ORIGINAL ARTICLE

ASSOCIATION OF VERTEBRAL FRACTURES AND HIP FRACTURES IN PATIENTS WITH OSTEOPOROSIS

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ABSTRACT

Background: Osteoporosis is quite common disease among aged in India. Studies indicate that vertebral fractures are probably the most common fragility fractures and that they are often followed by a second fracture. This study was planned to assess relationship between a hip fracture and vertebral fracture among patients with osteoporosis.

Methods: In this study, 77 patients above 50 year of age with osteoporosis-related hip fractures were investigated for the presence of a vertebral fracture. Thoraco-lumber X-rays were carried out to find out vertebral fracture. Patients with a history of significant trauma to the spine and those with a malignancy or connective tissue disorder were excluded from the analysis.

Results: Out of 77 patients with hip fractures, 39 had a fracture of the femoral neck while 38 had an intertrochanteric hip fracture. Of the 56 patients who were finally included in the study, after applying inclusion and exclusion criteria, 38 patients with an average age of 66.38 ± 10 years had no fractures of the spine. Eighteen patients with an average age of 77.8 ± 12.6 years (31.53%) had a total of 25 vertebral fractures. Patients with vertebral fractures were significantly older than those without fractures ($p<0.001$). Overall, 24.7% of these patients had an asymptomatic vertebral fracture.

Conclusion: It is recommended that all elderly patients who go to the radiology department for a chest X-ray also have a lateral thoracic and lumber spine radiograph.

Keywords: Osteoporosis, Vertebral fractures, Hip fractures, X-ray

INTRODUCTION

Osteoporosis is reported to be common among Saudi Arabians, and researchers report a prevalence of 30%-35%[1-5]. Fragility fracture is a major health care concern because of its relationship to morbidity and mortality. The incidence of fragility fractures in Saudi Arabia jumped from 2.9/1000 in 1999[6] to 6/1000 in 2007 at an annual cost of SR 4.27 billion[7]. Only 30% of the patients who were still alive remained ambulatory[8] and this put an extreme burden on the patient's family and caregivers[9-11]. Prevention of fragility fractures, particularly those of the femur, is an important part of the management of osteoporosis. In a 2012 paper, Chan et al[12] suggested that vertebral fractures are probably the most common fragility fractures and that they are often followed by a second fracture. In 2004, Johnell et al[13] studied the risk of a second fracture, particularly of the femur, after a fracture of the spine or the proximal part of the humerus and concluded that the risk of a second fracture is highest immediately after the first one. Studies also showed that some who experiences a vertebral fracture have a five-fold increased risk of experiencing a subsequent hip fracture[14-17].

The objective of this study was to evaluate the relationship between an asymptomatic vertebral fracture and a second hip fracture among patients living on the east coast of Saudi Arabia.

MATERIALS AND METHODS

Seventy seven patients with osteoporosis-related hip fractures and no history of a previous fracture were analyzed for the presence of a vertebral fracture. Demographic data about the patients, including their age, co-morbidities, and ASA score, was

retrieved from their medical records. All radiographic images were retrieved. Patients admitted with proximal hip fracture who were ≥ 50 years and had undergone thoraco-lumbar imaging and a dual energy X-ray absorptiometry (DEXA) scan were included in the study. Patients with a history of significant trauma to the spine, a malignancy, or a connective tissue disorder were excluded from the analysis. After applying inclusion and exclusion criteria, 56 patients were finally included in the study. The fracture morphology was entered in a database, including the side, site, type, and operative implants used. Patients were divided into two groups: a non-elderly group (50-64 years old) and an elderly group ≥ 65 years old, following the accepted definition of elderly patients[15]. Radiographs were reviewed independently by two authors, and later they reviewed them jointly.

The data was analyzed using SPSS software, version 14. Data were expressed as mean ± SD. Statistically significant differences between the two groups were determined with the Student's *t*-test using a ratio of $P < 0.05$, which is considered to be significant, and precision was ascertained at a CI of 95%.

RESULTS

Of the 77 patients with proximal hip fracture, 39 of them had a fracture of the neck of femur and 38 had an intertrochanteric fracture. Of the 56 patients included in the study, 29 were male and 27 female with an average age of 70.6 ± 13.7 years (Table 1).

Table 1: Demographic details of patients (mean ± SD)

Characteristrics	Hip fracture with vertebral fracture	Hip fracture without vertebral fracture	*P* value
No. of patients ($n = 56$)	18	38	
Mean age	77.8 ± 12.6	66.38 ± 10	0.001
BMD at hip (g/cm^2) non fractured side	0.511 ± 2.5	0.692 ± 3.1	0.7
BMD at spine (g/cm^2) non fractured vertebra	0.496 ± 4.3	0.728 ± 3.6	0.6
HTN/CAD (hypertension/ coronary artery disease)	7	22	0.18
Diabetes mellitus	12	24	0.79
Endocrine diseases	1	1	0.58
Stroke	2	4	0.94
Family history of osteoporotic fracture	1	0	0.14
Chronic kidney disease	5	2	0.01
Dementia	1	3	0.01
Asthma	3	1	0.06
Drugs, steroids, anticoagulants	2	3	0.7

BMD: Bone mineral density.

Table 2: Distribution of patients according to Age groups

Age range	Patients (n=77) (%)
<60	22 (28.6)
61-70	20 (26.0)
71-80	18 (23.4)
81-90	12 (15.6)
>91	5 (6.5)

The demographic data and associated diseases of the patients are provided in Table 2. Thirty nine (50.6%) were classified as elderly patients (≥ 70 years). Thirty eight (68.47%), 24 males and 14 females, had no fractures of the spine and an average age of 66.38 ± 10 years. Eighteen patients (32.14%), 6 males and 12 females, had a total of 24 vertebral fractures and an average age of 75.8 ± 14 years. [The odds ratio was calculated as 0.42, 95%CI (0.277 to 0.734) and $P = 0.001$].

Table 3: Site and number of vertebral fractures seen is patients with hip fractures

Fracture site	Patients (%)
T6	1 (4.2)
T7	1 (4.2)
T9	2 (8.3)
T10	2 (8.3)
T11	4 (16.7)
T12	5 (20.8)
L1	3 (12.5)
L2	3 (12.5)
L3	1 (4.2)
L4	1 (4.2)
Total	24 (100.0)

T: Thoracic; L: Lumbar

Patients with vertebral fractures were significantly older than those without fractures $P < 0.001$.

The majority of the fractures (62%) occurred between thoracic 11 and lumbar 2nd vertebra (Table 3). Women sustained a fractured neck of the femur more often than men $P < 0.001$. All women who had experienced such an injury had a vertebral fracture.

Overall, 24.7% of our patients had an asymptomatic vertebral fracture. Further analysis showed that 6 males (18.96%) and 12 females (45.28%) had a previous asymptomatic vertebral fracture.

Interestingly, in our sample all women who presented with a fractured neck of the femur had a prior asymptomatic vertebral fracture.

DISCUSSION

In this study we found that nearly one forth patients who presented with a hip fracture also had an asymptomatic vertebral fracture, and the remaining three forth patients had never experienced spine fractures. This indicates that proximal femoral fracture may be the first presenting complaint that indicates underlying osteoporosis. It also underlines the fact that asymptomatic spine fracture remains undiagnosed in almost 25% of elderly patients until they experience a debilitating hip fracture. Further analysis showed that 45.28% of elderly females and 18.96% of the males had experienced an asymptomatic vertebral fracture.

The results of this study cause us to emphasize the issue of a second fracture, which has been raised by many other researchers. Lönnroos et al[18] reported that this occurs at an incidence of 5.08%, but Berry et al[19] found the incidence of a second fracture was 14.8% in a follow-up study after 4.2 years. Recently Kaukonen et al[20] reported a second femoral fracture occurred in 12% of their patients. A recent study reported that in a cohort of 178 women, grade 1 vertebral fractures were identified in 33.1% and grade 2 and 3 fractures in 20.2%, and the researchers concluded that age, vitamin D levels, and osteoporosis as defined by DEXA were not factors influencing vertebral fractures[21]. Clinton et al[22] reported that the risk of a subsequent hip fracture after a proximal humeral fracture was highest within one year after the proximal humeral fracture, with a hazard ratio of 5.68 (95%CI = 3.70 to 8.73). We agree with Rouzi et al[23] that various clinical factors, including elderly age and sex, are independent risk factors that predict osteoporotic fractures.

This study was limited because of its retrospective nature and the relatively small patient population, which may not adequately represent the whole country. However, in the absence of literature published by researchers, the current study may stimulate more prospective studies on this subject.

CONCLUSION

We conclude by repeating that proximal femur fracture may be the first presenting complaint of a patient with underlying osteoporosis. It is not, as a rule, necessarily preceded by a spine fracture. However, asymptomatic vertebral fracture is a harbinger of a subsequent hip fracture, especially in elderly females. A health care worker needs a high degree of awareness to diagnose the underlying osteoporosis before his or her patient ends up suffering a fragility fracture.

RECOMMENDATIONS

We recommend a DEXA scan and a lateral thoracic spine radiograph for all elderly patients who go to the radiology department for a chest X-ray. This strategy has the potential to allow health care professionals to diagnose osteoporosis at an early stage and to detect at least 25% of asymptomatic vertebral fractures. If appropriate medical therapy is instituted for such patients, it is possible that the morbidity and mortality that result from a fragility fracture of the hip can be minimized significantly.

REFERENCES

1. Sadat-Ali M, El-Hassan AY, Ezzeldin IM, Al-Mohanna FA, Sayeed I. Postmenopausal osteoporosis in Saudi Women: A pilot screening. Annals of Saudi Med. 1993;13:272-274.
2. Sadat-Ali M, Al-Habdan I, Marwah S. Bone mineral density measurements of distal radius in Saudi Arabian females. Ann Saudi Med. 1996;16:414-416.
3. Al-Habdan IM, Sadat-Ali M, Al-Muhanna FA, Al-Elq AH, Al-Mulhim AA. Bone mass measurement using quantitative ultrasound in healthy Saudi women. A cross-sectional screening.Saudi Med J. 2009;30:1426-1431.
4. El-Desouki MI. Osteoporosis in postmenopausal Saudi women using dual x-ray bone densitometry.Saudi Med J. 2003;24:953-956.
5. Ardawi MS, Maimany AA, Bahksh TM, Nasrat HA, Milaat WA, Al-Raddadi RM. Bone mineral density of the spine and femur in healthy Saudis. Osteoporos Int. 2005;16:43-55.
6. al-Nuaim AR, Kremli M, al-Nuaim M, Sandkgi S. Incidence of proximal femur fracture in an urbanized community in Saudi Arabia. Calcif Tissue Int. 1995;56:536-538.

7. Bubshait D, Sadat-Ali M. Economic implications of osteoporosis-related femoral fractures in Saudi Arabian society. Calcif Tissue Int. 2007;81:455-458.

8. Al-Omran A, Sadat-Ali M. Is early mortality related to timing of surgery after fracture femur in the elderly?. Saudi Med J. 2006;27:507-510.

9. Cooper C, Campion G, Melton LJ. Hip fractures in the elderly: a world-wide projection. Osteoporos Int. 1992;2:285-289.

10. Schneider EL, Guralnik JM. The aging of America. Impact on health care costs. JAMA.1990;263:2335-2340.

11. Aharonoff GB, Koval KJ, Skovron ML, Zuckerman JD. Hip fractures in the elderly: predictors of one year mortality. J Orthop Trauma. 1997;11:162-165.

12. Chan PL, Reddy T, Milne D, Bolland MJ. Incidental vertebral fractures on computed tomography. N Z Med J. 2012;125:45-50.

13. Johnell O, Kanis JA, Odén A, Sernbo I, Redlund-Johnell I, Petterson C, De Laet C, Jönsson B. Fracture risk following an osteoporotic fracture. Osteoporos Int. 2004;15:175-179.

14. Naves Díaz M, Díaz López JB, Gómez Alonso C, Altadill Arregui A, Rodríguez Rebollar A, Cannata Andía JB. [Study of incidence of osteoporotic fractures in a cohort of individuals older than 50 years from Asturias, Spain, after a 6 year follow-up period]. Med Clin (Barc). 2000;115:650-653.

15. Black DM, Arden NK, Palermo L, Pearson J, Cummings SR. Prevalent vertebral deformities predict hip fractures and new vertebral deformities but not wrist fractures. Study of Osteoporotic Fractures Research Group. J Bone Miner Res. 1999;14:821-828.

16. Lauritzen JB, McNair PA, Lund B. Risk factors for hip fractures. A review. Dan Med Bull.1993;40:479-485.

17. Fujiwara S, Kasagi F, Yamada M, Kodama K. Risk factors for hip fracture in a Japanese cohort. J Bone Miner Res. 1997;12:998-1004.

18. Lönnroos E, Kautiainen H, Karppi P, Hartikainen S, Kiviranta I, Sulkava R. Incidence of second hip fractures. A population-based study. Osteoporos Int. 2007;18:1279-1285.

19. Berry SD, Samelson EJ, Hannan MT, McLean RR, Lu M, Cupples LA, Shaffer ML, Beiser AL, Kelly-Hayes M, Kiel DP. Second hip fracture in older men and women: the Framingham Study.Arch Intern Med. 2007;167:1971-1976.

20. Kaukonen JP, Lüthje P, Nurmi-Lüthje I, Kataja M, Naboulsi H. Second hip fracture and patients' medication after the first hip fracture: a follow-up of 221 hip fracture patients in Finland. Arch Gerontol Geriatr. 2011;52:185-189.

21. El Maghraoui A, Ouzzif Z, Mounach A, Rezqi A, Achemlal L, Bezza A, Tellal S, Dehhaoui M, Ghozlani I. Hypovitaminosis D and prevalent asymptomatic vertebral fractures in Moroccan postmenopausal women. BMC Womens Health. 2012;12:11.

22. Clinton J, Franta A, Polissar NL, Neradilek B, Mounce D, Fink HA, Schousboe JT, Matsen FA. Proximal humeral fracture as a risk factor for subsequent hip fractures. J Bone Joint Surg Am.2009;91:503-511.

23. Rouzi AA, Al-Sibiani SA, Al-Senani NS, Radaddi RM, Ardawi MS. Independent predictors of all osteoporosis-related fractures among healthy Saudi postmenopausal women: the CEOR Study. Bone.2012;50:713-722.