Asian Journal of Urology 11 (2024) 373–376

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/ajur

Original Article

Role of buccal mucosa graft ureteroplasty in the surgical management of pyeloplasty failure

Matthew Lee [a,*], Elizabeth Nagoda [a], David Strauss [a], Matthew Loecher [a], Michael Stifelman [b], Lee Zhao [c]

[a] *Department of Urology, Lewis Katz School of Medicine, Temple University, Philadelphia, PA, USA*
[b] *Department of Urology, Hackensack Meridian School of Medicine, Hackensack University Medical Center, Hackensack, NJ, USA*
[c] *Department of Urology, New York University Grossman School of Medicine, New York University Langone Health System, New York, NY, USA*

Received 3 July 2023; accepted 28 September 2023
Available online 15 November 2023

KEYWORDS
Ureteral obstruction;
Buccal mucosa graft;
Pyeloplasty;
Robotic;
Stricture

Abstract *Objective:* Secondary pyeloplasty for recurrent ureteropelvic junction obstructions may be a safe and feasible surgical option for patients. This study aimed to demonstrate outcomes of utilizing a non-transecting buccal mucosa graft ureteroplasty for management of recurrent ureteropelvic junction obstruction after prior failed pyeloplasty.
Methods: We performed a retrospective review of our Collaborative of Reconstructive Robotic Ureteral Surgery database for all consecutive patients who underwent buccal mucosa graft ureteroplasty between April 2012 and June 2022 for management of recurrent ureteropelvic junction obstructions after prior failed pyeloplasty. The primary outcome included surgical success which was defined as the absence of flank pain and no obstruction on imaging.
Results: Overall, ten patients were included in our analysis. The median stricture length was 2.5 (interquartile range [IQR] 1.8–4.0) cm. The median operative time was 230.5 (IQR 199.5–287.0) min and median estimated blood loss was 50.0 (IQR 28.8–102.5) mL. At a median follow-up of 10.3 (IQR 6.2–14.8) months, 80% of patients were surgically successful and there were no major (Clavien–Dindo Grade>2) complications.
Conclusion: Buccal mucosa graft ureteroplasty is a valuable non-transecting surgical option for patients with recurrent ureteropelvic junction obstructions who failed prior pyeloplasty and has comparable outcomes to the literature regarding standard transecting techniques.

* Corresponding author.
E-mail address: matthewlee019@gmail.com (M. Lee).
Peer review under responsibility of Tongji University.

https://doi.org/10.1016/j.ajur.2023.09.001

1. Introduction

The gold standard technique for definitive management of a ureteropelvic junction obstruction (UPJO) is a pyeloplasty. Primary robotic pyeloplasty has been associated with a greater than 90% success rate [1—3]. Although failure occurs infrequently in this setting, when it does occur, management of recurrent UPJOs after prior failed pyeloplasty can be challenging due to increased periureteral scarring and fibrosis in the previous surgical area. This can often make re-operative ureteral dissection and identification technically difficult and can risk further devascularization to the ureter.

Secondary pyeloplasty for recurrent UPJOs may be a safe and feasible surgical option. A dismembered (transecting) pyeloplasty is most often performed for these patients. With recent advancements in robotic ureteral reconstructive surgery, various additional non-transecting techniques may also be utilized in this setting [4]. Non-transecting techniques may be considered a good option for redo cases due to preservation of the ureteral blood supply. Buccal mucosa graft ureteroplasty (BMGU) is one type of non-transecting pyeloplasty technique which has gained favor in the recent literature for management of proximal and middle ureteral strictures [5,6]. However, published data regarding its use in management of recurrent UPJOs are limited. Herein, we report our surgical technique and perioperative outcomes with BMGU for management of recurrent UPJOs.

2. Materials and methods

We performed a retrospective review of our Collaborative of Reconstructive Robotic Ureteral Surgery database (this is an institutional review board approved multi-institutional database) for all consecutive patients undergoing BMGU between April 2012 and June 2022 for management of recurrent UPJOs after prior failed pyeloplasty (open, laparoscopic, and/or robotic techniques). BMGU was performed across three institutions (Temple University, Philadelphia, PA, USA; Hackensack University Medical Center, Hackensack, NJ, USA; New York University Langone Health, New York, NY, USA) using the da Vinci Surgical System (Intuitive Surgical, Sunnyvale, CA, USA). Surgery was indicated in patients with radiographic evidence (*i.e.*, CT, retrograde pyelogram, and antegrade pyelogram) of a UPJO and clinical symptoms (*i.e.*, flank pain and recurrent urinary tract infections) or decreasing renal function on preoperative renal scan. Not all patients had preoperative renal scans prior to their surgery; however, all patients did have one of the aforementioned radiographic imaging studies for diagnosis of their UPJOs. Surgical success was assessed at each postoperative visit and was defined as the resolution of radiographic obstruction on a 6-month postoperative renal scan and resolution of obstructive symptoms. Preoperatively, all patients underwent percutaneous nephrostomy drainage for at least 4 weeks to facilitate ureteral rest. All patients with positive preoperative urine cultures were treated with antibiotics (based on culture sensitivities) for 5—7 days prior to arriving for surgery and all patients received perioperative antibiotics on the day of surgery.

As described previously in the literature, we utilized BMGU for recurrent UPJOs in patients with nonobliterative (narrowed) long-segment (greater than 2 cm) UPJO and/or significant fibrosis around the UPJO [4]. For patients who only had a stricture identified on preoperative CT, we performed a retrograde and antegrade pyelogram on the day of surgery to evaluate the ureteral stricture. We began by performing a ureterolysis to expose the anterior surface of the UPJO and made a longitudinal incision over the strictured segment. The length of the graft was determined by intracorporeally measuring the ureteral defect. Intraureteral or intravenous indocyanine green (ICG) may be utilized under near-infrared fluorescence for aiding in ureteral and stricture identification. Injecting 2 mL ICG intravenously allowed for assessment of ureteral perfusion under near-infrared fluorescence. Intraureteral ICG aided in localizing the ureter and determining stricture margins by injecting 5 mL ICG into the ureteral lumen via a ureteral catheter and/or percutaneous nephrostomy tube [7]. Hypointense signals under near-infrared fluorescence signified poorly perfused tissue which indicates the stricture location and its margins (Fig. 1). A buccal mucosa graft was then harvested by hydrodissecting the buccal mucosa with lidocaine with epinephrine and excising it off the buccinator muscle. The buccal mucosa graft onlay was then anastomosed to the remaining defect with a 5—0 absorbable monofilament suture (Fig. 1). A broad-based pedicle of greater omentum was mobilized and wrapped around the reconstructed ureter and pexied in place to supplement healing. No intrabdominal drains were placed during these cases. A double-J ureteral stent is placed across the anastomosis and removed at approximately 6 weeks postoperatively. A foley was placed at the end of the case, but this was removed on postoperative Day 0 or 1 prior to discharge.

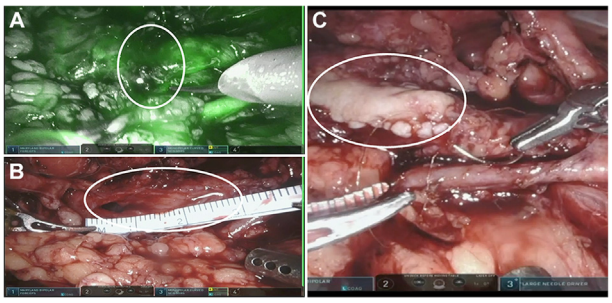

Figure 1 Buccal mucosa graft ureteroplasty. (A) Intravenous indocyanine was utilized for stricture identification and the strictured segment of the ureteropelvic junction appeared hypointense when visualized under near-infrared fluorescence; (B) A longitudinal incision was made along the ventral aspect of the ureteropelvic junction across the strictured segment and a ruler was utilized to measure the stricture length; (C) A buccal mucosa graft was anastomosed to the ventral defect in a running fashion using a 5—0 absorbable monofilament suture.

3. Results

Patient demographics and preoperative variables are summarized in Table 1. Ten patients were included in our analysis. Etiology of strictures included 40% congenital and 60% iatrogenic (prior ureteroscopy and/or prior UPJO surgery). Intraoperative and postoperative outcomes are summarized in Table 2. The median intraoperative stricture length was 2.5 (interquartile range [IQR] 1.8–4.0) cm. The median operative time was 230.5 (IQR 199.5–287.0) min and median estimated blood loss was 50.0 (IQR 28.8–102.5) mL. There were no intraoperative complications. ICG under near-infrared fluorescence was utilized in 60% of cases to aid in visualization of the ureter (intraureteral ICG in 83.3% of cases).

At a median follow-up of 10.3 (IQR 6.2–14.8) months, 80% of patients were surgically successful and there were no major (Clavien–Dindo Grade>2) complications. The two patients who failed secondary pyeloplasty have been managed with chronic ureteral stent exchanges. Both patients had decreasing split function on the affected side on their postoperative renal scans with prolonged half times and had recurrence of flank pain.

Table 1 Patient demographics and preoperative variables.

Variable	Value
Age, year	39.5 (29.5–52.5)
Body mass index, kg/m^2	25.7 (24.3–30.7)
Sex	
Male	5 (50)
Female	5 (50)
Etiology of stricture	
Congenital	4 (40)
Iatrogenic	6 (60)
Laterality	
Left	8 (80)
Right	2 (20)

Note: values are presented as median (interquartile range), or *n* (%).

4. Discussion

Recurrent UPJOs after prior failed pyeloplasty may be technically difficult to perform. There is typically significant fibrosis and scarring at the re-operative site which makes it difficult to perform ureterolysis and increases the risk of devascularization to the ureter during dissection. Nevertheless, surgical pyeloplasty in the re-operative setting has shown better outcomes as compared to endoscopic management in this setting [4,8–10].

Most studies in the literature describe utilization of a dismembered (transecting) pyeloplasty in the recurrent setting [8–10]. Sundaram et al [9]. performed a retrospective analysis reporting outcomes of patients undergoing secondary laparoscopic pyeloplasty after prior failed endoscopic (91.7%) or surgical (8.3%) intervention for a UPJO. At a mean follow-up of 10 months, 30 (83.3%) patients were successful. Hammady et al. [10] performed a retrospective study comparing primary and secondary laparoscopic pyeloplasty. There were 32 patients in the secondary UPJO group who underwent prior failed open pyeloplasty. At a mean follow-up of 32.4 months, 90.6% of patients were surgically successful. In their comparison, the authors found that there was a significantly longer operative time associated with the secondary group [10].

In our study, we describe outcomes of 10 adult patients who underwent robotic BMGU for management of recurrent UPJOs after a prior failed pyeloplasty. At a median follow-up of 10.3 months, there was an 80% success rate. The risk factors contributing to the failed reconstructive repair in the two patients involved in our study may be multifactorial. These patients had longer strictures that extended down into the proximal ureter which makes reconstruction more complex. Furthermore, these patients had multiple prior endoscopic and open ureteral reconstruction attempts which could increase the amount of periureteral scarring and inflammation in this area.

Table 2 Intraoperative details and follow-up results.

Variable	Patient (*n*=10)										Value
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	
Length of stricture, cm	2	2	4	3	7	4	1	1	3	2	2.5 (1.8–4.0)[a]
Operative time, min	146	201	265	225	280	236	308	206	195	318	230.5 (199.5–287.0)[a]
Estimated blood loss, mL	150	60	30	50	25	25	100	50	110	50	50.0 (28.8–102.5)[a]
Intraoperative complication	No	No	No	No	No	No	No	No	No	No	0%
Indocyanine green usage	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	60%
Length of stay, day	1	1	0	0	1	1	0	0	1	1	1 (0–1)[a]
Follow-up, month	22.4	47.1	11.4	11.6	9.2	12.3	8.5	6.0	6.3	6.0	10.3 (6.2–14.8)[a]
Major (Clavien–Dindo Grade>2) complication	No	No	No	No	No	No	No	No	No	No	0%
Surgical success	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	80%

[a] Values are presented as median (interquartile range).

We presume there are benefits of utilizing a non-transecting technique for management of UPJOs in the re-operative setting. This technique avoids complete transection of the ureter which may help avoid devascularization of the ureteral blood supply and reduces the need for significant ureterolysis. By solely making a longitudinal incision along the strictured segment, the ureteral blood supply may be preserved. Also, when performing BMGU, the ureter remains in continuity which may facilitate formation of an anastomosis that is tension-free. This technique may be limited in patients with a crossing vessel or other forms of extrinsic compression as only a transecting pyeloplasty is indicated in these cases.

This study certainly has its limitations. It is retrospective in design and includes a small sample size. Also, the benefit of utilizing a non-transecting technique for preservation of the ureteral blood supply is only theoretical as we did not have a way to measure ureteral vasculature during these cases. Furthermore, the safety and efficacy of BMGU for management of ureteral strictures have only been evaluated in smaller cohorts with intermediate-term follow-ups [6]. As such, larger series with longer term follow-ups are necessary to analyze outcomes of recurrent UPJOs.

5. Conclusion

BMGU is a valuable non-transecting surgical option for patients with recurrent UPJOs who failed prior pyeloplasty and has comparable outcomes to the literature regarding standard transecting techniques. Future robust studies are needed to validate this procedure for the management of recurrent UPJOs.

Author contributions

Study concept and design: Matthew Lee.
Data acquisition: Matthew Lee, David Strauss, Matthew Loecher, Elizabeth Nagoda.
Data analysis: Matthew Lee.
Drafting of manuscript: Matthew Lee.
Critical revision of the manuscript: Michael Stifelman, Lee Zhao.

Conflicts of interest

Matthew Lee, David Strauss, Matthew Loecher, Elizabeth Nagoda, and Lee Zhao declare no conflict of interest. Michael Stifelman is on the Scientific Advisory Board for Intuitive (Sunnyvale, CA, USA), a consultant for VTI Medical (Waltham, MA, USA), and performs educational activities for Ethicon (Somerville, NJ, USA).

References

[1] Sundaram C, Hopf H, Bahler C. Long-term outcomes of robot-assisted laparoscopic pyeloplasty for ureteropelvic junction obstruction. Urology 2016;90:106—11.
[2] Etafy M, Pick D, Said S, Hsueh T, Kerbl D, Mucksavage P, et al. Robotic pyeloplasty: the University of California-Irvine experience. J Urol 2011;185:2196—200.
[3] Gupta N, Nayyar R, Hemal A, Mukherjee S, Kumar R, Dogra P. Outcome analysis of robotic pyeloplasty: a large single-centre experience. BJUI 2010;105:980—3.
[4] Lee M, Lee Z, Strauss D, Jun MS, Koster H, Asghar A, et al. Multi-institutional experience comparing outcomes of adult patients undergoing secondary versus primary robotic pyeloplasty. Urology 2020;145:275—80.
[5] Zhao LC, Weinberg AC, Lee Z, Ferretti MJ, Koo HP, Metro MJ, et al. Robotic ureteral reconstruction using buccal mucosa grafts: a multi-institutional experience. Eur Urol 2018;73:419—26.
[6] Lee Z, Lee M, Koster H, Lee R, Cheng N, Jun M, et al. A multi-institutional experience with robotic ureteroplasty with buccal mucosa graft: an updated analysis of intermediate-term outcomes. Urology 2021;147:306—10.
[7] Lee Z, Moore B, Giusto L, Eun D. Use of indocyanine green during robot-assisted ureteral reconstructions. Eur Urol 2015;67:291—8.
[8] Atug F, Burgess SV, Castle E, Thomas J. Role of robotics in the management of secondary ureteropelvic junction obstruction. Int J Clin Pract 2006;60:9—11.
[9] Sundaram CP, Grubb R, Rehman J, Nan Y, Chen C, Landman J, et al. Laparoscopic pyeloplasty for secondary ureteropelvic junction obstruction. J Urol 2003;169:2037—40.
[10] Hammady A, Elbadry MS, Rashed E, Moussa A, Gamal W, Dawood W, et al. Laparoscopic repyeloplasty after failed open repair of ureteropelvic junction obstruction: a case-matched multi-institutional study. Scand J Urol 2017;51:402—6.