OSTEOPOROTIC PUBI RAMI FRACTURES: A BENIGN INJURY?

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Abstract:

Objective: To analyse patients treated for pubic rami osteorporotic fractures in our hospital.
Methods: We carried out a retrospective study of the patients with pubic rami fractures who received treatment at the emergency department of our hospital. The variables considered in our analysis included demographic and diagnostic data, associated injuries, comorbidities, degree of autonomy prior to hospitalization, complications, and mortality after one year.
Results: 60 patients (51 female) with a mean age of around 83.5 years (range, 65.1 – 99) presented with osteoporotic rami fractures. 6 patients had previously suffered other pubic rami fractures, and 23 osteoporotic fractures in other bones. Associated injuries in other pelvic bones were found in 27 cases. 3 patients had associated extrapelvic fractures, and 6 traumatic brain injury. 41 patients experienced complications of some sort. Hospitalization was necessary in 8 cases, with a mean stay of 18 days. Mortality after one year was of 13.3%.
Conclusions: Osteoporotic rami fractures mostly affect women with numerous comorbidities. These patients are affected by a number of complications, with high mortality rates after one year. After ensuring that there are no associated injuries, it is recommended to administer a proper analgesic treatment in order to promote an early recovery of mobility.

Key words: osteoporotic fracture; osteoporotic rami fracture; elderly; morbidities.

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Introduction

Pubi fractures represent between 3% and 8% of the cases of traumatic bone injury [1]. Osteoporotic rami fractures after low-energy traumatism are frequent in the elderly, and their prevalence in the general population is 37/100000 patients. Incidence increases with age and peaks in elderly women aged 85 (450/100000 patients per year). [2]
Due to population ageing, it is an increasingly common condition [3, 4], with which emergency departments deal with increasing frequency. Most elderly patients suffering pelvic fractures receive a conservative treatment, and are prescribed analgesic drugs and load-free rest, which places a heavy socio-economic load on the patients and their families and leading to a loss of autonomy [5].
The epidemiology and prospect of other osteoporotic fractures (such as hip fracture) in elderly patients is well known [6], but there is little data on the characteristics and functional results of osteoporotic rami fracture. Although osteoporotic hip fractures are three times more frequent than rami fractures, the increase in mortality for both types is similar, ranging from 2.0 to 2.5 [6].
Despite being low-energy fractures, they can often threaten the patient's life by causing hypovolemia due to bleeding, injury to pelvic structures, and systemic complications, which add to the risk that losing the ability to move (with its multiple associated comorbidities) can cause in this group of patients.
The objective of this work is to determine the morbidity and mortality rate of this type of fracture after one year.

Patients and Methods

This study was carried out at the Hospital Universitario Miguel Servet, a referral hospital in Zaragoza sector 2 (Spain). The number of citizens that depend on the hospital's services is around 400,000.
In our city, the fraction of the population aged 65 or more has increased over the last years, reaching 17.7% of the total population of Zaragoza (119.353 citizens). [7]
We conducted a retrospective record review of the patients received in the emergency department whose pelvis was sprained or were diagnosed with pelvic fracture, sacral fracture, and rami fracture between January 1 2012 and December 31 2012.
Inclusion criteria were patients aged 65 or more with a diagnosis of pubic rami fracture after low-energy traumatism, defined as fractures caused by falls from a height lower than a meter or occurring in the absence of known traumatism [8]. We excluded fractures caused by high energy traumatisms like car accidents, falls from a height higher tan one meter, and pathological fractures.
In order to obtain information regarding demography, comorbidities, prior autonomy, diagnostic tests used, associated injuries, length of stay at the emergency department, treatment and recommendations at discharge, hospitalizations, complications, and mortality after one year, we carried out a review of the digital clinical history of the patients, the database in which primary, specialized and hospital healthcare data from all the hospitals in the Comunidad Autónoma de Zaragoza are recorded.
Descriptive statistics were used to analyze the data using the software SPSS in its 20.0 version for Mac.

Results

During the whole study period a total of 184 patients received a diagnosis of pelvic fracture. We excluded 124 patients whose age was less than 65, who presented with pelvic fractures other than rami fractures, or suffered high-energy fractures. The remaining 60 cases met the definition of osteoporotic rami fracture. The groups of patients with low-energy fractures and high-energy fractures were demographically distinct: the high-energy group was predominantly male (73%) and included younger patients, with a mean age of 37.3 years (range, 16 – 78), while the low energy group was predominantly female (85%), with a mean age of 83.5 years (range, 65.1 – 99).
The data from patients with rami osteoporotic fracture are shown in Table 1. Falls were the main cause of injury, accounting for 58 patients (96.7%), and injury was not associated with known traumatism in only 2 cases (3.3%). The most frequent location –35 cases (58.3%)– where traumatism occurred were the patients' homes or regular residences.

Table 1: Characteristics of the 60 patients with osteoporotic rami fractures.

Characteristics	Number (%) of patients

Sex	
Female	51 (85)
Male	9 (15)
Mean age (range)	83.5 (65.1–99)
Mobility prior to the fracture	
Autonomous	25 (41.7)
Unilateral support	20 (33.3)
Bilateral support	1 (1.7)
Walker	5 (8.3)
Wheelchair	2 (3.3)
Not specified	7 (11.7)
Fracture mechanism	
Fall	58 (96.7)
No known traumatism	2 (3.3)
Location	
Home - Residence	35 (58.3)
Street	9 (15)
Not recorded	16 (26.7)
Time elapsed until the patient's arrival to the emergency department	
Less than 8 hours	35 (58.3)
8 - 24 hours	11 (18.4)
24 hours - 7 days	10 (16.7)
More than 7 days	4 (6.7)
Laterality of the pelvic fracture	
Right	32 (53.3)
Left	27 (45)
Bilateral	1 (1,7)
Associated pelvic injuries	27 (45)
Acetabulum	22 (36,7)
Sacroiliac	3 (5)
Alae of the sacrum	1 (1,7)
Iliac	1 (1,7)
Associated injuries	
Traumatic brain injury	6 (10)
Distal radius fracture	2 (3,3)
Proximal humerus fracture	1 (1,7)
Rib Fracture	1 (1,7)

Comorbidities and treatment are shown in Table 2. Only one patient had no associated comorbidities or treatment. In relation to the patients' antecedents of trauma, we found that 6 (10%) had suffered osteoporotic rami fracture prior to their current hospitalization and 23 (38.3%) had suffered some other type of osteoporotic fracture (fractures of the distal radius or vertebrae, and proximal humerus or proximal femur fracture). As regards habitual treatment, 30 patients (50%) were receiving some form of treatment that favored bleeding, and only 20 (33.3%) were being treated for osteoporosis at the time in which they suffered the new fracture.

Table 2: Comorbidities and treatments of the 60 patients with osteoporotic rami fractures.

Características	**Número (%) de pacientes**
Comorbidities	59 (98.3)
Arterial hypertension	42 (70)
History of osteoporotic fractures	29 (48,3)
Heart disease or arhythmia	18 (30)
Neurological disorders	17 (28.3)
Arthrosis	17 (28.3)
Depression – Anxiety	16 (26.7)
Dyslipidemia	15 (25)
Diabetes	14 (23.3)
Osteoporosis	14 (23.3)
Respiratory tract diseases	12 (20)
Endocrine disease	10 (16.6)
Dementia	8 (13.4)
Hematologic disease	4 (6.7)
Renal insufficiency	4 (6.7)
No comorbidities	1 (1.7)
Anticoagulant/antiaggregate therapy	30 (50)

Antiplatelets	19 (31.7)
Acenocoumarol	7 (11.7)
Low-molecular-weight heparin	2 (3.3)
Double antiaggregation	1 (1.7)
Antiaggregate + anticoagulant	1 (1.7)
Osteoporosis treatment	20 (33.3)
Calcium and Vitamin D	11 (18.3)
Bisphosphonates	7 (11.7)
SERM	1 (1.7)
Strontium	1 (1.7)

The most frequent fractures were those compromising the iliopubic and ischiopubic rami, which accounted for 50 cases (83.3%). Injury to one isolated ramus was found in 9 (15%) cases, out of which 6 (10%) were cases of fractures of one ischeopubic ramus. One patient was diagnosed with bilateral rami fracture. 27 patients (45%) suffered associated injuries in other areas of the pelvis, of which injury to the acetabulum was the most frequent, occruring in 22 cases (36.7%). Less frequently, we observed injuries to the sacroiliac joint (3 cases, 5%), the sacral ala or the ilium (3 (5%), 1(1.7%) and 1 (1.7%), respectively). In 4 cases (6.6%), extrapelvic fractures were associated to the fall, and in 6 other cases (10%) traumatic brain injury.

For 58 patients (96.7%), diagnosis required radiology exams. In 9 cases (15%) a computer tomography was carried out after the initial exam when it was desirable to clear doubts or it was suspected that there were associated pelvic injuries. Blood analyses were performed on 18 patients (30%). Mean hemoglobin values were 12.6 g/dl (range, 9.6 – 14.5 g/dl) and mean hematocrit values were 37.5% (range, 31.1 – 45.2%). The same measures were repeated after the observation period in the emergency department in 5 cases (8.3%), and it was found that hemoglobin and hematocrit values had dropped to 10.3 (range, 7.6-12.5) g/dl y 30.6% (range, 22.8-35%) respectively.

25 patients (41.7%) required parenterally administered analgesic drugs while in the emergency department. Non-steroidal anti-inflammatory drugs were used in 15 cases (25%), and weak opioids (first level of ATC/index or not) in other 9 cases (15%).

Patients stayed at the emergency department a mean of 390 minutes (range, 40–3270 minutes). 10 patients (16.7%) remained under observation prior to discharge or hospitalization. During this period, it was necesary to transfuse red blood cell concentrates to two patients (3.3%) due to bleeding. 8 patients (13.3%) were hospitalized and left in charge of the traumatology department, with a mean stay of 18 days (range, 7 – 28 days). One of the patients underwent surgery (retrograde screw fixation of the iliopubic ramus), enabling early load, reducing the need for analgesic drugs, and avoiding complications.

47 patients (90.4%) left the emergency department in a regular ambulance after discharge. The recommendations given to them included load-free rest and analgesic drugs of varying levels in all cases. Heparin-based prophylaxis was prescribed in 46 cases (76.6%). The average number of prescriptions for all patients was 3.2 (range, 0.5). Among the analgesic drugs prescribed, 56 were from the first level of the WHO analgesic ladder (paracetamol, metamizole or AINES), 11 from the second level (weak opioids), and 4 from the third (strong opioids).

Out of the 60 patients diagnosed with osteoporotic rami fracture, 41 (68.3%) experienced complications, most of which were solved in primary healthcare centers or while the patients were being examined, without requiring further assistance from the emergency department. The main complication was poor pain control, which occurred in 23 cases (38.3%). However, 14 patients (23.3%) returned to the emergency department within the following month, 5 of which required to be hospitalized due to complications that were directly atributable to the fracture. 7 patients visited the emergency department a third time, 5 of whom were hospitalized. Table 3 provides details on the types of fractures found and their frequency.

Tabla 3: Complications and complication frequency in patients wirh osteoporotic rami fractures.

Complication	Number (%) of patients
Poor pain control	23 (38.3)
Laboratory abnormalities	10 (16.7)
Urinary infection	5 (8.3)
Delirium	5 (8.3)
Pneumonia	4 (6.7)
Deep vein thrombosis or pulmonary embolism	2 (3.3)
Gastrointestinal atony	1 (1.7)

During her stay at hospital, one of the patients died as a result of a respiratory tract infection. After reviewing the clinical history of these patients, we identified 7 more cases (11.7%) of patients who died within the first year after suffering the fracture, which means that mortality after one year was 13.3% (8 cases).

Discussion

Osteoporotic rami fractures are becoming increasingly common due to population ageing. Proximal femur and vertebral fractures related to bone weakening have been widely studied, but few works have analysed the morbidity and mortality of pubic rami fractures.

Rami fractures, the most common form of pelvic bone injury, have traditionally been considered benign injuries, and treated with rest and common analgesic drugs [9]. However, their study is gaining importance, since emergency departments have to deal with them with increasing frequency. In most hospitals these fractures are treated by traumatology departments, but several authors suggest that geriatric medicine and traumatology departments should deal with them jointly in multidisciplinary units, in much the same way it is done with proximal femur fractures [2,4,10].

Despite being low energy fractures and being traditionally classified as stable (Type A fractures according to the classification by the AO/ASIF) [11], in a large number of cases osteoporotic pubic rami fractures are associated with injuries to the sacroiliac joint, ilium fractures, or sacral compression fractures. Lau and Leung [14] carried out CAT on 37 patients with osteoporotic pubic rami fractures and a mean age of 85 years and found that in 22 cases (59%) there were associated fractures in the posterior pelvic bones, which led them to propose that CAT should be routinely carried out when diagnosing these fractures. Cosker et al. [15] obtained magnetic resonance images of 50 osteoporotic rami fractures caused by low-energy traumatisms, and observed sacral fractures in 45 cases. These studies also show there is a strong correlation between posterior pain during physical examination and the presence of posterior injuries, and they argue that pain that persists after rami fractures heal is caused by the associated injuries, most often go undetected and untreated.

In our case, the 5 patients with posterior injuries were diagnosed using CAT, which were carried out when it was suspected that there were associated injuries. We believe that in our review sacral fractures and sacroiliac injuries were subdiagnosed, since more than two thirds of them cannot be detected by regular radiography [16].

Acetabulum fractures are also common. Dodge and Brison [17] studied 77 low energy fractures in patients with a mean age of 81 and found a 22% of cotilum fractures. In our revision, it was observed that in 36.7% cases the fracture crack compromised the cotilum. In several cases, this diagnosis was performed based on successive control X-ray scans during examinations, during which postraumatic hip osteoarthrosis was detected in two patients.

Many complications have been described as being associated to these injuries. First, there are those related directly to the fracture, like bleeding-caused anemia, injury to neighbouring organs or vessels, and pseudoarthrosis, but there can also be seen other complications that result from treating patients prescribing rest and analgesic drugs, which posit serious threats for patients with numerous comorbidities.

Hemorrhagic complications due to injury to the corona mortis (anastomosis between the external iliac system and the obturator that passes over the iliopubic ramus [18]) have been widely covered in the literature, and they are treated by performing embolization on the bleeding vessel. This type of injury has been described in both displaced and undisplaced fractures, independently of whether the injury was caused by high- or low-energy traumatism. According to the literature, the time before the first symptoms of hypovolemic shock varies from 30 minutes to 6 hours after the fracture [19]. It has been proposed that this lapse should be the minimum observation period, especially in cases where there is high risk of bleeding, which is habitual among elderly patients, patients on blood-thinning or antiplatelet therapy and patients with associated coagulopathy. A review of the cases presented in the literature, the only common characteristic of all the patients suffering this complication is injury to the superior ramus or iliopubic ramus, potentially the only fractured ramus [19]. Although certainty in diagnosis is achieved via arteriography, there are descriptions of indirect signs of bleeding in simple radiographies of the pelvis that might suggest the presence of this type of injury [21]. In our study 41.7% of the patients headed to the emergency department more than 8 hours after becoming injured, which means that the recommended minimum observation period had elapsed. Two patients who remained in observation due to having risk factors for bleeding required transfusions of red blood cell concentrates, since their fractures caused bleeding, linked to low hemoglobin and hematocrit. Both cases developed without complications.

Treatment should focus on an early recovery of movility and on controlling pain, which is the main complication. Fractures are usually managed conservatively, by prescribing load-free rest, analgesic drugs, and drugs preventing thrombosis. Some authors suggest that high doses of analgesic drugs (high enough for the patient to walk) should be administered immediately, in order to avoid the complications that result from sustained immobility [22]. Others recommed that patients undergo surgery (screw fixation of the iliopubic ramus) immediately [23]. One of the patients in our review was treated in this way, which improved pain control and allowed her to walk by herself immediately. Ramoplasty, a newer treatment, consists in injecting poly-methyl-methacrylate percutaneously [24, 45] in the same way that this is done in the case of other osteoporotic fractures, like vertebral fractures, which reduces pain instantly.

Despite being caused by minor trauma and being termed benign fractures, osteoporotic fractures have significant mortality rates. In our study, we found a mortality of 13.3%, the same rate found by Hill et al. [4], which is similar to the one in Taillanddier et al. [5], 14.3%. The results obtained by similar studies vary. Morris et al. [2] recorded a mortality of 27% after one year, Dodge and Brison a rate of 17% [17], and Koval et al. [9] a rate of 9.5%. These data are very similar to the mortality rates observed one year after a hip fracture, which varies from 14% to 36% [26].

In order for emergency departments to manage appropriately these types of fractures, it is necessary to prepare a protocol prescribing a minimum observation period of 6–8 hours in cases where there are increases in the risk of bleeding (during which analytic controls should be carried out), which should also specify which diagnostic tests should be carrried out in order to determine if there is a fracture, identify its type of displacement or check whether there are associated injuries to other pelvic bones. In these cases, it might be useful to perform different projections (such as inlet and outlet) of the pelvis aside from AP [27].

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