

# Mimicry of Physiological Urinary FDG Excretion

## Squamous Cell Carcinoma of Esophagus Metastasizing to Psoas Muscle

Te-Chun Hsieh, MD,\*† Shung-Shung Sun, MD,\*† Yu-Chin Wu, MD,\* Kuo-Yang Yen, RT,\*  
and Chia-Hung Kao, MD\*‡

**Abstract:** Skeletal muscle metastases are rare and usually occur with various malignancies at more advanced stages. FDG PET/CT has been known as a useful tool to detect these lesions because of the character of whole-body scanning and superior contrast between malignant and normal tissues, except in areas with abundant physiological FDG radioactivity, such as the urinary system. We present a patient with esophageal squamous cell carcinoma and an incidental, rare finding of psoas muscle metastasis that was initially omitted because of the similarity of its distribution to physiological urinary FDG excretion in the ureter.

**Key Words:** FDG PET/CT, contrast-enhanced CT, skeletal muscle metastasis, psoas muscle, esophageal squamous cell carcinoma

(*Clin Nucl Med* 2011;36: 36–37)

### REFERENCES

- Jovine E, Smerieri E, Mulas MM, et al. Muscle psoas metastasis from uterine squamous cell carcinoma. *ANZ J Surg.* 2008;78:213–214.
- Nabi G, Gupta NP, Gandhi D. Skeletal muscle metastasis from transitional cell carcinoma of the urinary bladder: clinicoradiological features. *Clin Radiol.* 2003;58:883–885.
- Seely S. Possible reasons for the high resistance of muscle to cancer. *Med Hypotheses.* 1980;6:133–137.
- Herring CL Jr, Harrelson JM, Scully SP. Metastatic carcinoma to skeletal muscle. A report of 15 patients. *Clin Orthop Relat Res.* 1998;355:272–281.
- Suto Y, Yamaguchi Y, Sugihara S. Skeletal muscle metastasis from lung carcinoma: MR findings. *J Comput Assist Tomogr.* 1997;21:304–305.
- Pop D, Nadeemy AS, Venissac N, et al. Skeletal muscle metastasis from non-small cell lung cancer. *J Thorac Oncol.* 2009;4:1236–1241.
- Linn JF, Fichtner J, Voges G, et al. Solitary contralateral psoas metastasis 14 years after radical nephrectomy for organ confined renal cell carcinoma. *J Urol.* 1996;156:173.
- Wu MH, Wu YM, Lee PH. The psoas muscle as an unusual site for metastasis of hepatocellular carcinoma: report of a case. *Surg Today.* 2006;36:280–282.
- Taira H, Ishii T, Inoue Y, et al. Solitary psoas muscle metastasis after radical nephrectomy for renal cell carcinoma. *Int J Urol.* 2005;12:96–97.
- Nash S, Rubenstein J, Chaiton A, et al. Adenocarcinoma of the lung metastatic to the psoas muscle. *Skeletal Radiol.* 1996;25:585–587.
- Husband JE, Bellamy EA. Unusual thoracoabdominal sites of metastases in testicular tumors. *Am J Roentgenol.* 1985;145:1165–1171.
- Takehara K, Shigemasa K, Sawasaki T, et al. Recurrence of invasive cervical carcinoma more than 5 years after initial therapy. *Obstet Gynecol.* 2001;98:680–684.
- Yang WT, Yeo W, Metreweli C. Imaging of iliopsoas metastasis. *Clin Radiol.* 1999;54:85–89.
- Kang S, Song BI, Lee HJ, et al. Isolated facial muscle metastasis from renal cell carcinoma on F-18 FDG PET/CT. *Clin Nucl Med.* 2010;35:263–264.
- Kenny JB, Widdowson DJ, Carty AT, et al. Malignant involvement of the iliopsoas muscle: CT appearances. *Eur J Radiol.* 1990;10:183–187.
- Pretorius ES, Fishman EK. Helical CT of skeletal muscle metastases from primary carcinomas. *Am J Roentgenol.* 2000;174:401–404.
- Pathy S, Jayalakshmi S, Chander S, et al. Carcinoma cervix with metastasis to deltoid muscle. *Clin Oncol (R Coll Radiol).* 2002;14:447–448.
- Devendra K, Tay SK. Metastatic carcinoma of the cervix presenting as a psoas abscess in an HIV-negative woman. *Singapore Med J.* 2003;44:302–303.
- Heeren PA, Jager PL, Bongaerts F, et al. Detection of distant metastases in esophageal cancer with (18)F-FDG PET. *J Nucl Med.* 2004;45:980–987.
- Heffernan E, Fennelly D, Collins CD. Multiple metastases to skeletal muscle from carcinoma of the esophagus detected by FDG PET-CT imaging. *Clin Nucl Med.* 2006;31:810–811.
- Bhargava P, Verstovsek G, Stair M, et al. Metastasis to psoas muscle detected by F-18 FDG PET-CT imaging. *Clin Nucl Med.* 2008;33:723–724.
- Wu G, Bybel B, Brunken R, et al. PET detection of solitary distant skeletal muscle metastasis of esophageal adenocarcinoma. *Clin Nucl Med.* 2005;30:335–337.

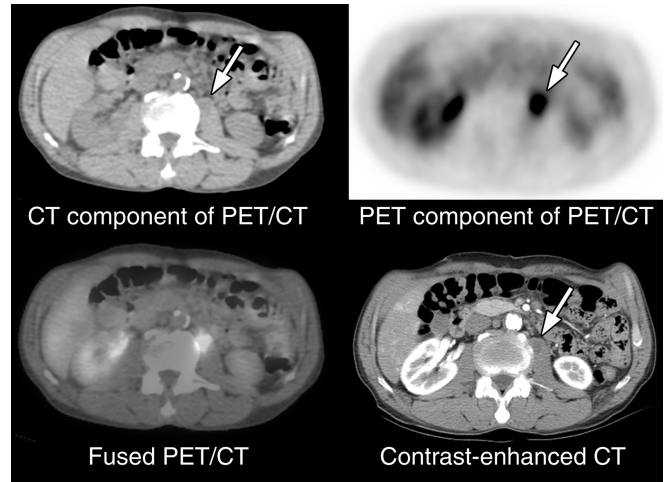
Received for publication April 27, 2010; revision accepted May 19, 2010.  
From the Departments of \*Nuclear Medicine and PET Center and †Biomedical Imaging and Radiological Science, China Medical University and Hospital, Taichung, Taiwan; and ‡School of Medicine, China Medical University and Hospital, Taichung, Taiwan.

Reprints: Chia-Hung Kao, MD, Department of Nuclear Medicine and PET Center, China Medical University Hospital, No. 2, Yuh-Der Road, Taichung 404, Taiwan. E-mail: d10040@mail.cmuh.org.tw.

Copyright © 2010 by Lippincott Williams & Wilkins  
ISSN: 0363-9762/11/3601-0036



**FIGURE 1.** A 58-year-old man with progressive odynophagia and dysphagia was diagnosed with esophageal squamous cell carcinoma via endoscopic biopsy recently. An FDG PET/CT scan using spiral low-dose CT scan without contrast media enhancement was performed for cancer staging. The maximum intensity projection image of the FDG PET scan revealed 2 foci of esophageal lesions in the upper and middle portions (white arrowheads) indicating double primary esophageal cancers. In addition, there were metastatic lesions in the chest wall (2 foci; black arrows) and bones (right humerus and right ilium; black arrowheads). There was also longitudinal linear FDG radioactivity seemingly along the route of left upper ureter (white arrow), possibly suggesting physiological urinary FDG excretion.



**FIGURE 2.** The transaxial FDG PET, CT, and fused FDG PET/CT images of the aforementioned longitudinal linear FDG radioactivity revealed a vaguely hypodense area seemingly anterior to the origin of left psoas muscle on the CT component of FDG PET/CT scan (arrow in the right upper panel). However, this finding on the corresponding diagnostic contrast-enhanced CT scan showed relative low attenuation and was within the anterior part of left psoas muscle. It revealed progressive enlargement on the follow-up CT scan 3 months later (not shown) and suggested skeletal muscle metastasis.

The incidence of skeletal muscle metastasis is rare<sup>1</sup> despite the abundant blood supply to the skeletal muscles. This rarity may be attributable to contractile activity, change in pH, accumulation of metabolites, intramuscular blood pressure, and local temperature.<sup>2-4</sup> There are few reports in the literature mentioning skeletal muscle metastases from various primary malignancies.<sup>5-14</sup> The skeletal muscles that are frequently involved are the diaphragmatic, iliopsoas, rectus abdominis, deltoid, and intercostal muscles.<sup>15</sup> Skeletal muscle metastases tend to be found in people with more advanced stage neoplasms or who are immunocompromised.<sup>16-18</sup> To detect the metastases from esophageal cancer, FDG PET has been shown to be more accurate than CT,<sup>19</sup> especially in the regions that are not routinely evaluated by CT.<sup>20</sup> Nevertheless, few reports have also found usefulness of FDG PET/CT to detect skeletal muscle metastases from esophageal adenocarcinomas.<sup>20-22</sup> However, the psoas muscle metastasis in our case reveals similar distribution pattern that mimics physiological urinary FDG excretion in the ureter and is easily omitted without the assistance of the contrast-enhanced diagnostic CT scan. On the other hand, the lesion is also probably easily missed even on the contrast-enhanced diagnostic CT scan without the high-contrast metabolic feature on the FDG PET scan. This case demonstrates the importance of comprehensive interpretation of an FDG PET/CT scan for cancer staging with incorporation of simultaneous multidisciplinary imaging studies, especially when the subject reveals the possibility of widespread metastatic disease.