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Introduction

- Vesicoureteral reflux (VUR) occurs in patients with neurogenic bladder, which is a high-pressure and low-compliant bladder.
- High-grade VUR leads to recurrent urinary tract infections (UTIs), and thus causes severe renal failure.
- If conservative managements for neurogenic bladder are ineffective, augmentation cystoplasty (AC) is generally accepted as one of the standard therapeutic options.
- Regarding the treatment of VUR in patients with neurogenic bladder, whether ureteral reimplantation should be simultaneously performed with AC for patients with VUR is controversial.

Objectives

- The aim of this study was to evaluate the need for ureteral reimplantation with AC for patients with VUR.

Methods

- This study included 19 patients (10 male, 9 female) who underwent AC for neurogenic bladder with VUR between March 1983 and March 2016 in our hospital.
- A minimum follow-up of 5 years after AC was necessary for inclusion in this study.
- The changes in VUR grade, urodynamic findings, and postoperative complications were evaluated retrospectively.
- The present study was approved by the Scientific Ethics Committee of Hokkaido University (# 020-0093).

Results

◆ Patients' characteristics

A total of 19 patients with a median age at surgery of 14 years (range 3-38 years) were included. Median follow-up from AC surgery was 14.8 years (range 5.7-30 years). (Table 1)

Table 1. Patients' Characteristics

	Number (%)
Number of patients	19
Male	10 (53)
Female	9 (47)
Age (y) (median, range)	14 (3-38)
Follow up (y) (median, range)	14.8 (5.7-30)
Diagnosis	
Myelomeningocele	12 (63)
Spinal lipoma	5 (26)
Anal atresia	2 (11)
Indications for AC	
Low-compliance bladder	7 (37)
Febrile UTI	6 (32)
High-grade VUR	6 (32)
Renal dysfunction	5 (26)
Surgical procedure with cystoplasty	
Fascial sling	5 (26)
Antegrade continence enema	7 (37)
Construction of catheterizable channel	2 (11)
Ureteral reimplantation	1 (5)

AC: augmentation cystoplasty, UTI: urinary tract infection, VUR: vesicoureteral reflux

Results

◆ Change in VUR grade before to after surgery

- VUR was found in 19 patients, involving 27 ureters before surgery. In a total of 27 ureters, reflux grade was V in 6, IV in 9, III in 5, II in 6, and I in 1.
- **Postoperative videourodynamics showed that the reflux resolved in 23 ureters (85%), was downgraded in 3 ureters (11%), and was unchanged in 1 ureter (4%)** (Table 2).

Table 2. Change in VUR grade from before to after surgery

VUR grade	Preoperative	Postoperative
0	0	23
I	1	2
II	6	2
III	5	0
IV	9	0
V	6	0

◆ Videourodynamic findings

The bladder capacity at which VUR occurred was significantly increased from 60 ml to 404 ml ($p < 0.05$), whereas detrusor pressure at the onset of VUR was not significantly different (Table 3).

Table 3 Videourodynamic findings before and after augmentation cystoplasty

	Preoperative	Postoperative	P value
Bladder capacity (ml) (median, range)	200 (90-509)	400 (93-585)	$P < 0.001$
Bladder compliance (ml/cmH₂O) (median, range)	7.5 (2.5-18.6)	28.1 (4.0-200)	$P < 0.001$
Detrusor overactivity (number, %)	9 (47)	2 (11)	NS
VUR (number, %)	19 (100)	4 (21)	$P < 0.001$
Bladder capacity at VUR occurred (ml) (median, range)	60 (10-300)	404 (50-500)	$P < 0.05$
Pdet when VUR occurred (cmH₂O) (median, range)	6.5 (0-32)	8.5 (0-14)	NS

◆ Renal function

eGFR and CKD stage was checked at the last visit. The median eGFR was 95 ml/min/1.73m² (range 3.3-154) in 19 patients. Chronic kidney disease: CKD stage 1 in 11, stage 2 in 5, stage 3 in 1, stage 4 in 0, stage 5 in 2 patients were observed respectively. Chronic renal failure (CKD stage ≥ 3) developed in 3 patients (16%) during follow-up; 2 of 3 the patients developed stage 5 CKD and were started on renal replacement therapy. However, these 3 patients with renal failure have no VUR after the operation.

Discussion

- Several previous studies have shown that ureteral reimplantation should be performed in patients with low-pressure or high-grade VUR, ureterovesical junction obstruction, and severe upper urinary tract dilation.
- On the other hand, there is a possibility that these complicated procedures result in prolonged operative time and increased surgical stress. Moreover, we should also consider the risk of ureteral stricture as a postoperative complication.
- Although VUR occurred at low detrusor pressure after AC, the frequency of VUR was considered to be less than at pre-operation, because bladder capacity was greatly increased.
- Appropriate CIC after AC is important to prevent VUR, febrile UTI, and to protect upper urinary function.

Conclusions

Although it is still controversial, from our study, we conclude that routine ureteral reimplantation is not necessary with AC in patients with VUR.

References

- Chiba et al. *BMC urology*, 22;48, 2022