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Can orthopedic surgeons help create a better head start for osteoporosis treatment after hip fracture?

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Abstract

Background: Treatment for osteoporosis in the community in patients who were operated for hip fracture appears to be suboptimal at best. Evidence regarding treatment beyond the 1st year after surgery is scarce. We examined the association between discharge recommendations for treatment of osteoporosis in patients suffering from hip fractures and treatment beyond the 1st year.

Methods and materials: We performed a retrospective observational cohort study in patients age 50 to 90 years operated for osteoporotic hip fractures between the years 2008 and 2014. We investigated the correlation between discharge recommendations and rates of osteoporosis treatment postdischarge 1 to 7 years, and the influence of osteoporosis diagnosis upon treatment. Exclusion criteria besides age included high-energy trauma, pathologic or periprosthetic fractures, and patients deceased within 1-year postsurgery.

Results: A total of 602 patient files were examined. Univariate analysis showed that, of 283 patients who were prescribed dietary supplementation of vitamin D and calcium, a significantly higher percentage of patients received treatment if they had a recommendation (50.3% vs 36.1%, $P = 0.0005$), were diagnosed (43.8% vs 14.4%, $P < 0.0001$), or were of female gender (84.1% vs 57.3%, $P < 0.0001$). Multivariate analysis showed that the odds ratio (OR) for receiving treatment compared with the control group (patients without a recommendation and a diagnosis) was higher among patients who had both a recommendation and a treatment (OR = 5.4, $P < 0.0001$) than the group with a diagnosis only (OR = 4.75, $P < 0.0001$) or a recommendation only (OR = 2.06, $P = 0.0006$).

Conclusions: A formal recommendation for osteoporosis treatment in the discharge letters of patients who suffered hip fragility fractures increases treatment rate of osteoporosis in the community compared with patients without a recommendation. Patients who receive such a recommendation but also have a formal coded diagnosis of osteoporosis in their medical files have an even higher chance of receiving treatment in the community. Our observations may assist in amplifying the overall treatment rates, which are still undoubtedly low.

Abbreviation: ICD-9 = International Classification of Diseases.

Keywords: calcium, communal treatment, diagnosis, discharge recommendation, osteoporotic fracture, vitamin D

1. Introduction

Proximal hip fractures due to low energy trauma comprise the most serious complications of osteoporosis and pose a great threat among a substantial number of elderly people. In the year 2000, the number of fragility hip fractures in Europe was estimated to be as high as 900,000, while mortality rates during the 1st year after an osteoporotic hip fracture reached 20% to 30%.[1–3] The majority of patients suffering from hip fractures show decreased low bone mass under bone mineral density assessment and up to 10% of these patients will suffer a second, contralateral fracture within 5 years.[4,5]

In light of the substantial medical and economic costs posed by osteoporosis-related morbidities,[6,7] great efforts are being made to prevent or slow the disease. Current common management, which is being done almost exclusively in the community, is divided into 3 main branches of treatment: lifestyle adjustments, which include sports activities, smoking cessation, and house safety evaluation; nonpharmacologic treatment with dietary supplementation of vitamin D and calcium; and pharmacologic treatment comprised of antiosteoporotic medications, most commonly bisphosphonates but also hormonal therapy, estrogen modulators, and others.[8–12] Yet, even though the above treatments can not only dramatically reduce the risk of hip fractures but also reduce the risk of a second osteoporotic fracture, there seems to be great gap between the generally accepted recommendations and the actual, relatively low, treatment rates for osteoporosis in the community, with men destined to even lower rates.[13–15]

As commonly accepted, osteoporosis is almost exclusively managed by general physicians and much less by orthopedic surgeons, even though the latter often encounters the disease in its primary appearance. The lack of involvement by orthopedic surgeons may be attributed to either their reluctance to take responsibility over a chronic disease, their focus on treating the disease's consequences rather than its causes, or, more possibly, to lack of knowledge regarding initiation of treatment. Moreover, it has been shown that orthopedic surgeons' involvement apparently increases the rate of treatment in the months following discharge.[16,17] In 2013, Gosch et al[18] even published a specific algorithm aimed at orthopedic surgeons, acknowledging their important role in the prevention of a second fragility fracture. Unfortunately, even in light of these studies, both initiation rates of in-hospital osteoporosis treatment[19] and treatment rates during the 1st year postdischarge seem to be suboptimal at best, with rates as low as 20% to 30%.[15,20–24]

To the best of our knowledge, scarce evidence exists regarding the influence of orthopedic surgeons' recommendations and official osteoporosis diagnoses on long-term treatment rates in the community. In 2005, a small-scale randomized controlled trial[25] showed that perioperative intervention by orthopedic surgeons can improve treatment in the community in the relatively short term. The goals of the present study were to assess both the impact of the surgeon's recommendations and that of the diagnosis, with the assumption that the 2 factors, together or independently, can raise the odds for a patient to be treated.

2. Materials and methods

2.1. Study design and data source

This is a retrospective observational cohort study based on the data files of 602 patients age 50 to 90 years, who were admitted to our Orthopedic Department between January 1, 2008 and August 21, 2014. Our medical center in northern Israel provided trauma services for a catchment population of approximately 350,000 people. All the patients were diagnosed with low-energy traumatic hip fractures upon admission and operated in the Orthopedic Department. All patients were later discharged either to homecare or a rehabilitation center with a formal discharge letter, aimed for their primary physician, most commonly their family doctor.

The relevant cohort was assembled by allocating patients treated by 1 of 3 most commonly used surgical procedures for treating osteoporotic proximal hip fractures, coded under the International Classification of Diseases (ICD-9) system (Z79350, Z8152, and Z79151). Data files included demographic information, patients' hospitalizations history, general medical history, and medical treatment. Each file was researched to identify whether postsurgical recommendation for osteoporosis treatment was included in the patients' discharge letter, whether and when the patient was officially coded with the diagnosis of osteoporosis (ICD-9 code 733.00 or 733.90) in his or her medical file, and whether he or she was prescribed with osteoporosis dietary supplementation of vitamin D and calcium. Data concerning patients age and gender was also collected.

Exclusion criteria included age younger than 50 or older than 90 years, fracture due to high energy trauma, pathologic fractures, and periprosthetic fractures. Patients who died within 1 year postsurgery, patients whose data files did not include a full medical history, discharge letter, or medical treatment were also excluded.

The medical history of all patients remained confidential; each patient was coded and unidentified. The study was approved by the Institutional Review Board.

2.2. Statistical methods

Our measured outcome was the existence of a vitamin D and calcium prescription in the medical files 1 to 7 years postdischarge. Since the current literature suggests a low incidence of postoperative osteoporotic treatment at around 20% in the 1st year postdischarge,[20,21,24] we calculated that approximately 600 patients (1:1 ratio) were needed in order to detect a 10% difference between patients who received orthopedic surgeons' recommendations and those who did not. This sample size results in 80% statistical power with 5% alpha (2-sided test). Continuous variables were analyzed using standard distribution measures (mean ± standard deviation and median) and categorical variables using frequencies and percentages. The association between recommendations and categorical variables was explored using Chi-squared test (or Fisher exact test). The association between recommendations and continuous variables was calculated using Wilcoxon 2-sample tests. Univariate and multivariate logistic regression models were performed. Data were collected, coded, and stored in Microsoft Excel 2010 and analyzed using SAS 9.2 statistical program. Statistical significance was considered when $P < 0.05$.

3. Results

The files of 1010 patients who were operated between the years 2008 and 2014 for osteoporotic hip fractures were reviewed. After exclusions, 602 patients remained, of whom 70% were female (n = 421). Mean age was found to be 78.5 years, and 28% (n = 170) of all the patients had a diagnosis of osteoporosis in their medical files while 43% (n = 257) had a recommendation for treatment.

Using univariate analysis (Table 1), we have shown that among the treated group, age was slightly higher (79.8 years vs 78.2 years, $P = 0.046$), females received more treatment compared with males ($P < 0.0001$), patients with a diagnosis of osteoporosis received more treatment than those without ($P < 0.0001$), and patients with a recommendation received more treatment than those without ($P = 0.0005$).

Since an osteoporosis diagnosis could act as a confounder to the recommendation as a cause for treatment, that is, was attached to the patients file for reasons other than an osteoporotic hip fracture (pathologic T-score, prior osteoporotic fracture, etc.), we later excluded patients who had the diagnosis in their medical files prior to the studied hip fracture (Table 1, excluded group). The results for the exclusion group (n = 573) were almost similar to the original cohort with treatment rates significantly higher among the female, diagnosed and recommended groups.

By isolating each risk factor using multivariate analysis, we could estimate the effect each 1 had independently upon the outcome measure (Table 2). We found that all 3 factors independently significantly raised the odds for treatment, with a diagnosis of osteoporosis having the highest odds ratio (OR = 3.7, $P < 0.0001$). Once again, the exclusion group showed almost similar results (Table 2, excluded group).

Finally, we investigated the combined influence of the 2 factors, diagnosis and recommendation, upon the outcome measure. Multivariate analysis showed that, compared to a patient with no diagnosis and a recommendation (control group) in his/her

Table 1

Univariate analysis showing distribution of treatment tested with 4 different independent factors (age, sex, diagnosis, and recommendation) including all data (left) and after exclusion of prior osteoporotic treatment (right).

	All data			Excluded		
	Treatment			Treatment		
	No (N=319)	Yes (N=283)	P value	No (N=317)	Yes (N=256)	P value
Age, y	75.9±10.1 (78.2)	77.4±8.9 (79.8)	0.0462	75.9±10.2 (78.2)	77.1±9.1 (79.5)	0.1482
Sex, %						
Male	136 (42.63)	45 (15.9)	<0.0001	136 (42.9)	45 (17.58)	<0.0001
Female	183 (57.37)	238 (84.1)		181 (57.1)	211 (82.42)	
Diagnosis, %						
No	273 (85.58)	159 (56.18)	<0.0001	273 (86.12)	159 (62.11)	<0.0001
Yes	46 (14.42)	124 (43.82)		44 (13.88)	97 (37.89)	
Recommendation, %						
No	204 (63.95)	141 (49.82)	0.0005	204 (64.35)	141 (55.08)	0.0241
Yes	115 (36.05)	142 (50.18)		113 (35.65)	115 (44.92)	

Table 2

OR for treatment compared with 3 different factors using multivariate analysis (95% CI).

	All data				Excluded			
	OR	Lower	Upper	P value	OR	Lower	Upper	P value
Gender	3.1	2.1	4.7	<0.0001	3.0	2.0	4.5	<0.0001
Diagnosis	3.7	2.5	5.5	<0.0001	3.2	2.1	4.9	<0.0001
Recommendation	1.8	1.2	2.5	0.0016	1.6	1.1	2.3	0.0081

All data (left) and after exclusion of prior osteoporotic treatment (right).

CI = confidence interval, OR = odds ratio.

medical file, a patient having them both had a higher chance, of over 5 times, of receiving a prescription for treatment (OR = 5.4, $P < 0.0001$), with chances declining when there was no diagnosis or recommendation in the files (Table 3). In the excluded group, odds were highest among those who had a diagnosis only but, once again, the 3 combinations showed a significantly positive OR compared with the control group (Table 3, excluded group).

4. Discussion

In this present retrospective study, we researched how treatment rates with vitamin D and calcium can be influenced by both a recommendation in the postoperative discharge letter and a formal diagnosis of osteoporosis. Our results have shown that the overall long-term treatment rates for osteoporosis in the community following a hip fragility fracture were slightly below 50%, with female gender raising the odds for being treated significantly. We found that rates of treatment can be altered positively by the 2 independent factors tested, the existence of a recommendation for osteoporotic treatment in the postop

discharge letter or the existence of a diagnosis of osteoporosis in the medical files, but having them both raises the odds even higher.

Although osteoporotic fractures pose an immense economic and medical burden on society, treatment rates reported in the literature are still relatively low.[9,22,24,26–28] Only recently Bawa et al[29] showed in a very large retrospective study of patients suffering from primary fragility fracture (of 4 different types) that only 10% had received treatment for up to 3 years after the fracture, but there was up to a 40% risk reduction of a subsequent fracture in those patients who were prescribed antiosteoporotic treatment. In our study, we showed a significantly higher percentage of patients being treated, but this may be attributed to 2 important differences: we looked into only dietary supplementation and not bisphosphonate medication with its higher costs, and we included only hip fractures that, due to their medical severity, might raise attention for treatment as compared, for example, to a distal radius fracture. Concerning gender influence, their results were similar to our findings, with females having higher rates of treatment.

Table 3

Multivariate analysis showing combined influence of osteoporosis diagnosis and discharge recommendations upon the outcome measure of treatment, compared with the control group (no diagnosis and no recommendation).

	All data				Excluded			
	OR	Lower	Upper	P value	OR	Lower	Upper	P value
Female vs males	3.13	2.08	4.71	<0.0001	3.01	2.00	4.52	<0.0001
Diagnosis (+) recommendation (+)	5.40	3.04	9.59	<0.0001	3.53	1.87	6.68	<0.0001
Diagnosis (+) recommendation (−)	4.75	2.75	8.21	<0.0001	4.77	2.76	8.24	<0.0001
Diagnosis (−) recommendation (+)	2.06	1.37	3.12	0.0006	2.06	1.36	3.11	0.0006

All data are presented on the left, after prior osteoporosis treatment on the right (95% CI).

CI = confidence interval, OR = odds ratio.

As to factors influencing the main outcome, in our study we showed the benefit of an orthopedic recommendation for osteoporosis treatment. This finding seems to correspond with the works of Kim et al[16] and Miki et al,[17] where both showed that orthopedic surgeons intervention and management with the treatment of osteoporosis after surgery raised the rates significantly. Still, it must be emphasized that both works were based on the relatively immediate period after surgery and lack long-term follow-up, which we found to be very scarce in the literature.

Osteoporotic hip fractures have an immense impact upon the patient, initially as a life-threatening event[30] or, if resolved, as a source of major morbidities.[26,27,31] Ideally, in our opinion, treatment of osteoporosis should be initiated once a high-risk patient has been identified[32] and should be conducted by multidisciplinary teams consisting of primarily general practitioners but also involving endocrinologists and orthopedic surgeons.[33] Our study has shown that a simple recommendation in the discharge letter by the Orthopedic Department together with a formal diagnosis in the patient's medical file can increase the odds of the patient receiving better treatment and, as a consequence, may reduce the risk of a possible future fracture. Even though prior works have shown some of the benefits of orthopedic surgeons' involvement in the treatment of osteoporosis, mainly in the short-term period, in our view, the value of the current research lies in the simplicity of its results that show how a small effort may provide a better head start for treatment. We believe that 1 cannot underestimate the importance of the recommendation written by a professional surgeon and how seriously it is perceived by the family doctors in the community as we have shown in this current study.

Finally, we are well aware that, even though our study shows significant results concerning primary outcomes, it has weaknesses that are comprised from its relatively small scale, its concentration on only 1 part of osteoporosis treatment, and its design as a retrospective study. We believe that a much large-scale study, with closer follow-up of patients, for longer periods of time, and with the possible cooperation of primary physicians in the community, will probably yield even more striking results in this extremely important field of medicine.

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