

The relation between pelvic trauma (fractured pelvis) with posterior urethral distraction injury associated with erectile dysfunction

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Background: The aim was to study the relation between posterior urethral distraction injury due to pelvic trauma (fractured pelvis) with erectile dysfunction and to do the clinical assessment of Erectile dysfunction by penile Doppler study for assessment of peak flow velocity. **Material and Methods:** Total number of cases included in the study was 13, out of which 5 patients belonged to young (<30 years) age group, 5 patients belonged to middle (30-50 years) age group and 3 patients belonged to old age group. Out of the total 13 patients, 8 patients had pelvic fracture associated with urethral injury and 5 patients had traumatic urethral stricture without pelvic fracture. **Results:** Out of 8 patients of pelvic fracture with urethral injury, all 8 developed erectile dysfunction after trauma. While among 5 patients of traumatic urethral stricture without pelvic fracture, 3 patients developed erectile dysfunction after trauma. While in traumatic urethral injury without pelvic fracture, amongst 3 patients who had erectile dysfunction, 2 patients had reduced flow on penile Doppler ultrasound and were classified as vascular erectile dysfunction while 1 patient was having a normal flow on penile Doppler ultrasound and was classified as neurogenic/psychological erectile dysfunction. **Conclusion:** Pelvic fracture associated urethral injury has a high incidence of erectile dysfunction. Vascular erectile dysfunction in such patients is more common than neurogenic/psychological erectile dysfunction. And postoperatively (urethroplasty), there is no significant decrease in penile colour doppler vascularity in such patients.

Keywords: Pelvic Fracture, Urethral Injury, Erectile Dysfunction. Urethroplasty, Penile Colour Doppler Vascularity

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Introduction

Pelvic fracture is a major component of road traffic injuries. Injury to the bladder and membranous urethra is the commonest associated urogenital injuries with pelvic fracture. The incidence of urogenital injury ranges from 23% to 57% [1].

A membranous urethral disruption occurs in up to 10% of men who sustain a pelvic fracture [2]. Urethral injury after pelvic fracture is associated with a high risk of erectile dysfunction. The effect of the type of posterior urethral disruption repair on erectile function has not been clearly established. The incidence of pelvic fracture urethral injury associated with a high incidence of erectile dysfunction due to traumatic, neurogenic, vasculogenic, and direct crural or tunica albuginea injury, resulting in intracorporal fibrosis or venous leakage. It is difficult to differentiate between Erectile Dysfunction due to Pelvic Fracture Urethral Injury and de novo Erectile Dysfunction due to urethral realignment or delayed urethroplasty unless patients are assessed for Erectile Dysfunction at several times, ideally before and after injury, as well as before and after repair. In fact, the urethral injury is probably just a surrogate for severe and localized trauma to the penis and its vascular and neurological inputs [3].

The current study tried to find out incidence, probable cause and the possibility of improvement of erectile dysfunctions in patients of post-traumatic urethral stricture due to pelvic fracture.

Materials and Methods

Study design: A comparative prospective study

Setting: This study was conducted at NSCB Medical College Jabalpur for a period of 1 year between 2016-2017.

Inclusion criteria: All patients of pelvic trauma (pelvic fracture) with posterior urethral distraction injury and traumatic urethral injury without pelvic fracture were selected. All patients had Suprapubic cystostomy at the time of admission.

Clinical examination- A detailed clinical examination of all patients with pelvic trauma is done to identify, type of urethral injury, associated bony injury and to exclude trauma to any other system of the body. Stricture in all patients was assessed by MCU (micturating cystourethrogram) and RGU (retrograde cystourethrogram) A brief

History regarding the erectile function of the patients were taken. Patients were asked questions included-Over the past 6 months, how many times did you had early morning erections? Patients having erectile dysfunction were subjected to preoperative penile colour Doppler

All patients of urethral injury were divided into two groups-

Group A- Pelvic trauma (pelvic fracture) with posterior urethral distraction injury.

Group B- Traumatic urethral injury without pelvic fracture. The patients with erectile dysfunction on the basis of colour. Doppler was also divided into 2 categories-

Category 1- Those having normal peak flow velocity on penile colour Doppler were considered as neurogenic/ psychological erectile dysfunction

Category2-Those having reduced flow on penile colour Doppler were considered as vascular erectile dysfunction. Penile colour Doppler was done postoperatively after definitive surgery (urethroplasty), to assess the impact of surgery on penile vascularity.

Investigations- Routine investigations like complete blood count, renal function test, serum electrolytes, random blood sugar, chest x-ray, pelvic x-rays, micturating cystourethrography/retrograde urethrography, penile colour Doppler are done.

MCU (Micturating cystourethrography)- It is a technique for fluoroscopic visualizing a person's urethra and urinary bladder while the person urinates. In the present study, this technique is used to localize the stricture region. In this, the urinary bladder of a patient is filled with diatrizoic acid dye (radiocontrast agent) after catheterization. Then real-time serial x-rays are taken. Stricture is seen as narrowing at any segment in MCU along the path of urethrae from external opening up to its opening in urinary bladder [4].

Colour Doppler findings and its interpretation - Penile colour Doppler of the patients with pelvic trauma with the urethral injury with erectile dysfunction was conducted using 12-3 MHz broadband linear-digital colour Doppler transducer with tissue harmonic imaging. Interpretations were in the form of appearance of corpus cavernosal and corpus spongiosum in flaccid state and cavernosal arterial waveform pattern and peak systolic velocity assessment.

Statistical Analysis- After getting the required information, the collected data were coded, tabulated and analysed. The various statistical techniques i.e. the mean, standard deviation and test of significance (t-test and chi-square test) were used for drawing valid conclusions. Statistical analysis was done using the student t-test. SPSS 13.0 software was used to calculate a p-value. P<0.05 was taken as statistically A descriptive analysis was done on all variables to obtain a frequency distribution. The mean + SD and ranges were calculated for quantitative variables. Continuous variables were compared by the Student t-test. Proportions were analyzed with the chi-square test

Result

Table-1: Distribution of patients according to the type of injury.

Types of injury	No. of patients	Percentage
Urethral injury with pelvic fracture	8	61.5
Urethral injury without pelvic fracture	5	38.5
Total	13	100

Out of the 13 patients in the present study, 8 (61.5%) patients have urethral injury associated with pelvic fracture and 5 (38.5%) patients have a traumatic urethral injury without pelvic fracture.

Table-2: Distribution of patients according to the presence or absence of Erectile dysfunction.

Types of injury	No. of patients	Erectile dysfunction presence	Erectile dysfunction absent
Urethral injury with pelvic fracture	8	8	0
Urethral injury without pelvic fracture	5	3	2
Total	13	11	2

Out of the 8 patients of urethral injury with pelvic fracture, all 8 patients had erectile dysfunction. While amongst 5 patients of traumatic urethral injury without pelvic fracture, 3 patients had erectile dysfunction.

Table-3: Distribution of patients according to vascularity on penile colour Doppler.

Types of injury	No. of patients	Normal Vascularity	Reduce vascularity
Urethral injury with pelvic fracture	8	2	6

Urethral injury without pelvic fracture	5	3	2
Total	13	5	8

Out of the 8 patients of urethral injury with pelvic fracture, 6 (75%) patients had reduced flow on penile Doppler ultrasound.

While out of 5 patients of traumatic urethral injury without pelvic fracture, 2 (40%) patients had reduced flow on penile Doppler ultrasound.

Table-4: Distribution of patients of erectile dysfunction in urethral injury according to vascularity on penile colour Doppler.

Types of injury	No. of patients	Normal Vascularity	Reduce vascularity
Urethral injury with pelvic fracture with erectile dysfunction	8	2	6
Urethral injury without pelvic fracture with erectile dysfunction	3	1	2
Total	11	3	8

Table-5: Incidence of Neurogenic/Psychological Erectile Dysfunction and Vascular Erectile Dysfunction in pelvic trauma with urethral injury.

No. of Patient	Erectile dysfunction present	Neurogenic/Psychological Erectile Dysfunction	Vascular Erectile Dysfunction
8	8	2	6

Out of 8 patients, 6 patients had vascular erectile dysfunction and 2 patients had neurogenic/Psychological erectile dysfunction.

Table-6: Comparison of preoperative and postoperative (urethroplasty) penile vascularity in pelvic fracture with urethral injury and urethral injury without pelvic fracture groups.

Group	No. of Patient	Improve-ment in vascularity	No significant difference in vascularity	Decrease in vascularity
Pelvic fracture with urethral injury	8	0	8	0
Urethral injury without pelvic fracture	5	0	5	0

On statistical analysis, it was found that the increase or decrease in vascularity postoperatively on penile doppler ultrasound was not significant in any of the patient in the present study (p=0.63).

Table-8: Incidence of erectile dysfunction in Pelvic fracture with urethral injury and Post-traumatic urethral injury without pelvic fracture.

Type of injury	No. of Patient	Erectile dysfunction present	Neurogenic/ Psychological Erectile Dysfunction	Vascular Erectile Dysfunction
Pelvic fracture with urethral injury	8	8	2	6
Post traumatic urethral injury without pelvic fracture	5	3	1	2

Out of 8 patients of pelvic fracture with urethral injury, all 8 (100%) developed erectile dysfunction after trauma. While among 5 patients of traumatic urethral stricture without pelvic fracture, 3 (60%) patients developed erectile dysfunction after trauma. Out of 8 patients of pelvic fracture with urethral injury, 6 (75%) patients had reduced flow on penile Doppler ultrasound. While among the 5 patients of traumatic urethral stricture without pelvic fracture, 2 (40%) patients had reduced flow on penile Doppler ultrasound. Out of 8 patients of pelvic fracture with a urethral injury who had erectile dysfunction, 6 (75%) patients had reduced flow on penile Doppler ultrasound and were classified as vascular erectile dysfunction, while 2 patients had a normal flow on penile Doppler ultrasound and were classified as neurogenic/psychological erectile dysfunction.

While in traumatic urethral injury without pelvic fracture, amongst 3 patients who had erectile dysfunction, 2 (66.6%) patients had reduced flow on penile Doppler ultrasound and were classified as vascular erectile dysfunction while 33.3% patient was having a normal flow on penile Doppler ultrasound and was classified as neurogenic/psychological erectile dysfunction. When a postoperative penile Doppler ultrasound was performed after urethroplasty, it was found statistically that there was no significant increase or decrease in vascularity on penile Doppler ultrasound in any of the patient (p=0.63).

Discussion

The urethral stricture and pelvic fracture injury (PFUI) may be associated with erectile dysfunction (ED) and ejaculatory dysfunction in some patients. We, in this study, try to find out incidence, probable

Cause and the possibility of improvement of erectile dysfunctions in patients of post-traumatic urethral stricture due to pelvic fracture.

Total 13 patients of urethral injuries were reported to our institute from Feb 2016 to Aug 2017. Out of 13 patients, 8 patients had pelvic trauma with posterior urethral injury, and 5 patients had only traumatic urethral injury without pelvic fracture. All 8 patients who had pelvic fracture with posterior urethral injury had erectile dysfunction, before and after surgery. 6 (75%) patients showed reduced flow on penile colour Doppler study and were categorized into vasculogenic erectile dysfunction and the remaining 2(25%) patients were categorized into neurogenic/Psychological erectile dysfunction. The study also shows that postoperatively (post urethroplasty), there was no further deterioration of erectile function in any of the patient.

Out of 5 patients with traumatic urethral injury without pelvic fracture, 3 (60%) patients had an erectile function. 2 (66.6%) patients had reduced flow on penile colour Doppler study and were categorized into vasculogenic erectile dysfunction group, while 1 (33.3%) patient was having normal peak velocity on penile colour Doppler study and was categorized into neurogenic/Psychological erectile dysfunction group. In this group too, postoperatively, there was no evidence of any deterioration of erectile function in any of the patient.

There are different studies conducted by Feng C from Oct 2004 to Jan 2006, by El Assmy between June 1998 to Jan 2014, by J T Anger from 1990 to 2004, Koraitin M from 1984 to 2009 and Guan Y between Jan 2009 to June 2013. Whereas the present study was conducted at NSCB medical college Jabalpur for a period of 1 year between 2016-2017. So as compared to other studies, the duration was less in the present study [4-7].

In the study conducted by Feng C, the total number of patients was 40. In the study conducted by Shenfeld, the total number of cases was 25. In the study conducted by El Assmy, the total number of cases was 81. In the study conducted by J T Anger, the total number of cases was 26. In the study conducted by Koraitin M, the total number of cases was 90. And in the study conducted by Guan Y, the total number of cases was 120. Whereas the total number of patients in the present study was 13. The number of cases in the present study was less as

Compared to other studies because the duration of the study was less as compared to other studies [4-9].

Young adults are commonly involved in road traffic accidents which is a common cause of urethral injuries. In the study conducted by Feng C, the mean age of patients was 35.43 years. Shenfeld showed the mean age of patients was 28.6 years (range 11 to 57) years in their study. El Assmy showed the mean age of patients 33.2 years (range 18 to 73 years) and J T Anger showed the mean age of patients was 40.2 years. Guan Y showed the mean age of patients was 37.6 years (range 21 to 48 years). Whereas in the present study, the mean age of patients was 36.38 years (range 17 to 70 years). So the mean age of patients in the present study was comparable to all other studies [9-14].

Urethral injuries associated with pelvic trauma(fracture) have a high incidence of erectile dysfunction. Chances of developing erectile dysfunction in such patients correspond with the severity of the pelvic injury. In the study conducted by Feng C, out of 40 patients of posterior urethral injury associated with pelvic trauma, only 11 patients (27.5%) had erectile dysfunction. In the study conducted by Shenfield, out of 25 patients of posterior urethral disruption injury associated with pelvic trauma, 18 patients (72%) had erectile dysfunction. In the study conducted by El Assmy, out of 81 pts, 48 (59.25%) patients had erectile dysfunction. In a recent study published, retrospective study of 58 patients who underwent posterior urethroplasty for posterior urethral injury associated with pelvic trauma from 1998-2008 showed that out of 58 patients, 42 patients (72%) had erectile dysfunction after pelvic trauma.

In the Retrospective study conducted by Anger JT out of 26 patients who underwent posterior urethroplasty for urethral injury associated with pelvic fracture, 14 (54%) had erectile dysfunction after trauma. In the Retrospective study conducted by Koraitin MM, out of 90 patients of pelvic fracture urethral injury, 40 (44%) patients had erectile dysfunction. In the Study conducted by Guan Y, out of 120 patients of traumatic pelvic fracture associated urethral injury, 96 (80%) patients had erectile dysfunction after trauma. Whereas in the present study, it was found that out of 8 patients of pelvic fracture with urethral injury, all 8 (100%) patients had erectile dysfunction. And out of 5 patients of traumatic urethral stricture without

Pelvic fracture, 3 (60%) had erectile dysfunction. So as compared to other studies, the incidence of erectile dysfunction in pelvic trauma associated urethral injury came out to be high in the present study compared to other studies, the reason may be that in other studies, a questionnaire was adopted to assess erectile dysfunction of the pts whereas in the current study early morning erection were asked to assess the erectile dysfunction in pts [12-16].

Erectile dysfunction associated with urethral injury in pelvic trauma(fracture) patients may be neurogenic/psychological because of the impact and morbidities associated with trauma or maybe vascular due to decreased penile vascularity due to trauma.

In the study conducted by Feng C, out of the 11 patients of pelvic trauma associated with a urethral injury who had erectile dysfunction, 3 (27.7%) patients were vascular and 8(72.3%) patients had neurogenic erectile dysfunction. In the study conducted by Shenfield, out of 18 patients of pelvic trauma with a urethral injury who had erectile dysfunction, 5 (27.7%) patients had vascular erectile dysfunction and 13 (72.3%) patients had neurogenic erectile dysfunction [16,17].

A recent study published showed that the incidence of vascular erectile dysfunction was 88% in pelvic trauma urethral injury associated with erectile dysfunction. A study conducted by Guan Y showed that in pelvic trauma urethral injury associated erectile dysfunction, out of 96 patients, 29 (30%) patients had vascular erectile dysfunction, 41 (42.7%) patients had neurogenic erectile dysfunction and 26 (27.1%) patients had both neurogenic and vascular erectile dysfunction.

Whereas in the present study, out of the 8 patients of pelvic fracture associated with a urethral injury who had erectile dysfunction, 6 (75%) patients had reduced flow on penile Doppler ultrasound and were categorized as vascular erectile dysfunction while 2 (25%) patients had a normal flow on penile Doppler ultrasound and were categorized as neurogenic/Psychological erectile dysfunction. The incidence of vascular erectile dysfunction was more than neurogenic/psychological erectile dysfunction in the current study as compared to other studies, a probable reason for that may be the severity of pelvic trauma, as the current study was conducted at the tertiary centre, so mostly severely injured patients as a referral case were reported [21]. study concluded that there is no significant decrease in

Vascularity on penile Doppler ultrasound in any of the patient after surgery. Furthermore, in a study conducted by El assay, 13.5% of patients had significant improvement in erectile function, 2 years after urethroplasty. In the present study also, it was found that post urethroplasty, there was no significant decrease in vascularity on penile Doppler ultrasound in any of the patient [16-21].

Limitation

01. Small sample size
02. Chances of bias
03. Single-centre trial

Conclusion

It was concluded from the present study that pelvic fracture associated urethral injury has a high incidence of erectile dysfunction. Vascular erectile dysfunction in such patients is more common than neurogenic/psychological erectile dysfunction. And postoperatively (urethroplasty), there is no significant decrease in penile colour doppler vascularity in such patients.

What does the study add to the existing knowledge

Pelvic fracture is a major component of road traffic injuries. Injury to the bladder and membranous urethra is the commonest associated urogenital injuries with pelvic fracture. The incidence of urogenital injury ranges from 23% to 57% vascular erectile dysfunction in such patients is more common than neurogenic/psychological erectile dysfunction.

Author's contribution

Dr. Bhavesh Khandelwal: Concept, data collection and discussion

Dr. Deepti Bala Sharma: Concept and guidance

Dr. Fanindra Solanki: Concept and guidance

Dr. Atul Kumar: Discussion and preparation of manuscript

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