

# Internal urethrotomy versus plasmakinetic energy for surgical treatment of urethral stricture

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**Summary** Purpose: we aimed to compare the long-term outcome of surgical treatment of urethral stricture with the internal urethrotomy and plasmakinetic energy.

**Material and Methods:** 60 patients, who have been operated due to urethral stricture were enrolled in our clinic. None of the patients had a medical history of urethral stricture.

The urethral strictures were diagnosed by clinical history, uroflowmetry, ultrasonography and urethrography.

The patients were divided two groups. Group 1 consisted of 30 patients treated with plasmakinetic urethrotomy and group 2 comprised 30 men treated with cold knife urethrotomy.

**Results:** There were no statistically significant differences between two groups in terms of patient age, maximum flow rate ( $Q_{max}$ ) and quality of life score (QoL) value. A statistical difference between the two groups was observed when we compared the 3<sup>rd</sup>-month uroflowmetry results. Group 1 patients had a mean postoperative  $Q_{max}$  value of  $16,1 \pm 2,3$  ml/s, whereas group 2 had a mean postoperative  $Q_{max}$  value of  $15,1 \pm 2,2$  ml/s ( $p < 0.05$ ). In the cold knife group, 3 of 11 (27,7%) recurrences appeared within the first 3 months, whereas in the plasmakinetic group zero recurrences appeared within the first 3 months in our study.

The urethral stricture recurrence rate up to the 12 month period was statistically significant for group 1 ( $n = 7$ , 23%) compared with group 2 ( $n = 11$ , 37%) ( $p < 0.05$ ).

**Conclusion:** We believe that plasmakinetic surgery is better method than the cold knife technique for the treatment of urethral stricture.

**KEY WORDS:** Internal urethrotomy; Plasmakinetic energy; Urethral stricture.

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## INTRODUCTION

Urethral stricture is one of the complex issues of urology due to the difficulty of diagnosis, treatment and risk of recurrence. Urethral stricture disease is defined as narrowing of the urethral lumen because of fibrosis, which occurs in urethral mucosa and surrounding tissues. The etiology could be congenital or idiopathic (1). There are several causes of idiopathic urethral stricture, for example, trauma, urethral catheterization, urologic instru-

mentation, and sexually transmitted diseases (2). Treatment depends on the localization, length, and type of the stricture (3). The most common technique for the management of urethral strictures is endoscopic internal urethrotomy (VIU), because it is an easy, minimally invasive technique (4). Endoscopic urethrotomy was first described in 1974 by Sachse with the use of a cold-knife technique to incise those stricture segments (5).

However low success and high recurrence rates of this technique make urologists to research different types of therapeutic alternatives for stricture treatment (6). Sources generating bipolar energy by means of radio frequency waves (*Gyrus plasmakinetic system*) are in use for endourological procedures in recent years. In this study we aimed comparing internal urethrotomy with plasmakinetic energy by urinary flow rate (maximum flow rate) ( $Q_{max}$ ), Quality of Life score (QoL), International Prostate Symptom Scores (IPSS) and duration of operation parameters.

## MATERIALS AND METHODS

Sixty patients, who have been operated due to urethral stricture were enrolled into the study. None of the patients had a medical history of urethral stricture. The urethral strictures were diagnosed by clinical history, uroflowmetry, ultrasonography and urethrography. All of the patients were preoperatively evaluated with physical examination and laboratory tests such as complete blood count, serum biochemical analysis, urine analysis and urine culture. If there was an active urinary infection, cases were treated with the appropriate antibiotics based on the urine culture. The stricture lengths were measured by urethrography and urethroscopy. After clinical and preoperative evaluation, the patients were divided two groups. Group 1 consisted of 30 patients treated with Plasmakinetic urethrotomy and group 2 comprised 30 men treated with cold knife urethrotomy. Pre-operative and post-operative IPSS score  $Q_{max}$ , QoL score, duration of operations of all patients were recorded. Operative time was described as the time interval beginning with insertion of optical urethrotome from external urethral meatus, continuing with the treatment of stric-

ture and ending with the removal of urethrotome or cystoscope from external urethral meatus. Patients with strictures longer than 2 cm, with meatal stenosis and those with history of surgical intervention due to any strictures were excluded from the study. All patients were reevaluated at the 3<sup>rd</sup>, 9<sup>th</sup> and 12<sup>th</sup> month postoperatively. Uroflowmetry was performed for the evaluation of strictures. During the follow-up period, if the patients had complaints of voiding difficulty and the maximum flow rate ( $Q_{max}$ ) was < 10 ml/s, urethroscopy and urethrography were planned. If urethral strictures were present at urethroscopy and urethrography, these were accepted as recurrent strictures and the same procedure was performed again. The procedure was accepted as successful when the patient did not complain of any voiding difficulty and the  $Q_{max}$  was > 12 ml/s.

**Surgical technique**

All patients were operated by the same surgeon. All the patients underwent urethrotomy under spinal anesthesia in the lithotomy position.

Cephazolin sodium, 1 g, i.v., was administered for preoperative antibiotic prophylaxis.

We used a 19 F cystoscope and Plasma-Cut TM instrument for the PlasmaKinetic group. First, a safety guide wire was applied through the stricture and cutting of the stricture was performed at 12 o'clock under 60 W with 0.9% sodium chloride as irrigation. A 20.5 F urethrotome was used for the cold knife urethrotomy group. As in the other group, a safety guide wire was first passed through the stricture and the urethrotomy was performed at 12 o'clock. For all patients, a 18 F Foley catheter was inserted and left in the bladder for 72 h at the end of the procedure.

Postoperatively, 500 mg ciprofloxacin (twice a day) was prescribed for 7 days.

**Statistical analyses**

Independent-Samples T test, and Fisher's exact test were used for comparing the groups of patients.  $P < 0.05$  was considered statistically significant. The computer software used was Statistical Package for Social Sciences (SPSS 12.0.1; SPSS Inc., Chicago, IL, USA).

**RESULTS**

Group 1 (n = 30, mean age:  $61.6 \pm 6.7$  years) were treated with Plasmakinetic urethrotomy. Group 2 (n = 30, mean age:  $60.3 \pm 4.6$  years) were treated with cold knife urethrotomy. The mean preoperative  $Q_{max}$  values for groups 1 and 2 were  $7.9 \pm 1.2$  and  $8.1 \pm 1.1$  ml/s,

respectively ( $p > 0.05$ ). There were no statistically significant differences between two groups in terms of patient age,  $Q_{max}$  and QoL value (Table 1).

A statistical difference between the two groups was observed when we compared the 3 month uroflowmetry results. Group 1 patients had a mean postoperative  $Q_{max}$  value of  $16.1 \pm 2.3$  ml/s, whereas group 2 had a mean postoperative  $Q_{max}$  value of  $15.1 \pm 2.2$  ml/s ( $p < 0.05$ ). Increases were statistically significant in both groups (Table 2). In the cold knife group, 3 of 11 (27.7%) recurrences appeared within the first 3 months, whereas in the plasmakinetic group no recurrences appeared within the first 3 months in our study. The urethral stricture recurrence rate up to the 12 month follow up was statistically significant for group 1 (n = 7, 23%) compared with group 2 (n = 11.37%) ( $p < 0.05$ ) (Figure 1).

Operative time was shorter in plasmakinetic group ( $15.6 \pm 3.3$  minutes) when compared with cold-knife group ( $19.5 \pm 4.2$  minutes). It was statistically significant ( $p < 0.05$ ).

**DISCUSSION**

Several techniques are currently available for minimally invasive treatment of urethral strictures, including cold-knife incision, electrocautery, and various types of laser incisions (7). Incision with the cold knife does not cause any thermal effect on surrounding tissues but should create mechanical injury that may lead to recurrence in long term. Incision with the electrocautery should cause sig-

**Table 1.** Characteristics in study groups and comparability of groups treated.

Parameters	Plasmakinetic group (n = 30)	Cold-knife group (n = 30)	p
Age (y)	$61.6 \pm 6.7$	$60.3 \pm 4.6$	0.41 a
Preoperative $Q_{max}$ value (ml/sec)	$7.9 \pm 1.2$	$8.1 \pm 1.1$	0.65 a
Preoperative IPSS	$18.4 \pm 2.4$	$18 \pm 2.2$	0.54 a
Preoperative QoL	$5.3 \pm 0.7$	$5.2 \pm 0.6$	0.84 a
Operative time (min)	$15.6 \pm 3.3$	$19.5 \pm 4.2$	0.00 a
Recurrence/no recurrence, n (%), 3 <sup>th</sup> month	0 (0)/30 (100)	3 (10)/27 (90)	0.23 b
Recurrence/no recurrence, n (%), 6 <sup>th</sup> month	3 (10)/27 (90)	7 (23)/23 (77)	0.02 b
Recurrence/no recurrence, n (%), 12 <sup>th</sup> month	7 (23)/23 (77)	11 (37)/19 (63)	0,04 b

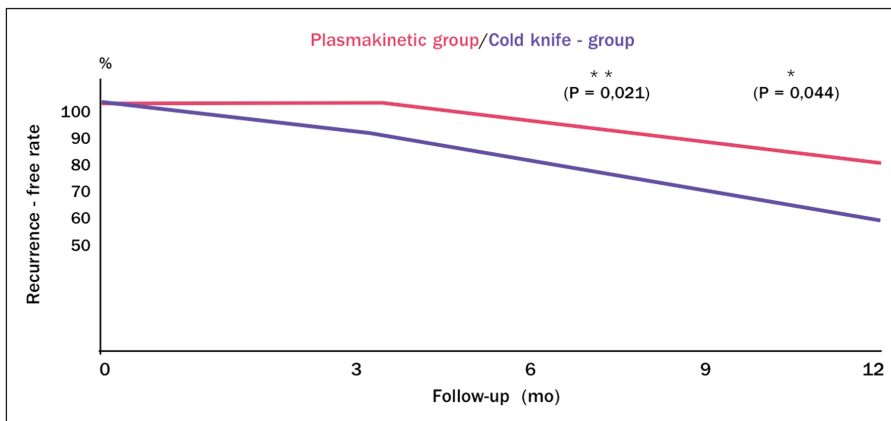
a: Independent Samples T test.  
b: Fisher's exact test.

**Table 2.** Pre-Post operative  $Q_{max}$ , IPSS and QoL scores of patients in both groups.

Plasmakinetic group	Pre-op $Q_{max}$	Post-op $Q_{max}$	Cold-knife Group	Pre-op $Q_{max}$	Post-op $Q_{max}$	p
	$7.9 \pm 1.2$	$16.1 \pm 2.3$		$8.1 \pm 1.1$	$15.1 \pm 2.2$	0.00*
	<b>Pre-op IPSS</b>	<b>Post-op IPSS</b>		<b>Pre-op IPSS</b>	<b>Post-op IPSS</b>	
	$18.4 \pm 2.4$	$9.7 \pm 2.7$		$18 \pm 2.2$	$7.1 \pm 3.1$	0.00*
	<b>Pre-op QoL</b>	<b>Post-op QoL</b>		<b>Pre-op QoL</b>	<b>Post-op QoL</b>	
	$5.3 \pm 0.7$	$1.9 \pm 0.7$		$5.2 \pm 0.6$	$1.4 \pm 0.5$	0.00*

\* Independent Samples T test.

**Figure 1.** Recurrence-free rates for 12 months (statistically significant p value) (Fisher's exact test).



nificant thermal effect on healthy surrounding tissues resulting in recurrent strictures during follow-up (7). Since 1984, lasers have been used in urethrotomies for the treatment of urethral stricture (8).

Another energy source have been used for urethrotomies is plasmakinetic. Plasma creates an electrically conductive cloud when radiofrequency energy contacts tissue (9). An advantage of PlasmaKinetic is cutting the tissues at a much lower average temperature (as low as 50°) than conventional electrocautery (10). As a result of this, thermal damage of the surrounding tissue is less than 1 mm. The main goal for using the PlasmaKinetic system is to vaporize the fibrous tissue.

Atak *et al.* reported in their study low-power holmium laser urethrotomy was compared with the cold knife technique (7). According to this study, the operative time of the laser group was shorter than that of the cold knife group and the recurrence rates for the laser and cold knife groups were 19 and 46.7%, respectively. The recurrence-free rates of both groups at 3 month were similar. In addition, the recurrence-free rates at 6, 9 and 12 months were significantly higher in the laser group.

There are a few studies about treatment of urethral stricture with plasmakinetic in the literature. Basok *et al.* (11) reported the first clinical experience with plasmakinetic and searched the effectiveness and outcomes of urethrotomies in 22 patients; 17 patients (77.3%) were recurrence-free during the mean follow-up period of 14.2 months; on the other hand, 5 (22.7%) developed strictures during the same period. Cecen *et al.* evaluated the efficacy and outcomes of PlasmaKinetic urethrotomy against cold knife direct vision internal urethrotomy in terms of recurrence rates in their study and they found recurrence-free rate for the plasmakinetic group was 14% during the 9-month follow-up period, which was statistically significant compared with the cold knife group (30%). But they found no statistical difference between the 2 groups in terms of the recurrence rate at the end of the 18<sup>th</sup> month (6). Another study about treatment of urethral stricture with plasmakinetic showed that the recurrent rate was 37.5% in both groups of urethrotomy and plasmakinetic surgery (12).

In our study, the recurrence rates was 36.6 % for the cold

knife groups during the 9 month follow up period. In the plasmakinetic group, recurrence rates was 23.3% during the 9 month follow up period. The main difference between the bipolar energy and cold knife procedures is that the fibrotic tissue is not only incised but also evaporated with the vaporization. Thus, the recurrence of scar tissue can be decreased (13).

“Time to recurrence” is also an important parameter in urethral stricture disease. In the cold knife group, 3 of 11 (27.7%) recurrences appeared within the first 3 months, whereas in

the plasmakinetic group zero recurrences appeared within the first 3 months in our study.

Our results like similar previous studies which done by laser (7).

Another important point that this study emphasis is duration of operation. The operative time of the plasmakinetic group was shorter than that of the cold knife group in our study. Also our results like similar previous studies which done by laser (7).

It is recommended to perform the internal urethrotomy procedure through the two corpora cavernosa at the 12 o'clock position to avoid bleeding. However, an additional incision may be required at the 6 o'clock position if a single incision does not suffice. Alternatively, it is recommended to administer incisions at the 10 and 2 o'clock positions (14). In our series, an incision performed at the 12 o'clock position to open the strictures proved to be sufficient for all patients as no patient suffered from corpora cavernosa damage.

On the other hand we observed that the tissue removal was rapid and bleeding was minimal with the vaporization and surgical field visually clearer than the cold knife urethrotomy.

As a conclusion, plasmakinetic surgery is a safe, an effective and a minimally invasive method for endoscopic treatment of urethral stricture. When compared with cold knife technique, it provides a better recurrence-free rate during the early period. We believe that plasmakinetic surgery is better method than the cold knife technique for the treatment of urethral stricture.

Nevertheless, the choice of surgical technique depends on surgeon's experience and whether the hospital is equipped enough.

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