

Free Ileal Flap: An Alternative Approach to Urethral Reconstruction

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Abstract

The scarred urethra remains a difficult reconstructive problem. Patients who have undergone multiple attempts at reconstruction lack the local tissue necessary for successful management using traditional techniques. In this report, we present two cases of urethral reconstruction performed at our institution with free ileal flaps. Both patients suffered from chronically strictured urethra, having failure multiple prior operative interventions. A joint plastic and genitourinary reconstructive surgical team excised all scarred native urethra, harvesting and inserted an ileal free flap for successful urethral substitution. Postoperatively, both intestinal neourethras remain patent. We offer this technique as a promising alternative solution to the reconstructive challenge.

Keywords: Urethral reconstruction, microsurgery, reconstructive

Introduction

Reconstruction of the scarred urethra remains a challenge. In the repeatedly operated patient, paucity of well-vascularized tissue often precludes the use of many described techniques, such as local skin flaps. Free flaps have been described as an option, with studies advocating the use of fasciocutaneous forearm flaps (1-3). However, these flaps carry significant donor site morbidity, including visible scarring and risk of vascular compromise to the hand. The use of intestinal flaps has been infrequently described, last in 2011, in which a transgender male patient's urethra was reconstructed with a free jejunal flap (4-6). We present the first two cases of anterior urethral reconstruction using free ileal flaps performed in cis-male patients with early postoperative results.

Case Reports

All patients undergoing ileal free flap urethral reconstruction were identified with pre-, intra-, and post-operative data collected.

Case 1

A 31-years-old-male presented with an obliterative bulbar urethral stricture. He sustained perineal trauma at age 11 and

had undergone multiple reconstructive procedures with skin flaps. He initially presented to us with a suprapubic tube in place and underwent the first stage urethroplasty with a buccal mucosal graft and gracilis flap for the creation of a perineal urethrostomy. The urethrostomy closed with the contraction of the buccal graft. Given his extensive surgical history, reconstruction was planned with an ileal free flap.

Case 2

A 35-years-old-male presented with recurrent urethral stricture since the age of 15 secondary to perineal trauma. He had failed multiple attempts at reconstruction, most recently staged urethroplasty using a gracilis flap with perineal urethrostomy creation with subsequent stenosis of the urethrostomy. Cystoscopy revealed an obliterated membranous urethra. Reconstruction was planned with a free ileal flap.

Operative Techniques

The ileal flap harvest was approached via a lower midline laparotomy incision. The terminal ileum (TI) was identified, and a 17 centimeter (cm) and 15 cm segment of bowel located 15 cm proximal to the TI was marked in cases 1 and 2, respectively. The mesentery of this section of the bowel was transilluminated to identify the proximal ileal artery and vein along with distal arcades supplying the bowel. The bowel was stapled at each end;

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marginal arcades were divided and the mesentery was dissected down to the proximal artery and vein to adequate vessel size and length. A side branch of the ileal vein was maintained in each case as an option for secondary venous outflow.

The deep inferior epigastric vessels were chosen as recipient vessels and were dissected through the same laparotomy incision. These were divided and brought down to the groin through the external ring for anastomosis. The saphenous vein was harvested and tunneled to the groin with anastomosis to the deep inferior epigastric artery (DIEA) for the creation of an arteriovenous (AV) loop.

The AV loop was divided after the flap was fully harvested with anastomosis between the DIEA and ileal artery and the ileal vein and saphenous vein proper (Figure 1). In Case 1, an ileal vein side branch was anastomosed to the deep inferior epigastric vein using a vein graft. Fluorescent angiography confirmed excellent inflow and outflow to the flap, which was then inserted in an isoperistaltic direction into the defect.

The ileal segment was prepared for urethral anastomosis by stapling the bowel over a 24-French catheter on the antimesenteric side (Figure 2). Proximal urethral anastomosis proceeded with absorbable sutures. The ileal flap was then

divided at the appropriate point for distal anastomosis, with the distal segment used as a monitoring limb. Distal urethral anastomosis was then completed. A suprapubic tube was retained for urinary diversion.

Outcomes

Patient 1's postoperative course was uneventful, whereas Patient 2's course was complicated by an abdominal wall abscess requiring IR drainage and prolonged intravenous antibiotics. There were no flap-related complications.

After 3 weeks postoperatively, cystourethrogram performed in Patient 1 revealed no extravasation, and at 3-months follow-up, he demonstrated normal voiding per the neourethra. He returned to the operating room 4 months postoperatively for takedown of his suprapubic tract and monitoring of the ileal segment. He was found to have a patent ileal urethral anastomosis with high bladder capacity. Cystoscopy in Patient 2 six weeks postoperatively revealed concern for distal anastomotic leak; however, it resolved on repeat study 2 weeks later. He returned to the operating room 3 months postoperatively for excision of his monitoring ileal limb and cystoscopy, which revealed narrowing at the proximal urethral anastomosis, treated with

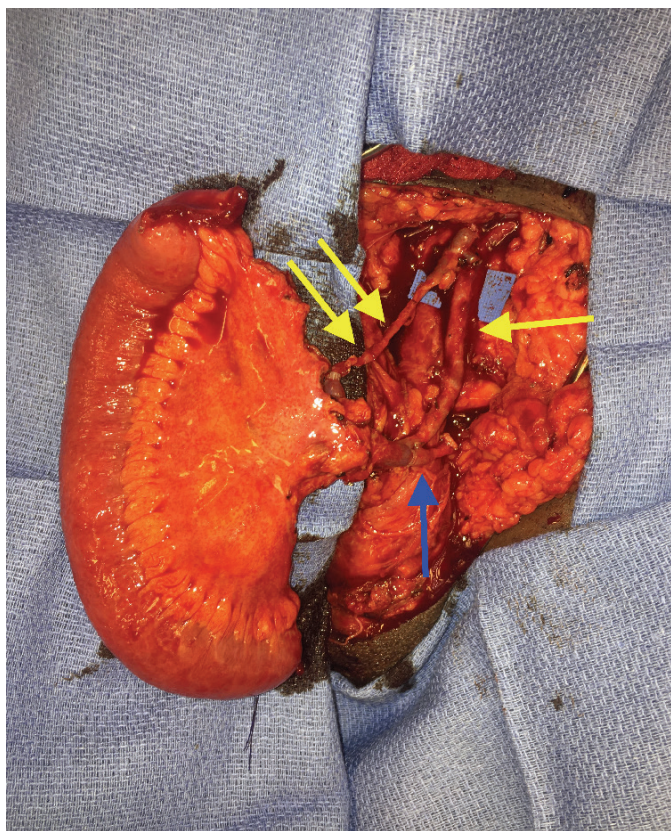


Figure 1. Free ileal flap after anastomosis between the ileal artery and the deep inferior epigastric artery via saphenous arteriovenous loop (yellow arrow), ileal vein proper and saphenous vein (blue arrow), and ileal vein side branch and deep inferior epigastric vein via vein graft (double yellow arrows)

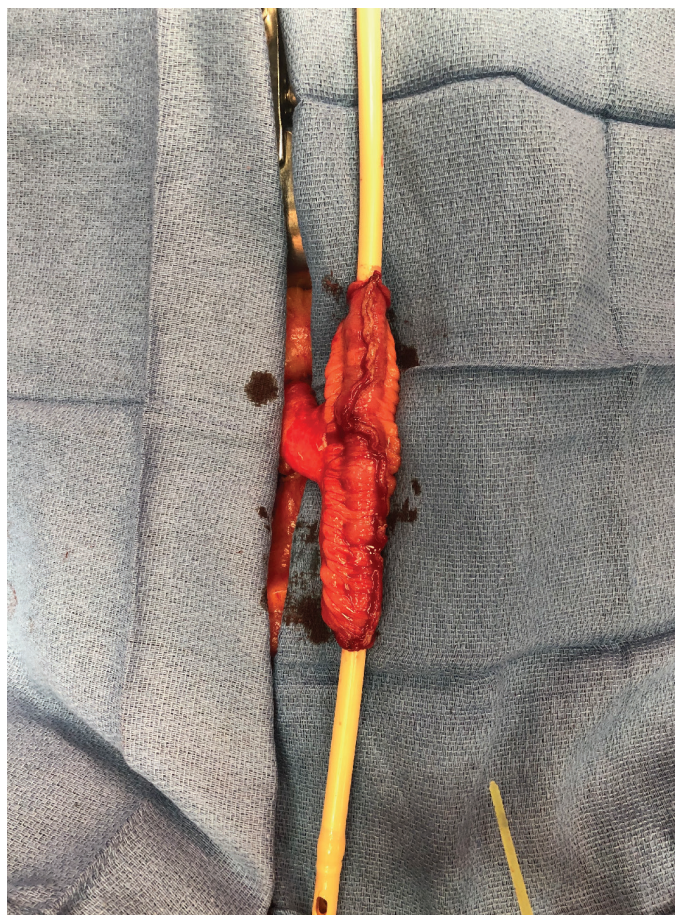


Figure 2. The free ileal flap is crafted into a neourethra by stapling the bowel on the anti-mesenteric side over a 24-French catheter

balloon dilation with good effect. At 4 months postoperatively, he is voiding well per the neourethra.

Discussion

The reconstructive armamentarium for treating severe urethral strictures remains limited. The addition of vascularized tissue in the form of a free flap can be beneficial to these patients (7). While the tubed forearm flap remains a viable option, no alternative flap has yet to be identified when this donor site is not available. The use of a jejunal flap for urethral reconstruction has been previously described in three patients (4,5). We prefer to use the ileum for multiple reasons. First, the identification of a usable bowel segment proximal to the ileocecal valve is simple. The luminal diameter is also smaller compared to the jejunum, better approximating that of the native urethra and requiring less manipulation for neourethral construction. Additional advantages include the fact that it is hairless; better providing a like-with-like reconstruction compared to forearm flaps; and can be used to reconstruct large segments of diseased urethra due to the availability of intestine.

Despite these advantages, several concerns exist. The need for a laparotomy and bowel manipulation for flap harvest is a significant consideration. Neither patient experienced a bowel-related complication. Additionally, while our short-term results yield promising outcomes, long-term follow-up is required.

In conclusion, we present our experience with free ileal flaps for urethral substitution in two patients who suffered traumatic perineal injuries and failed conventional methods of reconstruction. This technique represents an alternative for plastic and genitourinary reconstructive surgeons faced with end-stage urethral stricture, fistula, or obliteration of any etiology. Finally, the two-team approach with plastic and urologic surgery is invaluable in these cases.

Ethics

Informed Consent: Informed consent was obtained.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: L.M.A., D.A.D., J.D.F., L.C.Z., J.P.L., Concept: L.M.A., D.A.D., J.D.F., L.C.Z., J.P.L., Design: L.M.A., D.A.D., J.D.F., L.C.Z., J.P.L., Data Collection or Processing: L.M.A., D.A.D., J.D.F., L.C.Z., J.P.L., Analysis or Interpretation: L.M.A., D.A.D., J.D.F., L.C.Z., J.P.L., Literature Search: L.M.A., D.A.D., J.D.F., L.C.Z., J.P.L., Writing: L.M.A., D.A.D., J.D.F., L.C.Z., J.P.L.

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