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Original article

Retrograde pericatheter urethrography (RPU) technique and its clinical use after urethroplasty: A single center experience

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Abstract
Objective: To describe our technique of retrograde pericatheter urethrography (RPU) and its clinical use after urethroplasty.
Subjects and methods: Between January 2008 and December 2013, 387 patients with urethral stricture underwent urethroplasty at our center. A total of 343 of these patients underwent RPU 3 weeks post-operatively. For this retrospective study their files were evaluated with regard to: demographics, duration of symptoms, site, mean length of stricture, type of surgery, RPU findings, contrast-medium related complications and need of re-intervention. The eventual surgical success was defined as asymptomatic voiding with no clinical evidence of residual stricture (good flow rate and no residual urine) until the last follow up.
Results: Follow up ranged from 8 to 41 (mean 28) months. The mean duration of symptoms was 4.8 months. The mean stricture length, as seen on radiography, was 2.1 cm. 183 patients (53.3%) underwent anastomotic urethroplasty, while 160 (46.6%) underwent substitution urethroplasty. RPU showed urethral healing in 292 (85.2%) and contrast extravasation in 51 (14.8%) patients. No contrast-medium related complications were reported. Re-intervention was needed in 7.2% (21/292) of the patients who showed normal urethral healing and in 74.5% (38/51) of the patients who showed contrast extravasation on RPU. By the time of the last follow up the overall success rate was 82.7% (284/343 patients).
Conclusion: RPU is the most useful radiological diagnostic method for evaluating the appropriate time for catheter removal after urethroplasty. It helps to assess urethral healing and patency after urethroplasty. Prolonged catheterization in patients showing contrast extravasation may be helpful.

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Introduction

Urethral stricture mostly results from pelvic fracture, straddle injuries or urethral manipulation. It can be seen in patients of all ages with a marked increase in those older than 55 years [1,2]. Urethroplasty is the gold standard treatment for urethral stricture disease. The presence of a urethral catheter with or without suprapubic catheter (SPC) may play a role in postoperative morbidity. The usual time of catheter removal after urethroplasty varies from 7 to 21 days, depending on urethral healing [3–5]. However, there is a paucity of literature on how to assess urethral healing after urethroplasty and when to remove the urethral catheter [6]. Retrograde pericatheter urethrography (RPU) has been reported to be useful in assessing urethral healing at the anastomotic site [7]. Therefore, this study was carried out in order to verify whether this technique can be used routinely as a diagnostic tool for the evaluation of the appropriate time for catheter removal after urethroplasty and whether it can predict the success of urethroplasty.

Subjects and methods

We performed a retrospective review of prospectively collected medical records of patients who underwent urethroplasty for urethral stricture at our institution between January 2008 and December 2013. All patients underwent routine investigations including complete hemogram and urine culture. Preoperative assessment of the stricture was done subjectively using uroflowmetry, and radiologically by retrograde urethrography and micturating cystourethrography (RGU/MCU). The patients underwent end-to-end urethroplasty or substitution/buccal graft urethroplasty, depending upon the stricture length.

RPU was performed 3 weeks postoperatively before removal of the urethral catheter. In cases showing a normal urethral outline (Fig. 1), the urethral catheter was removed. The suprapubic catheter, if present, was clamped and removed after 1–3 days. In cases showing contrast extravasation (Fig. 2), the urethral catheter was kept for another one to three weeks, depending on the degree of extravasation which was subclassified into 3 grades (mild, moderate, severe) (Table 1). The patients were assessed for any pain, fever and infection during or after RPU.

The patients were followed up regularly at 3-month intervals and evaluated subjectively for the presence of obstructive symptoms, recurrent urinary tract infection (UTI) and the presence of suprapubic fistula. Objective assessment consisted of dynamic urethrography and VCUG with endoscopy, if needed. The eventual surgical success was defined as asymptomatic voiding with no clinical evidence of residual stricture (good flow rate and no residual urine) at the time of the last follow up. The following data were collected: demographics, duration of lower urinary tract symptoms, site of stricture, mean length of stricture, type of urethroplasty, RPU finding, contrast-medium related complications and re-intervention.

Table 1 Grades of extravasation on RPU.

Grade	Degree of extravasation on RPU	Timing for removal of the urethral catheter after RPU
Grade 1	Mild degree	1 week
Grade 2	Moderate degree	2 weeks
Grade 3	Severe degree	3 weeks

RPU procedure

RPU was performed under antibiotic coverage on the 21st postoperative day. With the patient in the lateral steep position, equal amounts of saline and contrast material (76% urograffin; 1 mL urograffin 76% contains 0.1 g sodium diatrizoate and 0.66 g meglumine diatrizoate) were injected through a small feeding tube into the pericatheter space (between the urethral lumen and the catheter). The patient was then asked to flex his right leg at the knee joint and to abduct it at the hip joint, and an anteroposterior pelvic radiograph was taken (Fig. 3).

Results

During the 5-year period, 387 male patients underwent urethroplasty for urethral stricture disease. RPU was performed in 343 patients with a mean age of 30.8 years. The duration of the symptoms at presentation was 3–7 (mean 4.8) months. The stricture length, as seen on radiography, varied from 1 to 5 (mean 2.1) cm. The location of the urethral stricture was bulbar in 142 (41.3%), bulbar and pendular in 75 (21.8%) and pendular in 56 (16.3%) patients, while a pelvic fracture urethral distraction defect (PFUDD) was seen in 70 (20.4%) patients. Forty-three patients reported a history of previous urethral surgery. 183 (53.3%) patients underwent end-to-end anastomotic urethroplasty, while 160 (46.6%) underwent substitution urethroplasty. The follow-up period ranged from 8 to 41 (mean

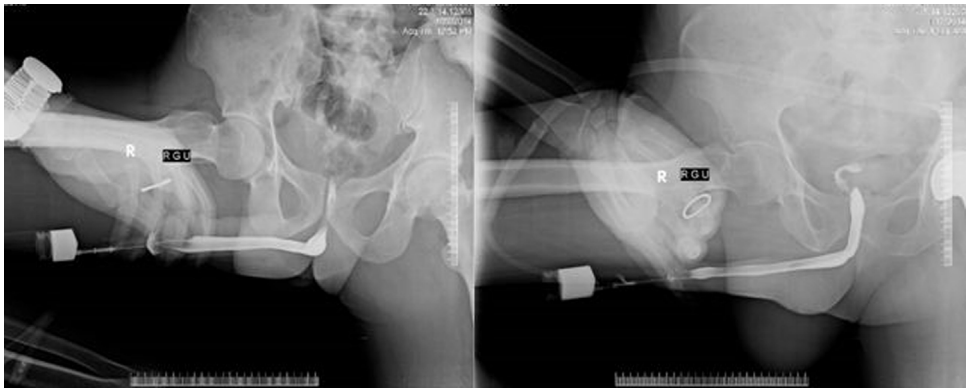

Fig. 1 RPU showing normal urethral healing.

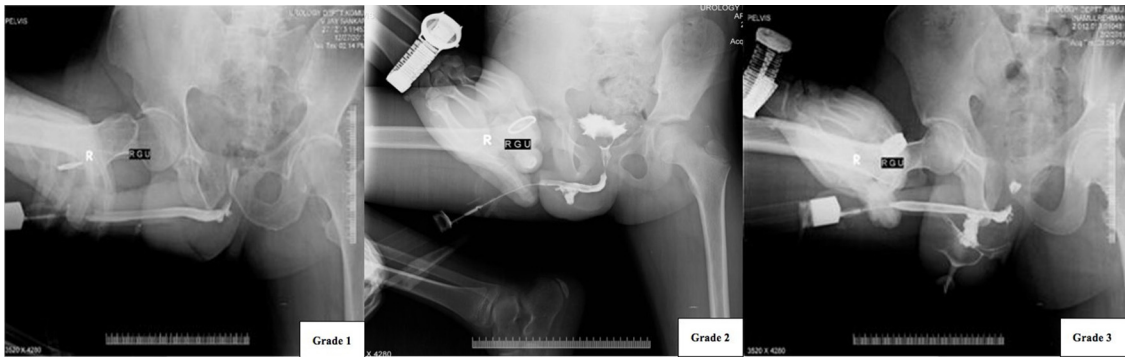

Fig. 2 RPU showing 3 grades of extravasation.

Fig. 3 Contrast medium used and positioning of the patient during RPU.

28) months. The demographic and operative data of the patients are summarized in Table 2. Pericatheter RGU was done three weeks following urethroplasty (Table 3). 292 patients (85.2%) showed normal urethral healing, while contrast extravasation was seen in 51 patients (14.8%). None of the patients developed contrast-medium related complications.

Table 2 Demographics and operative data of the patients.

Total no. of patients	343
Mean age (years)	30.8 (7–58)
Mean duration of symptoms (months)	3–7 months (4.8)
Mean stricture length on radiography (cm)	1–5 cm (2.1 cm)
H/O previous surgery	43
Q_{max} mean ± SD (who are able to void)	5.4 ± 3.7 mL/s
Bulbar urethral stricture	142 (41.3%)
Pendular urethral stricture	75 (21.8%)
Bulbar + pendular stricture	56 (16.3%)
PFUDD[a]	70 (20.4%)
EEA[b] urethroplasty	183 (53.3%)
Substitution urethroplasty	160 (46.6%)
Mean follow up (months)	8–41 months (mean – 28 months)

[a] PFUDD = pelvic fracture urethral distraction defect.
[b] EEA = end-to-end anastomotic urethroplasty.

Table 3 Findings on RPU (at 3 weeks).

No. of patients (*n*)	343
Urethral healing (*n*, %)	292 (85.2%)
Contrast extravasation (*n*, %)	
Grade 1	25 (7.28%)
Grade 2	17 (4.95%)
Grade 3	09 (2.62%)
Total	51 (14.8%)
Contrast-related complications	None

Re-intervention (optical internal urethrotomy, redo-urethroplasty) was needed in 7.2% (21/292) of the patients with normal urethral healing and in 74.5% (38/51) of the patients with contrast extravasation on RPU (Table 4). At the time of the last follow up, the overall success rate was 82.7% (284/343).

Discussion

There is some controversy about the best time for removal of the urethral catheter after urethral stricture repair. Many authors remove the

Table 4 Number of patients requiring re-intervention.

RPU finding	No. of patients (*n*)	% of patients
Normal urethral lining	*n* = 21/292	7.2%
Contrast extravasation		
Grade 1	*n* = 15/25	60%
Grade 2	*n* = 14/17	82.3%
Grade 3	*n* = 09/09	100%
Total	*n* = 38 (38/51)	74.5%

catheter between the 7th and the 21st postoperative day, depending on the type of intervention [3–5]. However, the usual postoperative scenario provides for removal of the urethral catheter three weeks after surgery, followed by a VCUG through the suprapubic catheter tube in order to confirm the integrity of the repair. When the results are satisfactory, the SPC is removed 1–3 days later.

In our study, we performed an RPU before the removal of the urethral catheter. In cases showing a normal urethral outline, the urethral catheter was removed. The suprapubic catheter, if present, was clamped and removed after 1–3 days. In cases showing contrast extravasation, the urethral catheter was kept for another one to three weeks, depending on the degree of extravasation (Table 1).

This technique has the following advantages: it helps to delineate the integrity of the urethral mucosa at the anastomotic site and to confirm urethral patency after urethroplasty. It also helps to identify patients who may benefit from retaining the catheter for a longer time (cases showing dye extravasation). It avoids unnecessary urethral manipulations such as removing and then re-inserting a catheter, which may cause an injury to the anastomosis or the patched area and should be avoided. This problem often occurs when VCUG is done to verify the integrity of urethral healing.

RPU was successful in all our patients and no complications arising from the procedure were recorded. According to Santucci et al. who performed anastomotic urethroplasty for bulbar urethral stricture in 168 patients, extravasation occurred in 1% of the patients after catheter removal on the 14th postoperative day [5]. In our study, RPU showed contrast extravasation in 14.8% (51/343) of the patients, and almost half of them had grade-1 extravasation (*n* = 25/51). 25.5% of these patients (13/51) benefitted from prolonged catheterization and reported satisfactory voiding by the end of the follow-up period.

We also found that RPU may predict the outcome of urethroplasty: 74.5% (38/51) of our patients with contrast extravasation required re-intervention as compared to 7.2% (21/292) of the patients with normal results on RPU. All patients with grade-3 extravasation required re-intervention as compared to only 60% of the patients with grade-1 extravasation.

Conclusion

RPU is the most useful radiological diagnostic method for evaluating the appropriate time of catheter removal after urethroplasty. It helps to assess urethral healing and patency after urethroplasty. Prolonged catheterization in patients showing contrast extravasation may be helpful.

Informed consent

Written informed consent was obtained from the patient.

Conflict of interests

No conflict of interest was declared by the authors.

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