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Appearance of Thyroid Gland on Bone Scan, Case of Euthyroid Sick Syndrome

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Abstract: For the purpose of identifying active bone lesions, 99m-methylene diphosphonate (MDP) whole body scintigraphy is the method of choice. There are numerous mechanisms that have been reported to lead to extraosseous radiopharmaceutical uptake on bone scintigraphy that must be understood in order to ascertain the underlying cause. Since these unexpected distributions of radiotracer activity on bone scintigraphy frequently result from technical causes, artifacts, and pitfalls related to quality control, the first step when these findings appear on the bone scan is to confirm or rule out these factors. In addition, they might affect other scans that department performed that day (for instance, colloid impurities caused by aluminum breakthrough in the molybdenum-technetium generator during 99mTc-MDP preparation could affect a wide range of radionuclide studies). It is mostly used to find bone damage caused by infections and other conditions as well as to help diagnose various bone-related conditions like primary or metastatic bone cancer, the location of bone inflammation, and fractures that may not be visible on traditional X-ray images. On a whole-body bone scan, pathologies of other systems can also be found by accident. In this paper, we present a captivating image of appearance thyroid gland on bone scan.

Keywords: Euthyroid, Bone Scan, Thyroid Gland, Thyroid Function Tests

1. Introduction

70 years old patients had ear discharge from the left ear for the last 3-4 months. She was admitted with pain in ear, fever and ear discharge. She was also suffering from Diabetes Mellitus type 2 and was on insulin. She was diagnosed as a case of chronic suppurative otitis media. She was sent to Nuclear Medicine department for bone scan.

Bone scan was performed after intravenous injection of 680 MBq of 99m Tc MDP and static whole body scan in anterior and post acquisition was acquired. Along with it SPECT and low dose CT of the skull and anterior neck was also acquired. It was acquired on SPECT CT 670 PRO. Planar whole body scan showed normal and symmterical radiotracer distrbution for age, along with it is the incidental finding of the visualization of thyroid gland. Figure 1. Hoewever SPECT CT images reveal increased radiotracer uptake in the squamous, tympanic and mastoid process. In addition to it opcaification of these bones are also noted. Along with it is the thickening of right sided mastoid air cells. Figure 2.

Figure 1. *Pt a known case of CSOM, was referred for bone scan, planar images reveals normal bone scan findings for age along with visualization of thyroid gland on bone scan.*

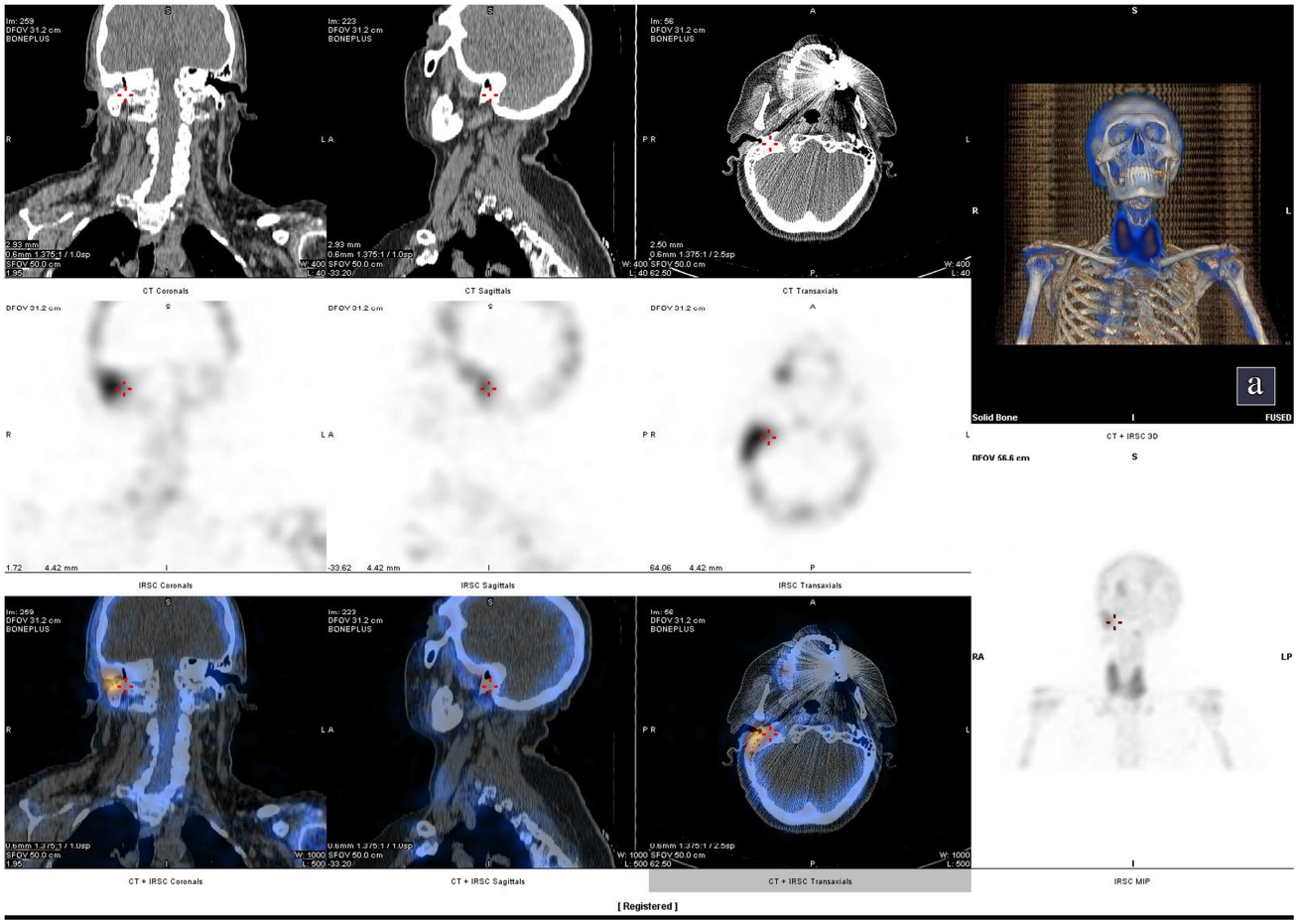

Figure 2. *Showed SPECT-CT showing uptake in the squamous, tympanic and mastoid process. Along with it there is visualization of thyroid gland.*

Case was discussed in our department with Nuclear Physicians and Radiopharmacist. Initial thought was that it was due to the presence of free pertechnetate, we checked the quality control of the kit one day back it was O.K, and secondly it doesnot appear on the other bone scans of that day.

Thirdly kidneys, urinary bladder and gastrointestinal tract were not visualized. The patient was again called in our department for the correlative thyroid scan and T.F.Ts. Thyroid scan showed multinodular goiter with reduced functioning nodules. Figure 3. Correlative neck USG showed TIRADS 3 nodule, and USG guided FNAC of the nodule showed TIRADS 2 nodule. Correlative TFT showed FT3 was low and rest of FT4 and TSH were normal. Patient was asked for any use of antithyroid medications or use of any contrast. She did not report any. Patient was thus labelled as a case of sick euthyroid syndrome.

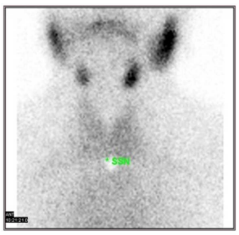

Figure 3. *Showing thyroid gland with multiple nodules.*

2. Discussion

Changes in serum thyroid hormone and thyroid-stimulating hormone (TSH) levels in people with a variety of non thyroidal illnesses, such as infections, cancer, inflammatory conditions, myocardial infarction, surgery, trauma, and starvation, are referred to as euthyroid sick syndrome. The nonthyroidal illness syndrome is another name for this condition. [1]. It is not a primary thyroid disorder; rather, the nonthyroidal illness causes changes in the metabolism and transport of thyroid hormone in the peripheral tissues. Changes observed in thyroid function tests performed on patients in the medical intensive care unit during critical illness episodes. It is not a real syndrome, and about 75% of hospitalized patients have significant changes in the hypothalamic-pituitary-thyroid axis. Patients suffering from severe critical illness, starving themselves, and recovering from major surgeries frequently experience this condition. Low total T3 and free T3 levels in conjunction with normal T4 and thyroid-stimulating hormone levels is the most common hormone pattern in sick euthyroid syndrome. [2, 3]

Most euthyroid ill syndrome patients do not require replacement thyroid hormones. The primary focus is on treating and managing the underlying medical condition,

although while the patient is in the hospital, thyroid function should be periodically monitored. Thyroid function problems may last for several weeks after hospital discharge. Thyroid function tests should be performed in a clinically euthyroid patient no earlier than six weeks following discharge in order to confirm overt thyroid dysfunction in cases of persisting TSH abnormalities or euthyroid sick syndrome in cases of normalisation of the TSH and T3 levels. [4]

A recent study demonstrated that, in children undergoing cardiac surgery, taking thyroid hormone prior to the procedure to prevent euthyroid sick syndrome helped reduce some cardiac complications, particularly ischemia-related ones. [5, 6]

Tc-99m-labeled diphosphonates have been used for bone scanning as a major diagnostic tool since the beginning of 1970s. [7]. MDP is ideal for bone imaging due to its high bone-to-soft tissue ratio, rapid blood clearance, and excellent in vivo chemical stability. [8, 9] Many instances of coincidental Tc-99m-MDP take-up by the delicate tissue have been accounted for because of different reasons, both benign (tumoral calcinosis, myositis ossificans) and malignant (sarcomas, adenocarcinomas, metastases) conditions [10, 11]

Extracellular fluid expansion, enhanced local vascularity and permeability, and a high tissue calcium concentration are all mechanisms that increase extraosseous Tc-99m MDP uptake. Important factors include the calcium deposition's composition and the presence of other elements like iron & magnesium, in calcific thyroid nodules, as a result of biopsy procedures, anaplastic thyroid carcinoma, or metastatic thyroid cancer, there is a possibility of incidental Tc-99m MDP uptake in the thyroid gland [12].

The development of hybrid SPECT/CT, which was first led by Lang et al. in 1992 [13], made it possible for information from low-dose CT or later helical CT to be efficiently coregistered with SPECT. In conjunction with radioactivity distribution attenuation and scatter correction, the synergistic combination of functional and anatomic datasets enhances lesion localization and characterization [14].

Our study was different from the case study published in 2017 [15] because in our case it was goiter with evolving nodules. It was correlated with FNAC and thyroid function tests. Secondly bone scan may show uptake in the calcified nodules in thyroid or in the thyroid cartilages.

3. Conclusion

To conclude this it the patient come for bone scan and he is having goiter, palpatae the patient first then give him the radiotracer injection, as radiotracer can accumulate in the thyroid calcifications in this case.

Contribution

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