ONE-YEAR EVALUATION OF OVERALL URETHRAL STRICTURE MANAGEMENT USING QUESTIONNAIRES AND UROFLOWMETRY

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ABSTRACT

Objective: To evaluate the overall outcomes of patients who get definitive treatment of urethral stricture. **Material & Method:** All patients who underwent various urethral stricture management in Cipto Mangunkusumo Hospital were evaluated over 1 year period. Patient demographics, type of surgery, International Prostate Symptoms Score (IPSS), quality of life (QoL) score, flow rate (FR) and post void residual urine (PVR) of all patients were evaluated at 3 months, 6 months and 1 year after surgery. **Results:** Out of 230 urethral stricture patients, 65 patients were eligible this study. Mean patient age was 41.19 ± 20.44 years. 37Direct Vision Internal Urethrotomy (DVIU), 20 end-to-end anastomosis, and 8 graft urethroplasties were performed. All patients underwent urethral stricture management showed improvement of IPSS (-22.64, $p < 0.001$), QoL (-3.36, $p < 0.001$), FR (16.72 ml/s, $p < 0.001$) and PVR (-126.23 ml, $p < 0.001$). Compliant patients showed better improvement of IPSS and FR than non compliant patient after DVIU procedure. Overall, open surgery give better improvement of IPSS and FR than DVIU procedure. These differences were more pronounced in recurrent and long (2 cm) urethral stricture disease. In open surgery group, end-to-end anastomosis give better improvement in FR compared to graft urethroplasty. **Conclusion:** Patients undergoing urethral stricture management experienced a significant improvement in self-reported outcomes and functional uroflow studies. Overall, open surgery gives better improvement in FR and IPSS than DVIU procedure. In open surgery group, end-to-end anastomosis give better improvement compares to graft urethroplasty.

Keywords: International Prostate Symptoms Score, quality of life, flow rate, post void residual urine, urethral stricture.

ABSTRAK

Tujuan: Mengevaluasi pasien yang dilakukan perawatan definitif striktur uretra. **Bahan & Cara:** Semua pasien yang menjalani penanganan pada striktur uretra di Rumah Sakit Cipto Mangunkusumo, dievaluasi selama 1 tahun. Data demografi pasien, jenis operasi, International Prostate Symptoms Score (IPSS), skor quality of life (QoL), flow rate (FR) dan post void residual (PVR) dari semua pasien dievaluasi pada 3 bulan, 6 bulan, dan 1 tahun setelah operasi. **Hasil:** Dari 230 pasien dengan striktur uretra, 65 pasien memenuhi kriteria penelitian ini. Rerata umur pasien adalah 41.19 ± 20.44 tahun. 37 pasien menjalani Direct Vision Internal Urethrotomy (DVIU), 20 dengan end-to-end anastomosis, dan 8 dengan graft urethroplasties.Semua pasien yang menjalani penanganan striktur uretra menunjukkan peningkatan pada IPSS (-22.64, $p < 0.001$), QoL (-3.36, $p < 0.001$), FR (16.72 ml/s, $p < 0.001$) and PVR (-126.23 ml, $p < 0.001$). Pasien yang disiplin menunjukkan hasil IPSS dan FR yang lebih baik dibandingkan dengan pasien yang tidak disiplin, setelah tindakan DVIU.Secara keseluruhan, operasi terbuka memberikan hasil IPSS dan FR yang lebih baik dibandingkan dengan DVIU. Hasil ini lebih tampak pada striktur uretra yang berulang dan panjang (2 cm).Pada kelompok operasi terbuka, end-to-end anastomosis memberikan perbaikan FR dibandingkan dengan graft urethroplasty. **Simpulan:** Pasien striktur uretra yang menjalani terapi definitif memberikan peningkatan yang signifikan, baik pada data subyektif maupun dengan pengukuran uroflowmetri. Secara keseluruhan, operasi terbuka memberikan perbaikan FR dan IPSS dibandingkan dengan DVIU. Pada kelompok operasi terbuka, end-to-end anastomosis memberikan perbaikan FR yang dibandingkan dengan graft urethroplasty.

Kata kunci: International Prostate Symptoms Score, quality of life, flow rate, post void residual, striktur uretra.

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INTRODUCTION

Urethral stricture is a medical problem that has been known since more than 2500 years ago. Based on the literature of Ayurveda (660 BC), urethral stricture was treated using a dilator made from wood or steel.[1] In 1817, the first internal prototype urethrotomy was invented. In 1848,

Maisonneuve invented the idea of ☐☐using a filiform wire which was inserted into the urethra through a uretrotome. In 1870, Otis introduced a urethrotome with 2 knives, but this procedure is still a blind procedure.

In 1883, Heurs reported primary urethral anastomosis procedure for the treatment of urethral strictures. The technique was modified in 1922 Heitz-Boyer. The Heitz-Boyer procedures has been used until now.[1-6]

In 1957 Ravasini reported internal urethrotomy (IU) with visualization and at 1971 Sachse introduced a sharp-bladed cold-knife urethrotome with visualization, then at 1974 he reported this procedure had 80% success rate. Since that moment, urethrotomy technique with single cut at 12 o'clock has been used for urethral stricture cases.[1,7-13]

Urethral stricture disease can be congenital or acquired. Acquired urethral strictures can be due to infection, trauma, inflammation, secondary to radiotherapy, idiopathic or iatrogenic. The use of urethral catheters can cause inflammation that lead to gradual scar formation and eventual strictures. Several studies have reported the incidence of urethral stricture was about 33.7% in patients after TURP.1 In Mexico, these complications varies from 1-29%.[1]

Several studies have shown long-term results of urethral strictures treatment. Some long-term outcomes based on radiologic findings,[13-15] uroflowmetry,[13-15] continence,[13] post void residual,[13] urinary tract infections,[13] post surgical instrumentation,[13,16,17] and sexual function.[13,15] The paradigm for the successful treatment of urethral stricture disease is when there is no more instrumentation after definitive action.

OBJECTIVE

The purpose of this research is to evaluate the medium-term outcomes of patients who had performed definitive treatment of urethral stricture at Cipto Mangunkusumo hospital.

MATERIAL & METHODS

This was a prospective study of urethral stricture patients who had undergone definitive treatment from January 2001 until May 2011 at Cipto Mangunkusumo Hospital.

Data were collected by questionnaires that have been standardized internationally by IPSS (International Prostate Symptoms Score) and QOL (Quality of Life) which were sent by registered express mail and also an envelope and stamp inside the envelope for reply. Data was also collected through phone interview. Uroflowmetry data were taken from urology medical record during patient visit to urology clinic. Patient who had incomplete uroflowmetry data were called to have uroflowmetry, flow rate (FR) and post-void residual (PVR) were checked. An IPSS, QOL, FR and PVR were taken before definitive treatment, 3 months, 6 months and one year after definitive action.

Data were analyzed with statistical analysis using SPSS v 13.0. We evaluated IPSS, QoL, FR and PVR score of all patients who underwent definitive action, then we grouped the patient by treatment to the patient whether DVIU (Direct Vision Internal Urethrotomy)/Sachse and open surgery, either end-to-end anastomosis or graft urethroplasty, then we usedstatistical paired T-test. We are looking for the trend of FR from all treatment, DVIU, end-to-end anastomosis or graft urethroplasty by using the Anova statistical test. And we also compared between DVIU and end-to-end anastomosis, DVIU and graft urethroplasty, and between end-to-end anastomosis and graft urethroplasty using post hoc test before operation, 3months, 6 months and 1 year postoperatively. We also evaluate whether there are significant differences between DVIU and open surgery, between end-to-end anastomosis and graft urethroplasty, between DVIU and open surgery in < 2 cm and recurrent urethral strictures patients, and between end-to-end anastomosis and graft urethroplasty in 2.5 cm urethral stricture patients with statistical T-test. The results were statistically significant if the value of $p < 0.005$.

RESULTS

From 230 patients who had undergone definitive therapy of urethral stricture in RSCM, we obtained the address and phone number for 90 patients. Of the 90 patients who were sent questionnaires by registered express mail, only 55 patients who replied, another 15 patients completed our questionnaires after we interviewed by phone call. Among 70 patients who had replied our questionnaires, 17 patients had incomplete one year postoperative uroflowmetry data, so that we called the patients for further uroflowmetry examination. Only 12 patients came to complete uroflowmetry

test. Most of the patients who didn't come to perform the test were due far distance from the hospital. Sixty five patients completed the criteria, profiles of those patients presented in table 1.

Table 1. Urethral stricture patients profile.

Category	DVIU (n = 37)	end-to-end anastomosis (n = 20)	graft urethroplasty (n = 8)	Total (n = 65)
Age	41.35 ± 20.38	39.78 ± 19.15	40.22 ± 20.19	41.19 ± 20.44
Location of urethral stricture				
Pendulous	0 (0%)	2 (10%)	3 (37.5%)	5 (7.69%)
Bulbar	20 (54.05%)	7 (35%)	5 (62.5%)	32 (49.23%)
Bulbomembranous	14 (37.83%)	9 (45%)	0 (0%)	23 (35.38%)
Membranous	3 (8.10%)	1 (5%)	0 (0%)	4 (6.15%)
Prostatic	0 (0%)	1 (5%)	0 (0%)	1 (1.53%)
Etiology of urethral stricture				
Trauma	23 (62.16%)	18 (90%)	5 (62.5%)	46 (70.76%)
Infection	2 (5.40%)	2 (10%)	3 (37.5%)	7 (10.76%)
Instrumentation	12 (32.43%)	0 (0%)	0 (0%)	12 (18.46%)
Characteristic				
New	27 (72.97%)	16 (80%)	6 (75%)	49 (75.38%)
Recidive	10 (27.02%)	4 (20%)	2 (25%)	16 (24.61%)
Urethral stricture length				
<2cm	25 (67.56%)	0 (0%)	0 (0%)	25 (38.46%)
=2cm	12 (32.43%)	20 (100%)	8 (100%)	40 (61.53%)
Treatment				
DVIU				37 (56.92%)
Compliant				25 (67.56%)
Non compliant				12 (32.43%)
Open surgery				
Anastomosis				20 (30.76%)
Graft				8 (12.30%)

Table 2. IPSS, QoL, FR, PVR score.

	Pre-op	Post-op	Average change	p
All patient who underwent definitive treatment (n= 65)				
IPSS	31.05	8.40	-22.64	< 0.001
QoL	4.65	1.68	-3.36	< 0.001
FR	3.61	20.33	16.72	< 0.001
PVR	146.95	20.71	-126.23	< 0.001
Patient who had been treated with DVIU procedure (n = 37)				
IPSS	28.59	10.11	-18.48	< 0.001
QoL	4.76	1.43	-3.32	< 0.001
FR	3.59	16.45	12.85	< 0.001
PVR	143.92	28.14	-115.77	< 0.001
Patient who had been treated by open surgery procedure (n= 28)				
IPSS	34.29	6.14	-28.14	< 0.001
QoL	4.50	1.07	-3.42	< 0.001
FR	3.63	25.46	21.82	< 0.001
PVR	150.96	10.90	-140.06	< 0.001
Patient who had been treated by end-to-end anastomosis (n = 20)				
IPSS	34.45	6	-28.45	< 0.001
QoL	4.45	1.05	-3.40	< 0.001
FR	2.54	26.13	23.59	< 0.001
PVR	145.65	10.78	-134.86	< 0.001

Table 2. IPSS, QoL, FR, PVR score (continued).

	Pre-op	Post-op	Average change	p
Patient who had been treated by graft urethroplasty (n = 8)				
IPSS	33.88	6.50	-27.37	< 0.001
QoL	4.63	1.16	-3.50	< 0.001
FR	6.37	23.78	17.41	< 0.001
PVR	164.25	11.18	-153.06	< 0.001

Table 3. Mean FR between DVIU, end-to-end anastomosis and graft urethroplasty.

| Evaluation Time	DVIU (n = 37)	Anastomosis (n = 20)	Graft (n = 8)	p	p (post-hoc test)
Pre-operative	3.59	2.54	6.37	0.001	DVIU vs graft (p 0.009) DVIU vs anastomosis (p 0.316) graft vs anastomosis (p 0.001)
3 months post-operative	17.35	24.99	23.17	0.001	DVIU vs graft (p 0.123) DVIU vs anastomosis (p 0.001) graft vs anastomosis (p 1.000)
6 months post-operative	17.40	25.40	23.82	< 0.001	DVIU vs graft (p 0.066) DVIU vs anastomosis (p < 0.001) graft vs anastomosis (p 1.000)
1 year post-operative	16.45	26.13	23.78	< 0.001	DVIU vs graft (p 0.010) DVIU vs anastomosis (p < 0.001) graft vs anastomosis (p 1.000)
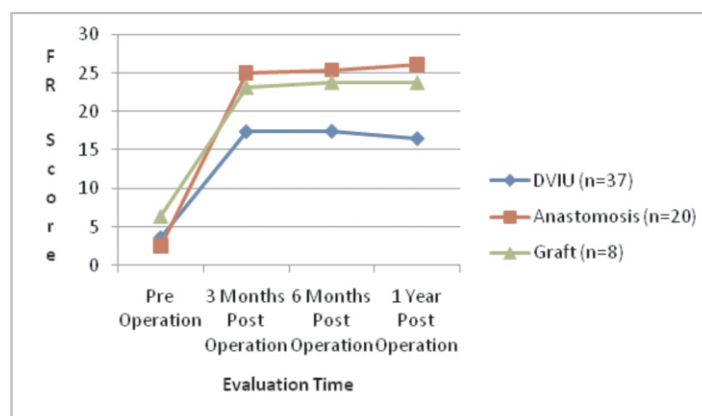
Figure 1. Trend of mean FR Pre operative, 3 months, 6 months, 1 year post operative between DVIU, end-to-end anastomosis and graft urethroplasty.

Based on table 2, we could evaluate the changes of IPSS, QOL, FR, and PVR score of all patients who underwent definitive therapy and also specific treatment whether DVIU, open surgery procedure, end-to-end anastomosis and graft urethroplasty. Based on that table we can conclude that all variables are statistically significant (p < 0.001).

Based on mean FR, we can conclude that between DVIU, end-to-end anastomosis and graft urethroplasty were statistically different for each evaluation period (preoperative, 3 months, 6 months and 1 year postoperative). Based on statistical post-hoc test, mean FR of DVIU vs end-to-end anastomosis were statisticaly significant on 3 months and 6 months post operative evaluation.

Figure 1 shows the pattern of FR trend between DVIU, graft and anastomosis. We could see that FR score of anastomosis are always higher than graft and DVIU.

Table 4. IPSS, QoL, FR and PVR changes in DVIU patients between compliant (n = 25) and non compliant (n = 12) groups.

		Average changes	p
IPSS	Compliant	-29.14	0.001
	Non Compliant	-18.47	
QoL	Compliant	-3.41	0.552
	Non Compliant	-3.32	
FR	Compliant	21.93	0.010
	Non Compliant	12.95	
PVR	Compliant	-145.77	0.217
	Non Compliant	-115.22	

Compliant: Patient who had routine bougination procedure after operation.
Non compliant: Patient who didn't have bougination procedure after operation.

Compliant patients had better IPSS (p < 0.001) and FR (p < 0.010) improvement than non compliant patients in post DVIU procedure.

Table 5. Average changes of IPSS, QoL, FR and PVR between DVIU (n = 37) and open surgery (n = 28).

		Average changes	p
IPSS	DVIU	-18.48	< 0.001
	Open	-28.14	
QoL	DVIU	-3.32	0.511
	Open	-3.42	
FR	DVIU	12.85	< 0.001
	Open	21.82	
PVR	DVIU	-115.77	0.217
	Open	-140.06	

Table 5 shows average changes of IPSS, QoL, FR and PVR in DVIU and open surgery, the statistical significant changes are significant in IPSS and FR.

Table 6 shows average changes of IPSS, QoL, FR and PVR between end-to-end anastomosis and graft urethroplasty, and a statistically significant difference was the average changes of FR, where end-to-end anastomosis provide greater changes than graft urethroplasty with a p value of 0.008.

Open surgery gives better results than DVIU, especially when viewed from the value of IPSS (p < 0.001) and FR (p < 0.011).

Table 6. Average changes of IPSS, QoL, FR and PVR between end-to-end anastomosis (n = 20) and graft urethroplasty (n = 8).

		Average changes	p
IPSS	Anastomosis	-28.45	0.314
	Graft	-27.37	
QoL	Anastomosis	-3.4	0.685
	Graft	-3.5	
FR	Anastomosis	23.59	0.008
	Graft	17.41	
PVR	Anastomosis	-134.86	0.589
	Graft	-153.06	

Table 7. Average changes of IPSS, QoL, FR and PVR in recurrent urethral stricture patients between DVIU (n = 10) and open surgery (n = 6)

		Average changes	p
IPSS	DVIU	-19.14	0.001
	Open	-28.55	
QoL	DVIU	-3.28	0.628
	Open	-3.44	
FR	DVIU	13.57	0.011
	Open	21.33	
PVR	DVIU	-85.66	0.301
	Open	-127.42	

Table 8. Average changes of IPSS, QoL, FR and PVR in 2 cm urethral stricture patients between DVIU (n = 12) and open surgery (n = 28).

		Average changes	p
IPSS	DVIU	-20.27	<0.001
	Open	-28.00	
QoL	DVIU	-3.27	0.238
	Open	-3.52	
FR	DVIU	12.88	0.001
	Open	21.77	
PVR	DVIU	-117.27	0.332
	Open	-148.94	

In patients with 2 cm urethral stricture disease, better increase of IPSS (p < 0.000) and FR (p < 0.001) are seen when performed open surgery compared to DVIU.

Table 9. Average changes of IPSS, QoL, FR and PVR in ≥ 2.5 cm urethral stricture patients between end-to-end anastomosis (n = 11) and graft urethroplasty (n = 8).

		Average changes	p
IPSS	Anastomosis	-28.14	0.321
	Graft	-27.97	
QoL	Anastomosis	-3.4	0.684
	Graft	-3.5	
FR	Anastomosis	22.43	0.051
	Graft	18.32	
PVR	Anastomosis	-133.87	0.577
	Graft	-152 09	

There were no statistically significant difference between end-to-end anastomosis and graft urethroplasty inurethral stricture patients ≥ 2.5 cm length.

DISCUSSION

The subjects of this study were 65 patients, with average age was 41.19 ± 20.44 years. A total of 37 patients underwent DVIU procedure, 20 patients end-to-end anastomosis and 8 patients were graft urethroplasty. In DVIU group, 20 patients were bulbar stricture, 14 patients were bulbomembranous stricture, and 3 patients were membranous strictures. In end-to-end anastomosis group, 2 patients were pendular strictures, 7 patients were bulbar stricture, 9 patients were bulbomembranous stricture, 1 patient were membranous stricture and 1 patients was prostatic stricture. In graft urethroplasty group, 3 patients were pendular stricture and 5 patients were bulbar stricture. In 40 patients, length of the stricture were ≥ 2 cm, and 12 patients still underwent DVIU procedure. In 16 recurrent stricture patients, 10 patients still underwent DVIU procedure. In 19 patients, length of the stricture were ≥ 2.5 cm, with 11 patients performed end-to-end anastomosis and 8 patients were graft urethroplasty.

Treatment of urethral strictures requires good planning to obtain satisfactory results. Minimally invasive procedures such as DVIU, urethral dilation, and urethral stenting can be performed in some patients, but with a high failure rate.[18,19] DVIU is dilatation procedure for initial treatment of short urethral stricture (< 1 cm) in pars bulbosa.[18,19] The paradigm for the successful treatment of urethral stricture is when there is no more instrumentation after definitive treatment. Therefore, open surgery should be the first option on the longer stricture or on the strictures that have failed in minimally invasive therapies. In our study found that in patients with long urethral stricture (≥ 2 cm) and recurrent strictures, changes in IPSS and FR value generated will be significantly better when performed open surgery.

The location and length of urethral stricture is a very important factor in determining the choice of definitive therapy. Strictures on navicularis fossa better treated by penile skin fasciocutaneous flaps, because the end-to-end anastomosis can produce a high failure rate, shortening of the penis, or the formation of chordee.[20] Management of the long pendular stricture is still a controversy. Some opinions favor dorsal onlay buccal mucosal graft,[21] but some are saying penile skin fasciocutaneous flap is better.[22] In short urethral strictures (< 2.5 cm) in the pars bulbosa, end-to-end anastomosis could be the right choice.[23,24] Pars bulbosa stricture with the length between 2.5 to 5 cm can be done by buccal mucosal onlay graft. On longer pars bulbosa stricture or failed post urethroplasty with buccal mucosal graft, penile fascsiocutaneus onlay flap could be used. Our study shows the results of operations of the ≥ 2.5 cm stricture between end-to-end anastomosis and buccal mucosal graft. There was no significant difference from the value of IPSS, QOL, FR and PVR between both technique.

At our institution, all patients underwent buccal mucosal graft, because the buccal mucosal graft is better than others, such as penile skin graft, scrotal skin, extragenital skin, bladder mucosa and colonic mucosa. The advantage of the buccal mucosa is the ease of planting, viability, resistance to infection and the characteristics of epithelial tissue with a thick, high content of elastic tissue and thin lamina propia.[25]

Based on the meta-analysis by Yuri P, et al. in patients with short bulbar urethra stricture (≤ 3 cm), there is a statistically significant difference between end-to-end anastomosis and buccal mucosal graft when viewed from the recurrence rate with p value 0.016 and RR 0.38. This is because end-to-end anastomosis excised all fibrotic tissue, whereas the buccal mucosal graft surgery success rate is influenced by the formation of scar tissue in the graft (fibrosis), blood flow to the graft and graft quality. Graft quality may decline in smokers.[25] In our study, it could be seen from the differences in the

average increase in the value of FR in which end-to-end anastomosis is better than graft with p value 0.008.

In general, the characteristics of the study subjects among patients who performed DVIU, end-to-end anastomosis and graft urethroplasty were similar. Different characteristics is the length of stricture that is one of the limitations of this study. Another limitation is the limited number of subjects, especially in patients who underwent graft urethroplasty by only 8 patients, if compared to DVIU with total 37 patients and end-to-end anastomosis 20 patients. Therefore, further study with more uniform characteristics of the subjects and increase the number of the subjects are needed.

CONCLUSION

Patients undergoing urethral stricture management experienced a significant improvement in self-reported outcomes and functional uroflow studies. Overall, open surgery gives better improvement in FR and IPSS than DVIU procedure. In open surgery group, end-to-end anastomosis give better improvement compared to graft urethroplasty.

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