

## ECHOGRAPHIC FOLLOW-UP OF REFLUX STATUS IN A CHILD WITH NEUROGENIC BLADDER AND INTERMITTENT VESICAL CATHETERIZATION

Camelia Daescu<sup>1,2</sup>, Adela Chirita Emandi<sup>1,2</sup>, C Popoiu<sup>1,2</sup>,  
A Craciun<sup>1,2</sup>, Andreea Militaru<sup>1,2</sup>, Oana Belei<sup>1,2</sup>

### Abstract

**Objectives:** We highlight the role of echography in the follow-up of an 8 year old girl with neurogenic bladder, right megaureter due to reflux; left obstructive megaureter, and impaired renal function.

**Methods:** The patient came quarterly to follow-up, to evaluate renal function and possible infections, while the hydronephrosis was evaluated by echography. She had intermittent vesical catheterization and antibiotic prophylaxis.

**Results:** The girl was diagnosed at 3 months of age with complex renal malformation, one month later she underwent bilateral cutaneous ureterostomy. Ureteral reimplantation surgery was performed at the age of 1 year and 6 months. At age 6, abdominal echography revealed bilateral hidronephrosis grade IV, which was sustained by uroMRI and stage 2 renal failure shown by renal function tests. Intermittent vesical catheterization 4 times/day and antibiotic prophylaxis were initiated. The echographic follow-up reported that the reflux remained mostly unchanged: left kidney had hydronephrosis grade III, and the right kidney presented hydronephrosis grade III/IV. Nevertheless the parenchymatous index increased, which correlates with the improved renal function, from stage 2 renal failure (moderate reduction in glomerular filtration rate=58mL/min/1.73m<sup>2</sup>) to normal glomerular filtration rate. The blood urea nitrogen and creatinine levels slightly decreased. The urinary tract infection rate remained low.

**Conclusions:** Long-term intermittent catheterization as method of treatment and prevention is associated with stable reflux status, renal function, and infection rate, which in the end result in better quality of life for the patient. Echographic method of follow-up is reliable for medical examinations since it is informative, harmless and economical.

**Key words:** Echographic follow-up; child; intermittent vesical catheterization

### Background

The urinary complications of patients with a neuropathic bladder consist of incontinence, inability to

empty the bladder, urinary infection, and deterioration of the upper urinary tract. Intermittent self-catheterization (ISC) or carer/nurse-assisted clinically clean intermittent catheterization (CIC) has developed over the past 30 years as a means of treating patients with bladder-emptying problems. It is now recognized as one of the safest methods of managing patients, especially those with neurogenic bladder disorders (1). CIC has been demonstrated to reduce infection hazards and greatly improve the lives of many patients with micturition disorders. In 1972, Lapidus et al (2) reported the successful treatment of neuropathic bladders with CIC and since then CIC has become widely accepted as the main therapeutic management for patients with such bladders. CIC can be undertaken by health professionals in a variety of clinical settings for a range of clinical indications, and increasingly by patients themselves who use it as a long-term bladder management technique. The relative simplicity of the technique comes with the potential for health professionals to underestimate the skills required when considering a regimen of intermittent catheterisation and, perhaps more importantly, to underestimate the impact it may have on individual patients (3). Adequate bladder emptying can be achieved by CIC, but urinary incontinence may persist in the presence of detrusor hyperreflexia and/or low compliance bladder.

### Objectives

To highlight the role of echography in the follow-up of an 8 year old girl with neurogenic bladder, right megaureter due to reflux; left obstructive megaureter, and impaired renal function.

### Case report

#### History

We present an 8 years old girl that we have in management, in the Nephrology department of Emergency Hospital for Children “Louis Turcanu” in Timisoara. The child is the first born of healthy non-consanguineous parents. There was no family history of similar symptoms.

<sup>1</sup>University of Medicine and Pharmacy “Victor Babes” Timisoara

<sup>2</sup>Emergency Hospital for Children “Louis Turcanu” Timisoara

E-mail: camidaescu@yahoo.com, adela.chirita@yahoo.com, mcpopoiu@yahoo.com, ad\_craciun@yahoo.co.uk, andreamilitaru@yahoo.com, oana22\_99@yahoo.com

The girl was diagnosed at the age of 3 months of age with agenesis of the corpus callosum and complex renal malformation (figure 1 and 2). At the age of 4 months, she underwent bilateral cutaneous ureterostomy. Ureteral reimplantation surgery was performed at the age of 1 year

and 6 months. At the age of 6 years abdominal echography revealed bilateral hydronephrosis grade IV, which was confirmed by the uroMRI (figure 3) that we performed and stage 2 renal failure, shown by renal function tests.



Figure 1. Cystography at age of 3 months – right megaureter due to reflux.



Figure 2. Urography at age of 3 months – left ureterohydronephrosis due to obstruction.



Figure 3. UroMRI aspect at age 6 years, showing distended neurogenic bladder and bilateral hydronephrosis.

*Clinical examination*

Currently, on clinical examination she is pale, multiple scars from abdominal surgery, she is severely underweight (weight= 21 Kg; Height= 126 cm – 50<sup>th</sup> percentile for age WHO; BMI= 13.22 - below the 3<sup>rd</sup> percentile WHO) (4). Her blood pressure is = 100/70 mmHg – normal for gender, age and height (5). The maximum evacuated urinary volume was 400ml, while normal for her age would be 190ml. The clinical exam was otherwise normal.

*Blood work:*

The complete blood count was unremarkable, no anemia (Hemoglobin= 13,5g/dl) or other pathologies were detected. Electrolytes and blood gas remained in normal range. She presented normal serum protein level and normal lipid profile. In the last 12 months of follow-up the serum creatinine levels ranged between 43-72  $\mu\text{mol/l}$  (normal), while blood urea nitrogen ranged between 5.5-7.7 mmol/l (normal). In the last year of management, she presented 4

episodes of urinary tract infections with *Escherichia Coli* that were treated with antibiotics.

*Consults:*

The neuropsychiatrist concluded she has a mild form of attention deficit disorder, learning disability borderline intellect (IQ- *Raven's Progressive Matrices*=80) and agenesis of the corpus callosum. She recommended vitamin B supplement, an aiding professor and behavioral therapy. She is also in follow-up with the pediatric surgeon for neurogenic bladder, right megaureter due to reflux; left obstructive megaureter and CIC.

*Treatment and follow-up:*

The patient was started on intermittent bladder catheterization 4 times/day, done by the mother –who was very compliant and antibiotic prophylaxis. The patient's bladder emptying time was approximately 30 minute, variably influenced (shortened) by voluntary increasing abdominal pressure, through laughing or coughing. She is scheduled for monthly urine sample and urine culture and

quarterly follow-up for blood work and clinical reevaluation. Echographic method of follow-up is reliable for medical examinations since it is informative, harmless and readily available, therefore applicable for this case. Figure 4 show the abdominal echography before and after CIC, reporting diminished hydronephrosis immediately after bladder emptying. The echographic follow-up after one year, in our patient, reported that the aspect remained mostly unchanged: left kidney had hydronephrosis grade III, and the right kidney presented hydronephrosis grade III/IV (6). Nevertheless, the parenchymatous index increased, which correlates with the improved renal function, from stage 2 renal failure (moderate reduction in glomerular filtration rate=58mL/min/1.73m<sup>2</sup>) to normal glomerular filtration rate (glomerular filtration rate=94.17mL/min/1.73m<sup>2</sup>). The blood urea nitrogen and creatinine levels slowly decreased in the 1 year period of follow-up. The urinary tract infection rate remained low. Her bladder emptying time has decreased from 30 to 25 minutes in the last year of CIC.

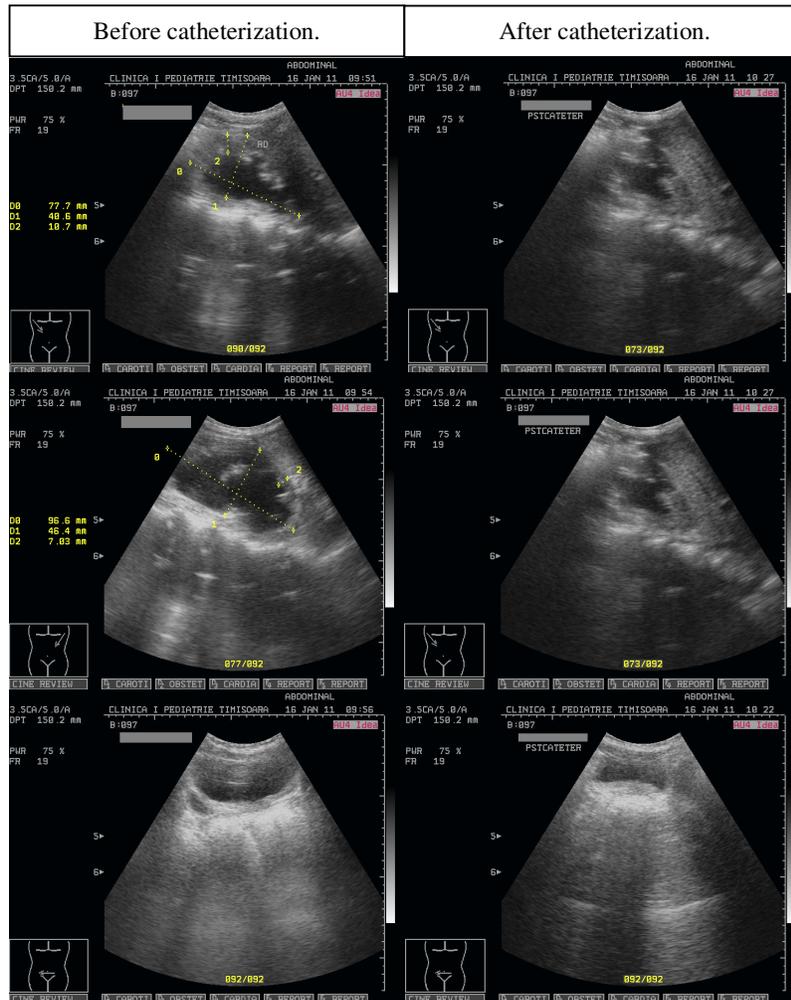


Figure 4. Abdominal echography (age 8 years) before and after the catheterization.

**Discussions**

The neurogenic bladder is a severe illness that seriously impairs the quality of life of patients, and at the same time, neurogenic bladder of retention type may represent a real threat to their life. The acute urinary retention is a condition resulted when the patient is unable to evacuate urine and may lead to bladder rupture through supradistension or/and vezico-ureteral reflux which leads to renal failure and even possibly exitus. A deficient management of avoiding – the absence of correct urinary catheterization regarding ritmicity, asepsis and antisepsis methods – represents a major cause of maintaining and aggravation of urinary tract infections, which may determine the impairment of the general state of the patient and eventually the potential loss of renal function – with poor prognosis (7). In addition, such patients may progress to bilateral hydronephrosis and end-stage renal insufficiency (8). CIC is considered the gold standard for bladder drainage because of the significantly decreased incidence of urinary tract infection in comparison with other catheterization methods (9). The principle in IC is the cvasicomplete and regular voidance of the bladder, resulting in a minimum post-mictional residuum and thus, maintaining a low intravesical pressure associated with a decreased risk of vezico-ureteral outflow (7).

Echographic anteroposterior measurements of hydronephrosis degree of the renal pelvis differs with a full

bladder versus when the bladder is emptied (10). This is an important aspect to consider, because it can influence the accuracy of echographic estimation of hydronephrosis.

In order to evaluate the hydronephrosis and renal function during the last year, the patient was evaluated clinically, with laboratory work and with Imagistics. Abdominal echography has proven highly useful in the management of this case. Long-term intermittent catheterization as method of treatment for neurogenic bladder is associated with stable reflux status, renal function, and infection rate, which in the end results in better quality of life for the patient. However, the prognosis of this case remains reserved due to the chronic progressive renal disease. Kidney transplant is considered for this case.

**Conclusions**

Long-term intermittent catheterization as method of treatment and prevention is associated with stable reflux status, renal function, and infection rate, which in the end results in better quality of life for the patient. Echographic method of follow-up is reliable for medical examinations since it is informative, harmless and economical.

**Ethical considerations**

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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Correspondance to:

Chirita Emandi Adela  
 “Louis Turcanu” Emergency Hospital for  
 Children Timisoara – Pediatrics Department,  
 Str Iosif Nemoianu nr 2-4,  
 300011, Timisoara,  
 Romania,  
 E-mail: adela.chirita@yahoo.com