



Clinical Course and Prognostic Factors of Isolated Pubic Ramus Fractures in Geriatric Patients

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Abstract

Aim: This study aims to evaluate the clinical outcomes of geriatric patients with pubic ramus fractures managed conservatively, assessing parameters such as length of hospitalization, blood loss, and accompanying comorbidities, and to investigate the impact of these factors on one-year mortality rates.

Material and Method: A retrospective evaluation was conducted on patients aged 65 and older diagnosed with pubic ramus fractures and admitted to a tertiary care center between 2012 and 2024. Demographic data, existing systemic diseases, laboratory findings, hospitalization duration, and mortality outcomes within a one-year follow-up were examined in detail.

Results: 60 patients were evaluated in the study, with a mean age of 78.00±7.32 years, and 71.7% of the participants were female. The mean hospitalization was calculated as 3.28±2.62 days. A statistically significant relationship was found between the burden of comorbidities and the duration of hospitalization ($p<0.001$). The change in hemoglobin data was 2.36±1.03 g/dL. The fractures of the pubic ramus were 85% unilateral. Among the comorbid conditions, heart failure was the most frequently observed, affecting 71% of the patients. Deep vein thrombosis was present in 9 patients. The mortality rate was 10 percent during the twelve-month follow-up period.

Conclusion: Isolated pubic ramus fractures in older adults should be considered a significant clinical concern due to their association with increased morbidity and mortality. Prompt identification of risk factors influencing hospitalization duration and mortality underscores the necessity of a multidisciplinary approach in patient management.

Keywords: Geriatric, pubic ramus fracture, fall-related fracture, risk factor

INTRODUCTION

With the global increase in life expectancy, fragility fractures have become a major health concern in the elderly population. Among these, isolated pubic ramus fractures are commonly observed but often underestimated in terms of their clinical impact and short-term outcomes.

Pelvic ring fractures are typically associated with high-energy trauma in younger individuals, whereas in the elderly, they more commonly result from low-energy injuries (1,2). With aging societies, the incidence of Fragility Fractures of the Pelvis (FFP), which develop especially on osteoporotic grounds, is increasing (3). One of the most common of these fractures is pubic ramus fractures (4).

In individuals over the age of 50 in the United States, pelvic fractures constitute approximately 7% of all osteoporotic fractures and are responsible for 5% of the

associated healthcare costs (5). While existing literature predominantly focuses on high-energy, unstable pelvic ring injuries in younger populations, Kannus et al. highlighted that the majority of pelvic fractures are osteoporotic reporting that 64% fall into this category, with the rate increasing to 94% among patients aged over 60 (6). Pelvic fractures in geriatric patients are injuries that are frequently associated with factors such as osteoporosis and age-related bone resorption and can lead to significant clinical and surgical difficulties. In particular, ramus pubis fractures can affect the stability of the pelvis and carry a high risk of complications, making the management of this patient group even more complex (7,8). The management of pelvic fractures in elderly patients typically necessitates a multidisciplinary approach. Treatment is individualized and tailored based on factors such as the fracture type, the patient's overall health, and any comorbid conditions present (9).

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In a study by Hamilton et al., the relationship between the duration of hospitalization and mortality in geriatric patients with ramus pubis fractures was examined and it was found that these fractures increased mortality, especially in combination with comorbid conditions such as cardiovascular diseases (10). This study reveals that mortality rates associated with ramus pubis fractures in geriatric patients vary according to age, comorbidity status, and response to treatment. Pubic ramus fractures are frequently associated with skeletal problems such as osteoporosis in geriatric patients, which may further complicate the treatment process. Comorbidities, especially cardiovascular and metabolic diseases, are important factors determining treatment outcomes (7,8,11). Furthermore, due to the high risk of falls in geriatric individuals, early diagnosis and appropriate treatment of these fractures are of vital importance (12).

MATERIAL AND METHOD

This study retrospectively examines the clinical outcomes of pubic ramus fractures in elderly patients. A total of 60 geriatric patients, diagnosed with pubic ramus fractures, were included from those admitted to the Emergency Department of the Department of Orthopaedics and Traumatology at Düzce University between 2012 and 2024. Approval for the study was obtained from the Düzce University Non-Interventional Clinical Research Ethics Committee (Date: 21.04.2025 number: 2024/115). By ethical guidelines, patient data were anonymized and analyzed in adherence to confidentiality protocols. The study included only patients diagnosed with isolated pubic ramus fractures who were treated conservatively and followed for a minimum of one year. Patients with posterior pelvic, acetabulum, and lower extremity long bone fractures, patients who had undergone pelvic surgery, Patients who experienced severe trauma unrelated to the fracture, and those with concurrent terminal illnesses were excluded from the study.

The data were retrieved from the hospital's archive. The parameters analyzed included demographic information (age, gender,) existing comorbidities (Diabetes, Heart failure, Respiratory failure, Cognitive disease, Osteoporosis, Coagulopathy), type of fracture (unilateral or bilateral), duration of hospitalization, changes in hemoglobin levels, need for blood transfusion and mortality at 1-year follow-up.

The first imaging method was anteroposterior (AP) X-ray evaluation. In patients in whom the pelvic ring could not be evaluated, the diagnosis was made with the help of Computed Tomography (CT). When the decrease in the control hemoglobin value of the hospitalized patients stopped, the absence of additional symptoms that would prevent discharge (cardiac or respiratory failure) and the time until discharge were accepted as the duration of hospitalization. The follow-up of the patients after discharge was completed for 1 year with X-ray radiograph controls at 2-week intervals for 6 weeks, 1 month after mobilization started in the sixth week, and then at 3-month intervals. Until the end of the 6-week absolute bed rest and immobilization period, antiembolic treatment was applied to the patients.

Pain management, early mobilization, and physical therapy applications formed the basis of the treatment process. Patients were evaluated clinically and radiologically at regular intervals during follow-up. In clinical follow-up, pain levels, mobility, healing time, and level of independence were taken into consideration. In radiological follow-up, pelvic X-ray radiographs and CT imaging were used when necessary, and fracture healing processes were monitored.

Statistical Analyses

For continuous data, descriptive statistics were calculated using the mean±standard deviation, median, and range (minimum-maximum), while categorical variables were reported as frequencies and percentages. The Shapiro-Wilk test was used to test for normality in continuous data. Comparisons between two groups for continuous variables were performed using the Mann-Whitney U test. For categorical variables, Chi-Square and Fisher's Exact tests were applied where appropriate. All statistical analyses were carried out using IBM SPSS Statistics for Windows, version 20.0 (SPSS Inc., Chicago, IL), with a significance level set at p<0.05.

RESULTS

The study included 60 patients. The mean age of the patients was 78.00±7.32 years, with a minimum age of 65 years and a maximum age of 94 years. Of the patients, 71.87% were female, 15% had bilateral fractures, and 60% had a single fracture. The demographic characteristics of the patients are summarized in Table 1. The prevalence of diabetes was 68.3%, heart failure was 71.7%, respiratory failure was 41.7%, cognitive disorders were present in 43.3%, osteoporosis in 68.3%, and coagulopathy in 60%. Deep vein thrombosis was observed in 15% of the patients. The distribution of comorbidities of the patients are given in Figure 1. During the one-year follow-up, 10% of the patients died.

Table 1. Characteristics of the patients		
	Mean±SD	Median (Min-Max)
Age (years)	78.00±7.32	79 (65-94)
Haemoglobin change	2.36±1.03	1.9 (1.2-1.4)
Amount of Blood used (unit)	1.25±1.14	1 (0-5)
Hospitalization days	3.28±2.62	2 (1-15)
	n	%
Gender		
Right	43	71.7
Male	17	28.3
Side		
Right	23	38.3
Left	28	46.7
Bilateral	9	15.0
Broken bone (Superior-inferior ramus)		
1	36	60
2	21	35
3	3	5.0

SD: standard deviation

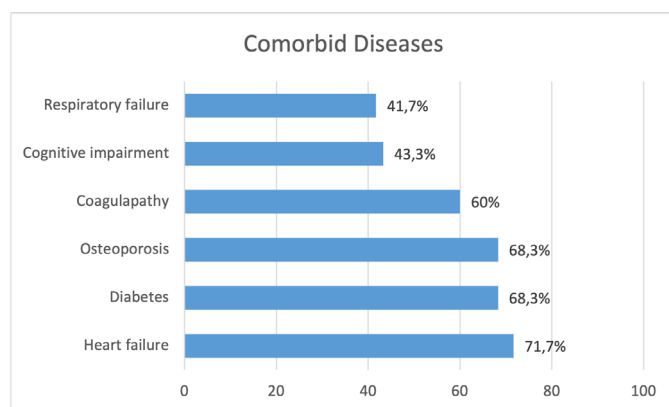


Figure 1. Rates of comorbidities in patients

Patients with coagulopathy had a higher decrease in hemoglobin (2.36 ± 1.03), greater blood transfusion

needs (1.25 ± 1.14), and longer hospitalization durations (3.28 ± 2.62 days) compared to those without coagulopathy ($p < 0.001$). There was no significant difference in hospitalization durations between patients with and without diabetes ($p > 0.05$) (Table 2). Patients with heart failure had longer hospitalization periods ($p < 0.01$). No significant difference was found in the hospitalization durations between patients with respiratory failure and those without cognitive disorders ($p > 0.05$). Patients with osteoporosis had longer hospitalization durations ($p < 0.01$). Patients with deep vein thrombosis also had longer hospitalization periods ($p < 0.05$). Hospitalization duration comparisons in comorbidities are given in Table 3.

No significant difference was observed in the mortality rates between patients with and without coagulopathy ($p > 0.05$).

Table 2. Comparison of haemoglobin change, blood volume and length of hospitalization between patients without coagulopathy and patients with coagulopathy

	Coagulopathy (-) (n=24)		Coagulopathy (+) (n=36)		p
	Mean $\pm$ SD	Median (Min-Max)	Mean $\pm$ SD	Median (Min-Max)	
Hemoglobin decline	1.72 $\pm$ 0.48	1.5 (1.2-3.3)	2.79 $\pm$ 1.08	2.8 (1.2-4.8)	<0.001 ^b
Blood used (units)	0.42 $\pm$ 0.58	0 (0-2)	1.18 $\pm$ 1.09	2 (0-5)	<0.001 ^b
Hospitalization days	1.91 $\pm$ 1.01	2 (1-5)	4.19 $\pm$ 2.96	3 (1-15)	<0.001 ^b

b: Mann Whitney U test, SD: standard deviation

Table 3. Hospitalization duration comparisons in comorbidities

	n	Hospitalization days		p
		Mean±SD	Median (Min-Max)	
Diabetes				
None	19	3.84±2.40	3 (1-10)	0.079 ^b
Yes	41	3.02±2.70	2 (1-15)	
Heart failure				
None	17	1.88±1.11	2 (1-5)	0.001 ^b
Yes	43	3.83±1.84	3 (1-15)	
Respiratory failure				
None	35	3.34±2.79	3 (1-15)	0.982 ^b
Yes	25	3.20±2.41	2 (1-10)	
Cognitive impairment				
None	34	3.32±2.33	3 (1-10)	0.497 ^b
Yes	26	3.23±3.01	2 (1-15)	
Osteoporosis				
None	19	1.89±1.10	2 (1-5)	0.001 ^b
Yes	41	3.92±2.87	3 (1-15)	
Coagulopathy				
None	24	1.91±1.01	2 (1-5)	<0.001 ^b
Yes	36	4.19±2.96	3 (1-15)	
b: Mann Whitney U test. SD: standard deviation				

b: Mann Whitney U test, SD: standard deviation

DISCUSSION

In this study, we evaluated the comorbidity profile, hematological parameters, blood transfusion requirement, length of hospitalization and one-year mortality rates of isolated pubic ramus fractures followed conservatively in the geriatric age group.

In elderly individuals, these pubic ramus fractures often occur with low-energy traumas and treatment management is directly related to the patient's general condition, comorbidities, and fracture type (5,13). Therefore, conservative treatment is generally preferred, but the healing process may be prolonged with age (4,5,9). In this

study, according to the literature, all 60 patients with isolated pubic ramus fractures without any additional fractures had a history of fracture after a simple fall or low-energy trauma.

The effect of comorbid diseases on the conservative treatment of pubic ramus fractures is quite evident (5,8). Especially the presence of dementia, Alzheimer's disease, Chronic obstructive pulmonary disease (COPD), and cardiovascular diseases increases the risk of complications by making compliance with treatment and mobilization difficult (8,9,14). Therefore, a multidisciplinary approach is inevitable in these fractures. Integration of geriatrics, internal medicine, neurology, cardiology, and pulmonology specialists into the process may positively affect the response of patients to treatment (15). In our study, cognitive disorders, along with diseases of the cardiac and respiratory systems, were found to be prevalent in the majority of patients, consistent with existing literature. As in previous studies, a collaborative approach involving relevant specialties was adopted for the treatment planning of all patients, beginning at hospitalization and continuing after discharge.

Osteoporosis constitutes a significant risk factor for pelvic fractures, and the majority of these fractures in individuals aged over 60 are attributed to osteoporotic causes (16). Kanis et al. reported that approximately 7% of osteoporotic fractures affect the pelvic ring and 94% of pelvic fractures are associated with osteoporosis (17). However, this rate was found to be 68.3% in our study, which is lower than the literature. This difference may be because osteoporosis screening has not yet become routine in patients diagnosed with pubic ramus fracture or in geriatric age groups treated for any fracture in our country.

Cognitive disorders, including dementia, are significant contributors to the increased risk of falls in older adults. In these patients, factors such as attention deficits, disorientation, and postural instability heighten their vulnerability to low-energy trauma (18). Tsutsumimoto et al. reported that there are delays in the diagnosis of pubic ramus fractures in individuals with dementia and posterior pelvic ring injuries are often missed. In addition, these patients have difficulty expressing their pain, leading to delayed mobilization and increased complications (19). In our study, when the patient anamnesis was carefully analyzed, there was no clear information about the mechanism and time of simple trauma in geriatric patients living alone. Therefore, it is important to consider the cognitive status in the initial evaluation of geriatric patients with pubic ramus fracture.

Cardiopulmonary diseases such as cardiac and respiratory failure are among the factors that directly affect the recovery process (14,20). These conditions increase postoperative complication rates, prolong hospitalization, and decrease functional independence (16,21,22). Although no direct correlation was observed between the length of hospitalization in our patients with respiratory failure, the length of hospitalization was found to be higher in our patients with heart failure. In addition, patients with osteoporosis, coagulopathy, and deep vein thrombosis had statistically longer hospitalization. In patients with this pubic

ramus fracture, meticulous monitoring of oxygenation and cardiac performance and regulation of coagulopathy are critical for a successful treatment process.

The review published by Roßler et al. in 2024, in which they analyzed the studies after 2000, reveals that the number of cases with mortality in ramus pubic fractures due to low-energy trauma is relatively low (23). However, the increase in the amount of hemorrhage revealed in our study may cause an increase in morbidity and mortality.

The number of concomitant comorbid diseases and especially the presence of coagulopathy increases the amount of bleeding at the fracture site in pubic ramus fractures and this affects the hemoglobin value (24). In our study, the presence of coagulopathy resulted in more bleeding and associated hemoglobin decrease (2.79 ± 1.08 g/dL), more blood product use (1.18 ± 1.09 units), and increased hospitalization (4.19 ± 2.96) days ($p < 0.001$). Unlike other comorbid diseases, this negative effect of coagulopathy is an important parameter in the evaluation of morbidity in geriatric patients with pubic ramus fracture.

This study has some limitations. Firstly, since the study was conducted retrospectively, patient information was analyzed through the existing file records. This may cause some data to be missing or inadequate. Secondly, since the patients included in the study were not routinely screened for osteoporosis, data on bone health were limited. This made it difficult to fully assess the effect of osteoporosis on fracture occurrence. In addition, the cognitive status of the patients was assessed based on available medical records, not on detailed tests. This made it difficult to determine the severity of conditions such as dementia. Another limitation is that the causes of death were not analyzed in detail. Therefore, it was not possible to determine whether mortality was related to fracture or other comorbidities. Finally, the fact that the study was conducted in a single centre and with a limited number of patients limits the generalizability of the results. Larger and multicentre studies are needed to understand this issue more clearly.

CONCLUSION

Conservative treatment is a safe option in geriatric patients with isolated pubic ramus fractures due to simple trauma. However, the success of this process is closely related to the patient's general health status, comorbidities, and hematological values. Therefore, individualized and interdisciplinary approaches are indispensable for optimal clinical outcomes in geriatric patients.

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