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ORIGINAL RESEARCH

Clinical Associated Factors of Tile B/C Type of Pelvic Ring Fractures; a Retrospective Cross-sectional study

Welawat Tienpratarn[1], Nucha Nakpipat[1], Chaiyaporn Yuksen[1]*, Sirote Wongwaisayawan[2], Yuranun Phootothum[1], Sutap Jaiboon[1]

1. Department of Emergency Medicine, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Thailand.

2. Emergency Radiology Unit, Department of Diagnostic and Therapeutic Radiology, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand.

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Abstract: **Introduction:** Pelvic ring fractures categorized under Tile Categories B and C denote partially and fully unstable fractures, respectively. This study aimed to identify the clinically associated factors of Tile B/C pelvic ring fractures.
Methods: This retrospective cross-sectional study reviewed medical records from the Emergency Medicine department at Ramathibodi Hospital in Bangkok, Thailand. The study included individuals aged ≥ 15 who experienced accidents from 2012 to 2021. To investigate the associations between the clinical variables and three critical outcomes, including Tile B/C pelvic ring fractures, major vascular injuries, and the necessity for surgical or radiological interventions, multivariable logistic regression analysis was employed. **Results:** A total of 198 patients were included in the study, among whom 34.8% were diagnosed with Tile B/C pelvic ring fractures. The analysis revealed several significant predictors of Tile B/C fractures, including the presence of pelvic tenderness (adjusted odds ratio [aOR] = 15.25, 95% confidence interval [CI] = 5.86-39.66, p < 0.001), and a shock index (SI) ≥1 (aOR = 4.2, 95% CI = 1.24-14.22, p = 0.021). Moreover, Tile B/C pelvic ring fractures were associated with an increased incidence of major vascular events and the imperative requirement for surgical or radiological interventions. **Conclusions:** Clinical findings of pelvic tenderness and an SI ≥1 are strong predictive clinical factors associated with Tile B/C pelvic fractures. Early diagnosis, application of an pelvic binder, provision of initial resuscitation, and prompt transportation to a definitive care facility are crucial components of management.

Keywords: Pelvic, fracture; trauma; emergency; injury

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1. Introduction

Pelvic ring fractures constitute approximately 3% to 8% of all reported fractures. The incidence of pelvic ring fractures has been observed to show an upward trend, with reported cases rising from 20 to 73 per 100,000 individuals within the population annually [1-4]. Various traumatic events can cause these fractures, encompassing low-energy incidents such as sports-related injuries and falls in the elderly, as well as high-energy occurrences like motor vehicle collisions (MVC) and substantial falls. Importantly, high-energy trauma is linked to a higher prevalence of pelvic ring fractures, primarily affecting younger individuals, with males comprising the majority, accounting for 64% of cases [5, 6].

While pelvic ring fractures are relatively uncommon, they are associated with a significant mortality rate, which can increase to as much as 40% when these fractures are associated with hemorrhage and the manifestation of unstable vital signs [7-9], particularly among geriatric trauma patients [10]. The pelvis encompasses a complex network of arterial branches and venous plexuses, and its bones have a dense vascular supply. Consequently, when a pelvic fracture occurs, it has the potential to lead to substantial hemorrhage. Notably, approximately 85% of this bleeding originates from venous sources, with the remaining 15% arising from arterial sources within the pelvic region [11, 12].

The Tile classification system divides pelvic ring fractures into three groups. Tile A is characterized as stable pelvic fractures with an intact posterior arch. Tile B represents partially stable pelvic fractures with incomplete posterior arch disruption. Tile B is further subdivided into Tile B1, which is an open-book injury involving external rotation; Tile B2, which is a lateral-compression injury involving internal rotation; and Tile B3, which is fractures encompassing bilateral open-book injuries, bilateral lateral compression injuries, or combinations thereof. Tile C represents unstable pelvic fractures with a complete disruption of the posterior arch [13]. This classification system serves as a valuable tool for characteriz-

*Corresponding Author: Chaiyaporn Yuksen; Department of Emergency Medicine, Faculty of medicine, Ramathibodi Hospital, Mahidol University, 270 Rama VI Road, Thung Phaya Thai, Ratchathewi, Bangkok, Thailand, 10400 E-mail: chaipool0634@hotmail.com, Tel: 662-2012404, ORCID: 0000-0002-4890-7176.

ing the patterns of pelvic fractures, prognosticating the severity of accompanying injuries, and is crucial for guiding the appropriate clinical management in prehospital and emergency settings. Tile categories B and C are particularly significant, representing partially and fully unstable fractures, respectively [11, 14].

In the prehospital setting, initial treatment of pelvic fractures involves inserting a pelvic binder [15] , providing initial resuscitation, and promptly transporting the trauma patient to the emergency department (ED) [16]. In the ED, early diagnosis and initial management of pelvic fractures, including pelvic binder application, resuscitation, referral for magnetic resonance imaging (MRI) for definitive diagnosis [17], preparation for blood transfusion, and timely involvement of trauma specialists for temporary external fixation or preperitoneal packing, or consultation with interventionists for immediate angioembolization [18].

The optimal management of unstable pelvic fractures, emphasizing early detection and identification of concurrent vascular injuries, is crucial for improving patient outcomes [19]. However, the study of van Leent et al. has highlighted challenges faced by emergency physicians (EP), with a sensitivity of only 45% and a specificity of 93% in diagnosing pelvic fractures accurately and categorizing their specific types [20]. Several clinical indicators were statistically significant predictors of unstable pelvic fractures. These indicators included an elevated respiratory rate (RR), a shock index (SI) exceeding 1, and a capillary refill time (CRT) exceeding 2 seconds. Furthermore, pedestrian collisions with vehicles and falls from heights greater than 2 meters were associated with odds ratios of 2.19 and 1.91, respectively, compared to injuries resulting from MVC [21].

In Thailand, prehospital care is provided by three specialized teams: Basic Life Support (BLS) teams led by Emergency Medical Technicians (EMTs), Advanced Life Support (ALS) teams led by paramedics, emergency nurse practitioners and Comprehensive Life Support (CLS) teams led by EP.. In the ED, care is provided by emergency physicians and emergency nurses. The diagnosis of Tile B/C type pelvic ring fractures relies on physical examination findings and the provider's experience. Therefore, the primary aim of this study was to evaluate the clinical variables for diagnosing Tile B/C type pelvic ring fractures. The secondary objective was to determine the prognostic factors of major vascular injuries and the need for surgical or radiological intervention in patients with pelvic ring fractures.

2. Methods

2.1. Study design and setting

This study was conducted as a retrospective cross-sectional study within the ED of Ramathibodi Hospital, a tertiary care facility affiliated with the university in Bangkok, Thailand from January 1, 2012, to December 31, 2021.

Ethical approval for this study was obtained from the Faculty of Medicine's Committee on Human Rights Related to Research Involving Human Subjects at Mahidol University's Ramathibodi Hospital, granted on July 5, 2022 (IRB COA. MURA2022/390). Given the study's retrospective nature, the requirement for obtaining informed consent from individual patients was waived.

2.2. Data gathering

We included all adult patients aged more than 15 years who underwent whole-body or pelvic CT scans, excluding non-trauma patients and trauma patients who undergo pelvic CT scans without a confirmed diagnosis by an emergency radiologist. We additionally excluded trauma patients who lacked radiological reports obtained from CT scans. We employed a naive approach for missing data in other variables with no data imputation.

Data collection, involving demographic variables (gender and age), clinical factors to predict Tile B/C type pelvic fractures, and anticipated major vascular injuries and need for surgical or radiological interventions.

Initial ED vital signs, including respiratory rate (RR), pulse oximetry (SpO2), heart rate (HR), systolic blood pressure (SBP), capillary refill time (CRT), shock index (SI), and Glasgow Coma Scale (GCS), were recorded. Additionally, ED physical examination findings such as pelvic tenderness, scrotal hematoma or perineal ecchymosis, bleeding per urethral meatus, mechanism of injury, and associated injuries were documented.

Outcome measures included classification of pelvic fracture patterns as Tile A, B, or C based on radiological reports obtained from CT scans, documentation of blood transfusions, and determination of discharge disposition for patients.

The primary researcher reviewed the data, and the second researcher verified the completeness and accuracy of the data records.

The ED at Ramathibodi Hospital comprises two divisions: emergency medicine and prehospital emergency medicine. It is staffed by 20 emergency physicians, 42 emergency medicine residency trainees, 21 paramedics, 75 registered nurses, and over 54 practical nurses. The estimated total number of trauma patients within the coverage area of our Emergency Medical Service (EMS) responsibility is approximately 40-50 cases per month, with an average of more than 3,500 trauma patient visits to the ED annually. These patients are classified according to the Emergency Severity Index (ESI), with approximately 2-5% categorized as ESI level 1 (indicating life-threatening injuries) and 30-35% categorized as ESI level 2 (indicating high risk of injury).

Trauma patients suspected of pelvic fractures typically receive initial treatment at the scene by paramedics, including pelvic binder application, resuscitation, and prompt transport to the ED. Upon arrival at the ED, patients are categorized based on severity, undergo resuscitation as necessary, and receive trauma specialist consultations.. Stable patients are directed to undergo computed tomography (CT) or MRI

scans for diagnostic confirmation and severity evaluation. Unstable patients are promptly referred for surgical or radiological interventions. All trauma patient care data are meticulously recorded in electronic medical records (EMR).

2.3. Definitions

The Tile classification system for pelvic ring fractures [13] comprises the following categories: Tile A: Characterized as stable pelvic fractures with an intact posterior arch, Tile B: Representing partially stable pelvic fractures with an incomplete disruption of the posterior arch. (This category is further subdivided into: Tile B1: Open-book injury involving external rotation, Tile B2: Lateral-compression injury involving internal rotation and Tile B3: Fractures encompassing bilateral open-book injuries, bilateral lateral compression injuries, or combinations thereof), and Tile C: Signifying unstable pelvic fractures with a complete disruption of the posterior arch.

High-energy mechanisms of injury [11] were defined as follows: High-Risk MVC: This involves motor vehicle accidents characterized by significant impacts, such as intrusion into the vehicle's passenger compartment by at least 12 inches for the occupant side or 18 inches for any side, incidents of ejection from the vehicle, or fatalities occurring within the same passenger compartment, Automobile Collisions: Involving Pedestrians or Bicyclists: This category encompasses accidents where pedestrians or bicyclists were either thrown from the collision, run over, or when the impact speed exceeded 32 kilometers per hour (kph) and Motorcycle Collisions: This includes motorcycle accidents with an impact speed exceeding 32 kph.

Fall from height [22] was defined as fall from more than 3 meters.

Major vascular injuries encompassed injuries to the iliac vessels or the vessels within the pelvic region.

Surgical interventions [11] included external fixation, internal fixation, and open reduction followed by external fixation procedures.

Radiologic interventions [11] consisted of angiography and embolization techniques used for diagnostic and therapeutic purposes in managing patients with pelvic fractures and associated vascular injuries.

2.4. Outcome

The primary objective of our study was to identify clinical predictive factors associated with the occurrence of Tile B/C pelvic ring fractures. Furthermore, we aimed to assess the correlation between pelvic ring fractures and the presence of vascular injuries, as well as the necessity for surgical or radiological interventions.

2.5. Sample size estimation

The sample size for this study was determined based on a previous study conducted by Zingg T. et al., considering the proportion of Tile B/C pelvic ring fractures [21]. A minimum sample size of 615 patients was calculated, with 28 of them belonging to the Tile B/C pelvic ring fractures group (referred to as N2) and the remaining 587 categorized as the non-Tile B/C pelvic ring fractures group (referred to as N1). These calculations were conducted using Stata version 16.0 software, with a one-sided alpha level of 0.05, a statistical power of 0.8, and an N2/N1 ratio of 0.046.

2.6. Statistical analysis

Data was analyzed using STATA version 17.0 (StataCorp, College Station, TX, USA). A p-value of less than 0.05 was considered statistically significant. Univariable statistical methods were employed to evaluate all study variables, aiming to discern disparities between the Tile B/C and non-Tile B/C groups. Chi-square and Fisher's exact tests were employed to compare independent categorical data. Independent t-tests and Rank-sum tests were used to compare independent continuous data with normal and non-normal distributions, respectively.

Clinical predictors for primary and secondary outcomes were meticulously chosen based on their clinical relevance and statistical significance observed in the univariable analysis. Subsequently, multivariable logistic regression analysis was conducted to further investigate these clinical outcomes and reported in terms of odds ratios, graphically represented in an odds ratio plot, p-values, and 95% confidence intervals.

3. Results

3.1. Baseline characteristics of studied cases

Initially, 366 cases were comprised of adult patients aged 15 years and older who underwent whole-body or pelvic CT scans. After excluding 15 patients with incomplete official CT reports and 153 cases unrelated to trauma, 198 cases remained eligible for analysis. Among these, 69 patients were confirmed to have Tile B/C pelvic ring fractures, while 129 patients with either no fracture or Tile A pelvic ring fractures were classified as the non-Tile B/C pelvic ring fractures group.

The difference between Tile B/C pelvic fractures (34.8%, 69 patients) and those with non-Tile B/C pelvic fractures (65.2%, 129 patients) are summarized in Table 1. The Tile B/C fracture group consists of Tile B1 (4, 5.8%), Tile B2 (48, 69.6%), Tile B3 (10, 14.5%), and Tile C (7, 10.1%). Vascular injuries were identified in 11 patients (5.6%), (7, 10.14% with Tile B/C fracture vs. 4, 3.10% without Tile B/C fracture, p-value = 0.052). Within the Tile B/C group, only two patients (2.90%) required embolization, 33 (47.83%) were transferred for further surgical intervention, and 34 (49.28%) received conservative treatment. The overall survival to discharge did not differ between the two groups. Tile B/C pelvic fractures significantly increase the risk of major vascular events (aOR = 4.82, 95% CI = 1.05-22.05, P = 0.043) and the requirement for surgical or radiological interventions (aOR = 28.77, 95% CI = 9.04-91.6, P < 0.001). Moreover, the need for blood trans-

fusion serves as an indicative factor for the requirement for surgical or radiological interventions (aOR = 6.77, 95% CI = 1.44-31.67, P = 0.015).

Clinical associated factors of Tile B/C pelvic ring fractures

Univariable analysis

In univariable analysis, the comparisons between patients with and without Tile B/C pelvic ring fractures, show a significant difference between the two groups regarding the patients' mean age (66.59±19.27 vs. 51.47±22.51 years, P-value <0.001), female gender (50, 72.46% vs. 51, 39.53%, P-value <0.001), presence of pelvic tenderness (60, 86.96% vs. 40, 31.01%, P-value <0.001), high-energy mechanism of trauma (31, 44.93% vs. 90, 69.77%, P-value 0.001), SI ≥ 1 (12, 17.65% vs. 13, 10.24%, p=0.017 and Glasgow Coma Scale (GCS) scores (P < 0.001).

Multivariable analysis

The results of the multivariable logistic regression analysis (table 2 and Figure 1A) revealed that female gender (adjusted odds ratio [aOR] = 3.82, 95% CI = 1.30-11.20, P = 0.015), presence of pelvic tenderness (aOR = 15.25, 95% CI = 5.86-39.66, P < 0.001), SI ≥1 (aOR = 4.20, 95% CI = 1.24-14.22, P = 0.021), and high-energy mechanism of trauma (aOR = 4.56, 95% CI = 1.1-18.90, P = 0.036) as independent associated factors with Tile B/C pelvic fractures.

Furthermore, the multivariable logistic regression analysis in (table 3 and Figure 1B) and (table 4 and Figure 1C) presents an analysis of factors in pelvic fracture patients to predict major vascular injuries and the necessity for surgical or radiological interventions. The analysis reveals that Tile B/C pelvic fractures significantly increase the risk of major vascular events (aOR = 4.82, 95% CI = 1.05-22.05, P < 0.043) and the requirement for surgical or radiological interventions (aOR = 28.77, 95% CI = 9.04-91.6, P<0.001). Moreover, the need for blood transfusion serves as an indicative factor for the requirement for surgical or radiological interventions (aOR = 6.77, 95% CI = 1.44-31.67, P = 0.015).

4. Discussion

This study identified several statistically significant clinical factors associated with the diagnosis of Tile B/C pelvic fractures, including female gender, involvement in high-risk mechanisms of injury, the presence of pelvic tenderness during clinical examination, and a SI ≥ 1. Furthermore, Tile B/C pelvic fractures significantly increase the risk of major vascular events and the requirement for surgical or radiological interventions. Moreover, the need for blood transfusion serves as an indicative factor for the requirement for surgical or radiological interventions.

The factors associated with the presence of Tile B/C pelvic fractures, as found in this study, are consistent with the findings of Zingg T. et al., which focused on identifying potential factors linked with Tile B/C pelvic fractures. This investigation highlighted that patients who exhibited signs of shock, characterized by elevated RR (OR 1.04), delayed CRT (OR 2.11), and a SI ≥ 1 (OR 3.91), along with involvement in high-energy mechanisms of injury such as MVC (OR 2.19) and falls from height (OR 1.91), were potential indicators associated with Tile B/C pelvic fractures [21].

Tile B/C pelvic fractures, classified as instability fractures, have a significant risk of vascular injury and pelvic bleeding. These injuries can precipitate a state of shock characterized by an elevated RR, increased HR, decreased SBP, diminished urine output, and decreased level of consciousness. This study reaffirms that an SI ≥ 1 is a reliable predictor for Tile B/C pelvic ring fractures [23]. It is worth noting that severe injuries such as tension pneumothorax, hemoperitoneum, or exsanguinous bleeding may also contribute to an elevated SI [5, 24, 25].

Female gender and advanced age, both factors associated with decreased bone density, confer an increased susceptibility to sustaining severe pelvic fractures, even in low-energy injury scenarios, as corroborated by previous research [23]. The detection of pelvic tenderness is indicative of potential pathologies associated with Tile B/C pelvic fractures within the pelvic region, suggesting the possibility of damage to nerves, ligaments, and muscles in the pelvic area [7, 24, 25]. These findings can be pivotal in facilitating timely interventions, including immediate treatment, emergency imaging, consultation with orthopedic specialists, or patient transfer to a more advanced medical facility, such as a trauma center, particularly in resource-limited healthcare settings.

In practical clinical settings, we recommend suspecting Tile B/C pelvic ring fractures when both pelvic tenderness and SI ≥ 1 are present. For conscious trauma patients, healthcare providers can assess both criteria, while for unconscious trauma patients, SI ≥ 1 can aid in suspecting Tile B/C pelvic ring fractures. In the prehospital setting, initial treatment of pelvic fractures involves the application of a pelvic binder [15], providing initial resuscitation, and promptly transporting the trauma patient to the ED [16]. In the ED, early diagnosis and initial management of pelvic fractures include applying a pelvic binder, resuscitation, and referral for magnetic resonance imaging (MRI) for definitive diagnosis.

4.1. Limitations

The present study is subject to several limitations. Firstly, the calculated sample size was determined based on the distance from the collected samples, with 615 compared to 198 cases. This was because only 198 cases met the eligibility criteria for tile B/C pelvic fracture over the nine years of our study. Secondly, relying on data from emergency EMR, its retrospective nature may introduce information bias and result in missing data. The analysis is based on data obtained from a single trauma center hospital, which may lead to a limited and non-diverse study population, potentially causing selection bias. Lastly, the study's participant pool is relatively small, primarily due to the hospital's location in the center of Bangkok, where strict speed limits for motor vehicles are enforced, leading to a low incidence of major accidents.

Additionally, our hospital is in close proximity to other

trauma centers, each within a kilometer's distance, which further reduces the number of severe trauma cases observed in our facility.

5. Conclusions

This study contributes valuable insights into the predictive clinical factors associated with Tile B/C pelvic fractures. It emphasizes the importance of indicators such as pelvic tenderness, and a SI ≥1 in diagnosing these fractures. Furthermore, this study demonstrates that Tile B/C fractures are associated with an increased incidence of vascular injuries and the necessity for surgical or radiological interventions. Early diagnosis, application of a pelvic binder, provision of initial resuscitation, and prompt transportation to a definitive care facility are crucial components of management.

6. Declarations

6.1. Acknowledgments

None.

6.2. Conflict of interest

The authors declare that they have no competing interests.

6.3. Funding

No funding was obtained for this study.

6.4. Authors' contribution

All contributors to this work have substantially participated in its development, encompassing the concept formation, study design, implementation, data collection, data analysis, and interpretation. Each author has been involved in the drafting and revision process, providing critical feedback on the manuscript. They have unanimously approved the final version for publication, concurred on the choice of journal for submission, and collectively accepted responsibility for the integrity of all aspects of the work.

6.5. Ethical considerations

Ethical approval for this study was obtained from the Faculty of Medicine's Committee on Human Rights Related to Research Involving Human Subjects at Mahidol University's Ramathibodi Hospital, granted on July 5, 2022 (IRB COA. MURA2022/390). Given the study's retrospective nature, the requirement for obtaining informed consent from individual patients was waived.

6.6. Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

6.7. Using artificial inteligence chatbots

During the preparation of this work, the author(s) used ChatGPT3.5 in order to check and correct grammatical errors during the manuscript writing process. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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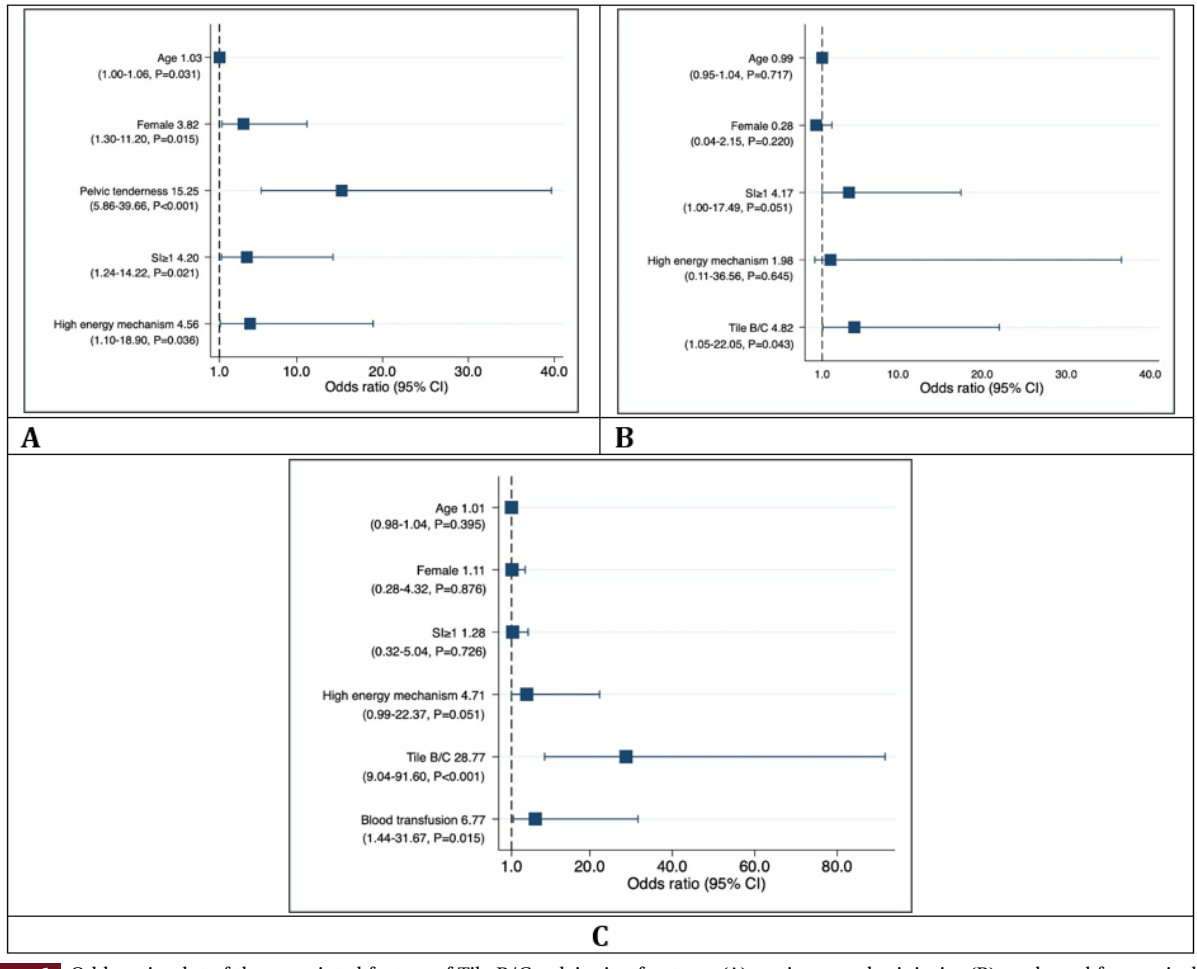

Figure 1: Odds ratio plot of the associated factors of Tile B/C pelvic ring fractures (A); major vascular injuries (B); and need for surgical or radiological interventions (C).

Table 1: Comparing the baseline characteristics of trauma patients with and without Tile B/C pelvic ring fractures based on computed tomography findings

Variables	Tile B/C pelvic fractures		P-value
	Yes (N = 69)	No (N = 129)	
Age (year)			
Mean ± SD	66.59 ± 19.27	51.47 ± 22.51	<0.001
Gender			
Female	50 (72.46)	51 (39.53)	<0.001
Male	19 (27.54)	78 (60.47)	
Physical examination			
Pelvic tenderness	60 (86.96)	40 (31.01)	<0.001
Bleeding per meatus	1 (1.45)	1 (0.78)	0.985
Mechanism of injury			
MVC (4-wheels)	2 (2.90)	9 (6.98)	0.335
MVC (2-3-wheels)	12 (17.39)	47 (36.43)	0.006
Pedestrian	7 (10.14)	8 (6.20)	0.399
Fall from height	10 (14.49)	26 (20.16)	0.439
High energy mechanism			
Yes	31 (44.93)	90 (69.77)	0.001
Vital Signs			
RR (/min)	20.72 ± 3.43	20.63 ± 3.56	0.854
SpO2 (%)	95.30 ± 12.11	95.96 ± 9.48	0.674
HR (/min)	89.88 ± 21.87	92.26 ± 17.71	0.410
SBP (mmHg)	133.93 ± 38.79	131.26 ± 34.53	0.621
Shock index (SI)			
Median (IQR)	0.63 (0.52, 0.86)	0.68 (0.58, 0.85)	0.310
SI ≥ 1	12 (17.65)	13 (10.24)	0.017
Capillary refilling time			
> 2	6 (8.70)	7 (5.43)	0.382
Glasgow Coma scale			
3-8	1 (1.45)	19 (14.73)	<0.001
9-12	2 (2.90)	15 (11.63)	
13-15	66 (95.65)	95 (73.64)	
Associated injury			
Lower extremity	10 (14.49)	34 (26.36)	0.072
Upper extremity	13 (18.84)	28 (21.71)	0.715
Abdomen	10 (14.49)	23 (17.83)	0.690
Bladder	3 (4.35)	0 (0.0)	0.041
Chest	17 (24.64)	43 (33.33)	0.256
Head/ Face	12 (17.39)	47 (36.43)	0.006
Spine	11 (15.94)	35 (27.13)	0.081
Vessel(s)	7 (10.14)	4 (3.10)	0.052
Need to blood transfusion			
Number (%)	11 (15.94)	13 (10.08)	0.257
Intervention			
No treatment	0 (0.0)	79 (61.24)	<0.001
Conservative	34 (49.28)	43 (33.33)	
Surgery	33 (47.83)	7 (5.43)	
Embolization	2 (2.90)	0 (0.0)	
Survival to discharge			
Yes	67 (97.10)	119 (92.25)	0.222

Data are presented as mean ± standard deviation (SD); frequency (%), or median (Interquartile range (IQR)).
MVC: Motor Vehicle Collision, RR: Respiratory Rate, HR: Heart Rate, SBP: Systolic Blood Pressure,
SI: shock index, min: minute.

Table 2: Multivariable logistic regression analysis of the factors associated with Tile Type B/C pelvic ring fractures

Variables	Adjusted OR	95% CI	P-value
Demographic			
Age	1.03	1.00-1.06	0.031
Female	3.82	1.30-11.20	0.015
Physical examination			
Pelvic tenderness	15.25	5.86-39.66	< 0.001
Initial vital signs			
SI ≥ 1	4.20	1.24-14.22	0.021
Mechanism of Injury			
High energy mechanism	4.56	1.10-18.90	0.036

OR: Odds ratio; CI: confidence interval.

Table 3: Multivariable logistic regression analysis of the factors associated with major vascular injury

Variables	Adjusted OR	95% CI	P-value
Demographic			
Age	0.99	0.95-1.04	0.717
Female	0.28	0.04-2.15	0.220
Initial vital signs			
SI ≥ 1	4.17	1.00-17.49	0.051
Mechanism of Injury			
High energy mechanism	1.98	0.11-36.56	0.645
Tile B/C	4.82	1.05-22.05	0.043

OR: Odds ratio; CI: confidence interval.

Table 4: Multivariable logistic regression analysis of the factors associated with need for surgical or radiologic intervention

Variables	Adjusted OR	95% CI	P-value
Demographic			
Age	1.01	0.98-1.04	0.395
Female	1.11	0.28-4.32	0.876
Initial vital signs			
SI ≥ 1	1.28	0.32-5.04	0.726
Mechanism of Injury			
High energy mechanism	4.71	0.99-22.37	0.051
Tile B/C	28.77	9.04-91.60	< 0.001

OR: Odds ratio; CI: confidence interval,
Blood transfusion, Adjusted OR: 6.77, 95%CI: 1.44-31.67, P-value: 0.015.