The diagnostic incremental value of $^{131}$I SPECT-CT scan compared to planar $^{131}$I WBS for differentiated thyroid carcinoma: A single institutional experience

Essam M. Alkhyybar, Salman M. Albashen, Bander M. Alanazi, Dalal M. Alqahtani, Hala K. Abokhater, Sundus H. Albakhiti and Intidhar E. Ghanem

*Faculty of Applied Medical Sciences, Department of Radiology and Medical Imaging, Prince Sattam Bin Abdulaziz University, Al Kharej, Saudi Arabia; †Department of Radiological Sciences, King Saud University, College of Applied Medica Sciences, Saudi Arabia; ‡Ministry of Health, King Khalid Hospital, Radiology department, Hail Health Cluster, Saudi Arabia; §Ministry of Health, Ad Diriah Hospital, Radiology Department, Riyadh, Saudi Arabia; ¶Ministry of Health, King Fahad Medical City, Nuclear Medicine Department, Riyadh, Saudi Arabia; #Nuclear Medicine department, Dallah Private Hospital, Radiology Department, Riyadh, Saudi Arabia

**ABSTRACT**

This study investigated the usefulness of iodine-131 ($^{131}$I) single-photon emission computed-tomography/computed-tomography (SPECT-CT) in conjunction with whole-body scan (WBS) planar imaging for the management of a patient presenting with differentiated thyroid carcinoma (DTC). A total of 100 patients with DTC post-total thyroidectomy were included in the study. The foci of $^{131}$I uptake were classified as neck site and outside the neck site by WBS planar and SPECT-CT imaging. SPECT-CT incrementally identified 141 neck sites and 217 distant neck foci compared to 139 at the neck site and 197 at the outside neck site identified by planar imaging. For the neck site, SPECT-CT downstaged 27 foci of 32 for indeterminate thyroid remnants at the neck site. Regarding sites distant to the neck, the SPECT-CT analysis led to the correct downstaging of two false-positive foci of suspicious uptake within the lung and bone, which were noted as metastases on planar images. SPECT-CT correctly upstaged one focus of iodine activity observed in the left arm as contamination on planar images, subsequently corrected as a metastatic bone lesion. The use of $^{131}$I SPECT-CT scans increased the incremental diagnostic data compared with $^{131}$I WBS planar scan imaging alone, which could change patient management.

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1. Introduction

Differentiated thyroid cancer (DTC) is identified as a malignant neoplastic abnormal endocrine disease with a good prognosis and low mortality rate. (Chen et al., 2008; Maruoaka et al., 2012; Xue et al., 2013) Globally, DTC is recognized as one of the most common endocrine cancers across adult patients, accounting for 1% of all tumors investigated annually. (Xue et al., 2013) The incidence of DTC has been continuously increasing worldwide. (Alzahrani et al., 2017) Inevitably, the Saudi Arabian population is not an exception from DTC. Data from the National Cancer Registry (NCR) acknowledged a significant increase in the incidence of DTC. (Alzahrani et al., 2017) In Saudi Arabia, DTC is identified as the second most common cancer in females after breast cancer, and the incidence of DTC has also been increasing in males. (Hussain et al., 2013).

The surgical operation of DTC is considered a primary treatment option. (Oral et al., 2018) Oral administration of radioiodine-131 ($^{131}$I) therapy dose post-total or near total thyroidectomy procedure has been an essential step for an appropriate therapeutic procedure for adult patients with DTC. (Barwick et al., 2010) Previous studies have demonstrated that $^{131}$I therapy dose improved the clinical prognosis of patients even when they had distant metastases, thus showing the uptake of $^{131}$I in the metastatic foci. (Bernier et al., 2001; Schlumberger et al., 1996) Furthermore, post-therapeutic $^{131}$I whole-body scan (WBS) is utilized for investigating the restaging cancer patients, while diagnostic $^{131}$I WBS is commonly used for the follow-up of DTC patients. (Oral et al., 2018) However, response to $^{131}$I therapy seems to be independent of prognostic characteristics that connected with improved survival in DTC patients with distant metastases. (Oh et al., 2011) Thus, illustrating the exact mechanism of local, distant location of foci and returning back metastasis of lymph node is vital for appropriate clinical follow-up and managing the DCT patients. (Maruoka et al., 2012).

DTC is routinely investigated with conventional planar $^{131}$I WBS after the administration of an oral $^{131}$I therapy dose. (Spanu et al., 2018; Sawka et al., 2008; Cooper et al., 2006) The use of $^{131}$I WBS is a highly sensitive and specific procedure that aids in discrepancies between normal and abnormal pathological thyroid tissue cancer. However, the WBS procedure suffers from lower sensitivity, and false-positive $^{131}$I uptake might be visualized. (Okuyama

CONTACT Salman M. Albashen salbashen@ksu.edu.sa Department of Radiological Sciences, King Saud University, P.O. Box 10219, Riyadh 11433, Saudi Arabia

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It is important to illustrate that the $^{131}$I can accumulate outside the functional thyroid tissue. The normal physiologic accumulation of $^{131}$I is commonly visualized in as the stomach, colon, nasopharynx, breast, urinary bladder, and salivary glands. It is less used to visualize the accumulation of $^{131}$I in the mammary glands, the urinary tract other than the bladder, and the thymus. (Okuyama et al., 2001; Oral et al., 2018) However, false-positive or false-negative radiiodine accumulation may be visualized on $^{131}$I WBS, which may lead to incorrect diagnosis result in unnecessary radiiodine treatment. (Oh & Ahn, 2012; Shapiro et al., 2000) This is due to the lack of anatomical details in $^{131}$I WBS and the nature of foci of radiopharmaceuticals being generally difficult to confirm on planar views. (Oral et al., 2018) Thus, the identification of false positive and false negative of conventional planar $^{131}$I WBS images routinely visualized in during clinical practice is crucial for appropriate management of patient disease condition. (Okuyama et al., 2001; Oral et al., 2018)

The integration of single photon emission computed tomography (SPECT) with X-ray computed tomography (CT) is an aid for clearly depicting the nature of thyroid metastases and for identifying the precise anatomic localization of the $^{131}$I avid foci. (Jeong et al., 2014; Oh & Ahn, 2012; Shapiro et al., 2000; Shinton et al., 2015; Wong et al., 2008; Xue et al., 2013; Yamamoto et al., 2003) SPECT-CT diminished the number of false positive or false negative results on planar imaging and was accurately interpreted by $^{131}$I WBS. As a result, $^{131}$I SPECT-CT scans lead to an increased opportunity to distinguish between abnormal and physiologic uptake. (Ruf et al., 2004; Shinton et al., 2015) Thus, the use of SPECT-CT assists in improving the accuracy of detecting DTC staging and changing the management of patients with thyroid carcinoma. (Lee, 2017)

This study sought to elaborate on the incremental value of SPECT-CT accuracy over the $^{131}$I WBS scan post an oral administration of a therapeutic $^{131}$I dose. Another objective was to assess the overall impact of SPECT-CT technology on the diagnosis and ongoing management of DTC and to illustrate some examples from our own clinical practice.

2. Material and methods

2.1. Patient recruitment and preparation

This study was approved by a King Fahad Medical City (KFMC) institutional ethics committee (Project number = 19-592E). A total of 100 patients with planar $^{131}$I WBS were retrospectively collected from the nuclear medicine database between March 2018 and October 2019. All patients have previously undergone thyroidectomy for DTC and referred to the Nuclear Medicine department. All identified patient sample were diagnosed at high thyroid-stimulating hormone (TSH) level ($\geq 30 \text{ mIU/ml}$).

Patient preparation of our institutional practice involved the patient stop taking all medications that contained iodide for 7–14 days and having a low diet prior to oral administration of $^{131}$I dose. Contraception was confirmed in all childbearing female patients. The $^{131}$I oral administered dose is often prepared contingent on the patient risk profile involving stimulated thyroglobulin (TG) levels, histopathological features, clinical parameters, and other diagnostic medical procedures where possible, utilizing the American Thyroid Association (ATA) guidelines.(Haugen et al., 2015) The amount of $^{131}$I therapeutic dose ranges between 30 and 200 mCi $^{131}$I (as sodium iodide capsule or liquid). Exclusion criteria for this study included patients who had iodinated contrast investigations within the previous two months, pregnant or breastfeeding women, and patients for whom the exam was suboptimal due to the patient’s risk classifications. In accordance with our department’s protocol, all patients who participated in this study underwent neck sonography.

2.2. Imaging acquisitions

The anterior and posterior planar projections were acquired during the $^{131}$I WBS by using a dual-head gamma camera (GE; Discovery NM/CT 670) with parallel-hole high-energy collimators, using a 20% energy window set at 364 kiloelectron volts (keV) (Figure 1). The table speed was set at 8 cm/min and a matrix size of $256 \times 1024$ was used. All patients underwent the $^{131}$I WBS planar imaging protocol, with anterior and posterior views obtained at 10 min per view. Additional anterior and posterior projections of other anatomical body parts were obtained based on the findings of the planar $^{131}$I WBS results.

The SPECT-CT imaging was performed immediately post $^{131}$I WBS scan. The SPECT-CT of the neck and chest regions was routinely acquired for all patients post $^{131}$I WBS planar imaging. Based on $^{131}$I WBS planar findings, extra SPECT-CT views were performed for other anatomical parts of the body, such as the skull, abdomen/pelvis, and extremities. Regarding the SPECT acquisition protocol, SPECT views were obtained in a step-and-shoot sequence (25 seconds/stop), with 64 frames/head obtained using a noncircular orbit, over 360° (180° per head); tomographic views were reconstructed into a $128 \times 128$ matrix using iterative reconstruction (IR). CT was used for attenuation correction, and anatomical localization (AC-AL) was obtained with a tube voltage of 130 kV; the tube current was 70 mAs. Reconstructed slice width was 2 mm. CT data were calibrated to obtain AC maps for the SPECT views. Moreover, the iterative method (ordered-subsets expectation-maximization)
was used to reconstruct the SPECT views, which were coregistered with the CT views using a Xeleris workstation (PHILPS, GE Healthcare).

### 2.3. Image interpretation

An expert senior nuclear medicine physician reviewed both planar $^{131}$I WBS and SPECT-CT images. The results of planar $^{131}$I WBS images were considered positive when single or multiple areas of uptake inconsistent with physiologic activity were recognized. Diffuse uptake was considered normal physiologic uptake in the liver, gastrointestinal tract, and urinary bladder. Indeterminate planar $^{131}$I WBS findings means that the nature and or location of radioiodine uptake was inconclusive. Regarding SPECT-CT, the result of SPECT-CT image was considered positive when single or multiple areas of uptake with or without CT correlate were recognized post exclusion of physiologic uptake.

The findings of both planar $^{131}$I WBS and SPECT-CT scans were confirmed by clinical assessments, the primary routine investigation by neck ultrasound (US) scan, and TG and TG antibodies (TG Abs). For each patient, the focal $^{131}$I uptake on both views demonstrated by planar of SPECT-CT views was analyzed per lesion for the neck site, and identified lesions outside the neck site, such as lesions in the chest and other distant at body part were noted. Regarding the $^{131}$I planar neck view, the identified foci lesions on the thyroid bed and extra-thyroid bed were recategorized for three groups: indeterminate, contamination, and lymph nodes metastasis (LNM). Findings of SPECT-CT neck foci were correctly anatomically localized, and the criteria for classification were recognized as follows: thyroid bed, thyroglossal duct remnant, soft tissue metastasis, LNM, bone metastasis, and physiological uptake.

The criteria of $^{131}$I planar chest foci classification include the following: pulmonary metastasis, mediastinal LNM, indeterminate. Based on SPECT-CT, the chest foci were classified as pulmonary metastasis, mediastinal LNM, and bone metastasis. For areas outside the chest, the $^{131}$I foci were classified as bone metastasis and indeterminate. The usefulness of the results of SPECT-CT in changing the primary risk stratification due to these alterations has an impact on patient management and follow-up.

### 2.4. Results

The cohort of this study included 100 patients with well-DTC (medullary excluded). Two patients were excluded due to motion artifacts identified during the SPECT-CT procedure. The final number of included patients was 98. The female to male ratio was 4.3:1. The mean age was 46.7 years, ranging from 13 to 87 years. Papillary thyroid carcinoma was diagnosed in 95% of the patients, and the remaining 5% had
follicular thyroid carcinoma. The results showed that 47 patients had foci of iodine uptake located only in the neck, 38 had foci located in both the neck and outside the neck, and 13 patients had foci of increased uptake located only outside the neck. The total number of planar foci was 336, classified as 139 neck foci and 197 distant foci (outside the neck), whereas the total number of ascertained foci by SPECT-CT was 358 and classified as 141 neck foci and 217 distant foci.

3. Findings of per lesion analysis

3.1. Foci of iodine uptake that located only in the neck

Table 1 shows the usefulness of SPECT-CT technology in changing the classification of diseases located within the neck. All 139 planar $^{131}$I WBS neck foci were further characterized and confirmed by SPECT-CT (Table 1). An incremental diagnostic value of SPECT-CT was found for 33 foci, defined as a change in focus classification for 32 indeterminate and 1 contamination. SPECT-CT accurately downstaged 27 of 32 indeterminate foci to thyroid remnant in 16 cases, thyroglossal tract in 6 cases, and physiological dental or salivary activity in 3 cases, and contamination in 2 cases. The SPECT-CT accurately upstaged 5 of 32 indeterminate foci to lymph node metastases. The SPECT-CT accurately upstaged one focus of iodine activity noted in the right lower neck, which was considered contamination on planar images but corresponded to metastatic deposits within the right sternocleidomastoid muscle on the SPECT-CT images (Figure 2). There was also one focal uptake within the skull, considered contamination on planar $^{131}$I WBS images, corresponding to bone metastases on the SPECT-CT images (Figure 3). Furthermore, the CT portion in the framework of the SPECT-CT scan provided additional information about non-iodine-avid lesions in two enlarged cervical lymph node (LN) nonavid to $^{131}$I. Both lesions show increased uptake of fluoro-deoxyglucose ($^{18}$F-FDG) on positron emission tomography-CT (PET-CT) procedure and proved by (US) imaging (Figure 4). The lesions were histologically proven to be LN metastases.

3.2. Foci of iodine uptake that located outside the neck (distant)

Table 2 shows the usefulness of SPECT-CT technology in changing the classification of diseases located outside the neck. The 197 planar distant foci were further characterized on SPECT-CT, as described in Table 2. All the planar foci 197 were recognized and confirmed by SPECT-CT. An additional diagnostic value was found in 15 foci, defined as a change in focus classification by using SPECT-CT. The findings of SPECT-CT led to accurate downstaging of two foci of suspicious uptake within the lung (Figure 5) and within the bone (Figure 6). The foci were noted as metastases on planar $^{131}$I WBS images but considered false positives on SPECT-CT images. For the 13 planar $^{131}$I WBS

![Image](https://via.placeholder.com/150)

Figure 2. Anterior and posterior $^{131}$I WBS planar image (a) and (b) showed unusual iodine avid metastases within the right sternocleidomastoid muscle. The $^{131}$I WBS showed (a) focal uptake within the lower neck (blue arrow). There is enhancing lesion in the right sternocleidomastoid muscle (C) SPECT, correlating with areas of increased uptake on the $^{131}$I WBS represent metastatic deposits (D) SPECT-CT.

| Lesion classification | Number of lesions in the neck |
|-----------------------|-------------------------------|
|                      | Planar $^{131}$I WBS findings | SPECT-CT findings |
| Thyroid remnant       | 102                           | 118               |
| Lymph node metastases | 0                             | 5                 |
| Indeterminate         | 32                            | 0                 |
| Physiological activity| 1                             | 4                 |
| Thyroglossal tract    | 1                             | 7                 |
| Contamination         | 3                             | 2                 |
| Bone metastases       | 0                             | 1                 |
| Other metastases      | 0                             | 1                 |
| Nontracer avid lesions| 0                             | 2 (LN)            |
| Total                 | 139                           | 141               |
indeterminate foci, SPECT-CT highlighted 9 cases of distant metastases (2 foci in the lung, 3 foci in the bones, 1 focus in the liver, 1 focus in the spleen, 2 foci in the kidneys, and 1 focus in the adrenal gland) (Figure 7), and 3 cases were of physiological uptake.

### Table 2. Comparison between planar $^{131}$I WBS and SPECT-CT findings outside the neck.

| Lesion classifications       | Planar $^{131}$I WBS findings | SPECT-CT findings |
|-----------------------------|-------------------------------|-------------------|
| Lung metastases             | 82                            | 87                |
| Bone metastases             | 88                            | 107               |
| Indeterminate               | 13                            | 0                 |
| Contamination               | 7                             | 6                 |
| Others metastases           | 5                             | 7                 |
| Physiological               | 2                             | 3                 |
| Nontracer avid lesions      | 0                             | 7                 |
| Total                       | 197                           | 217               |

Figure 3. The (A) anterior and (B) posterior $^{131}$I WBS showed faint focal uptake in the right side of the skull (C) SPECT, (E) CT, posteriorly cross correlated on the (D) SPECT-CT images to be at an underlying expansile lytic lesion in the posterior parietal bone ~1.4 $\times$ 0.7 cm and suspicious for metastatic deposits.

Figure 4. The $^{131}$I WBS imaging (A-B) showed no suspicious uptake in the neck. The axial SPECT-CT images (C–D) showed two nontracer avid cervical lymph nodes within the left neck. $^{18}$F-FDG PET-CT maximum intensity projection (MIP) images (E) and the axial PET-CT images (F–G) showed F-FDG avid lesions in the left cervical region concerning for $^{18}$F-FDG avid lymphadenopathy (SUV max 17.5 and 33.9, respectively). The cervical US images (H) showed hypoechoic nodule in the left neck with internal cystic component, measures 1.7 $\times$ 3.8 cm, for clinical and histological evaluation.

Figure 5. False positive iodine uptake within the lung. There is faint uptake in the left lung, seen on the posterior view (A), which cross correlate in the SPECT-CT (B) to bronchiectasis cysts change in the left lingual. (C) CT.
3.3. Discussion

In general, the precise localization of focal activity by $^{131}$I WBS planar procedure may be difficult due to numerous disadvantages (Haugen et al., 2015) including poor WBS image quality, low resolution, a lack of anatomical features, the challenge of interpretations of $^{131}$I WBS image due to various physiologic uptake. (Wong et al., 2008) These identified disadvantages of planar $^{131}$I WBS may hinder the visualization and localization of radioiodine foci, the small size of iodine-avid metastases, and the recurrence of the tumor in the neck, where the only anatomical markers are the sub-mandibular salivary glands in the upper neck, with no anatomical land markers in the lower neck. (Ahmed et al., 2018; Haugen et al., 2015)

SPECT-CT modality has played a vital role in the management of patients with DTC at different stages and has overcome many limitations of planar $^{131}$I WBS procedures. (Shinto et al., 2015) The utilization of $^{131}$I SPECT-CT had an enormous impact on the management of patients presenting with DTC compared to the planar $^{131}$I WBS procedures. The advantages of using the SPECT-CT modality include the appropriate determination of anatomical localization, size of the tumor, and characterization of radioiodine foci as a benign or malignant disease due to using the CT modality.(Oh & Ahn, 2012; Wong et al., 2008) SPECT-CT resulted in better evaluation of response to $^{131}$I therapy and assistance for further management decisions for patients. (Ahmed et al., 2018) However, it is important to highlight that a review of the literature reveals that the use of SPECT-CT with $^{131}$I studies is

Figure 6. False positive iodine uptake within the bones. The $^{131}$I WBS imaging (A) WBS image, showed faint focal uptake in the right mid and distal tibia cross (B) CT image, correlated on the SPECT-CT images (C), to be at a well-defined expansile lesion with ground glass matrix in keeping with monostotic fibrous dysplasia (benign entity).

The SPECT-CT findings led to accurate up staging of one focus of iodine activity observed in the left arm, considered as contamination on planar $^{131}$I WBS images, corresponding to suspicious aggressive metastatic bone lesions on the SPECT-CT images (Figure 8). The CT portion associated with the SPECT-CT scan provided extra valuable data about non-iodine avid lesions in seven cases with pulmonary nodules proved by the diagnostic chest.

Figure 7. The posttherapy whole body scintigraphy showed multiple foci of increased uptake involving the thyroid bed (green arrow), the residual tumor within the skull and the orbit (red arrow), the bone: spine (T4) and left iliac bone (blue arrow), the bilateral lung (yellow arrow), as well as suspicious uptake within the right kidney and the right adrenal (brown arrow). (A–E) Axial images of the abdomen showed focal hypodense splenic lesion measuring 0.9 × 1 cm (yellow star), focal small hypodense lesions at segment II measuring 0.7 cm (red star), the right kidney interpolar cortex mass measuring 3.5 × 3.1 cm (blue star), bilateral hypodense adrenal lesions, within the left adrenal measures about 1.3 × 1.1 cm (while star), the largest on the right side measures 1.5 × 1.3 cm (purple star). (F) The axial images of the lung showed bilateral lung metastasis with hilar lymphadenopathy and minimal bilateral pleural effusions, left more than right. (G) The axial images of the pelvis, bone window, showed complicated with fracture in the left iliac lytic lesion. (H–I) The axial and the coronal images of the CT of brain showed left temporal extracranial lobulated soft tissue (metastases).
SPECT-CT

not a routine clinical practice, particularly on post-therapy studies (Wong et al., 2008), which was also the case in our department. SPECT-CT imaging are only performed if there is unusual uptake within the neck or uptake outside the neck.

The present study illustrates the interpretation of SPECT-CT images accurately identifies more focal lesions than planar WBS $^{131}$I images. Figure 2 showed SPECT-CT accurately localized and identified unusual iodine-avid metastases within the right sternocleidomastoid muscle and focal uptake within the lower neck. Further, the axial SPECT-CT images accurately localized two non-tracer avid cervical lymph nodes within the left neck, while the $^{131}$I WBS imaging showed no suspicious uptake in the neck. The visual interpretation of SPECT-CT images identified 358 (100%) foci, whereas $^{131}$I planar WBS detected only 338 foci, all of which were positive (81.2%) on SPECT-CT images. Despite the fact that this study did not report the sensitivity and specificity of the detection of the lesion foci, the SPECT-CT identified all the lesions (100%), compared to 81.2% in $^{131}$I planar WBS. The findings presented in this study are comparable with the results reported by Barwick et al. (Shinto et al., 2015; Yamamoto et al., 2003)

SPECT-CT is often utilized in conjunction with post-therapy scanning to recognize noniodine-avid lesions utilizing the CT component. Grewal et al. pointed out that the result of the SPECT-CT acquired data diminished the need to conduct other medical imaging procedures in 29 patients (20%) and significantly changed the initial risk of cancer recurrence estimates in 7 out of 109 patients (6.4%), which resulted in altering patient management recommendations. (Grewal et al., 2010) Our study demonstrated the added value of the SPECT-CT in essentially assisting the classification of indeterminate foci found on $^{131}$I WBS planar images. The planar images showed 45 indeterminate foci, including 32 foci in the neck and 13 foci outside the neck, all of which were identified on SPECT-CT images. Similar findings were noted by Maruoka et al., who compared posttherapy SPET-CT scans in 147 patients to images obtained by $^{131}$I WBS planar procedures. (Spanu et al., 2018) The authors illustrated that $^{131}$I SPET-CT identified equivocal foci in 40 /147 positive $^{131}$I WBS planar views (27.2%), upstaging them to metastatic regional lymph nodes, thyroid remnant tissues, and physiological or benign uptake. (Spanu et al., 2018)

Shinto et al. demonstrated that the use of SPECT-CT correctly downstaged 61.1% of indeterminates or LNM lesions to thyroid remnants and aided in further upstaging 25% of thyroid remnants or indeterminate foci to LNM. In this study, the SPECT-CT depicted more foci than planar images and classified the indeterminate 139 of 141 foci. This study illustrated that using SPECT-CT in the neck site assisted in accurately downstaging 84.3% (27/36) of indeterminate lesions to nonsuspicious uptake and further helped upstage thyroid remnants, indeterminate foci, or contamination to suspicious LNM, muscle deposits, and bone metastases (Figures 3 and 8). The findings in this study are consistent with the results presented by Shinot et al., who showed that SPECT-CT aided the accurate differentiation of normal physiological uptake, malignant uptake on the skull, and carpal hand from contamination in patients. (Shinto et al., 2015)

This study showed that SPECT-CT has incremental value for the classification of distant metastases ascertained outside the neck regions, for improved image
interpretation, and for distinguishing between differentiated malignant lesions from sites of physiologic uptake (Figures 2, 3, and 4). The SPECT-CT findings assisted in accurately downstaging two foci of suspicious uptake within the lungs (Figure 5) and the bone (Figure 6), which were noted as metastases on planar images but considered false positives on SPECT-CT images. Additionally, SPECT-CT correctly upstaged one focus of iodine activity noted in the left arm, which was considered contamination on planar images but corresponded to suspicious aggressive metastatic bone lesions on SPECT-CT images (Figure 8).

3.4. Limitations

This study is prone to some limitations. First, the lack of a histopathological reference standard for radiiodine-avid lesions, histopathological confirmation would be difficult. This is because it is not appropriate to sample all potential lesions sites. Further, all the patients were followed up only by one nuclear medicine physician, who independently interpreted all the $^{131}$I WBS planar images and SPECT-CT images. Thus, the result of this study may not be generalizable to reflect the importance of incremental value for SPECT-CT over the $^{131}$I WBS planar imaging.

3.5. Conclusion

$^{131}$I WBS could be used as a very sensitive diagnostic procedure for detecting DTC. However, the conventional planar $^{131}$I WBS scan is prone to some limitations such as a lack of anatomical details and the non-specific uptake of radiotracers which may complicate the interpretation of imaging findings. This study concluded that the use of $^{131}$I SPECT-CT scans greatly increased diagnostic findings over the planar $^{131}$I WBS imaging. The information obtained from SPECT-CT can be utilized for the reclassification of the patient by upstaging or downstaging disease and can assist in altering the accurate management of patients suffered with DTC. SPECT-CT should be included in the routine clinical practice of patients with DTC post radioiodine therapy.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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