

## MANAGEMENT OF PELVIC FRACTURE URETHRAL DISTRACTION DEFECT (PFUDD)

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**ABSTRACT: INTRODUCTION:** Posterior pelvic fracture urethral distraction defect is a challenging urologic problem that may result in complications such as urinary incontinence and inability to void due to recurrent stricture leading to a lifelong disabling condition. **AIMS AND OBJECTIVES:** To evaluate the outcome of primary realignment after pelvic fracture urethral injury and the outcome of urethroplasty after development of urethral stricture. To study the outcome of simple trocar spc after pelvic fracture urethral injury and the results of stricture management. To compare the results of primary realignment versus simple trocar spc after pelvic fracture urethral injury. **MATERIALS AND METHODS:** 50 patients with pelvic fracture urethral injury who attended emergency department were included in the study. All patients were subjected to RGU, USG and CECT Abdomen with delayed films in selected cases with high probability of rectal, bladder neck injury. In our study subjects undergoing primary catheter realignment are included in group A. and those undergoing simple emergency SPC are included in group B. Both were followed up for the development of complications and managed accordingly. **RESULTS:** Out of 50 patients with pelvic fracture 26 (52%) were in 20-30 years age group. Trocar SPC was done in 40 patients (80%) and managed conservatively. They are grouped as Group B. All of them underwent RGU after three weeks. When there was no demonstrable stricture, suprapubic catheter was clamped and voiding trial given. If the patient was not voiding well, SPC catheter continued for 3-6 months until the healing of orthopedic injuries. If RGU shows stricture, SPC catheter is continued for 3-6 months. Patients with total block underwent combined RGU and VCUG (up and downogram) before planning for delayed urethroplasty. The remaining 10 patients (20%) were included in Group A who underwent primary catheter realignment simultaneously when laparotomy is done for other indications like rectal injury, bladder neck injury or internal fixation for pelvic fracture. In group A after primary realignment, 70% developed posterior urethral structure. All of them underwent progressive perineal urethroplasty. In group B after Trocar SPC, 95% developed post urethral stricture out of which 82.5% underwent progressive perineal urethroplasty and 12.5% needed perineoabdominal urethroplasty. **CONCLUSION:** Trocar SPC followed by delayed urethroplasty is the choice of treatment for PFUDD except in few selected cases where primary urethral realignment is necessary.

**KEYWORDS:** Pelvic fracture, urethral stricture, perineal urethroplasty.

**INTRODUCTION:** Posterior urethral injury most commonly occurs as a consequence of pelvic fracture and may occur in up to 10% of cases.<sup>[1]</sup> In 1977, Turner-Warwick popularized a distinction between simple and complex posterior urethral strictures resulting from pelvic fracture urethral distraction defect (PFUDD). Most post-traumatic strictures are simple and are suitable for one stage transperineal bulboprostate anastomosis. Complex stricture associated with fistula, false passage, chronic periurethral abscess, osteomyelitis or damage to bladder neck may require a more extensive

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abdominoperineal approach.<sup>[2]</sup> The aim of surgical reconstruction for urethral stricture is to provide an adequate caliber, compliant and stable urethra. In 1983, Webster and Raman popularized an elaborated perineal approach for the reconstruction of pelvic fracture related urethral distraction injury in which urethral mobilization is augmented by progressing through additional steps of corporal splitting, inferior pubectomy and supracrural urethral rerouting, as needed, to bridge long or complex urethral defect.<sup>[3]</sup> In 1990s, this approach became the gold standard for the treatment of traumatic posterior urethral stricture.<sup>[4]</sup> In 2003, Flynn et al. reported the long-term result of this progressive one stage perineal anastomosis repair in 120 patients with PFUDD.<sup>[4]</sup> This technique was successful in 95% of adults, 73% of prepubescent boys and 86% of patients undergoing secondary repair. Conversely, Kizer et al. suggested that ancillary procedures such as corporal splitting, inferior pubectomy and corporal rerouting are seldom required for successful posterior urethral reconstruction.<sup>[5]</sup>

As the understanding of the disease process has improved with evolution of better imaging and better surgical techniques, the success rates of posterior anastomotic urethroplasty have improved. We did immediate primary realignment for cases that required laparotomy for other conditions like bladder neck injury, rectal injury and favorable results are achieved with decreased incidence of urethral stricture, and subsequent urethroplasty will become easier, but expertise is required but sometimes results in torrential bleeding.

We evaluated the outcome after trocar SPC for urethral injury bypassing acute traumatic period. This results in increased number of urethral strictures but ultimately as delayed urethroplasty results have high success rate, this becomes gold standard for the management of Pelvic Fracture Urethral Distraction Defect.

**MATERIALS & METHODS:** This present study is a prospective study to analyze the various outcomes with immediate primary realignment versus Trocar SPC and delayed urethroplasty in Pelvic Fracture Urethral distraction Defect (PFUDD).

Our study population includes 50 patients with pelvic fracture urethral injury, who attended emergency department, King George Hospital between October 2011–January 2014. Our duration of study is 27 months.

### **Inclusion Criteria:**

1. All patients with Clinical symptoms and signs of Pelvic fracture urethral injury, with RGU showing Partial or complete urethral rupture.
2. Patients with visceral organ injury (like rectum, bladder neck, bowel, etc.) that required abdominal exploration are selected for Primary catheter realignment.
3. Patients with isolated pelvic fracture urethral injury without visceral organ involvement are selected for Trocar SPC with Delayed Urethroplasty.

**Exclusion Criteria:** The following patients are excluded from the study:

1. Women, children and elderly age group (>60 yrs)
2. All patients with associated spinal cord injury, anterior urethral injury.
3. All patients with previous lower urinary tract symptoms
4. Patients with previous urethral catheterization, instrumentation, lower urinary tract surgery.
5. Patients who developed complex strictures associated with multiple false passages, rectourethral fistulae, anterior urethral stricture.

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Initially at emergency room, all patients underwent RGU study and ultrasound Abdomen and Pelvis to exclude other visceral injuries. CECT Abdomen with delayed films are taken only in selected cases with high probability of rectal, bladder neck injury.

In our study, subjects undergoing Primary catheter realignment are included in Group A and those undergoing simple emergency Trocar SPC are included in Group B, and both groups were followed up for the development of complications.

In both groups, RGU done after 3-8 months based on the healing of orthopedic injury. When there is total block at the stricture site, then combined VCUG and RGU is taken. Antegrade cystourethroscopy done in all cases to rule out bladder neck incompetence. All Patients who developed posterior urethral strictures were managed with anastomotic urethroplasty. In patients who underwent anastomotic urethroplasty both perurethral and suprapubic catheter were kept for 3 weeks. Per urethral catheter was removed after 3 weeks and SPC catheter was blocked and a catheter free trial given. If there is adequate urinary flow, SPC catheter was removed on the following day. All patients underwent retrograde cystourethroscopy at 3 months post operatively to know the status of anastomotic site. If there is any development of flimsy stricture, it is managed with DVIU in the same sitting under spinal anaesthesia.

**ANALYSIS OF RESULTS:** In our study, total number of patients studied is 50. Detailed analysis of parameters of these patients is as follows:

**AGE:** A total of 50 patients attending emergency department with pelvic fracture and blood at the tip of urethral meatus are taken into study. Most of the patients (52%) are of young age group between 20-30 yrs and the incidence is decreasing with the age. All of them are male patients excluding children and women.

**INITIAL MANAGEMENT OF PATIENTS AT EMERGENCY ROOM:** All cases underwent Retrograde urethrogram at emergency room demonstrating posterior urethral injury. Foleys catheterization is not attempted in any case due to risk of conversion of partial tear into complete tear and risk of false passage which makes the development of complex stricture. Regardless of grade of urethral injury, 40 patients (80%) underwent Trocar suprapubic cystostomy (SPC) and managed conservatively. They are included in Group B. All patients in this group underwent RGU after three weeks. When there is no demonstrable stricture, suprapubic catheter is clamped and voiding trial is given. If the patient is not voiding well, SPC catheter is continued for 3-6 months until his orthopedic injuries healed well. If RGU shows stricture, SPC catheter is continued for 3-6 months. Patients with total block underwent combined RGU and VCUG (Up and Downogram) before planning for delayed urethroplasty. The remaining 10 patients (20%) are included in Group A who underwent Immediate Primary Catheter Realignment simultaneously when laparotomy is done for other indications like rectal injury, bladder neck injury or internal fixation for pelvic fracture.

**RESULTS OF IMMEDIATE PRIMARY REALIGNMENT (GROUP A):** After immediate Primary realignment, on follow up 30% of subjects in Group A become stricture free. 70% subjects developed posterior urethral stricture, no (0%) subjects developed urinary incontinence in our study.

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**MODE OF STRICTURE MANAGEMENT AFTER PRIMARY REALIGNMENT (GROUP A):** In Group A, after Primary realignment, 70% developed urethral strictures, all of them underwent progressive perineal urethroplasty. DVIU was not done for any patient. No patients underwent more morbid Perineo- abdominal urethroplasty due to good realignment and short length of stricture after Primary Realignment.

**RESULTS AFTER EMERGENCY TROCAR SPC (GROUP B):** In Group B, after emergency Trocar SPC, on follow up 95% patients developed posterior urethral stricture, which is significantly high when compared to Group A in which it is 70%. On subjective evaluation, no patients developed urinary incontinence in either groups.

**STRICTURE MANAGEMENT AFTER EMERGENCY TROCAR SPC (GROUP B):** In Group B, among 95% stricture cases, 82.5% required progressive perineal anastomotic urethroplasty and 12.5% required Perineo Abdominal Urethroplasty requiring Pubectomy which is more morbid. Only 5% patients remained stricture free.

**COMPARATIVE RESULTS BETWEEN PRIMARY REALIGNMENT AND EMERGENCY TROCAR SPC:** In our series, urethroplasty after Primary catheter realignment in selected cases have good results when compared with Trocar SPC and Delayed urethroplasty. 30% of subjects after Primary Realignment (Group A) are stricture free, whereas only 5% become stricture free after trocar SPC. (Group B).

**MANAGEMENT OF RESTRICTURE AFTER DELAYED URETHROPLASTY:** Stricture rate is 70% in Group A and 95% in Group B. Progressive Perineal Urethroplasty is required about 82.5% in Group B whereas only 70 % of subjects in Group A. No cases required Perineo-abdominal urethroplasty requiring more invasive Pubectomy in Group A due to good realignment whereas 12.5% of cases required Perineo-abdominal urethroplasty in Group B which is more invasive causing more morbidity. Average operative time in Group A is 180 min, due to good realignment surgery was easier and pubectomy was not required in any cases reducing total operative time. In Group B, surgery was difficult in some cases due to poor alignment of urethral ends requiring more operative time (Average 210 min.). None of cases in either groups developed post-operative incontinence. Restricture rate after delayed urethroplasty in Group B is 13.1% among which most of them (60%) are managed successfully by DVIU. 20% required redo-urethroplasty and only 1 case (20%) required Mitrofanoff procedure due to long restricture which is not amenable for urethroplasty.

**DISCUSSION: Age Group:** In our present study, mean age of the subjects is around 29 yrs (20-60) Most of the studies on PFUDD were conducted between age groups of 20-55 and most of the subjects fall in middle age group. PFUDD in the age groups of 20-55 with mean age of 34 and 39 respectively. (Koraitim MM. et al, and Al-Qudah HS et al).

**ASSESSMENT:** In our study RGU was done in all cases. Combined RGU and VCUG done when there is total occlusion of urethra, and extent of stricture is not visualized in RGU study. Antegrade cystoscopy done in all cases through SPC tract to assess the bladder neck. The same is the protocol in most of the studies. (Koraitim MM. et al, and Al-Qudah HS et al).

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**STRICTURE MANAGEMENT AFTER PRIMARY REALIGNMENT:** In most of the studies, rate of stricture formation is around 53-68% after primary catheter realignment. In our present study stricture rate is 70% which is slightly higher than other studies. In our study, All strictures were managed by progressive perineal urethroplasty group A. In our study, urethroplasty after primary realignment was simpler, with good realignment of both urethral ends, less time consuming and none required transpubic approach.

**STRICTURE FORMATION AFTER EMERGENCY TROCAR SPC:** Nearly 55-100% of patients developed posterior urethral stricture after conservative management with trocar SPC. (Koraitim MM. et al. and Al-Qudah HS, Santuci RA et al series). Nearly 95 % and 85% of subjects developed posterior urethral strictures after conservative management respectively in other study (Koraitim MM. et al. and Al-Qudah HS, Santuci RA et al series). In our series, 95% of patients treated with emergency trocar SPC only developed posterior urethral strictures, which is high when compared with that of Group A in our study. Good realignment is possible that brings the two urethral cut ends nearer, and possibly resulted into less incidence of stricture.

**COMPLICATIONS AFTER DELAYED URETHROPLASTY:** In most of the studies success rate after delayed urethroplasty was nearly 82- 95%. The reason behind the high success rate is total excision of stricturous segment and periurethral fibrosis with good vascularity of two urethral ends with tension free end to end anastomosis.

Restricture rate in most of the studies ranges from 5-18%. In our present study, it is about 13.1% which is comparable with other's results.

**MANAGEMENT OF RESTRICTURE:** In most of the studies, success rate after delayed urethroplasty was nearly 82- 95%.(Mc. Aninch JW at el 1997) The reason behind the high success rate is total excision of stricturous segment and periurethral fibrosis with good vascularity of two urethral ends with tension free end to end anastomosis.

Restricture rate in most of the studies ranges from 5-18%. In our present study, it is about 13.1% which is comparable with other's results (Mc. Aninch JW at el 1997).

In our present study, most of the recurrent strictures (60%) are managed by DVIU and no patient required CIC after DVIU. This higher success rate is due to complete excision of fibrosis in the previous urethroplasty. McAninch JW et al., Netto et al reported success rate of 88% and 72% after DVIU for restrictures after urethroplasty

In developing countries, more patients are reported with PFUDD due to accidents on the work site [6]Surgery for posterior urethral stricture is beset with problems of access, limited urethral length, surrounding fibrosis and the small caliber of the bulbar urethra that is susceptible to ischemic insult. [7] Recently, Koraitim determined the influence of bulbar urethral length on the outcome of bulboprosthetic anastomosis.[8]

Optimal timing (Immediate vs. delayed) and surgical approach (Endoscopic vs. open) of PFUDD remain controversial. Some advocate immediate urethral realignment,[9],[10] some suggest suprapubic cystostomy alone at the time of injury with delayed repair of the ensuring distraction defect.[11] There are circumstances in which immediate surgical exploration with pelvic hematoma evacuation and urethral realignment is generally indicated. These include concomitant bladder neck injury, severe

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prostatomembranous dislocation with pie in the sky bladder or rectal injury.<sup>[2],[11]</sup> Immediate open realignment of these injuries is associated with an unacceptable high morbidity and a high incidence of recurrent stricture (69%), urinary incontinence (20%) and erectile dysfunction (40%). In our experience and as reported by others, delayed repair is invariably accomplished with a perineal approach resulting in stricture free healing and minimal associated morbidity.<sup>[3],[11],[12],[13],[14]</sup>

Delayed endoscopic cut to the light techniques for PFUDD has been performed primarily for short stricture. The exact role of this approach needs to be established with respect to which distraction defects (In terms of length, etiology and prior treatment) are amenable to this management and what the optimal timing for this intervention is.<sup>[4]</sup> Many of these patients subsequently require urethrotomy and self-calibration and this outcome must be objectively compared to contemporary series of delayed perineal repair with their predictable success rate in excess of 90% and minimal morbidity.<sup>[3],[11],[14]</sup>

Furthermore, as in the series of delayed perineal repair, successful outcome should be defined as urethral patency independent of periodic self-calibration.<sup>[3],[11],[4]</sup> In this study we included the patients of simple posterior urethral stricture as defined in classification by Turner-Warwick 1977.<sup>[2]</sup>

We evaluated our results according to factors that are reported to influence the result of urethroplasty, which are patient's age, stricture length and previous treatment?}

**CONCLUSION:** We conclude that Immediate Primary catheter realignment for Pelvic Fracture Urethral injuries can be done only in selected cases like abdominal exploration for other visceral organ injury (Rectal, bladder neck injuries) or Primary internal fixation of pelvic fracture.

In our study, we found the advantage of 30% of patients become stricture free, who require no additional procedure. 70% developed bulbomembranous stricture that required perineal urethroplasty. We opined urethroplasty very easier, less operative time required when managed with catheter realignment.

But with primary realignment, intra-operative excessive bleeding when pelvic hematoma is disturbed, requirement of additional blood transfusion, apprehension both for patient's attendants and surgeon is the bothersome entity with this approach.

Trocar Suprapubic cystostomy is the safe and less invasive procedure at the time of acute trauma, associated with less anxiety on both patient's and surgeon's side, less need of blood transfusion, less expertise is required.

Even though, this conservative treatment is associated with high stricture rate (90% in our series), the results of delayed anastomotic urethroplasty have high success rate ranging from 85-95% (83% in our series), and most of the restrictures can be managed endoscopically.

So we conclude that Trocar SPC followed by delayed urethroplasty is the choice of treatment for PFUDD, except in few selected cases where primary urethral realignment is necessary.

### ABBREVIATIONS

AAST:	American Association of Surgery of Trauma.
CIC:	Clean intermittent catheterization.
CT	Computed tomography.
DVIUC:	Direct Visual Internal Urethrotomy.
ED	Erectile dysfunction.
EPA	Excision and primary anastomosis.
MRI	Magnetic resonance imaging.

PDE 5 Phosphodiesterase-5.  
 PGE1 Prostaglandin – 1.  
 POD Post-operative day.  
 PFUDD: Pelvic fracture urethral distraction defect.  
 RGU: Retrograde Urethrography.  
 SPC: Suprapubiccystostomy.  
 UTI: Urinary tract infection.  
 VCUG: Voiding cystourethrography.

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**Fig. 1:** AAST grade 4 injury with complete disruption of posterior urethra.



**Fig. 1**

**Fig. 2:** Simultaneous VCUG and RGU after primary realignment and complete healing of orthopedic injury showing stricture at bulbomembranous region.



**Fig. 2**

**Fig. 3:** End to end anastomosis completed- final appearance.



**Fig. 3**



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	<b>Primary realignment (Group A)</b>	<b>emergency trocar SPC (Group B)</b>
Stricture free	30%	5%
Stricture rate	70%	95%
Progressive perineal urethroplasty	70%	82.5%
Perineo-abdominal urethroplasty	0%	12.5%
Operative time (average)	180 min.	210 min
Urinary incontinence	0%	0%

**Table 1: Comparative results between primary realignment and emergency trocar spc**

<b>Study</b>	<b>Rate of stricture formation</b>	<b>Strictures managed with Urethroplasty</b>
Koraitim MM. et al. 2005 <sup>[82]</sup>	53%	20%
Al-Qudah HS, Santuci RA et al.2005 <sup>[83]</sup>	60%	53%
McAninch JW et al.1997 <sup>[84]</sup>	68%	38%
Mundy AR et al. 1996 <sup>[85]</sup>	52%	44%
Present study	70%	70%

**Table 2: Stricture management after primary realignment**

<b>Study</b>	<b>Rate of stricture formation</b>	<b>Strictures managed with Urethroplasty</b>
Koraitim MM. et al. 2005 <sup>[82]</sup>	97%	87%
Al-Qudah HS, Santuci RA et al.2005 <sup>[83]</sup>	85%	73%
McAninch JW et al.1997 <sup>[84]</sup>	54%	49%
Mundy AR et al. 1996 <sup>[85]</sup>	94%	89%
Present study	95%	95%

**Table 3: Stricture formation after emergency trocar SPC**

<b>Study</b>	<b>Follow up</b>	<b>Restricture</b>	<b>Incontinence (SUI)</b>
Koraitim MM. et al. 2005 <sup>[82]</sup>	36 mo.	8%	4%
Al-Qudah HS, Santuci RA et al.2005 <sup>[83]</sup>	26 mo.	10%	-
McAninch JW et al.1997 <sup>[84]</sup>	>12 mo	8%	5%
Mundy AR et al. 1996 <sup>[85]</sup>	60 mo.	12%	37%
Berger et al. 2005 <sup>[87]</sup>	24mo.	27%	-
Pratap et al. 2006 <sup>[86]</sup>	40mo.	10%	0%
Present study	27 mo.	13.1 %	0%

**Table 4: Complications after delayed urethroplasty**

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study	Restricture managed By DVIU
McAninch JW et al.1997 <sup>[84]</sup>	88%
Netto et al. <sup>[88]</sup>	72%
Present Study	60%

**Table 5: Management of restricture**

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