Assessing vertebral fractures with Bone Mineral Density in the diagnosis of osteoporosis; reporting initial findings

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Introduction and Background

Background

The Dual Energy X-ray Absorptiometry (DXA) is a gold standard for the assessment of the bone mineral density and is also the only validated technology that uses the BMD input for the WHO fracture risk assessment algorithm, FRAX. Identification of previously unrecognized vertebral fractures with VFA, have the tendency to change diagnostic classification, fracture risk assess--ment and decisions regarding treatment with alteration of management of the patient with reduction of morbidities.

Rationale of Study

The rational of this cross sectional study was to report an initial study prevalence of vertebral fractures and the advantage of VFA with BMD (as reported by others) in our current settings and offer an algorithm for the assessment of osteoporosis. Reported here are the initial findings of the study.

Materials and Methods

Clinical Settings

The setting for the study was "The Karachi Institute of Radiotherapy and Nuclear Medicine", Karachi, Pakistan

Sampling Technique

The sampling technique utilized was a non-probability consecutive sampling.

Study Design

This study was based on the study design of a prospective Cross-sectional study.

Study Settings

The setting for this study was the Department of Nuclear Medicine of the Karachi Institute of Radiotherapy and Nuclear Medicine.

Inclusion Criteria

The inclusion criteria for the study included any adult male or female patient, 18 years and above referred for BMD measurements to the Nuclear Medicine Department of the Karachi Institute of Radiotherapy and Nuclear Medicine.

Exclusion Criteria

Patients with either one or more than one of the following conditions were excluded from the study:

- Patients with obvious deformities such as scoliosis / kyphosis of the spine.
- Known previous history of spine fracture.
- Patients below the age of 18 years.

Data Collection Tool

All relevant data deemed necessary for the assessment of the final BMD scores and VFA assessment was collected on a predefined performa.

Data Collection Procedure

Data collection was started after the **approval from the Ethical Review Committee** of the parent institution. It was ensured that only those patients that stood meeting the inclusion criteria laid down for the study were included and that due **"informed consent"** was taken. An initial acquisition for the assessment of the BMD (non-dominant hip and AP lumbar spine) BMD was carried out. This was done first, which was followed by VFA. The study was carried out on Hologic Discovery A with standard Hologic reference database for Caucasian men and women.

The acquisition for the VFA was performed by turning the patient onto their right lateral position and acquiring the lateral spine images from the T4 to L4 vertebral levels.

After both acquisitions, visual interpretation was carefully made of the acquired images and if found necessary, vertebras that were deemed to be a source of aberrant values of the BMD, were excluded. The machine software was then used to generate the BMD as well as the VFA report and a comprehensive report stating the bone mineral condition as well as vertebral fracture assessment was generated.

Data Analysis

Initial data entry has been done on the SPSS statistical package version 20.0 and Microsoft excel software.

Preliminary Results and Discussion

Results

Data was acquired on 250 patients, however 16 of these were excluded based upon the exclusion criteria. The study included 234 patients. These included 6 males and 228 females (mean age 57.7 years +/- 4 years).

Compilation of the study revealed a normal BMD in 40 patients (17%), osteopenia in 88 (37.6%), and osteoporosis in 106 (45.3%) of the cases. The VFA identified fractures in 50 of theses patients, 35 of which were seen in osteoporotic patients and 15 in osteopenic. The VFA assessment served to change the diagnosis of these 15 patients from an osteopenia based upon their Hip and Spine analysis to an osteoporosis based on the WHO guidelines. The vertebras were all assessed on the Genant scores.

Discussion

Low bone mass, leading itself into osteoporosis has been deemed as a silent killer of women. The prevalence of the disease has been established at almost all levels and demographics of society. Osteoporosis leads to an increased risk of fragility fractures in the elderly. The lifetime fracture risk is estimated to be between 40 and 44% for women and 13 and 25% for men from age 50 years onward . To need to identify and establish the diagnosis of the disease, before the onset of the entailing complication and morbidities, has long been acknowledged. DXA scanning, as the gold standard, for the screening and diagnosis has been the standard practice of long.

Though the role of this scanning cannot be refuted however, it must be remembered that the modality acquires images only in the two dimensional, AP projections. Any subtle deformities of the lumbar acquisition, which could be an early harbinger of later morbidity, especially in the post-menopausal group, is hence missed. Adding on the lateral acquisition of the spine affords added information on the morphology of the spine and helps to identify fractures that are missed on the AP imaging. This lateral spine acquisition, added to the DXA acquisition, has been advocated as a "value added" scenario. Our study also supported previous findings of the addition of lateral imaging to the DXA scanning helped in the timely identification of patients for support and treatment, by upgrading their diagnosis from osteopenia to osteoporosis, which otherwise would have been missed by a simple DXA scanning. These patients were hopefully saved from a lifetime morbidity and disabilities by this timely identification of the diagnosis. Though the study is greatly limited by the small cohort, however the initial findings cannot be ignored and suggest important parameters to be discovered which will add to the final results of managements of the patient.

Limitations of the Study

- Single center study with a relative small cohort, therefore generalizability cannot be made.

Conclusion

Results findings of this study indicate that the addition of VFA to routine scanning of the patients for the evaluation of the bone mineral density can have advantages of a proper screening and categorization of the patients for osteoporosis.
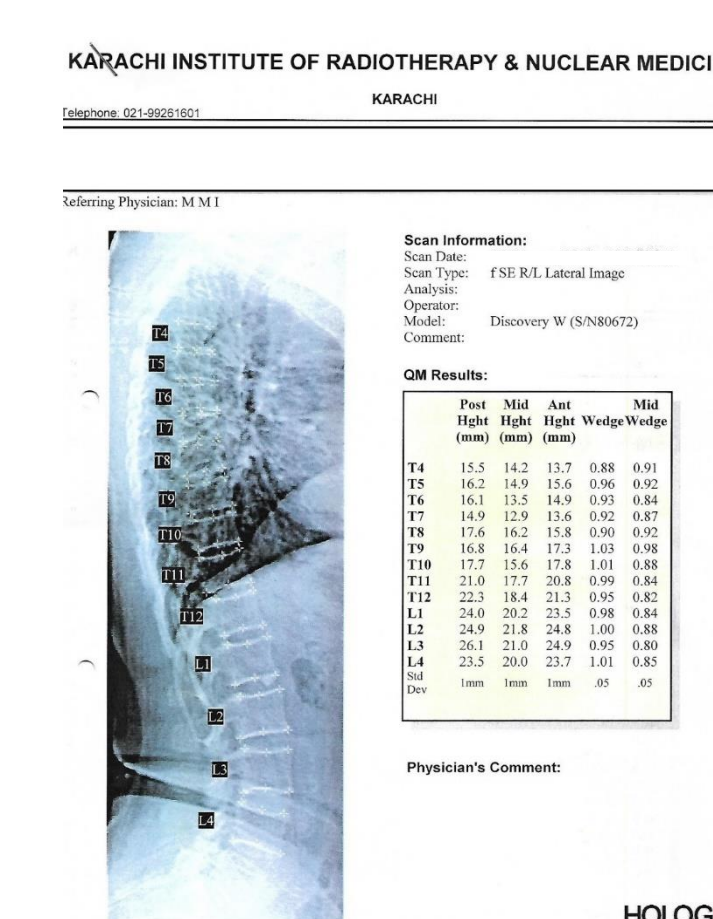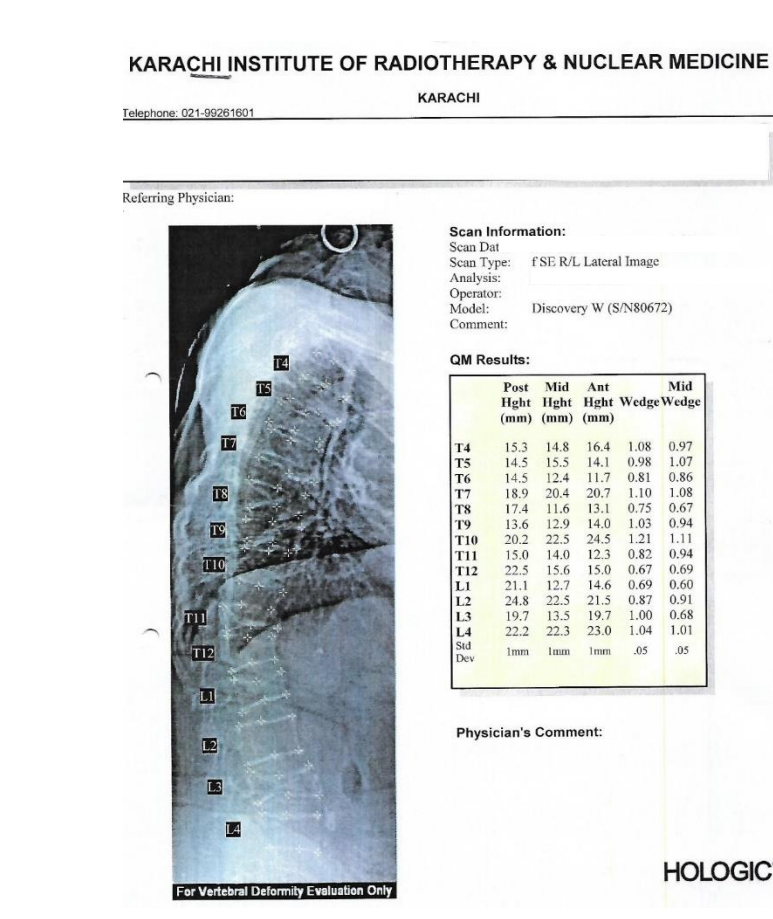
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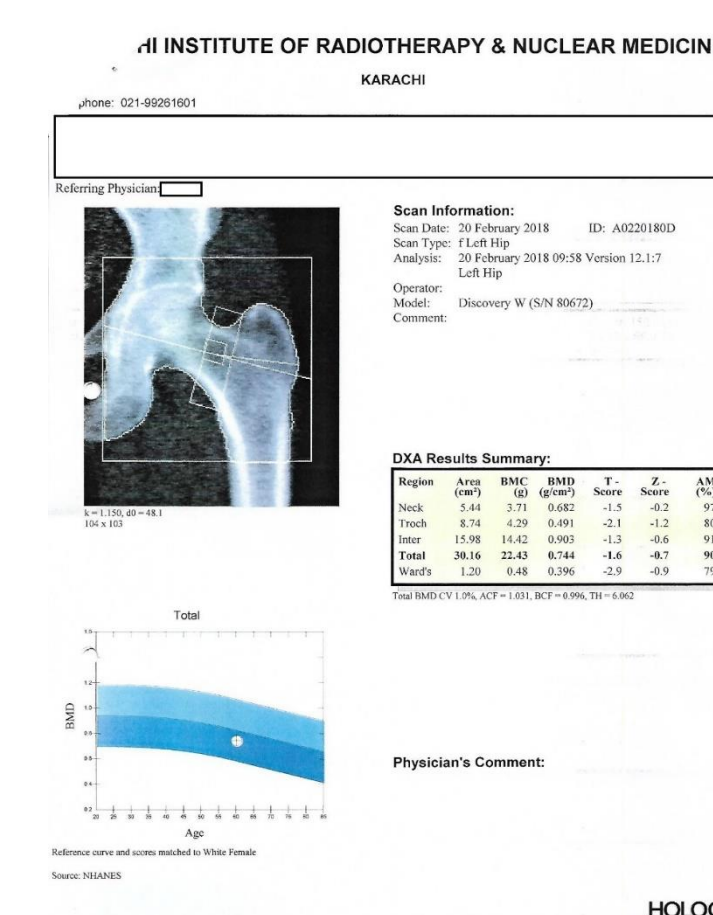
DXA Scan of the Left Hip
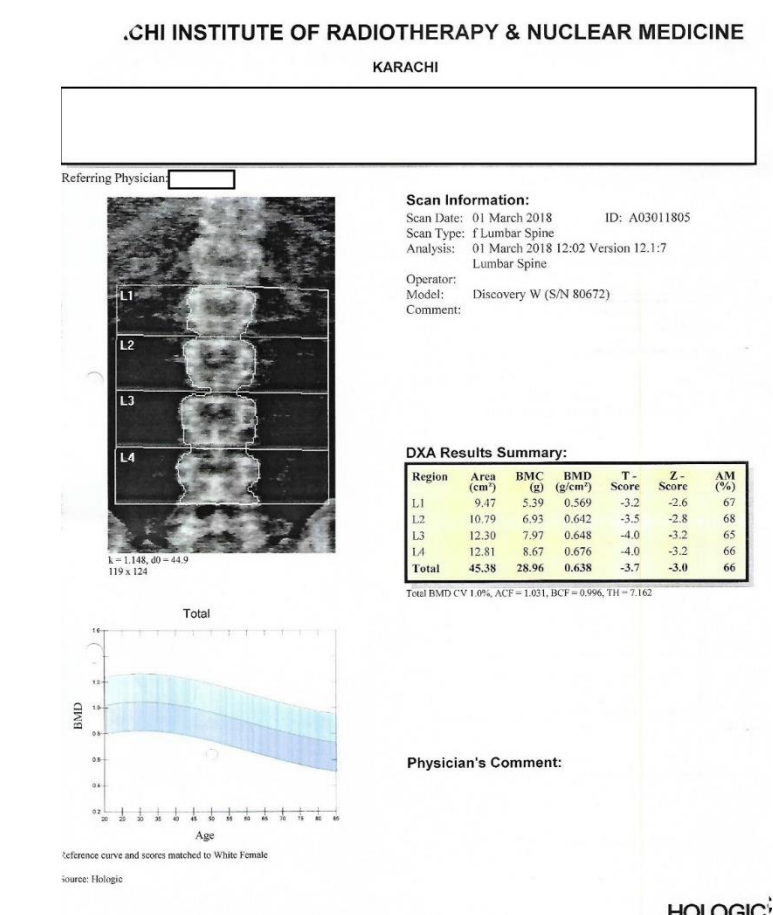
DXA Scan of the Lumbar Spine

VFA Lumbar Spine(normal)

VFA Lumbar Spine with fractures

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