


# False-Positive Laryngeal FDG Uptake During PET/CT Imaging: Reinke's Edema

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## Case Report

### Abstract

Positron emission tomography/computed tomography (PET/CT) is frequently used for diagnosing, staging, and following-up various malignancy types because it provides information on the site and metabolic activity of the tumor. Fluorodeoxyglucose (FDG) uptake by the normal laryngeal tissue is symmetric and low, whereas that under some non-malignant conditions of the larynx, such as vocal cord paralysis and Teflon granuloma, is asymmetrically

increased. We reported the first case of histologically proven Reinke's edema causing false-positive laryngeal FDG uptake on PET/CT imaging. A clinician must be aware of these rare benign lesions in the case of increased FDG uptake, and histopathological investigation is mandatory to rule out malignancy for suspicious cases.

**Keywords:** Larynx, Reinke's edema, benign, vocal cord, PET/CT

### Introduction

Reinke's edema (RE) can be defined as unilateral or bilateral pale whitish swelling of the true vocal cords, which are filled with fluid and are mobile during phonation. The mechanism underlying RE is unknown. Cigarette smoking, laryngopharyngeal reflux, and post-nasal drip syndrome are factors in the etiology of RE. Increased permeability of microvascular capillaries in the lamina propria results in RE because of accumulation of extracellular matrix in the Reinke's space (1). Recently, positron emission tomography/computed tomography (PET/CT) has been frequently used for diagnosing, staging, and following-up on various malignancy types because it provides information on the site and metabolic activity of the tumor (2). Some non-malignant conditions of the larynx, such as vocal cord paralysis (3) and Teflon granuloma (4), have been reported to cause false-positive fluorodeoxyglucose (FDG) uptake on PET/CT. In this case report, we presented the first case of histologically proven RE causing false-positive FDG uptake on PET/CT imaging in the English literature.

### Case Presentation

A 35-year-old female patient with a solitary pulmonary nodule was referred to Mersin University Department of Otorhinolaryngology for asymmetrical laryngeal FDG uptake on PET/CT. The patient had a 10-pack-year history of smoking. A thoracic CT of the patient showed a pulmonary parenchymal nodule of 10-mm diameter in the right middle lobe. PET/CT imaging was used for determining metabolic characterization of the solitary pulmonary nodule, and there was no FDG uptake in the well-defined nodule in the right lung. Asymmetrically increased FDG uptake was observed in the posterior region of the right vocal cord. The maximum standardized uptake value ( $SUV_{max}$ ) was 6.71 (Figure 1). She had a chronic history of voice abuse and varying levels of dysphonia. On indirect laryngoscopy of the patient, the right vocal cord was more edematous than the left. Direct laryngoscopy and biopsy were performed to confirm the diagnosis. On histopathological examination, edema with fibroblast and vessel proliferation in the subepithelium with an intact epithelium were observed, confirming the diagnosis of RE (Figure 2, 3). Although  $SUV_{max}$  on



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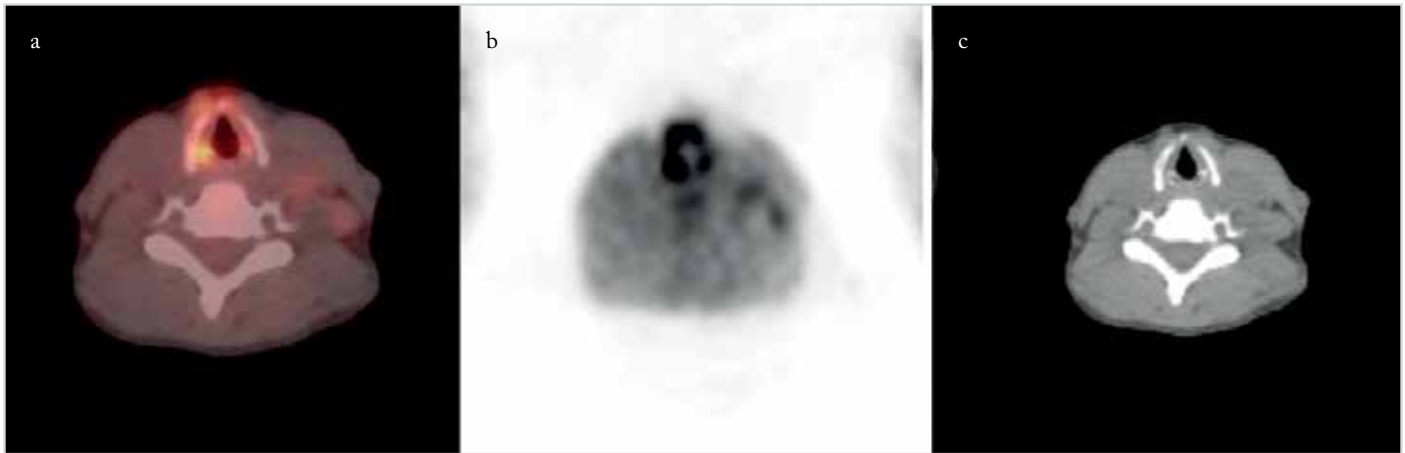


Figure 1. a-c. Representative positron emission tomography/computed tomography (PET/CT) (a), PET (b) and CT (c) images

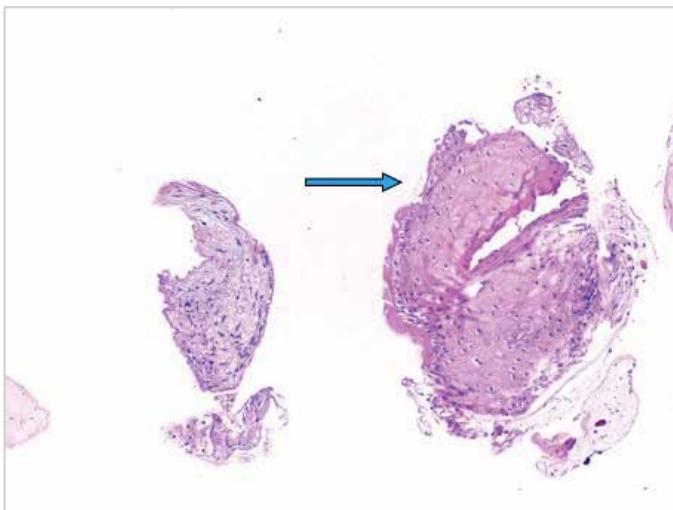


Figure 2. Intact epithelium of the vocal cord (arrow). Hematoxylin and eosin (HE, X100)

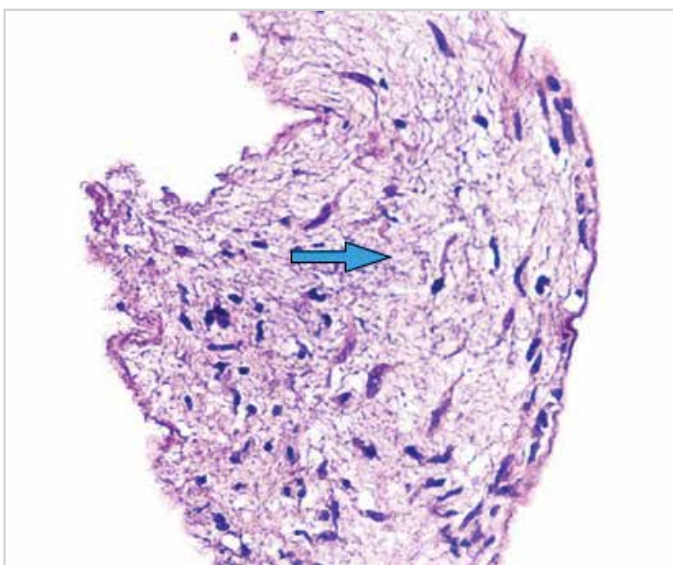


Figure 3. Edema, fibroblasts, and vessel proliferation in the subepithelium (arrow). Hematoxylin and eosin (HE, X100)

PET/CT was strongly suggestive of malignancy, it was excluded clinically and histopathologically. The patient gave informed consent for this case report.

## Discussion

Indications for the use of PET/CT for cancer investigations generally includes diagnosing and grading of the malignancy, staging the disease, detecting residual or recurrent tumor, evaluating response to therapy, and identifying the site of the primary tumor when secondary cancers are present (5). For lesions >8 mm in solitary pulmonary nodules, the malignancy risk is between 5% and 65%. The sensitivity of PET/CT in differentiating malign pulmonary nodules from benign nodules ranges between 72% and 94% (6). In our case, PET/CT was used for characterization of the nodule (metastatic or primary) and for guided biopsy of the lesion in the lung parenchyma that was detected on thoracic CT.

In recent years, because of broad PET/CT applications in malignancies, incidental non-malignant findings are commonly encountered during PET/CT imaging. Chopra et al. (7) reported that of the 1158 patients who underwent PET/CT, 18 had abnormal FDG uptake in the larynx and hypopharynx. Of these 18 patients, seven were evaluated; five patients were found to be normal and two patients had vocal cord paralysis. Heller et al. (3) reported another case of false-positive FDG uptake in the non-paralytic vocal cord. Teflon granuloma was also reported to show false-positive FDG uptake (4). Sugumaran et al. (8) reported the first case of RE having false-positive FDG uptake with a  $SUV_{max}$  value of 4.1, but they did not perform histopathological confirmation. In our case, because the  $SUV_{max}$  value was 6.71, a value indicating malignancy, we preferred to perform a histopathological investigation to exclude a microinvasive carcinoma accompanying RE (9).

The  $SUV_{max}$  value of laryngeal FDG avidity is important for distinguishing benign lesions from malignant ones. Normally, FDG uptake with a maximum SUV value of 0.2 in the larynx and pharynx can be regarded to be physiological (3). On the other hand, Kostakoglu et al. (10) demonstrated that laryngeal FDG uptake can symmetrically increase during phonation because of laryngeal muscle contraction.

Vocal cords are histologically composed of surface epithelium, lamina propria, and muscular layers. Layers of lamina propria

have different cellular activities. The superficial layer of lamina propria, also called as Reinke's space, contains macrophages, myofibroblasts, and fibroblasts at high concentrations. Morphologic changes, such as edema, vascular congestion, and venous stasis, are observed in the superficial layer of the lamina propria (11,12). Increased vascular permeability, which is caused by chronic irritation, causes fluid extravasation to the Reinke's space and the abnormal size of the vocal cord causes dysphonia. These vascular changes with high levels of fibroblasts in RE can be possible causes of false-positive FDG uptake during PET/CT imaging (8). In addition, compensatory muscle hyperfunction to overwhelm RE-related dysphonia, as observed in the case of vocal cord paralysis, can be another possible reason for increased FDG uptake during imaging (3).

### Conclusion

Benign laryngeal lesions, such as RE, can cause false-positive asymmetrical FDG uptake even with  $SUV_{max}$  value of  $>6$ . A clinician must be aware of these rare benign lesions in case of increased FDG uptake, and histopathological investigation is mandatory to rule out malignancy for suspicious cases.

**Informed Consent:** Written informed consent was obtained from the patient who participated in this study.

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### References

1. Tuzuner A, Demirci S, Yavanoglu A, Kurkcuoglu M, Arslan N. Reinke edema: Watch for vocal fold cysts. *J Craniofac Surg* 2015; 26: 338-9. [\[CrossRef\]](#)
2. Das BK, editor. Positron emission tomography: An overview. New Delhi: Springer India; 2015. [\[CrossRef\]](#)
3. Heller MT, Meltzer CC, Fukui MB, Rosen CA, Chander S, Martinelli MA, et al. Superphysiologic FDG uptake in the non-paralyzed vocal cord. Resolution of a false-positive PET result with combined PET-CT imaging. *Clin Positron Imaging* 2000; 3: 207-11. [\[CrossRef\]](#)
4. Yeretsian RA, Blodgett TM, Branstetter BF, Roberts MM, Meltzer CC. Teflon-induced granuloma: A false-positive finding with PET resolved with combined PET and CT. *AJNR Am J Neuroradiol* 2003; 24: 1164-6.
5. Maisey MN. Positron emission tomography in clinical medicine. Bailey DL, Townsend DW, Valk PE, Maisey MN, editors. *Positron Emission Tomography*. London: Springer-Verlag; 2005.p.1-12.
6. Divisi D, Barone M, Zaccagna G, Crisci R. Fluorine-18 fluorodeoxyglucose positron emission tomography in the management of solitary pulmonary nodule: A review. *Ann Med* 2017; 49: 626-35. [\[CrossRef\]](#)
7. Chopra A, Ford A, De Noronha R, Matthews S. Incidental findings on positron emission tomography/CT scans performed in the investigation of lung cancer. *Br J Radiol* 2012; 85: 229-37. [\[CrossRef\]](#)
8. Sugumaran M, Sulica L, Branski RC. Reinke edema finding on positron emission tomography. *Arch Otolaryngol Head Neck Surg* 2011; 137: 620-1. [\[CrossRef\]](#)
9. Martins RHG, Fabro AT, Domingues MAC, Chi AP, Gregorio EA. Is Reinke's edema a precancerous lesion? Histological and electron microscopic aspects. *J Voice* 2009; 23: 721-5. [\[CrossRef\]](#)
10. Kostakoglu L, Wong J, Barrington SF, Cronin BF, Dynes AM, Maisey MN. Speech-related visualization of laryngeal muscles with fluorine-18-FDG. *J Nucl Med* 1996; 37: 1771-3.
11. Dikkers FG, Nikkels PG. Benign lesions of the vocal folds: Histopathology and phonotrauma. *Ann Otol Rhinol Laryngol* 1995; 104: 698-703. [\[CrossRef\]](#)
12. Tan M, Bryson PC, Pitts C, Woo P, Benninger MS. Clinical grading of Reinke's edema. *Laryngoscope* 2017; 127: 2310-2313. [\[CrossRef\]](#)