Original Article

Comparison between the QCT and the DEXA Scanners in the Evaluation of BMD in the Lumbar Spine

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ABSTRACT

Introduction: Both QCT and DEXA scanners are being used for determination of BMD in lumbar spine in the diagnosis of osteoporosis. But till now, no consensus has been reached that out of QCT or DEXA scanner which modality is most efficacious in the diagnosis of osteoporosis.

Objectives: To evaluate BMD in lumbar spine of the same subjects under similar conditions both by QCT and DEXA scanners on the same day and to compare their findings in evaluating these subjects as osteoporotic, osteopenic or normal.

Materials and Methods: In this cross sectional study a population of 165 subjects both male and female which included 37 young healthy volunteers, 46 post menopausal females, 32 elderly patients above 65 years of age, 15 patients between 40- 65 years of age and 35 patients on steroid therapy for more than 6 months period underwent bone densitometry both by QCT and DEXA scanners. Light Speed Plus CT scanner of GE and DEXA scanner Norland XR 46 were used for measurement of BMD and accordingly, these subjects were diagnosed as osteoporotic, osteopenic and normal on the basis of WHO defined criteria of T score.

Results: In the present study QCT has diagnosed more cases of osteoporosis (both osteopenic and osteoporotic) as compared to DEXA lateral and DEXA AP in the total population as well as in females and males separately. In the total population, 67.3% (111) cases were diagnosed for osteoporosis by QCT as compared to 46.7% (77) and 49.7% (82) cases by DEXA lateral and DEXA AP respectively. In females, 75.8% (97) cases were diagnosed for osteoporosis by QCT as compared to 52.3% (67) each by DEXA lateral & DEXA AP. Similarly in males 37.8% (14) cases were diagnosed for osteoporosis by QCT as compared to 27% (10) cases by DEXA lateral and 40.6% (15) cases by DEXA AP.

Conclusion: Both the modalities confirm the direct correlation between age and osteoporosis, as with increasing age the risk of prevalence of osteoporosis increased across all age groups. But QCT has been found to be more efficacious than DEXA scan in the diagnosis of osteoporosis i.e. QCT helps discriminate between normal subjects and those with osteoporosis better than DEXA-lateral and DEXA-AP.

Key Words: QCT, DEXA, BMD, Lumbar spine, T-score, Z-score, Osteoporosis

INTRODUCTION

Bone density (g/cm³) is the amount of bone tissue in a certain volume of bone [1]. It is often very difficult to establish its measure without damaging the bone therefore, the term bone mineral density (gm/cm²) is used instead. BMD is the most important determinant of bone fragility to evaluate osteoporosis [2]. Patients with reduced bone mineral density have increased risk of fracture, the incidence of which particularly at the hip and spine increases with age in both women and men. BMD can be measured in a variety of sites with a variety of techniques. Numerous methods have been used for quantitative assessment of the skeleton in osteoporosis, with variable precision, accuracy and sensitivity. The requirements for a clinically useful measurement of BMD differ depending on the specific clinical problems under investigation. For serial determination in a given patient, precision and sensitivity are critical. When used as a diagnostic procedure to identify a patient with osteoporosis, accuracy and sensitivity are required [3]. Thus precision and accuracy of DEXA and QCT scanners are key issues when interpreting BMD measurements in clinical practice. The annual BMD loss in most postmenopausal women varies from 0.5% to 2%, and the increase in BMD following anti resorptive drugs is only around 1-6% in 3 years. Hence, minimizing precision errors in bone densitometry is critical, since lower precision errors allow for early detection of smaller changes in BMD [4].

A particular problem and serious controversies have evolved from the fact that results which have been obtained on different scanners do not agree or can hardly be compared. In the assessment of osteoporosis, the measurement of BMD obtained from DEXA is the most widely used technique because of its ease of use, low radiation exposure and its ability to measure BMD at both the hip and spine [5]. DEXA can also be used to measure peripheral sites such as the wrist and finger. Whereas, QCT allows for a true three dimensional bone density measurement without superimposition of other tissues and provides accurate anatomic localization of measured volume. Although not as widely used as DEXA, the main advantages of QCT are separate measurement of trabecular and cortical bone i.e. high sensitivity of the vertebral spongiosa measurement site and potential for widespread use [6]. QCT results into exclusion of extraosseous calcifications such as aortic sclerosis and plaques, ligament calcifications, osteophytes and any other overlying tissues that can influence projectional BMD measurements when measured by DEXA. Whereas, the limitation of QCT is its slightly higher radiation dose than DEXA and that the World Health Organization (WHO) definition of osteoporosis in terms of bone densitometry (T score with S.D. −2.5 or below as used in DEXA) is not applicable. At present no consensus has been reached that out of QCT or DEXA which modality is more efficacious in the diagnosis and serial assessment of osteoporosis in an individual

patient or in diagnostic screening of large population. On literature review it has been observed that different studies [7-16] have given different observations in comparing the findings of these two most commonly used modalities. However in recent years the use of QCT has increased with the advent of new developments in CT technique and recognition of its advantages over DEXA [17]. Since both these modalities, DEXA and QCT scanners are available in our institute and no such kind of study has ever been conducted in context to Indian population, it tempted us to undertake this study to compare their findings in evaluating the same patients as osteoporotic, osteopenic or normal.

AIMS AND OBJECTIVE

The objective of this study was to determine the bone mineral density of lumbar spine (L3 vertebrae) in both male and female subjects of various age groups by using both QCT and DEXA scanners and to compare their findings in discriminating the same subjects as osteoporotic, osteopenic or normal. This will help us to know which modality diagnoses more number of osteoporosis (both osteopenic as well as osteoporotic) cases in the same kind of subjects and be considered more efficacious than the other in accurate measurement of bone density. Accordingly, this will result in starting the treatment regimen early and decrease the future risk of fracture related to osteoporosis in lumbar spine.

MATERIALS AND METHODS

In this cross sectional study, a population of 165 subjects both female 77.6 % (128) and male 22.4 % (37) was included(Table/Fig-1).

It comprised of 37 young healthy volunteers (20 females and 17 males) between 20-40 years with mean age 22.62 years (who were either patients' relatives or staff members with no known history of any disease) – Group A and patients of various age groups comprising of 15 patients (9 pre menopausal females and

6 males) between 41 years and 64 years with mean age of 48.53 years – Group B, 46 patients (post menopausal females) between 41 years and 64 years with mean age 55.11years – Group C, 32 elderly patients (25 females and 7 males)above 65 years of age with mean age 70.25years – Group D and 35 patients (29 females including 18 premenopausal and 6 males) on steroid therapy for more than six months period with mean age 45.91 years - Group E [Table/Fig-2]. All these patients visited the out patient department of Nehru Hospital of PGIMER Chandigarh for consultation during the period from January 2008 to January 2011 and were advised bone densitometry by their clinicians. The study protocol was approved by the institute ethics committee and prior informed consent from each participant was taken.

Inclusion criteria: All the patients except young healthy volunteers included in this study were advised bone densitometry by their concerned clinicians on the basis of clinical findings.

Exclusion criteria: All the subjects excluded in this study were those who had the history for recent radionuclide uptake procedures (within ten half lives), recent ingestion of radio-opaque substances e.g. barium or dyes used in X-ray examination and had prosthetic devices, implants, surgical staples or other high density sub dermal materials that may effect density estimates.

All these subjects were subjected to both QCT of lumbar spine (L1 – L3 vertebrae) as well as DEXA of lumbar spine both in AP and Lateral position on Light Speed Plus CT scanner of G.E (installed in Nehru hospital) and Norland XR 46 DEXA scanner (installed in OPD) respectively on the same day .The age, height, weight, BMI, menopausal status in females [Table/Fig-1 & 2] along with history of any disease and treatment course if any was recorded. In each case, the bone mineral density, T score and Z score of Lumbar spine (L-3 vertebrae) was measured both by QCT and DEXA scan separately [Table/Fig-3].

QCT SCANNING & EVALUATION

Subjects were positioned supine on the CT scanner table, lying on top of QCT calibration phantom and bolus bag (gel pack) with the end of the phantom approximately at the iliac crest to ensure that L4 to T10 was covered by the phantom so that the feet entered the scanner first. The knees were elevated to flatten the back and achieve close contact with the phantom. Pillows were placed under the shoulders and head of patient for comfort. The patient's arms were raised and were out of the field of view. Patients were instructed to remain still and breathe normally during the study. First a lateral scout view of lumbar spine was taken at 120 KVp and 80mA. The scout view provided localization of the axial scans in the vertebral mid planes of three lumbar vertebras (L1–L3). Slices of 10 mm thickness were acquired parallel to the vertebral endplates with large scan field of view at 120 KVp & 160 mA. The scan time for each vertebra was 2 sec.

Parameters	Total Cases (165 No.)	Females (128 No.)	Males (37 No.)
Age (yrs) Mean ±SD (Range)	48.21 ± 17.4 (20–86)	50.06 ± 15.68 (20–86)	41.81 ± 21.42 (20–81)
Weight (Kg) Mean ±SD (Range)	63.27 ± 12.33 (39–110)	62.71 ± 11.62 (39–110)	65.21 ± 14.54 (39–95)
Height (cms) Mean ±SD (Range)	156.40 ± 9.06 (136–186)	153.31 ± 6.91 (136–179)	167.08 ± 7.35 (149–186)
BMI (kg/m²) Mean ±SD (Range)	25.96 ± 5.06 (14.7–43.5)	26.71 ± 4.8 (17.93–43.51)	23.39 ± 5.18 (14.69–36.65)

[Table/Fig-1]: Anthropometric data of Total 165 subjects (Females and Males)

Parameters	Group A (20–40 Yrs) 37 No.	Group B (>40–64 Yrs) 15 No.	Group C (>40–64 Yrs) 46 No.	Group D (>=65 Yrs) 32 No.	Group E 35 No.
Age (yrs) Mean ±SD (Range)	22.62±3.7 (20–37)	48.53±6.6 (41–64)	55.11±5.13 (44–64)	70.25±4.77 (65–86)	45.91±11.57 (23–70)
Weight (Kg) Mean ±SD (Range)	59.67±9.76 (43–86)	59.33±10.64 (39–75)	63.89±11.4 (48–90)	62.21±12.13 (39–95)	68.94±14.9 (50–110)
Height (cms) Mean ±SD (Range)	163.30±9.07 (149–186)	156.13±7.5 (142–167)	152.95±7.38 (140–179)	152.90±9.53 (136–172)	156.91±9.53 (136–172)
BMI (kg/m²) Mean ±SD (Range)	22.35±2.97 (14.69–28.13)	24.48±4.79 (14.86–31.62)	27.28±4.31 (21.50–38.27)	26.69±5.20 (16.20–41.33)	28.01±5.78 (20.32–43.51)

[Table/Fig-2]: Anthropometric data (Group wise)

Modality	Parameters	Group A (20–40 Yrs) 37 No.	Group B (>40–64 Yrs) 15 No.	Group C (>40–64 Yrs) 46 No.	Group D (>=65 Yrs) 32 No.	Group E 35 No.
QCT (mg/cc)	BMD Mean ±SD (Range)	187.30±27.57 (126.8–248)	113.47±36.19 (45.8–184.4)	101.46±36.2 (37.1–181.8)	82.18±33.83 (22.2–141.7)	131.34±34.39 (50.9–209.2)
	T Score Mean ±SD (Range)	0.37±0.96 [(–1.80)–(2.30)]	–2.03±1.27 [(–4.3)–(0.50)]	–2.66±1.19 [(–4.80)–(–0.20)]	–3.20±1.31 [(–5.50)–(–0.60)]	–1.57±1.21 [(–4.50)–(1.10)]
	Z Score Mean ±SD (Range)	0.46±.95 [(–1.5)–(2.4)]	–1.02±.90 [(–2.5)–(1)]	–0.97±1.09 [(–3.7)–(1.2)]	–0.60±1.14 [(2.7)–(1.5)]	–0.65±1.20 [(–2.5)–(1.4)]
DEXA Lateral (gm/cm²)	BMD Mean ±SD (Range)	0.72±.0.12 (.50–1)	0.59±.0.17 (0.38–0.98)	0.50±.0.13 (.28–.85)	0.55±.0.19 (.30 –1.11)	0.58±.0.14 (.30–.92)
	T Score Mean ±SD (Range)	1.04±1.99 [(–2.42)–(6.7)]	–0.59±2.47 [(–4.2)–(3.9)]	–1.50±2.14 [(–5.3)–(4.2)]	–1.21±2.78 [(–4.8)–(8.5)]	–0.63±2.12 [(–4.8)–(3.8)]
	Z Score Mean ±SD (Range)	1.07±2.26 [(–2.61)–(6.88)]	0.50±2.48 [(–3.05)–(5.14)]	0.10±2.14 [(–3.62)–(5.80)]	0.52±2.76 [(–3.05)–(10.29)]	0.47±2.0 [(–4.11)–(4.65)]
DEXA AP (gm/cm²)	BMD Mean ±SD (Range)	1.04±.0.15 (0.80–1.56)	0.88±0.18 (0.58–1.17)	0.84±0.16 (0.52–1.26)	0.82±0.198 (0.55–1.29)	0.97±0.17 (0.52–1.56)
	T Score Mean ±SD (Range)	–0.34±2.03 [(–9.9)–(3.6)]	–1.28±1.48 [(–3.5)–(1.1)]	–1.26±1.42 [(–3.9)–(1.9)]	–1.72±1.53 [(–4.1)–(2.2)]	–0.50±1.37 [(–2.9)–(2.3)]
	Z Score Mean ±SD (Range)	–0.21±1.28 [(–2.3)–(3.7)]	–0.76±1.5 [(–3.8)–(1.2)]	–0.51±1.31 [(–3.5)–(2.3)]	0.23±1.67 [(–4.2)–(4.0)]	–0.20±1.62 [(–2.9)–(4.1)]

[Table/Fig-3]: BMD results (Group wise)

The QCT derived BMD was determined using QCT - 5000 Bone Densitometry software [version 6.02] according to the directions provided by Image Analysis, Inc. The analysis was performed by positioning a circular region of interest (ROI) centred over the body of vertebra. BMD of each vertebra (L1-L3) was calculated in mg/cc and from these values mean BMD was calculated. T and Z scores based on UPDATED REFERENCE CURVE (December 1999) were also calculated.

DEXA SCANNING & EVALUATION

BMD was measured with Norland XR 46 DEXA scanner installed in OPD section of our institute. DEXA scanner was maintained according to the manufacturer's recommendations including the performance of daily quality control calibrations. All the BMD measurements were performed by the experienced technologists who performed the same procedure for patient positioning and analysis and all the subjects were examined in both AP and Lateral positions. The AP spine scan procedure estimated bone mineral in the lumbar spine using a posterior-anterior projection with region of interest L2–L3-L4 segment which was analyzed for individual and total vertebrae. The analysis excluded transverse vertebral process areas from the bone mineral estimations. The scan started at the Xiphoid process and ended just below the iliac crests. The scan procedure included an auto centring routine to ensure the spine was centred and straight in the scan area. The Lateral spine scan procedure estimated bone mineral in the lumbar spine using a lateral projection. The region of interest was the L2-L3-L4 vertebral bodies. The scout scan started 2 cm above the lowest point of the rib cage and extended to 2 cm below the iliac crest along a centre line that is approximately 10 cm anterior to the patient's back. Results were displayed automatically.

DEXA scan was analyzed according to the manufacturer's instructions and results were obtained in absolute values (g/cm2), in T score and in Z score on the basis of W.H.O. defined criteria. T score is the number of standard deviations from the mean of a healthy young adult population (20–40 years old); it is used for the definition of osteopenia (T score below –1.0 and above –2.5) and osteoporosis (T-score –2.5 or less). Z-score is the number of standard deviations from the mean of a healthy age- and gender-matched normal population, which allowed the comparison of BMD between patients of different age and gender.

STATISTICAL ANALYSIS

The Statistical Analysis was carried out using Statistical Package for Social Sciences (SPSS Inc. Chicago, IL, Version 15.0 for Windows). Data was checked for skewness by Kolmogorov Smirnov tests of normality. For normally distributed data means were compared using student's t-test for two groups. For more than two groups one way ANOVA or KruskalWallis test was applied. Proportions were compared using Chi square or Fisher's exact test whichever was applicable. All statistical tests were two sided and performed at a significant level of $\alpha=.05$.

RESULTS

In the present study out of 165 subjects QCT has diagnosed 67.3% (111), DEXA lateral diagnosed 46.7% (77) and DEXA AP 49.7% (82) cases of osteoporosis (both osteopenic and osteoporotic) (Table/Fig-4).

In females vs males mean BMD value measured was 117.75mg/cc vs 147.42mg/cc , 0.55 gm/cm² vs 0.71gm/cm² and 0.89gm/cm² vs 1gm/cm² by QCT, DEXA lateral and in DEXA AP respectively [Table/Fig-5]. Whereas in female QCT diagnosed 75.8% (97) cases for osteoporosis (both osteopenic and osteoporotic) as compared to 52.3% (67) each diagnosed by DEXA lateral & DEXA AP. Similarly in males 37.8% (14) cases were diagnosed for osteoporosis (both osteopenic and osteoporotic) by QCT as compared to 27% (10) cases by DEXA lateral and 40.6% (15) cases by DEXA AP (Table/Fig-6).

Comparison of diagnosis of Osteoporosis B/W Various Groups on the basis of T-score by QCT and DEXA

In group A comprising 37 young volunteers, QCT diagnosed 92% (34) normal and 8% (3) as osteopenic, Dexa-lateral diagnosed 86.5% (32) as normal, 13.5% (5) as osteopenic and Dexa-AP diagnosed 73% (27) as normal, 24.3% (9) as osteopenic, 2.7% (1) as osteoporotic [Table/Fig-7].

In group B comprising 15 patients of age group 40yrs - 64 yrs. QCT diagnosed 20% (3) normal, 46.7% (7) osteopenic, 33.3% (5) osteoporotic, Dexa-lateral diagnosed 53.3% (8) as normal, 26.7% (4) osteopenic and 20% (3) osteoporotic and Dexa-AP diagnosed 53.3% (8) as normal, 20% (3) osteopenic and 26.7% (4) osteoporotic [Table/Fig-8]

In group C comprising 46 post menopausal females patients QCT diagnosed 10.9% (5) normal, 26.1% (12) osteopenic, 63% (29) osteoporotic, Dexa-lateral diagnosed 32.6% (15) as normal, 28.3% (13) osteopenic and 39.1% (18) osteoporotic and Dexa-AP diagnosed 37% (17) as normal, 43.5% (20) osteopenic and 19.5% (9) osteoporotic [Table/Fig-9]

In group D comprising 32 elderly patients of age ≥ 65years QCT diagnosed 3.1% (1) as normal, 28.1% (9) osteopenic, 68.8% (22) osteoporotic, Dexa-lateral diagnosed 40.6% (13) as normal, 21.9% (7) osteopenic and 37.5% (12) osteoporotic and Dexa-AP diagnosed 31.1% (10) as normal, 20.8% (9) osteopenic and 40.1% (13) osteoporotic [Table/Fig-10].

In group E comprising 35 patients on steroid therapy QCT diagnosed 31.4%(11) normal, 40%(14) osteopenic, 28.6%(10) osteoporotic, Dexa-lateral diagnosed 57.1%(20) as normal, 22.9%(8) osteopenic and 20%(7) osteoporotic and Dexa-AP diagnosed 21(60%) as normal, 34.3% (12) osteopenic and 5.7% (2) osteoporotic (Table/Fig-11)
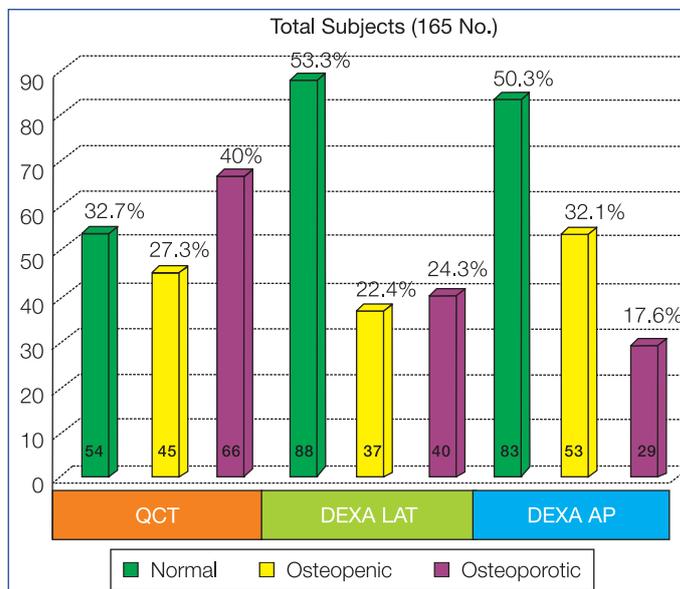
[Table/Fig-4]: Bar chart showing comparison of QCT, DEXA Lateral and DEXA AP findings in total population

DISCUSSION

In this study both the modalities i.e. QCT and DEXA scanners have confirmed that there is a direct correlation between age and osteoporosis as with increasing age the risk of prevalence of osteoporosis (decrease in BMD) has also increased in all the different groups evaluated. Further QCT has diagnosed more cases of osteoporosis as compared to DEXA Lateral and DEXA AP in the total population [Table/Fig-12] as well as separately in all the female and male subjects [Table/Fig-4] (This is due to the fact that QCT performs cross sectional scanning and measures actual volumetric density, thus provides separate estimates of the

Modality	Parameters	Total Cases (165 no.)	Total Females (128 no.)	Total Males (37 no.)	P Value
QCT (mg/cc)	BMD Mean ±SD (Range)	124.40±50.09 (22.2–248)	117.75±48 (22.2– 248)	147.42±51.01 (45.8– 240)	<.001
	T Score Mean ±SD (Range)	−1.80±1.74 [(−5.50)−(2.30)]	−2.09±1.6 [(−6)−(2)]	−0.81±1.74 [(−4)−(2)]	<.001
	Z Score Mean±SD (Range)	−0.52±1.2 [(−3.7) − (2.4)]	−0.65±1.2 [(−3.7)−(2.4)]	−0.013±1.09 [(−2.5)−(1.9)]	.000
DEXA Lateral (gm/cm²)	BMD Mean ±SD (Range)	0.58±0.17 (.28–1.11)	0.55±0.15 (0 − 1)	0.71±.0.15 (0 − 1)	<.001
	T Score Mean ±SD (Range)	−0.61±2.44 [(−5.27)−(8.5)]	−0.74±2.529 [(−5.27)−(8.5)]	−0.13±2.073 [(−4.8)−(3.5)]	<.001
	Z Score Mean ±SD (Range)	0.49±2.3 [(−4.11)−(10.29)]	0.56±2.35 [(−3.6)−(10.3)]	0.22±2.01 [(−4.1)−(4.1)]	.513
DEXA AP (gm/cm²)	BMD Mean ±SD (Range)	0.91±.0.19 (0.52–1.56)	0.89±.0.19 (1−1)	1.00±.0.18 (1−2)	<.001
	T Score Mean ±SD (Range)	−0.98±1.66 [(−9.9)−(3.6)]	−0.95±1.5 [(−4) − (2)]	−1.11±2.1 [(−10) − (4)]	.002
	Z Score Mean ±SD (Range)	−0.25±1.49 [(−4. 2)−(4.1)]	−2.9±1.5 [(−4.2) −(4.1)]	−0.12±1.44 [(−2.2) −(3.7)]	.169

[Table/Fig-5]: BMD results of Total 165 subjects (Females and Males)

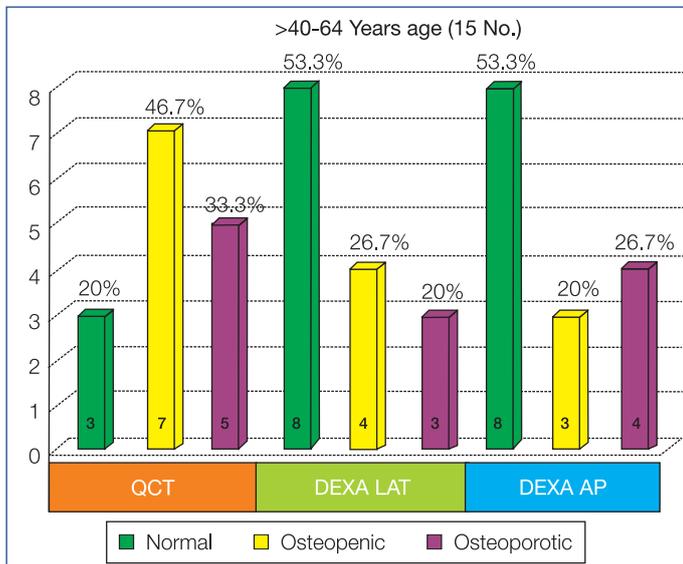| Modality	Female			Male			Chi Square test
	Osteoporotic	Osteopenic	Normal	Osteoporotic	Osteopenic	Normal	P values
QCT	58 (45.3%)	39 (30.5%)	31 (4.2%)	8 (21.6%)	6 (16.2%)	23 (62.2%)	<.001
DEXA LAT	35 (27.3%)	32 (25%)	61 (47.6%)	5 (13.5%)	5 (13.5%)	27 (73%)	.025
DEXA AP	21 (16.4%)	46 (36%)	61 (47.6%)	8 (21.6%)	7 (19%)	22 (59.4%)	.148

[Table/Fig-6]: Osteoporotic vs Normal cases between female and male patients diagnosed by QCT & DEXA (AP & Lateral)
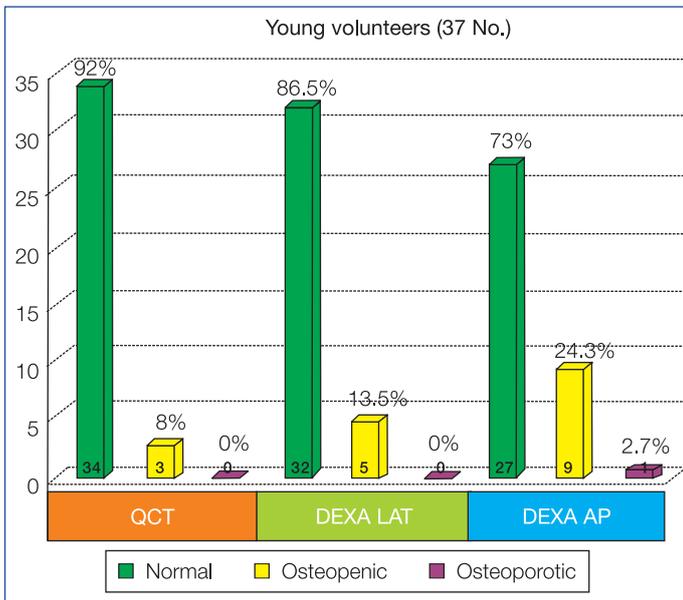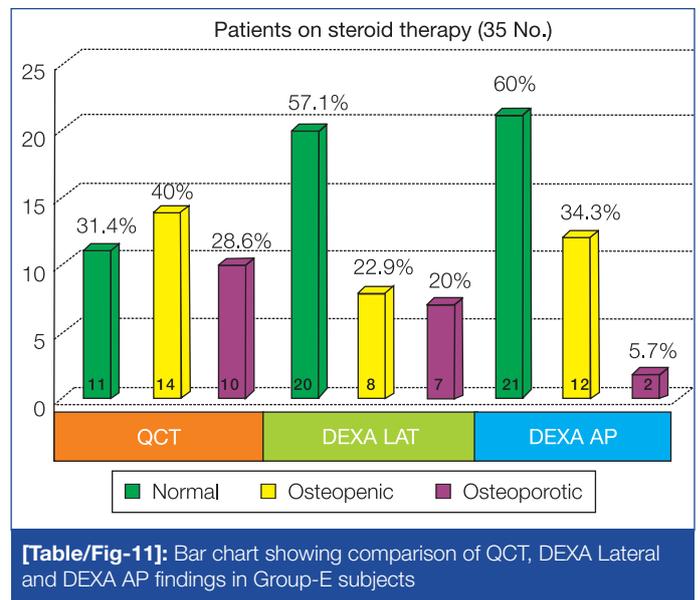
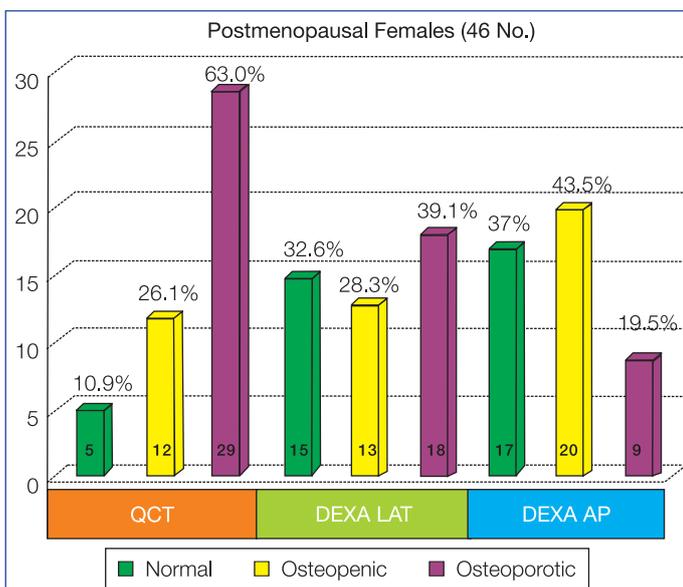**[Table/Fig-7]:** Bar chart showing comparison of QCT, DEXA Lateral and DEXA AP findings in Group-A subjects

[Table/Fig-8]: Bar chart showing comparison of QCT, DEXA Lateral and DEXA AP findings in Group-B subjects

[Table/Fig-9]: Bar chart showing comparison of QCT, DEXA Lateral and DEXA AP findings in Group-C subjects

[Table/Fig-10]: Bar chart showing comparison of QCT, DEXA Lateral and DEXA AP findings in Group-D subjects

[Table/Fig-11]: Bar chart showing comparison of QCT, DEXA Lateral and DEXA AP findings in Group-E subjects

trabecular and cortical bone and it is unaffected by the presence of osteophytes and other degenerative changes which mask the true BMD changes as measured by DEXA scan resulting into its diagnosing false normal cases and under estimating osteoporosis). This finding is in consistence with previous reported study [15]

Also, in all the groups (B,C,D and E) except group A , QCT has diagnosed more cases of osteoporosis as compared to DEXA Lateral and DEXA AP. Whereas, in group A , QCT has diagnosed lesser number of osteoporosis cases i.e. 8% as compared to 13.5% and 27% diagnosed by DEXA lateral and DEXA AP respectively which is unexplainable. Further in group C, the incidence of osteoporosis evaluated by QCT is 89%, by DEXA lateral is 67.4% and by DEXA AP is 63% which is much higher in QCT but slightly higher in DEXA AP & lateral than the previously reported study [18]. Similarly in group D, the incidence of osteoporosis evaluated by QCT is 97%, by DEXA lateral is 59.4% and DEXA AP is 69% which is much higher in QCT but in conformity by DEXA with the previously reported study [19].

This study has also confirmed that there is a direct correlation between height and BMD in both QCT and DEXA AP except DEXA lateral in all the groups except group A as with increasing height, BMD has also increased (Table/Fig-2 & 3).

	Osteoporotic	Osteopenic	Normal	p-Value
QCT	66 (40%)	45 (27.3%)	54(32.7%)	.000
DEXA Lateral	40 (24.3%)	37 (22.4%)	88(53.3%)	.000
DEXA AP	29 (17.6%)	53 (32.1%)	83(50.3%)	.000

[Table/Fig-12]: Total cases of osteoporosis, osteopenic and normal diagnosed by QCT,DEXA Lateral & AP on the basis of T score evaluation: correlation

Measure of Agreement	QCT vs DEXA AP	QCT vs DEXA Lateral	DEXA Lateral vs DEXA AP
Kappa (Value)	.311	.346	.303
No. of valid cases: 165			

[Table/Fig-13]: Symmetric Measures between QCT and DEXA (AP & Lateral)

CONCLUSION

In both the scanning modalities there is direct correlation between age and osteoporosis as with increasing age the incidence of osteoporosis increased in all the groups. But QCT has been found to be more efficacious than DEXA scan in the diagnosis of osteo-porosis i.e. QCT helps discriminate between normal subjects and those with osteoporosis better than DEXA – Lateral and DEXA-AP.

Further, on the basis of clinical history of the patients and other defined parameters it has been observed that still more studies with a large volume of data need to be done .This will help in estab-lishing the exact comparison between QCT and DEXA scanning for determination of BMD in making out the accurate diagnosis of osteoporosis as K value was 0.311, 0.303 and 0.346 [Table/Fig-13] which is a fair agreement between each of these two.

LIMITATIONS

With the available QCT scanner, the study of only lumbar spine was possible to assess BMD whereas with the DEXA scanner apart from peripheral sites, hip and lumbar spine could also be measured to assess the BMD. Hence, we could do this study only in lumbar spine to accurately compare the findings of these two modalities in the same region. Further, for this study T score and Z score only for L-3 vertebra were considered as Dexa – Lateral measures BMD of L-3 vertebra only (because of overlying rib and iliac crest affecting measurements in other lumbar vertebrae). Therefore, for accurate

comparison of these modalities we have considered values for L3 vertebrae only, both in QCT and DEXA.

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DECLARATION ON COMPETING INTERESTS:

No competing Interests.