

## RESEARCH ARTICLE

# Pain, Pattern and Polytrauma – Predictors of Sexual Dysfunction in Pelvic Fractures: A Retrospective Multicenter Analysis

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Received: 26 May 2021

Accepted: 26 May 2022

## Abstract

**Objectives:** In the local and cultural setting of high trauma rates and a reserved outlook on sexual function, this study examines the incidence and underlying factors of sexual dysfunction (SD) following pelvic fractures.

**Methods:** A Multi-center retrospective cohort analysis performed in two general hospitals and one tertiary orthopedic center with collection between 2017 and 2019. Consecutive patients with pelvic fractures between January 2017 and February 2019 were followed up at 18-24 months to screen for new-onset SD using the International Index of Erectile Function-5 (IIEF-5) and Female-Sexual-Function-Index-6 (FSFI-6). Additional variables include age, sex, Young-Burgess classification, urogenital injury, injury severity score, persisting pain, sacroiliac disruption, intervention and if sexual health was discussed or patient referred for sexual healthcare.

**Results:** One-hundred and sixty-five patients (n = 165) were included, (83%) male, (16%) female with a mean age of 35.1 years (Range 18-55). Fracture patterns included lateral compression (LC) (51.5%), anteroposterior compression (APC) (27.7%), and vertical shear (VS) (20.6%). The urogenital injury occurred in 10.3%. The mean IIEF-5 and FSFI-6 scores were 20.8 and 24.7 in males and females, respectively. A total of 40 males (29%) scored below the 21 cut-off scores for SD, while only one female (3.7%) scored below the corresponding score of 19. Of all participants reporting sexual dysfunction, 56% discussed sexual health with their providers, while 46% of these patients were referred for further management. Significant predictive factors for SD using a multivariate logistic regression model include increasing age (OR-1.093, p = 0.006), APC III (OR 88.887, p = 0.006), VS (OR-15.607, p = 0.020), persisting pain (OR 3.600, p = 0.021) and increasing injury severity score (OR 1.184, p <0.001).

**Conclusion:** SD is common among pelvic fractures, and risk factors include APC or VS type fractures, increasing age, increasing injury severity score, and persisting pain. Providers should ensure patients are screened for SD and referred appropriately as patients may not willingly disclose underlying symptoms.

**Level of evidence:** III

**Keywords:** Outcomes, Pelvic Fractures, Sexual Health, Trauma, Urogenital Injury

## Introduction

Pelvic fractures are typically synonymous with high-energy trauma in young patients. They are relatively uncommon, constituting 3-9% of all presenting fractures.<sup>1</sup> Nevertheless, this prevalence is noted to be higher than 20% in polytrauma.<sup>2</sup> While these challenging injuries have displayed a trend towards

survivability, they are inevitably coupled with chronic morbidity,<sup>2-4</sup> often requiring a multi-disciplinary approach. Pelvic fractures are associated with visceral organ damage, including intra-abdominal and genitourinary injuries,<sup>5, 6</sup> owing to their anatomy and proximity to these structures. The incidence of urogenital

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injury ranges from 3-15%, with most cases seen in males.<sup>1,6,7</sup> Even in the absence of urogenital injury, sexual dysfunction (SD) can occur following trauma due to complex vascular and neurogenic factors.<sup>8</sup> Sexual dysfunction usually manifests as erectile dysfunction or impotence in males, while presenting as dyspareunia, anorgasmia, decreased libido, and decreased pleasure in females.<sup>9,10</sup> It is associated with a diminished quality of life, and reduced treatment satisfaction that may predispose to various psychiatric complications.<sup>9,11</sup> However, sexual function can be a sensitive domain, particularly in conservative societies, where the lack of disclosure due to personal or cultural reasons may delay treatment and augment failure rates. The reported incidence of SD following pelvic fractures varies between 14-72%,<sup>10, 12</sup> which may be due to the lack of patient follow-up, inadequate reporting, and the absence of a well-established definition.<sup>10</sup>

Due to the scarcity of data on SD in the absence of urogenital injury, this study investigates the impact of pelvic fractures on sexual function in the presence and absence of urogenital injury and highlights the types of fractures that may be implicated in the increased risk of SD. Further, we assess if patients discussed sexual function with their providers and whether they were referred for further management.

### Materials and Methods

A total of 205 consecutive patients with documented pelvic ring fractures were retrospectively identified from two general hospitals and one tertiary orthopedic hospital between January 2017 and February 2019.

Seven patients below 18 years of age and ten patients with a prior history of sexual dysfunction or spinal cord injury/overt neurological deficit were excluded. There were six mortalities and seventeen non-responders, leaving 165 included participants.

Patients were evaluated according to age, sex, fracture characteristics based on the Young-Burgess classification,<sup>13</sup> sacroiliac disruption ( $\geq$  LC II,  $\geq$  APC II, VS), urogenital injury, injury severity score (ISS), the presence of persisting pain, and whether they were managed operatively. Persisting pain relates to chronic post-traumatic pain not associated with the surgical incision site if treated operatively, that negatively impacts the quality of life. Fractures were defined as lateral compression (LC), anteroposterior compression (APC), or vertical shear (VS). According to the predominant pattern on a plain radiograph, the fractures were classified by the consensus of two consultant trauma and pelvis surgeons.

All patients were assessed over the phone 18 to 24 months after injury. The International Index of Erectile Function-5 (IIEF-5) was used to determine males.<sup>14</sup> The Female Sexual Function Index-6 (FSFI-6) was used to assess females.<sup>15</sup> The presence of sexual dysfunction (SD) was determined if the sum score of responses to the International Index of Erectile Function (IIEF-5) for males or the Female Sexual Function Index (FSFI-6) for females reached the cut-off values of 21 and 19, respectively.<sup>14,15</sup> The IIEF-5 is a multidimensional validated questionnaire that assesses the scale of five domains of sexual function, including; erectile and orgasmic

functions, sexual desire, intercourse capability, and overall sexual satisfaction. The FSFI-6 examines six domains including; desire, arousal, lubrication, orgasm, satisfaction, and pain. Both tools are scored based on the sum of the ordinal responses in each domain analyzed. The validity of the Arabic version of both scales was confirmed by Shamloul et al. and Anis et al., respectively.<sup>16,17</sup> In addition, patients were asked whether their sexual health was discussed previously and whether they were referred for sexual health management.

Data analysis was performed using Minitab 19 (Minitab LLC, PA USA). Descriptive statistics for the 165 respondents employ the appropriate mean, standard deviation, median, range, frequency, and percentage of patients. In addition, a multivariate logistic regression analysis was carried out to assess the relationship of patient and fracture characteristics with sexual dysfunction as the binary dependent variable. The independent variables included age as a continuous predictor. Gender, fracture classification, sacroiliac disruption, urogenital injury, persisting pain, and treatment were assessed as categorical variables. The logistic regression model yielded a deviance  $R^2$  of 50% and a Wald Chi-Square p-value for the overall regression of 0.001. Individual p-values for each predictor and the odds ratios (OR) and 95% Confidence Intervals (95% CI) are reported. A p-value of less than 0.05 was considered to be statistically significant.

### Results

The descriptive characteristics of our study population are displayed in [Table 1]. Out of a total of 165 patients, 83% were male ( $n = 138$ ) and 16% were female ( $n = 27$ ) with a mean age of 35.1 years. The most common form of fracture was LC (51.5%), followed by APC (27.7%) and VS (20.6%). Sacro-iliac disruption was present in 43% of our population. The urogenital injury occurred in 10.3% of our patients, of which the majority were either APC or VS type fractures. The median ISS was 10 (Range 1-41). The majority of patients underwent surgical fixation with either open reduction and internal fixation (36.3%) or percutaneous fixation (27.8%), while the remainder were treated conservatively (35.8%).

The patient population responses at 18-24 months are presented in Table 2. The mean IIEF-5 score was 20.8, and the median was 22 (6-25). In males, 28.99% provided a score below 21, indicating SD in that population. The mean FSFI-6 score was 24.7, with a median of 25 (14-30). Only one female had a score less than 19, that is indicative of SD. Overall, 24.85% of our population had SD based on the screening tools used [Table 1].

Further, 35.7% of our patients complained of persisting pain at follow-up. The mean IIEF-5 score for APC was 19.24 and VS 19.14. Of all participants reporting sexual dysfunction, 56% discussed sexual health with their providers, while 46% of these patients were referred for further management. The majority of patients that consulted sexual health were those with urogenital injuries. Likewise, those referred for further management were more likely to have sustained urogenital injuries.

**Table 1. Descriptive statistics of patient and fracture characteristics**

Variable	Characteristics	Frequency (N=165)	Percentage	Sexual Dysfunction N (%)
<b>Age</b>	Mean			
	35 (SD 10.1)			
<b>Age</b>	Median			
	34 (Range 19-66)			
<b>Sex</b>	Male	138	84	40 (29)
	Female	27	16	1 (4)
<b>Fracture Classification</b>	APC I	26	16	4 (15)
	APC II	10	6	4 (40)
	APC III	10	6	9 (90)
	LC I	52	32	1 (2)
	LC II	33	20	8 (24)
	VS	34	21	15 (44)
<b>Sacroiliac Disruption</b>	Yes	72	44	8 (11)
	No	93	56	40 (43)
<b>Urogenital Injury</b>	Yes	17	10	4 (22)
	No	148	90	78 (53)
<b>Treatment</b>	Conservative	59	36	3 (5)
	ORIF	60	36	23 (38)
	Percutaneous fixation	46	28	15 (33)
<b>ISS score</b>	Median			
	10 (Range 1- 41)			
<b>ISS score</b>	Mean			
	11.880 (SD 7.3)			

Table 2 .Patient response at follow-up (18 - 24 months)			
Variable	Characteristics	Frequency (N=165)	Percentage
IIEF-5 (Male)	<b>Mean</b>		
	20.8 (SD 4.5)		
	<b>Median</b>		
	22 (Range 6 - 25)		
	≥ 21	98	71 (of males)
	< 21	40	29 (of males)
FSFI-6 (Female)	<b>Mean</b>		
	24.7 (SD 4.4)		
	<b>Median</b>		
	25 (Range 14 - 30)		
	≥ 19	26	96 (of females)
	< 19	1	4 (of females)
Sexual Dysfunction	Yes	41	25
	No	124	75
Persisting Pain	Yes	59	36
	No	106	64
Discussed Sexual Health (Reported sexual dysfunction)	Yes	23	56
	No	18	44
Referral for Sexual Health (Reported sexual dysfunction)	Yes	19	46
	No	22	54

Likewise, those referred for further management were more likely to have sustained urogenital injuries. Out of the 205 initially identified patients, 17 did not respond for follow-up, of whom 12 were females, and only 5 were males, despite the larger proportion of males in the study.

Predictors of sexual dysfunction using multivariate regression analysis are displayed in [Table 3]. None of the gender, urogenital injury, sacroiliac disruption, or treatment method were significant factors for an increased likelihood of SD. Increasing age was a significant factor in the development of SD (OR 1.093, p = 0.006).

Fracture severity was also a notable factor, as APC III was associated with significantly greater odds for SD against APC I (OR 88.887, p = 0.006). APC III was also significantly less favorable regarding SD against both LC fracture types, with VS remained the only insignificant comparison. Nine out of ten patients with APC III fracture developed SD, the highest proportion among the fracture types. Additional significant variables for developing SD included persisting pain (OR 3.600, p = 0.021) and increasing injury severity scale (OR 1.184, p <0.001).

**Table 3. Predictors of sexual dysfunction using multivariate logistic regression analysis**

Variable	P-Value	Odds Ratio	95% Confidence Interval	
			Lower	Upper
Age [years]	<b>0.006*</b>	1.1	1.0	1.2
Gender [Male/Female]	0.22	5.8	0.35	94
<b>Fracture pattern:</b>				
<b>[vs. APC I]</b>				
APC II	0.14	6.4	0.55	73
APC III	<b>0.006*</b>	89	3.6	2191
LC I	0.83	0.73	0.042	13
LC II	0.23	3.6	0.45	30
VS	<b>0.020*</b>	16	1.5	158
<b>[vs. APC II]</b>				
APC III	0.080	14	0.77	255
LC I	0.18	0.12	0.005	2.6
LC II	0.60	0.57	0.074	4.4
VS	0.33	2.5	0.40	15
<b>[vs. APC III]</b>				
LC I	<b>0.011*</b>	0.008	0.0002	0.34
LC II	<b>0.019*</b>	0.041	0.003	0.60
VS	0.18	0.18	0.014	2.2
<b>[vs. LC I]</b>				
LC II	0.23	5.0	0.37	67
VS	<b>0.042*</b>	21	1.1	404
<b>[vs. LC II]</b>				
VS	0.077	4.3	0.85	21
Sacroiliac Disruption [Yes/No]	0.46	0.52	0.093	2.9
Urogenital Injury [Yes/No]	0.27	0.40	0.080	2.0
Injury severity Score	<b>&lt;0.001*</b>	1.2	1.0	1.2
Treatment [vs. Conservative]	0.19	3.6	0.53	24
ORIF	0.12	5.6	0.65	48
Percutaneous fixation	0.22	4.2	0.44	40
Persisting Pain [Yes/No]	<b>0.021*</b>	3.6	1.2	11

**Discussion**

Pelvic fractures are notoriously challenging entities frequently interrelated with systemic injuries and subsequent morbidity. However, a paradigm shift

towards survivability has led to evolving comorbidities. Sexual dysfunction may become debilitating for young patients, negatively impacting quality of life, mental health, and treatment satisfaction.<sup>11, 18</sup> We describe an

overall incidence of sexual dysfunction of 24.8% overall and 28% in males, within the ranges from previous literature.<sup>10</sup> Increasing age was a significant factor in the development of SD after injury, perhaps due to a poorer physiological reserve and post-traumatic recovery.

Previously identified factors associated with SD following pelvic fractures are increasing age, fracture patterns such as APC and VS, and urogenital injury; however, previous studies do not differentiate between the severities of APC and LC fracture types.<sup>10,12,19</sup> The effect of fracture patterns on SD was significant, which was consistent with the existing literature.<sup>19,20</sup> As the severity of the fracture increased, so did the chance of SD developing; APC III fractures were more likely to develop SD than APC I. The injury severity scale also reflects this as a significant predictor of SD (OR: 1.184, P <0.001). Both APC and VS were significantly associated with SD. Given the amount of energy the patient suffers from creating an APC or VS fracture, this is anticipated, likely causing neurogenic and vascular injuries.<sup>8</sup> Contrary to previous literature, our data did not show statistical significance for SD in urogenital injuries, possibly due to prior treatment and appropriate referral of recognized injuries. It is supporting a more indiscriminate approach to sexual health referral amongst pelvic fracture patients.

We investigated two additional parameters that yielded significant associations with SD. Patients with higher injury severity scores were more likely to develop SD.<sup>21</sup> This reflects the propensity for multiple injuries to cause SD, whether physical or psychological. Persistent pain was a common complaint among pelvic fractures in our cohort. Results yielded significant results of chronic pain as a predictor of SD. Chronic pain and illness have previously been implicated in sexual dysfunction.<sup>22</sup> Pain is a debilitating and distracting symptom, and comprehensive analysis of unremitting pain is essential for treatment success.

Likely underestimated is the single case of SD amongst females in our results, which may reflect their non-response rate (12 out of 17). Despite the statistical insignificance likely due to constitute only 16% of the sample as a limitation of the study, this may suggest a complex issue about societal, cultural, and religious customs. This observation can also be explained by, firstly; the difficulty in identifying SD among females.<sup>23</sup> Secondly, females are less likely to sustain urethral injuries due to the anatomically shorter and more mobile urethra.<sup>24</sup> Despite the low participation rate in females, the study was designed to be as inclusive as possible by the use of the FSHI delivered by the female surveyor, in an attempt to improve responses in this cohort. The barriers to sexual healthcare also include a lack of knowledge about SD and the belief that it is likely

to resolve spontaneously.<sup>9</sup> Lastly, the potential psychological causes of sexual dysfunction were not explored in our cohort; this is especially pertinent to patients with no apparent underlying physiological pathology.

The strengths of our study include a relatively large sample size compared to previous literature,<sup>10, 19</sup> particularly for pelvic fractures in the absence of urogenital injury. The detection of SD employed validated questionnaires for both males and females, which are considered the gold standard.<sup>10</sup> Our follow-up period of 18-24 months allowed for spontaneous physiological recovery whilst simultaneously reducing the chances of unrelated disease. We analyzed various variables not previously mentioned in the literature that may be implicated in SD. On the other hand, our study was limited in its retrospective nature and lack of a control group. A prospective longitudinal approach in future studies would shed greater light on the immediate concerns and the long-term trajectories of these patients.

### Conclusion

Sexual dysfunction is an under-recognized and undertreated entity following pelvic fractures. This study highlights the difficulty in identifying sexual dysfunction in females and outlining possible predictors of sexual dysfunction, which is associated with recognizable factors after pelvic injuries such as; APC or VS type fractures, increasing age, increasing injury severity score, and persisting pain. Providers should ensure patients are screened for SD and referred appropriately.

### Acknowledgement

Not applicable

**Conflict of interest:** There is no conflict of interest in this study.

**Funding:** The author(s) received NO financial support for the preparation, research, authorship, and publication of this manuscript.

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