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# OVERWHELMING UNDERUSE OF BISPHOSPHONATES IN FRENCH NURSING HOME RESIDENTS AFTER PROXIMAL FEMORAL FRACTURE

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**Abstract:** *Objective:* To evaluate the prescription of bisphosphonates in female nursing home residents aged 75 and older with a history of proximal femoral fracture. *Design:* Observational descriptive study, led in Brest, France, between June and August 2015. *Setting:* 12 nursing homes in Brest, France. *Participants:* Female nursing home residents, aged 75 and older, with a history of proximal femoral fracture were included. Exclusion criteria were contraindications to bisphosphonate treatment and residents restricted to bed and chair. *Measurements:* The primary endpoint was the evaluation of prescription of bisphosphonates at the time of the study. The secondary endpoints were to evaluate vitamin D supplementation and factors associated with bisphosphonate prescription. *Results:* 12 of the 116 included residents (10.3 %) received bisphosphonates. 66.4 % received vitamin D supplementation. *Conclusion:* Despite successive French and international recommendations, there is still a very important underuse of treatment by bisphosphonates in old institutionalized female patients with a very high risk of fracture.

**Key words:** Osteoporosis, proximal femoral fracture, nursing homes, bisphosphonates, underuse.

## Introduction

As a result of the incidence and the severity of osteoporosis, as well as the increase in life expectancy, osteoporosis is a major public health concern with about 1.7 million new hip fractures in the world per year (1). In France, this number reached 67 000 in 2013 (2).

The main complication of osteoporosis is bone fracture, particularly severe fractures, after a common low energy fall, responsible for a significant increase in disability and mortality (3-5).

The strongest predictor of further fractures is a history of prior fracture (6).

Updates of international and national guidelines have recently been published and recommend bisphosphonates as first line treatment for elderly patients with a high risk of fracture(s) (7, 8).

But the recommendations can be misinterpreted and bisphosphonates may be underused in this population (9).

Among nursing home residents, 18.0% to 24.2% are affected by osteoporosis (10, 11). A previous study demonstrated that using bisphosphonates reduced all-cause mortality in this population (12), aged 85.7 on average.

No data exists on the use of bisphosphonates in nursing home residents with prior proximal femoral fracture, who are at high risk of new fractures.

The main objective of this study was to evaluate the frequency of prescription of bisphosphonates after a proximal femoral fracture in institutionalized women over 75, in the nursing homes of the city of Brest, Brittany, France.

The second objectives were to observe the frequency of prescription of vitamin D and to compare the characteristics of the residents who received bisphosphonates with those of the residents who did not receive bisphosphonates.

## Methods

It was a descriptive study conducted in the nursing homes of the city of Brest, France, between June and August 2015.

The inclusion criteria were:

- Women aged 75 years or over
- With a previous proximal femoral fracture after a low energy fall within ten years before the beginning of the study

The exclusion criteria were:

- Contra-indication for bisphosphonates: renal failure with creatinine clearance calculated with Cockcroft formula below 30mL/min (oesophageal diseases were not an exclusion criteria because of the possibility of parenteral administration)
- Proximal femoral fracture having occurred more than 10 years before the beginning of the study
- Residents who could not walk, and were restricted to bed and chair.

Nursing homes residents were included after approval of coordinating doctors and general practitioners.

The Ethic Committee of the University Hospital of Brest agreed to this study.

Data were collected in medical files: age, date of proximal femoral fracture, creatinine clearance, history of other fractures, vitamin D supplementation, recurrent falls (two falls or more in the last year), diagnosis of a neurodegenerative disease, result of the last Mini Mental State Examination scoring, polypharmacy (defined as 5 medications or more a day), comorbidities, mobility (walking, with or without aid, restriction to bed and chair).

The primary endpoint was the existence of a prescription of bisphosphonates at the time of the study.

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**Table 1**
Population Characteristics and Variable of Interest According to Prescription of Bisphosphonates

| Collected Data | | Study population (n=116) | Residents not treated by BP (n=104, 89.7%) | Residents treated by BP (n=12, 10.3%) | P-value |
|---|---|---|---|---|---|
| Mean age (years±SD) | | 88.9 (±4.9) | 89.0 (±5.0) | 87.8 (±4.0) | .35 |
| Mean anteriority of proximal femoral fracture (years±SD) | | 4.0 (±2.5) | 4.0 (±2.6) | 3.8 (±2.1) | .77 |
| History of other fracture (n, %) | | 70 (60.3%) | 61 (58.7%) | 9 (75.0%) | .36 |
| Vitamin D supplementation (n, %) | | 77 (66.4%) | 67 (64.4%) | 10 (83.3%) | .33 |
| Recurrent fall (≥2 last year) (n, %) | | 56 (48.3%) | 53 (51.0%) | 3 (25.0%) | .09 |
| Neurodegenerative disease(n, %) | | 51 (44.0 %) | 48 (46.2%) | 3 (25.0%) | .16 |
| MMSE scoring (±SD) | | 19.6 (±5.2) | 19.7 (±5.1) | 18.7 (±6.4) | .72 |
| Comorbidities (n±SD) | | 6.9 (±3.0) | 7.0 (±3.4) | 6.9 (±2.8) | .32 |
| Number of medications per day (n±SD) | | 7.9 (±3.1) | 7.8 (±3.2) | 9.1 (±2.5) | .11 |
| Polypharmacy (≥5 medications a day) (n, %) | | 91 (78.5%) | 80 (76.9%) | 11 (91.7%) | .31 |
| Mobility (n, %) | | | | | |
| | Wheelchair | 28 (24.1%) | 26 (25.0%) | 2 (16.7%) | .73 |
| | Walking | 88 (75.9%) | 78 (75.0%) | 10 (83.3%) | .73 |

BP: bisphosphonates; MMSE: Mini Mental State Evaluation

The second objectives were to evaluate the frequency of vitamin D prescription and to compare the characteristics of the residents depending on the prescription of bisphosphonates.

Statistical analysis: average, standard derivation, numbers and percentages were calculated by Microsoft Excel. We used a khi² test, Fisher exact test and Student test for univariate analysis. The analyses were considered significant when $p<0.05$.

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## Results

We contacted coordinating doctors of the 16 nursing homes of Brest. Twelve agreed to include their residents. The data collection was conducted between June and August 2015.

The results are reported in Table 1.

Out of the 861 women living in the 12 nursing-homes, 225 had a previous proximal femoral fracture (26.2%). Thirty-nine were excluded because of renal insufficiency (creatinine clearance below 30mL/min with Cockcroft formula), 56 were excluded because they were restricted to bed or chair, 14 were excluded because the fracture had happened more than 10 years before the beginning of the study.

Thirty-two residents for whom the date of the fracture was not indicated in their medical records were included in the study. A total of 116 residents were included. The mean age was 88.9±4.9 years. The proximal femoral fracture occurred on average 4.0±2.5 years before the inclusion. Residents had an average of 6.9±3 comorbidities and were prescribed an average of 7.9±3.1 medications per day. Ninety-one were polymedicated (78.5%). 51 had a neurodegenerative pathology (44.0%). Fifty-five residents had a MMSE scoring mentioned in their medical records with an average score of 19.6 (±5.2). Fifty-six residents had fallen twice or more in the 12 last months (48.3%).

Seventy-seven received vitamin D supplementation (66.4%).

At the time of the study, 12 residents were prescribed a bisphosphonate (10.3%), intravenous zoledronic acid for one patient, oral risedronate for one patient and oral alendronic acid in 10 patients. It was impossible to know precisely when the treatment by bisphosphonate was initiated.

In univariate analysis, there were no significant difference between the treated group by bisphosphonates and the untreated group considering the different variables of interest (table 1).

## Discussion

Our study showed an important underuse of bisphosphonates in nursing homes residents with proximal femoral fracture (10.3%) despite the last guidelines (7, 8). To our knowledge, it was the first French study conducted specifically in nursing home residents. A study published in 2014 showed that only 8.1% of non-institutionalized elderly patients received bisphosphonates immediately after hip or wrist fractures (13). Some studies were conducted in nursing homes in the United States. A study conducted in New Jersey between 1999 and 2004 concluded that only 5.5% of nursing home residents with severe fractures received an anti-osteoporotic treatment (14). Prescription of bisphosphonates concerned 19% of nursing home residents with osteoporotic fractures in Arizona and North Carolina in 2003 and 2004 (15).

This underuse of bisphosphonate in nursing home residents may be explained by difficulties with an oral treatment (treatment has to be taken before meal, without lying down during 30 minutes afterwards). Theses constraints could induced a poor compliance (16). Compliance could be increased

by once yearly injection treatment. In our study, only one resident was treated by intravenous zoledronic acid.

Other studies analyzed determinants of the prescription of bisphosphonate in elderly nursing home residents. Colon-Emeric and al. found that residents living in nursing home far from a big city received most frequently bisphosphonates. Patients with esophageal pathology were treated less frequently (15). In another study, Parikh and al. showed that female sex, age and history of prior fracture were predictive of bisphosphonate prescription (14).

In our study, 66.3% of the included residents received a vitamin D supplementation. In 2004, Kamel and al. showed than 58% of nursing home residents received vitamin D supplementation (17) and in 2007,Colon-Emeric and al. published a study in which 63% of nursing homes residents with prior severe fracture received vitamin D supplementation (15). These results demonstrate the persistence of an underuse of vitamin D supplementation in the institutionalized population.

Explanations for this overwhelming underuse of bisphosphonate in nursing home residents with very high risk of fracture could be the lack of knowledge of the recommendations, the misinterpretation of the guidelines as suggested by Tuck and al. (9) and/or the absence of specific recommendations for institutionalized persons. Recently, specific recommendations were published in Australia (18) and Canada (19) for the treatment of osteoporotic nursing home residents, and these recommendations indicated to treat residents with prior severe osteoporotic fracture by bisphosphonates in first line.

The strength of this study was the inclusion of a majority of nursing homes in the city of Brest (12 nursing homes out of 16 participated in the study), the selected sample could be representative of the target population.

But we could hypothesize an inclusion bias, by including only residents living in nursing homes where coordinating doctors had agreed to participate in this study. Furthermore, there is a measurement bias, with the inclusion of residents whose date of proximal femoral fracture was unknown in the medical records.

In conclusion, this study shows that there is an important underuse of bisphosphonates in female residents over 75 years with a history of proximal femoral fracture living in 12 nursing homes of the city of Brest, despite successive guidelines on treatment of osteoporotic severe fractures. It seems that there has been no improvement in the frequency of prescription of bisphosphonates in nursing homes so far (14). Guidelines on the treatment of osteoporosis should probably include specific recommendations for nursing home residents at very high risk of fracture.

A further study would be useful to evaluate why medical doctors do not prescribe bisphosphonates in this population.

*Conflicts of interest:* None.

*Ethical standards:* The authors declared that this study complies with the current laws in France.

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