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## Does the Nipple Valve Ureteral Reimplantation Work in Infants?

### ABSTRACT

**Purpose:** To present our initial experience with direct nipple ureteral reimplantation in infants with primary obstructed megaureter and an evaluation of two anti-reflux techniques.

**Methods:** We reviewed patients who underwent ureteral nipple valve reimplantation from 2/2010 to 6/2018. We included all patients who presented with obstructed megaureter required surgical intervention, age less than 12 months. Indications for surgical intervention were urinary infection and or split renal function less than 40%. The result is evaluated six months postoperatively. We compared two techniques: nipple length 10-15 mm versus nipple length 20 mm.

**Results:** The follow-up time was from 12 months to 102 months. There were four girls and 16 boys with 19 ureters of unilateral kidneys, two ureters of a bilateral system. The mean age at the time of surgery was 5.3 months (2.0 to 8.0 months). The first six ureters had the nipple length from 10 to 15 mm. The last 15 ureters had the nipple length of 20 mm. Six ureters with nipple length from 10 mm to 15 mm demonstrated vesicoureteral reflux, while 15 others with the 20 mm nipple length did not have reflux. No postoperative obstruction was found.

**Conclusion:** Direct nipple valve ureteral reimplantation is feasible in infants. The nipple length must be 20 mm to prevent vesicoureteral reflux.

**KEYWORDS:** Nipple valve; Ureteral reimplantation; Obstructed megaureter; Urinary infection

### INTRODUCTION

Ureteral reimplantation with or without tapering is a common procedure in pediatric urology for obstructed megaureter. However, as for under one year old children, besides support opinions [1-4], there is no consensus about these conventional reimplantations because they could cause ureteral stenosis, even permanent neurologic lesions [5,6]. In the surgical treatment of obstructed megaureter, to avoid these complications, some other techniques may be used as temporary procedures, such as double J ureteral stenting [7], cutaneous ureterostomy [8], temporary refluxing ureteral reimplantation [9,10], while waiting for bladder growth when conventional reimplantation can safely be performed. Temporary refluxing ureteral reimplantation has been recommended for primary obstructed megaureter [11]. We present the direct refluxing ureteral reimplantation

[8,9] and evaluate the antireflux effect of this technique. We hypothesized that a nipple valve of 20 mm length would result in less reflux than the 10-15 mm length nipple, as has been reported in the literature [12,13].

## METHODS

This study was performed at Children Hospital 1, Ho Chi Minh City; Children Hospital 2, Ho Chi Minh City and Hospital for Women and Children, Da Nang Vietnam and was approved by the ethical committees of these hospitals. The parents were explained why this procedure is done and were informed about the possibility of vesicoureteral reflux or obstruction.

A retrospective study of patients who underwent ureteral nipple valve reimplantation was from 2/2010 to 6/2018. All patients who presented with primary obstructed megaureter requiring surgical intervention, age less than 12 months, were included. Surgical indication was breakthrough urinary infection, or split renal function less than 40% on the obstructed side. Preoperative imaging studies included ultrasound, VCUG, intravenous pyelogram (IVP) and diethylene triamine penta acetic acid (DTPA) nuclear renal scan with diuretic. Postoperative results were evaluated with ultrasound and VCUG six months postoperatively [12,13], or if patients developed a urinary tract infection with or without fever. Postoperative functional study was not routinely done if ultrasound showed hydronephrosis improvement.

**Surgical techniques:** The ureter was approached through a standard muscle splitting inguinal incision, and particular attention was made to the vas deferens. The ureter was divided proximally to the stenosis with ligation of the distal stump. The proximal ureter was straightened, the redundancy was excised (Figure 1) then folded on itself from 10-20 mm with or without spatulation (Figure 2). Two stay sutures are placed posterolaterally on the bladder, not too high in the bladder so that if reflux happen afterward, the reimplantation would be performed easily [12]. A small cystotomy was made between two stay sutures, through which insert the ureter into the bladder, and then make a mucosa (ureter) to mucosa (bladder) anastomosis with 5.0 Vicryl [12]. The bladder was catheterized for four days. No ureteral stenting.

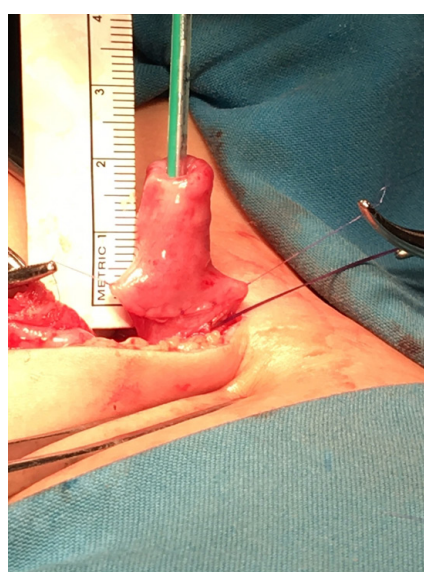
## RESULTS

Patients were followed up from 12 months to 102 months. Twenty patients included four girls, 16 boys with 21 ureteral units. Affected ureters occurred in 19 of unilateral kidneys, two of one bilateral system. Only one case had a low split renal function (26%), surgical indication of all others was

urinary infection. Mean age was 5.3 months (2-8 months). Six ureters had the length of nipple from 10-15 mm, the last 15 ureters were 20 mm length. In the six ureters with the nipple length 10-15 mm, all had postoperative vesicoureteral reflux, while those 15 with nipple length 20 mm did not demonstrate reflux. No postoperative obstruction was seen in either group based on the improvement of postoperative hydronephrosis ultrasound findings for all cases. A urinary infection without fever occurred in 3/6 cases having reflux, but none in the 15 cases without reflux. Two of six cases of reflux the parents refused the conventional reimplantation because they found their children were doing well after the procedure. The other four underwent submucosal reimplantation between 12 and 18 months post nipple valve reimplantation.



**Figure 1:** The ureter was straightened; the distal redundancy will be excised.



**Figure 2:** An averted nipple with 20 mm length.

## DISCUSSION

Two anti reflux procedures that have been used for ureteral reimplantation include creating a tunnel through the bladder wall or creating a nipple valve. The submucosal tunnel techniques of Cohen, Leadbetter and Politano, and extravesical reimplantation are more popular, but difficult to perform on small infants. The nipple valve reimplantation was first performed by Urquhart-Hay et al in cadaveric renal transplantation in 1977 [13]. The authors stated that to prevent the reflux the nipple must be at least 15 mm in length. They had 40 patients but the follow up was only 18 patients and they assumed that the necessary time for the final evaluation is six months after surgery. Among these 18 cases, four had vesicoureteral reflux. In 2005, Atila Tatlisin and Oguz Ekmekcioglu performed this technique in five adult patients with six primary obstructive megaureters [12]. They created the nipple 20 mm in length without open the bladder in midline. One ureter was reimplanted without folding back the distal end because the ureteral wall was thick. Three cases were spatulated at the distal end of ureter and everted about 20 mm. In two cases the ureteral wall was thin so they were everted, not spatulated. All had good results with no reflux. Abou-Elela A, et al. [14] used the nipple valve reimplantation for 36 bilharzia patients with 56 ureters. There was no reflux reported except 2 stenosis at the ureterovesical anastomosis. Besides that, the nipple valves are often used in bladder augmentation.

The nipple valve reimplantation has been used primarily in adults. Friedman A, and Hanna MK. [15], described this technique in children who had secondary vesicoureteral reflux caused by posterior urethral valves. They created the submucosal tunnel with a 20mm nipple. Abou Youssif TM, et al. [16] used the embedded nipple to repair the obstructed megaureter in children. They created the bed for the nipple by cauterize the bladder mucosa. The planned nipple is designed with a length to width ratio of 2:1. Liu W, et al. [17] used the orthotopic ureteral reimplantation technique for 15 ureters in 13 patients under 12 months. The bladder is opened in the midline, the ureteral orifice is dissected around then the ureter is pulled inside the bladder, the distal stenosis is resected and the nipple is created. One ureter had reflux and one had stenosis, the other 13 ureters had good results. We used the nipple valve reimplantation technique of Tatlisin A, and Ekmekcioglu O [12] also without midline cystostomy. With this technique, the incisions created on the bladder were minimal, similar to that of refluxing ureteral reimplantation. As such, there was little concern for dissection around the

ureter opening that is too close to the bladder neck in a small bladder [5]. The small difference between our technique from the refluxing ureteral reimplantation [9] is the nipple inside the bladder.

As experience of Urquhart-Hay D, et al. [13] the length of nipple was at least 15 mm to prevent the reflux, meanwhile the 20 mm length was used by Tatlisin A, and Ekmekcioglu O [12].

All ureters were found to be soft so they were easy to be everted into a nipple without spatulation. Only one ureter was tapered and spatulated. That ureter was 23 mm in diameter. Concerning the spatulation, we found that all eversion without spatulation did not cause ischemic necrosis and stenosis (Figure 3) as Tatlisin A, and Ekmekcioglu O quoted [12].



**Figure 3:** An averted nipple without spatulation after 10 months of reimplantation.

The stent insertion and cutaneous ureterostomy have their complications [7,8], especially the stent insertion cannot be used if the reflux and the obstruction exist simultaneously in case of urethral ectopic ureters [18].

Compared with other techniques, the nipple valve reimplantation is always feasible with any opening site of the ureter [18], the incision on the bladder is minimal. It does not require any special instrument as stent insertion.

The limitations of this study are a retrospective case series, the small number of patients with a 20 mm nipple length and the short follow-up time.

## CONCLUSIONS

The nipple valve ureteral reimplantation is a simple technique.

Our data indicates that a nipple length of 20 mm is not associated with postoperative vesicoureteral reflux.

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## CONFLICTS OF INTEREST

All the authors declared that they have no conflicts of interest.

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