Original Article: Density of One-Third Distal Radius in Patients Prone to Primary Osteoporosis

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ABSTRACT

Due to the high prevalence of osteoporosis in Iran and its relationship with bone fractures and reduced life expectancy in these patients and the knowledge that early diagnosis and timely treatment reduces the financial burden on the treatment system and the burden of disease complications on patients. Density of one-third distal radius was performed in patients prone to primary osteoporosis.

This descriptive cross-sectional study was performed during 2019 with the participation of 71 patients referred to orthopedic clinics of Tabriz University of Medical Sciences. Clinical examinations and bone density measurements were performed for them and its relationship with distal third radius fractures was investigated. Data were analyzed using Pearson correlation test. Sensitivity of one-third of the distal radius T-score compared to femoral neck T-score in terms of diagnosis of osteoporosis and osteopenia 82.35 and 51%, respectively, and its specificity 46.51%, and for total lumbar vertebrae in terms of diagnosis of osteoporosis and osteopenia, respectively. 92.31% and 65.62% and its specificity was 30.77%. According to the findings of this study, the study of one distal one-third mineral density of radius bone by DXA method for the diagnosis of osteoporosis has a significant sensitivity and has a significant relationship with the density of lumbar vertebrae (femur).

Introduction

Osteoporosis is the most common metabolic disease of the bone, characterized by a decrease in the amount of minerals and underlying bone and increases the risk of fractures. The disease affects about 200 million people worldwide. There are currently over 25 million Americans with osteoporosis, 80% of whom are women [1].

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Today, osteoporosis is a problem considered by health organizations and is referred to as the silent disease of the century. The World Health Organization has declared the year 2000 to 2010 as the decade of joint bone disease and has declared it as one of the most important and important diseases in the world [2]. The diagnostic standard for osteoporosis is densitometry performed with Dual X-ray Absorptiometry (DXA) [3]. In 1994, the World Health Organization announced a classification of bone mineral density (BMD) based on the difference in standard deviation between patients' BMD and a young adult from a healthy population, which is now referred to as the T-score [4].

A T-score equal to or less than -2.5 equals the diagnosis of osteoporosis, and a T-score between -1 and -2 is classified as low bone mass (osteopenia) and -1 and above is normal. Every year, more than 5 million cases of osteoporosis fractures occur worldwide. The distal radius fracture is the most common site of upper limb fracture, accounting for approximately one-sixth of all treated fractures in the United States [5].

Due to the high prevalence of osteoporosis in Iran and its relationship with bone fractures and reduced life expectancy in these patients and the knowledge that early diagnosis and timely treatment reduces the financial burden on the treatment system and the burden of disease complications on patients. Density of one-third distal radius was performed in patients prone to primary osteoporosis.

Methods

Study design: This cross-sectional study was performed during 2019 in patients referred to orthopedic clinics of Shohada and Imam Reza hospitals (both affiliated to Tabriz University of Medical Sciences) by observing the inclusion and exclusion criteria and by sampling Available. The final sample size was such that all patients were admitted to the study within the mentioned time period by observing the inclusion and exclusion criteria and their total reached 71 people.

Inclusion and exclusion criteria: Inclusion criteria included all patients over 50 years and having the consent to participate in the study and exclusion criteria also included: inflammatory diseases, history of corticosteroids, metabolic diseases, renal failure, diseases They were thyroid and parathyroid.

Methods: Patients were first visited by an orthopedic resident and after taking a history and performing clinical examinations, patient characteristics and data including: alcohol consumption, smoking, familial osteoporosis, endocrine disease, age, sex, history of drug use. The cause of osteoporosis, a history of rheumatic disease, and a previous fracture were entered into a checklist, and then a lumbar vertebral bone density (L1-4) femur (femoral neck and total) and a distal third of the dominant hand radius were requested. All cases were performed by Hologic QDR 4500Wdensitometer (Hologic, Inc., Bedford, MA, USA) by DXA method and its interpretation was done according to the definition of the World Health Organization.

Data analysis: The collected data were entered into SPSS statistical software version 21. Frequency, percentage, mean and standard deviation were used to display the initial information. All qualitative data were analyzed using Pearson correlation coefficient and P value was considered significant for values less than 0.05.

Ethical considerations: This study was conducted after approval by the ethics committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1399.1070). Routine examinations were performed by orthopedic specialists and the studies performed for the purposes of this study were performed at no cost to patients; Also, all patients completed written informed consent before entering the study.

Results

During a one-year period, a total of 71 patients were studied with a mean and standard deviation of patients' age of 59.36 ± 5.81 years; The minimum age for patients was 51 years and the maximum age for one patient was 91 years. Of these, four were male and 67 were female. The mean and standard deviation of body mass index was 28.03. 2.41 with the lowest body mass

index being 16.19 and the highest body mass index being 42.59. The average age of menopause in women was 49 years.

Table 1. Correlation coefficient between mineral density of one third distal radius with femur

femur	radius	Correlation coefficient	P Value*
neck of the femur	One third distal	0.51	0.001
T-score of femoral neck	One-third distal T-score	0.68	0.001
Total	One third distal	0.66	0.001
Total T-score	One-third distal T-score	0.71	0.001
***: Pearson Correlation**			

In terms of personal and medical records: Family history of osteoporosis in 14 people History of pathological fractures in 16 people, history of family fractures due to osteoporosis in six people; Alcohol consumption was not seen in any of the participants.

Table 2. In terms of personal and medical records

Lumbar vertebrae		radius	Correlation coefficient	P Value*
L1	BMD	One-third distal BMD	0.55	0.001
	T-score	One-third distal T-score	0.63	0.001
L2	BMD	One-third distal BMD	0.65	0.001
	T-score	One-third distal T-score	0.59	0.001
L3	BMD	One-third distal BMD	0.54	0.001
	T-score	One-third distal T-score	0.58	0.001
L4	BMD	One-third distal BMD	0.60	0.001
	T-score	One-third distal T-score	0.55	0.001
L Total	BMD	One-third distal BMD	0.57	0.001
	T-score	One-third distal T-score	0.58	0.001
***: Pearson Correlation**				

The results of correlation between densitometry of one third of the distal radius with the femur and lumbar vertebrae are shown in Tables 1 and 2. Sensitivity of one-third of the distal radius T-score compared to femoral neck T-score in terms of diagnosis of osteoporosis and osteopenia 82.35 and 51%, respectively, and its specificity 46.51%, and for total lumbar vertebrae in terms of diagnosis of osteoporosis and osteopenia, respectively. 92.31% and 65.62% and its specificity was 30.77%.

Table 3. Densitometric result of one-third distal radius T-score with T-score of different lumbar and femoral vertebrae

Lumbar vertebrae		Radius *			Correlation coefficient	P Value**
		Osteoporosis	Osteopenia	Normal		
L1	Osteoporosis	19	3	0	0.38	0.001
	Osteopenia	12	18	3		
	Normal	2	9	5		
L2	Osteoporosis	20	1	1	0.41	0.001
	Osteopenia	11	19	3		
	Normal	2	10	4		
L3	Osteoporosis	25	4	1	0.35	0.001
	Osteopenia	7	19	5		
	Normal	1	7	2		

L4	Osteoporosis	24	4	1	0.36	0.001
	Osteopenia	7	16	3		
	Normal	2	10	4		
L Total	Osteoporosis	24	2	0	0.42	0.001
	Osteopenia	7	21	4		
	Normal	2	7	7		
femur Total	Osteoporosis	5	0	0	0.039	0.54
	Osteopenia	16	9	2		
	Normal	12	21	6		
femur neck	Osteoporosis	14	3	0	0.41	0.008
	Osteopenia	18	20	5		
	Normal	1	8	3		
***: frequency **: Pearson Correlation**						

The results of T-score of one third of the distal radius with lumbar and femoral vertebrae and their correlation are given in Table 3. The sensitivity of one-third radius densitometry in comparison with L1 vertebrae in terms of diagnosis of osteoporosis and osteopenia was 82.35% and 54.54%, respectively, and its specificity was 31.25%. The sensitivity and specificity of other lumbar vertebrae are also presented in Table 3.

Table 4. Total radius T-score densitometry with femoral neck in the diagnosis of osteoporosis and osteopenia

T-score Total Radius	T-score of the femoral neck			Correlation coefficient	P Value**
	Osteoporosis	Osteopenia	Normal		
Osteoporosis	15	16	1	0.38	0.001
Osteopenia	2	25	7		
Normal	2	2	4		

The results of total densitometric correlation of radius bone with femur and lumbar vertebrae are shown in Tables 4, 5 and 6, respectively. The radiographic sensitivity of the total radius T-score compared to the femoral neck T-score for the diagnosis of osteoporosis and osteopenia was 88.23% and 58.14%, respectively, and its specificity was 36.36%. Among the risk factors for osteoporosis, only a statistically significant relationship was observed between the age of 65 years and osteoporosis (P=0.004).

Table 5. Total radius T-score densitometry with total femur in the diagnosis of osteoporosis and osteopenia

T-score Total Radius	T-score of Total femur			Correlation coefficient	P Value**
	Osteoporosis	Osteopenia	Normal		
Osteoporosis	5	16	10	0.031	0.614
Osteopenia	0	10	24		
Normal	0	1	25		

Table 6. Total radius T-score densitometry with total lumbar in the diagnosis of osteoporosis and osteopenia

T-score Total Radius	T-score of total lumbar			Correlation coefficient	P Value**
	Osteoporosis	Osteopenia	Normal		
Osteoporosis	20	9	1	0. 36	0.001
Osteopenia	6	19	9		
Normal	0	4	2		

Discussion

The aim of the present study was to determine the density of one-third distal radius in patients prone to primary osteoporosis. One study found that there was a strong association between distal radius bone density at the end of the leg and at the beginning, in the proximal and distal

and femoral trunk. In the present study, a significant correlation was observed between the distal radius bone density and the axial bone density of the body, which our findings are consistent with the results of the study [6-8].

In another study, the distal radius density of patients with type 2 diabetes was lower than that of the femurs and lumbar vertebrae. In the present study, the distal radius density of people over 50 years of age was lower than the density of femurs and lumbar vertebrae. Researchers have shown in a study that measuring bone mineral density in peripheral bones can be a good criterion for identifying patients to measure bone mineral density in the axillary bones of the body. The present findings are consistent with the results of the study [۹-11].

The researchers reported that there was no statistically significant difference between BMD in the distal radius and hip. In the present study, a positive correlation was observed between BMD of the distal radius and hip, which is not in line with the results of the study and is not in the same direction. It seems that the difference in the age of the study participants is the reason for this mismatch between the two studies [۱2].

The researchers concluded that patients with osteoporosis were more likely to have a distal radius fracture than those without osteoporosis. In another study of patients with distal radius fractures, the prevalence of osteoporosis in the lumbar spine was reported. In our study, changes in the distal bone mineral of the radius bone compared to the femur and lumbar vertebrae in osteoprotic patients showed a greater decrease. According to the results of this study, the sensitivity of distal radius BMD in the diagnosis of osteoporosis is more than 80% compared to the lumbar vertebrae (femur). In one study, the relationship between vertebral bone density and distal radius was reported, but due to the small sample size, it was not possible to evaluate and compare accurately, but in this study, with a sample size of more than 10 times their study, the results are quite similar [13].

In some studies, a significant increase in distal radius bone density in patients with underlying diseases such as rheumatoid arthritis or psoriatic arthritis has been reported compared to the bone density of the lumbar and femoral vertebrae. In our study, similar results were obtained in patients with primary osteoarthritis. In this study, the mean total radius BMD bone density was lower than that of the hip and lumbar vertebrae, which is consistent with the findings of previous studies [14].

Limitations

Low sample size, lack of history of osteoporosis, lack of minerals such as vitamin D and calcium were some of the limitations of this study, which are recommended to be removed in future studies.

Conclusion

According to the findings of this study, the study of one distal one-third mineral density of radius bone by DXA method for the diagnosis of osteoporosis has a significant sensitivity and has a significant relationship with the density of lumbar vertebrae (femur).

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