



Genital and Sexual Function in Women With a History of Pelvic Fracture

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Abstract

Objectives: Pelvic fractures in women significantly affect the urogenital organs, and thus may cause urinary, genital, and sexual problems. The present study aimed to assess the incidence of pelvic fractures and the correlation between genital and sexual complications in different kinds of pelvic fractures among women of reproductive age.

Materials and Methods: The population of this cross-sectional study included 180 women with pelvic ring fractures who referred to Shohada teaching hospital of Tabriz during 2013-2017, out of whom 102 patients were selected based on the inclusion criteria. However, 11 patients discontinued the treatment. The remaining 91 patients were physically examined in terms of the pelvic fracture type, the function of genital and sexual organs, and the mode of delivery after the trauma. The required data were recorded through the questionnaire. Finally, the patients were followed up for 12 months, on average.

Results: The mean age was 28.38 ± 6.0 years. In addition, the frequencies of anteroposterior compression (APC), acetabular, combined, LC, and VS fractures were obtained 54%, 24%, 7.6%, 7.6%, and 4.3%, respectively. A number of 28 women (25.2%) reported symptoms of pelvic floor dysfunction while the other women complained about pelvic pain ($n = 16$), dysmenorrhea ($n = 9$), a sensation of vaginal prolapse ($n = 8$), and pelvic organ prolapse ($n = 1$). Further, only 6 women (out of 18 births, 33 %) had a cesarean section due to the complications of pelvic fracture. Furthermore, 21 women described their problems during the sexual intercourse, 12 reported dyspareunia, 3 had coital incontinences, 4 had anorgasmia and 15 had a reduced frequency of intercourse. Finally, the frequency of pelvic floor dysfunction symptoms and sexual problems was high in the VS and combined fractures.

Conclusions: In general, the frequency of APC fracture was higher than the other types of fractures. However, genital and sexual complications were higher in VS and combined fractures. Eventually, pelvic pain and dyspareunia were the most common complications among these patients.

Keywords: Female pelvic fracture, Genital complication, Sexual problem

Introduction

The high-energy pelvic trauma causes a major injury in women of reproductive age, which results in different clinical problems with high rates of mortality and morbidity (1). The pelvic ring fractures comprise 2%-8% of all the skeletal injuries and nearly 20% of the multiple injured cases suffer from pelvic injuries (2). These types of fractures are known to be associated with high-energy trauma such as motor vehicle accidents or falling from a height. It is reported that around 12%-62% of the patients with pelvic fractures have additional injuries to their brain, peripheral nervous system, thorax, other bones, spine, abdominal organs, and the genitourinary system. The anteroposterior compression (APC) injuries are found to have the worse scores as regards the musculoskeletal dysfunction compared to other patterns (48.3 vs. 31.0, $P = 0.01$) and trends toward

the worse outcomes are emphasized after the symphyseal disruption (3). In addition, location and displacement of anterior pelvic fractures can predict the urethral injury. Therefore, each millimeter of inferior displacement of the medial pubic bone fracture fragment is associated with nearly 10% of the increased risk of urethral injury (4). The Young-Burgess classification is currently used for the pelvic fracture. According to Agrawal et al study, this classification includes 4 types of pelvic fractures such as APC, combined mechanical (CM) injury, lateral compression (LC), sacroiliac (SI), and vertical shear (VS). Direct disruption of the pelvic floor, as well as indirect damage to the muscle, nerve, connective tissue, and blood supply can lead to pelvic floor dysfunction and neuropathy. Accordingly, immediate primary and secondary workouts are needed in this regard (4). Further, pelvic fractures occur approximately in 11% of the patients with blunt trauma.

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The genitourinary injuries are well known in women with pelvic ring disruptions. Furthermore, patients suffering from pelvic ring fractures are normally young and often sexually active (5). Dyspareunia and painful intercourse are common in women after pelvic ring fracture while APC injuries are more associated with dyspareunia (6). Moreover, genital and sexual dysfunctions are probably related to depression, decreased quality of life, and poorer final outcome after the injury. The consequences of pelvic trauma reported by the patients are difficult to evaluate since these patients are often unwilling to explain about their genital, sexual, and urethral problems in the clinic. Additionally, pelvic trauma in young women can cause cesarean section (C-section) due to pelvic deformity and thromboembolism event due to low activity because of the orthopedic complications (6). In addition, there is a limited consensus on the definition of genital dysfunction and its methods of evaluation (7). Considering the importance of this topic and the lack of related data in this respect, the present study sought to evaluate the genital problems of the women with a pelvic ring fracture and its correlation with surgical or nonsurgical treatment alternatives.

Materials and Methods

A total of 180 female patients with pelvic ring fractures were admitted to Shohada teaching hospital of Tabriz, Iran during 2013-2017. A hundred and two women aged 16-65 years old (age of sexual activity) who were treated for a pelvic fracture were included. Exclusion criteria were the death of the patient during the study, mental retardation, the unwillingness of the patient to cooperate, and the inability to contact the patients. Eleven patients were excluded due to the discontinuing of follow-up.

The purpose of the study was completely explained for all the patients and written consent was obtained accordingly. Participation in the study was completely voluntary. The hospital notes of 91 patients were reviewed to obtain data regarding the fracture type and method of treatment. Pelvic fractures were classified based on the Young-Burgess Classification. Patients were interviewed by the telephone in order to find if they had any orthopedic or genital symptoms and then were invited to visit the clinic. Patients were examined by an orthopedist for the ability to bear weight, looking for Trendelenburg position, ability to flex the hip, or a limp, and sagging of the contralateral hip. Further, the length of the leg, tenderness, as well as mobility of the hip and pelvis were assessed to find if there are any limitations. Furthermore, genital system functions including dysmenorrhea, a sensation of vaginal prolapse, pelvic pain, pelvic organ prolapse, dyspareunia (sexually active women), and coital incontinence were evaluated by an expert gynecologist.

Statistical Analysis

Quantitative and qualitative data were presented as the mean \pm standard deviation (SD), as well as frequency and

percentage, respectively. Moreover, independent *t* test, as well as Chi-square, Wilcoxon, and Mann-Whitney tests were used to compare the variables. The data were analyzed using SPSS software, version 15. In this study, $P \leq 0.05$ was considered statistically significant.

Results

Totally, 190 women patients referred to Shohada hospital of Tabriz over the past 3 years, out of whom 80 cases were excluded due to the lack of availability. Additionally, 11 patients refused to enroll while 8 other patients discontinued participation. Finally, 91 patients successfully completed the survey. The mean age of the patients was 28.38 ± 6.09 years old, (within the range of 18-49 years). The frequencies of single and married cases were 22.22% and 77.77%, respectively. In addition, the mean gravida among the married cases was 1.03 ± 0.98 . The frequencies of APC, acetabular, combined, LC, and VS fractures were found 50, 22, 7, 7, and 4 cases, respectively. Forty-six patients (50.54%) were treated non-surgically while 44 of them (48.4%) needed a surgery. Eventually, four women had an injury to the perineum and one of them needed perineal surgery.

In the follow-up period, 28 women (25.2%) reported symptoms of pelvic floor dysfunction developed since the accident while 8 of them pinpointed more than one symptom. Further, other symptoms highlighted by the patients included pelvic pain (16 cases), dysmenorrhea (9 cases), a sensation of vaginal prolapse (8 cases), and pelvic organ prolapse (1 case). Furthermore, as shown in Table 1, the frequencies of pelvic floor dysfunction in APC, combined, and VS fractures are 8, 42.85, and 50%, respectively ($P = 0.000$). Genital dysfunction included dysmenorrhea (6 in APC, 2 in VS, and 1 in combined type), pelvic pain (4 in APC, 2 in LC, 1 in acetabular, 2 in VS, 3 in combined type), a sensation of vaginal prolapse (2 in APC, 0 in acetabular, 2 in VS, 2 in combined type), and pelvic organ prolapses (1 in APC and 1 in VS).

Moreover, based on the results, the occurrence of pelvic floor dysfunction was significantly high in combined and VS compared to APC, LC, and acetabular fractures ($P = 0.004$). However, no statistical differences ($P = 0.05$) was found in posttraumatic pelvic floor dysfunction between the nulliparous (21 cases) and multiparous women (3 cases). Additionally, no woman experienced surgery because of prolapse or incontinence. About 6 women were advised to do pelvic floor exercises (Kegel) and the remaining patients were treated with nonsteroidal anti-inflammatory drugs. Totally, 18 births occurred at the time of accident including 4 (22%) vaginal delivery and 14 (78%) C-section. In one of the women who had a vaginal delivery, surgical fixation of the fracture was implemented while the other women were treated non-surgically. In addition, 6 of the cases had cesarean deliveries due to the complications of pelvic fracture while the other patients had other indications for C-section. Despite the low activity in

Table 1. Pelvic Floor Dysfunction in Different Types of Pelvic Fracture

Group	APC	LC	VS	Acetabulum	Combined
Total of 91 cases	50 (54)	7 (7.6)	4 (4.3)	21 (23)	8 (8.7)
Genital function:					
Normal	38 (76)	5 (71)	0	17 (80)	1 (12)
Dysmenorrhea	6 (12)*	1 (14)	2 (50)	1 (4.7)	1 (12)
Pelvic pain	6 (12)*	3 (42)	2 (50)	1 (4.7)	4 (50)
Pelvic organ prolapse	1 (2)*	0 (0)	0 (0)	0 (0)	0 (0)
Vaginal prolapse feeling	2 (4)*	1 (14)	2 (50)	0 (0)	3 (37)
Sexual function					
Normal	41 (82)	5 (71)	2 (50)	16 (76)	0 (0)
Dyspareunia	7 (14)*	1 (14)*	1 (25)*	1 (4.7)*	3 (37)*
Anorgasmia	1 (2)*	1 (14)*	0 (0)*	1 (4.7)*	1 (12)*
Coital incontinence	2 (4)*	1 (14)*	0 (0)*	0 (0)*	1 (12)*
Painful orgasms	0 (0)*	0 (0)*	1 (25)*	0 (0)*	0 (0)
Reduce frequency of sexual contact	1 (2)*	0 (0)*	0 (0)*	2 (9.5)*	3 (37)*
Cesarean section due to pelvic fracture	3 (6)*	1 (14)*	1 (25)*	1 (4.7)*	1 (12)*

Abbreviations: APC, anteroposterior compression; LC, lateral compression; VS, vertical shear

Data are shown as No. (%).

The Young-Burgess Classification for pelvic fracture was used in this study. Some women experienced more than one symptom.

* shows significant difference with the Normal ($P \leq 0.05$).

Table 2. Orthopedic Complications in Women With Pelvic Fractures

	Orthopedic Complication				
	APC	LC	VS	Acetabulum	Combined
Total of 91 cases	50 (54)	7 (7.6)	4 (4.3)	21 (23)	8 (8.7)
Normal	26 (52)	1 (14)	0 (0)	2 (9.5)	0 (0)
Disability of weight bearing	9 (18)*	1 (14)	3 (75)	7 (33)*	4 (50)*
Sagging contralateral and ipsilateral hip	4 (8)*	0 (0)	1 (25)*	6 (28)*	1 (12)
Decrease range of motion	5 (10)*	2 (28)*	2 (50)	4 (19)*	3 (37)*
Limping	4 (8)*	1 (14)	3 (75)	5 (23)*	4 (59)*

Abbreviations: APC, anteroposterior compression; LC, lateral compression; VS, vertical shear

Data are shown as No. (%).

* shows significant difference with the Normal ($P \leq 0.05$).

pregnant women, there was no case of thromboembolism. Further, other patients described having problems during sexual intercourse (21 cases), dyspareunia (13 cases), coital incontinences (3 cases), anorgasmia (4 cases), and a reduced frequency of intercourse (15 cases) due to the scars, changed anatomy, and pain.

There were significant differences between VS and combined in terms of sexual problems compared to other types of fractures ($P = 0.000$). As regarding orthopedic complications, the obtained data were as follows: sagging contralateral and ipsilateral hip in 10.9% (APC: 4, LC: 1, VS: 1, Acetabular: 6, & Combined: 1), leg length discrepancy in 9.8% (APC: 4, LC: 1, VS: 1, Acetabular: 6, & Combined: 1), disability to bear weight in 26% (APC: 9, LC: 1, VS: 3, acetabular: 7, & Combined: 4), a decreased

range of motion in 17% (APC: 5, LC: 2, VS: 2, Acetabular: 4, & Combined: 3), and limping in 19% (APC: 4, LC: 1, VS: 4, Acetabular: 5, & Combined: 4). Furthermore, significant differences were observed between VS, acetabular, and combined fracture groups compared to the other pelvic fractures regarding the orthopedic complications ($P = 0.004$) (Table 2).

As previously mentioned, in this study, the Young-Burgess classification was used to identify the type of pelvic fracture. Moreover, several women experienced more than one symptom.

Discussion

Damage to the pelvic cavity may cause various problems including bleeding, neurological damage, and damage

to the digestive, urological, or gynecological structures. Additionally, degeneration of pelvic floor due to initial fracture, if not corrected, may lead to malunion, pain, and motor disability, as well as reproductive and physiological problems. Therefore, numerous pre-existing and delayed complications associated with pelvic fractures are highlighted (8). Long-term studies and numerous performance evaluations were conducted to optimize the management of these complex injuries. The benefits of modifying the pelvic ring include reduced frequency of late pain or walking disorders along with an increase in the level of activity and the ability to return to work following the injuries. However, sexual disorders in women after the pelvic injury were not well addressed in previous studies. Accordingly, the present study attempted to determine the relationship between the type of fracture and the function of the genitourinary and reproductive system in female patients with pelvic fractures who referred to Shohada hospital of Tabriz during 2014-2017. There were 190 women with pelvic fractures residing in this hospital during the time of study. Out of whom 91 patients were included in the current study. APC fractures (54.9%) were more frequent compared to the other groups (i.e., Acetabular, Combined, LC, and VS fractures included 22, 7, 7, and 4 cases, respectively). However, orthopedic, genital, and sexual dysfunctions were significantly higher in VS and combined groups. More accurate outcomes were reported after the fractures were isolated and in women who received no surgical treatment.

In two separate studies, McCormack et al (3) and Baessler et al (8) found that pelvic fractures account for 2%-11% of all the skeletal injuries. This incidence was about 25% among the patients with multiple traumas. In addition, Agrawal et al (4) performed a study on 105 females with pelvic fractures aged over 15 years old. Based on their findings, nearly 47.6% of the fractures were through the anteroposterior ring. Further, the results revealed that complications such as genital organ injury, rupture of the uterus, rupture of the ovary, rupture of fallopian tube, and laceration of vagina occurred in 15 (14.5%), 5 (three wombs conceived over three months, 1 in the nursing period, & 1 in a normal state), 2, 1, and 7 patients, respectively (9,10).

In another study on 123 women with pelvic ring fracture, Copeland et al (9) reported that patients had residual pelvic fracture displacement (14%), residual lateral (60%) or vertical displacement (67%), and medially displaced fractures (21.4%).

Furthermore, Goussous et al (10) found that 4.8% of all the traumas were related to pelvic fractures. Multiple types of pelvic fractures included pubic rami (33%), acetabular (26%), sacral/coccygeal (29%), and iliac (17%).

According to different studies, APC is the most common type of fracture. Although the incidence of genital urinary and sexual complication is rare in this type of fracture, complications are higher in this group. Moreover, pelvic

fractures can lead to major damages with long-term functional, social, and economic effects. The related effects can be categorized into short-term and long-term effects on the urinary and reproductive system including a wide range of signs and symptoms regarding pelvic dysfunction with or without direct damage to the vagina, bladder, and rectum. The women are naturally concerned about the pain of sexual intercourse, the probability of becoming pregnant, and the type of delivery (12). Additionally, studies on this issue are increasing as Spanjersberg et al reported that post-traumatic stress and the reduction of reproductive function in patients with pelvic trauma are common and can be regarded as the main concern of the physician and the patient (12).

In the current study, 28 women (25.2%) emphasized that symptoms of pelvic floor dysfunction developed since the accident. A number of 8 patients complained about having more than one symptom. In addition, other patients reported other symptoms including pelvic pain (16 cases), dysmenorrhea (9 cases), a sensation of vaginal prolapse (8 cases), and pelvic organ prolapse (1 case). The frequencies related to the symptoms of pelvic floor dysfunction in APC, combined, and VS fractures were 8, 42.85, and 50%, respectively.

As regards the symptoms of pelvic injury, Johnson et al emphasized that the most commonly reported symptoms were related to the bladder, bowel, and sexual problems (13). To the best of our knowledge, there is no previous study regarding the genital function among the cases with pelvis fractures and this is the first study performed in this regard. Based on the findings, there were 18 births due to the accident including 4 (22%) vaginal delivery and 14 (78%) C-section. One of the women with the first type of delivery had a surgical fixation of the fracture while the other patients were treated non-surgically. Further, 6 other patients had cesarean deliveries since they had complications respecting the pelvic fracture whereas the other patients had another indication for C-section ($P = 0.001$).

There is a belief that women with pelvic fractures cannot deliver vaginally and accordingly, most of them are not even given a chance for a trial of labor (1-4). Studying 35 women with a previous pelvic fracture, Cannada and Barr (14) found that 26 of them had children after their pelvic fracture including vaginal delivery (10 cases, 38%) and C-section (16 cases, 62%). Furthermore, Copeland et al (9), investigating 123 women with fractures reported increased rates of the C-section including 14.5% preinjury versus 48% postinjury ($P < 0.0001$). Adjusting for previous C-sections, C-section was significantly more frequent in patients with fractures initially displaced ($P = 0.02$). Moreover, no difference was found in the incidence of miscarriage or infertility among the groups. Accordingly, they concluded that pelvic trauma negatively affected reproductive and genitourinary functions of female patients. Finally, the increased rate of C-section in women

after pelvic trauma may be mainly multifactorial and thus warrants further investigation.

Predicting the mode of delivery which a woman decides to have once she becomes pregnant following a pelvic fracture is very difficult. Various rates of C-section after pelvic fractures were reported by different authors ranging from 8% to 66% (15). Although different studies demonstrated a very high rate of C-section even up to twice as high as the standard rates, vaginal delivery after the pelvic fracture is still possible (16). Therefore, care should be taken not to affect the pelvic proportions or mobility of the sacroiliac joints and symphysis while using non-operative treatment of these fractures or operative treatment with an external fixator, iliac wing fixation, or ramus screws. Considering the importance of the mobility of the sacroiliac joints and symphysis during delivery, concerns may be warranted when there is a fixation across the pubic symphysis and possibly the sacroiliac joints.

Additionally, whether a woman with a history of pelvic fracture should have an elective C-section is a decision which the patient, orthopedic surgeon, and obstetrician have to discuss. Normal vaginal deliveries are found to be possible even after pelvic fracture displacement (10). However, a C-section might be considered for patients with the previous disruption of the pubic symphysis due to recurrent diastasis of the symphysis (4). Sexual dysfunction after major pelvic trauma is a significant long-term problem in patients who survive their injuries and includes multifactorial causes (17).

In the current study, 21 women pinpointed the problems related to sexual intercourse, 13 had dyspareunia, 3 reported coital incontinences, 4 had anorgasmia, and 15 had a reduced frequency of intercourse because of the scars, changed anatomy and pain.

In addition, significant differences were observed between VS and combined respecting sexual problems compared to the other types of fractures ($P = 0.000$).

Similarly, Copeland et al (9) reported that pain during the intercourse (dyspareunia) was more common in patients with displaced fractures (≥ 5 mm) compared to those with non-displaced fractures (43% vs. 25%, $P = 0.04$).

Goussous et al, in their study on 74 women with pelvic trauma, concluded that pelvic fractures indicate a worse long-term quality of life and sexual function compared to the general population (10). Further, in their survey of 24 consecutive women with pelvic trauma, Baessler et al reported that 16 women had type B while 8 other women had type C pelvic fractures. In their study, 16 women reported de novo pelvic floor dysfunction. Furthermore, other symptoms included bladder symptoms (12 cases), bowel problems (11 cases), and sexual dysfunction (in 7 out of 17 sexually active women). Finally, they noted that pelvic fracture can be regarded as a risk factor for pelvic floor dysfunction (8). Genital and sexual dysfunction were common among women with VS and combined

fracture (worse score) while the rate of APC fracture was higher compared to the other fracture groups addressed in the present study. Although this result is in line with those of Copeland et al, the sexual complication was more common in patients with displaced fractures (≥ 5 mm) compared to patients with non-displaced fractures (9). Regarding orthopedic complications, there were sagging contralateral and ipsilateral hip, leg length discrepancy, disability of weight bearing, a decreased range of motion, and limping. Moreover, a significant difference was found between VS, acetabular, and combined fracture groups in terms of orthopedic complications compared to the other pelvic fractures ($P = 0.004$). Additionally, as previously mentioned, patients of the study were treated either non-surgically or needed surgery and had an injury to the perineum or needed a perineal surgery.

Matityahu et al reported the most common complications of pelvic fractures as follows: low back pain, lameness, long-term inability to stand with a frequency. In their study, patients were treated non-surgically, received the surgical intervention or needed surgery (18).

Due to the small number of patients and the disadvantages of a retrospective evaluation of the fracture, analyzing the optimal relationship between the early complication of orthopedic management and genital-aseexual functions was not possible. In addition, pelvic floor symptoms were found to be common among young women and thus the initial injury cannot be regarded as the main cause. Therefore, a prospective multicenter study is recommended for revealing the nature of the pelvic floor damage due to pelvic trauma and its complications in women of reproductive age.

Conclusions

The frequency of APC fractures was higher compared to the other fracture groups. However, orthopedic, genital, and sexual dysfunctions were significantly higher in VS and combined fracture groups. More precise outcomes were reported after fracture isolation and in women with no surgical treatment. Since genital and sexual dysfunctions have a significant correlation with a pelvic fracture, specialized interventions should be performed for quick and periodic evaluation regarding the performance of these organs. Accordingly, pelvic trauma should be managed using a multidisciplinary approach and ultimately conducted considering the anatomy of the injury and the physiology of the patient.

Conflict of Interests

Authors have no conflict of interests.

Ethical Issues

This study, which was in accord with the Declaration of Helsinki, was approved by the local Medical Ethics Committee of Tabriz University of Medical Sciences (IR.TBZED.MED.REC.1396.996).

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References

1. Coccolini F, Stahel PF, Montori G, et al. Pelvic trauma: WSES classification and guidelines. *World J Emerg Surg.* 2017;12:5. doi:10.1186/s13017-017-0117-6
2. Rau CS, Wu SC, Kuo PJ, et al. Epidemiology of Bone Fracture in Female Trauma Patients Based on Risks of Osteoporosis Assessed using the Osteoporosis Self-Assessment Tool for Asians Score. *Int J Environ Res Public Health.* 2017;14 (11). doi:10.3390/ijerph14111380
3. McCormack R, Strauss EJ, Alwattar BJ, Tejwani NC. Diagnosis and management of pelvic fractures. *Bull NYU Hosp Jt Dis.* 2010;68 (4):281-291.
4. Agrawal S, Nayak P, Mitra S, Agrawal A, Jain A, Singh V. Pelvic trauma in women of reproductive age. *J Orthop Traumatol Rehabil.* 2014;7 (1):23-28. doi:10.4103/0975-7341.134007
5. Fardiazar Z, Hajizadeh K, Dinparvar S, Esmaili F. Thromboembolism and Thrombosis during Pregnancy and After Delivery between 2009 and 2012 in Al-Zahra Educational Center. *J Caring Sci.* 2014;3 (3):221-226. doi:10.5681/jcs.2014.024
6. Vallier HA, Cureton BA, Schubeck D. Pelvic ring injury is associated with sexual dysfunction in women. *J Orthop Trauma.* 2012;26 (5):308-313. doi:10.1097/BOT.0b013e31821d700e
7. Vallier HA, Cureton BA, Schubeck D, Wang XF. Functional outcomes in women after high-energy pelvic ring injury. *J Orthop Trauma.* 2012 May;26(5):296-301. doi: 10.1097/BOT.0b013e318221e94e.
8. Baessler K, Bircher MD, Stanton SL. Pelvic floor dysfunction in women after pelvic trauma. *Bjog.* 2004;111 (5):499-502. doi:10.1111/j.1471-0528.2004.00120.x
9. Copeland CE, Bosse MJ, McCarthy ML, et al. Effect of trauma and pelvic fracture on female genitourinary, sexual, and reproductive function. *J Orthop Trauma.* 1997;11 (2):73-81.
10. Goussous N, Sawyer MD, Wuersmer LA, Huebner M, Osborn ML, Zielinski MD. Comparison of sexual function and quality of life after pelvic trauma with and without Angioembolization. *Burns Trauma.* 2015;3:21. doi:10.1186/s41038-015-0022-8
11. Perry MO, Husmann DA. Urethral injuries in female subjects following pelvic fractures. *J Urol.* 1992;147 (1):139-143.
12. Spanjersberg WR, Knops SP, Schep NW, van Lieshout EM, Patka P, Schipper IB. Effectiveness and complications of pelvic circumferential compression devices in patients with unstable pelvic fractures: a systematic review of literature. *Injury.* 2009;40 (10):1031-1035. doi:10.1016/j.injury.2009.06.164
13. Johnson MH, Chang A, Brandes SB. The value of digital rectal examination in assessing for pelvic fracture-associated urethral injury: what defines a high-riding or nonpalpable prostate? *J Trauma Acute Care Surg.* 2013;75 (5):913-915. doi:10.1097/TA.0b013e3182a68668
14. Cannada LK, Barr J. Pelvic fractures in women of childbearing age. *Clin Orthop Relat Res.* 2010;468 (7):1781-1789. doi:10.1007/s11999-010-1289-5
15. Riehl JT. Caesarean section rates following pelvic fracture: a systematic review. *Injury.* 2014;45 (10):1516-1521. doi:10.1016/j.injury.2014.03.018
16. Bishop JA, Routt ML Jr. Osseous fixation pathways in pelvic and acetabular fracture surgery: osteology, radiology, and clinical applications. *J Trauma Acute Care Surg.* 2012;72(6):1502-9. doi: 10.1097/TA.0b013e318246efe5
17. Odutola AA, Sabri O, Halliday R, Chesser TJ, Ward AJ. High rates of sexual and urinary dysfunction after surgically treated displaced pelvic ring injuries. *Clin Orthop Relat Res.* 2012 Aug;470(8):2173-84. doi: 10.1007/s11999-012-2257-z.
18. Matityahu A, Marmor M, Elson JK, et al. Acute complications of patients after pelvic angiographic embolization. *Clin Orthop Relat Res.* 2013;471 (9):2906-11. doi: 10.1007/s11999-013-3119-z.

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