

## Demographic and morphological characteristics of combined pelvic and acetabular injuries: a critical study for surgeons specializing in pelvic and acetabular procedures

*Características demográficas y morfológicas de las lesiones combinadas de pelvis y acetábulo: un estudio crítico para cirujanos especializados en procedimientos de pelvis y acetábulo*

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**ABSTRACT. Introduction:** the prevalence of pelvic and acetabular fractures has significantly increased in recent years. Mortality associated with pelvic fractures can reach up to 13%, with hemorrhagic shock being the leading cause of death. There is limited evidence regarding the combined evaluation of pelvic and acetabular fractures, with or without other concomitant injuries. **Material and methods:** a retrospective cohort study was conducted, including patients treated in a high-complexity trauma management service with a diagnosis of pelvic ring fracture associated with an acetabular fracture. The descriptive statistical analysis employed percentage distributions and frequencies for qualitative variables, as well as measures of central tendency and dispersion for quantitative variables. **Results:** sixty-five patients were included in this study, of whom 19 were women (29.23%) and 46 were men (70.77%). The most common type of pelvic ring fracture was type B. The transverse fracture pattern was the most frequent. **Conclusions:** combined pelvic and acetabular fractures are primarily caused by high-energy trauma and are more prevalent in young men. Accurate classification and

**RESUMEN. Introducción:** la prevalencia de fracturas pélvicas y acetabulares ha aumentado significativamente en los últimos años. La mortalidad asociada con fracturas pélvicas puede alcanzar hasta 13%, siendo el choque hemorrágico la principal causa de muerte. Existe evidencia limitada sobre la evaluación combinada de las fracturas pélvicas y acetabulares, con o sin otras lesiones concomitantes. **Material y métodos:** se realizó un estudio de revisión de cohorte retrospectivo, de una serie de casos, que incluyó a pacientes tratados en un servicio de manejo de trauma de alta complejidad con diagnóstico de fractura del anillo pélvico asociada con fractura acetabular. El análisis estadístico descriptivo empleó distribuciones porcentuales y frecuencias para variables cualitativas y medidas de tendencia central y dispersión para variables cuantitativas. **Resultados:** en este estudio se incluyeron 65 pacientes, de los cuales 19 eran mujeres (29.23%) y 46 eran hombres (70.77%). El tipo más común de fractura del anillo pélvico fue el tipo B. El patrón de fractura transversal fue el más frecuente. **Conclusiones:** las fracturas combinadas de pelvis y acetábulo son causadas principalmente por traumatismos

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individualized treatment plans are essential for improving patient outcomes. This study emphasizes the importance of multidisciplinary approaches in managing these complex injuries to minimize complications and promote recovery.

**Keywords:** combined injury, pelvic fracture, acetabular fracture, demographics, morphology.

de alta energía y son más prevalentes en hombres jóvenes. La clasificación precisa y los planes de tratamiento individualizados son esenciales para mejorar los resultados de los pacientes. Este estudio destaca la importancia de enfoques multidisciplinarios en el manejo de estas lesiones complejas para reducir las complicaciones y mejorar la recuperación.

**Palabras clave:** lesión combinada, fractura pélvica, fractura acetabular, demografía, morfología.

## Introduction

The prevalence of pelvic and acetabular fractures has significantly increased in recent years, especially those not linked to bone fragility. These fractures are primarily associated with high-energy trauma, with traffic accidents being the leading cause, followed by falls from heights and direct trauma.<sup>1</sup> Due to the high energy involved, these injuries often present additional complications. Injuries, such as fractures in other bones or damage to internal organs, contribute to increased morbidity and mortality in patients, further raising the costs associated with medical care across different health institutions. Mortality associated with pelvic fractures can reach up to 13%, with hemorrhagic shock being the leading cause of death.<sup>2,3</sup> Conversely, although acetabular fractures rarely compromise the patient's hemodynamic status, they are linked to high rates of short-term, medium-term, and long-term complications.<sup>4,5</sup>

In the past, both pelvic and acetabular fractures were associated with unfavorable clinical outcomes due to inadequate classification systems, limited therapeutic opportunities, and incomplete imaging studies.<sup>6,7,8</sup> However, advancements in classification systems, additional radiological projections, and improvements in management technologies, such as pelvic binders and external fixation, have significantly enhanced the prognosis of these injuries, reducing mortality and associated complications.<sup>6,8</sup> Despite this progress, the current literature includes several studies that evaluate pelvic and acetabular fractures either in isolation or in conjunction with other injuries; however, there is limited evidence regarding the combined evaluation of pelvic and acetabular fractures, with or without other concomitant injuries.

It is crucial to understand the specific characteristics of these injuries and the classification systems used in order to accurately evaluate and treat patients and establish more precise prognoses.<sup>9</sup> The most widely used classification systems for pelvic ring fractures are the Tile and Young-Burgess systems.<sup>10,11</sup> The Tile classification, which is widely accepted, provides a clear description of the degree of instability of a fracture, categorizing them into three main groups based on their biomechanical stability: type A for stable fractures, without interruption of the pelvic ring;

type B for injuries with rotational instability but vertical stability due to the integrity of the posterior ligamentous system; and type C for fractures exhibiting both vertical and rotational instability, resulting from the complete rupture of the posterior ligamentous complex.<sup>11,12</sup>

Each group is further subdivided based on the degree of displacement and instability. For example, Type A fractures are classified into A1 (marginal avulsion), A2 (affecting part of the anterior arch), and A3 (transverse pattern of the sacrum or coccyx). Types B and C are similarly subdivided, providing a clear framework for clinical evaluation and management.<sup>10,11</sup>

The Judet-Letournel classification is the most widely known and utilized classification for acetabular fractures.<sup>13</sup> This system is divided into simple and complex patterns based on the location and characteristics of the fracture line. Its understanding aids in surgical planning and selecting the most appropriate approaches.<sup>13,14</sup>

The initial diagnosis for radiological evaluation is based on simple radiographs, including anteroposterior (AP),<sup>15,16</sup> inlet and outlet projections for the pelvic ring, as well as alar and obturator views for the acetabulum.<sup>17</sup> These images should be complemented by computed tomography and 3D reconstructions, which provide a more detailed visualization of the anatomical structures, facilitating diagnosis and surgical treatment planning.<sup>17,18</sup>

Combined pelvic and acetabular fractures present significant management challenges due to the forces involved in their causation and the frequent presence of associated injuries. A study conducted by Osgood evaluated 40 cases of combined fractures and demonstrated that the most common patterns included type T (23%), followed by transverse fractures (20%) and anterior column fractures (18%). However, this study found no significant differences between anteroposterior and lateral injury mechanisms, emphasizing the importance of individualized evaluation for each patient.<sup>19</sup> Another study conducted by Renji Li also explores the clinical characteristics of patients with unstable pelvic fractures associated with acetabular fractures in a sample of 24 patients with an average follow-up of 23 months, evaluating therapeutic prognosis strategies, emphasizing once again the importance of individualizing each patient's chosen treatment.<sup>20</sup>

Ultimately, bone quality plays a significant role in determining the severity of these injuries. Patients with fragile bones can experience severe fractures even after low-energy trauma, underscoring the need to consider this factor in treatment planning.<sup>21</sup> Although prognosis has improved due to advancements in diagnosis and management, these injuries remain associated with high complication rates and represent a significant challenge for both medical teams and health systems.<sup>22</sup>

### Material and methods

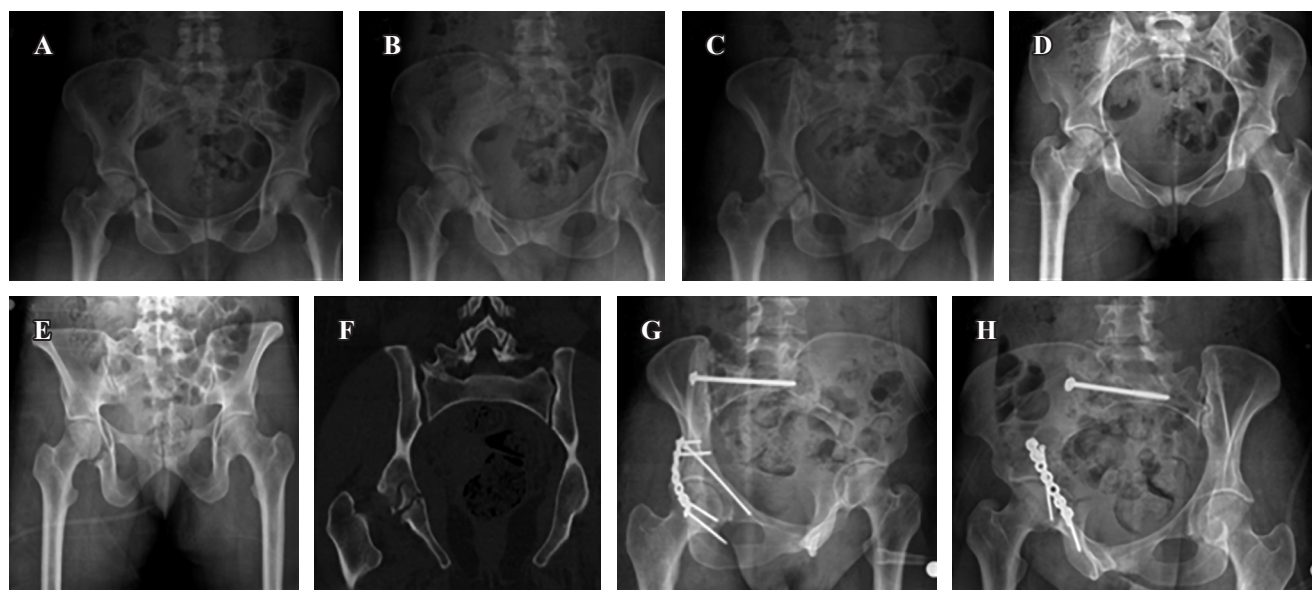
A retrospective cohort was conducted, including patients treated in a high-complexity trauma management service with a diagnosis of pelvic ring fracture associated with acetabular fracture from January 1, 2018, to December 31, 2023. The study population consisted of adult patients who were 18 years of age or older, of any designated sex, with a confirmed diagnosis requiring surgical treatment. The sampling was non-probabilistic, involving consecutive cases within the established period, considering all patients who met the inclusion criteria (*Figure 1*).

Patients with insufficient or unclear medical histories regarding the injury, or those who did not complete treatment in the hospital unit, were excluded from the study. Data was collected through an exhaustive review of medical records, ensuring compliance with ethical standards and a thorough examination of factors such as designated sex, injury mechanisms, and fracture classification according to the systems of Judet-Letournel, Tile, Nakatani and Denis, as well as associated injuries and the time elapsed until surgical intervention.

The descriptive statistical analysis, which aimed to analyze the morphological and demographic characteristics, employed percentage distributions and frequencies for qualitative variables, as well as measures of central tendency and dispersion for quantitative variables. This study, considered «minimal risk» according to the regulations of the General Health Law on Health Research, did not involve direct intervention with participants or intentional modification of physiological, psychological, or social variables, as data were obtained exclusively through document review. All activities were conducted in accordance with the International Ethical Guidelines for Health-Related Research Involving Humans (WHO, 2016). Data were collected and stored anonymously using coded identifiers, and records were kept in locked file cabinets or password-protected electronic files. This approach facilitated control over potential biases resulting from the study's retrospective nature through a high-quality review of clinical records and the exclusion of cases with incomplete information, thus ensuring the reliability of the data and the results obtained. The hospital's bioethics committee approved this study.

### Results

Sixty-five patients were included in this study, comprising 19 women (29.23%) and 46 men (70.77%). Ages ranged from 17 to 65 years, with a mean age of 35. The most common age range was in the third decade of life (17 cases), followed by the fourth decade (14 cases). According to the Tile classification, the most common type of pelvic ring fracture was type B (31 patients, 47.69%),



**Figure 1:** Complete X-ray series for the correct analysis of combined pelvic and acetabulum fractures. **A)** antero-posterior, **B)** Iliac oblique, **C)** obturator oblique, **D)** Inlet, **E)** outlet. This series shows a transverse acetabulum fracture and a sacroiliac dislocation on the same side. Notice how the transverse fracture contributes to generating anterior instability. **F)** CT scan showing sacroiliac instability and the transverse fracture line. **G and H)** Iliac oblique and obturator oblique views with the final fixation of the injury.

**Table 1: The number of pelvic and acetabular fractures is categorized by four classification systems: Tile, Judet-Letournel, Denis and Nakatani.**

| Classification  | Women n | Men n | Total n |
|---|---------|-------|---------|
| <b>Tile classification</b>                            |         |       |         |
| Type A  | 2       | 5     | 7       |
| Type B  | 8       | 23    | 31      |
| Type C  | 9       | 18    | 27      |
| <b>Judet-Letournel classification</b>                 |         |       |         |
| Simple fracture                                       | 12      | 29    | 41      |
| Associated fracture                                   | 7       | 12    | 19      |
| Bilateral (Simple + Associated)                       | 1       | 1     | 2       |
| Bilateral (Simple + Simple)                           | 0       | 3     | 3       |
| <b>Denis classification (sacral fracture)</b>         |         |       |         |
| No fracture   | 15      | 24    | 39      |
| Type I  | 0       | 9     | 9       |
| Type II   | 3       | 11    | 14      |
| Type III  | 1       | 2     | 3       |
| <b>Nakatani classification (pubic ramus fracture)</b> |         |       |         |
| No fracture   | 3       | 14    | 17      |
| Type I  | 0       | 2     | 2       |
| Type II   | 13      | 12    | 25      |
| Type III  | 1       | 7     | 8       |
| Type IV   | 2       | 11    | 13      |

These are disaggregated by sex, indicating counts for women and men. Tile types are denoted as A, B, and C. Judet-Letournel includes simple, associated, and bilateral combinations. The Denis and Nakatani classifications use Roman numerals (I-IV) and indicate the absence of fracture.

followed by type C (27 patients, 41.54%) and type A (seven patients, 10.77%). Frequency was higher in men, with Tile type B predominating in this group, while in women, the most common type was Tile type C (*Tables 1 and 2*).

Regarding acetabular fractures classified according to Judet-Letournel, 41 patients presented with simple acetabular fracture lines, the most common pattern among men (44.62%) and women (18.46%) (*Table 3*). Nineteen patients were shown with complex acetabular fractures; two had a bilateral presentation, combining one simple and one complex, while three presented with bilateral simple patterns. No bilateral subjects with associated fracture lines were identified in this series. The transverse pattern was the most frequent, observed in 26.15% of men. In women, both transverse and anterior columns were equally common (9.23% each). On the right side of the acetabulum, 44.62% of fractures occurred, while on the left side, the rate was 47.69%. Only 7.69% of patients had a second acetabular fracture, which occurred in men and predominantly presented in the transverse pattern (two cases) (*Table 4*).

Sacral fractures occurred in 40% of the patients, being more frequent in men. The most common type, according to Denis classification, was type II, identified in fourteen out of twenty-six patients. Only two subjects presented with bilateral sacroiliac dislocation, while 29 patients (60%) had some degree of sacroiliac dislocation, which predominated in men (25 cases). Regarding the mechanism

of injury, 86.2% were due to traffic accidents, with vehicular accidents being the most common type, followed by motorcycle collisions. Falls from heights greater than 3 meters accounted for the majority of cases outside traffic accidents.

Among the associated injuries, the floating knee was identified in eight patients (12.3%). In three cases, it was present alongside ipsilateral fractures of the pelvic ring, acetabulum, and femur (floating lower limb), while another three cases involved just the tibia. Lumbar transverse process fractures were the most common among spinal injuries, totaling 16 cases (24.6%). Pubic symphysis disruption occurred in 29 patients (44.61%) and was more frequent in men. Ramus fractures were present in 44.62% of the cases, with Nakatani type II predominating. Crescent fractures of the iliac wing were observed in 9.23% of the patients, with equal distribution between men and women.

Additionally, 10.77% of the subjects had ipsilateral hip dislocations corresponding to the acetabular fracture. We also identified six patients (9.23%) with a floating hip due to acetabulum and ipsilateral femur compromise, which generates significant trauma and presents a greater challenge for resolution. Furthermore, four patients (6.15%) exhibited exposed fractures of the pelvic ring, increasing the risk of acute complications such as infections.<sup>23</sup>

Regarding treatment, 36.9% of the patients required external fixation for pelvic ring instability, while 63.1% did not. For definitive management of the pelvic ring, a combination of anterior and posterior approaches (49.2%), followed by the anterior (18.5%), the percutaneous (10.8%), and the posterior approach alone (7.7%). Additionally, 13.8% of the patients did not undergo surgical intervention. In cases of acetabular fractures, the most frequent approaches were the Stoppa combined with the first window of the ilioinguinal (27.7%), the combination of anterior and posterior (21.5%), and the Kocher-Langenbeck approach (18.5%).

In summary, this study indicates that combined pelvic and acetabular fractures are more prevalent in young

**Table 2: Expanded classification of systems in Table 1 includes demographic variables for the entire patient sample.**

|                              |    |
|------------------------------|----|
| <b>Demographic variables</b> |    |
| Sex (Women)                  | 20 |
| Sex (Men)                    | 48 |
| Mean age (years)             | 67 |
| BMI > 40 (No)                | 61 |
| BMI > 40 (Yes)               | 7  |
| In-hospital death (No)       | 63 |
| In-hospital death (Yes)      | 5  |
| Work-unrelated accident      | 49 |
| Work accident                | 11 |
| Commuting accident           | 8  |
| Unknown accident type        | 1  |

The variables include sex, mean age, BMI over 40, in-hospital mortality, and type of accident (work-related, commuting, unrelated, or unknown). Totals are displayed across the population. BMI = Body Mass Index.

**Table 3: Specific anatomical patterns of acetabular fractures align with the Judet-Letournel classification.**

| Fracture type                              | Women<br>n | Men<br>n | Total<br>n |
|--|------------|----------|------------|
| Posterior wall                             | 0          | 4        | 4          |
| Posterior column                           | 0          | 0        | 0          |
| Anterior column                            | 6          | 7        | 13         |
| Anterior wall                              | 1          | 6        | 7          |
| Transverse                                 | 6          | 17       | 23         |
| Transverse + posterior wall                | 3          | 4        | 7          |
| T-shaped                                   | 2          | 5        | 7          |
| Both columns                               | 1          | 2        | 3          |
| Anterior column + posterior hemitransverse | 0          | 1        | 1          |
| Posterior column + posterior wall          | 0          | 0        | 0          |

Includes posterior and anterior wall and column fractures, transverse fractures, T-shaped fractures, both-column fractures, and mixed-pattern types, with counts for women and men.

**Table 4: Presence or absence of a second acetabular fracture reported per patient, as well as the types of secondary fractures when present.**

| Fracture type                              | Women<br>n | Men<br>n | Total<br>n |
|--|------------|----------|------------|
| No second fracture                         | 19         | 41       | 60         |
| Posterior wall                             | 0          | 0        | 0          |
| Posterior column                           | 0          | 0        | 0          |
| Anterior column                            | 0          | 1        | 1          |
| Anterior wall                              | 0          | 0        | 0          |
| Transverse                                 | 0          | 2        | 2          |
| Transverse + posterior wall                | 0          | 0        | 0          |
| T-shaped                                   | 0          | 1        | 1          |
| Both columns                               | 0          | 1        | 1          |
| Anterior column + posterior hemitransverse | 0          | 0        | 0          |
| Posterior column + posterior wall          | 0          | 0        | 0          |

Most patients did not exhibit a second fracture. The breakdown by fracture type reflects the primary acetabular classification used in *Table 3*.

men, with traffic accidents being the primary mechanism of injury. The complexity of these traumas and the high prevalence of associated lesions underscore the importance of accurate diagnosis and appropriate surgical management (*Table 5*).

### Discussion

Combined fractures of the pelvic ring and acetabulum are more common than estimated, with studies showing incidences of up to 15.7%. Their importance lies not only in the detailed search but also in the associated injuries that can increase the complexity of these lesions.<sup>24</sup> The analysis highlights several epidemiological, clinical, and therapeutic

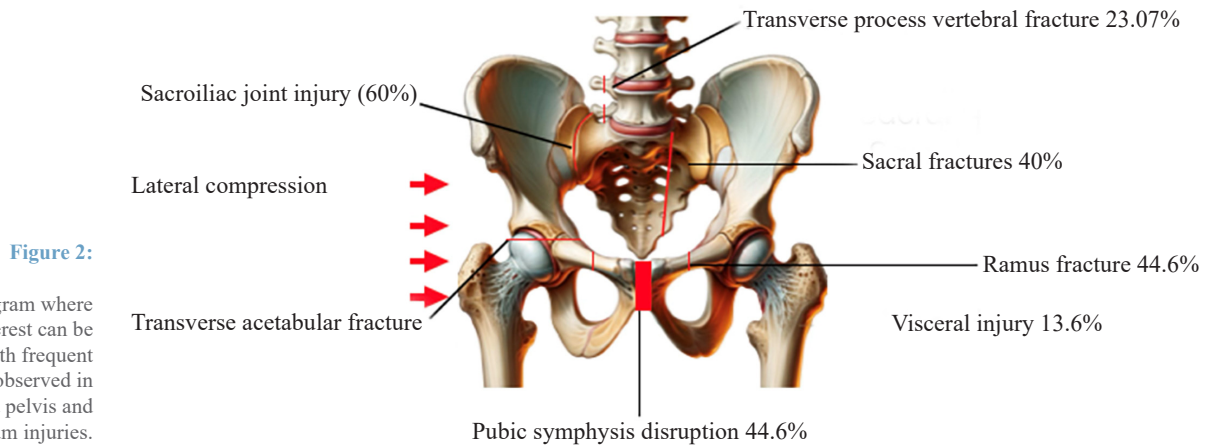
aspects that align broadly with the most recent medical literature. Describing and understanding this pattern allows not only to determine the morphological characteristics but also to establish the risk of associated complex injuries that can not only compromise the patient’s hemodynamic status but also influence the sequence and timing of their fixation.<sup>25</sup> These results highlight the complexity and severity of these injuries, as well as the importance of a multidisciplinary management approach that is grounded in classifications to inform therapeutic decisions. Such decisions depend on the classification of injuries and the patient’s hemodynamic status, which determines the choice between initial damage control (external fixation) and early appropriate definitive management, directed towards various approaches, whether simple or combined, according to the injury and based on pre-surgical planning. There is still a lack of literature on studies that adequately follow up on the objectives of fixation in these combined injuries and the ideal fixation sequence for such injuries due to their complexity.<sup>9</sup> A multidisciplinary approach is necessary to treat combined injuries definitively, based on the patient’s hemodynamic status and associated injuries; therefore, adequate planning is crucial to achieve a favorable outcome.<sup>5</sup>

**Distribution by gender and age:** the prevalence of pelvic and acetabular fractures in young men is consistent with previous studies that attribute this trend to the greater exposure of this group to high-energy mechanisms, such as traffic accidents and falls from significant heights. In our series, 70.77% of the cases were men, with an average age of 35. This aligns with findings from retrospective studies

**Table 5: Summarized key demographic variables by sex, including pregnancy at the time of injury, body mass index over 40 kg/m<sup>2</sup>, in-hospital death, marital status (single, married, other), and religious affiliation (Catholic, atheist, evangelical groups).**

| Variable                     | Women<br>n | Men<br>n | Total<br>n |
|------------------------------|------------|----------|------------|
| Pregnancy at injury          |            |          |            |
| No                           | 18         | 47       | 65         |
| Yes                          | 1          | 0        | 1          |
| BMI > 40 kg/m <sup>2</sup>   |            |          |            |
| No                           | 17         | 43       | 60         |
| Yes                          | 2          | 4        | 6          |
| Death during hospitalization |            |          |            |
| No                           | 19         | 43       | 62         |
| Yes                          | 0          | 4        | 4          |
| Marital status               |            |          |            |
| Single                       | 13         | 25       | 38         |
| Married                      | 6          | 21       | 27         |
| Other                        | 0          | 1        | 1          |
| Religion                     |            |          |            |
| Catholic                     | 17         | 42       | 59         |
| Atheist                      | 0          | 1        | 1          |
| Light of the world           | 0          | 1        | 1          |
| Christian                    | 2          | 3        | 5          |

The table reflects the social profile of the patient population.



where approximately 69% of patients with pelvic fractures were men, although with a slightly higher average age of 48 years. Differences may be explained by geographical, cultural, or occupational contexts influencing risk exposure.

**Fracture patterns and mechanisms of injury:** according to the Tile classification, type B is the most frequent pattern in pelvic fractures, occurring in 47.69% of cases. This aligns with previous studies highlighting rotational instability as a common characteristic of these traumas. Additionally, the lateral compression mechanism is associated with direct trauma, which may explain the frequent occurrence of transverse acetabular fractures and transverse-family acetabular fractures, with relatively low rates of hip dislocation. Type C, representing rotational and vertical instability, is the second most common, observed in 41.54% of patients. This could be related to transverse apophyseal fractures in lumbar vertebrae, which are associated with this instability. This type of fracture is of particular clinical interest due to its association with higher morbidity and the need for complex surgical interventions. Specifically, the transverse pattern is the most common, particularly among men, accounting for 26.15% of cases and also associated with bilateral pubic rami fractures. In some instances, Nakatani III type fractures are associated with transverse fractures, due to a combination of anatomical factors and the trauma mechanism, primarily occurring as a result of high-energy trauma, alongside force distribution that significantly impacts pelvic stability. Acetabular fractures are more prevalent in high-energy injuries, such as vehicular accidents, which accounted for 86.2% of our cases. Within this group, motor vehicle accidents, especially rollovers, were the most frequent, while falls from heights exceeding three meters represented another significant cause (Figure 2).

**Associated injuries and complications:** pelvic and acetabular fractures rarely occur in isolation. In our series, the most frequently related injuries included appendicular skeletal fractures, thoracic trauma, and abdominal visceral injuries. This aligns with previous studies that reported a high prevalence of concomitant

injuries in polytraumatized patients. Specifically, major vascular injuries have been observed in approximately 2.15% of cases, while visceral injuries account for 13.6%, including urethral ruptures and intestinal perforations. These complications not only increase morbidity and mortality but also highlight the necessity for multidisciplinary management involving general surgery, vascular, and orthopedic specialists.

On the other hand, crescent-type fractures, which indicate pelvic instability associated with sacroiliac joint disruption, were identified in 9.23% of cases, with an equal distribution between men and women. Although these fractures are less frequent, they present significant challenges regarding surgical management and functional prognosis.

**Management and Prognosis:** the treatment of pelvic and acetabular fractures largely depends on the stability of the pelvic ring and the fracture pattern, as described by the Tile and Judet-Letournel classifications.<sup>10,13</sup> In our series, over a third of the patients required external fixation. However, whether this intervention was employed as temporary management for patients with hemodynamic instability or as definitive treatment was not documented; this point is relevant, as external fixation is a valuable tool in the initial management of unstable fractures, facilitating patient stabilization and reducing hemorrhage in the context of polytrauma.

The definitive management of pelvic ring fractures involves various surgical approaches, with the combined approach being the most common (49.2%), followed by the anterior approach (18.5%) and the percutaneous approach (10.8%). This finding reflects a trend toward an individualized approach that integrates various techniques to optimize outcomes. In the case of acetabular fractures, the most frequent approach was the Stoppa combined with the first window of the ilioinguinal (27.7%), followed by the combined anterior and posterior approach (21.5%) and the Kocher-Langenbeck (18.5%). These methods facilitate adequate anatomical reduction, essential for preserving long-term joint functionality. Possibly, the «pelvic ring first» approach is the better option to achieve improved outcomes during reduction.<sup>26</sup>

We recommend organizing the preoperative plan as follows: first, assess whether the acetabular fracture causes pelvic ring instability. For instance, a transverse acetabular fracture involves a complete disruption of both columns. If the acetabular fracture does not destabilize the pelvis, such as a posterior wall fracture, the fixation sequence depends on the surgeon's priorities and the practicality of patient positioning. A clear fixation order should be established based on these factors.

When ring stability is compromised, as in the case of the transverse family fractures, it is crucial to follow a fixation order to achieve proper reduction. Our recommendation is to begin by reducing the affected sacroiliac joint or fracture at the level of the sacrum or iliac wing (posterior arch), starting with the posterosuperior part of the pelvis. Achieving a reduction in the support base of the posterior ring is essential to establish a stable structure to begin acetabulum reconstruction. Therefore, the second step will be the acetabular fixation, starting from superior to inferior and from medial to lateral. This approach enables the construction of a stable brim and the completion of the wall reconstruction, which will be followed by stabilizing the anterior ring, such as the pubic rami or pubic symphysis. Sometimes, the reconstruction of the anterior arch coincides with the fixation of the acetabulum (Figure 3).

It is essential to highlight that the prognosis for patients with pelvic and acetabular fractures depends not only on the quality of surgical reduction but also on the presence of associated injuries and complications.<sup>27,28</sup> For example, acetabular fractures accompanied by hip dislocations present a higher risk of developing post-traumatic arthritis, which underscores the need for long-term follow-up and appropriate rehabilitation.<sup>29</sup>

In our series, bilateral acetabular fractures were rare, observed in only 7.69% of cases, all of which occurred in men. This subgroup of patients presents a particular challenge due to increased surgical complexity and a heightened risk of complications. Additionally, Denis II-type sacral fractures, the most common in our population, are associated with a higher risk of neurological injuries, underscoring the importance of thorough preoperative evaluation and postoperative management focused on functional recovery.

One limitation of this study is the small number of patients, so a series with a larger number of cases is recommended for future analyses.

### Conclusions

The findings of this cohort highlight recent studies that emphasize the utility of the Tile and Judet-Letournel classifications as essential tools for guiding the diagnosis and treatment of pelvic and acetabular fractures. Based on trauma characteristics, various fracture morphologies, with transverse acetabular fractures (26.15%) and the transverse family fractures being the most frequent, may be attributed to the lateral compression mechanism. Furthermore, type B pelvic fractures were the most common pelvic injury (47.69%), providing a more precise focus for planning and preferred approaches, considering preoperative evaluation and planning. Given the characteristics and complexity of the predominant injuries, this study preferred combined approaches that offer a broader view of the fracture lines to achieve better fixation sequences with improved outcomes. These outcomes should be assessed in the follow-up of these patients as part of an additional protocol, evaluating

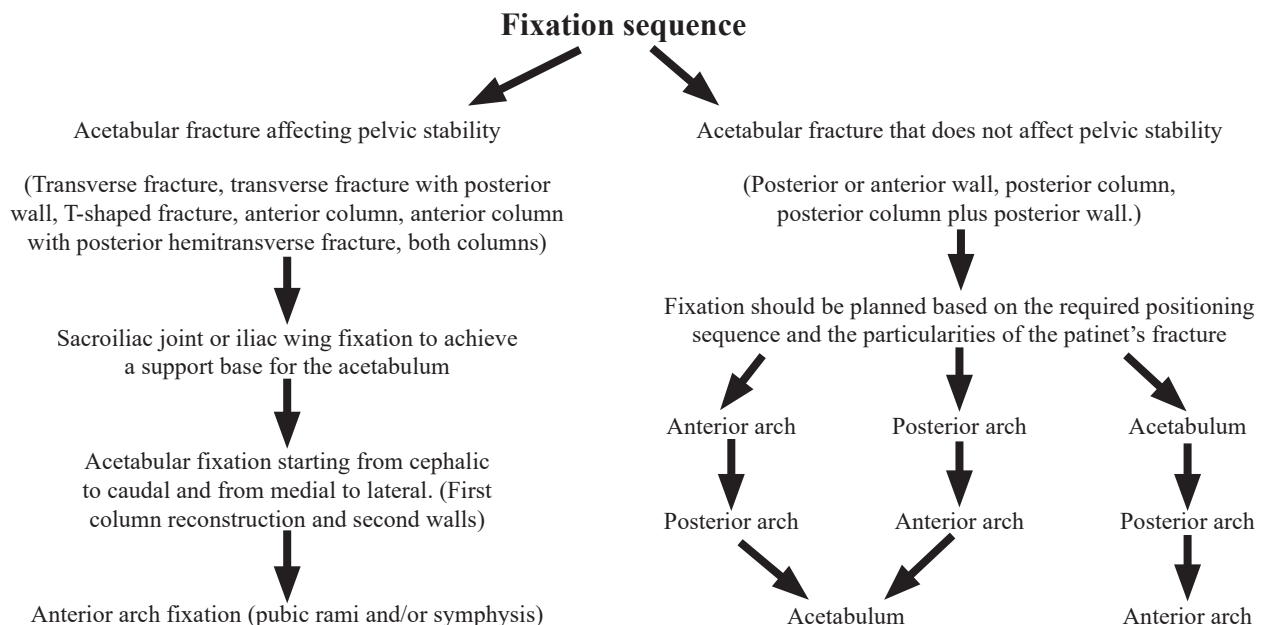


Figure 3: Flowchart illustrating the authors' preferred fixation sequence. Generally, initial pelvic ring stabilization followed by acetabular reconstruction is recommended.

the quality of reduction and function based on the selected treatment.

The high frequency of associated injuries, such as extremity fractures, thoracic traumas, and visceral injuries, highlights the importance of multidisciplinary management in polytraumatized patients. Collaboration among orthopedic teams, general surgery, intensive care, and rehabilitation is essential to address the complexity of these injuries and their complications. Additionally, surgical management must be carefully planned, considering the optimal timing of intervention and selecting the most appropriate approaches for each case, such as combined or acetabulum-specific methods.

In conclusion, managing pelvic and acetabular fractures requires a comprehensive approach that considers anatomical reduction and surgical fixation while also addressing associated complications and long-term functional prognosis. This approach ultimately improves the quality of life for affected patients.

Understanding the most common patterns in combined pelvic and acetabular fractures can lead to the development of appropriate management protocols. This research team is committed to developing a management guide based on the collected data, furthering this line of research.

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