Original Article

Role of Endoscopic Ultrasonography and EndoscopicUltrasonography Guided Fine Needle Aspiration in the Evaluation of Mediastinal Lesions

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Abstract

Background and aim of study: Although computed tomographic (CT) scanning remains the mainstay of imaging the mediastinum but it has limited sensitivity and specificity for detecting nodal involvement. Endoscopic ultrasonography (EUS) is an advance endoscopic procedure has the capability to imaging the mediastinam through the esophagus for localization and staging of lung cancer, detection of mediastinal lymph nodes, and EUS guided fine needle aspiration (FNA) from mediastinal lesions.

The aim of this study is to evaluate the role of EUS and EUS guided fine needle aspiration (FNA) in the localization and histological confirmation of mediastinal lesion.

Patients and methods: A retrospective analysis was performed on 315 (208 men, 107 women) patients of mediastinal lesions. EUS examination was performed with a linear-array echoendoscope (FG34UX, Pentax/Hitachi) at the gastroenterology and hepatology teaching hospital-Baghdad by single endosonographer (R.A.Z). These patients were classified into (3) groups according to the indication of EUS examination. Group (1) (42%) included patients were referred for EUS guided FNA after detection of mediastinal lesions by CT scanning and chest radiograph. Group (2) (17%) included patients referred for EUS because of dysphagia and proved to had external compression on the esophagus during esophagogas

troscop. Group (3) (40%) included patients with mediastinal lesions were detected incidentally. EUS guided FNA was performed in 242/315 patients using a 22-gauge needle (Echo Tip, Wilson-Cooke Medical Inc., Winston-Salem, N.C.).

Results: EUS scanning of group (1) patients revealed mediastinal lymadenopathy in 117/135 patients and lung lesions adjacent to the esophagus in 18/135. EUS study of group (2) patients showed esophageal submucosal tumors in 42/54 patients and mediastinal lesions compressing the esophagus in 12/54 patients. Mediastinal lymphadenopathy was detected incidentally in group (3) patients during EUS evaluation for staging of other malignancies (pancreatic carcinoma in 86/126 and gastric carcinoma in 40/126 patients). EUS guided FNA was performed in 242/315

.Conclusion: EUS and EUS guided FNA can readily identify lymph nodes and masses in the posterior mediastinum and lungs. It is sensitive and accurate in the localization of mediastinal lesions.

Key Words:
Endoscopic ultrasonography, Endoscopic ultrasonography guided fine needle aspiration, mediastinal lesions, mediastinal lymadenopathy

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Introduction:

Endoscopic ultrasonography (EUS) is an advance endoscopic procedure. It is an ultrasound scanning under endoscopic guidance [1]. (EUS) has the capability to imaging the mediastinam, perigastric region, and retroperitoneal region through the gastrointestinal tract. One of the most important indication of EUS is visualization of mediastiunm through the esophagus for localization and staging of lung cancer, detection of mediastinal lymph nodes, and EUS guided fine needle aspiration (FNA) from mediastinal lesions[1,2]. Transesophageal endoscopic ultrasound is novel technique for diagnosis and staging of lung cancer and mediastinal lymphadenopathy[11]. Regarding the intrapulmonary tumors, EUS can localize the lesions located adjacent or near the esophagus. Once the primary tumor identified, EUS guided fine needle aspiration (FNA) of the lesion is possible [1, 2]. Regarding the mediastinal lymphadenopathy, EUS can localize the lymph nodes lie adjacent to the esophagus or centrally located vessels. These lymph nodes regions (according to the American Thoracic Society schema for mapping mediastinal lymphadenopathy by anatomic location as seen with EUS) are: left paratracheal (station 4), aortopulmonary window (station 5), paraaortic (station 6), subcarinally (station 7), lower esophageal region (station 8), and pulmonary ligmentum (station 9)[19]. Comparing with other techniques, EUS is the most sensitive and accurate diagnostic modality for localization and staging of mediastinal tumors. Although CT scanning is the method of choice for evaluating the mediastinum, but it is not reliable for determination of whether lymph nodes are reactive or metastatic, in addition EUS accuracy for diagnosis and staging of lung cancer is superior to that of CT scanning (90% vs. 71%)[14,17]. EUS detected mediastinal lymph nodes in 30% of patients without mediastinal adenopathy by CT scanning[17].

Regarding the mediastinoscopy and thoracoscopy, these procedures are expensive, require GA, and can not reach the posterior mediastinum, while EUS and EUS guided FNA are safe, less invasive, an out patient procedure, and accurate means of screening patients with lung cancer and histological confirmation[8,9]. EUS guided FNA allowed 60% of surgical procedures to be avoided by demonstrating lymph nodes metastasis in patients with lung cancer and saving of more than $ 11,000 if mediastinoscopy is avoided[9,10]

Patients and methods:

A retrospective analysis (from March 2002 to April 2008) was performed on 315 patients (208 men, 107 women; mean age 52 years, range 28-76 years) of mediastinal lesions. EUS examination was performed with a linear-array echoendoscope (FG34UX, Pentax/Hitachi) at the gastroenterology and hepatology teaching hospital-Baghdad by single endosonographer (R.A.Z).

EUS Examinations: EUS was performed with the patient under conscious sedation by using variable combinations of pehtidin and midazolam. These patients were classified into (3) groups according to the indication of EUS examination. Group (1) [135/315(42%)] included patients were referred for EUS guided FNA after detection of mediastinal lesions by CT scanning and chest radiograph. Group(2) [54/315(17%)] included patients referred for EUS because of dysphagia and proved to had external compression on the esophagus during esophagogastroscop. Group (3) [126/315(40%)] included patients with mediastinal lesions were detected incidentally. After performing an upper endoscopy to evaluate the anatomy of the esophagus, we start the EUS examination with the echoendoscope. The scope is advanced into the stomach and slowly withdrawn until the celiac axis is identified. The area is examined for the presence of celiac lymphadenopathy. The probe is then slowly withdrawn to the gastroesophageal junction and then cephalad at 1 cm intervals, keeping the aorta as landmark. The mediastinal lymph nodes were considered suspicious if at least two of 3 morphologic lymph-node criteri

The area is examined for the presence of celiac lymphadenopathy. The probe is then slowly withdrawn to the gastroesophageal junction and then cephalad at 1 cm intervals, keeping the aorta as landmark. The mediastinal lymph nodes were considered suspicious if at least two of 3 morphologic lymph-node criteri
a were encountered: (1) round shape, (2) hypoechoic, and (3) sharp margins, and when the lymph nodes were 10 mm or more in diameter.

EUS guided FNA: EUS guided FNA was performed in 242/315 patients using a 22-gauge needle (Echo Tip, Wilson-Cooke Medical Inc., Winston-Salem, N.C.). Fine needle aspiration procedures were performed in the lymph nodes situated in the most accessible regions (subcarinal space, paraesophageal, aortopulmonary window) and in the mediastinal lesions adjacent to the esophagus. The needle was advanced into the mass under ultrasound guidance. Color Doppler US was used to avoid intervening vascular structures. The tissue samples in most cases were obtained by using suction generated with a 10-mL syringe as the needle was moved to and fro within the mass. The specimen was then smeared onto slides both air-dried and fixed specimens.

All the specimens were red by single pathologist at the gastroenterology and hepatology teaching hospital.
hepatology teaching hospital.

Results:

EUS scanning of group (1) patients revealed mediastinal lymadenopathy in 117/135 patients and lung lesions adjacent to the esophagus in 18/135 (Table 2). EUS guided FNA was difficult in 2 cases with lung lesions because intervening descending aorta between the echoendoscope and the lesions. Tables (3) and (4) demonstrate the histopathological results of EUS guided FNA in these patients. EUS study of group (2) patients showed esophageal submucosal tumors in 42/54 patients and mediastinal lesions compressing the esophagus in 12/54 patients without endosonographic evidence of invasion of esophageal wall by these extramural lesions (Tables 5 and 6). Mediastinal lymphadenopathy was detected incidentally in group (3) patients during EUS evaluation and staging of other malignancies (pancreatic carcinoma in 86/126 and gastric carcinoma in 40/126 patients) (Tables 7 and 8). EUS guided FNA was performed in 242/315 (133 patients from group (1), 12 patients from group (2) that had extramural lesions (compressing
the esophagus from outside), and 97 from group (3) that had endosonographic features of malignant lymph nodes.

Table (1) Character of patients

Number of patients	315
Male	208
Female	107
Mean age (range)	52 years (28 -76)

Table (2): EUS findings in group (1) patients

No. of patients (%)	EUS findings
41	Multiple lymph nodes involving subcarinal space
22	Multiple lymph nodes involving aorto-pulmonary window (A-P window)
33	Multiple lymph nodes involving both subcarinal space and (A-P window)
9	Multiple lymph nodes involving paraesophageal area
7	Multiple lymph nodes involving paraaortic area
5	Multiple lymph nodes involving pulmonary ligmentum
8	Pulmonary mass involving left upper lobe
6	Pulmonary mass involving right upper lobe
4	Centrally located left side tumor

Table (3): Histopathological results of EUS- guided FNA from mediastinal lymph nodes in group (1) patients

No. of patients (%)	Histopathological results of EUS- guided FNA
52	Non Hodgkin lymphoma
20	Metastatic adenocarcinoma
14	Metastatic sequmous cell carcinoma
31	Non conclusive

Table (4): Histopathological results of EUS- guided FNA from mediastinal lesions in group (1) patients

No. of patients (%)	Histopathological results of EUS- guided FNA
9	Sequmous cell carcinoma
4	Large cell carcinoma
2	Small cell carcinoma
1	Non conclusive

Table (5): EUS findings in group (2) patients

No. of patients (%)	EUS Findings
39	Hypoechoic lesion arising from muscle layer of esophageal wall
3	Hyperechoic lesion arising from submucosal layer of esophageal wall
8	Mediastinal mass arising from thyroid glands
2	Mediastinal mass invading pulmonary artery
1	Mediastinal mass invading left atrium
1	Mediastinal mass arising from cervical spine

Table (6): Histopathological results of EUS- guided FNA from mediastinal lesions in group (2) patients

No. of patients (%)	Histopathological results of EUS- guided FNA
8	Metastatic adenocarcinoma
4	Non conclusive

Table (7): EUS findings in group (3) patients

No. of patients (%)	Mediastinal lymph nodes
36	Multiple lymph nodes involving subcarinal space
23	Multiple lymph nodes involving aorto-pulmonary window(A-P window)
57	Multiple lymph nodes involving both subcarinal space and(A-P window)
10	Multiple lymph nodes involving paraesophageal area

Table (8): Histopathological results of EUS- guided FNA from mediastinal lymph nodes in group (3) patients

No. of patients (%)	Histopathological results of EUS- guided FNA
78	Metastatic adenocarcinoma
15	Non Hodgkin lymphoma
4	Non conclusive

Discussion:

EUS with fine needle aspiration offer unique ability to assess and biopsy of posterior mediastinal lesions. This study focuses in the EUS diagnosis of posterior mediastinal masses, lymph nodes, and lung cancer. At the same time it is evaluate the role of EUS guide FNA from mediastinal lesions. Mediastinal masses may be detected by CT scanning, by chest radiograph, or by the presence of extrinsic compression of the esophagus detected during gastroscopy. Its causes reflect both benign processes (e.g., tuberculosis) and malignant processes (e.g., metastatic cancer, lymphoma)[11]. In addition, mediastinal adenopathy maybe suspected in patients with lung or esophageal cancer despite prior negative imaging[13]. Mediastinal lymph nodes are commonly encountered during the EUS for non thorasic indications. The most common features of these benign nodes are triangular or crescent shape, with possibly an echogenic center, while that of malignant lymph nodes include round shape, short axis diameter >10mm, hypoechoic texture, and well demarcated borders[9]. In this study (86%) of posterior mediastinal lymph nodes had one or more of these echo features of malignancy. This percentage was lower in other studies[11,14] which may be due to selection of patients in our study. Numerous studies in recent years, reported predominantly in the gastrointestinal literature, have demonstrated the superiorityof EUS over CT scanning for the detection of mediastinal node involvement.[16,17]. In study[15] done by Julia K. in USA demonstrate that EUS played a significant role in identifying patients with unresectable non small lung cancer(NSLC) and appears to be more sensitive than CT scanning in detecting lymph node metastases. While sonographic criteria (large hypoechoic round nodes with discrete borders) may suggest malignancy, imaging alone cannot reliably differentiate benign reactive nodes from malignant ones. When FNA sampling is added, the sensitivity for detection of malignancy is 8191% with an overallaccuracyof9095%.[16,17] Ina significant proportionof patients EUS-FNA also provides the primary tissue diagnosis, especially when other methods have failed. To date, computed tomographic (CT) scanning remains the mainstay of imaging the mediastinum but it has limited sensitivity and specificity for detecting nodal involvement. Enlarged benign reactive nodes are frequently present in patients with a lung primary and, conversely, micrometastasis may exist in "normal" sized nodes.[18] Thus, the finding of nodes greater than 1 cm on CT scanning usually leads to mediastinoscopy or anterior mediastinotomy to obtain histological proof of involvement. These procedures are invasive, require general anaesthesia, and have a small (13%) complication rate. Mediastinoscopy alone may also provide limited access to the subcarinal space and posterior mediastinum. By contrast, in 1012% of patients with apparently negative preoperative CT scans, mediastinal nodal disease is discovered at operation.[19] In this study, subcarinal space and aorto-pulmonary are the most commonly affected regions by mediastinal lymph node. Regarding the histopathological results of mediastinal lymph nodes; non-Hodgkin lymphoma (45%) was the common findings in group (1) patients, while adenocarcinoma (80%) is the most common histopathological findings in group (3) patients and this due to secondary metastasis of mediastinal lymph nodes from the primary in the stomach and pancreas in the group (3). In patients with pancreatic cancer, the presence of malignant mediastinal lymphadenopathy would preclude definitive resection. A recent studies suggested routine evaluation for mediastinal lymph-node metastases in all patients being evaluated for pancreaticobiliary masses[19,20]. It is reported that 10%-15% of patients with pancreaticobiliary or gastric cancers have mediastinal lymph nodes metastasis[21]. In our practice, we routinely assess for mediastinal lymph-node metastases in all patients undergoing EUS for pancreaticobiliary and gastric cancers. In this study the yield of EUS-FNA from the mediastinal lymph nodes (84%) was equal to that from the mediastinal masses

(82%). Similar results were obtained from other studies[13].

In conclusion EUS can readily identify lymph nodes and masses in the posterior mediastinum and lungs. It is sensitive and accurate in the detection and evaluation (benign or malignant) of mediastinal lymph nodes. EUS guided FNA are safe procedure and less invasive than other surgical modalities like mediastinoscopy and thoracoscopy for sampling of mediastinal lesions.

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