

Management Trend and Attitude Regarding Osteoporotic Vertebral Compression Fracture: A Comparative Study Between Surgeons and Internists

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Research article

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Abstract

Background: Osteoporotic vertebral compression fracture (OVCF) is the most common form of osteoporotic fracture, both surgeons and internists included in the management of that. This study aimed to identify whether a discrepancy exists between spinal surgeons and internists in the diagnosis and management of OVCF.

Method: This comparative study included 124 spinal surgeons and 47 internists in the WeChat group of the Society of Osteoporosis and Bone Mineral Research. They were sent a self-administered electronic questionnaire that asked about practice pattern, diagnosis trend, and management choice in OVCF management. The validity of the survey was examined in advance.

Results: A significantly higher percentage of surgeons obtained T2-weighted images scan with fat suppression than internists. A significantly higher proportion of spinal surgeons provided surgical treatment as first-line treatment and considered fracture as the most important aspect in OVCF management than internist. No significant difference was observed in the use of dual-energy X-ray absorptiometry scan, in performing laboratory examination, or in the collaboration rate between the two groups.

Conclusion: Differences exist between internists and spinal surgeons in imaging diagnosis, choice of therapeutic schedule, and attitude to osteoporosis treatment in the management of OVCF.

Background

Osteoporotic vertebral compression fracture (OVCF), the most common form of osteoporotic fracture, is pervasive in older population with osteoporosis [1]. OVCF can cause chronic pain, progressive vertebral deformity with sagittal imbalance, decreased quality of life, and shorter survival time [2, 3]. Osteoporotic vertebral fracture causes huge burden on medicine, public health, and economy. The cost of OVCF is significantly higher than that of other fragile fractures, and it would continuously increase in the future [4].

However, the management of OVCF might not be sufficiently considered by physicians. The rate of clinical diagnosis of OVCF ranges from only one quarter to one third [3, 5], and underdiagnosed vertebral fracture is a worldwide problem [6]. It is important to determine if patients with fragility fractures have osteoporosis and to provide timely treatment in order to reduce the risk of future fracture. However, whether kyphoplasty or vertebroplasty should be used in the treatment of osteoporotic vertebral fractures remains controversial, with different scientific societies giving contradictory recommendations [1, 7]. Even osteoporosis treatments are debated, as different departments have different medication adherence programs and patient outcomes [8, 9].

Unlike other osteoporotic fractures, OVCF is not typically managed in an orthopedic environment, and patients could also consult internists first to determine the condition and obtain treatment. The different

educational backgrounds and attitudes between spinal surgeons and internists may result in different treatments and patient outcomes [9]. However, no studies to date have examined the management trend and attitude among physicians of different specialties who treat OVCF. This study aimed to assess and compare the management trend and attitude of orthopedic surgeons and internists regarding the medical treatment of their patients with OVCF in order to find the gap between the disciplines.

Methods

Briefly, we carried out a comparative study to determine any differences between surgeons and internists on the management of osteoporosis vertebral fractures.

The study protocol has been approved by the Ethics Committee of Tangdu Hospital. In October 2019, an electronic survey using Sojump, a platform for professional online surveys (Shanghai Information Technology Co., Shandong, China), was sent to the WeChat group of the Society of Osteoporosis and Bone Mineral Research, which includes endocrinologists, spinal surgeons, surgeons, and internists from other departments associated with management of osteoporosis. WeChat, an application used broadly on smartphones, has a monthly usage of more than 1 billion [10]. It is a promising tool for data collection whose validity and feasibility have been tested, and it has been used in many studies [11]. The self-designed questionnaire was developed for this study, which is provided as Additional File 1. It is based on a literature review and interviews with spinal surgeons and internists. Questions were focused on the respondents' demographic information, opinions regarding appropriate diagnosis and treatment of OVCF, and related responsibilities.

To qualitatively examine the clarity and validity of the survey, four experts (two surgeons and two internists associated with management of osteoporosis) critiqued the questionnaire; after which, the questionnaire was rectified according to their comments. To quantitatively identify the validity of the study, the scale-level content validity index (S-CVI) was calculated [12]. Another 10 experts (five spinal surgeons and five internists) were asked to rate the overall questionnaire from 1 to 4 (1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, 4 = highly relevant). Then, the S-CVI was computed as the number of experts who ranked the whole survey 3 or 4 divided by the total number of experts. A scale with excellent content validity should have an S-CVI ≥ 0.8 , the S-CVI in this study was 0.85, the quantitative validity was verified. Of the 499 surgeons and 159 internists in the WeChat group who received the questionnaire, 124 surgeons and 47 internists completed the questionnaire, corresponding to response rates of 24.8% and 29.6% respectively.

Data are presented as frequencies and percentages. We used Sojump and Statistical Package for the Social Sciences (SPSS) version 20.0 (IBM Corp., Armonk, NY, USA) for the data analysis. Sojump was used to conduct descriptive analysis automatically. SPSS was used for the Fisher's exact test and Pearson's correlation to explore the correlation between the characteristics of the respondents and the other items in the questionnaire. $P < 0.05$ was considered statistically significant.

Results

Overview and population demographics

A total of 171 respondents (124 surgeons and 47 internists) from 26 provinces and 60 cities across mainland China were included. The demographic data are described in Table 1. The sex proportion in the two groups was varied. The two groups were similar in terms of age, years of practice, and job title at baseline; however, the proportion of surgeons from tertiary university teaching hospitals was slightly larger than that for internists (Table 1).

Table 1
Baseline characteristics of the surgeons and internists

Variable	Surgeons (n = 124)	Internists (n = 47)	P value*
Sex (male/female)	123 (99.2)/1 (0.8)	28 (59.6)/19 (40.4)	< 0.001
Age			0.60
< 30 years	6 (4.84)	1 (2.13)	
30–40 years	43 (34.68)	14 (29.79)	
40–50 years	54 (43.55)	26 (55.32)	
> 50 years	21 (16.94)	6 (12.77)	
Years in practice			0.86
< 10	23 (18.55)	9 (19.15)	
10–20	53 (42.74)	18 (38.3)	
> 20	48 (38.71)	20 (42.55)	
Job title			0.56
Student, graduate student, or resident	7 (5.65)	4 (8.51)	
Attending doctor	28 (22.58)	13 (27.66)	
Associate chief physician, or chief physician	89 (71.77)	30 (63.83)	
Grade of hospitals working in			0.009
Tertiary university teaching hospitals	72 (58.06)	15 (31.91)	
Tertiary nonteaching hospitals	23 (18.55)	15 (31.91)	
Nontertiary hospitals	29 (23.39)	17 (36.17)	
Values are presented as n (%).			
*Chi-square test.			

Diagnosis and treatment trend of OVCF and physicians' practice pattern

As for diagnosis and treatment trend, 87.9% of the surgeons and 85.11% of the internists usually provide dual-energy X-ray absorptiometry (DEXA) scan to patients with suspected OVCF. Meanwhile, 67.74% of the surgeons usually obtain additional T2-weighted images with fat suppression, whereas only 36.17% of the internists do so ($P = 0.000$). No significant difference existed in laboratory examination between two groups (internists, 78.7%; surgeons, 64.5%; $P = 0.07$). Physicians who provided additional T2-weighted images with fat suppression were more likely to perform laboratory examination ($P = 0.000$). Furthermore, 41.9% of the surgeons and 25.53% of the internists provided surgical treatment as their first-line treatment ($P = 0.005$), whereas 56.45% of the surgeons and 74.47% of the internists agreed with performing surgical operation when conservative treatment is not working, and no significant difference was found between them ($P = 0.031$). We found significant difference between the two groups regarding the most important aspect of OVCF management ($P = 0.000$), with 30.65% of the surgeons paying more attention on the management of fractures, while only 6.38% of internists do so. Regarding practice pattern, approximately 13% of the surgeons and 9% of the internists manage OVCF independently, and no significant difference was found between them. Meanwhile, 68.55% of the surgeons agreed that spinal surgeons should be the team leader, with the assistance of internists, whereas only 44.68% of the internists agreed to that ($P = 0.006$) (Fig. 1).

We found that physicians from nontertiary hospitals had significantly lower rate of diagnosis based on DEXA scan and additional T2-weighted imaging than physicians from tertiary hospitals ($P = 0.000$), but no difference was found in laboratory examination, usage of surgical treatment, and attitude on most important management for physicians from different types of hospitals. Physicians from nontertiary hospitals had a relatively lower rate of collaboration (Table 2). Although no significant difference was found in the diagnosis and management trend of OVCF between physicians with different job titles, we found a relatively lower collaboration rate for students and residents than attending doctors (Table 3).

Table 2
Practice trend of doctors from different grades of hospitals

	From tertiary university teaching hospitals	From tertiary nonteaching hospitals	From nontertiary hospitals	P value*
Uses dual-energy X-ray absorptiometry scan	80 (92)	44 (96)	25 (66)	< 0.001
Obtains additional T2-weighted images with fat suppression	56 (64)	33 (72)	12 (32)	< 0.001
Performs laboratory examination	61 (70)	33 (72)	23 (61)	0.49
Provides surgical treatment first	34 (39)	16 (35)	10 (26)	0.39
Regards fracture management as the most important	24 (28)	9 (20)	8 (21)	0.52
Collaborates	78 (90)	45 (98)	31 (82)	0.046
Values are presented as n (%).				
*Chi-square test.				

Table 3
Practice trend among doctors with different job titles

	Student, graduate student, or resident	Attending doctor	Associate chief physician or chief physician	P value*
Use dual-energy X-ray absorptiometry scan	10 (91)	33 (80)	106 (89)	0.33
Obtain additional T2-weighted images with fat suppression	5 (45)	20 (49)	76 (64)	0.15
Perform laboratory examination	7 (64)	29 (71)	81 (68)	0.85
Provide surgical treatment first	2 (18)	15 (37)	43 (36)	0.52
Regard fracture management as the most important	3 (27)	12 (29)	26 (22)	0.59
Collaborate	8 (73)	40 (98)	106 (89)	0.037
Values are presented as n (%).				
*Chi-square test.				

Discussion

In this study, we compared the current status of management trend and attitude in practice pattern between orthopedic surgeons and internists who treat OVCF. We found no difference between the two groups regarding obtaining DEXA scan, performing laboratory examination, and team collaboration. However, the two groups significantly differed in obtaining additional T2-weighted image with fat suppression, attitude on management choice, and the most important concern in the management of OVCF. We also found that the rates of collaboration and image-based diagnosis were lower for physicians from nontertiary hospitals, and the collaboration rate was lower for students and residents. This study analyzed the management trend and attitude of orthopedic surgeons and internists regarding the treatment of patients with OVCF, which, to our knowledge, has not been studied before.

The DEXA scanning rates in previous studies ranged from 1.4% in a retrospective cohort study by Barton et al [13] to 32.0% in Hawaii in a study by Nguyen et al [14] and to 52.9% in South Korea in a study by Park et al [15], which differ from the results of our study, as most of the physicians in our study agreed to performing DEXA bone mineral density (BMD) scan to middle-aged and elderly patients with suspected OVCF. The results of previous studies and our results suggest that the rate of BMD measurement has increased over the years; however, doctors' knowledge and attitude may not translate into action in diagnosis. Our result also indicated that the type of hospitals may be an influencing factor.

An additional T2-weighted image with fat suppression is necessary to identify abnormalities in regions with abundant fat, which is the only way to determine the potentially painful vertebrae in old-aged patients who have more fat at the vertebrae [16]. It is better in identifying acute and hidden lesions before cement augmentation than plain radiographs and computed tomography scans. Similar to a nationwide population-based study in South Korea that found that the rate of magnetic resonance imaging (MRI) was only 35% for patients with OVCF [17], our study found that the rates of T2-weighted imaging with fat suppression were 67.74% for surgeons and 36.17% for internists. It indicates that the importance of MRI scanning has been ignored by different physicians in the diagnosis of OVCF, and a difference existed between surgeons and internists.

The issue of choosing nonsurgical management, vertebroplasty, or balloon kyphoplasty in the treatment of OVCF remains complicated [18]. The heterogeneity of the patient population, including those with negative manifestation in MRI, varied symptoms, insufficient response to conservative treatment, etc., was found to be the reason behind the management choices [19]. However, the influence of differences in discipline has rarely been studied. Schupfner et al [19] found that surgeons tend to choose balloon kyphoplasty as their main treatment, whereas more nonsurgeons chose vertebroplasty. On the contrary, our result showed that nonsurgical management was the first-line treatment for both groups, but more surgeons chose surgical treatment, whereas more internists insist on conservative treatment. Except for the diversity of respondents between Schupfner et al's study and ours, we note that Schupfner et al investigated only three nonsurgeons (two radiologists and one internist) and five surgeons. The results of Schupfner et al and our results suggest that a difference in management choice indeed exists between

surgeons and internists, as surgeons and radiologists tends to choose surgical management, whereas internists prefers nonsurgical management.

For patients with OVCF, the rate of osteoporosis diagnosis after fractures has significantly increased, whereas the rate of osteoporosis treatment has only increased minimally [20]. Barton et al [15] found that only 15% of patients had calcium or vitamin D supplementation or had FDA-approved osteoporosis medication following vertebral fractures. Unsurprisingly, 38% had another vertebral fracture within 2 years following the first one. Previous studies found that osteoporosis treatment after fragility fractures might be influenced by factors such as BMD measurement, fracture history, and hospitalization, which might lead to a higher prescribing rate [21]. Our study investigated whether the differences in discipline are an influencing factor and found significant difference between the two groups. We found that most internists were more concerned with osteoporosis treatment, whereas the proportion of surgeons with the same concern was only two thirds. The result of previous studies and our result suggest that the hospital medical staff play an important role in the management of osteoporosis after fragility spinal fractures, and a difference might exist between different disciplines, in which internists might contribute more.

The collaboration among disciplines in osteoporosis was globally initiated, and its advantages have been reported in previous studies, including increased efficiency and better treatment coordination [22, 23]. Correspondingly, our study showed that most physicians were willing to collaborate with different disciplines. Hjalmarso et al [24] found that a practice pattern with a horizontal structure would trigger free action of the professionals and would encourage a changeable leadership, which would balance the top-down structure and improve the outcome of interprofessional collaboration. In our study, we also found the feasibility of a horizontal structure in collaboration and that both surgeons and internists were willing to subjectively take leadership of the team. The results of the study of Hjalmarso et al and our results suggest that physicians are willing to take the leadership in a team, and a horizontal practice pattern with changeable leadership is feasible. We also noted that the sense of collaboration might be disparate among physicians from different grades of hospitals and physicians with different job titles.

Our study is the first to compare the management trend and practice pattern for patients with OVCF between orthopedic surgeons and internists. However, our study has some limitations. First, a significant difference in sex ratio was found between the two groups. Although only a few surgeons in our study were women, it conforms to a previous report that female surgeons dominated only 10–20% of the surgical workforce [25]; thus, we believe that it may not be a bias. Second, compared with internists, more surgeons were from teaching hospitals, which might bias the estimation. Besides, in our study, most physicians were from tertiary hospitals, and doctors with senior professional titles had the highest proportion among the respondents, which indicates that our result may be more optimistic than the reality. Third, this is a self-assessment study, and deviation might exist compared with the real condition. Further studies are needed to demonstrate the result more conclusively. Although our study has some deficiencies, they are not cofounders to the conclusion.

Conclusion

This is the first comparative study that investigated the management trend and practice pattern for patients with OVCF between orthopedic surgeons and internists. The results of our study indicate that differences, including utilization of imaging diagnosis, management choice, and osteoporosis treatment, exist between the two groups. This study also found that physicians of different disciplines are willing to collaborate in teamwork and take leadership. OVCF management trends indeed vary among multidisciplinary physicians, which may provide suggestions on collaboration among different disciplines in the future.

Abbreviations

OVCF

Osteoporotic Vertebral Compression Fracture

S-CVI

Scale-level Content Validity Index

SPSS

Statistical Package for the Social Sciences

DEXA

Dual-energy X-ray Absorptiometry

BMD

Bone Mineral Density

MRI

Magnetic Resonance Imaging

Declarations

Ethics approval and consent to participate:

Approval was obtained from the ethics committee of Tangdu Hospital. Written informed consent was obtained from all participants. When the questionnaire link was opened, only participants who chose “I gave my informed consent to the survey” could enter into the questionnaire page and submit their answers. The ethics committee of Tangdu Hospital approved this procedure. The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

Consent for publication:

Not applicable

Competing interests:

The authors declare that they have no competing interests.

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Authors' contributions:

XL and BL contributed to the study conception and design. Material preparation, data collection and analysis were performed by ZZ, TL and SS. The first draft of the manuscript was written by ZZ and JF, all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Figures

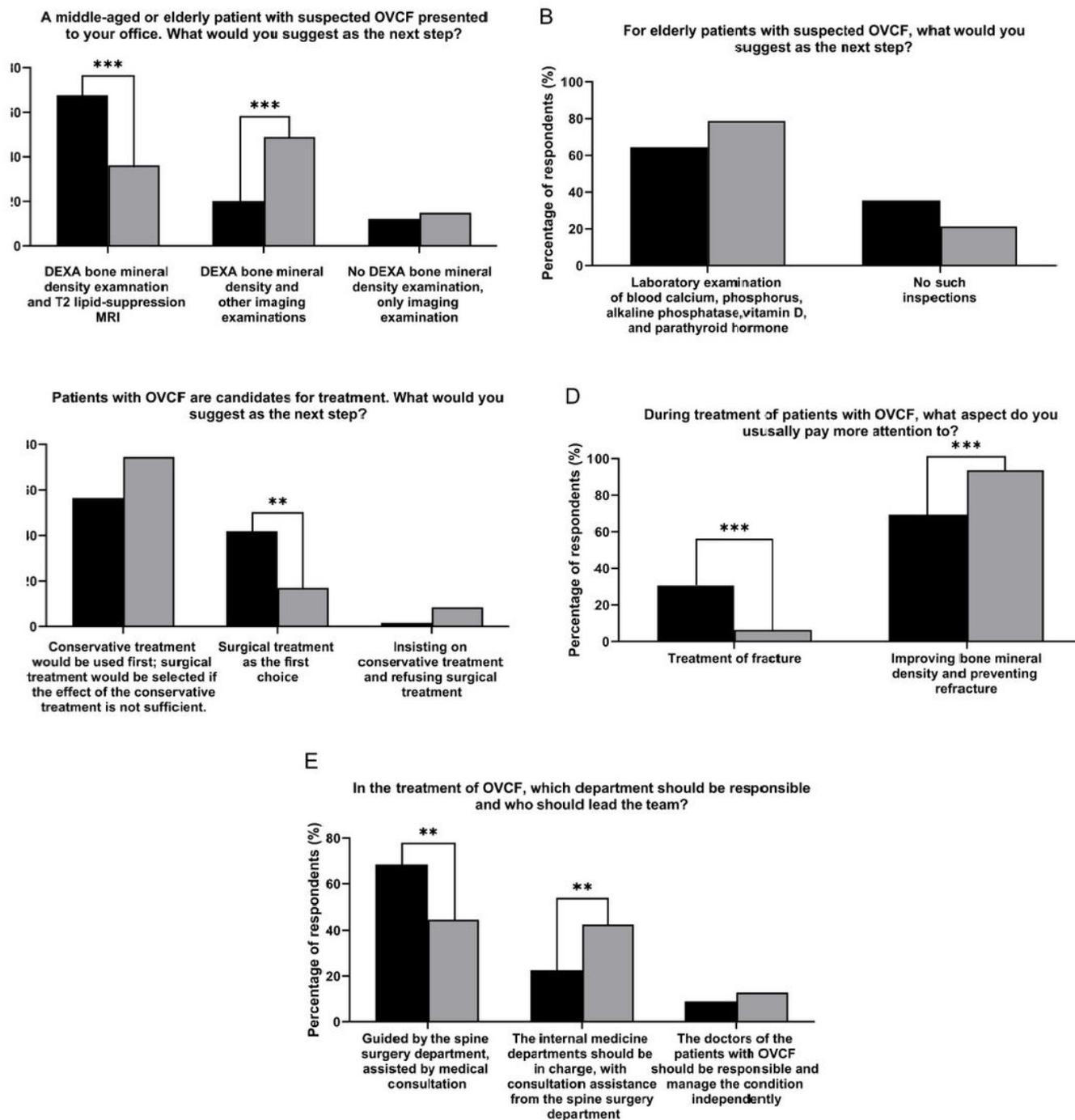


Figure 1

Survey questions and ratio of respondents Black columns, number of spinal surgeons' response; gray columns, number of internists' response. ***P<0.001; **P<0.01.

Supplementary Files

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