a sterile urine-collection bag. The darker end (screw-like) is firmly inserted into the bag's anti-reflux mechanism.

prior to catheterization, if required. Intranasal midazolam, a benzodiazepine with proven efficacy and security in pediatric clinics, is preferred. After informed parental consent and in the presence of a pediatrician, 0.2—0.3 mg/kg is administered directly into the infant's nose with a cone-shaped, commercialized device. Breastfeeding (and a noiseless atmosphere) is encouraged, if feasible, during the procedure, as they eliminate anxiety even better than sedatives [6].

In infants, according to the ICCS (International Childrens Continence Society), whenever possible, two urodynamic investigations, each including filling and voiding phases, are performed in each study [7].

In order to assure that no artifacts or measurement modifications were created (due to resistance and reservoir effect of the collecting tube), an experimental model was created. Tap water in a constant flow (as if it was urine stream) was collected and prolonged with plastic tubes of different calibres and longitudes to reach the flowmeter.

Results

So far, this device has been used in 11 infants (age range 4—23 months, three girls and eight boys). It worked really well in the male infants, but not so well in the females because of some urine spillage; however, a urodynamic diagnosis was obtained in all infants (six normal and five detrusor overactivity). Dysfunctional voiding was observed in four of them (Fig. 5), as was a high maximum detrusor voiding pressure (range 79—95 cm H_2O in boys); they were all referred as probably physiological, according to the specific literature [2—5].

In the experimental model, the flowmetries were surprisingly identical when enlarging the tube diameters and longitudes, but obstruction and overflow were created when lowering the tube diameters.

Discussion

When trying to define the existence of bladder function pathology in infants, it is necessary to perform both VC and EMG. In this report, a simple urine-collecting device was developed to perform VC studies in infants. This device, which consists of a sterile urine-collection bag (used to collect urine cultures in infants) connected to a larger

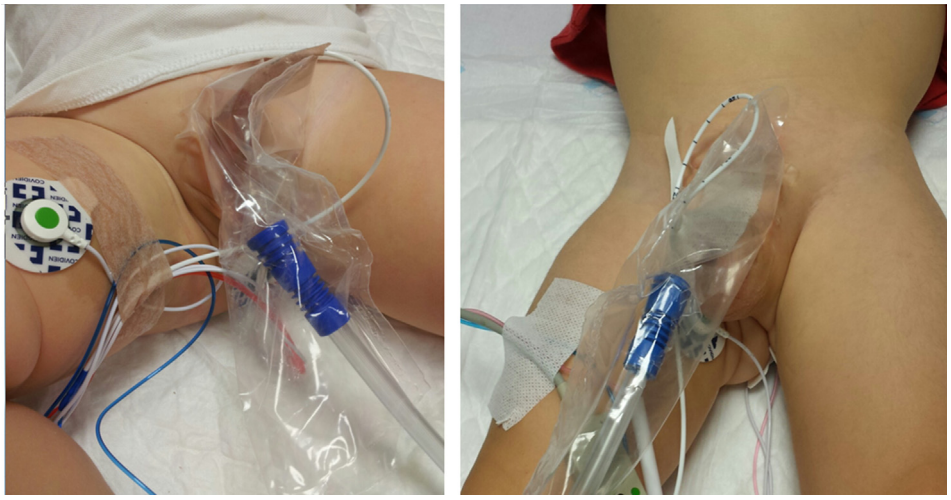

Figure 2 A urodynamic, thin (Ch 6), sterile, polyethylene catheter is introduced into the upper part of the sterile urine-collection bag and into the infant's urethra. The aspiration tube is inserted into the bag as previously shown. Pictured are two views of the same mechanism.