

# Management of Lower Urinary Tract Injuries

## Alt Üriner Sistem Yaralanmalarının Tedavisi

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**ABSTRACT Objective:** To compare immediate realignment of the urethra plus a suprapubic cystostomy approach with only suprapubic cystostomy followed by later reconstruction in urethral injuries. **Material and Methods:** Twenty male patients with lower urinary tract injuries due to external trauma were included in the study. Seventeen patients had urethral, 2 of patients had both urethral and bladder and 1 patient had only bladder injury. There were 4 anterior, 15 posterior urethral injuries, the majority of these being complete urethral ruptures. The results in 14 patients who had immediate realignment of the urethral injury by an urethral catheter plus suprapubic cystostomy (Group 1), compared with 5 patients who had only immediate suprapubic cystostomy (Group 2). Patients with bladder perforation were treated immediately by open operation. **Results:** During follow up of 2 year period %60 of patients in the first group and %25 of patients in the second group had urethral stricture respectively. Six patients in the first group and 1 patient in the second group required urethroplasty in the follow up period. Urinary incontinence and erectile dysfunction were more common in the first group. **Conclusion:** Suprapubic cystostomy and if necessary delayed urethroplasty approach has better results than immediate realignment approach in the urethral injury.

**ÖZET Amaç:** Üretra yaralanmalarında, üretranın erken uç uca yaklaşıdırılması ve birlikte suprapubik sistostomi uygulanan olgular ile ilk müdahale olarak yalnızca suprapubik sistostomi uygulanan ve daha sonra gerekirse uretral rekonstrüksiyon uygulanan olguları karşılaştırmak. **Gereç ve Yöntemler:** Eksternal travma nedeniyle alt üriner sistem yaralanmalı 20 erkek hasta çalışmamıza alındı. On yedi hastamızda üretral, 2 hastamızda hem üretral hem de mesane, 1 hastamızda ise yalnızca mesane yaralanması vardı. Üretra yaralanmaları 4 hastamızda anterior, 15 hastamızda ise posterior üretradaydı. Ve bunların çoğu komplet üretral rüptürdü. Suprapubik sistostomi ile beraber bir üretral kateter vasıtasıyla üretra rüptürü uç uca erken yaklaşıdırılan 14 hasta (Grup 1) ile yalnızca erken suprapubik sistostomi uygulanan 5 hastanın (Grup 2) sonuçları karşılaştırıldı. Mesane perforasyonu olan hasta ise acil olarak açık operasyon ile tedavi edildi. **Bulgular:** İki yıllık takip sürecinde ilk gruptaki hastaların %60'ında ve ikinci gruptaki hastaların %25'inde üretral darlık gözlemlendi. Bu takip sürecinin sonunda birinci gruptaki 6 hasta ve ikinci gruptaki 1 hastaya uretroplasti gerekti. Üriner inkontinans ve erektil disfonksiyon birinci gruptaki hastalarda daha sık oranda görüldü. **Sonuç:** Çalışmamız sonucunda, üretra yaralanmalarında ilk aşamada suprapubik sistostomi ve gerekirse daha sonra ürethroplasti uygulanmasının erken üretra yaklaşıdırma tekniğinden daha iyi sonuç verdiği kanaatindeyiz.

**Keywords:** Urinary bladder; urethral stricture; urethra

**Anahtar Kelimeler:** Mesane; üretra darlığı; üretra

Lower urinary tract injuries are usually caused by blunt, penetrating and iatrogenic traumas. These injuries are more common with increased traffic accidents and iatrogenically in endourologic manipulations in recent years.

Bladder injury rate in abdominal injuries which require surgical intervention is 2%. Bladder

injuries are 75% caused by blunt trauma.<sup>1</sup> Bladder injuries occur in 30% of patients who had pelvic fractures.<sup>2</sup>

Bladder injuries can be extraperitoneal or intraperitoneal. Retrograd cystography with accuracy rate of 85-100% and computed tomography can be used for diagnosis.<sup>2,3</sup>

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**TABLE 1:** Classification of posterior and anterior urethral injuries (EAU Guideline).

Type	
I Strain	Contrast without extravasation elongation in the urethra
II Contusion	Blood on the meatus, urethrography: contrast no extravasation
III Partial rupture in the anterior and posterior urethra	Contrast passage to the posterior urethra and bladder, contrast extravasation at the injury site
IV Ant. urethra complete rupture	Proximal urethra and bladder is not imaging and contrast extravasation at the injury site
V Complete rupture in the post.urethra	Contrast extravasation at the injury site and the bladder cannot be displayed
VI There is a rupture in the bladder neck or vagina with full or partial rupture in the posterior urethra	

The management of acute trauma to the urethra has always been a challenge. Controversy continues regarding preliminary diversion and a planned repair. Inappropriate therapy in urethral injury causes complications including stricture, erectile dysfunction, incontinence, fistula and abscess formation.

Urethral injuries can be classified as anterior and posterior injuries.

Posterior urethral injuries usually develop in traffic accidents (75%) and falling from height (25%).<sup>4,5</sup>

Anterior urethral injuries can occur by blunt, penetrating, iatrogenic and sometimes is seen with penile fractures at 1.20%.<sup>6</sup>

Classification of posterior and anterior urethral injuries are shown in [Table 1](#).

Blood from external meatus is the most important finding in physical examination. This finding in posterior and anterior urethral injury is 37-93% and 75% respectively.<sup>7-9</sup>

In complete urethral rupture, patient can not urinate. Hematoma, swelling in the perineum are physical findings suggest us urethral injury. Upward displacement of the prostate in rectal examination suggests that the urethra is complete injury.

We compared two surgical approaches in treatment of urethral injury in this study.

## MATERIAL AND METHODS

Twenty male patients with lower urinary tract injuries due to external trauma are included in this study. The age of the patients were between 12 and 72 years (mean age: 30.89).

Urethral injuries due to instrumentation or pulling out of inflated Foley catheters and female patients were excluded from this study.

Distribution of age in urethral injury is shown in [Table 2](#).

Seventeen patients had urethral, 2 patients had both urethral and bladder, 1 patient had only bladder injury in our study.

Location and nature of urethral injuries are shown in [Table 3](#).

Fifteen (78.9%) patients had posterior, 4 (21.1%) patients had anterior urethral injuries. 8

**TABLE 2:** Distributions of urethra ruptures and age groups.

		n (%)
Age		12-72 (45)
(Mean age)	Min-Max (median)	(30.89)
Age classification	10-20	5 (26.3)
	21-30	5 (26.3)
	31-40	5 (26.3)
	> 41	4 (21.1)
Type of rupture	Complete	11 (57.9)
	Incomplete	8 (42.1)
Location of rupture	Anterior urethra	4 (21.1)
	Posterior urethra	15 (78.9)

**TABLE 3:** Type of urethra ruptures.

	Posterior urethra n (%)	Anterior urethra n (%)
Incomplete Rupture	5 (33.3)	3 (75.0)
Complete Rupture	10 (66.7)	1 (25.0)

**TABLE 4:** Causes of urethra trauma.

	Posterior urethra n (%)	Anterior urethra n (%)
Traffic accidents	8 (53.3)	0
Ride in horseback	2 (13.3)	2 (50.0)
Crush	5 (33.4)	1 (25.0)
The reason is not clear	0	1 (25.0)

(42.1%) of these cases were incomplete and 11 (57.9%) of them were complete urethral injuries.

All of the bladder ruptures had occurred in traffic accidents. One of these perforation was intraperitoneal, the other two were extraperitoneal.

Causes of urethral injury are shown in [Table 4](#).

Most urethral injuries were accompanied with pelvic fractures. Multiple organ injuries accompany with urethral injuries occurred by blunt trauma.

#### DIAGNOSTIC METHODS

Physical examination had been done in 20 male patients with urethral injuries due to external trauma who admitted to our hospital. A retrograde urethrography was performed with presence of blood at the external urinary meatus or difficulty passing a urethral catheter.

Contusion of the urethra was diagnosed when urethrogram was normal. Partial urethral rupture was diagnosed when there was localized extravasation at the site of urethral injury with dye passing into the proximal urethra and bladder. In complete urethral rupture, gross extravasation at the site of urethral injury with no dye passing into the proximal urethra and bladder was diagnosed.

Intravenous urography was performed in 2 patients who had bladder perforation.

#### TREATMENT

Three patients who had only bladder perforation and bladder perforation together with urethral injury were operated immediately. Bladder perforation was repaired primarily with open surgical procedure and cystostomy tube with urethral catheter were placed.

Three patients who had anterior urethral injury were treated by realignment approach and 1 patient

**TABLE 5:** Treatment types to the urethra ruptures.

	Cystostomy+Realignment Appr. (Group 1) n:14 (74%)	Cystostomy only (Group 2) n:5 (26%)
Complete post. urethral rupture	8 (57.2)	2 (40.0)
Incomplete post urethral rupture	3 (21.4)	2 (40.0)
Anterior urethral rupture	3 (21.4)	1 (20.0)

who had anterior urethral injury had only cystostomy as a treatment.

Five patients had incomplete, 10 patients had complete posterior urethral ruptures. 2 patients who had incomplete posterior urethral rupture treated was by cystostomy and 3 patients with incomplete posterior urethral rupture had realignment approach.

Two patients who had complete posterior urethral rupture (26%) had cystostomy, the other 8 patients (74%) had realignment approach ([Table 5](#)).

We obtained approval from the Ethics Committee of Okmeydanı Training and Research Hospital for collecting and analyzing data. (No:48670771-514.10) Permission was obtained from patients or legal representatives and the study was conducted in accordance with Helsinki Declaration principles.

#### STATISTICAL ANALYSIS

Descriptive statistical methods (mean, standard deviation, median, frequency, ratio) were used when evaluating the data. Fisher's Exact test was used to compare qualitative data. Significance was evaluated at  $p < 0.05$  level.

#### RESULTS

Three patients with bladder rupture and treated primarily had no complication in the follow up.

Fourteen patients treated with realignment approach had urethral stenosis (57.1%), urinary incontinence (21.4%) and erectile dysfunction (50%) as a complication in the follow up. Five patients in the second group had urethral stenosis (20%), urinary incontinence (20%) and erectile dysfunction (40%) as a complication ([Table 6](#)).

There was no significant difference between the groups in the distribution of complications  $p > 0.05$ .

**TABLE 6:** Complication rates (Fisher's Exact test) ( $p>0.05$ ).

	Cystostomy+		Total 19 pts	p
	Realignment Appr. (Group 1: 14 pts)	Cystostomy only (Group 2: 5 pts)		
	n (%)	n (%)		
Stricture	8 (57.1)	1 (20.0)	10 (47.3)	0.303
Incontinence	3 (21.4)	1 (20.0)	4 (21.0)	1.000
Erectile dysfunction	7 (50.0)	2 (40.0)	9 (47.3)	1.000

## DISCUSSION

We diagnosed bladder ruptures with retrograde urethrocytography or intravenous urography. There were no complications in these patients in the follow up. Some authors in the literature emphasize that small and extraperitoneal bladder ruptures can be treated by only urethral catheterization.<sup>2</sup> However in our study the bladder ruptures were not small enough to encourage this.

For successful treatment of urethral injuries, we must diagnose location and type of injury at first. A history of trauma, retrograde urethrography, difficulty in urination, hematuria, hematoma in the penis and perineum cause us to suspect from urethral injury.

Urethral injuries are usually accompanied by pelvic fractures, so it is useful to search fracture of symphysis pubis in the evaluation of the patient. Pelvic fracture rate was 79% in our series. We made retrograde urethrography in the diagnosis of urethral injury. Opaque material (dye) passed into the proximal urethra and bladder in 80% of patients in our study group. We evaluated these patients as incomplete injuries and we gently insert a thin catheter to these patients. In 20% of the patients in our study opaque material did not pass in to the proximal urethra and bladder, evaluated as complete urethral injuries. We never tried catheter insertion in those patients. We must diagnose the location and type of urethral injury for successful treatment. Catheter insertions must be gentle to prevent incomplete ruptures to become complete ruptures and resulting malign stenosis. In addition, this catheterization can infect the hematoma at the site of the rupture.

Treatment modality is still controversial in urethral injuries. Many clinics use realignment approach

in the treatment and others perform cystostomy immediately after the trauma and followed by urethral reconstruction if necessary.

Higher urethral stricture, incontinence and erectile dysfunction complication rates are due to penile hematoma, edema and trauma in realignment approach. Webster et al. reported 69% stenosis, 44% erectile dysfunction and 20% urinary incontinence in their realignment group.<sup>10</sup>

Koraitim et al. reported 97% stenosis, 2.7% incontinence and 18% erectile dysfunction in their patients who treated with only cystostomy. However they could not report stenosis in patients with incomplete urethral rupture. While these rates were 52%, 4% and 28% in primary realignment, and these rates were found 50%, 0% and 50% respectively in patients approached with sutures.<sup>11</sup>

Fourteen (74%) patients with urethral rupture in our series were treated by using the first method (cystostomy + realignment approach) and the other 5 (26%) only by placing a cystostomy catheter and delayed urethral reconstruction if necessary.

57.1% of our patients in the first group who were treated cystostomy+realignment approach had severe stenosis.

In the second group (5 pts) who were treated only cystostomy had urethral stenosis 20%.

Table 7 and Table 8 show the results of operating techniques and complication rates of different authors.

According to EAU guideline, the frequency of urethral stenosis was 62% in cases treated with primary realignment approach of urethra. On the other hand, the rate of urethral stenosis was given as 12-

**TABLE 7:** Results of suprapubic cystostomy and delayed reconstruction.

References	No Pts.	Impotence	Incontinence
		No (%)	No (%)
Coffield and Weems <sup>22</sup>	11	0 (0)	0 (0)
Mitchell <sup>13</sup>	37	23 (56)	2 (5)
Morehouse and MacKinnon <sup>14</sup>	58	6 (10)	1 (1.6)
Webster et al. <sup>10</sup>	11	4 (36)	1 (1.3)

**TABLE 8:** Results of urethral realignment techniques.

References	No Pts.	Stricture	Impotence	Incontinence
		No (%)	No (%)	No (%)
Cass and Godec <sup>15</sup>	20	13 (65)	4 (20)	3 (15)
Cullum <sup>16</sup>	7	(100)	3 (43)	Not reported
Gibson <sup>17</sup>	44	26 (59)	14 (32)	1 (2)
Jackson and Williams <sup>18</sup>	19	14 (73)	16 (67)	Not reported
Kaiser and Farrows <sup>19</sup>	8	1 (13)	00	
Malek and associates <sup>23</sup>	7	4 (57)	00	
Morehouse, Mc Kinnon <sup>20</sup>	54	54 (100)	23 (43)	24 (44)
Peters and Bright <sup>21</sup>	12	8 (67)	6 (50)	4 (33)
Wilkinson <sup>12</sup>	12	6 (50)	4 (33)	1 (8)
Webster et al. <sup>10</sup>	19	18 (94)	10 (50)	1 (7)

15% in patients undergoing late reconstruction after cystostomy.

Another complication, incontinence, was found in EAU guideline at a rate of 3%, while we encountered 21.4% in the first group, 20% in the second group in our series.

While erectile dysfunction associated with urethral injury and treatment has occurred in 30-35% of patients with primary realignment approach of urethra according to EAU guideline, 50% of our patients in the same treatment group have complained about erectile dysfunction within two years. The rate of erectile dysfunction was 40% in patients treated with cystostomy alone.

However, this rate has been reported to be 13-15% in EAU guideline.

Although we did not find a statistically significant difference in the complication rates between the two groups of patients in our series, we observed that the complication rates of the patients treated in the second group were lower when we examined the series in other authors.

## CONCLUSION

Once again it has been confirmed that the application of an urethral catheter in patients suspected of having urethra trauma is extremely inconvenient as both incomplete rupture to complete rupture and complications known as urethral stenosis incontinence and erectile dysfunction increase. For this reason, we believe that it is more appropriate to plan the treatment of the patients after urethrography.

In addition, our study suggested that it would be more appropriate to use only a suprapubic catheter and delayed urethral reconstruction if stenosis develops, instead of cystostomy and immediate realignment technique as a first-line treatment for urethral ruptures. Because in this way, urethral trauma complications such as stricture, urinary incontinence and erectile dysfunction have decreased. However, the advantages of immediate realignment technique on this subject, which is still controversial today, can not be ignored.

### Source of Finance

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### Conflict of Interest

*No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.*

### Authorship Contributions

**Idea/Concept:** Ahmet Ariman, **Design:** Ahmet Ariman, **Control/Supervision:** Erkan Merder, **Data Collection and/or Processing:** Erkan Merder, **Analysis and/or Interpretation:** Ahmet Ariman, **Literature Review:** Ahmet Ariman, **Writing the Article:** Ahmet Ariman, **Critical Review:** Erkan Merder.

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