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Incidence of bone protection and associated fragility injuries in patients with proximal femur fractures

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ABSTRACT

Objectives: Our aim was to investigate whether patients presenting with fragility fractures of the proximal femur are receiving osteoporosis treatment and to assess the number of other fragility fractures they have sustained prior to admission.
Methods: All patients presenting to our institution with fragility fractures of the proximal femur within an 18-month period (January 2012–August 2013) were included. Patient demographics; fracture classification (AO/OTA); American Society of Anesthesiologists (ASA) grade; Abbreviated Mental Test Score (AMTS) on admission; type of operation; time to operation; *peri*-operative complications; length of hospital stay (LOS); walking status; osteoporotic medication; Dual-energy X-ray absorptiometry (DEXA) results; additional fragility fractures; and mortality were collected and analysed.
Results: A total of 1004 patients (278 male) met the inclusion criteria and were included into the study. The mean age was 82.01 years and mean LOS was 19.54 days. Fifty-four per cent of the patients were admitted from their own homes whereas 43% were capable to walk indoors without any aids before their injury. Mean time to surgery was 2.06 days (Median: 1.31, range: 0–26 days).
Three hundred and six patients (30.5%) had at least another fragility fracture before the index episode (mean 1.40 fractures; SD: 0.71 fractures; range: 1–6 fractures). Only 16.4% were under complete osteoporosis treatment on admission, defined as receiving calcium with vitamin D and a bisphosphonate or an alternative agent.
When we compared patients without a history of a previous fragility fracture (Group A) and patients with at least another previous fragility fracture (Group B), we found that patients in Group B had a significantly lower AMTS score, lower bone mineral density (BMD) as evident on the DEXA scan, an inferior mobility before admission and a higher incidence of extracapsular fractures ($p < 0.05$).
On discharge, patients in Group B had a higher chance of receiving complete bone protection compared to group A (27.9% versus 41.7%; $p < 0.01$).
Following discharge, 11.2% of the patients sustained an additional fragility fracture. The mean time from the index episode to the additional fracture was 0.65 years, whilst these injuries were more frequent in Group B (RR = 1.638; $p < 0.05$).
Conclusion: Patients presenting with a hip fracture are generally under-treated for osteoporosis. Post-operative assessment by a designated geriatrician and use of a standardised protocol is of paramount importance for reducing the risk of additional fragility fractures. Additionally, screening of the elderly population for identifying the patients who suffer from osteoporosis can potentially reduce the risk of sustaining a further fragility fracture.

Introduction

Osteoporosis represents a progressive pathological condition characterised by the loss of bone mineral density (BMD), involving the disruption of the microscopic structure of bone [1]. Its prevalence in adults older than the age of 50 years has been

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reported as high as 9.0% in the United Kingdom [2] and 10.3% in the United States [3]. It has also been estimated that osteoporosis affects more than 22 million women and 5.5 million men in the European Union, making this one of the biggest problems of our times [4].

Osteoporosis is often associated with the presence of fragility fractures, defined as fractures that occur as a result of minimal trauma, such as a fall from a standing height, or even with no identifiable trauma [5]. Hip fractures, a common manifestation of fragility fractures, represent injuries with devastating consequences and are associated with great mortality and morbidity, posing a significant financial burden to any healthcare system [6]. Their incidence is estimated as high as 400 per 100,000 persons-years [7], whereas less than 50% of these patients return to their prior-to-fracture functional status [8,9].

It has been previously reported that the presence of a fragility fracture increases the risk of an additional fragility fracture by 2.03 times during the first year post-injury [10,11]. It is obvious from the above that osteoporosis treatment should commence as soon as possible in order to prevent any additional fractures, whereas for patients who are currently under treatment, this should be revisited [5,12].

The World Health Organization (WHO) and the National Institute for Health and Care Excellence (NICE) has set the criteria for treating osteoporosis according to the results obtained in dual energy X-ray absorptiometry (DEXA). Initiation of treatment is recommended for patients with T scores lower than −2.5 of either spine or the hip, or patients who sustain a fragility fracture [13,14]. It remains however difficult to decide whom to treat among the large number of patients who have osteopenia (T score of −1.0 to −2.5). For patients with T scores higher than −1.5, therapy is not recommended unless clinical manifestations of osteoporosis are evident.

With regards to the type of treatment, if the patient can take an oral agent, first line therapies involve oral bisphosphonates such as alendronate or risedronate. If the patient cannot tolerate oral bisphosphonates, intravenous zoledronic acid, ibandronate or denosumab are recommended. Anabolic agent teriparatide is also used as an alternative to bisphosphonates [15,16]. Calcium and Vitamin D supplements are required when the dietary intake is insufficient [15,16]. Adherence to therapy should be confirmed with regular follow-ups, as several authors suggested that this can be as low as 20% [17,18,19]. Additionally, in the UK it has been postulated that osteoporosis is undertreated, with only 9.7% of the patients sustaining a hip fracture receiving at least one drug for bone protection [12].

The aim of our study was to identify the incidence of osteoporosis treatment in patients presenting to our institution with a fragility fracture of the proximal femur. Secondary outcomes include investigating the type of osteoporotic medication prescribed and the effectiveness of treatment in preventing additional fragility fractures.

Materials and methods

Following institutional board approval, we performed a retrospective analysis of all consecutive patients admitted to our institution with fragility fractures of the proximal femur, over an 18-month period (March 2012 to August 2013). In patients older than the age of 65, fragility fractures were defined as fractures occurring as a result of minimal trauma (fall from a standing height, or even with no identifiable trauma). In patients younger than the age of 65, the presence of a DEXA scan with a T-score lower than −1.5 (hip and/or spine) was necessary to confirm the diagnosis of fragility fracture. Patients presenting with pathological fractures or fractures as a result of high-energy injuries were excluded from the study. Finally, all patients were managed according to a multidisciplinary standard protocol and were followed-up for a minimum of one year (mean: 1.61 years; range: 1.0–2.25 years).

Patients' information and clinical records were retrospectively reviewed for seven years prior to the index admission. Data documented included: patient demographics; mechanism of injury; fracture classification (according to AO/OTA [20]); type of osteoporotic treatment; DEXA scan results (T Scores of hip and/or spine; the lowest value was considered when examining degree of osteoporosis); number and location of additional fragility fractures; American Society of Anaesthesiologists (ASA) grade; abbreviated mental test score (AMTS); time to operation; complications and mortality.

Complications were divided into two groups according to their severity and the effect on patient's health and recovery. Minor complications included those that did not have a significant impact to the patient's outcome (such as the development of urinary tract infection (UTI), urinary retention, constipation etc.). Major complications on the other hand included those that resulted to a re-intervention, a significantly increased length of hospital stay or adversely affected the patient's post-operative recovery and quality of life (such as wound infection, generalised sepsis, thromboembolic events etc.).

For assessing the completeness of the osteoporotic treatment, this was considered as complete when administration of Vitamin D (800–1000 IU per day) with or without the addition of Calcium (1000 mg per day for male population and 1200–1500 mg per day for female population) as required and a bisphosphonate agent. In any other case, treatment was considered as incomplete [21,22].

Patients were then divided into two groups according to the presence or not of previous fragility fractures. Group A included patients with no previous history of fragility fractures. Group B comprised of patients who had at least one fragility fracture prior to the index hip fracture. Subgroup analysis was also performed according to the number of previous fragility fractures.

Statistical analysis

Statistical analysis was performed using the SPSS version 22.0 software (SPSS inc., Chicago, IL) for Windows®. Parametric and non-parametric tests were used as appropriate. A p-value of less than 0.05 was considered as significant.

Results

During the period investigated, 1028 patients presented to our institution with fragility fractures of the proximal femur. Five patients were excluded due to metastatic disease and nine patients due to the background of a high-energy trauma. The remaining 1004 patients (723 females) met the inclusion criteria and were included into the study. The median age was 84.20 years and mean time to surgery was 2.06 days (median: 1.31; range 0-28 days). The 30-day mortality was calculated as 10.0%, whereas 1-year mortality as 30.8% (Table 1). Twenty-eight patients sustained bilateral fractures, in those patients, the second hip fracture was considered as the index event.

The incidence of proximal femoral fractures in our area (population of 751,000 during 2011 census [23]) was 0.9 fractures per 1000 habitants/year. For patients older than the age of 60 years, the incidence was 4.23 fractures per 1000 habitants/year, whereas in the female population the incidence was calculated to 5.8 fractures per habitants/year. Finally, for female patients older than