

Elderly Patients with Pertrochanteric Hip Fracture: In Hospital Care

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Abstract

Objective: To evaluate the improvement in the care of elderly patients hospitalized due to pertrochanteric hip fractures.

Methods: A comparative study of two cohorts of patients admitted due to pertrochanteric hip fracture before (2010) and after the application of in hospital management protocols (2018). The intervention consisted in the implementation of multidisciplinary measures during hospitalization based on current scientific evidence. An evaluation of the clinical results was performed, as well as the health care impact.

Results: The characteristics of patients admitted for hip fracture in 2010 (216 patients) and 2018 (205 patients) were similar in age, sex, Barthel index and the Charlson abbreviated index. In 2018 patients had more comorbidity. A significant reduction of preoperative stay and overall stay in the cohort of 2018 was achieved. Detection of delirium, malnutrition and anaemia was higher in 2018, and a reduced incidence of infection and a better functional efficiency was achieved in this period.

Conclusion: The introduction of measures for the improvement of the pertrochanteric hip fracture management reduces hospitalization with consequent cost reduction. Unification of criteria among professionals may be an opportunity for better clinical results and reduction of complications.

Keywords: Hip; Pertrochanteric; Fracture; Elderly patient; Management

Introduction

Petrochanteric hip fracture is a common pathology in the elderly population and has significant comorbidity and mortality rates [1]. In Spain there are around 40,000 pertrochanteric hip fractures per year [2]. It is estimated that the incidence rate will double by 2050 [3]. The described mortality rate one year after the lesion in the

elderly is around 30%, with less than 50% of the cases recovering the functional capacity prior to the fracture [3-5]. The time elapsed from admission to surgery has implications for global hospitalization time. In-hospital organizational problems and medical comorbidities of patients are two of the main reasons for surgical delay [6]. The cost of treatment of pertrochanteric hip fracture is high mainly in relation to the acute phase of

hospitalization and surgical treatment, with an estimated price in the European Union of between 5,000 and 9,000 euros [4].

There is an association between a worse functional recovery, a higher rate of comorbidities and longer stays, with surgical delay.

In Spain, the average in-hospital mortality during admission due to pertrochanteric hip fracture is 5.3% [7,8]. Our main objective is to present the comorbidity data in the in-hospital management of patients with pertrochanteric fracture, before and after the establishment of multidisciplinary medical protocols in this regard.

Methods

A longitudinal comparative study of two cohorts of patients affected by pertrochanteric hip fracture was carried out. The admitted patients in 2010 constituted the control group, and on patients admitted in 2018 new multidisciplinary medical protocols for in-hospital management were used.

The criteria considered for the selection of the patients were: patients with pertrochanteric hip fracture, with an age equal to or greater than 75 years, excluding those patients with pathological fractures or those who presented high energy trauma. In 2010, 216 patients were admitted, in which no established protocol was applied.

In 2018, 205 patients were admitted, and they constituted the intervention group in which the new measures of medical protocols for in-hospital management were applied.

For the study of the patients the following data were collected: clinical and functional history, epidemiological information on admission, degree of dependence and functional capacity, pharmacological treatments, complications and mortality during admission, existence or not of surgical delay and its cause, epidemiological information on discharge, and existence or not of change of destination of the patient after discharge.

The in-hospital management of patients admitted during 2018 due to pertrochanteric hip fracture was carried out following various multidisciplinary protocols, according to the scientific evidence in this regard [9].

These points of improvement in patient care covered the following aspects:

- **Antibiotic Prophylaxis:** Preoperative antibiotic prophylaxis was performed in all patients. A single preoperative dose of Cefazoline 2 gr. was used. In case of allergy to Bethalactamics, Vancomicine 2 gr. was used.
- **Oxygen Therapy:** In all patients, nasal glasses were used at 3 liters per minute in the preoperative period and during the first 48 hours postoperatively. Oxygen therapy is subsequently maintained if the oxygen saturation was less than 90%.
- **Thromboprophylaxis:** Preoperative low molecular weight heparin was used, with treatment suspension 12 hours before surgery and reintroduction 12 hours after surgery. In patients with renal dysfunction, heparin was withdrawn 24 hours before surgery.
- **Analgesia:** Parenteral regimen of paracetamol alternating with metamizol was used, with a rescue dose of tramadol if needed, in the preoperative time and the first postoperative day. During the second day of the postoperative period, oral analgesia administration was indicated.
- **Management of the Antiplatelet/Anticoagulated Patient:** Establishment of minimum waiting times to surgery from the administration of the antiagregant: five-days for clopidogrel and between two and three days for the new oral anticoagulants according to renal function, while acetylsalicylic acid does not need to wait. In relation to acenocumarol, surgical waiting is reduced using K vitamin, until normalization of the INR.
- **Surgical Priority:** Elderly patients with hip fracture were a surgical priority, and the necessary means and infrastructure must be sought to carry out the surgery in the first hours after the injury.
- **Delirium:** If the patient is diagnosed with dementia or has delirium since admission, treatment was prescribed, if possible orally, with risperidone 0.5 mg / 12h. Without the history of dementia and without delirium, risperidone was prescribed 0.5-1 mg if agitation.
- **Anemia:** Transfusion indication of two red blood cell concentrates with hemoglobin (Hb) levels less than or equal to 8 gr / dl. If the Hb figure is greater than 10 gr / dl, transfusion is not required. With Hb levels between 8 and 10 gr / dl, transfusion is indicated if the patient has cardiac insufficiency, respiratory or cerebral ischemia. In the case of Hb between 8 and 10 gr / dl, with no indication of transfusion, sucrose iron 200 mg iv / 3 times per week (600 in total) was used.

- **Rehabilitation:** In the postoperative period, the sitting was performed within the first 24 hours and the standing started between 36 and 48 hours according to the patient's tolerance. The re-education of the march was carried out with the help of the Rehabilitation Service.
- **Malnutrition:** If the patient presented nutritional risk or malnutrition, (score greater than 3 on the Nutritional Risk Scale), protein supplements were prescribed.
- **Social Risk:** In a multidisciplinary way, the geriatric, traumatology and nursing services carried out an assessment of the patient's social situation from the moment of admission, coordinating with the social workers the necessary resources in this regard.

The treatment of the personal data required in this study complies with the Spanish Law of Protection of Personal Data 03/2018, of December 5.

The descriptive analysis consisted in the study of the means and standard deviations for the quantitative variables, and of the proportions for the qualitative ones. Bivariate analysis was performed to compare the groups. To know the pattern of relationship between the variables, the t-Student test and the χ^2 test (Chi square) with Yates correction if necessary were used. Statistical analysis was performed with the SPSS © version 16 program (SPSS Inc., Chicago, IL). Throughout the

statistical analysis, the existence of statistically significant differences was assumed when a value of $p < 0.05$ was obtained.

Results

The analysis of the epidemiological variables did not reveal the existence of significant differences between the groups of patients admitted in 2010 and in 2018 in relation to age and sex (Table 1). The most predominant origin of the patients was from the private home in both groups, but with a greater presence in the group of the year 2010 of patients from family home. We found no differences in the preoperative Charlson and Barthel index between the two periods, with the most frequent comorbidities being dementia, cardiovascular pathology and diabetes mellitus. The surgical treatment used in all cases was the proximal femoral nailing. The type of anesthesia most used was the spinal one in the two groups, with no differences in this regard ($p = 0.706$).

During admission (Table 2), significant differences were found between the groups in the diagnoses of anemia, delirium and malnutrition, more frequent in the 2018 patient group; on the other hand, the incidence of surgical infection was higher in the 2010 group. The overall mean hospital stay showed a significant difference from 16.5 days in 2010 to 9.3 days in 2018.

Variable	2010 n (%)	2018 n (%)	Value p
Patients (n ^o)	216	205	
Age (SD)	87,26 (5,76)	85,18 (5,82)	0,057
Sex			0,125
-Males	38(17,59)	47 (23,98)	
-Females	178(82,41)	149(76,02)	
Provenance			0,009
-Family	65(30,10)	33(16,09)	
-Individual	78(36,11)	95(46,34)	
-Residency	73(33,79)	77(37,56)	
Deambulation			0,427
-Autonomous	62 (28,71)	51(24,87)	
-With help	145(67,13)	142(69,26)	
-No deambulation	9(4,16)	12(5,85)	
Barthel Index. Media (DE)	64,86 (25)	65,13 (27)	0,983
Comorbidity	214(99,07)	205(100)	0,50
Number of comorbidities. Mean (SD)	5,59 (3,04)	5,72(3,4)	0,115
Charlson Index. Mean (SD)	1,63 (1,2)	1,78(1,2)	0,361
with ≥ 3	49(22,68)	51(24,87)	0,410
Anaesthetic Risk ASA			
-III-IV	177(81,94)	140(71,42)	0,563

-I-II	39(18,06)	56(28,58)	
Surgical treatment	196(90,74)	186(91,77)	0.664
No surgical treatment possible (no suitable anesthesia)	20(8,26)	19(-8,23)	0.764
Anesthetic technique			0.165
Spinal	165 (-84,18)	171 (-91,9)	
General	31(-15,8)	15(-8,1)	

Table 1: Baseline characteristics of the patients.

In relation to the surgical delay, the number of patients waiting for surgery for more than 72 hours decreased by almost 15% from 2010 to 2018 (Table 2). The mean reason for the delay in 2018 was the lack of operating room available or admission during weekend (Figure 1).

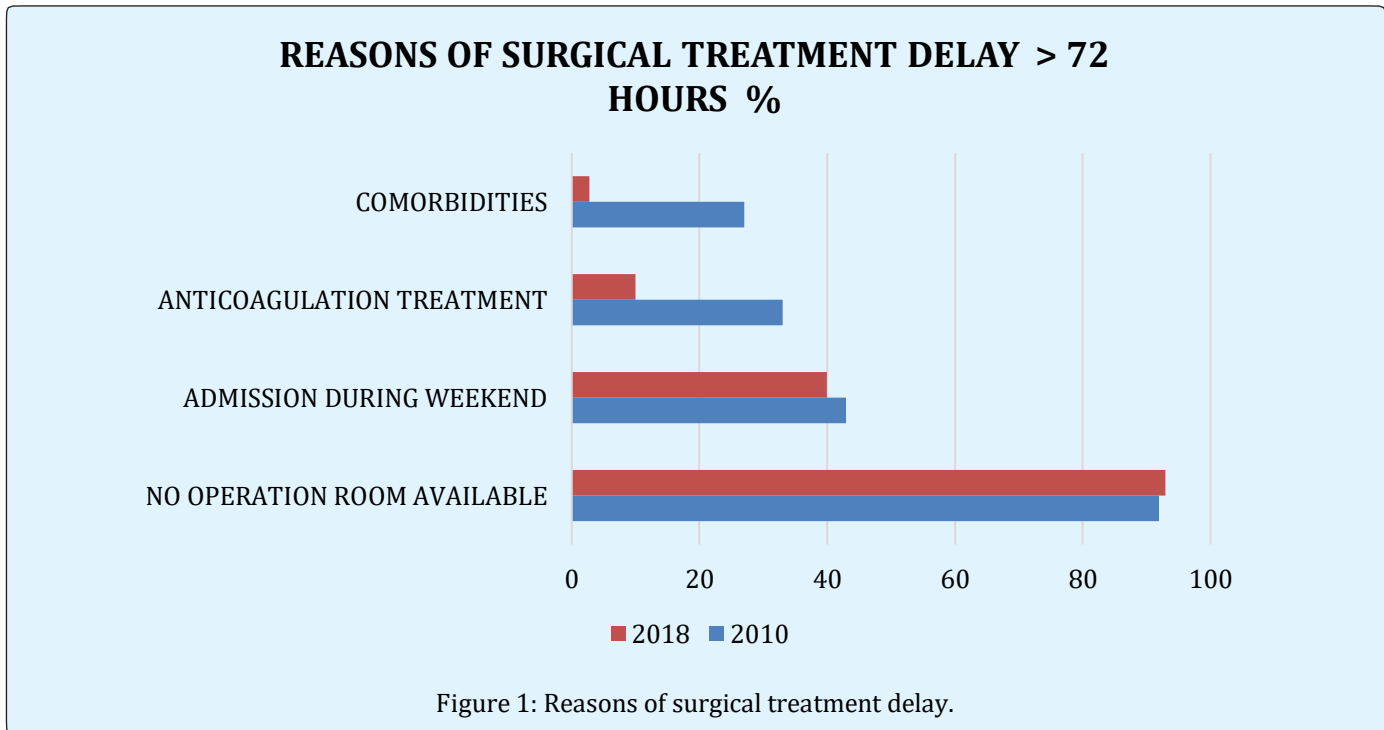
The hospital mortality was 9.26% in the case of the group of patients of the year 2010 and 6.52% in the group of 2018, without significant differences ($p = 0.265$). The functional capacity at discharge, including the variable hospital stay duration as a correction factor, presented significant favorable results in the group of patients of the year 2018 ($p = 0.000$). The number of drugs at discharge

was similar in both groups. Differences were found regarding the number of patients treated for osteoporosis at discharge, which is much higher in 2018 ($p = 0.00$). There were no differences in terms of institutionalization or change of habitual residence. The analysis of the entire group of patients showed that the surgical delay was significantly associated with a greater overall stay ($p = 0.000$), with a greater number of complications during hospitalization ($p = 0.022$) and a greater number of drugs at discharge ($p = 0.023$). Likewise, it was observed that the number of complications was related with a high number of comorbidities and with a delay in surgery exceeding 72 hours ($p < 0.005$).

Variable	2010 n (%)	2018 n (%)	Signification (p< 0,05)
Nº complications >=2	109 (50,5)	173 (83,9)	0,00
Cardiovascular	60(27,77)	49(25,51)	>0.05
Respiratory	39(18,05)	27(14,79)	>0.05
Surgical wound infection	14(6,48)	5(2,04)	0,031
Urinary infection	12(5,55)	14(8,67)	>0.05
Anemia	174(80,55)	181(95,41)	0,001
Delirium	78(36,11)	101(53,00)	0,002
Malnutrition	24(11,11)	52(28,57)	0,001
Pressure ulcers	12(5,55)	10(5,10)	>0.05
Renal insufficiency	51(23,61)	47 (-22,83)	>0.05
Thromboembolic disease	6(2,77)	4 (-1,95)	>0.05
Hidroelectrolytic	41(18,98)	42 (-20,48)	>0.05
Diabetes decompensation	22(10,18)	17 (-8,29)	>0.05
Mortality	20 (9,26)	13 ((6,12))	>0.05
Transfusion	114 (65,51)	104 ((56,15))	>0.05
Intravenous iron	0 (0)	47 (24)	0,004
Nº drugs at discharge. Mean (SD)	7,53 (3,1)	8,80 (3,09)	>0.05
Osteoporosis treatment (%)	29(14,80)	140 ((76,09))	0,002
Preoperative hospital stay. Mean (SD)	6,23 (3,3)	3,2 (2,3)	0,001
Global hospital stay. Mean (SD)	16,61 (8,1)	9,08 (3,9)	0,001
Surgical delay n (%)	163(83,16)	118 (68,40)	0,005
Destination to discharge			0,012
-Home address	54(27,55)	62 (30,43)	
-Family address	59(30,10)	33 (16,09)	
-Residency	83(42,34)	97(47,31)	
Change of location	29(14,79)	39 ((20,11))	>0.05

Institucionalization	21(10,7)	31(15,2)	>0.05
Barthel Index on Admission	64,86	65,14	>0.05
Barthel Index at discharge	31,35	37,72	>0.05
Eficiencia funcional. Mean (SD)	4,21 (3,6)	7,56 (4,4)	0

Table 2: Clinical comparison of both groups (2010 / 2018).



Discussion

The studied patients have on average a number of comorbidities that far exceeds that registered in other similar series [11,12]. In this regard, it is worth mentioning dementia (present in 42% of patients in 2010 and 47% in the 2018 group), followed by cardiovascular pathology and diabetes. González Montalvo [13] collected the prevalence of other diseases in patients admitted due to hip fracture obtained by various series, registering a percentage of arterial hypertension of 29-47%, dementia of 8-36%, 8-40% of ischemic heart disease, 7-23% of diabetes, cancer disease of 5-13%, Parkinson's of 4-8% and 3-18% of renal failure, among others. The patients in this study took an average of six drugs, with a polypharmacy percentage of 60%-70%, a figure higher than that recorded in other publications [4,14].

During the acute phase of a hip fracture, between 15 and 30% of patients present serious complications,

registering a great variability in the frequency of some authors to others [15-17]. Our patients had a higher average of complications in 2018. The fact that health personnel have been trained in the detection of them through the implementation of protocols may influence the greater registration of complications in the group of patients of the year 2018. In the analysis of all the patients we have found that the number of complications was associated with a high number of comorbidities (Charlson index greater than three and more than five comorbidities), including dementia, the degree of dependence on admission (Barthel index) and the delay in surgery exceeding 72 hours ($p < 0.005$). Postoperative anemia was, with a percentage of around 95%, the most frequent complication in 2018, finding statistically significant differences compared to the 2010 group ($p = 0.00$). Despite this, the number of patients treated with blood transfusion was lower in the 2018 group.

Delirium is detected more frequently in our group of 2018 (53%) than in 2010 and with similar percentages to other studies of the literature [18]. The improvement in the detection and treatment of delirium, included in the nursing registry, is related to an early detection. The same explanation may be the case of malnutrition, with percentages in 2018 exceeding 28%, comparable to those of other works [19] and much lower than in 2010. The lower proportion of surgical wound infection was registered in the 2018 group, with a significant difference from 2010. It should be noted that the percentage of this complication in the two periods studied is lower than in other series [6,11]. Several factors may have influenced this result. We highlight the implementation of an antibiotic prophylaxis protocol, reviewed in 2017, the early detection and treatment of malnutrition and the lower number of transfusions, all of which are related to increased infections. The results are consistent with the intervention performed, since the training of personnel in the revised protocols allows improving the detection and treatment of complications [20].

In Spain, hospital mortality in elderly people with hip fracture is around 5% [5]. In our study, in-hospital mortality frequencies in the acute phase were greater, 9.26% and 6.12% in the 2010 and 2018 groups, respectively. There are numerous factors that influence hospital mortality, making comparison between studies difficult. Factors that contribute to a lower percentage of hospital mortality in previous studies [6,21,22] are the inclusion of younger patients, the exclusion of preoperative deaths and patients with non-surgical treatment with a short hospital stay. The meta-analysis published by Hu, et al. [23] analyzes preoperative mortality predictors and concludes that among the 12 most potent are the high number of comorbidities and preoperative dementia. In this aspect, in the two years studied, a high number of previous comorbidities were obtained (between five and six), with a percentage of dementia of 42% and 48%, respectively, all factors related to increased hospital mortality.

On the other hand, this work has included people older than 75 years old, non-surgical treatments and deaths prior to surgery, which may have contributed to the result of higher mortality (excluding the last two, hospital mortality drops to 5.1% in 2010 and to 2.87% in 2018). The average time of admission in our study has been reduced comparing the year 2010 with 2018. Literature described the improvement in the rates of total hospital stay depending on the type of geriatric assistance between five and nine days [12,13,24]. The average

preoperative stay in Spanish hospitals is around 4.31 days [5,25]. In our revision, the waiting time until surgery has been significantly reduced in the group of 2018 in 1.83 days. This data has been improved with the new planning of the scheduled surgical activity and the establishment of a higher priority for hip fracture surgery. It has been the lack of operating room availability, as in other studies [6], with figures greater than 90% in the two periods, the most frequent cause of surgical delay. Analyzed all the patients of our study, a relationship has been established between surgical delay and the number of complications, the increase in drugs at discharge and the total hospital stay. There is a discrepancy in the literature about the association between surgical delay and mortality. In fact, prospective and retrospective studies conclude that there is no relationship between presurgical stay and one-year mortality [6,26], although they recommend early surgery in order to avoid medical complications and improve patient comfort. On the other hand, when an adjustment is made for age, sex and comorbidity, others authors showed that the delay of more than 48 hours from the moment of admission to the hospital leads to an increase in mortality at six months and one year [27,28].

In our data, almost 6% more patients in the 2018 group change their location at discharge. The change is that fewer patients go to the family home and more patients go to residences, probably influenced by the new family structure, with less support for the dependent ancient. The absence of a Functional Recovery Unit as a specific geriatrics resource means that the only options available are the return to the home or the ancient's residency [29]. Many times, the absence of centers to which patients can be referred after the acute phase avoids early discharge [30]; however, in our experience it has been possible to reduce the overall stay of the intervention group, sometimes using the only recourse available (ancients residences) [29]. Both groups studied were discharged with a higher prescription of drugs than in the period prior to admission. This data may reflect the ability of geriatrics to detect a greater number of new diagnoses and reduce the incidence of complications that go unnoticed during the time of admission, which justifies the increase in the number of drugs at discharge. These therapies include, as in other studies [14,19], the highest degree of treatment for secondary prevention of osteoporosis.

Among the limitations of this study, the possibility of information biases can be considered. Since the variables used have been recorded from the clinical history of each patient, the quality of the completion of the same could

have a different impact. To avoid it as much as possible, electronic and paper-format documentation have been used, which has helped to improve data recording. As advantages, the update on clinical problems is pointed out by the researchers themselves and by the collaborative group, provoking a consensus to improve patient care. The descriptive nature of the study prevents establishing causal relationships, although the consistency of the results with other studies of similar characteristics supports the coherence of the findings.

The establishment of a quality improvement plan, agreed upon among all the professionals involved in the hip fracture process, contributes to unifying criteria, determines opportunities for improvement and can achieve beneficial effects comparable to the organization in an orthogeriatrics unit. Among the benefits, this work finds a reduction in hospital stay, with the consequent reduction in costs and greater detection of complications, which allows them to be treated more efficiently, without negative repercussion at the clinical, functional or survival level.

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