# Assessment of lower urinary tract function in children before and after transanal endorectal pull through for Hirschsprung's disease

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***Introduction*** **Usually, in Hirschsprung's disease (HD), long-term sequelae in children are related to abnormalities in defecation. However, some of these patients also develop lower urinary tract problems. The aim of this study was to assess and define the effects of transanal endorectal pull-through procedure in patients with HD on lower urinary tract function through urodynamic studies performed before and after surgery.**

***Patients and methods*** **The present study was conducted at Ibn Rochd University hospitals during the period from 2007 to 2016. Twenty-eight patients with HD were subjected to urodynamic studies before and after the different definitive surgical procedures. They were all males with a mean age of 3 years. The main outcome measurements were maximum cystometric capacity, compliance, unstable detrusor contraction, and residual urinary volume.**

***Results*** **Urodynamic findings were normal in 23 (82%) children, and abnormal in five (18%) children. In the uroflowmetric study, dysuria with detrusor sphincter dyssynergia and significant postvoid urine residuals (>20 ml) were found in the three symptomatic children. In the cystometric study, five children had unstable detrusor contraction, low bladder compliance, and small-capacity bladder.**

***Conclusion*** **In HD, neurovesical dysfunction may exist preoperatively, and, although the incidence of postoperative changes in neurovesical function may appear high, children who present with urinary problems after surgery should be assessed urodynamically. *Ann Pediatr Surg* 13:217–219 © 2017 Annals of Pediatric Surgery.**

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## Introduction

The pelvic splanchnic nerves, the hypogastric nerves, or the pelvic nerve plexus can be damaged during pelvic visceral surgery, resulting in autonomic denervation of the lower urinary tract. Depending on which neural structures are injured, different patterns of dysfunction are seen. In children, bladder and sphincter dysfunctions have been observed after resection of sacrococcygeal teratoma and reconstruction of anorectal malformations [1].

Long-term sequelae in children with Hirschsprung's disease (HD) are caused mainly by anorectal dysfunction, and the chief complaints are constipation, soiling, and fecal incontinence. However, some of the patients also seem to suffer from urinary incontinence, for example, the mean percentage of postoperative 'enuresis' for different surgical techniques in HD was reported to be 9.5% in a study by Holschneider *et al.* [2].

## Patients and methods

This study was performed on 28 children who presented for definitive surgical treatment of HD to the outpatient clinics of Ibn Rochd University hospitals during the period between 2007 and 2016. They were all males. Their ages ranged from 3 months to 6 years (mean age: 3 years).

After obtaining informed consent from the parents of all patients, they were evaluated clinically and radiologically for evidence of lower urinary tract dysfunction, and were then subjected to urodynamic evaluation before the definitive procedure and 6 months after the operation at least. The urodynamic investigations were performed in accordance with the International Children's Continence Society standards [3].

A single operator performed the procedure, and intravenous midazolam (0.05–0.1 mg/kg body weight) was used for sedation in uncooperative children [4]. Cystometry was performed in a supine position. Perineal surface electrodes were used for electromyography. In all patients, a 4-Fr balloon catheter was placed into the rectum to measure intra-abdominal pressure. A two-way, 7-Fr catheter was used for filling the bladder and measuring the intravesical pressure. The bladder was filled with physiological saline at 37°C at a rate of 20 ml/min.

During the urodynamic studies (UDS), bladder capacity; maximum filling pressure; compliance, unstable detrusor contractions; intra-abdominal, bladder, and detrusor pressures; residual urine volume; and pelvic muscle electromyography activities were evaluated. The artifacts caused by anxiety of the child were eliminated. The residual urine was aspirated through the intravesical catheter and measured. Lower urinary tract functions of patients were evaluated according to capacity, compliance, and activity of the bladder during filling, micturition pressure, sphincteric activity during micturition, leak pressure, and residual urine volume.

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## Results

Before surgery, all children were clinically asymptomatic and had a normal UDS evaluation. During the uroflowmetric study, the maximum parameter, average flow rate, and flow time were difficult to calculate in younger children. However, all children were able to void spontaneously and were clinically asymptomatic.

Postoperatively, three children were clinically symptomatic. All of them had dysuria, and one of them had urinary incontinence. Only one child developed transient retention of urine after removal of the urinary catheter.

Urodynamic findings were normal in 23 (82%) children and abnormal in five (18%) children. In the uroflowmetric study, dysuria with detrusor sphincter dyssynergia (Fig. 1) and significant postvoid urine residual (> 20 ml) were found in the three symptomatic children. In the cystometric study, five children had unstable detrusor contraction (Fig. 2), low bladder compliance, and small-capacity bladder. The UDS results of the five patients are summarized in Table 1.

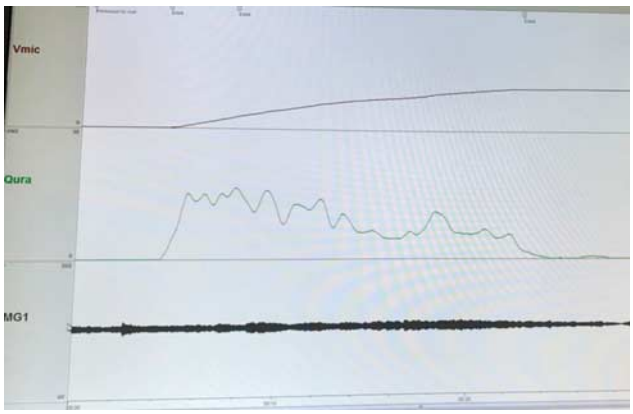
**Table 1 Abnormal results of urodynamic studies**

| Patients | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Age of patients (years) | 2 | 4 | 1.5 | 5 | 3.5 |
| Maximum Cystometric Capacity (ml) | 132 | 170 | 90 | 230 | 200 |
| Instability detrusor pressure ($cmH_20$) | 41 | 53 | 100 | 62 | 49 |
| Maximum flow Rate (ml/s) | 25 | 17 | 5 | 15 | 9 |
| Compliance ($cmH_20$/ml) | 9 | 11 | 12 | 15 | 10 |
| Residual urine volume (ml) | 4 | 0 | 20 | 100 | 50 |

## Discussion

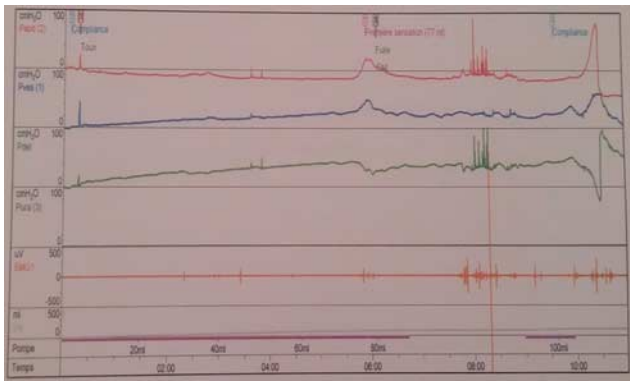
Pelvic surgery and dissection may injure the innervation of pelvic organs [5,6]. Lower urinary tract dysfunctions have been defined after anorectal malformations and sacrococcygeal teratoma resections [2,7,8]. Pelvic nerves and pelvic nerve plexus are the primary neurological structures that are mostly affected during these operations. Various lower urinary dysfunctions may appear according to the nerves that have been damaged [6]. Sacral agenesis and neurospinal abnormalities usually do not accompany HD. Urinary system symptoms occurring postoperatively are usually because of iatrogenic pelvic nerve injuries [6]. In our study, all patients underwent clinical and radiological evaluation to rule out urinary system abnormalities and had a normal preoperarative UDS evaluation. In consequence, any changes are directly related to surgery.

**Fig. 1**




Uroflowmetry: dysuria with detrusor sphincter dyssynergia.

**Fig. 2**



Cystometry: unstable detrusor contraction with low compliance and small capacity.

Among the lower urinary tract dysfunctions encountered after HD operations, urinary retention and enuresis have been the most emphasized findings during the early postoperative period [9–13].

Motor innervation to the detrusor muscle was not observed substantially, because all children were able to void spontaneously, except one patient who developed transient retention of urine after removal of catheter in the early postoperative period, which improved with massage of the bladder and use of warm packs on the lower abdomen, and was able to void spontaneously on follow-up.

In this study, as in Boemers *et al.*'s [14], assessment of bladder sensation and filling perception was difficult, especially in young children; therefore, accurate determination and differentiation between the first desire to void, normal desire to void, strong desire to void, and urgency were not possible.

Small capacity, low bladder compliance, has been described after sympathetic detrusor denervation in adults [15]. This can explain the low bladder compliance found in our five children.

Boemers *et al.* [14], suggested that only the sensorial innervation of the bladder is affected partially, whereas the motor neurons are not affected during the Duhamel procedure. According to their results, the increased bladder capacity and the postvoiding urinary retention may be the result of partial denervation of the bladder [14].

From this study, it appears that transanal, endorectal pull through is associated with least postoperative urological disturbance, from an urodynamic point of view. These results are parallel to findings in the literature [16–19].

## Conclusion

In HD, neurovesical dysfunction may exist preoperatively, and, although the incidence of postoperative changes in neurovesical function may appear high, a larger study is required for statistical validation. Children who present with urinary problems after surgery should be assessed urodynamically.

### Conflicts of interest

There are no conflicts of interest.

## References


1 Boemers TM, van Gool JD, de Jong TP, Bax KM. Lower urinary tract dysfunction in children with benign sacrococcygeal teratoma. *J Urol* 1994; **151**:174–176.

2 Holschneider AM, Kraeft H, Scholtissek C. Urodynamic investigation of bladder disturbances in imperforate anus and Hirschsprung's disease. *Z Kinderchir* 1982; **35**:64–68.

3 Nørgaard JP, van Gool JD, Hjälmås K, Djurhuus JC, Hellström AL. Standardization and definitions in lower urinary tract dysfunction in children. International Children's Continence Society. *Br J Urol* 1998; **81** (Suppl. 3):1–16.

4 Bozkurt P, Kilic N, Kaya G, Yeker Y, Eliçevik M, Söylet Y. The effects of intranasal midazolam on urodynamic studies in children. *Br J Urol* 1996; **78**:282–286.

5 Mundy AR. An anatomical explanation for bladder dysfunction following rectal and uterine surgery. *Br J Urol* 1982; **54**:501–504.

6 Boemers TM. Urinary incontinence and vesicourethral dysfunction in pediatric surgical conditions. *Semin Pediatr Surg* 2002; **11**:91 –99.

7 Bauer SB. Neurogenic vesical dysfunction in children. In: Walsh PC, Retik AB, Stamey AP, Vaughn Jr, editors. *Campbell's urology*. Philadelphia, PA: 7 W.B. Saunders; 1992. pp. 1634–55.

8 Raffensperger JG. *Anorectal anomalies. Swenson's pediatric surgery*. Norwalk: Conn7 Appleton & Lange; 1990. pp. 587–623.

9 Holschneider AM, Bfrner W, Burman O, Caffarena PF, Issendorf HV. Clinical and electromanometrical investigations of postoperative continence in Hirschsprung's disease. An international workshop. *Z Kinderchir* 1980; **29**:39–48.

10 Sarioğlu A, Tanyel FC, Senocak ME, Büyükpamukçu N, Hiçsönmez A. Complications of the two major operations of Hirschsprung's disease: a single center experience. *Turk J Pediatr* 2001; **43**:219–222.

11 Fuchs O, Booss D. Rehbein's procedure for Hirschsprung's disease. An appraisal of 45 years. *Eur J Pediatr Surg* 1999; **9**:389–391.

12 Dierks SM, Colberg JW. Urinary retention in a child secondary to Hirschsprung's disease. *Br J Urol* 1997; **79**:806.

13 Ateş O, Hakgüder G, Kart Y, Olguner M, Akgur FM. Hirschsprung hastaliginda tek basamak li transanal endorektal pull-through ameliyati sirasinda genislemis ganglionik segment varliginin anorektal ve uriner fonksiyonlara etkisi. [One step in Hirschsprung's disease is enlarged ganglionic in transanal endorectal pull-through operation effect of segment presence on anorectal and urinary functions]. *Dokuz Eylul Tip Fak Derg* 2006; **20**:35–43.

14 Boemers TM, Bax NM, van Gool JD. The effect of rectosigmoidectomy and Duhamel-type pull-through procedure on lower urinary tract function in children with Hirschsprung's disease. *J Pediatr Surg* 2001; **36**:453–456.

15 Blaivas JG, Barbalias GA. Characteristics of neural injury after abdominoperineal resection. *J Urol* 1983; **129**:84–87.

16 Ateş O, Hakgüder G, Kart Y, Olguner M, Akgur FM. The effect of dilated ganglionic segment on anorectal and urinary functions during 1-stage Transanal endorectal. *J Pediatr Surg* 2007; **42**:1271–1275.

17 Marty TL, Seo T, Sullivan JJ. Rectal irrigations for the prevention of postoperative enterocolitis in Hirschsprung's disease. *J Pediatr Surg* 1995; **30**:652–654.

18 Jasonni V, Pini Prato A, Martucciello G. Soave's extramucosal endorectal pull-through procedure. In: Holschneider AM, Puri P, editors. *Hirschsprunǵs disease and allied disorders*, 3rd ed. Berlin Heidelberg: Springer-Verlag; 2008. pp. 337–344.

19 Jindal B, Grover VP, Bhatnagar V. The assessment of lower urinary tract function in children with anorectal malformations before and after PSARP. *Eur J Pediatr Surg* 2009; **19**:34–37.