

Role of DXA in Diagnosis and Assessment of Fracture Risk in Osteoporotic Patient.

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Introduction: Osteoporosis has operationally defined by the WHO on the basis of bone mineral density (BMD) assessment. Dual-energy X-ray absorptiometry (DXA) is a means of measuring bone mineral density (BMD). The DXA scan is typically used to diagnose and follow osteoporosis. DXA scans to measure BMD at the spine and hip have an important role in the evaluation of individuals at risk of osteoporosis, and in helping clinicians advise patients about the appropriate use of anti-fracture treatment. Compared with alternative bone densitometry techniques DXA have number of advantages. FRAX is a computer-based algorithm that employs bone density, age and a number of clinical risk factors to help patients and their doctors predict the likelihood of having a fracture in the next 10 years.

Objective: To predict fracture risk in osteoporotic men and women with the use of clinical risk factors for fracture and femoral neck T-score with the help of FRAX score.

Method: FRAX tool is used assess fracture risk with the help of T-score with and knowing CRF's from 400 men and women drawn from the general population with age more than 40 years.

Results: Out of 400 individuals 140 were found to be osteoporotic with T-score < -2.5 and FRAX score is calculated which show >3% chances of hip fracture in 66.43% individuals and >20% chances of other major osteoporotic fracture in 12.86% individuals.

Conclusion: In elderly men and women it is showed that low BMD is a major risk factor for fracture and incorporation of CRFs improves the operating characteristics of fracture risk assessment over.

Keywords: osteoporosis, fracture, bone mineral density, clinical risk factors, FRAX, 10-year probability.

Date of Submission: 07-01-2019

Date of acceptance: 22-01-2019

I. Introduction

Osteoporosis is the most common generalized disease of the skeleton. It causes reduction in the bone mass and change in the bone structure, both of which eventually result in reduced bone strength and increased propensity to fractures.¹

Osteoporosis is widely recognized as an important public health problem because of the significant morbidity; mortality and costs associated with its complications—namely, fractures of the hip, spine, forearm and other skeletal sites².

Dual-energy X-ray absorptiometry (DXA, previously DEXA^{2,3}) is a means of measuring bone mineral density (BMD). Dual-energy X-ray absorptiometry is the most widely used and most thoroughly studied bone density measurement technology. The DXA scan is typically used to diagnose and follow osteoporosis. Dual energy x ray absorptiometry (DXA) scans to measure bone mineral density (BMD) at the spine and hip have an important role in the evaluation of individuals at risk of osteoporosis, and in helping clinicians advise patients about the appropriate use of anti fracture management. Compared with alternative bone densitometry techniques, hip and spine DXA examinations have a number of advantages that include a consensus that BMD results can be interpreted using the World Health Organization T-score definition of osteoporosis, a proven ability to predict fracture risk, proven effectiveness at targeting anti fracture therapies, and the ability to monitor response to treatment.

FRAX is a computer-based algorithm that employs bone density, age, and a number of clinical risk factors to help patients and their doctors predict the likelihood of having a fracture in the next 10 years. The FRAX tool takes your T-score into account if you have it, but it also incorporates information about several other osteoporosis risk factors, i.e. age, height and weight, smoking, alcohol consumption, other health conditions, such as rheumatoid arthritis, corticosteroid use, family history of fractures and personal history of fractures.

II. Material And Method

This study was conducted at the Department of Orthopaedics, Rajkiya Medical College Jalaun(orai). Patients fall under risk of osteoporosis selected randomly from urban and rural areas. At the end of study, a total

of 400 patients had been included. All participants completed a questionnaire about any metabolic bone disease except vitamin D deficiency, any infection and tumors. Subjects were excluded if they had at least one of the above conditions. Information about current age, fracture history, family history of fracture, history of alcohol intake and corticosteroid therapy, vitamin D deficiency and long term immobilization.

Anthropometry measurement: Height and weight were measured while subjects were standing, wearing light clothing and no shoes. Body mass index was calculated as the ratio of weight (in kilograms) to height (in meters) squared.

Bone mass assessment: Bone mass was assessed by DXA scan. This device assesses bone marrow density(g/cm²).of hip and lumbar spine. T-scores are calculated by taking the difference between a patient's measured BMD and the mean BMD in healthy young adults, matched for gender and ethnic group, and expressing the difference relative to the young adult population standard deviation (SD).

Fracture risk assessment: Patients who found to be osteoporotic after calculating T score i.e. is of < -2.5, fracture risk assessment tool (FRAX) is used to assess ten-year probability of a major osteoporotic fracture (in the proximal part of the humerus, the wrist, or the hip or a clinical vertebral fracture) and of a hip fracture.

III. Results

There were total 400 patients, DXA has been done of all patient out of which 140 (35%) were osteoporotic with hip T score <-2.5 and majority i.e. 220 (55%) were osteopenic with hip T score -1 to -2.5. The osteoporotic patients are subjected to FRAX tool to found fracture risk and we found the, 10 years probability of hip fracture is < 3% in 47(33.57%) cases &> 3% in 93(66.43%) cases and 10 years probability of major osteoporotic fracture is < 20% in 122(87.14%) cases &> 20% in 18(12.86%) cases.

IV. Discussion

Osteoporosis means literally "porous bone," a condition of there being "too little bone" to provide mechanical support. Osteopenia is a reduction in BMD below a pre defined level. Osteoporosis is characterized by a reduction in bone mineral density to level below what is required for mechanical support. A consensus development conference defined osteoporosis as a systemic skeletal disease characterized by low bone mass and micro-architectural deterioration with a consequent increase in bone fragility and susceptibility to fracture.¹⁴In a previous study¹⁵, X-ray examination of the vertebral column was done for diagnosis of osteoporosis. In the present study dual energy X-ray absorptiometry (DXA) was used to assess bone mineral density in lumbar spine and femur which is similar to studies by Reinhart *et al*¹⁶. Dual energy X-ray absorptiometry (DXA) measurements are good predictors of fracture risk. The average radiation exposure for DXA is 1 to 3 mrad, per scan and it is a safe method for assessing bone mineral density. In an earlier study¹⁷, the metacarpal index was used to detect osteoporosis, in the present study bone mineral density in anterior posterior view of lumbar spine and femur were assessed in concurrence to study by WactawskiWende *et al*¹⁸.In our study we use DXA scan for the diagnosis of osteoporosis that is supported by Rizzoli R *et al* in 1995 has found in his study that DXA is most suitable for diagnosis of osteoporosis in the elderly⁶. Other studies uses DXA for measuring bone mass are;Diagnosis of osteoporosis and assessment of fracture risk by Kanis J A in 2002⁴.Estimation of low bone mass for the assessment of osteoporosis fracture risk in Indian men and women using quantitative USG and DEXA by Mallikarjun S. Holi *et al* in 2004⁷.Bone imaging: traditional techniques and their interpretation by Boehm HF and Link Tm in 2004⁸.Role of dual energy X-ray absorptiometry in the diagnosis and treatment of osteoporosis by Black G M and Fogrlman I in 2007⁹.Validity of the DEXA diagnosis of involuntional osteoporosis in patients with femoral neck fractures by Ali Humadi *et al* in 2010¹⁰.Radiographic absorptiometry for pre-screening of osteoporosis in patients with low energy fractures byIneBuch *et al* in 2010¹¹.Application of the WHO fracture risk assessment tool (FRAX) to predict need for DEXA scanning and treatment in patients with inflammatory bowel disease at risk of osteoporosis by Goodhand *et al* in 2011¹³. In our study we found out of 400 selected patients 140(35%) were osteoporotic and 220 (55%) were osteopenic which is comparable to the study by Marwaha RK, *et al*. Bone health in healthy Indian population aged 50 years and above in 2011 and found osteoporosis was present in 35.1% of subjects (M-24.6%, F-42.5%) and osteopenia in 49.5% (M-54.3%, F-44.9%)¹⁹.

In our study we use FRAX tool for the assessment of fracture risk in osteoporotic patients other studies supported this are FRAX and its applications to clinical practice by Kanis JA in 2009⁵, assessment of fracture risk by Unnanuntana in 2010¹², the application of the WHO fracture risk assessment tool (FRAX) to predict need for DEXA scanning and treatment in patients with inflammatory bowel disease at risk of osteoporosis by Goodhand J.R. in 2011¹³.

In our study we found 10 years probability of hip fracture is < 3% in 47(35.57%) cases and > 3% in 93(66.43%) cases and 10 years probability of major osteoporotic fracture is < 20% in 122(87.14%) cases and > 20% in 18(12.86%) cases by FRAX score assessment.

V. Conclusions

A total of 400 patients selected under the inclusion criteria, attending the outpatient department of orthopedics, , Rajkiya Medical College Jalaun(orai). The patients are subjected to DXA scan to find out the T-score and found 140 (35%) were osteoporotic and also questioned for the clinical risk factors then the FRAX score is assessed using international FRAX scoring system and conclude that the osteoporotic patient are at greater risk of hip fracture and other major osteoporotic fracture in future.

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Dr.SushantVerma. “Role of DXA in Diagnosis and Assessment of Fracture Risk in Osteoporotic Patient.” *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, vol. 18, no. 1, 2019, pp 26-28.