Underdiagnosis of osteoporotic vertebral fractures in patients with fragility fractures: retrospective analysis of over 300 patients

Vanna Bottai¹
Stefano Giannotti¹
Gloria Raffaetà¹
Maurizio Mazzantini²
Francesco Casella¹
Gaia De Paola¹
Agnese Menconi¹
Francesca Falossi¹
Giulio Guido¹

¹ Second Orthopedic and Traumatologic Clinic, University of Pisa, Pisa, Italy
² Rheumatology Clinic, University of Pisa, Pisa, Italy

Address for correspondence:
Stefano Giannotti
Second Orthopedic and Traumatologic Clinic
University of Pisa
Via Paradisa 2
56124 Pisa, Italy
Phone +39 050 993647; Fax +39 050 992025
E-mail: s.giannotti@med.unipi.it

Summary

Osteoporosis (OP) is a silent disease unless a fracture occurs; it is a major health problem, mainly due to fragility fractures, that occur at vertebral and peripheral sites. Vertebral fractures (VF) are probably the most common fragility fractures, but they go often unrecognized. The main clinical symptoms of VF are acute and chronic back pain, spinal deformity, reduced mobility and impaired quality of life. They are frequently associated with other fragility fractures.

We examined 476 patients at our outpatient clinic, who were referred for fragility fracture occurrence. The most common fragility fractures were hip fractures. However, after execution of spine X-rays in patients who had sustained hip fracture, we found that a large proportion of them had VF, which had not been reported in their medical history.

KEY WORDS: fragility fractures; vertebral fractures; osteoporosis.

Introduction

Twenty percent of the Italian population is over 65 years of age, 5.6% over 80 (1), resulting in increasing number per year of osteoporotic fractures. Vertebral fractures (VF) are common in the elderly, and approximately 1.5 million VF occurs annually in the U.S. population (2). Approximately 25% of all postmenopausal women in the US have a VF during their lifetime. The prevalence of this condition increases with age (3, 4). VF are the most common fragility fractures and the European Vertebral Osteoporotic Study found that 12% of both men and women, aged 50-80 years old have VF (5, 6). Population studies have shown that the annual incidence of VF is 10.7 for 1000 women and 5.7 for 1000 men (7). In Italy only 27.6% of clinical vertebral fractures are hospitalized, based on database of hospitalization, results from a 3-year multicentric study (2004-2006: 2792 vertebral fractures) (8). It is difficult to assess their real incidence of VF, because it is estimated that 2/3 of VF never come to clinical attention (9). However, vertebral deformities are associated with higher risk of subsequent osteoporotic fractures and increased risk of mortality (10-12).

VF can cause severe physical limitations and significant disability; multiple adjacent VF can lead to progressive deformity of the spine, resulting in thoracic hyperkyphosis and/or lumbar hyperlordosis, with consequent muscle hypotrophy, impaired pulmonary function due to volume restriction, dyscalcium and poor gait (14, 15).

VF confers a 5-fold increased risk of developing another vertebral fracture (13).

VF also significantly increase medical costs: the estimated annual costs of VF in the US is 746$ million (17, 18).

The diagnosis of VF is based on clinical examination and radiography. Anteroposterior and lateral radiographs of dorso-lumbar spine are the initial diagnostic modality (Figures 1, 2). Genant et al. developed an evaluation method of VF, based on vertebral shape (wedge, concave, or crush) and on decreases in anterior, posterior, and/or middle vertebral height (grade 0, no reduction; grade 1, minimal fracture, 20-25% height decrease; grade 2, moderate fracture, 25-40% height decrease; and grade 3, severe fracture, greater than 40% height decrease) (19).

Another imaging modality used to evaluate VF is computer tomography (CT) scan, ideal for imaging complex fractures and determining the degree of VF (Figure 3). Magnetic Resonance Imaging (MRI) is helpful for evaluation of cord compression and cord injury and for ligamentous disruptions (Figure 4). MRI scan can also show if VF are recent and/or not consolidated, showing bone edema in T1- and T2 sequences.

Non surgical treatment is the preferred approach to VF. Conservative treatment includes a short period of bed rest followed by gradual mobilization with or without external orthoses (20, 21). Conservative treatment included adequate analgesia, osteoporosis medication and individualized physiotherapy. However there are not standardized protocols for this conservative treatment.

About 65% of patients are treated successfully with conservative treatment. Risk factors of failure of 3-weeks conservative treatment are older age (> 78.5 years), severe OP (T-score < -2.95), overweight (BMI > 25.5) and larger collapse rates (> 28.5%) (22).

Surgical treatment is indicated for those patients with intractable/unresponsive pain (23-25).
Systematic reviews of kyphoplasty have shown significantly improved back pain and quality of life compared to conservative therapy (26). It is always necessary to combine the surgery with an

Figure 1 - AP X-ray.

Figure 2 - LL X-ray.

Figure 3 - CT scan of VF.

Figure 4 - MRI of multiple VF.
adequate antosteoporotic therapy. The incidence of new fractures, despite antosteoporotic treatment, three years after percutaneous vertebroplasty, has been reported to be as high as 27.8% (27).

The purpose of the study is to assess, on a sample of 478 patients over 65 with at least one fracture, the incidence of patients with:

- fragility fractures, defined on the basis of medical history, dynamics of occurrence of a fracture (minor trauma or atraumatic), blood chemistry and densitometry exams
- total VF
- isolated VF
- VF associated with other fractures
- VF undiagnosed prior to the visit.

Materials and methods

Authors evaluated 478 patients, 424 W (minimum age 66, max 98, average 81.43) and 54 M (min 69, max 90, average 80.25), treated at the outpatient clinic dedicated to fragility fractures. This clinic is dedicated to those patients over 65 years that reported at least one fracture. At the first visit, not all patients had a prior diagnosis of osteoporosis and fractures were not necessary all fragility fractures. The age of the patients spanned from 67 to 98 years, with an average of 79.6 years.

The diagnosis of fragility fracture was performed based on the history and fracture dynamic, radiographs (evaluation cortical index of the humerus and femur to upper or lower limb fractures) (28), blood tests (blood count, Ca, P, ALP, PTH, vitamin D, protein profile, Ves, creatinine) and mineralometric evaluation. The patients who complained pain in the thoracic and/or lumbar spine, even in the absence of direct trauma, a dorsal/lumbar spine X-rays, AP and LL was carried out.

Results

Of the 478 patients considered (424 women and 54 men), the patients with a fragility fracture were 322, 67.6% of total fractures, 279 W and 43 M.

The most common fragility fracture was a femur neck fracture (146 cases corresponding to 45.4% of all fractures, of which 16 M, 130 W, minimum age 67, max 98, average age 81.8) followed by the fracture of the humerus (85 cases, 65 W and 20 M, 67 min, max 89, average 75.23) (Table 1).

VF were found in 47 patients (14.6% of fragility fractures) including 44 W and 3 M with minimum age of 68 years and a maximum of 98 (mean 80.1); 18 VF were “isolated fractures” (38.3% of VF, 5.60% of fragility fractures) and 29 VF were associated with other fractures (61.7% of VF, 9% of fragility fractures) (Table 2).

Table 1 - Number of fragility fractures recorded in different sites.

<table>
<thead>
<tr>
<th>Fragility fractures</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femoral neck fr.</td>
<td>146</td>
<td>45.4%</td>
</tr>
<tr>
<td>Homerus fr.</td>
<td>85</td>
<td>26.3%</td>
</tr>
<tr>
<td>Vertebral fr.</td>
<td>47</td>
<td>14.6%</td>
</tr>
<tr>
<td>Wrist fr.</td>
<td>34</td>
<td>10.6%</td>
</tr>
<tr>
<td>Others</td>
<td>10</td>
<td>3.1%</td>
</tr>
</tbody>
</table>

Table 2 - VF associated with other fractures.

<table>
<thead>
<tr>
<th>Fragility fractures</th>
<th>Number of associated VF</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femoral neck</td>
<td>19</td>
<td>65.5%</td>
</tr>
<tr>
<td>Homerus</td>
<td>5</td>
<td>17.2%</td>
</tr>
<tr>
<td>Wrist</td>
<td>3</td>
<td>10.3%</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
<td>6.98%</td>
</tr>
</tbody>
</table>

Regarding the combination with other fractures, 19 VF (65.5% of "associated" VF, 40.4% of total VF) were associated with femoral neck fractures; 5 (17.2% of "associated" VF, 10.6% of total VF) with homerus fractures; 3 (10.3% of "associated" VF, 6.38% of total VF) with wrist fractures and 2 (6.98% of "associated" VF, 12.76% of total VF) with fractures in different sites.

All isolated VF were already diagnosed before the clinical evaluation at the outpatient clinic for fragility fractures; 25 of the 29 "associated" VF were not diagnosed at the time of the visit (53.1% of total VF, 86.2% of "associated" VF).

Discussion

From our observational study on the sample of 322 fragility fractures, it appears that 14.6% of patients have at least one vertebral fracture.

However, of this 14.6%, only 38.3% of patients had a diagnosis of VF at first outpatient evaluation. In 61.7% of cases the diagnosis was made during the outpatient visit performed for control of patients with fractures in other locations, mostly femoral neck and humerus fractures, who reported back pain. These cases were considered “not diagnosed” VF.

However, this percentage is likely to be underestimated; in fact in many cases VF are pauci- or asymptomatic. The association of VF to other fragility fractures, typically affects patients of older age (mean age 84.6 years). The severity of the initial “major fracture” and in some cases the need to undergo the patient to a surgical treatment in a short time, often leads to VF underdiagnosis.

For this reason it is recommended the prescription of an exam in two radiographic projections of the spine in all patients with hip and humeral fractures. The aim is to find a possible osteoporotic vertebral fracture, recent or remote, not observed. This investigation is necessary, to set adequate therapy (29) and to reduce both the symptoms and the costs due to the decrease quality of life, as well as to reduce mortality and re-fracture probability.

A proper screening, such as the prescription of a simple X-ray of the spine in 2 projections, in high-risk patients, such as elderly patients with fragility fractures in other sites (> 65 years old), increases the diagnosis of these fractures and leads to a correct therapy. With this examination the Authors obtained the diagnosis of 25 of VF associated with other fractures and not diagnosed at admission, equal to 86.2% of VF associated with other fractures and 53.1% of total VF.

Conclusions

The results of this observational study confirm what is found in the literature. Vertebral fractures are mostly frequent among high-risk patients with fragility fractures.
individuals, such as postmenopausal women. In more than 2/3 of cases are not diagnosed and do not come to medical attention; very frequently they are associated with other fragility fractures (30) (especially fractures of the femoral neck and humerus). In the data reported by Tarantino et al., this association was 30% of all vertebral fractures (31).

However, they represent an important socio-economic reality, especially related to the refracture frequence, especially in patients where it is not taken proper medical and rehabilitative treatment. For this clinical, epidemiological and social dimensions represented by fragility fractures, today the trend is to develop interdisciplinary structures dedicated to the prevention and treatment of these fractures.

In our view, it is therefore necessary to develop “fracture unit” that include the involvement of the orthopedic surgeon, in primis, for a proper diagnosis and a proper surgical or non surgical treatment of the fractures, supported by internal and physiatrist figures. This may allow the application of standardized and reproducible paths with the aim to optimize the functional recovery of the patient, thus reducing the costs and problems associated with vertebral fractures (permanence of pain, functional limitation, diminished quality of life) and their consequences, as the refractures. Especially regarding VF, the entity of the problem is enlarged by the under-diagnosis of fractures with subsequent increase of the consequences related to a fracture and its non-treatment, primarily the disability and the increase of refracture risk. Also missing, today, standardized treatment protocols especially for non-surgical treatment.

References

8. Tarantino U, Piscielli P, Brandi ML, et al. The incidence of hip, forearm, humeral, ankle and vertebral fragility fractures in Italy: Results from a 3 Years Multicentric study; Arthritis Research & Therapy. Published online 29/12/2010.