Medical Management of Fragility Fractures of the Distal Radius

CPT EMILY N. MORGAN, MD; MAJ DAVID A. CRAWFORD, MD; MAJ WILLIAM F. SCULLY, MD; LTC NICHOLAS J. NOCE, MD

abstract

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Fragility fractures of the distal radius represent an opportunity to diagnose and treat osteoporosis before further fractures occur. The goal of this study was to determine the prevalence of prescriptions for calcium/vitamin D supplementation and the prevalence of dual-energy x-ray absorptiometry (DEXA) scans in patients who sustained fragility fractures of the distal radius. A further goal was to determine the prevalence of patients who received prescriptions for the treatment of osteoporosis after DEXA scans. The authors performed a retrospective review of all patients 50 years and older who sustained a fragility fracture of the distal radius and were treated by the orthopedic surgery service at the authors’ institution from 2004 to 2010. After a fragility fracture of the distal radius, fewer than 25% of previously unidentified at-risk patients received a prescription for vitamin supplementation and underwent a DEXA scan. Women were 7 times more likely than men to receive calcium/vitamin D supplementation, 14 times more likely to undergo a DEXA scan for the evaluation of osteoporosis, and 25 times more likely to receive a prescription for bisphosphonates. Patients who underwent a DEXA scan were 9 times more likely to receive pharmacologic treatment than those who did not undergo this scan. More than half of patients did not receive a prescription for calcium/vitamin D supplementation and did not undergo DEXA scanning as recommended by current National Osteoporosis Foundation guidelines. Most patients who received prescriptions or underwent DEXA scans did so before rather than after fracture, indicating poor compliance with National Osteoporosis Foundation guidelines. [Orthopedics. 2014; 37(12):e1068-e1073.]

The authors are from the Department of Orthopaedics (ENM, NJN), Madigan Army Medical Center, Tacoma, Washington; the Department of Orthopaedics (DAC), Blanchfield Army Community Hospital, Fort Campbell, Kentucky; and the Orthopaedics Service, Department of Surgery (WFS), Martin Army Community Hospital, Fort Benning, Georgia.

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Correspondence should be addressed to: CPT Emily N. Morgan, MD, Department of Orthopaedics, Madigan Army Medical Center, 9040A Fitzsimmon Dr, Tacoma, WA 98431 (emily.n.morgan3.mil@mail.mil).

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Osteoporosis is defined by the National Institutes of Health as a skeletal disorder characterized by low bone strength and increased risk of fracture. The lifetime risk of osteoporosis is approximately 50% in women and 13% to 25% in men. According to recent estimates, 10 million Americans currently have osteoporosis and by 2020 approximately 14 million Americans older than 50 years will have this condition. The incidence of osteoporotic fractures currently exceeds that of breast cancer, stroke, and myocardial infarction combined.

Osteoporotic, or fragility, fractures have a significant economic effect, with an annual cost of $19 billion. These injuries also have a significant effect on the use of health care. Osteoporotic fractures result in 432,000 hospital admissions, 2.5 million medical office visits, and approximately 180,000 nursing home admissions annually in the United States. Most concerning, however, is the indirect effect of these fractures on patient morbidity and mortality. Approximately 1 in 5 patients with an osteoporotic fracture, especially involving the proximal femur, will die within 12 months of injury.

The treatment of fragility fractures of the distal radius highlights the high costs and time-intensive demands associated with osteoporotic injuries. Distal radius fractures often require formal reduction and immobilization (Figures A-B) and may require surgery (Figures C-D), with the inherent costs and resource expenditures associated with these procedures and subsequent care. However, fragility fractures also represent an important early opportunity to diagnose, treat, and potentially prevent future osteoporotic fractures. Fragility fractures of the distal radius are associated with an increased risk of future hip fracture in both men and women. Therefore, these injuries can be used to detect osteoporosis and initiate treatment before these predisposed patients sustain more serious fragility fractures.

Current recommendations by the National Osteoporosis Foundation (NOF) for patients older than 50 years who sustain a fragility fracture of the distal radius include: (1) initiation of calcium/vitamin D supplementation and (2) completion of a dual-energy x-ray absorptiometry (DEXA) scan. Based on the results of the DEXA scan, additional treatment may be warranted. Studies of the efficacy of calcium/vitamin D supplementation in preventing fragility fractures have had problems with patient compliance, leading to mixed results. However, based on the available data, calcium/vitamin D supplementation can decrease bone loss and prevent at least 12% to 29% of subsequent fractures in compliant patients. In addition to calcium/vitamin D supplementation, the NOF recommends treatment with bisphosphonates, calcitriol, teriparatide,
Although the magnitude of this problem is beginning to be more fully recognized, much remains to be studied. The goal of this study was to evaluate a cohort of patients older than 50 years who sustained fragility fractures of the distal radius. By analyzing the diagnostic studies and pharmacologic treatment that these patients received, the authors sought to identify general trends and potential opportunities to improve patient treatment after fragility fracture of the distal radius.

**Materials and Methods**

The cohort of patients was drawn from a military facility that serves a beneficiary population that covers a 6-state region. The authors performed a retrospective review of all men and women 50 years and older who were treated for a fragility fracture of the distal radius between January 2002 and July 2010 at the authors’ institution. Menopausal status of female patients was not included in the medical record. Therefore, the authors included all female patients 50 years and older to capture all postmenopausal women within the study because the average age at menopause has previously been reported to be 51 years. Patients were identified through the electronic medical record by a combination of International Classification of Diseases, 9th edition (ICD-9), and Current Procedural Terminology (CPT) codes. Patients with high-energy mechanisms of injury, pathologic fracture, or iatrogenic fracture were excluded.

Patient records were reviewed to determine whether and when a DEXA scan had been performed and the resulting T-score. Records were also examined to determine whether and when each patient received a prescription for calcium/vitamin D supplementation, bisphosphonates, calcitriol, teriparatide, estrogen, and/or raloxifene. Denosumab was not available at the authors’ institution within the study period, so it was not included. Patients were divided into cohorts by sex. Power analysis determined that a group of 30 patients per cohort was required to determine the statistical significance of the results. These endpoints were examined for statistical significance with the chi-square test, Fisher exact test, and Student’s t test as indicated.

**Results**

During the study period, 210 patients were identified. Of this group, 46 were male (22%) and 164 were female (78%). The average patient age was 67 years, with a standard deviation of 10.6 years. Sixty-six patients required operative treatment for a fracture, representing 31% of the patient population. Among the entire patient population, 48% received calcium/vitamin D supplementation and 58% underwent a DEXA scan in accordance with NOF guidelines. Denosumab was not available at the authors’ institution within the study period, so it was not included. Patients were divided into cohorts by sex. Power analysis determined that a group of 30 patients per cohort was required to determine the statistical significance of the results. These endpoints were examined for statistical significance with the chi-square test, Fisher exact test, and Student’s t test as indicated.

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Approximately one-third of the patients studied were receiving calcium/vitamin D supplementation (32%) before injury. Forty-five percent of the patients had obtained a DEXA scan before their distal radius fracture. Fifty-four percent of the patients were receiving a drug included in the NOF guidelines for the treat-
ment of osteoporosis before the fracture occurred. However, 51 of the 113 patients included in the patient group receiving treatment before injury, or 45% of this patient cohort, were women being treated with estrogen for unknown conditions and may not have been receiving this medication specifically for osteoporosis. With estrogen removed from the pool of pharmacologic treatments for osteoporosis, 29% of the patients received a prescription for a drug designated by the NOF for the treatment of osteoporosis before the distal radius fracture occurred (Tables 1-2).

To assess provider compliance with NOF guidelines, postinjury data percentages were calculated after elimination of patients who had already received the recommended treatment or diagnostic procedure. Twenty-four percent of the patients who were prescribed calcium/vitamin D after the fracture occurred had not received supplementation before their fracture. This finding was not statistically significant, with \( P=1.0 \). Additionally, 23% of patients who had not previously had a DEXA scan were sent for the study after injury. This difference in the number of patients who underwent a DEXA scan before vs after sustaining a fragility fracture was statistically significant, with \( P<.0001 \).

Twelve percent of patients who had not received a prescription for pharmacologic treatment of osteoporosis received a prescription after fracture. The difference between patient groups receiving a prescription for the treatment of osteoporosis before and after a fragility fracture of the distal radius was statistically significant, with \( P<.0001 \). This significance was maintained when estrogen was excluded, with \( P=.0083 \), suggesting a statistically significant difference for the prescription of pharmacologic treatment in patient groups before and after fragility fracture (Table 1). When each pharmacologic agent was considered, a statistically significant difference was also found between patients who received bisphosphonates before (29%) and after fracture (17%), with \( P=.01 \). In women, a statistically significant difference was seen between the prescription of estrogen before and after fracture, with \( P<.001 \) (Table 2). Most patients received treatment before injury rather than after, suggesting that the distal radius fracture was not the event that led to recognition of the increased risk of subsequent fracture.

Further data analysis showed a sex disparity within the patient cohort. Women were 7 times more likely than men to receive calcium/vitamin D supplementation and 14 times more likely than men to undergo a DEXA scan for the evaluation of osteoporosis. Even with estrogen excluded, women were more likely to receive pharmacologic agents for the treatment of osteoporosis. They were 25 times more likely to receive bisphosphonates and twice as likely to receive calcitonin (Table 3).

A DEXA scan was shown to be a helpful tool in the diagnosis of osteopenia and osteoporosis in this population. It was also associated with a higher prevalence of supplementation and pharmacologic treatment. Among patients who underwent a DEXA scan, 87% had either osteoporosis or osteopenia. Twenty-nine percent of patients were diagnosed with osteoporosis and 58% were diagnosed with osteopenia, according to DEXA scan results. Among patients who underwent a DEXA scan, 97% received a prescription for calcium/vitamin D supplementation, bisphosphonates, estrogen, or calcitonin, compared with 26% among patients who did not undergo a DEXA scan. This finding was statistically significant, with \( P<.001 \).

**DISCUSSION**

Distal radius fractures have long been associated with poor bone quality in older patients.\(^9,18\) Despite this well-established association, provider response to distal radius fragility fractures in the elderly continues to be inadequate. The results of this study, with only 24% of patients receiving calcium/vitamin D and 23% being referred for a DEXA scan postinjury among those who had not already received these measures, reflects these persistent inadequacies in recognition and treatment. Similar poor results, related to both initiation of supplementation and completion of a DEXA scan after fracture, have been reported elsewhere.\(^4,8,18\) This leads to the question of how best to address the lack of intervention directed toward the prevention, detection, and treatment of osteoporosis.

### Table 3

<table>
<thead>
<tr>
<th>Sex</th>
<th>Calcium/Vitamin D</th>
<th>DEXA Scan</th>
<th>Bisphosphonates</th>
<th>Calcitonin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female, %</td>
<td>0.60</td>
<td>0.72</td>
<td>0.51</td>
<td>0.05</td>
</tr>
<tr>
<td>Male, %</td>
<td>0.09</td>
<td>0.05</td>
<td>0.02</td>
<td>0.02</td>
</tr>
</tbody>
</table>

*Abbreviation: DEXA, dual-energy x-ray absorptiometry.*

*No patients within the study cohort received a prescription for teriparatide. The sex disparity was statistically significant, \( P=.028 \). Patients within each cohort by sex who received calcium/vitamin D supplementation, underwent a DEXA scan, or received a prescription for bisphosphonates or calcitonin before or after sustaining a fragility fracture of the distal radius.*
Although the results of this study cannot answer this question, the data may provide some clues and indicate trends. First, the patient population with distal radius fractures comprised 167 women and 46 men, which closely mirrors the commonly quoted female-to-male ratio of 4:1.19 This suggests that the patient cohort was representative of the general population. Of those who were ordered a DEXA scan either before or after injury, 87% were diagnosed with either osteopenia or osteoporosis, reinforcing the idea that these patients could benefit from intervention.

At the time of injury, approximately one-third of patients had already been given calcium/vitamin D supplementation and had completed a bone mass density study by DEXA scan. Fifty-four percent of the patients had also received a prescription for a drug to treat osteoporosis before the fracture occurred. The reasons why this subset of patients had already been identified are likely variable and include a history of fragility fractures, other medical diagnoses that prompted evaluation and treatment for osteoporosis, and a health care provider who was particularly diligent or conscious of bone health. Many of the women in the study were receiving estrogen before fracture, likely for the treatment of other medical conditions. Of the remaining patients who had not received supplementation or undergone a DEXA scan before injury, very few received the suggested treatment protocol as suggested by the NOF. The authors propose two reasons to explain these results: (1) complications associated with defining the role of orthopedic providers in the medical management of osteoporosis and (2) sex bias.

Multiple studies have shown concern by orthopedic surgeons about ordering diagnostic studies and pharmacologic treatment for osteoporosis.20 The cause for concern is likely multifactorial and includes apprehension about managing the side effect profile of many medications, most notably bisphosphonates, and the time-intensive nature of ordering and reviewing serial DEXA scans. To provide appropriate care for patients who require bone health monitoring and medical treatment, many studies advocate either hiring a dedicated provider within the orthopedic practice to manage these patients or establishing an easily accessible and trusted referral network with local primary care providers to manage this aspect of patient care.20,21 As a result of this study and in recognition of this weakness within their system, the authors established a dedicated orthopedic osteoporosis clinic within their department. A policy has also been instituted whereby all patients presenting with a fragility fracture, whether through a clinic or the emergency department, are referred to this designated provider, who ensures that the appropriate medications and studies are ordered and subsequently reviewed.

A sex disparity was evident in both the evaluation and treatment of osteopenia/osteoporosis, similar to previously published findings.18 Recognition and correction of this treatment gap is vital. Men have an even greater risk than women of subsequent hip fracture after a distal radius fracture.10-12 Along with this increased risk of future hip fractures, men have increased mortality and morbidity rates after a hip fracture. Men are twice as likely as women to die after a hip fracture and are less likely than women to return to autonomous living.22,23 Given that men traditionally have been more likely than women to have a fracture as their initial presentation of osteoporosis,13 injuries such as distal radius fragility fractures provide an excellent opportunity to capture this patient population and initiate treatment.

The results of this study also suggest that patients who are ordered a DEXA scan are more likely to be treated for osteoporosis subsequently with both calcium/vitamin D supplementation and pharmacologic agents. Simply recognizing the underlying bone health considerations of an injury such as a distal radius fragility fracture and beginning the evaluation process can improve the likelihood that these patients will receive the appropriate treatment.

One limitation of the current study was the relatively smaller number of male vs female patients. However, as previously mentioned, this is representative of the typical sex ratio of those sustaining this injury and the decreased prevalence of osteoporosis in men. Another limitation of the study was the inability to capture prescriptions that were placed through pharmacies outside of the authors’ network as well as the use of over-the-counter calcium/vitamin D supplementation, which may have affected the results.

CONCLUSION
Fragility fractures of the distal radius represent an often missed opportunity to diagnose and treat osteoporosis before a more morbid fragility fracture occurs. Establishing specific osteoporosis providers for each orthopedic institution and improving recognition of this harbinger of underlying bone disease, particularly in men, will improve the overall medical care provided for these patients.

REFERENCES


