

# The hypoglossal nerve palsy involved by papillary thyroid carcinoma detected on $^{18}\text{F}$ -FDG PET/MRI

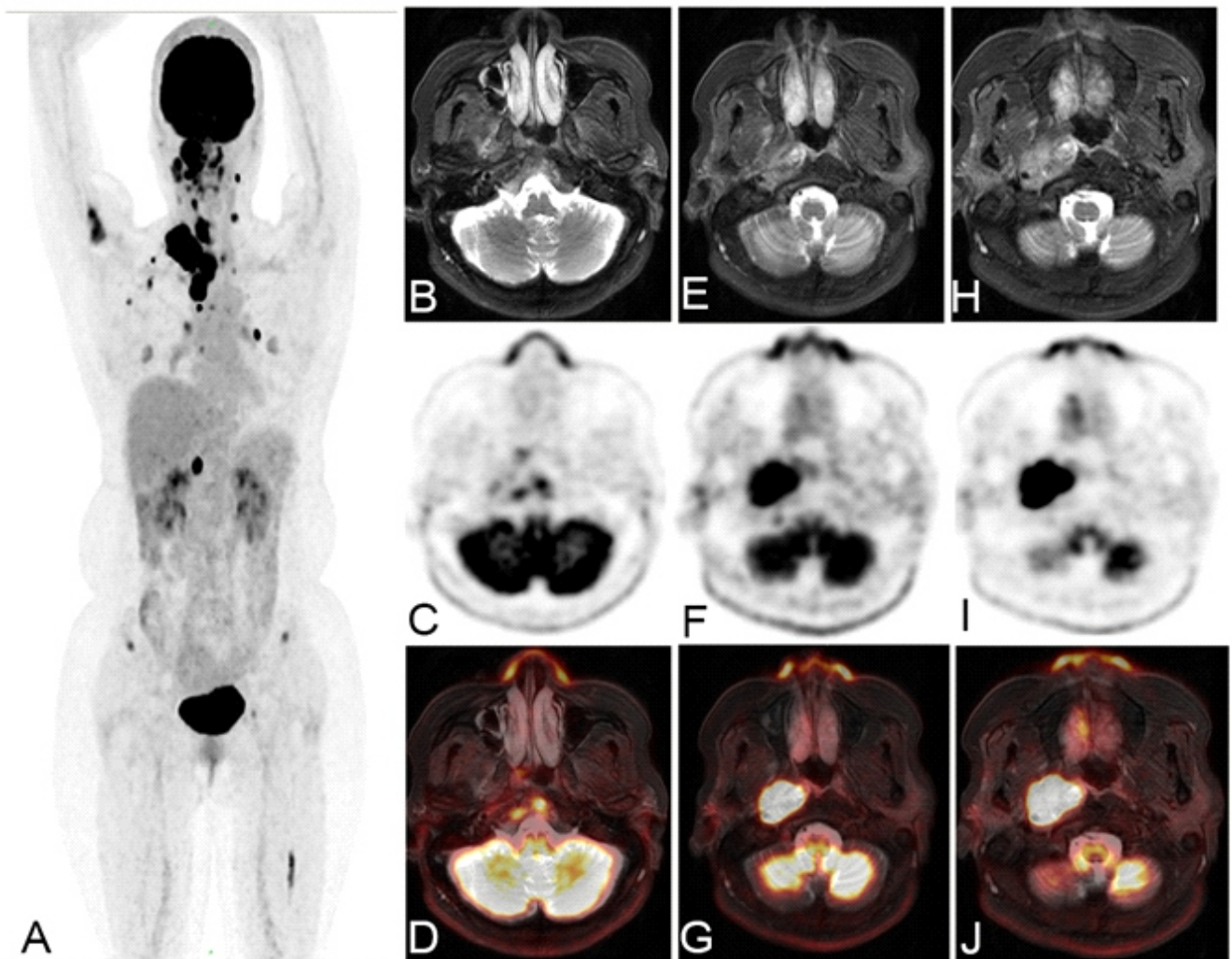
## Abstract

A 51-year-old woman with papillary thyroid cancer (PTC) complained of headache. Physical examination found the tongue deviation to right side. Fluorine-18-fluorodeoxyglucose positron emission tomography/magnetic resonance imaging ( $^{18}\text{F}$ -FDG PET/MRI) detected a hypermetabolic soft-tissue mass in the right retropharyngeal carotid space, where the nasopharyngeal carotid segment of right hypoglossal nerve passing inferiorly. The musculature in the right side of tongue was inflammatory instead of fatty infiltration, with hyperintense on T2-weighted image and hypermetabolism on PET. These images together indicated the early phase of hypoglossal nerve palsy caused by PTC invasion.

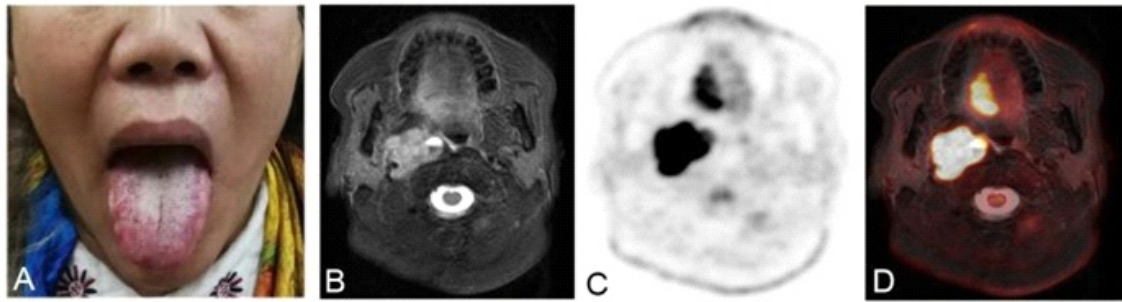
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**Figure 1.** A 51-year-old woman underwent total thyroidectomy with central and lateral lymph node dissection. The tumor involved the recurrent laryngeal nerve (T4aN1bM0) which proved as PTC by pathological diagnosis. One year later after radioiodine adjuvant therapy, she noticed a mass above the right clavicle and gradually felt ipsilateral headache, fatigue and anorexia. Ultrasound found multiple irregular solid masses in bilateral neck. The thyroglobulin level was 4.69ng/mL with TGAb interference (273.0IU/mL). Fluorine-18-FDG PET/MRI was performed to detect local and distant lesions distribution. Maximum intensity projection (MIP) revealed metastases lesions of neck, liver and bones, all with intense uptake (A). Co-registered axial T2-weighted MRI, PET and fused images showed a hypermetabolic soft-tissue in right lateral retropharyngeal space, extending to involve the right clivus (B, C, D), musculus longus capitis (E, F, G) and carotid space (H, I, J). At this region, the hypoglossal nerve emerges from hypoglossal canal and then lies deep to the internal jugular vein and internal carotid artery (B and E).



**Figure 2.** Physical examination revealed the tongue moderate deviation to the right side (A). Axial T2-weighted image showed hyperintense in the right base of tongue without muscle atrophy on T2-weighted image (B), which corresponding to intense hypermetabolism with maximum standardized uptake value (SUVmax) of 7.76 (C and D). Combination these features, we concluded the nasopharyngeal carotid segment of right hypoglossal nerve was involved by PTC causing the palsy of hypoglossal nerve.

With superior soft tissue contrast resolution and multiparametric imaging of MRI, PET/MRI can help to get a more accurate staging of tumors, especially in some complex anatomy [1-3], recurrent tumor [4], and small lesions [5]. Hypoglossal nerve is divided into five segments namely medullary segment, cisternal segment, skull base segment, nasopharyngeal carotid segment and sublingual segment [6]. Hypoglossal nerve palsy can be caused by damage to each of them, including invasion of cancers [7, 8], metastases [9, 10], vascular diseases [11, 12], infection [13], trauma [14, 15] and iatrogenic causes [16-18]. Chronic unilateral hypoglossal palsy is characterized by the atrophy muscles of the ipsilateral hemitongue as a consequence of longstanding denervation of hypoglossal nerve. The opposite side of tongue is compensatory hypertrophy, so hypermetabolic activity is seen on its contralateral hemitongue [19-21]. But in our case, hypermetabolic activity on the tongue base of same paralysis side was found, which was not reported.

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**Shuhui Huang<sup>1</sup> BS, Hongyuan Dai<sup>1</sup> BS, Rui Huang<sup>1\*</sup> MD, Minggang Su<sup>1</sup> MD**

<sup>1</sup>. Department of Nuclear Medicine, West China Hospital of Sichuan University, Chengdu, China.

**Corresponding author:** Rui Huang MD and Minggang Su MD, Department of Nuclear Medicine, West China Hospital of Sichuan University, No.37 Guoxue Alley, Chengdu, 610041, People's Republic of China. Tel: +8618980605781, Fax: +86 02885422187, E-mail: huang\_rui@scu.edu.cn; suminggang@sina.com