Technique of Antireflux Procedure without Creating Submucosal Tunnel for Surgical Correction of Vesicoureteric Reflux during Bladder Closure in Exstrophy

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Aim: To report the clinical application of the new surgical technique of antireflux procedure without creating submucosal tunnel for surgical correction of vesicoureteric reflux during bladder closure in exstrophy.

Materials and Methods: Based on the report of published experimental technique, the procedure was clinically executed in seven patients of classic exstrophy bladder with small bladder plate with polyps, where the creation of submucosal tunnel was not possible, in last 18 months. Ureters were mobilized. A rectangular patch of bladder mucosa at trigone was removed exposing the detrusor. Mobilized ureters were advanced, crossed and anchored to exposed detrusor parallel to each other. Reconstruction included bladder and epispadias repair with abdominal wall closure. The outcome was measured with the assessment of complications, abolition of reflux on cystogram and upper tract status.

Results: At 3-month follow-up cystogram, reflux was absent in all. Follow-up ultrasound revealed mild dilatation of pelvis and ureter in one.

Conclusions: The technique of extra-mucosal ureteric reimplantation without the creation of submucosal tunnel is simple to execute without risk and complications and effectively provides an antireflux mechanism for the preservation of upper tract in bladder exstrophy. With the use of this technique, reflux can be prevented since the very beginning of exstrophy reconstruction.

Keywords: Exstrophy bladder, ureteric reimplantation, vesicoureteric reflux

INTRODUCTION

In reconstructive surgery of classic exstrophy bladder, irrespective of the methods of reconstruction selected, safety and preservation of upper tract is mandatory and cannot be overemphasized. In the protocol of modern staged reconstruction of exstrophy, Cohen’s anti-reflux procedure is performed in the third stage of reconstruction.[1] Vesico-ureteric reflux (VUR), unless corrected, is present in almost 100% of cases of bladder exstrophy after bladder reconstruction.[2] In the technique of single stage total reconstruction (SSTR) of exstrophy, Cohen’s ureteric reimplantation can be performed only in patients with the large bladder plate exstrophy.[3] In the complete primary repair of bladder exstrophy,[4] antireflux procedure is not combined with initial closure although it is desired to prevent VUR in early stages of reconstruction of exstrophy. Limitations to create antireflux mechanism during initial stages of bladder closure can be due to a poor quality of mucosa of bladder plate, the presence of multiple polyps and inadequate working space particularly in small bladder plate in exstrophy patients.

To overcome these difficulties, an experimental study has been reported about the creation of effective anti-reflux mechanism without the creation of submucosal tunnel.[5]
but there is no study about the clinical application and efficacy of the technique of creating antireflux mechanism without the need to create a submucosal tunnel.

This study reports the efficacy of creating antireflux mechanism without the creation of submucosal tunnel in those patients with classic exstrophy bladder where the creation of submucosal tunnel is not possible due to multiple polyps, friable, adherent, poor quality mucosa and inadequate working space.

MATERIALS AND METHODS
Ethical clearance for the human interventional study was obtained from the Institutional Ethical Committee.

Study design
It was a prospective interventional study where a new method of antireflux procedure was performed in those patients with classic exstrophy bladder where the creation of submucosal tunnel was not possible at the time of bladder closure.

Setting
This study was conducted in a super specialty center where the clinical operative load of exstrophy-epispadias complex comprising of >25 cases per year. Patients presenting with large bladder plate exstrophy receive SSTR of exstrophy with Innervation preserving sphincteroplasty (6) and Cohen’s ureteric reimplantation. Patients presenting with small bladder plate are subjected to combined bladder closure and Epispadias repair, leaving the bladder neck wide patent, for subsequent assessment of bladder growth in the follow-up study. In last 18 months, 10 patients received SSTR of exstrophy while 16 patients were suitable for bladder urethra closure without bladder neck repair. Of these 16, informed consent of new intervention was available in seven patients. These seven patients were selected for extramucosal ureteric reimplantation with the methods described as under.

Surgical technique
After extraperitoneal bladder plate mobilisation and corporal-urethral separation without complete penile disassembly [Figure 1a], with ureteric stents in place, the ureters were adequately mobilized by dissecting in the plane of Waldeyer’s fascia, preserving the vessels and smooth muscles of the ureters [Figure 1b]. In the proposed area of the creation of submucosal tunnel for cross trigonal Cohen’s reimplantation, rectangular area on bladder plate mucosa was marked with needle tip cautery [Figure 1c]. After infiltration of saline in the submucosal plane in the marked area, the mucosa was excised away with needle tip cautery exposing and preserving the detrusor muscle in the rectangular area [Figure 1d]. All bladder polyps including those present in the rectangular area were excised.

At this point, the ureters already mobilized, were crossed and positioned parallel to each other. In this position, ureters were anchored to the exposed detrusor muscle with 3–4 interrupted sutures of 5-0 polyglycolic acid [Figure 1e]. Ureteric orifices were spatulated and fixed to the bladder mucosa and detrusor at the margin of exposed rectangular area. From neo-ureteral orifice, infant feeding tube was advanced proximally to rule out kink, interruption, twist, or any other possible obstruction that may have occurred during the trans-trigonal advancement and fixation of ureters. At this stage, the flow of urine from neo-ureteral orifices was also checked by giving fluid and intravenous Furosemide. A residual gap in ureteral hiatus, which occurred during ureteric mobilisation, was repaired. The bladder was closed keeping the bladder neck wide open. Urethroplasty, glansplasty, ventral translocation of the urethra and dorsal corporoplasty were completed. After osteotomy pubic bones were approximated with the closure of anterior abdominal wall defect. Ureteric stents were kept for 14 days, a suprapubic vesical stent for 18 days and urethral stent up to 21 days. Follow-up assessment included ultrasound for upper tract dilatation at 6 weeks and 6 months and cystogram to look for VUR after 3 months.

Outcome Measurements: The outcome of procedure were assessed using following parameters; (1) complications
during surgery, (2) postoperative complications, (3) presence or absence of VUR in cystogram after 3 months, (4) upper tract dilatation on USG at 3, 6 months and 1 year. In one patient presenting with posttraumatic hematuria after 9 months, diagnostic cystourethroscopy was performed and status of trigone was recorded [Figure 2].

RESULTS

Intra-operative problems

During ureteric mobilization with a stent in place, partial tear of the distal most segment of ureter necessitating revision of ureteric orifice was observed in two. Ureters could be easily mobilized up to peritoneal reflection with preservation of ureteral musculature and vascularity in all. After cross-trigonal fixation with the passage of stent, kink at ureteral hiatus was discovered and revision of fixation was needed in one. There was no problem in excision of bladder mucosa off the detrusor in the marked rectangular area.

Postoperative problems

Premature dislodgement of left ureteric stent on 3rd postoperative day occurred in one, but it was not associated with urinary extravasation or any other problem. In all patients, bladder urethra and abdominal wall closure healed. A transient occurrence of minute penopubic fistula was noted in five but all healed within 1 month.

Follow-up cystogram

Follow-up cystogram was performed in all seven patients and complete abolition of reflux was demonstrated in all.

Follow-up USG

On follow-up USG, the upper tract was not dilated in six patients, mild dilatation of pelvis and upper ureter was seen in one. There was no evidence of renal function deterioration.

DISCUSSION

Among the various abnormal morphology described in classic exstrophy bladder, an abnormal vesicoureteric junction is one of them. In classic exstrophy bladder; ureters enter the bladder plate without any obliquity of the intramural course.[2] Therefore, as soon as the bladder is closed and epispadias is repaired, VUR occurs in almost 100% of cases.[2] Bladder reconstruction leads to the creation of bladder reservoir with high intravesical pressure especially in patients with small to moderate bladder plate exstrophy with histologically abnormal detrusor muscle.[2]

Persistent reflux in these cases may firstly contribute to the deterioration of renal function over the period of 4–5 years, till the next stage of surgery is planned where bladder neck repair is combined with ureteric reimplantation. Secondly, persistent reflux of urine and backward flow of urine in response to bladder contraction in the upper tract may also have an adverse effect on bladder growth.

Provision of the nonrefluxing vesicoureteric junction as nature has provided in normal individuals is also desired in cases of classic exstrophy bladder since the beginning. However, because of multiple polyps, friable bladder mucosa adherent to the detrusor, difficulty in creation of submucosal tunnel, and somewhat limitation of working space especially in small bladder plate exstrophy, a reconstructive surgeon is forced to postpone the antireflux procedure for the later stage until the bladder has grown after reconstruction. This surgical technique of excising the rectangular patch of bladder mucosa, mobilizing and advancing the ureters to anchor it overexposed detrusor has offset most of these difficulties making this anti-reflux procedure a practically achievable goal in the beginning of reconstruction of bladder exstrophy. In these group of patients, the second stage of surgery is still awaited which will give us the opportunity to look at the status of trigone and advanced ureters. But, because of posttraumatic hematuria, cystourethroscopy performed in one such patient has demonstrated the automatic creation of submucosal tunnel with regeneration of bladder mucosa over the advanced and crossed ureters [Figure 2].

CONCLUSIONS

The technique of extra-mucosal ureteric reimplantation without the creation of submucosal tunnel is simple to execute without risk and complications and effectively provides an antireflux mechanism for the preservation of upper tract in bladder exstrophy. With the use of this technique, reflux can be prevented since the very beginning of exstrophy reconstruction.

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Conflicts of interest

There are no conflicts of interest.

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