

EUS-FNA of the Left Adrenal Gland is Safe and Useful

Tiing Leong Ang,¹MBBS, MRCP (UK), FAMS, Tju Siang Chua,¹MBBS, MRCP (UK), FAMS, Kwong Ming Fock,¹MBBS, FRCP, FAMS, Augustine KH Tee,²MBBS, MRCP (UK), FAMS, Eng Kiong Teo,¹MBBS, FRCP, FAMS, Kent Mancer,³MD, Bsc (Med), FRCPC

Abstract

Introduction: There are limited data on the use of endosonography-guided fine-needle aspiration (EUS-FNA) to determine the nature of left adrenal lesions. We described our experience in performing EUS-FNA of left adrenal lesions. **Clinical Picture:** During a 20-week period, data on consecutive patients who underwent EUS with or without EUS-FNA were prospectively captured. Patients with a left adrenal mass and who underwent EUS-FNA formed our study population. **Treatment:** EUS-FNA. **Outcome:** A total of 119 consecutive patients underwent diagnostic EUS +/- FNA, during which the left adrenal gland was routinely examined. Twelve of these patients underwent EUS as part of lung cancer staging and among these 12 lung cancer patients, 2 had left adrenal masses detected by computed tomography (CT). EUS detected left adrenal nodules in 2 other patients which were not visualised by CT. The overall prevalence of a left adrenal mass was 3.4%; in the subgroup with confirmed lung cancer, the prevalence was 33.3%. All 4 patients were male, with a mean age of 76.3 years (range, 67 to 87). The mean size of the left adrenal lesion was 30.4 mm (range, 9 to 84.8). EUS-FNA of the left adrenal lesions was performed under Doppler guidance. The mean number of needle passes was 2 (range, 1 to 4). A cellular aspirate was obtained in all patients. No procedural complications occurred. Metastatic non-small cell lung cancer was diagnosed in 2 patients, including a lesion missed on CT. For the other 2 cases, EUS-FNA revealed benign adrenal cells. **Conclusions:** EUS-FNA appears safe and useful for the evaluation of left adrenal masses.

Ann Acad Med Singapore 2007;36:954-7

Key words: Adrenal gland neoplasms, Endosonography

Introduction

The occurrence of an adrenal mass in patients with an underlying malignancy may represent distant metastases, precluding curative surgical resection of the primary malignancy. On the other hand, it may simply represent a benign adrenal adenoma with no prognostic implications. In a cohort of lung cancer patients, an isolated adrenal mass was found in 10% of cases, but only 32% of these cases were due to metastases, with the remaining 68% being benign adenomas.¹ Imaging characteristics alone are unreliable for distinguishing between benign and malignant adrenal lesions. A comparison of morphologic assessment of adrenal glands using computed tomography (CT) and magnetic resonance imaging (MRI) against CT-guided tissue sampling showed that diagnostic certainty of metastases could not be obtained in 78% of cases with

imaging alone.² These observations underscore the importance of histological diagnoses in such cases.

To obtain histological diagnosis, ultrasound or CT-guided percutaneous fine-needle aspiration (FNA) is usually performed.³ However, this may be associated with an overall complication rate of 5.3%, due to the need to traverse intervening structures such as the pleura and pancreas.⁴ In addition, an inadequate or unsatisfactory sampling rate of 4% to 37% has been reported.^{5,6}

Endoscopic ultrasound (EUS) is a relatively new imaging modality that allows both detailed imaging as well as FNA of the left adrenal gland. It may even detect small lesions not visible on transabdominal imaging, because of the proximity of the ultrasound transducer to the adrenal gland. EUS has been shown to be superior to transabdominal ultrasound (US) in visualising the left adrenal gland, with

¹ Division of Gastroenterology, Changi General Hospital, Singapore

² Division of Respiratory Medicine, Changi General Hospital, Singapore

³ Laboratory Medicine Service, Changi General Hospital, Singapore

Address for Correspondence: Dr Ang Tiing Leong, Division of Gastroenterology, Changi General Hospital, 2 Simei St 3, Singapore 529889.

Email: tiing_leong_ang@cgh.com.sg

a detection rate of 98% as compared to 69% for US.⁷ There are limited published data on the use of EUS-FNA to determine the nature of left adrenal lesions.⁸⁻¹¹ Furthermore, it is quite clear that in the local Singapore medical community, there is limited awareness of this novel method of obtaining tissues from left adrenal lesions,³ probably due to that fact that the limited publications on this topic have been in subspecialty journals. Hence, we aimed to describe our experience in performing EUS-FNA to determine the nature of left adrenal lesions in order to increase awareness of this novel technique.

Materials and Methods

During a 20-week period from 9 January to 9 June 2006, data on consecutive patients who underwent EUS with or without EUS-FNA at the Division of Gastroenterology, Changi General Hospital were prospectively captured. Patients with a left adrenal mass and who underwent EUS-FNA formed our study population.

Diagnostic EUS was performed with a linear-array echoendoscope (GF-UC160P, Olympus, Tokyo, Japan) using the Aloka SSD 5000 ultrasound processor (Aloka Co Ltd, Tokyo, Japan) by 2 gastroenterologists experienced in performing EUS (TLA, TSC). Intravenous midazolam and fentanyl were used for conscious sedation. When a left adrenal lesion was visualised, its size, shape and echogenicity were recorded. EUS-FNA was performed using a 22-gauge needle (Echo-1-22, Cook Endoscopy, Winston-Salem, NC, USA) under Doppler guidance. On-site cytopathologic assessment was available to guide the FNA. The aspirate was smeared onto slides, air-dried and stained with Diff-Quik (American Scientific Products, McGraw Park, Ill) and reviewed by a cytotechnologist. Additional slides were fixed in 95% ethanol for formal histopathological review by the cytopathologist.

Statistical analysis of the patients' data and clinical parameters were expressed as mean values, ranges and proportions. Informed written consent was obtained from all patients prior to all procedures.

Results

During a 20-week period from 9 January to 9 June 2006, 119 consecutive patients underwent diagnostic EUS +/- FNA, during which the left adrenal gland was routinely examined. Twelve of these patients underwent EUS as part of lung cancer staging. Among these 12 patients, 2 had left adrenal masses detected by helical abdominal CT. In addition, EUS detected left adrenal nodules in 2 other patients which were not visualised by CT. Hence the overall prevalence of a left adrenal mass was 3.4% (4/119), while in the subgroup with confirmed lung cancer, the prevalence was 33.3% (4/12). All 4 patients were male, with a mean age of 76.3 years (range, 67 to 87) (Table 1).

Table 1. Clinical Features

Patient	Age (y)	Diagnosis	Adrenal mass on CT	EUS morphology
1	79	NSCLC	Present	84.4-mm heterogeneous mass with distortion of adrenal morphology
2	67	NSCLC	Absent	16.6-mm hypoechoic round mass in body of adrenal gland
3	87	NSCLC	Absent	9-mm hypoechoic nodule in lateral limb of adrenal gland
4	72	NSCLC	Present	11-mm hypoechoic nodule in lateral limb of adrenal gland

CT: computed tomography; EUS: endoscopic ultrasound; NSCLC: non-small cell lung cancer

The mean size of the left adrenal lesion was 30.4 mm (range, 9 to 84.8). Two lesions were located in the lateral limbs of the adrenal gland as hypoechoic round nodules, 1 lesion was located in the body of the adrenal gland as a hypoechoic round nodule (Fig. 1), and the largest lesion (84.8 mm) appeared heterogeneous and completely distorted the left adrenal morphology. The morphology of the left adrenal gland was elliptical in the 3 cases in which the anatomy was not distorted.

EUS-FNA of the left adrenal lesions (Fig. 2) was performed under Doppler guidance. The mean number of needle passes was 2 (range, 1 to 4). A cellular aspirate was obtained in all patients. No procedural complications occurred. Metastatic non-small cell lung cancer (NSCLC) (Fig. 3) was diagnosed in the patient with distorted left adrenal gland structure as well as the patient with the adrenal body mass which had been missed on CT. For the other 2 patients, EUS-FNA revealed benign adrenal cells.

Discussion

The presence of an adrenal mass may denote either a benign adenoma, which may or may not be hormonally active, or a malignancy which may be a primary adrenal adenocarcinoma or a metastasis. With the widespread use of cross-sectional imaging, more adrenal lesions are being detected. The limited studies on prevalence rate showed that at autopsies, the prevalence rate of these incidental lesions was 2.3%, while the results of CT studies showed a prevalence rate of 0.5% to 2%. Most of these lesions would be non-functional adenomas, with adrenal carcinoma being relatively rare and hyper-functioning lesions comprising only 1.7% of these cases.¹² In the presence of an underlying cancer, the likelihood that these adrenal lesions may be metastases increases,^{9,13} but up to two-thirds may

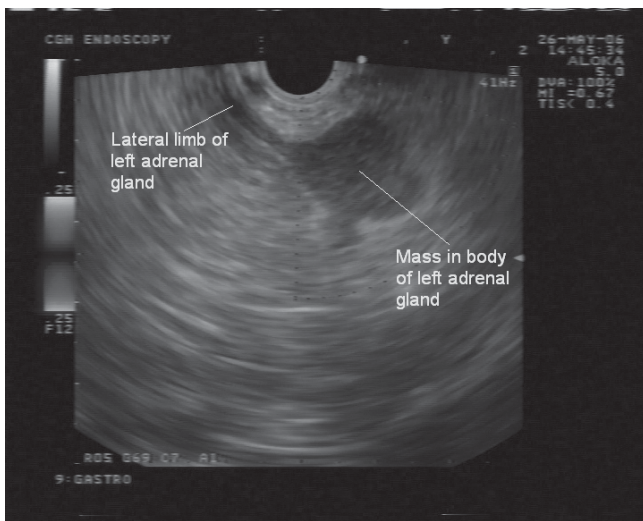


Fig. 1. Nodule in body of left adrenal gland seen on EUS.

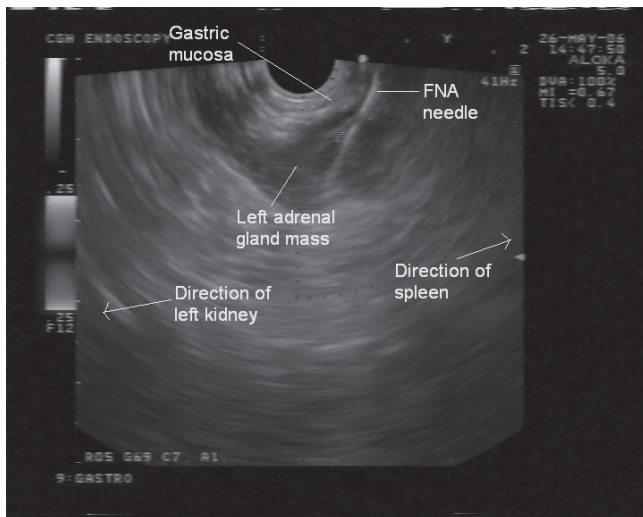


Fig. 2. EUS-FNA of left adrenal mass.

still be a benign adrenal adenoma.¹ In such circumstances, obtaining histological proof becomes important in terms of guiding treatment and prognosis, even though imaging characteristics may offer some clues, which unfortunately, are not specific enough.^{5,9,13}

The results of our study support the observations that EUS-FNA of the left adrenal gland is safe and provides a tissue diagnosis. In 2 of the patients, one of whose adrenal lesions were not detected on CT, adrenal metastases were confirmed, thus precluding curative surgery. Compared to the traditional percutaneous techniques of tissue acquisition, EUS-FNA provides several advantages. Importantly for EUS-FNA, a transgastric approach is used, which provides proximity to the left adrenal gland, so that organs that are usually traversed with a percutaneous approach, such as liver, pancreas, spleen and pleura, are avoided, significantly reducing the risk of complications. Furthermore, the needle

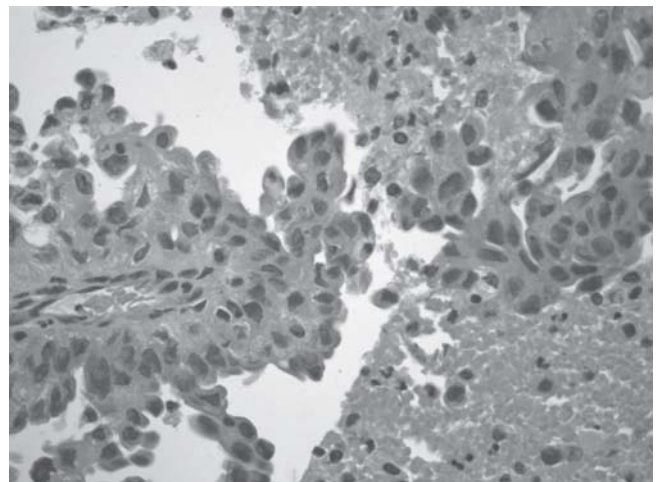


Fig. 3. Cell block from fine-needle aspirate, fixed in formalin and stained with haematoxylin and eosin. Fragments of tumour tissue are seen.

insertion is performed under real-time ultrasound, with Doppler guidance, avoiding intervening vascular structures and reducing the risk of bleeding. In addition, EUS-FNA can also be performed in the same setting as a staging EUS, unlike CT-guided FNA, in which a separate session is required after the initial staging CT. Importantly, EUS may detect lesions not seen on US and CT,^{7,14-17} and facilitate the diagnosis of occult metastases, thus avoiding unnecessary non-curative surgeries.

We acknowledge that a limitation of our results is the absence of surgical histopathological correlation. This would be impossible and unethical to achieve in the context of this study. Positive cytology is generally accepted as the basis for patient management; in particular, it is not possible that the results are false positives because the needle traverses the normal gastric wall into the lesion in the left adrenal gland. The 2 lesions with benign histology may have been false negatives, on account of sampling error. However, our results did show that adrenal tissue can be reliably obtained from EUS-FNA, since there was no acellular aspirate. In addition, there are data that suggest that when an adequate tissue sample has been obtained by CT-guided biopsy of the adrenal gland and shown to be benign, it can be regarded as a true negative, with no need to repeat the biopsy.¹⁸ This should be equally applicable in the context of EUS-FNA.

In this study, we addressed only the left adrenal gland lesions. It is well recognised that EUS imaging of the right adrenal gland is suboptimal on account of anatomical reasons,⁷ although at times EUS-FNA may still be feasible.¹⁰ On the other hand, the percutaneous FNA of the right adrenal gland is technically less difficult than the left side, and hence the role of EUS-FNA is less crucial in this setting.¹⁹

The decision to perform FNA of the left adrenal gland depends on its impact on subsequent management and should be individualised. Should there be a need for histological diagnosis, EUS-FNA offers a minimally invasive alternative to the traditional percutaneous techniques. It is probably safer and has an excellent diagnostic yield.

REFERENCES

1. Oliver TW Jr, Bernardino ME, Miller JI, Mansour K, Greene D, Davis WA. Isolated adrenal masses in non-small cell bronchogenic carcinoma. *Radiology* 1984;153:217-8.
2. Porte HL, Ernst OJ, Delebecq T, Metois D, Lemaitre LG, Wurtz AJ. Is computed tomography-guided biopsy still necessary for the diagnosis of adrenal masses in patients with respectable non-small-cell lung cancer? *Eur J Cardiothorac Surg* 1999;15:597-601.
3. Chong YL, Tan JK, Teo N. Clinics in diagnostic imaging (109). Nocardial adrenal abscess. *Singapore Med J* 2006;47:425-9.
4. Mody MK, Kazerooni EA, Korobkin M. Percutaneous CT-guided biopsy of adrenal masses: immediate and delayed complications. *J Comput Assist Tomogr* 1995;19:434-9.
5. Lumachi F, Borsato S, Tregnaghi A, Basso SM, Marchesi P, Ciarleglio F, et al. CT-scan, MRI and image-guided FNA cytology of incidental adrenal masses. *Eur J Surg Oncol* 2003;29:689-92.
6. Dusenbery D, Dekker A. Needle biopsy of the adrenal gland: retrospective review of 54 cases. *Diagn Cytopathol* 1996;14:126-34.
7. Dietrich CF, Wehrmann T, Hoffman C, Herrmann G, Caspary WF, Seifert H. Detection of the adrenal glands by endoscopic or transabdominal ultrasound. *Endoscopy* 1997;29:859-64.
8. Chang KJ, Erickson RA, Nguyen P. Endoscopic ultrasound (EUS) and EUS-guided fine-needle aspiration of the left adrenal gland. *Gastrointest Endosc* 1996;44:568-72.
9. Eloubeidi MA, Seewald S, Tamhane A, Brand B, Chen VK, Yasuda I, et al. EUS-guided FNA of the left adrenal gland in patients with thoracic or GI malignancies. *Gastrointest Endosc* 2004;59:627-33.
10. Jhala NC, Jhala D, Eloubeidi MA, Chhieng DC, Crowe DR, Roberson J, et al. Endoscopic ultrasound-guided fine-needle aspiration biopsy of the adrenal glands: analysis of 24 patients. *Cancer (Cancer Cytopathol)* 2004;102:308-14.
11. Stelow EB, Debol SM, Stanley MW, Mallery S, Lai R, Bardales RH. Sampling of the adrenal glands by endoscopic ultrasound-guided fine-needle aspiration. *Diagn Cytopathol* 2005;33:26-30.
12. Barzon L, Sonino N, Fallo F, Palu G, Boscaro M. Prevalence and natural history of adrenal incidentalomas. *Eur J Endocrinol* 2003;149:273-85.
13. Ang TL, Seewald S, Dy F, Mendoza G, S Omar, Seitz U, et al. EUS-FNA of the left adrenal gland – diagnostic yield and complications. *J Gastroenterol Hepatol* 2005;20:A139.
14. Wallace MB, Silvestri GA, Sahai AV, Hawes RH, Hoffman BJ, Durkalski V, et al. Endoscopic ultrasound-guided fine needle aspiration for staging patients with carcinoma of the lung. *Ann Thorac Surg* 2001;72:1861-7.
15. Fritscher-Ravens A, Davidson BL, Hauber HP, Bohuslavizki KH, Bobrowski C, Lund C, et al. Endoscopic ultrasound, positron emission tomography, and computerized tomography for lung cancer. *Am J Respir Crit Care Med* 2003;168:1293-7.
16. Prasad P, Schmulewitz N, Patel A, Varadarajulu S, Wildi SM, Roberts S, et al. Detection of occult liver metastases during EUS for staging of malignancies. *Gastrointest Endosc* 2004;59:49-53.
17. DeWitt J, Jowell P, Leblanc J, McHenry L, McGreevy K, Cramer H, et al. EUS-guided FNA of pancreatic metastases: a multicenter experience. *Gastrointest Endosc* 2005;61:689-96.
18. Harisinghani MG, Maher MM, Hahn PF, Gervais DA, Jhaveri K, Varghese J, et al. Predictive value of benign percutaneous adrenal biopsies in oncology patients. *Clin Radiol* 2002;57:898-901.
19. Welch TJ, Sheedy PF 2nd, Stephens DH, Johnson CM, Swensen SJ. Percutaneous adrenal biopsy: review of a 10-year experience. *Radiology* 1994;193:341-4.