

Lower urinary tract trauma and its outcome

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Abstract

Background: Trauma is non-discriminatory and affects in all age group. Injuries to the urinary bladder (60-90%) and posterior urethra (75%) are mainly associated with pelvic fractures. Urethral injuries from pelvic fracture are typically associated with multiple organ injuries (bladder, spleen, liver, and bowel). The bulbar urethra is most commonly injured by a straddle injury iatrogenic injuries to the urethra occur when difficult urethral catheterization leads to mucosal injury with subsequent scarring and stricture formation. Urological injuries have been inescapably associated with gynecological and obstetrical surgeries, owing to anatomic proximities of urogenital organs.

Methods: This prospective study was carried out from May 2018 to June 2021 at government medical college and hospital, Aurangabad. All patients presenting with trauma either blunt or penetrating or iatrogenic who were admitted to emergency care unit or who were admitted to inpatient department as per hospital protocol were screened and evaluated, out of this those patients who were diagnosed to have lower urinary tract trauma on clinical and radiological findings were enrolled in the present study. The cases suffering trauma to the lower urinary tract during the procedures like abdominal hysterectomy, lower segment caesarean section surgeries were also included in the study.

Results: 58.3% patients of bladder injury, 44.4% urethral injury and 50% of ureteral injury were in the age group 21-30 years. The male to female ratio was 2.38:1 showing male preponderance. Gross hematuria was most common presenting symptom in 50% of total cases especially urinary bladder (70.8%) followed by difficulty in micturition 31.8%, and suprapubic tenderness 27.3%. Blunt trauma to abdomen was the commonest cause of lower urinary tract reported in 59.1% of total cases.

Conclusion: Lower urinary tract trauma is a specialized injury that can have significant sequelae if left untreated. Recognizing and treating these injuries can be difficult in the multi-trauma patient. In general, when the index of suspicion is high, retrograde imaging should be attempted whenever possible. Expert urological opinion should be sought early and the safest method of urinary diversion within the experience of the clinician should be attempted.

Keywords: UTI, trauma, outcome

Introduction

Trauma is non-discriminatory and affects in all age group. Motor vehicle collision remains the most common cause of abdominal trauma in our country. Other less frequent causes being blunt trauma to the abdomen includes fall from a height, assaults, bicycle accidents, and horseback riding injuries^[1, 2]. Of all the genitourinary organs, kidney is the most likely to be injured in cases of external trauma followed by urethra and urinary bladder. Most of the road traffic accidents involves young people driving two wheelers. Hematuria is the best indicator of trauma to genitourinary system and the presence of microscopic (>5 red blood cells/high power field) or gross hematuria is characteristic^[3]. Injuries to the urinary bladder (60-90%) and posterior urethra (75%) are mainly associated with pelvic fractures. A combination of bladder and urethral injury is present in 4.1-15% of cases. Damage to the urethra represents the second commonest form of urinary tract injury after renal trauma^[4, 5].

Injury to the lower urinary tract is relatively uncommon in the setting of blunt trauma. However, it is particularly susceptible to those forces that produce sufficient energy to cause pelvic ring disruption^[6-8]. As a result, at least 85% of bladder ruptures are associated with pelvic fracture. The bulbar urethra is most commonly injured by a straddle injury. Injuries to the penile urethra are most frequently related to penile fractures. Urethral disruption has been reported in 3.5% to 28.8% of patients with pelvic fractures, almost exclusively in men. Iatrogenic injuries to the urethra occur when difficult urethral catheterization leads to mucosal injury with subsequent scarring and stricture formation. Catheter placement is the most common cause of iatrogenic urethral trauma. Patients of spinal cord injury, patients with comorbid condition like diabetes mellitus and ischemic heart disease, poor catheter care and long duration catheterization are likely to have severe urethral injury^[9, 10].

Urological injuries have been inescapably associated with gynecological and obstetrical surgeries, owing to anatomic proximities of urogenital organs. Fortunately, good obstetrical care has led to decreasing trend of such injuries at least in obstetric sector, in contrast to complex gynecological surgeries in which urinary tract injury complicates an estimated 0.2% to 1% of all gynecologic procedures and pelvic operations^[14]. In rural and semi urban settings where expertise is not widely available the general surgeons have to deal with trauma with limitations thus the purpose of this research is to study lower urinary tract trauma and its outcome in a General Surgery department at tertiary care center.

Objectives: Primary objective is to study the lower urinary tract trauma and its outcome. The secondary objectives being to study aetiology and mode of trauma (blunt, penetrating or iatrogenic-intraoperative/trauma due to attempted failed per urethral catheterization, Clinical features of lower urinary tract trauma, Radiological findings, Management of lower urinary tract trauma and its complications.

Materials and Methods

A prospective study was conducted from May 2018 to June 2021 among 44 subjects at Government Medical College and Hospital, Aurangabad, Maharashtra, India. All patients presenting with trauma either blunt or penetrating or iatrogenic who were admitted to emergency care unit or who were admitted to inpatient department and those patients those patients who were diagnosed to have lower urinary tract trauma on clinical and radiological findings were enrolled in the present study. All patients presenting with trauma either blunt or penetrating or iatrogenic who were admitted to emergency care unit or who were admitted to inpatient department as per hospital protocol were screened and evaluated, out of this those patients who were diagnosed to have lower urinary tract trauma on clinical and radiological findings were enrolled in the present study. The cases suffering trauma to the lower urinary tract during the procedures like abdominal hysterectomy, lower segment caesarean section

surgeries were also included in the study. The present study includes a total of 44 patients which sustained lower urinary tract trauma with mode of trauma as blunt, penetrating and iatrogenic of which 24 patients had sustained urinary bladder trauma, 18 patients with trauma to urethra and 2 patients had injuries to lower ureter. A detailed clinical examination of every admitted trauma patient was carried out and all the necessary investigations like haematological, biochemical and radiological were done. The injuries were categorized into lower ureter injury, urinary bladder injury or urethral injury based upon the detailed clinical examination, its presenting symptoms and findings on the radiological investigations and also based on the intraoperative findings. Based upon the type and nature of injury, the cases were managed conservatively, posted for emergency surgery or planned for delayed repair surgeries.

Inclusion criteria

- All patients with lower urinary tract trauma (blunt or penetrating or iatrogenic injury).
- Patients who sustained intra operative lower urinary tract trauma during surgical and gynecological procedures.
- Patients who sustained trauma due to attempted failed per urethral catheterization.

Exclusion criteria

- All patients sustaining trauma other than lower urinary tract trauma.
- Genital trauma including blunt and penetrating trauma.
- Patients not willing to enroll in study.

Results

This prospective observational study was performed in tertiary care center where majority of the patient pool is referral and with no expertise in urology department. We conducted the study upon 44 participants.

Table 1: Age Distribution

Age group in years	Urinary Bladder (n=24)		Urethra (n=18)		Lower Ureter (n=2)		Total	
	No.	%	No.	%	No.	%	No.	%
21-30 yrs	14	58.3	8	44.4	01	50.0	23	52.03
31-40 yrs	08	33.3	8	44.4	01	50.0	16	36.04
41-50 yrs	01	4.2	1	5.6	00	00	03	6.08
51-60 yrs	01	4.2	1	5.6	00	00	02	4.05
Total	24	100.0	18	100	02	100	44	100

It was seen from Table 1 that 58.3% patients of bladder injury, 44.4% urethral injury and 50% of ureteral injury were in the age group 21-30 years. The youngest patient was 21 years of age while the eldest patient was 58 years with a mean age of 24.3 ± 9 years.

Table 2: Clinical Presentation

Clinical Presentation	Urinary Bladder (n=24)		Urethra (n=18)		Lower Ureter (n=2)		Total (n=44)	
	No.	%	No.	%	No.	%	No.	%
Blood at meatus	04	16.7	14	77.8	0	0	18	40.9
Suprapubic tenderness	10	41.7	02	11.1	0	0	12	27.3

Distension of Abdomen	04	16.7	00	0	2	100	04	9.1
Difficulty in Micturition	06	25.0	08	44.4	0	0	14	31.8
Gross hematuria	17	70.8	05	27.8	0	0	22	50.0
Flank Pain	01	4.2	01	5.6	2	100	04	9.1

It was observed from Table 2 that gross hematuria was most common presenting symptom in 50% of total cases especially urinary bladder (70.8%) followed by difficulty in micturition 31.8% and suprapubic tenderness 27.3%. Blood at meatus 77.8% was seen as most common presentation in urethral trauma. Patients with lower ureteric injury presented with abdominal distension and right flank pain in both the cases.

Table 3: Distribution of aetiology of lower urinary tract injury

Aetiology	Urinary bladder (n=24)		Urethra (n=18)		Lower ureter (n=02)		Total (n=44)	
	No	%	No	%	No	%	No	%
Blunt Trauma	16	66.7	09	55.6	0	0	26	59.1
Stab Wound	01	4.2	00	0	0	0	01	2.2
Injury sustained while per urethral catheterization	0	00	07	38.9	0	0	07	15.9
Self-inflicted urinary catheter injury	0	0	02	5.5	0	0	00	6.2
Adhesions due to previous Lower Segment Caesarean Section scar	4	16.7	0	0	0	0	04	9.1
During Abdominal Hysterectomy surgery	3	12.5	0	0	0	0	03	6.8
During Placenta accrete surgery	0	0	0	0	02	100	02	4.5

As seen from Table 3 that blunt trauma to abdomen was the commonest cause of lower urinary tract reported in 59.1% of total cases, of which 16 cases (66.7%) with urinary bladder and 09 cases (55.6%) with urethral injury. Iatrogenic injury to urinary bladder was seen in 29.2% cases due to obstetric and gynaecological surgery. Stab injury over lower abdomen with bladder perforation was seen in 4.2% of the cases. Blunt trauma to urethra was seen in 55.6% cases and was followed by injury sustained due to per urethral catheter insertion which was seen in 38.9% of urethral injuries. 5.5% injury to urethra was due to urinary catheter pull by patient in ICCU. Iatrogenic injury sustained due to surgery during placenta accreta was found to be the cause in 02 cases of lower ureteric injuries.

Table 4: Management of bladder injuries

Management of bladder injuries (N=24)	Number	Percentage
Primary repair with suprapubic catheterization	10	41.7
Primary repair without suprapubic catheterization	12	50
Per urethral catheter drainage for extra peritoneal bladder injuries	02	8.3
Total	24	100

It was seen from Table 4 that primary repair with suprapubic catheterization (SPC) was performed in 41.7% cases and in 50% cases repair was done without SPC in intra peritoneal urinary bladder rupture and catheter drainage was done in 8.3% cases of extra peritoneal bladder rupture.

Table 5: Management of urethral injuries

Management of urethral injuries (N=18)	Number	Percentage
Single successful Per Urethral catheterization	06	33.3
Emergency bedside suprapubic cystostomy	02	11.1
Ultrasound guided Suprapubic cystostomy	10	55.5

It was seen from Table 5 that single successful per urethral catheterization was done in 06 cases (33.3%) while ultrasound guided suprapubic cystostomy was done in 10 cases (55.5%). Emergency bedside suprapubic cystostomy was done in 02 cases (11.1%) as the patient was admitted in ICCU setup and were not shiftable to radiology department.

Table 6: Management of lower ureteric injuries

Management of Lower ureter Injuries	Number	Percentage
Lower ureter injuries diagnosed post operatively	02	100

As seen from Table 6 that 2 cases of right lower ureter injuries who were diagnosed post operatively in operated cases of obstetric and gynaecological surgery, on post-operative day 04 in the first patient and on post-operative day 05 in the second patient. An ultrasonography abdomen and pelvis followed by along with contrast enhanced computed tomography abdomen and pelvis was suggestive of right lower ureteric injury and the patients were referred to higher center for further management due to lack of expertise in absence of urology department.

Discussion

This prospective observational study was carried out at a tertiary care centre in a Government set up in department of general surgery over a period of two years. The present study included a total of 44 patients which sustained lower urinary tract trauma with mode of trauma as blunt, penetrating and iatrogenic of which 24 patients had sustained urinary bladder trauma, 18 patients with trauma to urethra and 2 patients had injuries to lower ureter. In the present study the most common age group presenting with lower urinary tract trauma was in the age group 21-30 years. The youngest patient was of the age 21 years while the eldest patient was 58 years with a mean age of 24.3 ± 9 years. The findings were similar with the studies done by Siram *et al.* [1], Pereira *et al.* [2] and Jehan *et al.* [3] where the most common age group was 21-30 years. Lower ureteric injury in 50% of the cases was seen in age group 21-30 years similar to findings seen by Davis *et al.* [4] Deibert *et al.* [5] noted that 75% of the urethral injuries were males out of the total 120 patients included in the study. Pereira *et al.* [2] in a review on ureteral trauma observed that the majority of trauma occurs in young males, the reviewers noted that an average of 83.4% of patients with ureteral trauma were males averaging 23.2 years of age. The present study showed male preponderance with male to female ratio 2.38:1 thus correlating with the studies of Pereira *et al.* [2] and Diebert *et al.* [5]. In the present study gross hematuria was most common presenting symptom in 50% of total cases especially urinary bladder (70.8%) followed by difficulty in micturition 31.8%, and suprapubic tenderness 27.3% and blood at meatus 40.9% was seen as most common presentation in urethral trauma 77.8% which co related findings with the studies of Alanwar A *et al.*, [6], Jehan A Muhammad [3] and Rassweiler J. *et al.* [7] while the present study did not co related with studies of Rao D *et al.* [8] and Armenakas NA *et al.* [9] as they had a more sample size. In the present study Blunt trauma to abdomen was the commonest cause of lower urinary tract reported in 59.1% of total cases, of which 16 cases (66.7%) with urinary bladder and 09 cases (55.6%) with urethral injury. Iatrogenic injury to urinary bladder was seen in 29.2% cases due to obstetric and gynecological surgery. Stab injury over lower abdomen with bladder perforation was seen in 4.2% of the cases. Blunt trauma to urethra was seen in 55.6% cases and was followed by Injury sustained due to per urethral catheter insertion In the present study 22 cases were diagnosed to have intra peritoneal and 02 patients had extraperitoneal bladder injury of which 10 cases were diagnosed on retrograde cystogram which showed extravasation of contrast form the bladder in the intra peritoneal space, in 04 cases contrast enhanced computed tomography was performed to rule out any other solid

organ injury which had findings of contrast extravasation in the surrounding space and 10 patients with suspected fracture pelvis, an x ray pelvis with both hips was performed and had findings of disruption of pubic symphysis in 04 cases, 03 cases had involvement of hip joints and 03 cases had pelvis ring fractures thus correlating with the studies of Manchev V *et al.* ^[10], Matlock KA *et al.* ^[11] and Kong J *et al.* ^[12]. In our study Single successful Per Urethral catheterization was done in 06 cases (33.3%) while ultrasound guided suprapubic cystostomy was done in 10 cases (66.6%). Emergency bedside suprapubic cystostomy was done in 02 cases as the patient was admitted in ICCU setup and was not shift able to ultrasonography. The present study had findings similar to studies done by WuAK Blaschko SD ^[13] and Kashefi C ^[14]. The findings did not co related with study of Yuminaga Y ^[15] as our tertiary care center had lack of expertise in urology department. In the present study, X ray abdomen erect, ultrasonography of Abdomen and Pelvis and contrast enhanced computed tomography abdomen were performed in both the cases of right lower ureteric injury during the post-operative period on postoperative day 04 in one case and on post-operative day 05 the other case of primary surgery. The present study co related with the study done by Frankman EA ^[16] and Guttman I ^[17]. In the present study, 2 cases of right lower ureter injuries who were diagnosed post operatively in operated cases of obstetric and gynecological surgery, on postoperative day 04 in the first patient and on post-operative day 05 in the second patient and the patients were referred to higher center for further management due to lack of expertise in urology department. In the present study Urinary tract infection was most common complication which occurred in 22.7% of total cases. Complications in cases with urinary bladder injury seen were urine leakage in 16.7%, surgical site infection 12.5% and burst abdomen in 8.33%. Incontinence was seen in 16.67% of cases with urethral injury and correlated with the study Wadhwa N *et al.* ^[18] and Kuehhas *et al.* ^[19]. Complications with ureteric injuries were not documented in the present study as the diagnosis was made post operatively and the patients were referred to higher center due to lack of expertise in urology.

Conclusion

Lower urinary tract trauma is a specialized injury that can have significant sequelae if left untreated. Recognizing and treating these injuries can be difficult in the multi-trauma patient. In general, when the index of suspicion is high, retrograde imaging should be attempted whenever possible. Expert urological opinion should be sought early and the safest method of urinary diversion within the experience of the clinician should be attempted. The aim of bladder and urethral trauma management should be to maintain continence, potency, and the avoidance of stricture.

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