Augmentation enterocystoplasty without reimplantation for patients with neurogenic bladder and vesicoureteral reflux

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Abstract  The objective of this study was to assess the clinical outcome of vesicoureteral reflux (VUR) after augmentation cystoplasty alone in patients with a hypocompliant neurogenic bladder. Between January 2009 and December 2014, 29 patients with a hypocompliant bladder associated with VUR confirmed by videourodynamics (VUD) preoperatively were recruited in this study. All patients had undergone bladder augmentation with a generous detubularized segment of bowel at our institution. No effort had been made to correct the existing reflux. Preoperative assessment included urinalysis, kidney function tests, ultrasonography, and videourodynamic evaluation. All patients had various degrees of VUR. The status of VUR and bladder function were studied by VUD. The mean follow-up period was 2.2 years (range 0.5–5.5 years). The VUD manifested a significant improvement of bladder capacity, diminution of intravesical pressure, and resolution of reflux after bladder augmentation. After the surgery, 24/29 (83%) no longer had reflux, 3/29 (10%) showed improvement in reflux, and 2/29 (7%) demonstrated no change in reflux. In addition, 16/21 (76%) patients had reflux Grades I–III; 100% patients with reflux Grades IV and V had complete cessation of reflux. Only one patient had symptomatic urinary infection after the surgery. Augmentation enterocystoplasty without ureteral reimplantation is thus effective and adequate for patients with high-pressure and hypocompliant neurogenic bladder. Therefore, ureteral reimplantation is not necessary when augmentation enterocystoplasty is recommended for patients with high-pressure, low-compliant bladder and VUR.

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Introduction

Vesicoureteral reflux (VUR) occurs in more than 20% of patients with neurogenic bladder. High detrusor pressure and reflux are responsible for renal damage and renal failure. The best treatment option for reflux is to normalize the detrusor pressure [1]. In this regard, an important question arises: "How should we normalize the detrusor pressure?" Our initial attempts to lower the detrusor pressure and protect the upper urinary tract included the following: clean intermittent catheterization (CIC) and administration of parasympathomimetic drugs or botulinum toxin injection. When these conservative programs failed to achieve an adequate bladder volume with lower pressure urine storage and in these cases VUR more commonly occurs due to increased intravesical pressure than due to a congenital malformation of the vesicoureteral junction [4–6]. Theoretically, by eliminating the high detrusor pressure, the reflux should be improved or resolved; consequently, the upper tract deterioration would be postponed or avoided. However, the simultaneous ureteral reimplantation and bladder augmentation procedure remains controversial. Following the experience of Nasrallah and Aliabadi [7], in this study, we decided not to correct VUR surgically in our 29 patients with a poor-compliant, high-pressure bladder who underwent bladder augmentation alone.

Materials and methods

In this retrospective study, 29 patients with low-compliant neurogenic bladders underwent augmentation enterocystoplasty alone as their lower urinary tract reconstruction surgery at our institution between January 2009 and December 2014. We reviewed 20 male and 9 female patients with an average follow-up of 2.2 years following the initial augmentation surgery. The mean age of patients at the time of surgery was 30.1 years (range 14–58 years). The etiology of low-compliant bladder dysfunction was as follows: a history of traumatic spinal cord injury (n = 22 patients), a history of myelomeningocele (n = 5 patients), and unexplained causes (n = 2 patients). The videourodynamics (VUD) procedure was performed according to the criteria of the International Continence Society. All patients received conservative treatments over a period of 6 months before the surgery. All 29 patients received augmentation enterocystoplasty without antireflux technique at our institution (Figure 1). The clinical examination consisted of a targeted neurological examination, ultrasound of the bladder and the upper urinary tract, urinary and blood laboratory studies, and preoperative and postoperative VUD.

Statistical analysis

All values are presented as mean ± standard deviation. Statistical analysis was performed using the Student t test. All p values less than 0.01 were considered significant.

Results

The mean follow-up period of the 29 patients was 2.2 years (range 0.5–5.5 years). All patients had a detrusor leak point pressure more than 40 cmH2O, decreased bladder compliance (<10 mL/cmH2O), and refluxing detrusor pressure with an average of 55.3 ± 15.2 cmH2O before the surgery. All 29 patients had various degrees of reflux, as demonstrated by VUD during the filling phase, including Grade I reflux (n = 3), Grade II (n = 7), Grade III (n = 11), Grade IV (n = 5), and Grade V (n = 3), according to the International Reflux Study Group Classification. To evaluate the change of the bladder compliance and VUR, postoperative urodynamic variables were compared with preoperative urodynamic variables (Figure 2 and Table 1). Reflux resolved in 24 patients (83%), downgraded in three (10%), but persisted in two (7%). In addition, 16/21 (76%) patients had reflux Grades I–III; 100% patients with reflux Grades IV and V had complete cessation of reflux. The VUD manifested a significant improvement of bladder capacity, diminution of maximum detrusor pressure, bladder compliance, and resolution of VUR after augmentation enterocystoplasty. The mean total bladder capacity increased from 250.4 ± 127.5 mL to 457.5 ± 37.3 mL (p < 0.01) and the mean maximal end filling pressure decreased from 61.4 ± 28.2 cmH2O to 14.5 ± 4.3 cmH2O (p < 0.01). Twenty-seven patients were managed with CIC, with a mean interval of 4–6 hours between catheterizations; most patients did not experience any difficulty during the procedure, but two elderly female patients experienced occasional difficulty. Two vigorous male patients emptied their bladders by abdominal straining after surgery. Twenty-six patients reported completely dry bladder, two had mild incontinence, and one had moderate incontinence. The incontinence occurred in two patients with mild leakage once a day to once a week, usually at night when the bladder was either too full or CIC incompletely emptied the bladder. One patient with moderate leakage complained of urinary incontinence despite regular CIC six to eight times a day. This patient was given an anticholinergic drug (solifenacin) after the surgery to control the incontinence. Only one patient had recurrent febrile urinary tract infection after surgery and this patient was treated with antibiotics. In four patients, casing slime obstructed the catheter after the operation, and thus these patients received bladder irrigation.

All of the patients had normal creatinine levels (range 55–80 μmol/L). Neither anemia nor electrolyte abnormality was diagnosed. Similarly, cancer and urolithiasis did not develop in any of the augmented bladders.
Discussion

Low bladder compliance means an abnormal volume and pressure relationship, in which there is a high incremental rise in bladder pressure during the storage phase [8,9]. Renal deterioration and the incidence of VUR have been unequivocally shown to be related to high intravesical pressure, which mainly arises from low bladder compliance in neurogenic bladders cases [10,11]. Some authors believe that a high intravesical pressure is responsible for VUR in this type of bladder and VUR should be resolved after the abnormally high intravesical pressure is eliminated by bladder augmentation alone, rendering simultaneous ureteral reimplantation unnecessary [12,13]. Some authors have also supported this view because they believe that reimplantation in a thick, high-pressure, and contracted bladder is difficult, and may lead to complications such as ureteral stenosis or aggravated upper tract deterioration [14]. Based on this report, we decided to perform augmentation cystoplasty alone, and thus no effort had been made to correct reflux surgically. In our study, it is very clear that all patients had significant improvements after bladder augmentation alone in terms of safe capacity, compliance, and renal function. Twenty-nine patients were identified as having reflux before surgery, with 21 in the low-grade category and eight in the high-grade category. After cystoplasty, 24/29 patients had complete cessation of reflux, whereas reflux improved in three and remained unchanged in two patients. Our findings suggest that antireflux surgery may not be routinely necessary with bladder augmentation in hypocompliant neurogenic bladders.

In the study by Nasrallah and Aliabadi [7], 14 patients received augmentation cystoplasty. After adequate evaluation of 13 patients, cessation of reflux was achieved in 12 patients [7]. Krishna and Gough [15] assessed 17 renal units for the outcome of reflux after clam ileocystoplasty; in their study, during the mean follow-up period of 3.3 years, reflux resolved in 11 patients [15]. Our findings are also consistent with these early studies, which have shown that augmentation cystoplasty itself, without ureteric reimplantation, may resolve or improve reflux in the vast majority of cases, even when high-grade VUR is present [12,13]. However, whether ureteral reimplantation should be simultaneously performed is still being debated. Some

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**Table 1** Comparison of preoperative and postoperative urodynamic data.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Preoperative</th>
<th>Postoperative</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCBC</td>
<td>250.4 ± 127.5 mL</td>
<td>457.5 ± 37.3 mL</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>MDP</td>
<td>61.4 ± 28.2 cmH2O</td>
<td>14.5 ± 4.3 cmH2O</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>BC</td>
<td>3.3 ± 3.1 mL/cmH2O</td>
<td>34.2 ± 10.1 mL/cmH2O</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>VUR</td>
<td>29 (No. Pts.)</td>
<td>2 (No. Pts.)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

BC = bladder compliance; MCBC = maximum cystometric bladder capacity; MDP = maximum detrusor pressure; No. Pts. = number of patients (p < 0.01); VUR = vesicoureteral reflux.
researchers hold the view that, no matter what the reasons are, ureteral reimplantation should be performed simultane-ously with bladder augmentation when significant reflux is present [16–18]. Few studies have provided a more precise cutoff point for determining whether ureteral reimplantation should be performed. Soygur et al. [19,20] stated that patients with preoperative VUR should un-dergo simultaneous correction during bladder augmentation when there is low pressure on preoperative VUD, because persistent VUR can induce scarring from febrile urinary tract infection. We agree that ureteral reimplan-tation is not necessary in all patients but may be performed in patients with lower VUR pressure [21,22]. We currently believe that most of the reflux or incontinence associated with high intravesical pressure bladder dysfunction will resolve once detrusor pressures are adequately lowered [12,13]. However, whether it can be reimplanted still needs additional investigations with a larger number of patients with long-term follow-up. Our data also showed that persistent postoperative VUR was not the main reason for postoperative recurrent pyelonephritis and renal deterio-ration. In our study, five patients (17%) had persistent VUR postoperatively, as demonstrated by VUD. Furthermore, only one patient had symptomatic urinary infection after the surgery. Surprisingly, by performing frequent CIC within the scope of safe bladder volume, most patients will not suffer recurrent infection postoperatively. Thus, season-able CIC and safe bladder volume may be more important than reimplantation for protecting kidneys from damage due to febrile urinary tract infection.

Conclusion
In low-compliant neurogenic bladder patients with VUR, bladder augmentation seems to be more important than reimplantation for offering protection against kidney damage. Simultaneous reimplantation may be not neces-sary during bladder augmentation to treat hypocompliant neurogenic bladders.

References


