Clinical Studies

Osteoporosis and vertebral compression fractures—continued missed opportunities

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Abstract

BACKGROUND CONTEXT: Untreated osteoporosis causes decreased bone mineral density, which predisposes to fragility fractures. Low-energy vertebral compression fractures are the most common type of osteoporotic fragility fracture. Prior studies have shown that only one-quarter of patients diagnosed with an osteoporotic fracture are referred or treated for osteoporosis.

PURPOSE: To identify the rate of therapeutic interventions for patients aged 50 years and older within a capitated population who sustained low impact vertebral compression fractures over a 6-month period.

STUDY DESIGN/SETTING: Retrospective observational study.

PATIENT SAMPLE: The reports of all imaging studies of the chest, abdomen, and spine taken from July to December 2002 within a large military health-care system were queried on the Composite Health Computer System (CHCS). The sample included patients 50 years or older who had a low-energy vertebral compression fracture.

OUTCOME MEASURES: The computerized medical records were examined for osteoporotic medication prescriptions, referrals to endocrinology, and to dual-energy X-ray absorptiometry (DEXA) scans. These results were compared with results obtained from a similar study on osteoporotic distal radius fractures.

RESULTS: The records of 156 patients (average age: 77.3 y; 78 women, 78 men) meeting the inclusion criteria were analyzed to determine what proportion was followed-up with osteoporosis interventions. Within 1 year after the fracture, 39% (37 females, 24 males) had undergone a DEXA scan, 35% (37 females, 18 males) had been referred to endocrinology, 38% (47 females, 12 males) were receiving active osteoporosis treatment, and 51% (55 females, 25 males) were receiving any form of osteoporosis-directed medication. The rate of medical intervention was similar to the rate of intervention after distal radius fractures (n=111; 30% active medication; 47% any osteoporosis medication) (p=.21). The rate of all interventions was significantly greater for women than men.

CONCLUSIONS: Although the likelihood of intervention is slightly greater after vertebral compression fractures than for distal radius fractures, orthopedic surgeons, emergency room physicians, and primary care providers continue to miss opportunities, especially in males, to diagnose and/or initiate active therapeutic interventions for osteoporosis in patients presenting with osteoporosis-related fragility fractures. Published by Elsevier Inc.

Keywords:

Osteoporosis; Fragility; Fracture; Vertebral; Compression; Incidence

Introduction

As our population distribution shifts toward the elderly, and the elderly continue to live longer, bone disease and fractures will become more prevalent. About 10 million Americans older than 50 years have osteoporosis, a complex metabolic bone disease that results from the uncoupling of
osteoclastic and osteoblastic activities [1]. Originally
thought to be a women’s disease, more than 30% of people
with osteoporosis are men [2]. Although Type I primary os-
teoporosis (trabecular bone loss) is six times more common
in women than men, Type II osteoporosis occurs only two
times more commonly in women [2]. According to the
2004 US Surgeon General’s report on Bone Health and
Osteoporosis, each year 1.5 million osteoporotic fragility
fractures occur—the most common being vertebral compres-
sion fractures (~700,000/y). Between 50% and 80% of
vertebral compression or wedge fractures are asympto-
matic and are identified incidentally on routine chest radi-
ographs or clinically by progressive height loss (>2 in)
[3]. Greater than 50% of women and 30% of men will
experience a vertebral compression fracture in their lifetime
[3,4]. Ten to twenty percent of these people will experience
another fragility fracture within 1 year [5]. In addition to
vertebral compression fractures, fractures of the distal
radius are being recognized as harbingers of osteoporosis.
Ninety-one percent of patients who sustain a fragility
fracture of the distal radius meet the World Health Organiz-
ation bone mineral density criteria for osteopenia or
osteoporosis [6].

Osteoporosis is a disease process for which there are
several, well-proven therapeutic options. Currently, there
are several medications with Food and Drug Administration
(FDA) approval for the active treatment of osteoporosis:
bisphosphonates (eg, alendronate, risedronate, and iban-
dronate), raloxifene, estrogen (hormone replacement ther-
apy), teriparatide (a recombinant segment of human parathyroid
hormone), and calcitonin. Elemental calcium (1,200–
1,500 mg/d) and Vitamin D (400–800 IU/d) are indicated
for prevention but are not sufficient for the active treatment
of known osteoporosis [7]. Combined, these medications
can increase bone mineral density by 0% to 7.5% per year
of treatment and reduce the incidence of subsequent
fragility fractures by 50% [2,7–13].

The purpose of this study was to detect the rate of diag-
nostic evaluation and therapeutic intervention for patients
aged 50 years and older within a capitated population
who sustained low-energy vertebral compression fractures
over a 6-month period. Similar studies have identified the
rates of these interventions after hip and distal radius fragil-
ity fractures, but none to date has evaluated the therapeutic
response after vertebral compression fractures (VCFs), the
most common osteoporosis-related fragility fracture.

Materials and methods

Before initiation of this study, approval from the institu-
tional review board was received. The official reports for all
radiographs of the chest, abdomen, thoracic, and lumbar
spine as well as the forearm, wrist, and hand for all patients
aged 50 years and older in a military beneficiary population
were collected and reviewed from July 1, 2002 to Decem-
ber 31, 2002. The study sample was pulled from a capitated
population of all individuals eligible for care within the
National Capital Area (NCA) health-care system, a system
that includes three medical centers and nine other health-
care facilities. Military beneficiaries include all active duty
and retired soldiers as well as their dependents living in
Washington, DC and the surrounding area and other special
exception cases. Within the NCA health-care system, all
patient visits, radiological services, and prescriptions are
ordered and recorded on the Composite Health Computer
System (CHCS). This system has been on line since 1993
and entry of all X-ray requests, clinical referrals, and
prescriptions is mandatory. Radiological order entry is a
limited field function. Chest, abdomen, thoracic and lum-
bar spine, hand, wrist, and forearm were selected body sites
for this study, as they are the only body-site orders available
that would be used to evaluate for vertebral and distal
radius fractures.

A computer program was developed that searched
CHCS for the official reports from the radiographs being
studied. All identified records were collected and displayed
on a single report. X-ray reports identified were then indi-
vidually reviewed for the indication of a fracture. A sepa-
rate file of all identified fractures was then created and
this file was reduced to the final study sample size by
eliminating all patients less than 50 years old, those with
neoplastic pathological fractures, those who sustained
a high-energy fracture (motor vehicle accident or fall from
greater than standing height), or in which the medical his-
tory did not suggest acute onset of symptoms related to
a vertebral compression fracture (specifically, back pain).
The complete computerized medical records of this final
study sample were then reviewed. All osteoporotic medica-
tions prescribed were annotated, including calcium, vitamin
D (or calcitriol), estrogen (or hormone replacement ther-
apy), alendronate, risedronate, raloxifene, and calcitonin.
Teriparatide is not on the formulary within the NCA
health-care system, so its use was not evaluated. For anal-
ysis purposes, patients were considered to be receiving “ac-
tive osteoporosis treatment” if they were prescribed
a medication approved by the FDA for the treatment of
osteoporosis. Calcium and Vitamin D were not considered
active treatments. The records were also reviewed for dual-
energy X-ray absorptiometry (DEXA) scans and endocri-
nology clinic appointments occurring in the 12-month
period after fracture diagnosis. DEXA scan is the only
method of measuring bone mineral density routinely used
in the NCA health-care system. Lastly, the computerized
records of all study patients were reviewed to identify those
who had been treated for osteoporosis before their osteo-
porotic fracture. The data were then collected in a database
and analyzed to determine the number of low-energy
fractures occurring; the demographic breakdown of these
fractures, the number of patients referred to endocrinology,
sent for DEXA scan and/or prescribed medications for os-
teoporosis. Sigma Stat (SPSS Inc., Chicago, IL) was used to
calculate descriptive statistics and perform Fisher’s exact
tests for significant differences between male and female therapeutic interventions.

Search criterion

The search criterion used in this study was selected in an attempt to perform the most comprehensive review of the NCA eligible beneficiaries. It was the goal of this study to identify all vertebral compression and distal radius fractures occurring within the NCA population during the study period. Previous similar studies have identified patients based on ICD-9 codes (International Classification of Diseases, Ninth Revision); however, this may overlook fractures, which are miscoded or alternatively coded. On the other hand, all fractures require serial radiologic evaluation. In the rare instances in which a fracture was treated acutely outside of the NCA health-care system, the follow-up radiological examination with a NCA provider would serve as a means to capture these patients as well. Because there is a significant financial penalty for not obtaining medical care within the NCA closed system, it was assumed that reviewing all X-ray reports obtained during the study period would provide the most exhaustive search of the population.

Results

A search of the computerized medical records of eligible beneficiaries in the NCA health-care system found 267 patients met the inclusion criteria, being both 50 years or older and having been diagnosed with their vertebral compression (156 patients) and/or distal radius fractures (111 patients) from low-energy mechanisms. (Fig. 1) No patients sustained both fractures during the study period. The 111 patients with distal radius fractures have been previously reported and are included in this study for comparison [14]. The 156 patients with vertebral compression fractures during the study period composed our study sample.

Our results are summarized in Table 1. Fifty percent of the patients identified were women. This compares to 70% of patients in the distal radius study, which approximated the previously reported female predominance in osteoporosis [2,4]. The average age for patients identified with low-energy vertebral compression fractures was 77.3 years. This was about 4 years older than the distal radius fracture patients. Thirty-seven female patients and 18 male patients were referred to the endocrinology clinic. Thirty-seven females and 24 males underwent a DEXA scan.

Sixty percent (47 of 78) of women were prescribed a medication indicated for the active treatment of osteoporosis, whereas only 15% of men (12 in 78) received similar prescriptions (p < .0001). Twenty-four of these 47 women (51%) were taking an active osteoporosis medication before their fall, whereas no man was receiving any medication for the treatment of osteoporosis before their fracture (p < .0001). Thus, 25 of the 54 women (46%) not taking active osteoporosis medications before their diagnosis were started on a new active medication in response to their fracture diagnosis.

One year after sustaining a vertebral compression fracture, 28% of patients (combining results for males and females) not previously being treated for osteoporosis were started on a new active osteoporotic medication and 35% were started on any new medication for the treatment of osteoporosis. This figure is a significant improvement over the same figure for the distal radius fracture patients—(8% received a new active medication and 19% received any new medication; p < .0001). Although the rate of new starts was significantly improved in the vertebral compression patients, the overall rate of intervention is not significantly greater, than that for distal radius fragility fractures (38% vs. 30% active medication; 51% vs. 47% any osteoporosis medication) (p > .21) (Table 1).

Discussion

Osteoporosis is largely a disease of postmenopausal women. The average age of menopause in the United States is 51 years old, but perimenopause activity, including increased bone resorption, begins as early as 40 years old [13]. As a result, 50 years of age has been a natural cutoff for clinical studies evaluating the effect of medications targeting the treatment of osteoporosis. In keeping with this precedent, 50 were selected as the lower age limit for inclusion in the present study.

As hypertension was in the middle of this century, osteoporosis today is a silent process that can lead to significant morbidity and mortality if not treated. After a hip fracture,
quality of life diminishes, and one in three to five patients die in the year after the fracture [15]. Significant morbidity also follows vertebral compression fractures. A previous fracture is the strongest risk factor for a new fracture; for vertebral compression fractures, the relative risk is 4.0 [15]. As aggressive medical evaluation and management of hypertension resulted in a dramatic decline in morbidity and mortality from cardiovascular sequelae, so too could the medical intervention for osteoporosis result in a significant decline in morbidity and mortality from fragility fractures. Diagnostic modalities are readily available, accurate, noninvasive, and relatively inexpensive, and antiosteoporotic medicines are highly effective. Thus, the burden is to recognize osteoporosis underlying fragility fractures and initiate effective modalities to reduce the ultimate impact of osteoporosis on the health of our elderly population.

Recently, there has been increased attention on osteoporosis in the United States, as 2002 to 2011 has been named the National Bone and Joint Decade [16]. The American Academy of Orthopaedic Surgeons has established collaborative initiatives with the National Osteoporosis Foundation to try to improve the evaluation and management of osteoporosis in this country. At the beginning of this decade, Freedman et al. [17] published a similar article detailing the opportunities missed by orthopedic surgeons to initiate evaluation and treatment of osteoporosis in patients sustaining low-energy distal radius fractures. They found that only 24% of postmenopausal women received either diagnostic evaluation or active treatment for osteoporosis after their distal radius fracture. In our study on distal radius fractures, we found 60% received either medication aimed at treating osteoporosis or a DEXA scan [14]. In the current study, 68% received this level of attention after a vertebral compression fracture.

Subsequently, Gardner et al. reported that only 29% of a random sampling of patients who sustained femoral neck fractures in 2000 left the hospital with a prescription for any type of medication aimed at treating osteoporosis [18]. This figure included 11 patients who were on osteoporosis medications before their injury, leaving only 10 of 75 (15%) who received new osteoporosis medications in response to their fracture. Further, only 6% were discharged on an antiresorptive agent indicated for the active treatment of osteoporosis [18]. Jachna and Whittle in a similar study evaluating the impact of hospital care on patients being treated for osteoporotic hip fractures, found almost identical rates of medical interventions (29% any medication and 7% active medication) in patients at hospital discharge [19]. In the current study, our overall medical intervention rate and our rate of starting a new medication were much greater. One year after sustaining a vertebral compression fracture, 28% of patients not previously being treated for osteoporosis were started on a new active osteoporotic medication (vs. 6–7%) and 35% (vs. 15%) were started on any new medication for the treatment of osteoporosis after their vertebral compression fracture. This intervention rate was also significantly greater than that for our distal radius fracture patients [14]. Although these studies demonstrate a general trend toward increased diagnosis and treatment of osteoporosis in patients with fragility fractures, these numbers still fall short of ideal.

Fragility fractures are the single most morbid and clinically significant consequence of osteoporosis. Most commonly these occur in the vertebral body, proximal femur, and distal radius. Lindsay et al. [5] showed that the rate of refracture after osteoporosis-related vertebral fractures was 20% within the first year, emphasizing the need for timely intervention. In light of this, we selected 1 year as the follow-up period for this study. Previous studies have only evaluated discharge data [18,19]. Although this may be more semantically in keeping with National Osteoporosis Foundation treatment recommendations, outlined by Heinemann, it is not the most practical approach for evaluating a health-care system’s recognition and response to the newly fractured patient’s osteoporosis [20]. By evaluating the 1-year period after fracture, this study was better able to gauge whether the NCA health-care system appropriately diagnosed and managed the fractured patient’s underlying osteoporosis.

Although orthopedic surgeons did not treat all patients included in the vertebral compression group of this study (the CHCS record indicates no involvement of the orthopedic surgery service in 36% of patients [n=56]), they were involved in the care of all 111 distal radius fracture patients [14]. Regardless, orthopedic surgeons have an integral role in recognizing osteoporosis underlying fragility fractures [21]. Orthopedic surgeons need to inform patients of their underlying condition and initiate proper follow-up. As the result of the potential complications of medications approved for the active treatment of osteoporosis, orthopedic surgeons may not, however, be the medical managers of this disorder [20,21]. This may better be left to the primary

### Table 1

<table>
<thead>
<tr>
<th>No. in study</th>
<th>Referred to endocrinology</th>
<th>Underwent dual-energy X-ray absorptiometry scan</th>
<th>Receiving active osteoporosis treatment</th>
<th>Receiving calcium, vitamin D, or active treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women (average age, 82.4 y)</td>
<td>78 (50%)</td>
<td>37 (47%)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>37 (47%)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>47 (60%)&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Men (average age, 72.2 y)</td>
<td>78 (50%)</td>
<td>18 (23%)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>24 (31%)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>12 (15%)&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Total average age, 77.3 y)</td>
<td>156</td>
<td>55 (35%)</td>
<td>61 (39%)</td>
<td>59 (38%)&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> There was a significant difference between the number of women and men prescribed any diagnostic or therapeutic intervention. (p<.02).
care physicians or endocrinologists, who receive formal training in this subject matter during residency. However, orthopedic surgeons should be aware of the initial diagnostic work-up and medical treatment so that they can assess the adequacy of their patient’s osteoporosis diagnosis and treatment (Fig. 2) [20].

For example, calcium and vitamin D supplementation alone is inadequate treatment for people with newly diagnosed osteoporosis. Although it has been shown to increase bone mineral density, calcium and Vitamin D intake provide less fracture risk reduction than the FDA-approved medications mentioned previously [7,9,22,23]. Therefore, they should not be considered, nor are they FDA indicated, for the active treatment of osteoporosis. Calcium and Vitamin D are important supplements to the treatment of active osteoporosis and valid therapeutic agents in the prevention of osteoporosis. As a result, the outcome measure for future observational studies should be the prescription of an FDA-approved medication for the active treatment of osteoporosis, which in this study was 38% in the first year after radiographic confirmation of a low-energy vertebral compression fracture.

One additional finding of this study was the significantly lower rate of all interventions prescribed to males who sustained a VCF (Table 1). A disproportionate response between genders was seen to an even greater degree in our distal radius patients [14]. These finding are clinically relevant, because Melton et al. have demonstrated that the relative risk of subsequent fragility fractures (at any body site, but most significantly in the spine) after the VCF is greater (almost double) in males than females, suggesting that missing an opportunity to initiate osteoporosis

Appendix

WHAT TO DO AFTER A FRAGILITY FRACTURE

What is a fragility fracture?

A fragility fracture is a broken bone that has occurred from a minor accident that would not usually break a bone. For example, falling down from a standing position usually will not break a healthy bone. Fragility fractures occur in bone that has lost some of its normal strength. The most common reason why bone loses its strength is osteoporosis.

Am I at risk of osteoporosis?

About 10 million Americans have osteoporosis, and it causes about 1.5 million fragility fractures each year, with 700,000 occurring in the spine.

Thin, white women age 50 or older are at greatest risk. Other risks include:

- Prolonged use of steroids
- Abusing alcohol
- Smoking

People with these risk factors and people who have fragility fractures should be tested for osteoporosis.

How can I be tested for osteoporosis?

The most common way to test for osteoporosis is to perform a DEXA scan. A DEXA scan is a special x-ray test that measures bone density. Osteoporosis causes bones to become thin and weak. A DEXA scans detects the decrease in bone mineral density that occurs when bones become thin and weak with age or as a result of medical conditions.

What should I do now?

Once you are diagnosed with a fragility fracture, you are at risk of breaking another bone unless your osteoporosis is treated. Within the next 4-6 weeks, you should:

1. Tell your regular doctor that you had a fragility fracture. He or she may want you to see a bone health specialist. An endocrinologist is a specialist in bone health, but rheumatologists, gynecologists, and primary care physicians may also treat osteoporosis. Your doctor might start you on an osteoporosis medication.
2. Get a DEXA scan, if you have not already had one or your last one is out-dated.
3. Take 1200-1500 mg/day of calcium and 600-800 IU/day of vitamin D. This can come from a well-balanced diet or may require use of vitamin supplements. Discuss the best way to achieve this dietary goal with your doctor.
4. Talk to your doctor about weight-bearing exercises that will be safe for you (walking, dancing, running, biking), and try to exercise 3 times per week.
5. If you drink alcohol, do not drink more than 1 or 2 drinks of alcohol per day.
6. If you smoke, ask your doctor for help with quitting.

Fig. 2. Appendix.
treatment in males after incident VCFs may portend more negative consequences than for females [24].

In addition, it should be noted that the equal prevalence of VCFs between sexes is not consistent with most general population-based studies evaluating osteoporosis and fragility fractures and may be a spurious finding [2]. This finding may better be explained by the significant male predominance in our military retiree population; however, VCFs are the osteoporosis-related fragility fractures with the lowest female preference. One large epidemiologic study in Europe, which included over 15,000 participants demonstrated an equal prevalence of vertebral compression deformities in males and females (12%) over the age of 50 years [25]. Regardless, the important conclusion from this portion of the data is not the equivalent prevalence rates of VCFs in our study sample, but the consistently poor recognition and initiation of osteoporosis-related interventions for male patients who sustain fragility fractures.

Although similar studies have been published, the data collection for this study is more comprehensive than that previously used, because it employed the use of a well-established computerized medical record and radiographic imaging results to define the study population. Further, this is the first study to evaluate osteoporosis treatment response after VCFs. Freedman et al. [17] derived their study population from a claims database that included patients enrolled in multiple health plans from 30 states. One benefit of the current study is that our population is capitated and derived from a single health-care system. There is a large financial incentive (health care within the system is completely free, including prescriptions) to obtain all care within the NCA system. Further, all clinical, radiological, and pharmaceutical services are mandatorily recorded on the CHCS computer system. Previous studies reviewed variably less comprehensive records to collect their data [17–19]. Lastly, these studies should not be viewed competitively, but symbiotically, because the current study reinforces the lack of recognition that is still occurring within the orthopedic community regarding osteoporosis.

Conclusion

Osteoporosis is a morbid condition that underlies vertebral compression fractures in patients older than 50 years. Orthopedic surgeons have been historically remiss in initiating diagnostic and treatment pathways for patients presenting with osteoporotic fractures. This study once again highlights this deficiency in care. Although we have made gains in the nonoperative and operative treatment of osteoporotic fractures, we continue to miss opportunities, especially with male patients, to initiate treatment for the underlying cause of these fragility fractures.

One optimistic finding from this study is that the rate of therapeutic intervention has trended upward from previous studies. Nevertheless, it is incumbent upon orthopedic surgeons to continue to improve our recognition and responsiveness to patients with undiagnosed osteoporosis presenting with fragility fractures. Toward this goal of raising consciousness about osteoporosis management, we have created a handout (Fig. 2) that is provided to all patients older than 50 years who present with low-energy fractures of the hip, wrist, and spine.

References


