



# I-131 Avid Tumor Thrombus in a Case of Poorly Differentiated Thyroid Cancer

## Kötü Diferansiye Tiroid Kanseri Olgusunda I-131 Tutan Tümör Trombüsü

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### Abstract

Intravenous tumor extension is a well-recognized phenomenon occurring in various malignancies but is a relatively rare entity in thyroid carcinoma. In patients with poorly differentiated thyroid cancer (pDTC), I-131 avid superior vena cava tumor (SVC) thrombus at initial presentation is infrequent and potential life threatening. Tumor thrombus can form either due to direct vascular extension of the primary mass or by hematogenous spread. Hybrid nuclear imaging can differentiate the two entities, which can impact the treatment plan of the patient. We present images of an interesting case of evolution of SVC thrombus in a 46-year-old woman with diagnosed pDTC over the span of two years.

**Keywords:** I-131 avid tumor thrombus, SPECT/CT, poorly differentiated thyroid cancer

### Öz

İntravenöz tümör yayılımı, çeşitli malignitelerde ortaya çıkan iyi bilinen bir fenomendir, ancak tiroid kanserinde nispeten nadir bir antitedir. Kötü diferansiye tiroid kanseri (pDTC) olan hastalarda, başlangıçta I-131 avid superior vena cava tümörü (SVC) trombüsü nadirdir ve potansiyel olarak yaşamı tehdit eder. Tümör trombüsü, primer kitlenin doğrudan vasküler yayılımı veya hematojen yayılım nedeniyle oluşabilir. Hibrit nükleer görüntüleme, hastanın tedavi planını etkileyebilecek bu iki antiteyi ayırt edebilir. Bu yazıda, pDTC tanısı konan 46 yaşındaki bir kadında ilginç bir SVC trombüs gelişiminin iki yıllık görüntülerini sunuyoruz.

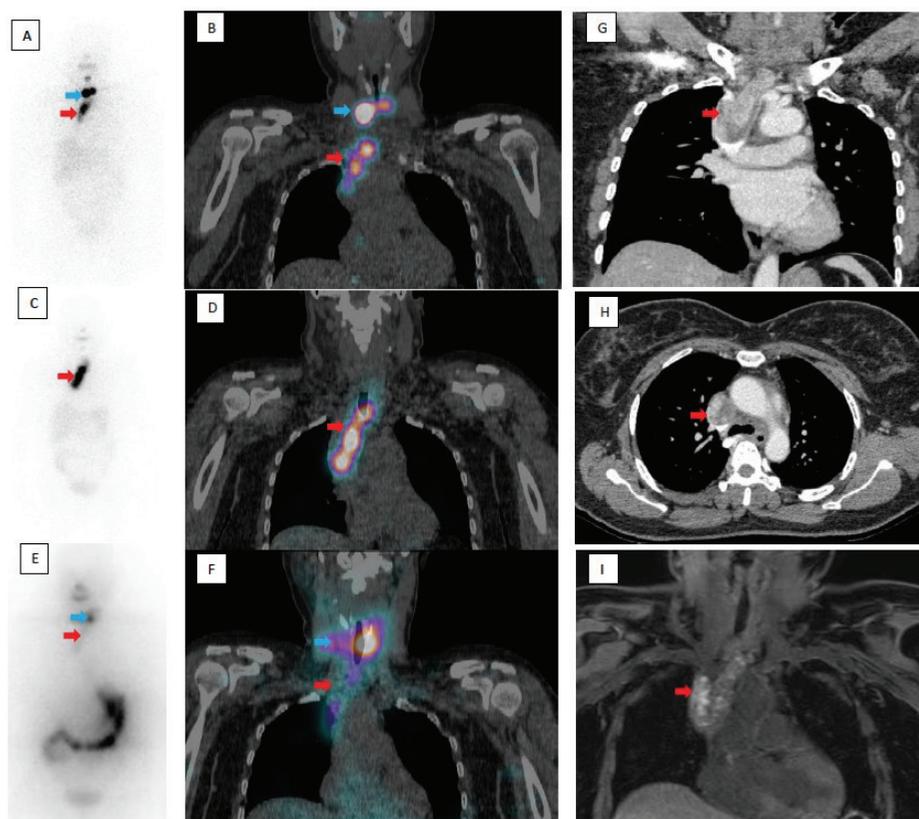
**Anahtar kelimeler:** I-131 tutan tümör trombüsü, SPECT/BT, az diferansiye tiroid kanseri

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**Received:** 08.11.2022 **Accepted:** 22.01.2023

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**Figure 1.** A 46-year-old female was referred for radioactive iodine (RAI) ablation therapy after total thyroidectomy. Histopathology revealed poorly differentiated thyroid carcinoma (pDTC). Per ATA guidelines, she was at highrisk for disease recurrence and was staged as T3aN1M0. A pre-therapy whole body scan (WBS) was performed 48 h after oral administration of 3.5 mCi of I-131(A). It showed bifocal RAI (I-131) uptake in the thyroid bed (blue arrow) more prominent on the right side. Linear increased activity (red arrow) was confirmed to be a superior vena cava (SVC) tumor thrombus on a single-photon emission tomography/computed tomography (SPECT/CT) scan (fused coronal SPECT/CT, B). Stimulated thyroglobulin level was 11,135 ng/mL with normal anti-thyroglobulin antibody levels.

She received 100 mCi of RAI, which was well delivered to the thyroid remnant on post-therapy scan. The patient also had a CT thorax with contrast, which confirmed SVC thrombus extending into the left brachiocephalic vein with an enhancing component, consistent with tumor thrombus. Magnetic resonance imaging (MRI) thorax also showed a long segment thrombus of SVC with expansion (G, H, I). As iodinated contrast in CT scan can increase the total body iodine stores for up to 3 months, which can render subsequent RAI therapy ineffective, adequate interval was ensured between CT with contrast and RAI therapy. Subsequently, she developed facial swelling (SVC syndrome) and urgently received 800 cGy of palliative radiation to the mediastinum. SVC is rarely involved in thyroid carcinomas at initial presentation, and if present, it usually occurs with systemic disease (1). SVC tumor thrombus can result in severe symptoms due to vascular congestion.

Two months after radiotherapy, she received another 150 mCi of RAI. Post-therapy WBS and coronal SPECT/CT (C, D red arrow) showed a well-delivered dose to SVC tumor thrombus. No avidity was noted in the thyroid surgical bed. Stimulated thyroglobulin levels declined to 5788 ng/mL and anti-thyroglobulin levels remained normal.

pDTC has intermediate characteristics between well-differentiated thyroid carcinoma and anaplastic tumors (1). The incidence of pDTC has increased over the last few years with significant morbidity and mortality due to its aggressive behavior (2). Among thyroid cancers, it has an incidence of 0.23% to 2.6% (3). Thyroid carcinoma has a microscopic vascular invasion; however, gross venous thrombus is a rare occurrence (4). Conventional imaging such as MRI and CT is helpful in the diagnosis of venous thrombus (5). Doppler ultrasound has limited yield in this area as SVC is mostly obscured by adjacent structures (6). However, the differentiation of a tumor thrombus from other thrombi can be a challenge in conventional imaging. Thus, in iodine sensitive cases of thyroid carcinoma, hybrid nuclear scans such as I-131 planar images coupled with SPECT/CT are highly beneficial in identifying tumor thrombus versus benign thrombosis using the iodine avidity of the thrombus as in this case.

One year later, the patient had an evidence of recurrent disease on ultrasound in the left thyroid bed. pDTC is an aggressive tumor accounting for approximately 1-15% of thyroid carcinomas (7). More than 80% of patients with pDTC have good RAI uptake; however, 15% are non-avid iodine (8). As our patient had previously had iodine avid disease and had also shown response, she received a third dose of RAI, 200 mCi (cumulative dose 450 mCi). Post-therapy WBS and coronal SPECT/CT images (E,F, blue arrow) re-demonstrated ultrasound findings of soft tissue nodule in the left thyroid bed, which was iodine avid. Interval regression in the avidity of SVC tumor thrombus was also noted (E, F red arrow). She received 20 Gy radiation in 5 fractions to the thyroid. She is under regular follow-up and stable.

## Ethics

**Informed Consent:** Written consent was taken from the patient.

**Peer-review:** Externally and internally peer-reviewed.

## Authorship Contributions

Surgical and Medical Practices: A.H., H.B., W.S., Concept: A.H., H.B., Design: S.M.G., A.H., Data Collection or Processing: S.M.G., A.H., Analysis or Interpretation: A.H., H.B., Literature Search: S.M.G., Writing: A.H., H.B., W.S.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study received no financial support.

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