THE ROLE OF EUS-FNA IN THE DIAGNOSIS OF GASTROINTESTINAL, PANCREATIC & MEDIASTINAL LESIONS

Thesis submitted in partial fulfillment of the requirements for the Master of Science Degree (M.Sc.) in Internal Medicine

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بسم الله الرحمن الرحيم

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Abstract

Title

THE ROLE OF EUS-FNA IN THE DIAGNOSIS OF GASTROINTESTINAL, PANCREATIC & MEDIASTINAL LESIONS.

Summary

Background
Endoscopic ultrasound (EUS)-guided fine needle aspiration biopsy (EUS-FNA) has extended the application of EUS. Through this procedure, cytopathological examination of abnormalities discovered on imaging studies can be made. EUS-FNA has become an important diagnostic tool as it permits sampling of lesions not amenable to percutaneous biopsy or which are too small to be identified by other imaging modalities.

EUS uses have been expanded to include the upper and lower gastrointestinal tracts, hepatobiliary and portal systems, and the anal sphincter, as well as the diagnosis and staging of esophageal, gastric, pancreaticobiliary and mediastinal lesions.

Objective
Assessment of the value of the EUS-FNA in the diagnosis of gastrointestinal, pancreatic & mediastinal lesions.

Methods

This prospective study will include a suitable number of patients referred for an endoscopic ultrasound-guided fine needle aspiration biopsy (EUS-FNA) from the gastrointestinal wall, the pancreas and the mediastinum.

All patients will be subjected to;

- Complete medical history.
- Complete physical examination.
- Routine laboratory tests which usually include complete blood count (CBC), coagulation profile, liver and renal function tests, and tumor markers if needed.

- Abdominal ultrasound.
- Computed tomography (CT), or magnetic resonance imaging (MRI) of the chest, abdomen, and pelvis if possible.

All patients will be subjected to endoscopic ultrasound exam using a Pentax EG 3830-UT linear-array echoendoscope connected to a Hitachi EUS-7500 machine.

All patients will be under deep sedation with propofol and subjected to endoscopic ultrasound-guided fine needle aspiration biopsy (EUS-FNA) using a needle 19 or 22 gauge in diameter. Fine needle aspiration biopsy will be taken from different sites including;

- Gastrointestinal wall sites, comprised of the esophageal, gastric, duodenal and rectal wall lesions.
- Pancreatic solid and cystic lesions.
- Extraluminal, abdominal and mediastinal lymph nodes.
- Mediastinal lesions.

The fine needle aspiration biopsy (FNA) material will be spread over glass slides and fixed by alcohol (95% ethanol), and the rest of the material will be preserved in formalin. The material will then be examined by an expert cytopathologist.

Results

In our study we found the size of the lesion not to be a determining factor in the accuracy of the endoscopic ultrasound-guided fine needle aspiration diagnosis.

We found that the nature of the lesion and the system affected were factors that affect the accuracy of diagnosis of this modality.

Keywords
EUS-FNA, esophageal, gastric, pancreaticobiliary, mediastinal

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Rationale and Aim of work

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Endoscopic ultrasound (EUS) combines 2 modalities: endoscopic visualization and high-frequency ultrasound (US). The ability to image the wall of the gastrointestinal tract as a series of definable layers corresponding to histology, rather than as a single entity, is the basis for most indications for EUS. The addition of endoluminal US offers a unique advantage over traditional endoscopy, allowing precise differentiation of the individual layers of the GI tract, and direct imaging of the surrounding organs and tissue. **(ASGE, 2007)**

Endoscopic ultrasound (EUS) was introduced in the early 1980s. Echoendoscopes were initially developed to improve sonographic imaging of the pancreas.
When linear echoendoscopes were introduced in the early 1990s, it generated ultrasonic images parallel to the shaft of the instrument over the exit port of the biopsy channel. With this modification, objects exiting the biopsy channel of the endoscope (e.g., a needle) could be followed and guided into lesions in "real-time". Very soon after the introduction of linear echoendoscopes, in 1991, the first report of EUS-FNA of the pancreas appeared and, shortly thereafter, of EUS-FNA of a pancreatic cancer. **(Erickson, 2000)**

Endoscopic ultrasound (EUS)-guided fine needle aspiration biopsy (EUS-FNA) has extended the application of EUS. Through this procedure, cytopathological examination of abnormalities discovered on imaging studies can be made. EUS-FNA has become an important diagnostic tool as it permits sampling of lesions not amenable to percutaneous biopsy or which are too small to be identified by other imaging modalities. **(Gress, & Savides, 2009)**

EUS uses have been expanded to include the upper and lower gastrointestinal tracts, hepatobiliary and portal systems, and the anal sphincter, as well as the diagnosis and staging of esophageal, gastric,pancreaticobiliary and mediastinal lesions. **(Ingram et al., 2004)**

EUS has become firmly established as an adjunctive endoscopic imaging study for patients with previously identified lesions of the GI tract and surrounding organs. **(ASGE, 2007)**

Aim of work

Assessment of the value of the EUS-FNA in the diagnosis of gastrointestinal, pancreatic & mediastinal lesions.

Review of literature

1. Introduction

1.1 History

Endoscopic ultrasound (EUS) was introduced in the early 1980s, with the prototype mechanical sector scanning instruments displaying only 180-degree images. With the introduction of the Olympus GF-UM3 (Figure 1.1), the first marketable echoendoscope, 360-degree imaging was now possible. Echoendoscopes were initially developed to improve sonographic imaging of the pancreas. EUS uses have been expanded to include the upper and lower gastrointestinal tracts, hepatobiliary and portal systems, and the anal sphincter, as well as the diagnosis and staging of esophageal, gastric, and pancreaticobiliary tumors. **(Ingram et al., 2004)**

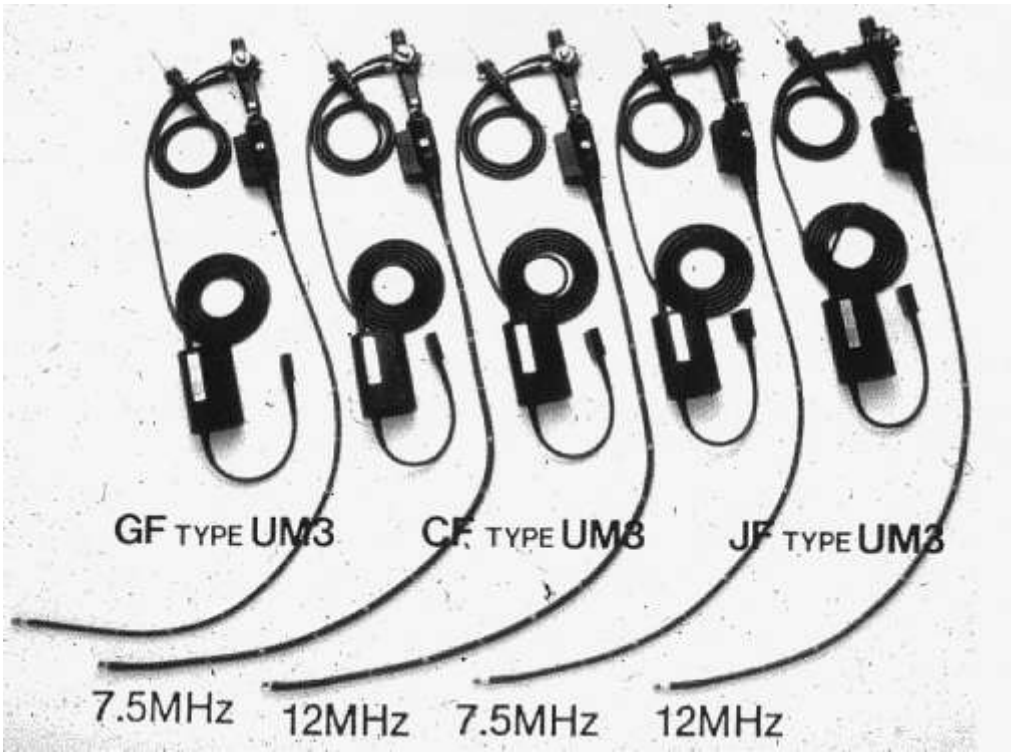

Fig. 1.1 Series of the first marketable sonoendoscopes for endoscopic ultrasonography of gastrointestinal (GI) tracts. Left to right: GF-UM3 for upper GI, CF-UM3 for colon, and JF-UM3 for pancreas and biliary systems, manufactured by Olympus Co. Ltd. (Tokyo, Japan). **(Fukuda et al., 2000)**

The ultrasound component of early echoendoscopes consisted of a transducer coupled to a rotating acoustic mirror at the distal tip of the insertion tube. The mirror was turned by means of an electric motor within a motor housing situated between a standard design control section and the insertion tube; thus the designation, "mechanical, sector-scanning echoendoscope". **(Gress, F. & Savides, T., 2009)** (Figure 1.2)

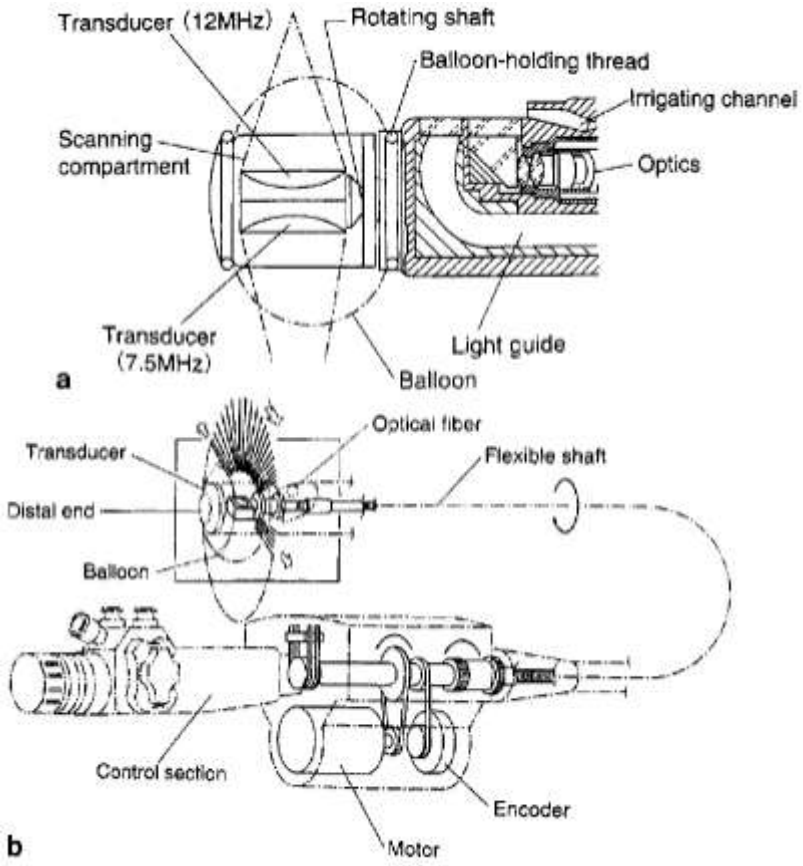

Fig. 1.2 Schematic drawing of Olympus GF-UM3 sonoendoscope. A disk transducer (dual disc) in the scanning chamber is rotated by the motor unit housed in the proximal end of the scope via the flexible shaft in the scope. a. Schematic drawing of the scope. b. Drawing of the scan head. **(Fukuda et al., 2000)**

When linear echoendoscopes were introduced, this introduction generated ultrasonic images parallel to the shaft of the instrument over the exit port of the biopsy channel. With this modification, objects exiting the biopsy channel of the endoscope (e.g., a

needle) could be followed and guided into lesions in "real-time. Very soon after the introduction of linear echoendoscopes, the first report of EUS-FNA of the pancreas appeared (Vilmann, P., et al., 1991) and, shortly thereafter, of EUS-FNA of a pancreatic cancer (Vilmann, P., et al., 1992). **(Erickson, 2000)**

1.2 Equipment

There are essentially two forms of echoendoscope, denoted as radial or linear, based upon the arrangement of the piezoelectric crystals that generate the EUS image.
The curvilinear echoendoscope permits continuous visualization of the needle as it is advanced beyond the biopsy channel. Most instruments are equipped with an elevator that facilitates targeting of biopsy sites.

The scanning frequency used in EUS is usually between 5 and 20 MHz. In general, higher frequency is associated with higher resolution but shorter scanning depth, that is, lesions close to the echoendoscope can be seen in more detail, whereas lower frequency is associated with lower resolution but longer scanning depth, that is, lesions further away from the echoendoscope can be seen, but with less detail.

As the ultrasound waves cannot be transmitted through air, which is present throughout the gastrointestinal tract, a balloon is used to cover the tip of the echoendoscope. This can be filled with water to provide coupling with the gastrointestinal wall to allow ultrasound waves to pass.

The various layers of the gastrointestinal wall are seen as five echogenic layers (Figure 1.3). The same echogenic layers are seen throughout the gastrointestinal tract. **(Caddy, G., et al., 2007)**