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

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ABSTRACT

Aims: Long-term sequelae in children with Hirschsprung's disease (HD) are usually related to abnormalities in defecation. However, some of these patients also suffer from voiding dysfunction. The aim of this study is to assess and define the effects of Swenson's 'pull through' procedure in patients with HD on lower urinary tract function by means of urodynamic studies (UDS) performed before and after surgery. **Materials and Methods:** Six patients with Hirschsprung's disease underwent UDS before and after the definitive procedure. Parameters observed were maximum cystometric capacity, compliance, unstable detrusor contraction (UDCS), leak point pressure, residual volume, end filling pressure, volume at Pdet <20 cm H_2O and volume at Pdet <30 cm H_2O. **Results:** On UDS evaluation, one patient (16.6%) showed a small-capacity bladder and one patient (16.6%) showed a large-capacity bladder with occasional uninhibited detrusor contraction (UDCS) preoperatively. All the children had good compliant bladders. Postoperatively, one child was clinically symptomatic and showed hyporeflexic large-capacity bladder without any UDCS, one patient showed a small-capacity bladder with UDCS. **Conclusions:** In Hirschsprung's disease, neurovesical dysfunction may exist preoperatively and though 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.

KEY WORDS: Hirschsprung's disease, lower urinary tract dysfunction, urodynamic studies

INTRODUCTION

Pelvic and perineal surgery may cause damage to the nerve supply of the genitourinary tract and pelvic floor muscles, resulting in functional problems of the lower urinary tract. Neurovesical dysfunction in adults after rectal surgery has been described in the literature.[1,2] In children, bladder and sphincter dysfunction has been observed after resection of sacrococcygeal teratoma and reconstruction of anorectal malformations.[3] In Hirschsprung's disease (HD), postoperative wetting has been documented but without definitive evidence of being related to iatrogenic nerve damage.[4,5] Long-term sequelae in these children are caused mainly by anorectal dysfunction. However, some of the patients also seem to suffer from urinary incontinence; postoperative 'enuresis' for different surgical techniques in HD has been reported in a study by Holschneider *et al*.[5]

MATERIALS AND METHODS

The study included a total of six cases of HD between January 2003 and July 2005. All patients were evaluated clinically for evidence of lower urinary tract dysfunction and were then subjected to urodynamic evaluation before and after the definitive procedure. Patients were evaluated for signs and symptoms of urinary tract infection; and if present, the study was deferred until the infection subsided. The urodynamic investigation was performed in accordance with the International Continence Society standards,[6] using Phoenix Griffon (Albyn Medical) V 2.04V interactive computer-based machine. A single operator performed the study, and intravenous midazolam (0.05-0.1 mg/kg body weight) sedation was used for uncooperative children. The cystometry was performed in supine position. The patients were catheterized under aseptic precautions

using a double lumen 8 Fr (Albyn Medical) urethral catheter with facilities for simultaneous infusion of saline and recording of intravesical pressure (Pves). A Mediplus (4.5 Fr, MED, 5400, UK) rectal catheter was placed per rectally after ensuring that the rectum was empty; the abdominal pressure was recorded (Pabd). Artificial filling was performed with normal saline at room temperature at slow filling rate (<10 ml/min). The machine displayed the events on a color monitor during the study, including tracing of the Pabd, Pves and the computed detrusor pressure (Pdet = Pves - Pabd). The infusion was stopped at urgency/ sensation to void/ pain/ continuous cry/ continuous pericatheter leak. The variables recorded in the cystometrogram were maximum cystometric capacity (MCC), compliance, unstable detrusor contraction (UDC^S), leak point pressure (LPP), residual volume (RV), end filling pressure (EFP), volume at Pdet <20 cm H_2O and volume at Pdet <30 cm H_2O.

Six to eight weeks after the surgery, patients were again evaluated clinically and subjected to UDS for evidence of any postoperative neurovesical dysfunction. The terminology recommended by the International Children's Continence Society[6] was used in evaluating and comparing the results. The parameters were compared using Wilcoxon signed ranks test; a '*P*' value of <0.05 was considered significant.

RESULTS

Preoperatively, all the children were clinically asymptomatic for voiding dysfunction. However, on UDS evaluation, one patient (16.6%) showed a small-capacity bladder and one patient (16.6%) showed a large-capacity bladder with occasional uninhibited detrusor contraction (UDC^S). All the children had good compliant bladders. Postoperatively, one child was clinically symptomatic and showed hyporeflexic large-capacity bladder without any UDC_S on UDS. One patient showed a small-capacity bladder with UDC^S. One patient with preoperative finding of large-capacity bladder with UDC^S remained as such in the postoperative study. The child was clinically asymptomatic. The details are presented in Tables 1 and 2.

Preoperatively the mean MCC, bladder volume at Pdet <20 cm, bladder volume at Pdet <30 cm and LPP/EFP were found to be 150.50 ± 49.87 ml, 133.83 ± 48.12 ml, 141.50 ± 47.67 ml and 46.16 ± 10.41 cm H_2O respectively. Postoperatively, the mean MCC, bladder volume at Pdet <20 cm, bladder volume at Pdet <30 cm and LPP/EFP were found to be 198.83 ± 134.40 ml, 177.66 ± 138.80 ml, 139.40 ± 75.85 ml and 44.66 ± 19.56 cm H_2O respectively [Table 3].

DISCUSSION

Pelvic and anorectal surgery may cause damage to the pelvic splanchnic nerves, the hypogastric nerves or the pelvic nerve plexus, resulting in autonomic denervation of the lower urinary tract. Neurovesical dysfunction after rectal surgery has been described in the literature.[1,2]

Long-term sequelae in children with HD are caused mainly by anorectal dysfunction. However, some of the patients also suffer from urinary incontinence. The incidence of lower urinary tract dysfunction for the different surgical techniques has been reported as 10.4% following Swenson's, 14.3% following Duhamel's procedure and 15.3% following Soave's procedure.[4,5] It is likely that at least some of the patients suffered from functional urinary incontinence caused by acquired denervation of the lower urinary tract.

Our study shows that after Swenson's 'pull through' procedure, there was no significant difference between the preoperative and postoperative urodynamic variables. However, of the six patients with HD, one had small-capacity bladder and one had large-capacity bladder with UDCS in the preoperative study. On postoperative evaluation, the one with a small-capacity bladder in the preoperative study developed a normal-capacity compliant bladder, maybe due to the fact that the bladder might have been compressed by the retained fecal matter in the colon or a distended retrovesical sigmoid loop or rectum. One case developed a hyporeflexic large-capacity bladder without any UDCS in the postoperative period. In one patient, the normal-capacity compliant bladder became a small-capacity compliant bladder with UDCS after the

Table 1: Comparison of urodynamic studies in Hirschsprung's disease before and after the Swenson's 'pull through'

Age in years	Sex	MCC (ml)		Volume at Pdet < 20 cm (ml)		Volume at Pdet < 30 cm (ml)		LPP/EFP (cm H_2O)	
		Preop	Postop	Preop	Postop	Preop	Postop	Preop	Postop
7	M	137	257	128	225	135	235	42	40
5	M	209	207	188	160	194	205	46	49
4.5	M	192	434	185	434	189		41	19
3.5	M	165	95	135	75	149	77	67	79
1.5	M	130	125	105	105	115	110	41	41
1	M	70	75	62	67	67	70	40	40

LPP - Leak point pressure, EFP - End filling pressure

Table 2: Comparison of bladder capacity, UDCS and bladder compliance in Hirschsprung's disease before and after the Swenson's 'pull through'

Bladder capacity		UDCS		Bladder compliance	
Preop	Postop	Preop	Postop	Preop	Postop
Small	Normal	No	No	Good	Good
Normal	Normal	No	No	Good	High
Normal	Large	No	No	Good	Good
Normal	Small	No	Yes	Good	Good
Large	Large	Yes	Yes	Good	Good
Normal	Normal	No	No	Good	Good

Table 3: Comparison of mean values of urodynamic variables in Hirschsprung's disease before and after surgery

Variables	Preoperative (mean ± S.D)	Postoperative (mean ± S.D)	*P* value
MCC (ml)	150.50 ± 49.87	198.83 ± 134.40	0.528
Volume at P_{det} < 20 cm (ml)	133.83 ± 48.12	177.66 ± 138.80	0.500
Volume at P_{det} < 30 cm (ml)	141.50 ± 47.67	139.40 ± 75.85	0.686
LPP/EFP (cm H_2O)	46.16 ± 10.41	44.66 ± 19.56	1.00
Bladder capacity			
Normal	4(66.6)	3(50)	1.00
Abnormal	2(33.3)	3(50)	
UDCS			
Present	1(16.6)	2(33.3)	
Absent	5(83.3)	4(66.6)	1.00

LPP - Leak point pressure, EFP - End filling pressure, Figures in parentheses are in percentage

definitive surgery. Of these three patients with lower urinary tract dysfunction on UDS, one was clinically symptomatic with intermittent stream. These findings suggest that some form of bladder denervation must have occurred, at least from the urodynamic point of view. An increase in bladder capacity without any residual urine usually suggests weakening of detrusor. However, it might be that motor innervation was not affected substantially in our patients as all children were able to void spontaneously. Small capacity, low bladder compliance has been described after sympathetic detrusor denervation in adults.[7] In our patients, although the child was asymptomatic clinically, we were not able to observe the patient for a longer period as he was lost to follow-up. Boemers et al.[8] studied 11 patients of HD and demonstrated 87% increase in mean cystometric capacity and 156% increase in postvoid residue compared to the preoperative value. Holschneider *et al*. had analyzed 68 children with HD with respect to postoperative incontinence of urine and observed bladder disturbances in 15 (22%) patients.[4]

The main portion of the pelvic nerve plexus lies in close relationship to the rectovesical pouch in males and rectouterine pouch in females.[9,10] To reduce the risk of neural injury, it is necessary to stay close to the rectal wall and perform sharp, instead of blunt, dissection of the retrorectal space, as blunt dissection may tear the visceral fascia and can cause damage to the pelvic splanchnic nerve ensheathed by it. Traction injury (neuropraxia) is likely to be responsible for the partial denervation observed in our patient, which is reported to resolve within 4 to 6 months; and in our study, the time interval between operation and postoperative urodynamic studies was less than 3 months. Rectosigmoidectomy with Swenson's 'pull through' procedure may cause bladder dysfunction. However, because most of the children remain asymptomatic and because of small size of the study group, it is difficult to comment on its statistical significance; a larger group of study patients with a longer follow-up is required to define the routine use of urodynamic study in Hirschsprung's disease. However, the parents should be informed about the possibility of urologic problems related to surgery.

CONCLUSIONS

In HD, preoperative abnormalities of neurovesical dysfunction can be detected on UDS. Children who present with urinary problems after surgery should be assessed urodynamically. To determine whether UDS should be performed routinely in the postoperative follow-up, a larger study and longer follow-up are required.

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