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Treatment of Thyroid Carcinoma with Radioactive Iodine (^{131}i) following total thyroidectomy with incomplete neck dissection

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ABSTRACT

Treatment of follicular thyroid carcinoma (FTC) is well documented in this case. An unusual case of total thyroidectomy, Central Neck Dissection (CND), Left lower parathyroid re-implantation and resection of Right Internal Jugular Vein (RIJV) tumour thrombus followed by second operation of excision of lymph nodes metastasis have been described. Three Radioiodine therapies were delivered to the patient.

Keywords: Endocrine, Thyroid Carcinoma, Oncology, Radioiodine Therapy, Thyroidectomy

1. INTRODUCTION

Thyroid cancer is the most common endocrine disease. Although rare, it is becoming more common around the world and its characteristics are changing. Approximately 90% of thyroid cancers are differentiated thyroid carcinoma, which include follicular thyroid carcinoma and papillary thyroid carcinoma. The thyroid gland produces hormones that regulate heart rate, blood pressure, body temperature and weight. Thyroid cancer may not initially cause any symptoms. However, as it grows, it can cause pain and swelling in the neck (Ricardo et al., 2000). Differentiated thyroid carcinoma when properly treated by experienced physicians and surgeons, most patients can be cured of this disease. The primary treatment modalities are surgery, selective postoperative radioiodine therapy (RAI) and thyroid stimulating hormone suppressive therapy (Yang et al., 2015).

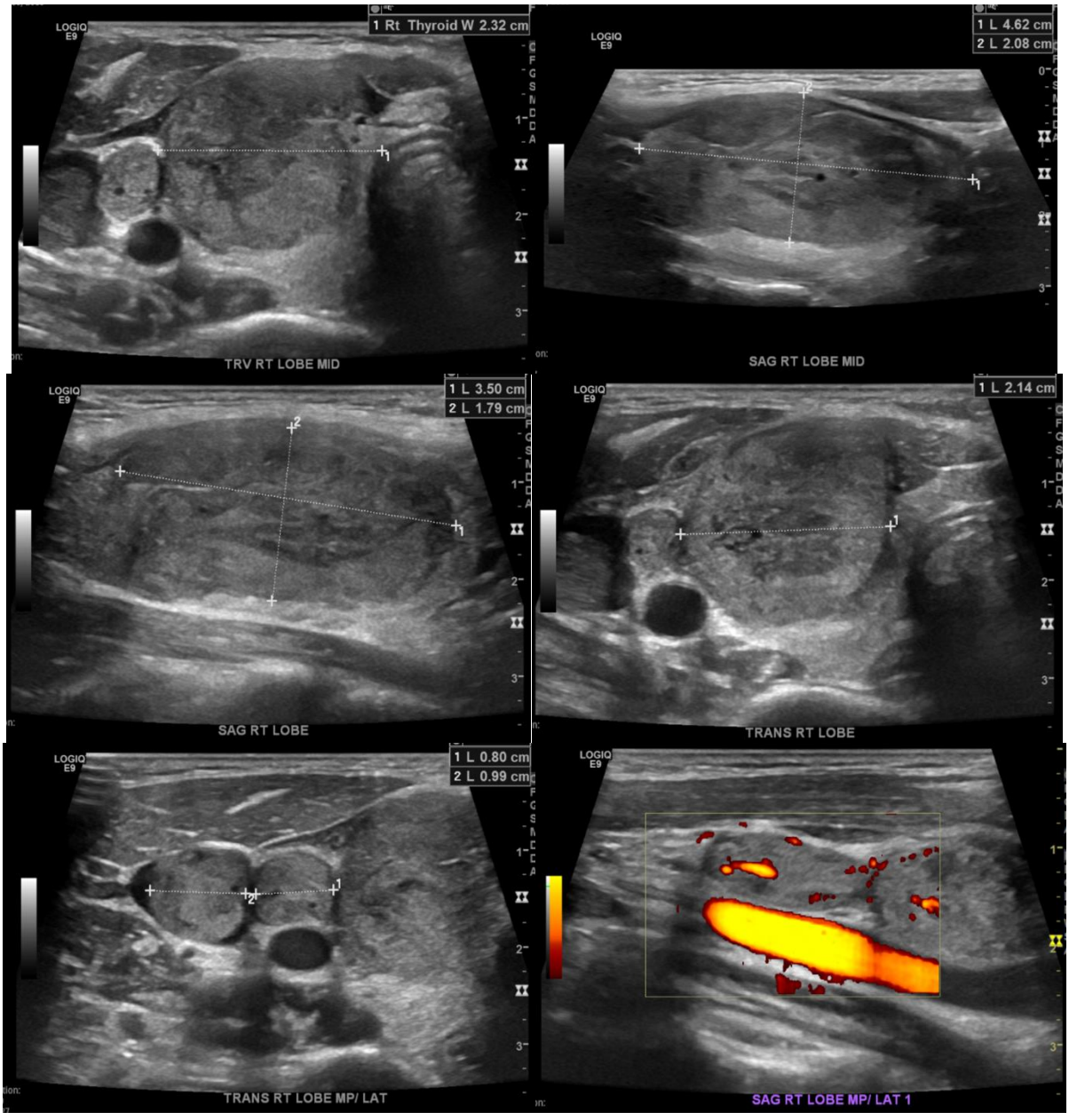
Diagnostic imaging is used prior to surgery to determine the extent of disease and to aid in surgical decision making. The primary imaging modality recommended is a neck ultrasound, which includes the thyroid as well as the central and lateral compartments. Before surgery, fine needle aspiration (FNA) biopsy should be performed on lesions suspected of lateral compartment nodal metastasis that are amenable to needle biopsy. The thyroglobulin (Tg) wash out assay can be a helpful supplement to FNA

biopsy. When cytology is inconclusive, molecular diagnostics may be a useful adjunct. For locally advanced disease (e.g., if the thyroid lesion is fixed, bulky or sub sternal) or vocal cord paresis, cross sectional imaging (Computed Tomography CT or Magnetic Resonance Imaging MRI) should be performed. For optimal neck imaging, CT iodinated contrast scan is required. Despite the fact that iodinated contrast will postpone RAI treatment (delaying RAI treatment is not harmful) (Haddad et al., 2022).

In this case reports complicated medical conditions of a patient with a history of invasive follicular carcinoma have been discussed.

2. CASE REPORT

A 24 year old female with a history of widely invasive follicular thyroid carcinoma (FTC), including intraluminal involvement of the Right Internal Jugular Vein (RIJV) the patient had two surgeries and three doses of radioiodine (RAI) therapy. The patient visited the General Practitioner (GP) Clinic for regular check-up her physician noticed a lump on her neck. Ultrasound (US) soft tissue/Thyroid scan was performed to rule out the suspected thyroid goitre. As a result, (figure 1) shows follicular thyroid carcinoma involving soft tissue was found revealing a 5 cm tumour with positive lymphatic invasion, extensive angioinvasion, positive perineural invasion, although without extrathyroidal extension. Carcinoma extended to less than 0.1 cm from the external surface. One of the eight (1/8) lymph node was positive for metastases.



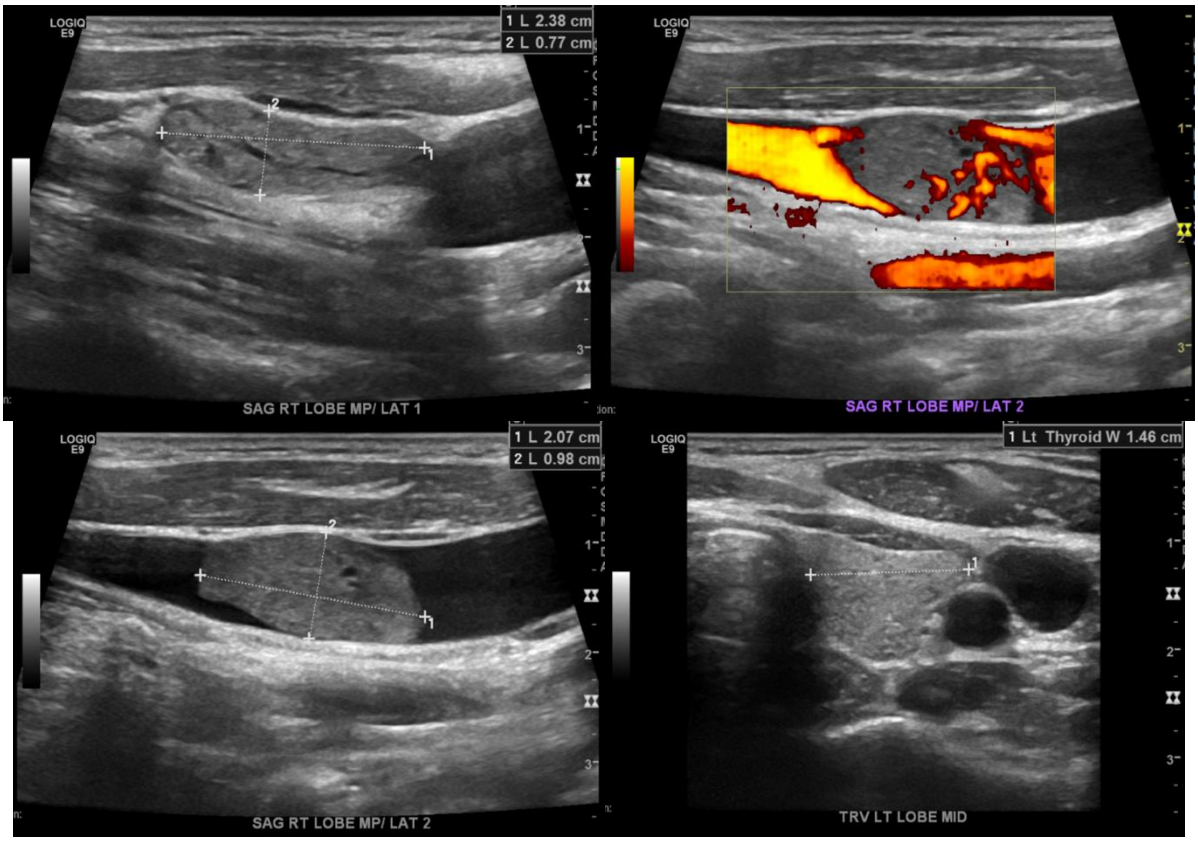


Figure 1 Thyroid US showed large heterogeneous solid mass in the right thyroid measuring 3.5 x 1.8 x 2.1 cm. There is exophytic component that mass measuring approximately 2.4 x 0.8 x 0.8 cm. Also, there is a solid mass extending out from this exophytic mass invading into intralobular vein measuring 2.1 x 1.0 x 1.0 cm.

Following the detection of thyroid carcinoma, the patient had her first surgery for total thyroidectomy with the excision of the right internal jugular vein as well as excision of lymph nodes in addition to the excision of the right lateral neck tissue. After surgery, the patient had a radioiodine ablation therapy with approximately 106.7mCi dose of ^{131}I.

During follow up after one year of the first surgery, the whole body scan (WBS) was negative, but the stimulated Thyroglobulin (TG) was greater than 150 (after a baseline value of TG 7.6 was recorded). A month later, TG was 14.5 with negative Computed Tomography (CT) neck and negative Positron Emission Tomography/Computed Tomography (PET/CT) scan. Two months later, the patient noticed a lump in the anterior neck and more recently appreciated growth in the size of the lump over the couple of months. Mapping Ultrasound (US) neck (Figure 2) and Fine Needle Aspiration (FNA) was done, FNA showed the presence of metastatic follicular thyroid carcinoma in right level intrajugular vein lymph node and left sternal notch while US neck (Figure 3) revealed 2.6 cm RT thyroid bed mass partially engulfing RIJV with associated intraluminal tumour thrombosis with 80% stenosis, Few bilateral metastatic cervical lymph node also noted with the largest in LT level VI 1.5 cm.

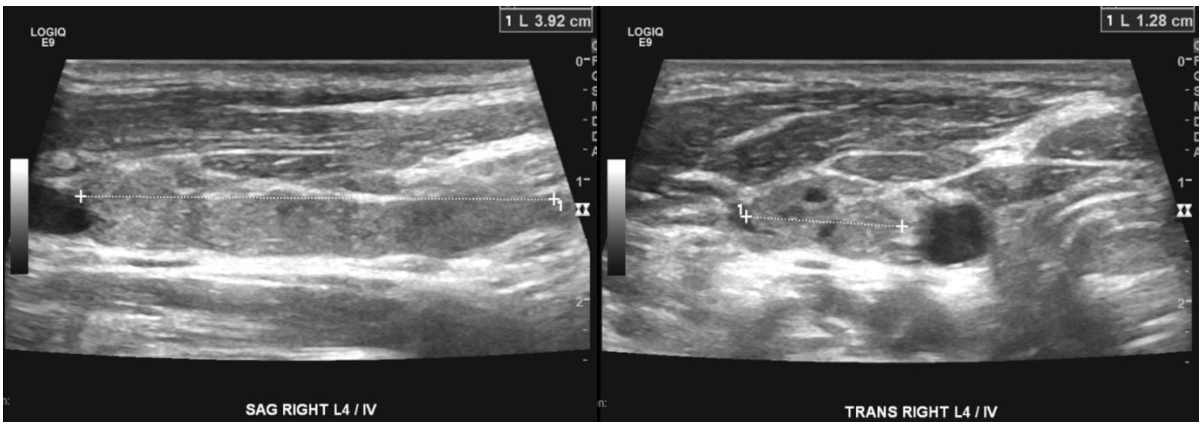


Figure 2 US showed a segmental wall thickening and tumour infiltration involving the inferior internal jugular vein extending over an area measuring approximately 3.9 x 0.8 x 1.3 cm.

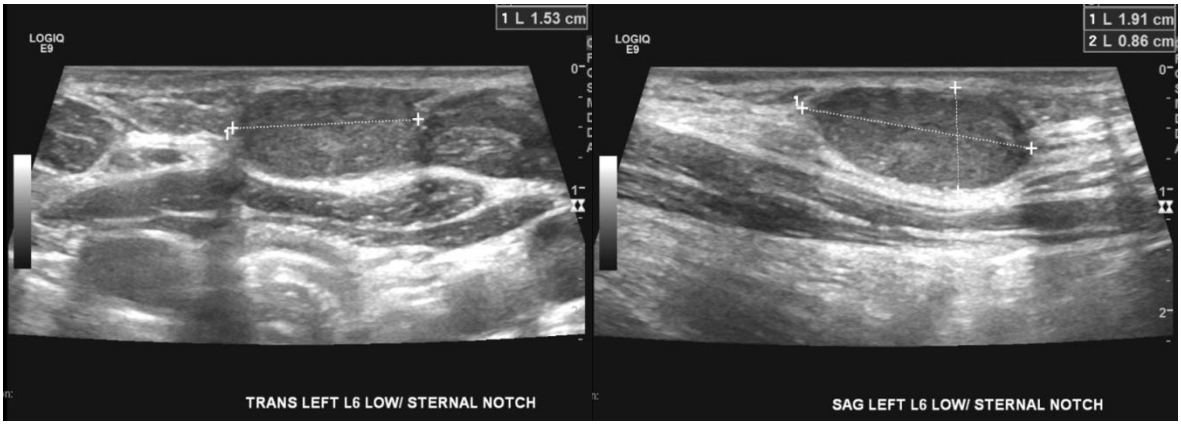


Figure 3 A hypoechoic hyper vascular nodules was found on the left midline of the sternal notch measuring 1.9 x 0.9 x 1.5 cm.

Figure 4 A 2.6 cm mass in the RT thyroid bed partially engulfing Right Internal Jugular Vein.

CT neck showed 2 cm mass at the level of thoracic inlet suggestive of tumour along the surgical tract. Seven months later, TG level increased to 61.6. Then the patient under went for the second surgery, the patient had a reoperation of right modified neck dissection and right central neck dissection as well as resection of the right internal jugular vein. The pathology report indicated that the presences of FTC in the central neck (5mm) in aggregation, FTC involving right internal jugular vein and infiltrating the skeletal muscle and RT lateral neck wall.

A year later after the second surgery, the patient completed her follow up, the CT neck with contrast showed bilateral paratracheal tiny enhancing nodules at the lower thyroid bed, multiple bilateral cervical lymph nodes and ligated partially thrombosed RT IJV. The ^{123}I WBS showed multiple focal area of increased uptake noted at the right side of the neck extending from right supraclavicular region to inferior border of hyoid bone (level III, IV), while 24 hours uptake 0.17%. The US neck showed two hypoechoic nodules were noted in the right bed in the mid bed measuring 0.7 x 0.5 x 0.3 cm and in the inferior bed measuring 0.4 x 0.3 x 0.8 cm in addition to a few right cervical lymph nodes, suspicious for recurrence, the largest in the right mid neck measuring 1.6 x 1.1 x 0.7 cm.

A month later, the patient had another ^{123}I WBS and the results showed a focus of tracer uptake localized at right thyroid bed with 24 hour uptake of 0.4% consistent with recurrent/residual soft tissue at the thyroid bed. Also, there was a large focus of radiotracer uptake localized at the right supraclavicular region; just inferior to right thyroid bed, most likely corresponds to pathological lymph node seen in prior ultrasound of the neck. Focal tracer activity is also noted within the suprasternal notch. There were two foci of radiotracer uptake one seen at the posterior element of T3 and the right iliac bone, suspicious for bone metastasis. There was also focal increased radiotracer uptake at the anterior mediastinum with no obvious underlying structural abnormality that could be related to either normal thymic uptake at this age group or less likely metastatic disease.

The post operative thyroglobulin level was found to have a high risk of recurrence also it provides incremental values to aid the physicians in making a good decision for radioactive iodine therapy (Biermann et al., 2011; Mao et al., 2016). Although the patient had two surgeries and had a previous radioiodine ablation therapy after the first surgery, the patient status based on the imaging follow-up results highly recommend having a second radioiodine therapy. As known in literature, recurrence of disease in lymph

nodes maybe possible post incomplete surgical resection of neoplastic tumours and is not prevented in all cases by postoperative radioactive iodine therapy (Baudin et al., 2007; Schlumberger et al., 2014). In this case, the patient had a second dose of ^{131}I 119mCi which was given orally.

A year later after the course of the second radioiodine dose, the patient had US neck for follow-up which showed a re-demonstration of new right mid thyroid bed hypoechoic fairly circumscribed minimally vascular nodule, measuring 0.3 x 0.3 x 0.5 cm. The second right thyroid bed nodule is not visualized in the study. Interval visualization of eight tiny hypoechoic left lower thyroid bed nodule, measuring 0.1 x 0.1 x 0.3 cm. The bilateral lower cervical lymph nodes which demonstrate interval increase in size and number, some of which demonstrate suspicious morphology. Findings were suspicious cervical lymphadenopathy.

Also, for follow-up the patient had ^{123}I WBS, which showed that there was interval resolution of most of previously seen multiple focal tracer uptakes seen in the chest and pelvic regions related to osseous metastasis. Subtle iodine uptake was seen in the mid thoracic region posterior. There were persistent few focal tracer uptakes seen in the right neck, related to the known nodal metastasis with interval reduction of the 24 hour calculated neck uptake that measures about 0.17%, previously 0.4%. No new concerning focal tracer uptake in the neck or elsewhere. The scan shows residual iodine avid right neck nodal metastases and probable mid thoracic spine metastatic disease with no new focal tracer uptake elsewhere. In that case, physicians advised the patient to have a third radioiodine therapy with a dose of 155.32mCi again was given orally.

3. DISCUSSION

According to (Haddad et al., 2022) patients with Papillary Thyroid Carcinoma (PTC) from the National Cancer Database discovered that tumor size was related to recurrence and survival and that total thyroidectomy reduced recurrence rates and improved survival in patients with PTC of 1 cm or larger. In contrast, researchers were able to risk adjust for more variables in a more recent National Cancer Database examination and concluded that there was no correlation between the extent of thyroid surgery and better overall survival for tumors measuring (1-4cm) although this study have not examined recurrence rate or tumors larger than 4 cm. The majority of literature in thyroid carcinoma recommends total thyroidectomy for patients with biopsy proven PTC which has one of the following clinical features: Aggressive subtype disease, significant radiation exposure, significant family history or coexisting thyroid disease. In this presented case study, total thyroidectomy is recommended according to radiographic evidence (i.e., neck ultrasound and FNA) also, apparent of widely invasive follicular thyroid carcinoma (FTC), including intraluminal involvement of the Right Internal Jugular Vein (RIJV).

Postoperative Radioactive Iodine (RAI) therapy is frequently used in patients with known postoperative residual disease or inoperable distant metastasis based on whether the persistent tumor is shown to be iodine-131-avid. Imaging of pre and post Iodine-131 treatment is recommended for patients who are suspected or proven iodine-131-avid metastatic foci. In patients with known or suspected distant metastatic disease, radioiodine diagnostic imaging should be considered (either Iodine-123 or Iodine-131) with adequate thyroid stimulating hormone (TSH) stimulation before therapeutic dose of iodine-131 is administered, taking in to consideration the dosing recommendations to avoid the problem of stunning, which may limit treatment effect. Along with the medical treatment, it is important to consider the improvement of patient's living standards if improvements of patient's overall life quality besides addressing the patient's physiological and psychological needs, will help in focusing on prolonged survival (Barbus et al., 2018; Wu et al., 2016).

4. CONCLUSION

The case presented illustrates a widely intensive follicular thyroid carcinoma with extensive angioinvasion. In this case, post total thyroidectomy showed post-surgical changes both post first and second surgery with the repetition of the radioiodine therapy for three times. Elevation of thyroglobulin level while negative WB scan should be kept under regular follow-up as it is a mark indicator for possible recurrent disease.

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Author Contributions

The author contributed fully for manuscript work and production.

Informed consent

Written & Oral informed consent was obtained from all individual participant included in the study.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data associated with this study are present in the paper.

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