Case Report/Series

Sigmoid colon flap for urethroplasty in bulbar spongionecrosis: a case report

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ABSTRACT

Bulbar urethral ischemic necrosis (BUIN) is an unfortunate complication of urethroplasties. This is a result of previous unsalvageable strictures resulting from previous repairs. Here, we present the first case of entero-urethroplasty performed using a sigmoid flap. A 27-year-old man visited the urology clinic with a complaint of urine retention on cystostomy 1 year prior. He had a motor vehicle accident that injured the urethra. He had previously undergone excision and primary anastomosis (EPA) urethroplasty and redo EPA; however, the results were unsatisfactory. Entero-urethroplasty was performed using a sigmoid colon flap harvested carefully from the patient's sigmoid colon, and reconstructive options are limited to BUIN. The sigmoid flap reconstruction appears for treating BUN. This study's limitation is the short follow-up period. Therefore, further studies and long-term follow-up should be performed to assess the effectiveness of this technique.

KEYWORDS sigmoid, stricture, urethra, urethroplasty

Bulbar urethral ischemic necrosis (BUIN) is a complication in patients with previously failed pelvic fracture urethral injury (PFUI) repair. The exact mechanism of this pathology has been described by Turner-Warwick as follows: (1) over mobilization of the distal urethra, (2) hypospadia, and (3) multiple previous surgeries. The incidence of BUIN is approximately 8.65% in patients with PFUI. Retrograde urethrography revealed long bulbar urethral stenosis, suggesting a diagnosis of BUIN.[1]

There are limited options for reconstructing this condition. Uncircumcised patients provide surgeons with more options for reconstruction, such as performing a pedicle preputial tube. However, circumcised patients must be treated with other methods such as penile flap, anastomosis, oral mucosal flap, and ultimately entero-urethroplasty. The success rates of these techniques range from 50 to 100%.[1]

Entero-urethroplasty was first performed by Lee et al[2] in 2005 to repair long incomplete posterior urethral strictures in a patient previously implanted with a urethral stent (UroLume). UroLume was previously selected as a conventional management options, such as reconstruction using grafts or flaps was considered unsuitable for very long urethral defects. Subsequently, entero-urethroplasty was performed using a 15 cm segment of sigmoid colon, which was harvested and tailored to create a 3 × 5 cm colonic patch.

Entero-urethroplasty offers the advantage of a readily available intestinal flap and a reduced need for a well-vascularized urethral bed. The sigmoid

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colon was selected because of its anatomical location in the pelvis; therefore, its use for reconstruction is more feasible than that of other intestinal segments. It has also been shown to have minimal impact on bowel function.[3] This study aimed to describe the first urethroplasty with sigmoid colon flap in Indonesia.

CASE REPORT

A 27-year-old man presented with a recurrent urethral stricture. He had sustained PFUI 1 year earlier following a motor vehicle accident. He experienced urinary retention after the accident, and a suprapubic cystostomy was performed. Urethrography revealed a total stricture in the prostatic urethra. Erectile dysfunction was also observed after the accident. Excision and primary anastomosis (EPA) urethroplasty was performed in 2022. However, he developed recurrent urinary retention 6 months after surgery. Redo EPA urethroplasty was performed in 2023. During the procedure, a bulbar urethral abscess was identified and evacuated along with an unhealthy segment of the bulbar urethra. Following surgery, he experienced another episode of urinary retention.

After a thorough discussion with the patient, we decided to perform sigmoid flap entero-urethroplasty. Urethroscopy was performed prior to perineal exploration and revealed total stenosis of the pendulous segment of the urethra. Ureteroscopy was performed through the cystostomy defect, which revealed a normal bladder neck, verumontanum, and complete stenosis of the prostatic segment of the urethra. Perineal preparation was performed, and the distal segment of the stenosis was identified using bougie guidance. However, the proximal segment of the stenosis could not be identified even with bougie guidance. An abscess was also observed in the bulbar urethra (Figure 1).

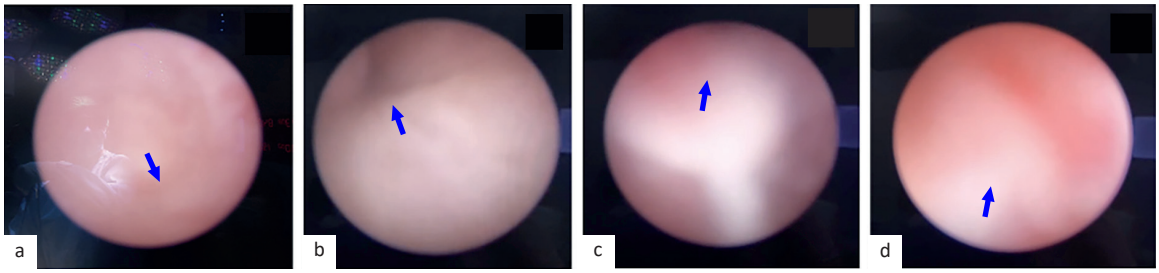


Figure 1. Urethroscopy of the patient. (a) Total stenosis in the pendulous urethra (blue arrow); (b) bladder neck from antegrade ureteroscopy (blue arrow); (c) verumontanum was visualized from antegrade ureteroscopy (blue arrow); (d) total stenosis in the prostatic urethra (blue arrow)

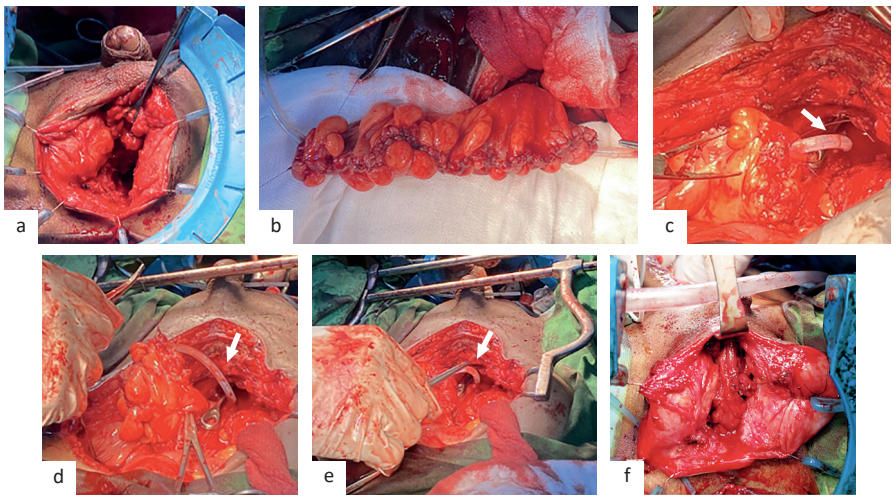


Figure 2. Tailoring of the sigmoid flap. (a) Exposure of the perineum, proximal, and distal stump; (b) tailoring of the sigmoid flap; (c and d) anastomosis of the bladder neck–proximal sigmoid flap (white arrows); (e) anastomosis of the distal sigmoid flap–distal stump (white arrow); (f) final result of the sigmoid flap anastomosis

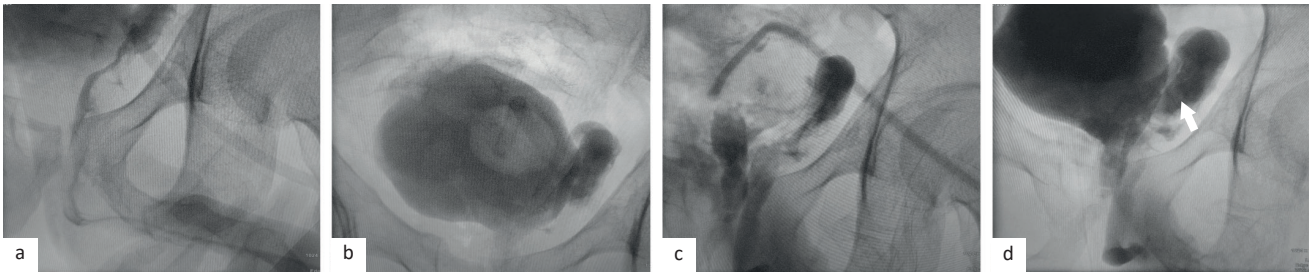


Figure 3. Bipolar urethrocystography 1 month following surgery. (a) Retrograde urethrography; (b) cystography; (c) there was no stricture or urine extravasation in the urethra or anastomosis location; (d) slight kinking was observed in the proximal urethra, near the bladder neck (white arrow)

A midline laparotomy was then performed to identify the proximal segment of the stenosis and to facilitate harvesting of the sigmoid flap. A 15-cm segment of the sigmoid colon was harvested for the sigmoid flap. The sigmoid colon and mesenteric pedicle were mobilized meticulously. The sigmoid artery was preserved to maintain the vascular supply to the flap, whereas the superior rectal artery was clamped and resected. The left colic artery was temporarily clamped to assess the vascularization of the remaining left colon for anastomosis. As the remaining left colon remained viable without the left colic artery, it was resected to facilitate further mobilization of the sigmoid flap toward the pelvis.

The sigmoid colon was tailored to create a smaller lumen fit for an 18 Fr silicone catheter (Figure 2b). After tailoring the sigmoid colon, a dissection distal to the bladder neck was performed to expose the proximal stump of the stenosis. Inferior pubectomy was performed to create space for mobilization of the sigmoid flap. End-to-end anastomosis of the bladder neck to the sigmoid flap was performed from the bladder neck to the proximal segment of the sigmoid flap (Figure 2, c and d), and from the distal segment of the sigmoid flap to the distal segment of the stenosis using 4-0 polyglactin suture (Figure 2e). An 18 Fr Foley catheter was inserted from the urinary meatus or external urethral orifice to the bladder neck. An 18 Fr foley cystostomy catheter was used for urinary diversion. Both catheters were placed 1 month postoperatively. The result of the surgery is shown in Figure 2f. The surgery lasted for 6 hours, with an estimated blood loss of 1,600 ml requiring intraoperative packed red cell transfusion. No other intraoperative complications were observed.

One month after the surgery, bipolar urethrocystography was performed (Figure 3). No stricture or urinary extravasation was observed in the urethral or anastomotic locations. A slight kinking was noted in the proximal urethra near the bladder neck. Therefore, the Foley catheter was removed. Subsequent follow-up evaluations indicated that he was able to void via the cystostomy. Subsequent urethral evaluation revealed complete stenosis of the membranous urethra. A stage I Johanson procedure was performed. Postoperatively, he was able to void through the neourethra without significant complaints. A second-stage Johanson reconstruction was planned. Informed consent was obtained for the publication of this case.

DISCUSSION

The urethra receives an antegrade blood supply from the bulbourethral artery and a retrograde blood supply from the penile dorsal artery. Bulbar urethral necrosis results from injury to both blood supplies. However, it represents a complex problem for reconstructive surgeons. The available reconstruction techniques are limited and highly complex, particularly in circumcised patients. The bulbar urethral abscess found in this patient was an indicator of urethroplasty failure and a possible etiology of spongiform necrosis.[3]

Entero-urethroplasty using a sigmoid flap was performed for this patient because of the favorable success rate reported in a previous study.[4] Grafting was not an option because a well-vascularized urethral bed was unavailable. The patient had previously undergone multiple EPA urethroplasties. Therefore, no well-vascularized ventral or dorsal beds were available for grafting. In this case, it was essential to preserve the penile dorsal arteries through careful inferior pubectomy and periosteal elevation.

Other authors have used flaps from other sources for entero-urethroplasty. Bales et al[5] used jejunal free tissue transfer to reconstruct complex anterior urethral strictures. This technique requires meticulous skill and microvascular anastomosis. Xu et al[6] reported the use of colonic mucosal grafts for reconstruction of complex anterior urethral strictures. Nevertheless, this technique requires a well-vascularized urethral bed, which is rarely available in patients with BUIN.[6]

The sigmoid colon was selected owing to its anatomical location in the pelvis. This aids in the creation of a tension-free urethral anastomosis, as deployment of the sigmoid is easier than that of other intestinal segments, such as the ileum. In addition, the vascular pedicle of the colon arises from the pelvis, which further facilitates this process. However, the disadvantage of this technique is the potential morbidity following surgery, such as postoperative ileus, fistula, and obstruction of the colon.

In this case, colonic blood flow was assessed using a simple technique involving temporary clamping of the vascular pedicle. However, fluorescein angiography using indocyanine green (ICG) would have provided a more precise evaluation of the blood supply to the flap and remaining bowel for anastomosis. ICG, a dye that fluoresces under near-infrared light, allows the real-time visualization of tissue perfusion. This technique has also been employed to assess colonic conduits used for esophageal replacement following esophageal surgery, significantly reducing the risk of ischemia and related complications.[7]

ICG is widely used in various surgical specialties and offers an accurate bowel blood flow assessment, ensuring the viability of the mobilized segment and reducing the risk of ischemic complications. This advanced technique can enhance the surgical precision and improve the overall outcome of the procedure.[7] ICG has also been used in other procedures in urology, such as the evaluation of vascular anastomosis in renal transplantation and perfusion angiography of tissue flap in complex hypospadias repair.[8]

Previous authors have noted the one out of four patients developed recurrent strictures requiring urethral dilation.[9] Stress urinary incontinence, straining, post-void dribbling, and small amounts of mucus were the residual symptoms at the last follow-up. The patient also expressed concerns about the long-term success rate and the risk of recurrent strictures following this procedure. Therefore, further multimodal evaluations using urethrocystoscopy, uroflowmetry, and urodynamic assessments may be required. This technique is most suitable for use in referral hospitals with adequate resources needed for this surgery, such as reconstructive urology surgeons, gastrointestinal surgeons, and intensivists.

To the best of our knowledge, this is the first reported case of entero-urethroplasty using a sigmoid colon flap in a patient with BUIN. The limitation of this study is the lack of long-term follow-up data. In conclusion, sigmoid flap urethroplasty appears to be a technically feasible salvage option for urologists who treat bulbar urethral necrosis in highly selected cases. Further studies with larger patient cohorts and longer follow-up are required to evaluate functional outcomes and complication rates.

Conflict of Interest
The authors affirm no conflict of interest in this study.

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