

Assessment of Bone Mineral Density of Patient's with Thyroid Disorder using Computed Tomography

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Abstract

Study of bone mineral density of patients with thyroid disorders was carried out in radiology department at Algazira state in Algazira Scan hospital, Wad Madani diagnostic advance, Shakrin diagnostic center and the patients sample was 100 patients whom investigation by CT scan and the results shows that the Osteoporosis was dominate in the female and Osteopenia almost same for male and female with frequency 11:10 respectively. The calcium score gives us a good value of the bone density and the relation between the calcium score and the patients gender, where the male governs the higher score start from 7-8 and the female concentrate at the medium and low scores 3-6. Comparing of means to calcium score between the male and female where the mean of male 5.70 was higher than the mean for female 6.56. The linear regression equation shows that the relation between the age and cerium was decrease with value 0.002 for each year. Recommended every patient with thyroid disorder may be undergo to CT scan examination to assess significant change in bone mineral density, every patient such as patients on high dose of steroid medication may need follow-up periodically by intervals of six months. CT scan modality should be introduced in the syllabus of the faculties of radiology and the post menopause female should takes estrogen to avoid decrease bone density.

Keywords: Bone mineral density; Calcitonin; Thyroid disorders

Introduction

Bone density loss and increased risk for osteoporosis are a cause for concern in Hodgkin lymphoma (HL) patients but there are no recommendations regarding identification and follow-up of patients at high risk. There is evidence of decreased bone mineral density in post-menopausal women with subclinical hyperthyroidism [1,2] but little evidence in men or pre-menopausal women. In a large cohort of post-menopausal women aged 65 years or older, there was a fourfold increased risk of vertebral fractures and threefold higher risk of occurrence of hip fracture in patients with serum TSH <0.10 mIU/l. In another study of patients older than 65 years, the incidence of hip fracture was higher in men but not in women with subclinical hyperthyroidism than euthyroid patients [3]. Thyroid hormones (TH) affect bone metabolism and turnover increasing the number of bone remodeling cycles, activating and increasing the number of osteoclasts and altering the relation between bone reabsorption and bone formation [4-7]. The disease is typically characterized by an age-related reduction in bone strength that predisposes affected individuals to low-energy fractures. Parathyroid hormone (PTH) is released by the parathyroid glands depending on serum calcium and its major action is to stimulate bone reabsorption through the osteoclasts [8]. Calcitonin (CT) is a hormone mainly produced by the parafollicular cells of the thyroid (C cells) and is a potent inhibitor of bone reabsorption. Its secretion is stimulated by calcium. In hypothyroidism there is a lower CT reserve and its response to a hypercalcemic stimulus is significantly reduced [9] probably due to the destruction of (C cells) by the process of chronic thyroiditis. In hypothyroid patients when starting hormonal replacement therapy bone remodeling of high turnover owing to the action of TH. CT scanning is widely used in diagnosis and prognosis for cancers, With the high resolution MDCT images clinicians can obtain important information of BMD, trabecular microarchitectural and mechanical property, as an additional utility to clinical applications. Quantitative Computed Tomography (QCT) may serve as an alternative tool for bone densitometry with the advantage that its results are independent of extraskeletal pathology, such as aortic calcifications [10-12]. QCT

results in the spine have been found to be reproducible, and they are considered a prognostic factor for pathologic fractures [13,14]. Dual x-ray absorptiometry (DXA) is currently the standard for assessing bone mineral density (BMD) and has been correlated with fracture risk and treatment efficacy [15]. While useful for assessing osteopenia or osteoporosis [16] it is not without methodological limitations [17]. In fact, comparisons between QCT and DXA have shown that the former is better at identifying vertebral fractures [18]. However, the obligatory use of a reference standard and the image post-processing that is required in addition to the increased cost and radiation dose has set back the wide use of the method in spite of its technical superiority. The use of Hounsfield units (HUs) from CT scanning to assess regional BMD of the spine has recently been described [19], Based on a defined scale of 0 for water and -1000 for air. Modern radiology imaging software programs allow this to be calculated from a region of interest (ROI) on CT scans without any additional cost or radiation exposure. Values are calculated based on the following formula: $HU = ((\mu - \mu_w) / \mu_w) \times 1000$, where μ is defined as the linear x-ray attenuation coefficient of the selected voxel and μ_w the attenuation coefficient of distilled water at room temperature and pressure. The aim of this study to estimate the bone mineral density of patients that associated with thyroid disorder.

Methodology

The study was carried out in radiology department at Algazira state in Algazira Scan hospital, Wad Madani diagnostic advance, Shakrin diagnostic center and the patients sample was 100 patients whom

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investigation by CT scan and the machine model Toshiba and Siemens both with 16 slices.

Patient preparation

The patient is positioned supine and head – first for complete spine and during the CT examination of lumbar spine only positioning the patient supine and feet first may improve comfort by limiting how much of the patient's body enter the gantry.

T-Score and Z- score

T-score indicates the difference between the patients measured BMD and the ideal peak bone mass achieved by a young adult. If T-score is < -2.5 at the spine, hip, or forearm the patient is classified as having osteoporosis. If T-score is between -2.5 and -1 at the spine, hip, or forearm patient is classified as having osteopenia. If T-score is > -1 the patient is classified as normal Z-score indicates the difference between the patients' measured BMD and the ideal peak bone mass achieved by aged-matched peers. Z-score cannot be used to diagnose osteoporosis indicate a need for further medical tests.

Results and Discussion

Osteopenia is a bone condition characterized by a decreased density of bone which leads to bone weakening and an increased risk of breaking a bone fracture. This study tends to identify the role of CT scan in the diagnosis bone diseases and monitor the ability of CT scan in diagnostic of bones diseases with hypothyroidism.

The statistical parameters showed as mean, median, standard deviation, minimum and maximum for all patient's parameters, the median age was 65 years and the mean ± standard deviation for the patients high was 163.04±11.57 cm, for the patient's weight and calcium score was 68.14 ± 13.55 kg and 6.06 ± 1.11 as shown in Table 1.

In Table 2 the difference between the patient's gender measured the BMD and categorized to Osteoporosis and Osteopenia, where the Osteoporosis was dominate in the female and Osteopenia almost same for male and female with frequency 11:10 respectively. The calcium score gives us a good value of the bone density and the relation between the calcium score and the patients gender where the male governs the higher score start from 7-8 and the female concentrate at the medium and low scores 3-6 (Table 3). Table 4 shows comparison of means to calcium score between the male and female where the mean of male 5.70 was higher than the mean for female 6.56. A linear regression equation shows that the relation between the age and cerium was decrease with value 0.002 (Figure 1) for each year every patient with thyroid disorder may be undergo to CT scan examination to assess significant change

	Age	Height	Weight	Serum Ca
Mean	63.16	163.04	68.14	6.064
Median	65.00	166.00	70.00	6.000
Std. Deviation	19.291	11.569	13.550	1.1137
Minimum	29	145	40	3.8
Maximum	99	190	93	7.9

Table 1: Statistical parameters for all parameters.

Gender	BMD T-score		Total
	Osteoporosis	Osteopenia	
Female	28	1	29
Male	11	10	21
Total	39	11	50

Table 2: Cross tabulation between the gender and bone mineral D for all patients.

Serum Ca	Gender		Total
	Female	Male	
3-4	3	0	3
4.1-5	5	2	7
5.1-6	11	6	17
6.1-7	5	4	9
7.1-8	5	9	14
Total	29	21	50

Table 3: Cross tabulation between the gender and calcium level for all patients.

Serum Ca	Gender	Mean	Std. Deviation	Std. Error Mean
	Female	5.703	1.0608	0.1970
	Male	6.562	1.0072	0.2198

Table 4: T-test to compare the mean of serum Ca for the patients according to their gender.

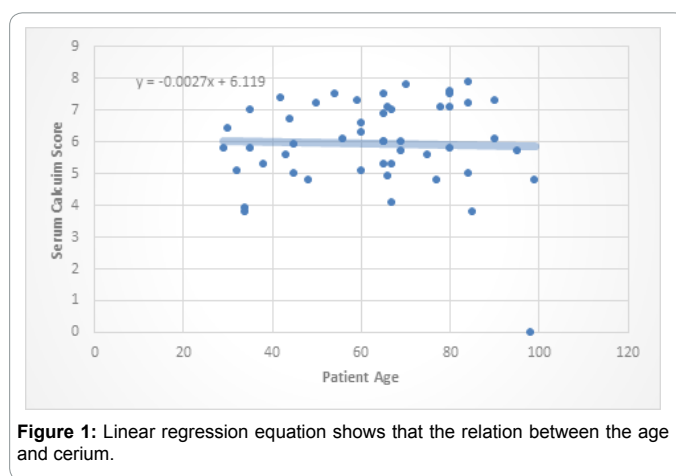


Figure 1: Linear regression equation shows that the relation between the age and cerium.

in bone mineral density every patient such as patients on high dose of steroid medication may need follow-up periodically by intervals of six months CT scan modality should be introduced in the syllabus of the faculties of radiology and the post menopause female should takes estrogen to avoid decrease bone density.

Conclusion

This study was carried out in radiology department at Algazira state in Algazira Scan hospital, Wad Madani diagnostic advance, Shakrin diagnostic center and the patients sample was 100 patients whom investigation by CT scan the Osteoporosis was dominate in the female and Osteopenia almost same for male and female with frequency 11:10 respectively. The calcium score gives us a good value of the bone density and the relation between the calcium score and the patient's gender where the male governs the higher score start from 7-8 and the female concentrate at the medium and low scores 3-6. Comparing of means to calcium score between the male and female where the mean of male 5.70 was higher than the mean for female 6.56. Linear regression equation shows that the relation between the age and cerium was decrease with value 0.002 for each year. It was recommended to every patient that thyroid disorder patients should undergo CT scan examination to assess significant change in bone mineral density. Every patient, such as patient on high dose of steroid medication, may need follow-up periodically by intervals of six months CT scan modality should be introduced in the syllabus of the faculties of radiology and the post menopause female should takes estrogen to avoid decrease bone density.

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