Experiences in Endoscopic Ultrasonography at a Tertiary Center General Surgery Endoscopy Unit

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Abstract

Aim: Endoscopic ultrasonography (EUS) is used for diagnosing pathologies in the gastrointestinal system and surrounding organs. This study aims to share the experiences and results of EUS and biopsy at a tertiary center general surgery endoscopy unit, in the context of the literature.

Methods: Patients who underwent EUS imaging at the general surgery endoscopy unit between January 2021 and January 2022 were retrospectively reviewed. Demographic characteristics, EUS biopsy indications, clinical pre-diagnoses, preoperative imaging methods, biopsy counts, and results, as well as complications, were analyzed.

Results: The mean age of the 292 patients was 56.5±15.5 years, with 157 (53.8%) being male. The most common EUS indication was a mass in the pancreas, accounting for 181 (62%). Endoscopic fine-needle aspiration biopsy was performed on 127 (43.4%) patients, and the mean diameter of biopsied masses was 35.1±27.7 mm. Malignancy was detected in 74 (58.2%) of the biopsied patients. Based on biopsy and lesion characteristics, 49.3% of patients were followed up, 80 (27.4%) underwent surgery, 45 (15.4%) received oncological treatment, and 23 (7.9%) were given endoscopic retrograde cholangiopancreatography.

Conclusion: The role of EUS in the diagnosis and treatment of gastrointestinal malignancies, pancreatic diseases, and biliary diseases continues to evolve. We believe that EUS plays a key role in the multidisciplinary management of complex surgical and oncology patients and those with pancreatobiliary disorders.

Keywords: *Endoscopic ultrasonography, fine needle aspiration biopsy, pancreatic tumor, gastrointestinal mass, biliary obstruction*

1. Introduction

Endoscopic ultrasonography (EUS) provides high-resolution, simultaneous imaging of the gastrointestinal system and surrounding extramural structures. It is an effective, efficient, and cost-effective method for evaluating a wide range of benign and malignant gastrointestinal diseases. In recent years, EUS has played an increasingly important role as an adjunct or alternative to traditional surgical treatments.

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EUS initially served as a diagnostic tool in the 1980s, but it has gradually transitioned into a therapeutic modality. The evolution of therapeutic procedures guided by EUS has progressed steadily due to reported high technical and clinical success rates. Treatment methods applied with EUS include gastrojejunostomy creation, gallbladder drainage (GBD), angiotherapy, drainage of postoperative fluid collections, portal vein (PV) sampling, and liver biopsy[1,2]. EUS has been reported in the literature to have significantly changed the management of nearly half of the patients with various diseases. However, making an accurate diagnosis using only traditional B-mode EUS imaging can often be challenging. Tissue biopsy guided by EUS is usually required. Vilmann et al. reported the first case of EUS-guided fine-needle aspiration cytology/biopsy (EUS-FNA) in 1992; EUS and EUS-FNA have become indispensable examinations in the clinical field as their applications have expanded[3]. Today, the accuracy of biopsy under EUS guidance is quite high, with sensitivities ranging from 80% to 85% and specificities approaching 100%[4,6].

Various indications exist for EUS procedures. However, some contraindications apply to therapeutic EUS-guided procedures, including hemodynamic instability, inability to visualize the target access

region or find a window due to intervening vessels, and severe, uncorrectable coagulopathy[7]. While several retrospective case series and meta-analyses worldwide have described EUS-guided drainage procedures and EUS outcomes, there is a lack of large-scale, high-volume center results from our country[3,7-11].
In this article, we aimed to share the EUS biopsy experiences and results of a tertiary advanced center general surgery endoscopy unit in the context of the literature.

2. Materials and methods

Following the approval from the local ethics committee (CREB/2022.01.29), patients who underwent EUS (Endoscopic Ultrasound) for various indications in the general surgery endoscopy unit between January 2021 and January 2022 were included in the study. Approximately 300 EUS imagings have been performed per year in this high-volume endoscopy unit. Patients under 18 years of age and those with incomplete clinical data were excluded. Data were retrospectively analyzed from the dataset created using hospital information systems, nurse observation forms, and pathology results. Patients' demographic characteristics, EUS and biopsy indications, clinical pre-diagnoses, pre-procedural imaging methods, number of biopsies, and results, as well as complication status, were analyzed.
All procedures were performed by the same endoscopist (HB). Technical success of EUS-FNA (Endoscopic Ultrasound-Guided Fine Needle Aspiration) was defined as the presence of visible tissue after biopsy. Clinical success was defined as the presence of a sufficient sample for histological or cytological diagnosis.

2.1. Technique

The procedure was conducted in a fasted state, with patients receiving instructions to abstain from oral ingestion of food starting from midnight on the night preceding the procedure. Sedation was administered to patients with midazolam or a combination of midazolam-propofol-fentanyl prior to EUS, and the EUS procedure was performed in the left lateral position. A Fujinon EG-530UT linear echoendoscope was used for the procedure. The EUS evaluation with the Fujinon EG-530UT linear echoendoscope involved examining all areas of the pancreas by withdrawing the scope from the duodenum to the gastric corpus. A linear EUS (Fujinon EG-53UT) device was employed for the aspiration biopsy procedure. Platelet count, activated partial thromboplastin time, and prothrombin time were measured in patients before the procedure. Patients were questioned regarding coagulopathy, anticoagulant, and/or antiplatelet use. Vascular structures were identified using color Doppler ultrasonography prior to the procedure. Fine-needle aspiration was performed using 22 or 25 gauge needles with either "slow pull" or syringe suction, at the discretion of the endoscopist. After the procedure, patients were observed for 2-3 hours in the Endoscopy Unit and discharged if no signs of complications were observed.

2.2. Statistical analysis

IBM SPSS Statistics for Windows, version 24 (IBM Corp., Armonk, N.Y., USA) software package was used for the statistical analysis of the data. Categorical measurements were summarized as numbers and percentages, while continuous measurements were presented as means and standard deviations (medians and minimum-maximum values, where necessary).

3. Results

Our study included 292 patients, 157 (53.8%) of whom were male with an average age of 56.5±15.5. The most commonly applied preoperative imaging method was computed tomography (CT), accounting for 107 (36.7%). Demographic and clinical data are shown in Table 1.

Examining the application indications, the most common causes were pancreatic mass 181 (62%), gastric mass 31 (10.6%), and biliary obstruction 23 (7.9%). Indications are shown in Table 2. The average diameter of the detected lesions was 35.1±27.7 mm, and biopsy was performed on 127 patients. No procedural complications were detected in any of the patients. Biopsy results indicated malignancy in 74 (58.2%) cases, and nondiagnostic results were observed in 5 (4%) patients.

Table 1
Demographic and Clinical Data

Variables	n:292
Age mean+std (min-max)	56.5 + 15.5 (19-98)
Gender	
Female	135 (46.2%)
Male	157 (53.8%)
Pre-procedural imaging method	
CT	107 (36.7%)
CT and MRI	91 (31.2%)
MRI	46 (15.8%)
Gastroscopy	25 (8.5%)
CT and PET	12 (4.1%)
CT, MRI, and PET	11 (3.7%)

CT: Computed Tomography, MRI: Magnetic Resonance Imaging, PET: Positron Emission Tomography

Table 2
Indication

Indication	n:292
Pancreatic mass	181 (62%)
Gastric mass	31 (10.6%)
Biliary obstruction	23 (7.9%)
Esophageal mass	18 (6.1%)
Duodenal mass	14 (4.8%)
Common bile duct mass	12 (4.1%)
Intra-abdominal mass	5 (1.9%)
Mediastinal mass	3 (1%)
Adrenal mass	3 (1%)
Rectal mass	1 (0.3%)
Ascites	1 (0.3%)

Table 3
Procedures and outcomes

Variables	n:292
Lesion diameter (mm) mean+std (min-max)	35.1+27.7 (4-160)
Number of patients who underwent biopsy.	127 (43.4%)
Procedure-related complications	0
Biopsy result	
Malignancy	74 (58.2%)
Benign lesion	48 (37.8%)
Non-Diagnostic	5 (4%)
Decision	
Medical Follow-up	144 (49.3%)
Surgical Treatment	80 (27.4%)
Medical Oncology	45 (15.4%)
ERCP	23 (7.9%)

ERCP: Endoscopic Retrograde Cholangiopancreatography

Treatment determinations were established considering the biopsy and lesion characteristics, with 144 (49.3%) patients undergoing follow-up, 80 (27.4%) receiving surgical intervention,45 (15.4%) receiving medical oncology, and 23 (7.9%) undergoing endoscopic retrograde cholangiopancreatography (ERCP). The applied procedures and results are shown in Table 3.

The probability of pathological complete response for those with radiological complete response was 41% (PKD), and the probability of non-response not being a response in pathology was 90% (NKD) (Figure 1). When the evaluation was made according to the receptor status, it was possible to make an evaluation only in the USG group due to the number of samples. While there was no PTY in the Luminal A group, the results were statistically meaningless in the Luminal B group and the Triple group. In each 2+ group, the AUC value was 0.75 (p=0.008), the success of determining the complete response of the test was 51%, and the success of determining no response was 98% (Table 3).

4. Discussion

Endoscopic ultrasonography (EUS) was first performed by Jenssen C and colleagues in 1980 at the Wolfgang von Goethe University in Frankfurt, Germany, and the Mayo Clinic in Rochester, USA, using a rotating mechanical ultrasound scanner or an electronic linear ultrasound array with side-viewing gastroscopes (Olympus GF-B3; ACMI FX-5)[2,4]. The clinical use of these early echoendoscopes had limitations such as the length (80 mm) and diameter (13 mm) of their rigid tips. Due to this limited flexibility, endoscopists struggled to pass the pyloric canal, but they did not define any complications despite mechanical disadvantages. Today, 60% of gastroenterologists in the United States use EUS, and approximately 43% of gastroenterologists and visceral surgeons in four European countries have access to EUS[8].

In a study presenting EUS results of 732 patients in the literature, the average age was 51, and the female gender was dominant at 62%. In this study, with a success rate of 97.7%, EUS changed clinical management in 58.7% (430/732) of cases overall. Management plans were altered in 26.0% of choledocholithiasis cases, 91.2% of malignancy investigation cases, and 72.7% of other benign conditions such as pancreatic, hepatic, and biliary diseases[12]. In our series, the male gender was dominant, which was related to the disease population, and our average age was consistent with the literature. In our series, EUS changed management in many diseases, and particularly in all cases of choledocholithiasis, it constituted an indication for ERCP. It played a key role in making follow-up decisions for submucosal lesions and management of malignant pancreatic masses.

EUS (Endoscopic Ultrasound) presents multiple advantages over other imaging modalities. It does not involve radiation, as is the case with computed tomography (CT) or positron emission tomography (PET), and is not subject to contraindications related to magnetic resonance imaging (MRI), such as the presence of metal implants or claustrophobia. EUS provides high-resolution real-time imaging and can be combined with Doppler ultrasound to assess vascular structures and perform diagnostic procedures, angiotherapy, fine-needle aspiration biopsy, and core biopsy for tissue diagnosis. Furthermore, EUS permits therapeutic interventions[13]. In selecting patients for EUS procedures, we identified the use of several pre-procedural imaging methods. In our study, CT was the most frequently employed imaging method, which we associated with the use of EUS as a therapeutic and advanced diagnostic tool.

In the literature, the indications for the use of EUS in the upper gastrointestinal system have been examined under three main categories: esophageal and gastric malignancies, submucosal tumors, and pancreatobiliary diseases. Focusing on these indications sequentially, EUS can be used to identify benign tumors of the upper gastrointestinal system, including submucosal esophagogastric tumors. EUS-guided fine-needle aspiration and biopsy can aid in the cytohistological diagnosis of solid esophagogastric subepithelial lesions. EUS is routinely employed in the diagnosis and staging of malignant esophageal tumors[14].

EUS is more sensitive, specific, and accurate than high-quality cross-sectional imaging for the detection of pancreatic lesions. Numerous studies have demonstrated the high sensitivity (92-100%), specificity (89-100%), and accuracy (86-99%) of EUS in detecting pancreatic malignancies. In particular, it yields better results for small-sized lesions compared to cross-sectional imaging[15]. Biliary obstructions can result from a wide spectrum of diseases, ranging from benign to malignant causes. In our indications, pancreatic masses constituted the largest portion. We performed procedures to detect pancreatic masses, aspirate cysts, and obtain tissue diagnoses. In cases of biliary obstruction, we used EUS to detect choledocholithiasis prior to ERCP in suspicious cases and to rule out malignant causes. We also employed the procedure to identify the originating layer of upper gastrointestinal subepithelial lesions and for fine-needle aspiration biopsy.

Previous studies describing the diagnostic performance of EUS-FNA for pancreatic tumors have reported sensitivities of 54-95%, specificities of 71-100%, and overall accuracy rates of 65-96%[16]. In our series, biopsies were performed on 43% of the patients. Biopsy results indicated malignancy in 58% of cases, which we attributed to the high prevalence of pancreatic diseases in our patient population.

5. Conclusions

The role of EUS in the diagnosis and treatment of gastrointestinal malignancies, pancreatic diseases, and biliary diseases continues to evolve. Therapeutic EUS procedures for various pancreas and biliary tract indications can be performed with high technical and clinical success rates, along with low rates of adverse effects. We believe that EUS plays a pivotal role in the multidisciplinary management of

complex surgical and oncology patients and those with pancreatobiliary disorders.

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Statement of ethics

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and was approved by for this study the Başakşehir Çam ve Sakura Şehir Hastanesi Klinik Araştırmalar Etik Kurulu (CREB/2022.01.29).

Conflict of interest statement

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Author contributions

Collection of the data, draft: MU, SS, Writing of the article, performed the analysis, review of the literature: SY, EA, Critical review of the article, design of the study: HB,UT,EK
All authors read and approved the final manuscript.

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