

# The use of pedicled prepuccial skin flap urethroplasty for proximal bulbomembranous urethral stricture in children: an easy alternative to transpubic urethroplasty

Harshjeet S. Bal, Jujju J. Kurian and Sudipta Sen

**Objective** Pediatric urethral strictures are not uncommon, and a myriad of treatment options is available. The use of pedicled prepuccial skin to augment a narrowed urethra is one of the useful methods. In this study, we describe the successful use of this technique in three children with stricture of the proximal bulbomembranous urethra.

**Materials and methods** In this study, we reviewed three children aged 4, 7, and 10 years, respectively, with proximal bulbomembranous urethral stricture, who were treated at Christian Medical College, Vellore, India, between 2012 and 2014, using a pedicled prepuccial skin flap.

**Results** The mean follow-up time was 28 months (range: 20–41 months). There were no intraoperative or postoperative complications. All three children were symptom-free with a good urinary stream at last follow-up.

**Conclusion** The pedicled prepuccial flap technique for proximal bulbomembranous urethral stricture in children is simple and easy to perform with good overall outcome. *Ann Pediatr Surg* 13:38–42 © 2017 Annals of Pediatric Surgery.

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**Keywords:** children, prepuccial flap, urethral stricture, urethroplasty

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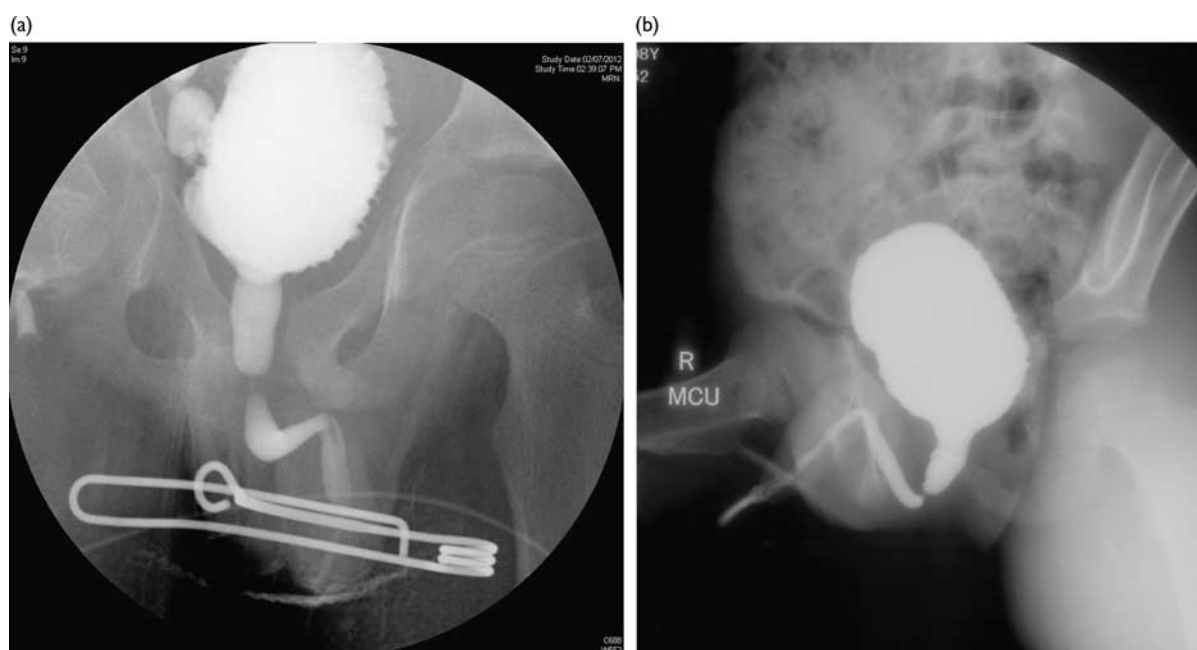
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## Introduction

Urethral stricture is narrowing of the urethra by scar tissue with trauma being the most common cause. Endoscopic and surgical options have been described in the management of post-traumatic urethral strictures [1–3]. The various treatment options include

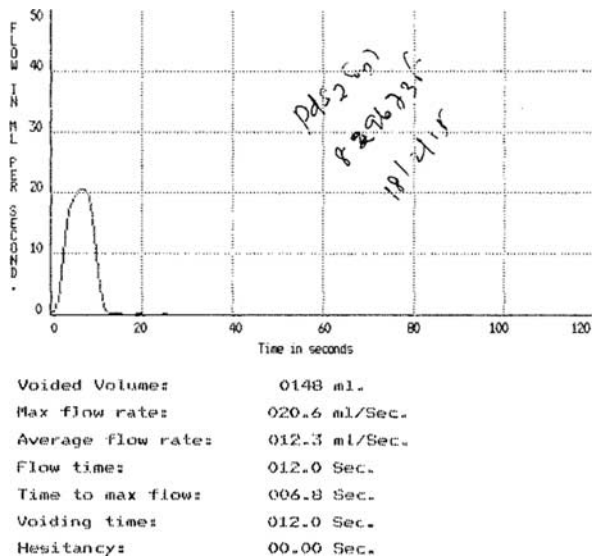
dilatations, endoscopic urethrotomy [4,5], resection of the stricture with primary anastomosis [6,7], augmented anastomotic repair using skin or buccal mucosa, and staged repair [8,9]. In this study, we describe our experience with the use of a pedicled prepuccial flap for the repair of proximal bulbomembranous urethral

Fig. 1



(a, b) Micturating urethrogram with a retrograde urethrogram showing a bulbomembranous stricture.

Fig. 2



Posturethroplasty follow-up uroflowmetry showing good urinary flow.

stricture in children and the course of follow-up. The advantage of this technique is that it is simple and easy to perform with good overall outcome.

### Materials and methods

In this study, we reviewed three children aged 4, 7, and 10 years, respectively, with membranous urethral stricture, who underwent treatment at Christian Medical College, Vellore, India, between 2012 and 2014. Children were identified through an electronic search of pediatric surgery database and operation records. A review of the preoperative hospital outpatient records, radiological investigations, operation records, and postoperative follow-up records was carried out. Follow-up of patients was carried out with ultrasound of the kidneys and urinary bladder, micturating cystourethrogram (MCU), and uroflowmetry analysis. This work was approved by our institution's IRB (Institutional Review Board).

### Results

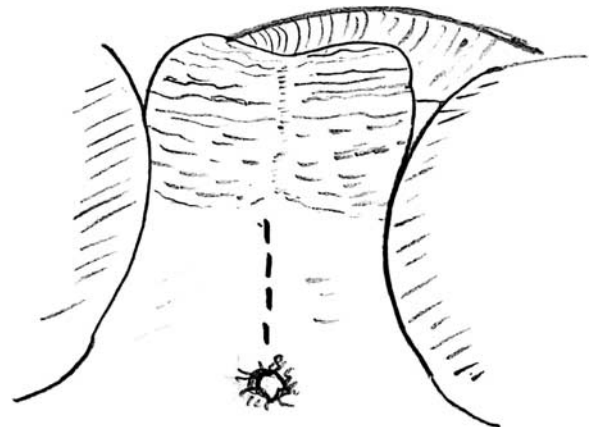
All three children presented with poor urinary stream. Although two of them had perineal trauma, one had an overzealous attempt of posterior urethral valve fulguration. Although one of the children with post-traumatic stricture presented to us primarily, the other two had failed attempts at internal urethrotomy and dilatations at other institutions. The child with a stricture following posterior urethral valve fulguration underwent an initial perineal urethrostomy followed by Mitrofanoff procedure. An initial MCU combined with a retrograde urethrogram revealed proximal bulbomembranous urethral stricture in all three children (Fig. 1). Intraoperative assessment revealed the length of the stricture to be more than 2.5 cm in all three cases. A pedicled prepuccial flap onlay urethroplasty was performed in all, the details of which are described later. None of the children had any intraoperative or postoperative complications. The postoperative MCU at 3 weeks showed a patent urethra with

Fig. 3



Assessment of whether the prepuccial skin would reach the perineum was carried out by pulling down the penis with the prepuccial skin inferiorly to see whether it reached the strictured area.

Fig. 4



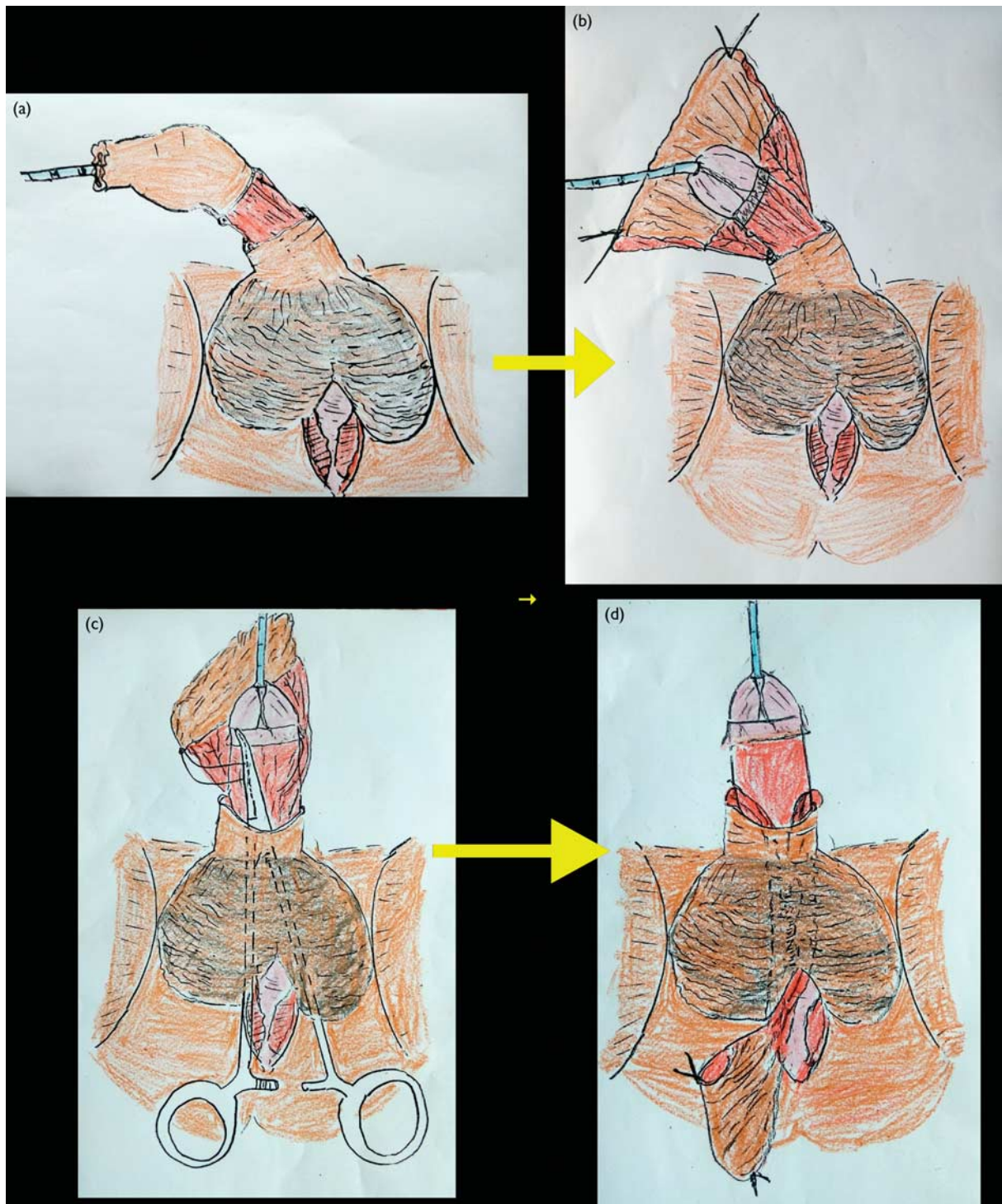
A longitudinal incision extending from the root of the scrotum to the anal margin.

resolution of the stricture. Although the MCU revealed a small outpouching at the site of anastomosis in all, none of the children had contrast retention within the outpouching in the postmicturition film. The mean follow-up time was 28 months (range: 20–41 months). All three children were symptom-free during the follow-up period, with an insignificant postvoid residue on ultrasound and a good urinary stream confirmed by uroflowmetry (Fig. 2).

### Discussion

Urethral stricture is scarring and subsequent narrowing of the urethra, resulting in bladder outlet obstruction. The causes of pediatric urethral strictures can be broadly classified into congenital and acquired, with the acquired

Fig. 5



Line-arts steps of the operation showing the circumcising incision (a), the degloved penis (b), and a pedicled prepucial skin flap isolated and brought to the perineum by tunneling it through the scrotum (c and d).

type making up the vast majority of cases [10,11]. Any stricture for which a cause is identified is termed as acquired. Trauma, both iatrogenic and exogenous, constitutes the majority of acquired cases. Other reasons for acquired strictures are traumatic indwelling catheter, transurethral interventions, posthypospadias surgery, balanitis xerotica obliterans, and rarely bacterial urethritis.

The sequelae of trauma associated pelvic fractures are more complicated in children as compared with adults. The incidence of complete rupture and subsequent stricture formation is also more common in children. The delicate puboprostatic tissues are easily sheared off in children causing the prostate to be displaced proximally, making the repair of the stricture all the more difficult. In



Fig. 6



The pedicled prepuccial skin flap was sutured to the remnant dorsal urethra over a 9-Fr silastic catheter.

addition, as the prostate is small and soft in children, there is little stabilizing effect on the posterior urethra, making it vulnerable to rupture [2,12–14]. Thus, children require a transpubic approach for a safe and secure bulboprostatic anastomosis, as compared with adults in whom a transperineal approach might suffice [15].

The symptoms of stricture disease include hesitancy, a poor urinary stream, terminal dribbling, acute retention, hematuria, and urinary tract infection. The strongest association of any of these symptoms with stricture disease is a sensation of incomplete emptying. Diagnosis of the condition is usually based on investigations, as physical examination is usually unrewarding. Ultrasound may reveal a thick-walled bladder, significant postvoid residual urine, and hydronephrosis/hydroureteronephrosis. A retrograde urethrogram along with a MCU establishes the diagnosis of stricture [16,17].

There are several techniques described for the treatment of urethral strictures in children. They include urethral dilatation, endoscopic visual internal urethrotomy, and open surgical procedures [4–9]. As the long-term results of urethral dilatation and endoscopic visual internal urethrotomy have been poor, these procedures are now indicated only in the treatment of very small strictures. Open surgery is considered the gold-standard procedure for the treatment of urethral stricture. Surgical repair of a proximal bulbomembranous urethral stricture can be performed either through a transperineal or through a transpubic route, with the transperineal approach being adequate in the majority of cases [2,18]. Resection of the strictured area with a primary spatulated end-to-end anastomosis is often adequate. However, a more than 2 cm defect after stricture excision can result in tension on a primarily performed anastomosis. In such cases, a transpubic approach is warranted [19].

The pedicled prepuccial flap repair of a proximal bulbomembranous urethral stricture requires meticulous preoperative

Fig. 7



The posturethroplasty micturating urethrogram showing a small outpouching at the site of anastomosis

planning and appropriate intraoperative assessment for obtaining a good outcome [20,21]. Patient selection is of paramount importance, with an intact and healthy prepuccial skin being a necessary prerequisite for performing this operation. In our series, the stricture was seen primarily in the proximal bulbomembranous and membranous urethra. Excision of the strictured segment on the ventral aspect resulted in a more than 2.5 cm defect involving the distal prostatic and proximal bulbar urethra in all three children.

Assessment of whether the prepuccial skin would reach the perineum was then carried out by pulling down the penis with the prepuccial skin inferiorly to see whether it reached the strictured area (Fig. 3). In case the prepuccial skin length is either short or inadequate, a transpubic urethroplasty is performed.

#### Operative technique

With the child in lithotomy position, a urethroscopy was performed using a 7.5 Fr scope, and the stricture was identified. A longitudinal incision was made extending from the root of the scrotum to the anal margin (Fig. 4). The spongiosum was separated at the midline, and the urethra was identified, dissected, and taped. The bladder was opened, a bougie was passed from the bladder into the urethra, and the strictured area in the urethra was identified. The urethra was then circumferentially dissected proximal to the strictured segment and opened keeping the dorsal wall intact. The strictured segment was excised on the ventral aspect. The resultant defect was then assessed. All three children had a resultant defect of more than 2.5 cm.

A circumcising incision was made, the penis was degloved, and a pedicled prepuccial skin fasciocutaneous flap was isolated and brought to the perineum by tunneling it through the scrotum (Fig. 5). This pedicled prepuccial skin flap was sutured to the remnant dorsal urethra over a 9-Fr silastic catheter (Fig. 6). The perineal wound was closed in layers after keeping a corrugated

drain and the bladder closed with a Malecot's catheter *in situ*.

Diverticulum formation with subsequent stasis and obstruction is a potential complication of this technique. In our series, although a small outpouching was seen at the site of anastomosis, it emptied completely in the postmicturition film (Fig. 7). Further follow-up investigations such as uroflowmetry revealed a normal voiding pattern, and ultrasound showed an insignificant volume of residual urine in all three children.

The alternative to treating a long-segment membranous and bulbomembranous stricture is transpubic urethroplasty. Studies have indicated that the morbidity and complications associated with this approach are slightly higher compared with a transperineal approach [1,22]. The pedicled preputial flap urethroplasty, being fully transperineal, is therefore definitely advantageous over the transpubic approach. Although the pedicled preputial flap has been described for the repair of distal bulbar and penile urethral strictures in children, we feel that this technique can be used to successfully repair proximal bulbar and bulbomembranous urethral strictures as demonstrated in our series [23]. There is, however, a prerequisite for performing this – the presence of a good and healthy preputial skin of adequate length so as to reach the perineum without tension.

## Conclusion

Long-gap proximal bulbomembranous strictures require a transpubic approach, as a tension-free bulboprostatic anastomosis is imperative. However, the transpubic approach is fraught with complications and high morbidity. We propose that a pedicled preputial flap urethroplasty in select cases can be a safe and effective alternative to transpubic urethroplasty for managing long-gap proximal bulbomembranous strictures.

## Acknowledgements

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## Conflicts of interest

There are no conflicts of interest.

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