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Assessment of Undiagnosed Fractures in Trauma Patients with Pelvic Injuries Admitted to Non-Orthopedic Wards at Tabriz University of Medical Sciences

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ABSTRACT

Introduction: Pelvic fractures are severe injuries commonly resulting from high-energy trauma, such as motor vehicle accidents and falls. These fractures can be complicated by missed diagnoses, particularly when patients are admitted to non-orthopedic wards. This study aimed to assess the incidence of undiagnosed pelvic fractures in trauma patients treated in non-orthopedic settings at Tabriz University of Medical Sciences.

Materials and Methods: A retrospective, cross-sectional analysis was conducted on trauma patients with pelvic fractures admitted to non-orthopedic wards from January 2020 to December 2024. Patient demographics, injury mechanisms, fracture types, and missed diagnoses were reviewed from medical records. Data were analyzed using descriptive and inferential statistics.

Results: A total of 300 patients were included, with a mean age of 46.35 years. The majority were male (60.67%), and the primary injury mechanism was motor vehicle accidents (50.33%). Pelvic ring disruptions (42.33%) were the most common fracture type. The incidence of missed fractures was 34%, with pelvic ring disruptions being the most frequently missed (10.33%).

Conclusion: Missed pelvic fractures represent a significant challenge in trauma care, particularly in non-orthopedic wards. The findings highlight the need for comprehensive diagnostic protocols, including early orthopedic consultation and advanced imaging, to reduce the risk of undiagnosed fractures and improve patient outcomes.

Introduction

Pelvic fractures are among the most severe injuries observed in trauma patients, often resulting from high-energy mechanisms such as motor vehicle accidents, falls from significant heights, or blunt force trauma(1). These fractures not only pose a substantial risk to the patient's life but also carry the potential for long-term complications, including hemorrhage, organ damage, and neurological deficits.

In trauma care, timely identification and appropriate management of pelvic injuries are crucial to prevent further morbidity and mortality. However, the complexity of these injuries and the anatomical region involved often leads to challenges in the diagnosis, especially when patients are admitted to non-orthopedic wards (2).

The pelvic region comprises several critical structures, including the pelvis bones, ligaments, and internal organs, such as the bladder, reproductive organs, and large blood vessels.

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Due to the intricate nature of these anatomical components, pelvic fractures can be complicated by associated soft tissue injuries or organ involvement, making the clinical presentation varied and sometimes subtle (3). As a result, fractures may go undiagnosed, particularly when patients are not immediately assessed by orthopedic specialists, or when diagnostic protocols such as imaging are insufficiently implemented in non-orthopedic wards(4).

Trauma patients are frequently admitted to various hospital wards depending on the severity of their injuries, available facilities, and hospital protocols. Non-orthopedic wards, such as emergency departments, intensive care units (ICUs), or general surgery wards, are often the first point of contact for trauma patients(5). While these wards may provide urgent care and stabilize patients, they might lack the specialized orthopedic expertise needed to detect subtle or non-displaced fractures. This gap in specialized care can lead to delayed diagnoses, where fractures remain unnoticed, and treatment is delayed, potentially worsening the outcomes for the patient(6).

The issue of undiagnosed fractures in trauma patients with pelvic injuries is of particular concern in hospitals that have limited access to advanced diagnostic imaging or where orthopedic consultation is not immediately available(7). These fractures, if overlooked, can lead to significant complications, such as chronic pain, disability, and impaired mobility, which can severely impact the patient's quality of life. Moreover, untreated pelvic fractures may result in more extensive surgeries or even long-term care requirements, adding to the healthcare burden and increasing overall medical costs(8).

To address this issue, it is essential to explore the frequency and nature of undiagnosed fractures in trauma patients with pelvic injuries admitted to non-orthopedic wards. Understanding the underlying reasons for missed diagnoses and identifying potential strategies to improve diagnostic accuracy are crucial steps toward optimizing patient outcomes(9). One potential solution is the implementation of a more comprehensive and systematic approach to fracture screening in trauma patients, regardless of their admission ward. Early detection, through a combination of clinical evaluation and advanced imaging techniques such as CT scans or MRI, can significantly improve the prognosis of these patients(10).

Additionally, fostering collaboration between orthopedic specialists and other healthcare providers in non-orthopedic wards is vital. This interdisciplinary approach can ensure that trauma patients receive comprehensive care, encompassing both acute management and long-term rehabilitation. Regular training and education for non-orthopedic medical staff on the identification of pelvic fractures, coupled with the development of standardized protocols for diagnostic imaging, can further reduce the risk of missed fractures(11).

In conclusion, undiagnosed fractures in trauma patients with pelvic injuries pose a significant challenge in healthcare settings, especially in hospitals with limited orthopedic resources or in non-orthopedic wards. These missed diagnoses can result in severe complications, prolonged recovery, and decreased quality of life. By recognizing the importance of timely and accurate diagnosis, improving interdepartmental collaboration, and enhancing staff education, healthcare institutions can better manage trauma patients with pelvic injuries and reduce the incidence of undiagnosed fractures.

Materials and Methods

Study Design: This study is a retrospective cross-sectional analysis conducted at Tabriz University of Medical Sciences. The research aims to evaluate the incidence of undiagnosed fractures in trauma patients with pelvic injuries who were admitted to non-orthopedic wards. Data were collected from hospital records and medical charts of patients who met the inclusion criteria. The study period spans from January 2020 to December 2024.

Inclusion and Exclusion Criteria: Inclusion criteria for this study were:

1. Trauma patients with pelvic fractures, regardless of the severity.
2. Patients admitted to non-orthopedic wards (including emergency department, ICU, and general surgery wards).
3. Patients aged 18 years and older.
4. Availability of sufficient medical records and imaging data.

Exclusion criteria were:

1. Patients with isolated orthopedic injuries (without pelvic fractures).
2. Patients who were transferred to orthopedic wards within the first 24 hours of admission.
3. Individuals with incomplete or missing medical records.
4. Pediatric patients (under 18 years of age).
5. Patients with previous pelvic fractures or conditions affecting bone integrity prior to the current injury.

Sampling Method: A convenience sampling method was employed to select participants from the hospital's trauma registry. The sample included all patients meeting the inclusion criteria during the specified study period. Given the retrospective nature of this study, all eligible cases identified through the hospital database were included, ensuring an unbiased selection process based on clinical presentation and imaging outcomes.

Methodology: Medical records of trauma patients with pelvic fractures admitted to non-orthopedic wards were reviewed. Demographic data, mechanism of injury, clinical presentation, and diagnostic imaging reports (e.g., X-ray, CT scan, MRI) were collected. Special attention was given to identifying any fractures that were initially missed upon admission or during the early stages of hospital care. Any discrepancies between initial clinical assessments and final diagnoses were noted, and reasons for missed diagnoses were explored.
Patients underwent detailed imaging studies, including radiographs, CT scans, and MRIs, as part of their standard trauma assessment. The data was reviewed by a team of orthopedic specialists to identify fractures that may have been initially overlooked by non-orthopedic physicians. The fractures were categorized based on their location, severity, and involvement of surrounding structures such as blood vessels, nerves, and internal organs.

Statistical Analysis: Data were analyzed using descriptive and inferential statistical methods. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize patient characteristics, fracture types, and diagnostic outcomes. Inferential statistics, such as chi-square tests, were applied to evaluate associations between variables, including the presence of missed fractures and the type of trauma or initial clinical presentation. A p-value of less than 0.05 was considered statistically significant. All analyses were performed using SPSS (version 28) or a similar statistical software.

Ethical Considerations: This study was conducted in accordance with the ethical guidelines of the Declaration of Helsinki. The research protocol was reviewed and approved by the ethics committee of Tabriz University of Medical Sciences. All patient data were anonymized, and confidentiality was maintained throughout the study. No direct patient interventions were performed, and all data were collected from existing medical records. Participation in the study did not involve any additional risks or burden to the patients. The ethical code for this study is IR.TBZMED.REC.1401.054.
The ethical guidelines of this study emphasize patient privacy and the use of anonymized data to ensure that individual identities were not disclosed. Informed consent was not required for participation due to the retrospective nature of the study. However, the research team ensured that all data handling followed strict ethical and legal standards related to medical data privacy.

Results

Table 1. Demographic Characteristics of the Study Population

Demographic Factor	Frequency (n)	Percentage (%)
Age (Mean ± SD)	46.35 ± 18.23	-
Gender		
Male	182	60.67
Female	118	39.33
Mechanism of Injury		
Motor Vehicle Accident	151	50.33
Fall from Height	93	31.00
Blunt Trauma	56	18.67

Table 1 summarizes the demographic characteristics of the trauma patients included in the study. The average age of the patients was 46.35 years (± 18.23), with a higher prevalence of male patients (60.67%) compared to female patients (39.33%). The primary mechanism of injury was motor vehicle accidents, which accounted for 50.33% of cases. Falls from height (31%) and blunt trauma (18.67%) were the second and third most common causes, respectively. These patterns reflect a varied range of trauma mechanisms, which can influence the severity and complexity of pelvic injuries.

Table 2: Types of Pelvic Fractures Identified in Trauma Patients

Fracture Type	Frequency (n)	Percentage (%)
Acetabular Fracture	53	17.67
Pubic Symphysis Fracture	38	12.67
Sacral Fracture	34	11.33
Iliac Wing Fracture	48	16.00
Pelvic Ring Disruption	127	42.33

Table 2 outlines the distribution of the different types of pelvic fractures identified among the trauma patients. Pelvic ring disruptions were the most common fracture type, occurring in 42.33% of the cases. Acetabular fractures were observed in 17.67% of patients, while iliac wing fractures

accounted for 16%. Pubic symphysis fractures and sacral fractures were less frequent, at 12.67% and 11.33%, respectively. The predominance of pelvic ring disruption reflects the severe nature of the trauma and the complexity of pelvic injuries, which require thorough evaluation to avoid diagnostic delays.

Table 3: Incidence of Missed Fractures in Non-Orthopedic Wards

Missed Fracture Type	Frequency (n)	Percentage (%)
Acetabular Fracture	22	7.33
Pubic Symphysis Fracture	17	5.67
Sacral Fracture	12	4.00
Iliac Wing Fracture	20	6.67
Pelvic Ring Disruption	31	10.33
Total Missed Fractures	102	34.00

Table 3 presents the data on the incidence of missed fractures in trauma patients admitted to non-orthopedic wards. A total of 102 fractures (34.00%) were missed during the early assessment. Pelvic ring disruptions accounted for the highest proportion of missed fractures (10.33%), followed by acetabular fractures (7.33%) and iliac wing fractures (6.67%). Pubic symphysis fractures and sacral fractures were less commonly missed, at 5.67% and 4%, respectively. This data emphasizes the importance of comprehensive evaluation, including orthopedic consultation and advanced imaging, to reduce the risk of missed diagnoses in trauma patients.

Discussion

Pelvic fractures are severe and complex injuries often associated with high-energy trauma, such as motor vehicle accidents, falls from height, and blunt trauma. The present study aimed to assess the incidence of undiagnosed pelvic fractures in trauma patients admitted to non-orthopedic wards at Tabriz University of Medical Sciences. The findings highlighted that a significant proportion of fractures were either initially missed or misdiagnosed, particularly in patients managed outside of orthopedic specialty care settings. The overall incidence of missed fractures was 34%, underscoring the importance of enhanced diagnostic protocols and collaborative care in trauma management (12).

The demographic data in this study revealed that the majority of the patients were male (60.67%), which aligns with previous studies reporting higher trauma rates among males due to greater exposure to risk factors such as driving or manual labor. The mean age of the cohort was 46.35 years, which is relatively consistent with the general trauma population. The primary mechanism of injury was motor vehicle accidents (50.33%), followed by falls from height (31%) and blunt trauma (18.67%). This distribution reflects the high prevalence of these mechanisms in trauma centers and highlights the need for careful consideration of pelvic fractures in trauma patients, especially those presenting with high-energy injuries (13).

In terms of fracture types, the study found that pelvic ring disruptions were the most common (42.33%), followed by acetabular fractures (17.67%) and iliac wing fractures (16%). Pelvic ring fractures, which involve the bony structure that supports the trunk and the organs in the lower abdomen, are typically associated with significant trauma and are often accompanied by other injuries. These fractures are particularly concerning due to their potential to cause hemorrhage, organ injury, and long-term functional impairment. The finding that pelvic ring fractures were the most common type of injury reinforces the need for thorough screening in trauma patients, as these fractures can easily be overlooked without proper imaging(14).

While pelvic ring disruptions were the most common fractures identified, they were also the most frequently missed, comprising 10.33% of all missed fractures in the cohort. This finding is particularly concerning given the potential for life-threatening complications associated with missed pelvic ring fractures, including massive blood loss and compromised organ function. The fact that 10.33% of pelvic ring fractures went undiagnosed during the initial assessment emphasizes the importance of orthopedic consultation and advanced imaging techniques, such as CT scans, in all trauma patients with suspected pelvic injuries. Early detection and management of these fractures are crucial in preventing delayed complications, including chronic pain, disability, and the need for more extensive surgeries (15).

The study also identified a substantial number of missed acetabular fractures (7.33%) and iliac wing fractures (6.67%), both of which can have long-term consequences for patients if left undiagnosed. Acetabular fractures, in particular, are associated with a high risk of joint dysfunction and long-term disability, especially if they are not identified and treated early. In contrast, iliac wing fractures can lead to complications such as pelvic instability, although they are often less recognized compared to other pelvic injuries. These findings highlight the necessity for a more systematic approach to diagnosing pelvic fractures, particularly in non-orthopedic settings where initial assessments may

lack the expertise to identify subtle or non-displaced fractures (16).

An interesting aspect of the results was the low incidence of missed sacral fractures (4%) and pubic symphysis fractures (5.67%). These fractures, while still clinically significant, were less commonly missed, possibly due to their more easily identifiable clinical presentations or because they were associated with less complex injury patterns. Nevertheless, the presence of missed fractures, particularly in patients admitted to non-orthopedic wards, calls attention to the critical role of early and appropriate imaging, particularly in trauma cases where pelvic injuries are suspected. Standardizing diagnostic protocols across trauma centers, including mandatory imaging for all trauma patients with pelvic injury suspicion, could significantly reduce the incidence of missed fractures(17).

The findings of this study also highlight the importance of collaboration between orthopedic and non-orthopedic specialists in trauma care. Many patients with pelvic fractures were initially admitted to non-orthopedic wards, such as emergency departments and general surgery units, where specialized orthopedic expertise might not be immediately available. This lack of specialized input in the initial stages of care may contribute to the failure to diagnose certain types of fractures. The implementation of a multidisciplinary approach to trauma care, where orthopedic consultation is mandatory in patients with pelvic injuries, could help ensure that fractures are not missed, and appropriate interventions are initiated early(18).

Moreover, the study emphasizes the critical role of imaging in trauma management. While X-rays are the first-line diagnostic tool in many trauma cases, they may not be sufficient to detect all pelvic fractures, particularly subtle or non-displaced fractures. The use of more advanced imaging techniques, such as CT scans or MRI, should be considered in patients with suspected pelvic fractures, particularly when clinical findings are inconclusive or when injuries are complex. Integrating advanced imaging into standard trauma protocols could enhance diagnostic accuracy and reduce the likelihood of missed diagnoses.

Conclusion

In conclusion, the findings from this study highlight a significant gap in the detection of pelvic fractures in trauma patients admitted to non-orthopedic wards, with 34% of fractures remaining undiagnosed during the initial hospitalization. This underscores the need for improved diagnostic practices, including mandatory orthopedic consultation and the use of advanced imaging techniques in trauma settings. Enhanced collaboration between orthopedic and non-orthopedic teams, along with the development of standardized diagnostic protocols, could lead to better identification of pelvic fractures and improved patient outcomes. Ultimately, ensuring that pelvic fractures are diagnosed and managed promptly will reduce the risk of long-term complications, such as chronic pain and disability, and improve the overall quality of care for trauma patients.

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Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

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