Interesting Image

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Papillary Thyroid Carcinoma with Tumour Thrombus Extending Into the Superior Vena Cava Demonstrated by Multimodality Imaging

Multimodal Görüntüleme Yöntemleriyle Gösterilen, Tümör Trombüsünün Superior Vena Kavaya Uzandığı Papiller Tiroid Karsinomu

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Abstract

Macroscopic venous tumor thrombus is an uncommon manifestation of differentiated thyroid carcinoma and is more frequently associated with follicular thyroid carcinoma than papillary thyroid carcinoma (PTC). We report a 45-year-old woman with PTC comprising follicular (80%) and solid (20%) subtypes, extensive vascular invasion, and tumour thrombus extending from the right internal jugular vein into the superior vena cava (SVC). Contrast-enhanced computed tomography (CT) delineated the intravascular extent. Following total thyroidectomy and thrombus resection, three iodine-131 treatments totalling 16.65 GBq were administered over 22 months. Serial post-therapy imaging demonstrated persistent iodine-avid pulmonary, left acetabular, and intravascular disease, while stimulated thyroglobulin increased from 150,002 to 232,920 ng/mL. Subsequent ^{18}F-fluorodeoxyglucose (^{18}F-FDG) positron emission tomography/CT showed thyroid bed recurrence, pulmonary and skeletal metastases, and prominent ^{18}F-FDG uptake within the SVC tumour thrombus. These findings confirmed viable intravascular tumour and demonstrated phenotypic heterogeneity, raising concern for evolution toward radioiodine-refractory disease and supporting referral for multidisciplinary assessment of systemic therapy.

Keywords: Papillary thyroid carcinoma, tumor thrombus, superior vena cava, ^{131}I SPECT/CT, ^{18}F-FDG PET/CT

Öz

Makroskopik venöz tümör trombüsü, diferansiye tiroid karsinomunun nadir görülen bir bulgusudur ve papiller tiroid karsinomuna (PTK) kıyasla foliküler tiroid karsinomunda daha sık görülür. Bu olgu sunumunda, foliküler (%80) ve solid (%20) alt tiplerden oluşan PTK tanılı, yaygın vasküler invazyonu ve sağ internal juguler venden vena kava süperiora (VKS) uzanan tümör trombüsü bulunan 45 yaşında bir kadın hasta bildirilmektedir. Kontrastlı bilgisayarlı tomografi (BT), tümörün damar içindeki uzanımını ortaya koymuştur. Total tiroidektomi ve trombüs rezeksiyonunun ardından, 22 ay içinde toplam 16,65 GBq dozunda üç iyot-131 tedavisi uygulanmıştır. Ardışık tedavi sonrası görüntülemelerde akciğerlerde, sol asetabulumda ve damar içinde iyot tutan hastalığın devam ettiği izlenirken, uyarılmış tiroglobulin düzeyi 150.002 ng/mL'den 232.920 ng/mL'ye yükselmiştir. Daha sonra gerçekleştirilen ^{18}F-florodeoksiglukoz (^{18}F-FDG) pozitron emisyon tomografisi/BT incelemesinde, tiroid yatağında nüks, akciğer ve kemik metastazları ile VKS içindeki tümör trombüsünde belirgin ^{18}F-FDG tutulumu saptanmıştır. Bu bulgular, damar içinde canlı tümör dokusunun varlığını doğrulamış ve fenotipik heterojenliği ortaya koymuştur. Ayrıca, hastalığın radyoiyot tedavisine dirençli hâle gelme olasılığına ilişkin kaygı uyandırmış ve sistemik tedavi açısından multidisipliner değerlendirmeye yönlendirilmesini desteklemiştir.

Anahtar Kelimeler: Papiller tiroid karsinomu, tümör trombüsü, vena kava süperior, ^{131}I SPECT/BT, ^{18}F-FDG PET/BT

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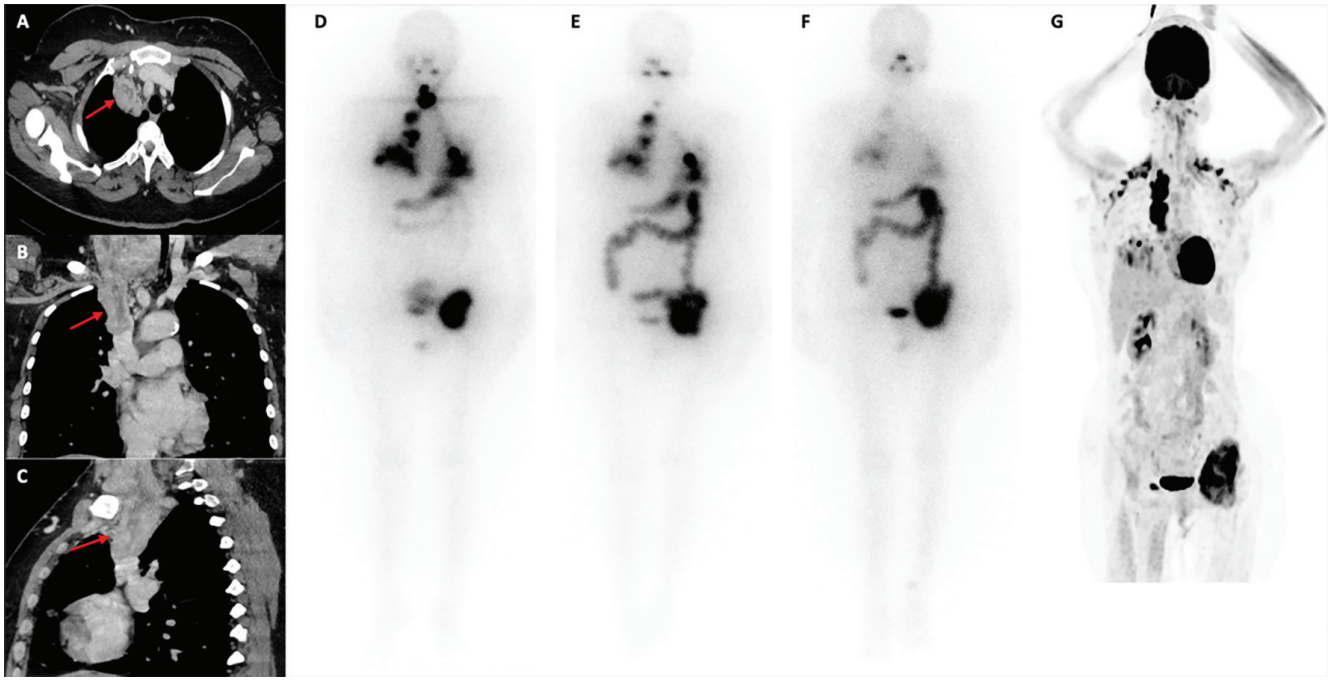


Figure 1. A 45-year-old woman presented with a right thyroid mass. Contrast-enhanced computed tomography demonstrated a large right thyroid mass with airway narrowing and enhancing intraluminal tumour thrombus extending from the right internal jugular vein (IJV) into the superior vena cava (SVC) (A, axial; B, coronal and C, sagittal). She underwent total thyroidectomy, bilateral modified radical neck dissection, right IJV thrombus resection, and partial sternotomy. Histopathology confirmed a 26 x 35 x 65 mm papillary thyroid carcinoma comprising follicular (80%) and solid (20%) subtypes, with microscopic extrathyroidal extension, extensive vascular invasion (>4 vessels) and an IJV tumour thrombus, 2 mm from the isthmus margin. No mitoses, necrosis, or poorly differentiated/anaplastic component was identified. All 22 lymph nodes were negative (pT3a pN0); Ki-67 was not assessed. Over 22 months, she received three iodine-131 treatments totalling 16.65 GBq (450 mCi). Serial post-therapy imaging showed resolved thyroid bed uptake but persistent iodine-avid pulmonary, left acetabular, and right upper mediastinal/intravascular disease (D, F). ^{18}F-fluorodeoxyglucose positron emission tomography/computed tomography (G, maximum intensity projection image) was performed for persistent disease and rising stimulated thyroglobulin from 150,002 to 232,920 ng/mL. It demonstrated thyroid bed recurrence, pulmonary metastases, an expansile destructive left acetabular mass, and tumour thrombus involving the SVC and right brachiocephalic vein.

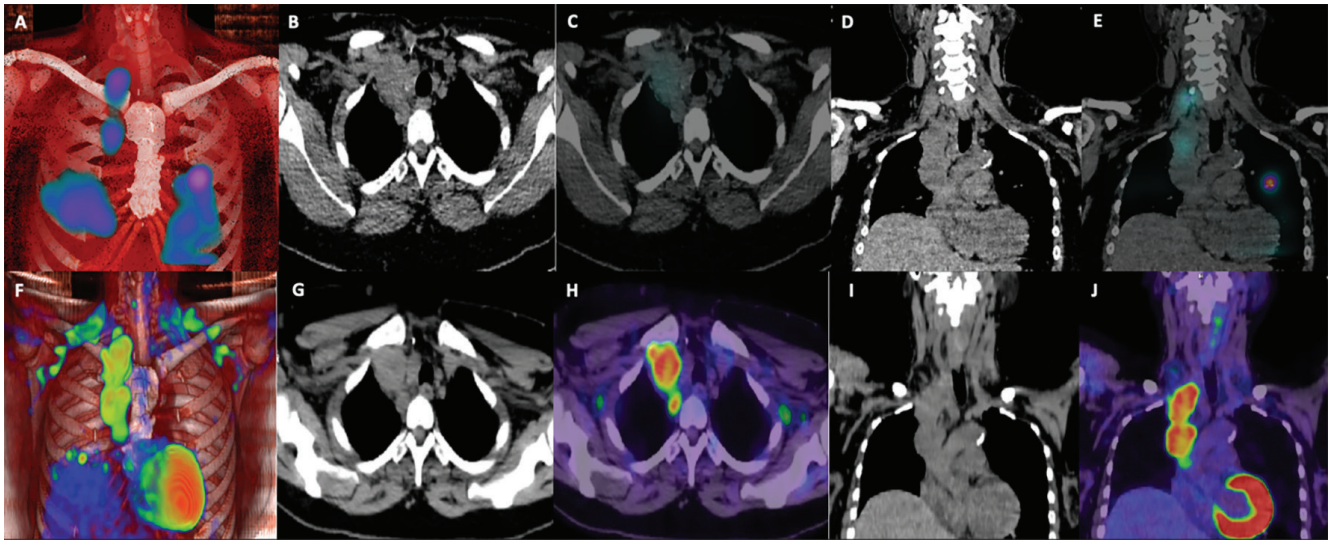


Figure 2. Iodine-131 single-photon emission computed tomography/computed tomography (A, 3D volume-rendered image; B-C, axial; D-E, coronal) demonstrated mild radioiodine uptake within the superior vena cava (SVC) tumour thrombus. In contrast, ^{18}F-fluorodeoxyglucose (^{18}F-FDG) positron

emission tomography/computed tomography (F, 3D volume-rendered image; G-H, axial; I-J, coronal) demonstrated prominent linear ^{18}F-FDG uptake along the intraluminal SVC tumour thrombus, confirming metabolically active tumour. The discordantly prominent ^{18}F-FDG uptake and mild iodine uptake suggested phenotypic heterogeneity and prompted referral for systemic therapy assessment.

Macroscopic venous tumour thrombus is a rare manifestation of differentiated thyroid carcinoma and is more frequently associated with follicular thyroid carcinoma than papillary thyroid carcinoma (PTC), which typically spreads through lymphatic pathways (1,2,3,4). When present, tumour thrombus commonly involves the IJV and middle thyroid vein, with occasional extension into the brachiocephalic vein, SVC, mediastinal venous system, or right ventricle (1,2,3,4). This case demonstrates internal jugular vein (IJV) to SVC tumour thrombus in PTC with mixed follicular and solid architecture. The large primary tumour, solid component, and extensive vascular invasion indicated aggressive biology. Microscopic extrathyroidal extension provided an additional adverse feature; however, the absence of mitoses, necrosis, high-grade components, and nodal metastases highlights the importance of interpreting these findings collectively rather than individually (5). Contrast-enhanced computed tomography delineated the venous extent, while histopathology confirmed tumour rather than bland thrombus (2). Discordantly prominent ^{18}F-FDG uptake and mild iodine uptake within the thrombus suggested phenotypic heterogeneity (6,7). Although^{18}F-FDG avidity and rising Tg raised concern for radioiodine refractoriness, several lesions remained iodine-avid, and progression of individual lesions despite radioiodine uptake was not conclusively documented (8). Therefore, the findings support possible evolution toward radioiodine-refractory disease rather than uniformly established refractoriness. This rare case of IJV to SVC tumour thrombus in PTC highlights the complementary role of multimodality imaging in confirming viable intravascular disease, characterising tumour heterogeneity, and guiding referral for systemic therapy after repeated radioiodine treatment.

Ethics

Informed Consent: This Interesting Image report was approved by the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia (approval number: NMRR-20-1008-54807).

Footnotes

Authorship Contributions

Surgical and Medical Practices: L.H.M., M.F.M.R., S.Z.A.H., Concept: L.H.M., M.F.M.R., Design: L.H.M., M.F.M.R., Data Collection or Processing: L.H.M., M.F.M.R., Analysis or Interpretation: L.H.M., M.F.M.R., S.Z.A.H., Literature Search: L.H.M., M.F.M.R., S.Z.A.H., Writing: L.H.M., M.F.M.R., S.Z.A.H.

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