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ORIGINAL RESEARCH

Incidence of Erectile Dysfunction in Patient with Pelvic Fracture and Posterior Urethral Distraction Defects and Colour Doppler Correlation in Preoperative and Postoperative Period

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ABSTRACT

Background: Pelvic injuries are a component of major Road traffic accidents. Erectile dysfunction together with stricture formation and urinary incontinence form a triad of deleterious consequences that affect patients sustaining a pelvic fracture urethral injury (PFUI). There is also a difficulty in differentiating erectile dysfunction due to PFUI 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 this study, we try to find the incidence, probable cause and impact of surgery for urethral stricture on erectile dysfunction in patients with post traumatic urethral stricture due to pelvic fracture.

Materials & Methods: A randomized prospective observation study done on 33 patients of pelvic trauma (pelvic fracture) with urethral injury and pelvic fracture without urethral injury at NSCB medical college & hospital, Jabalpur, from January 2019 to august 2020. All patients with pelvic fracture were divided into two groups- Group A- Pelvic trauma (pelvic fracture) with posterior urethral Distraction injury and Group B- Pelvic fracture without urethral injury. Patients who were having erectile dysfunction were subjected to preoperative penile colour doppler. Colour doppler was done 3 months after the trauma, when the patient was admitted for urethroplasty.

Results: The total number of cases was 33. Of 23 patients had pelvic fracture with urethral injuries and 10 patients had only pelvic fracture. Majority of patients belonged to younger age group (42.42%) as they are more prone to road traffic injuries. The incidence of erectile dysfunction is 33.33%. The incidence is 39.13%. Out of which, 6 patients developed vasculogenic erectile dysfunction (incidence 26%) and 3 patients developed neurogenic/psychogenic erectile dysfunction (incidence 13%).

Conclusion: We concluded that pelvic fracture with urethral injuries is associated with higher incidence of erectile dysfunction (P-value 0.042). Pelvic fracture alone also has

association with erectile dysfunction but not significant (P-value0.476). Vasculogenic erectile dysfunction is more common than neurogenic /psychogenic erectile dysfunction in patients with pelvic fracture. Surgery for urethral stricture (urethroplasty) is not associated with any improvement or deterioration in erectile function in these patients (P-value1).

Keywords: PFUI, Colour Doppler, Erectile dysfunction, Vasculogenic, Neurogenic/psychogenic.

INTRODUCTION

Pelvic injuries are a component of major Road traffic accidents. Overall incidence of pelvic ring injuries is 3-8%. Usually caused by blunt trauma due to road traffic accidents. Whereas In elderly, it is caused even by low energy accidents.[1] Injury to the bladder and membranous urethra are the most common urogenital injuries associated with pelvic fracture. The incidence of urogenital injuries ranges from 23-57% .[2]

Membranous urethral disruption occurs in upto 10% of men who sustain a pelvic fracture. It very often represents injury to the membranous urethra from the proximal bulbar urethra rather than through the membranous urethra. About 66% of posterior urethral injuries are complete and remainder are incomplete.[1] Urethral injury after these pelvic fractures is associated with high risk of erectile dysfunction but it has not been clearly established. Erectile dysfunction together with stricture formation and urinary incontinence form a triad of deleterious consequences that affect patients sustaining a pelvic fracture urethral injury (PFUI). In addition, less attention is being given to erectile dysfunction in patients with pelvic fracture without urethral lesions.[3] Special fracture patterns have been associated with increased sexual dysfunction including bilateral pubic rami fracture and sacroiliac fracture and also pubic diastasis. Pathophysiological factors in these patients includes psychological sequelae, cavernous autonomic nerve dysfunction, haemodynamic (arterial and corporeal veno-occlusive) impairment and direct crural or tunica albuginea injury resulting in intracorporeal fibrosis.[4]

There is also a difficulty in differentiating erectile dysfunction due to PFUI 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 this study, we try to find the incidence, probable cause and impact of surgery for urethral stricture on erectile dysfunction in patients with post traumatic urethral stricture due to pelvic fracture.

MATERIALS & METHODS

A randomized prospective observational study done on 33 patients of pelvic trauma (pelvic fracture) with urethral injury and pelvic fracture without urethral injury at NSCB medical college & hospital, Jabalpur, from January 2019 to august 2020.

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

ALL PATIENTS WITH PELVIC FRACTURE WERE DIVIDED INTO TWO GROUPS

GROUP A

Pelvic trauma (pelvic fracture) with posterior urethral Distraction injury

GROUP B

Pelvic fracture without urethral injury

Patients who were having erectile dysfunction were subjected to preoperative penile colour doppler. Colour doppler was done 3 months after the trauma, when the patient was admitted for urethroplasty. The patients with erectile dysfunction on the basis of colour

Doppler were also divided into 2 categories-

CATEGORY 1

Those having normal peak flow velocity on colour Doppler were considered as neurogenic/ psychological erectile dysfunction.

CATEGORY 2

Those having reduced systolic peak velocity on penile colour doppler were considered as vasculogenic erectile dysfunction.

Penile colour doppler was done post operatively after definitive surgery (urethroplasty), to assess the impact of surgery on penile vascularity. Colour doppler was done 1 month after urethroplasty in our study.

MCU (MICTURATING CYSTO URETHROGRAPHY)

It is a flouroscopic study of the lower urinary tract (urinary bladder and urethra). The contrast is introduced into the bladder via a catheter. In this technique is used to localize the site of injury/stricture in the urethra. In this, urinary bladder of patient is filled with diatrizoic acid dye (radiocontrast agent) after catheterization. After the bladder is filled to its capacity, the patient is asked to void. Then real time serial X-ray are taken. Acute injury is presented as extravasation of contrast at the site of urethral injury (abrupt cutoff of urethra in MCU seen in patients presenting late) and Stricture is seen as narrowing at any segment in MCU along the path of urethra from the external opening to its opening in urinary bladder.[5]

FIG 1: MCU SHOWING ABRUPT CUTOFF IN POSTERIOR URETHRA

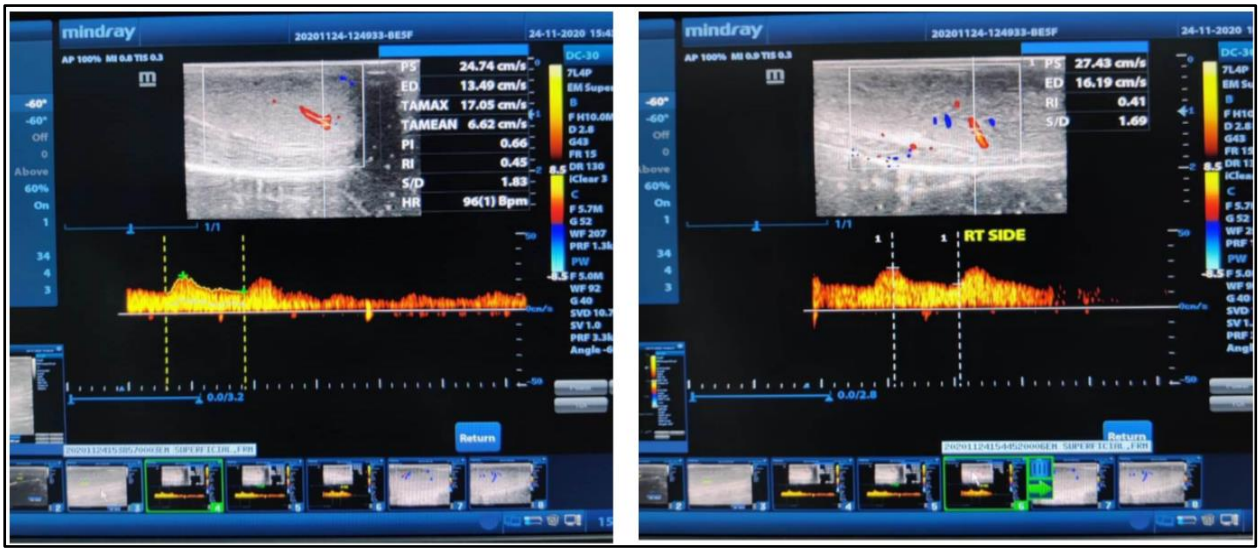
PENILE COLOUR DOPPLER

Penile colour Doppler of the patient with erectile dysfunction was conducted using a high frequency tansducer (7.5-9 MHz). Patient is placed in supine position and doppler angle is set at 30-60 degrees. 60mg of papaverine injected intracavernosally.

Interpretation - Inner diameter of cavernosal artery, appearance of corpus cavernosa and corpus spongiosum in flaccid state, cavernosal arterial waveform pattern including peak

systolic velocity and end diastolic velocity assessment, visual tumescence and erection. Peak systolic velocity <30cm/sec (arteriogenic) or end diastolic velocity >5 cm/sec (venous dysfunction) were classified as vasculogenic erectile dysfunction.[6]

FIG 2: PENILE COLOUR DOPPLER SHOWING REDUCED PEAK SYSTOLIC VELOCITY



RESULTS

Our study showed that there were 33 patients of which, 14 patients belonged to younger age group (< 30years), 8 patients belonged to age 30-39 years and 6 patients belonged to 40-49 years and 5 patients belonged to older age group (>50 years). 11 out of 33 patients developed erectile dysfunction in our study. The total incidence in our study is 33.33. Of which 4 patients belonged to younger age group. The incidence is 12.12.2 patients belonged to 30 -39 years. The incidence here is 6.06.3 patients belonged to 40-49 years where the incidence is 9.09 and 2 patients belonged to older age group (>50years) wheretheincidenceis6.06 (table 1).

Table 1: Distribution of cases according to age

Age	No. of patients	No. of patients developed erectile dysfunction (n = 33)	Percentage of patients developing erectile dysfunction acc. To age (%)	Total incidence of each age group (%)
< 30 years	14 (42.42%)	4	28.57	12.12
30-39 years	8 (24.24%)	2	25	6.06
40-49 years	6 (18.18%)	3	50	9.09
> 50 years	5 (15.15%)	2	40	6.06
total	33	11		33.33

Out of 23 patients who had pelvic fracture with urethral injuries, 9 developed erectile dysfunction (39%). Out of 10 patients who had only pelvic fracture without urethral injuries, 2 patients developed erectile dysfunction (20%) (table 2).

Table 2: Distribution of patients according to urethral Injury

Type of injury	No. of patients (n =33)	Patients with erectile dysfunction (n = 33)	Incidence (%)
Pelvic fracture with urethral injury	23	9	39.13%

Pelvic fracture without urethral injury	10	2	20%

Out of 11 patients with erectile dysfunction, 8 patients showed reduced vascularity on colour Doppler (72%). 3 patients showed normal vascularity (27%). Of the 9 patients with urethral injuries, 6 patients had reduced vascularity (66%). Of the 2 patients without urethral injuries all showed reduced vascularity on colour Doppler (100%) (table 3).

Table 3: Distribution of patients according to vascularity on penile color doppler

Type of injury	No. of patients with erectile dysfunction (n = 33)	Normal vascularity (n = 33)	Reduced vascularity (n = 33)
Pelvic fracture with urethral injury	9	3 (33%)	6 (66%)
Pelvic fracture without urethral injury	2	0	2 (100%)
total	11	3 (27.27)	8 (72.72%)

In our study, incidence of erectile dysfunction in pelvic fracture with urethral injury is 39%. out of which, 6 had vasculogenic erectile dysfunction (39%) and 3 had neurogenic/psychogenic erectile dysfunction (13%). Among the patients with erectile dysfunction due to pelvic trauma with urethral injuries, 66.66% had vasculogenic erectile dysfunction and 33.33% had neurogenic/psychogenic erectile dysfunction. All patients who had erectile dysfunction due to pelvic trauma (without urethral injuries) had vasculogenic erectile dysfunction (100%) (table 4).

Table 4: Incidence of vascular erectile dysfunction and Neurogenic/psychogenic erectile dysfunction in Pelvic trauma with & without urethral injury

Type of injury	Erectile dysfunction present	Vascular erectile dysfunction	Neurogenic /psychogenic erectile dysfunction
Pelvic fracture with urethral injury (N=23)	9 (39%)	6 (26%)	3 (13%)
Pelvic fracture without urethral injury (N=10)	2 (20%)	2 (20%)	0 (0%)
Total (N=33)	11 (33.33%)	8 (24.24%)	3 (9.09%)

We are comparing the effect of surgery for urethral stricture on erectile dysfunction. Out of 6 patients who had vasculogenic erectile dysfunction continued to have reduced vascularity on colour doppler. Of the 3 patients who had neurogenic/psychogenic erectile dysfunction with normal colour doppler findings pre-operatively, have normal colour doppler findings post-operatively also (table 5).

Table 5: Impact of surgery for urethral stricture on erectile dysfunction (comparing preoperative and postoperative colour Doppler changes)

Type of ED	No. Of patients	Urethroplasty Done	Preoperative reduced vascularity	Post-operative reduced vascularity
Vasculogenic erectile	6	6	6	6

dysfunction				
Neurogenic/psychogenic erectile dysfunction	3	3	0	0

DISCUSSION

Pelvic fracture with or without urethral injuries are associated with erectile dysfunction. Pelvic fracture with urethral injuries is most commonly associated with erectile injuries than pelvic fracture without urethral injuries.

In our study, out of 33 patients, 11 patients had erectile dysfunction. Incidence in our study is 33.33%. The incidence in patients with pelvic fracture alone is 20% and the incidence in patients who had pelvic fracture with urethral injuries is 39.13%. The total incidence of vasculogenic erectile dysfunction is 24.24% (8 out of 33 patients) and neurogenic/psychogenic erectile dysfunction is 9.09% (3 out of 33 patients). Young adults are commonly associated with road traffic accidents (and pelvic fracture) and are therefore they are the main age group commonly associated with erectile dysfunction. In Feng's et al[7]study, the mean age of patients was 35.43 years. In the study by Shenfield et al[8], the mean age of patients was 28.6 years. El Assmy et al[9]showed mean age of patients was 33.2 years and JT Anger et al[10]showedmean age was 40.2 years. In the study by guan y et al[11], the mean age of patients was 36 years. In our study, the mean age of patients was 34.64. So, the mean age of patients in our study was comparable to all other studies. In our study, the incidence of erectile dysfunction in younger age groups (12.12%) is greater than incidence in other age groups.

Pelvic trauma associated with urethral injuries have a high incidence of erectile dysfunction than pelvic trauma without urethral injuries. In the study by Metze M et al[3], the incidence of erectile dysfunction in patients with pelvic fracture alone (without urethral injuries) is 19%. In the study by Feng C et al[7], out of 40 patients of posterior urethral injury associated with pelvic fracture, 11 patients (27.5%) had erectile dysfunction. In the study by Shenfield et al[8], out of 25 patients of posterior urethral disruption injury, 18 patients (72%) had erectile dysfunction. El Assmy et al[9]study showed that 48 of 81 patients (59.25%) developed erectile dysfunction. In the retrospective study by Anger JT et al[10] out of 26patients undergone urethroplasty for urethral stricture associated with pelvic trauma 14 (54%) had erectile dysfunction. In another retrospective study by Koraitin MM et al[12]out of 90 patients with pelvic trauma urethral injuries, 40 patients (44%) had erectile dysfunction. In the study by Nelis V Johnsen et al[13], the incidence of erectile dysfunction in patients with pelvic fracture alone (without urethral injury) is 5 to 20% and the incidence of erectile dysfunction in pelvic fracture urethral injuries is 42-62%. In our study we found out 9 out of 23 patients of pelvic trauma with urethral injury developed erectile dysfunction (incidence39.13%). And 2 out of 10 patients with pelvic fracture alone developed erectile dysfunction (incidence 20%).

Erectile dysfunction due to pelvic fracture may be vasculogenic due to vascular injury associated with pelvic fracture or may be neurogenic/psychogenic due to nerve damage or morbidities/impact associated with trauma. In the study by Feng C et al[7], out of 11 patients of pelvic trauma with urethral injury and erectile dysfunction, 3 patients were vasculogenic (27.7%) and 8 patients had neurogenic erectile dysfunction (72.3%). In the study by Metze M et al[3], 80% of patients with pelvic fracture (without urethral injury) had vascular cause of erectile dysfunction. In the study by Shen field et al[8], out of 18 patients with erectile dysfunction, 5 patients had vascular erectile dysfunction (27.7%) and 13 patients had neurogenic erectile dysfunction (72.3%) study conducted by Guan Y et al[11]showed that in pelvic trauma urethral injuries associated with erectile dysfunction, out of 96 patients, 29 had vascular erectile dysfunction, 30%) and 41 patients had neurogenic erectile dysfunction

(42.7%) and 26 patients had both neurogenic and vascular erectile dysfunction (27.1%). whereas in our study, out of 9 patients with pelvic trauma with urethral injuries and erectile dysfunction 6 patients had vasculogenic erectile dysfunction (66.66%) whereas 3 patients had neurogenic/ psychogenic erectile dysfunction (33.33%). in patients with pelvic fracture alone, 2 patients had erectile dysfunction, and both are vasculogenic erectile dysfunction. (100%).in total of 11 patients with pelvic fracture with/without urethral injuries who had erectile dysfunction, 8 patients had vasculogenic erectile dysfunction (72.72%) and3 patients had neurogenic erectile dysfunction (27.27%).

Urethroplasty had no significant impact on erectile function in patients with pelvic fracture and urethral injuries with erectile dysfunction. Studies conducted by Feng C et al[7], El Assmy et al[9]and are cent study concluded that there is no significant decrease in vascularity on penile doppler ultrasound in any of the patients after surgery. But in the study conducted by El Assmy et al[9], 13.5% patients had significant improvement in erectile function, 2 years after surgery. In another study by Akshay pratap et al[14], 21% of patients developed erectile dysfunction post-perineal urethroplasty. In our study we found that there is no significant improvement or deterioration in erectile function after urethroplasty. All 6 patients with vasculogenic erectile dysfunction and urethral stricture continued to have reduced vascularity in penile colour doppler. Also patients who had normal doppler findings prior to surgery, had normal doppler findings postoperatively also. But we did our study for the duration of 1 year only. These patients are in long term follow-up.

CONCLUSION

We concluded that pelvic fracture with urethral injuries is associated with higher incidence of erectile dysfunction (P-value 0.042). Pelvic fracture alone also has association with erectile dysfunction but not significant(P-value0.476). Vasculogenic erectile dysfunction is more common than neurogenic/psychogenic erectile dysfunction in patients with pelvic fracture. Surgery for urethral stricture (urethroplasty) is not associated with any improvement or deterioration in erectile function in these patients (P-value1).

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