Short Communication

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Endoscopic Ultrasound in Gastrointestinal Oncology: Expanding Diagnostic and Therapeutic Indications

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ABSTRACT

Endoscopic ultrasound (EUS) has transitioned from a purely diagnostic imaging technique to a comprehensive platform integrating staging, tissue acquisition, and therapeutic interventions. In gastrointestinal oncology, EUS provides high accuracy in the staging of esophageal and rectal cancers [1,2], enables tissue acquisition in pancreatic masses with fine-needle biopsy (FNB) as the current standard [3-6], and refines the characerization of pancreatic cystic neoplasms [7,8]. EUS-guided biliary drainage (EUS-BD) is now recommended over percutaneous drainage after failed ERCP in expert centers [9-11], while lumen-apposing metal stents (LAMS) have revolutionized the management of pancreatic fluid collections [12-15]. Emerging technologies such as contrast-enhanced EUS (CE-EUS), elastography, and artificial intelligence (AI) are expanding diagnostic confidence [16-18]. This short communication reviews current evidence and highlights the evolving role of EUS in gastrointestinal oncology.

Keywords: Endoscopic Ultrasound; FNB; Pancreatic Cancer; Biliary Drainage; Pancreatic Fluid Collections; CE-EUS; LAMS

Abbreviations: EUS: Endoscopic Ultrasound; FNB: Fine-Needle Biopsy; EUS-BD: EUS-Guided Biliary Drainage; LAMS: Lumen-Apposing Metal Stents; CE-EUS: Contrast-Enhanced EUS; AI: Artificial Intelligence; EUS-TA: EUS-Guided Tissue Acquisition; PNETs: Pancreatic NeuroEndocrine Tumors; CE-EUS: Contrast-Enhanced EUS; DPPS: Double-Pigtail Stents; NET: NeuroEndocrine Tumor; FNA: Fine-needle Aspiration

Introduction

Since its introduction, EUS has provided unmatched resolution for gastrointestinal wall layers and peri-digestive structures. It rapidly became essential for staging esophageal and rectal cancer [1,2], with accuracy superior to CT and MRI for early T and N staging. The development of EUS-guided tissue acquisition (EUS-TA) allowed cytological and histological confirmation, transforming EUS into a diagnostic and therapeutic hub. Modern guidelines by the ASGE (2024) [3] and ESGE (2025) [4] have refined its role, recommending FNB needles for solid pancreatic lesions and recognizing EUS-BD as an evidence-based intervention after failed ERCP [9] (Figure 1).

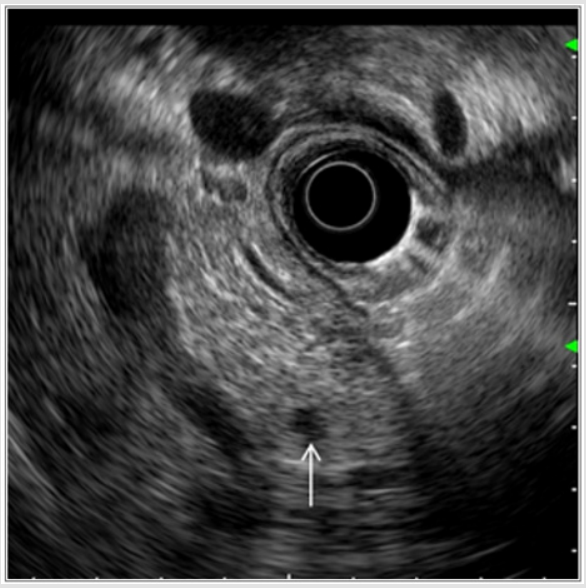


Figure 1: Endoscopic ultrasound (EUS) image showing a small neuroendocrine tumor (NET) of the pancreatic head, consistent with a gastrinoma (arrow).

Diagnostic Indications

EUS remains highly accurate in differentiating T1 from T2 esophageal cancer [1] and in guiding neoadjuvant therapy for rectal cancer [2]. For pancreatic adenocarcinoma, EUS detects small lesions often missed by CT, with pooled sensitivities around 95% and specificities >90% [3,4]. Meta-analyses confirm that FNB outperforms FNA in sample adequacy and diagnostic accuracy [5,6]. EUS-FNB also allows immunohistochemistry and Ki-67 index assessment in pancreatic neuroendocrine tumors (PNETs), achieving concordance >85% with surgical specimens [19]. For pancreatic cystic neoplasms, EUS identifies mural nodules, septa, and ductal communication [7,8]. Fluid aspiration for CEA and cytology, and increasingly molecular analysis, improves differentiation between mucinous and non-mucinous cysts [7,8]. Contrast-enhanced EUS (CE-EUS) and elastography further enhance lesion characterization [16], while AI-assisted CH-EUS systems are emerging [17,18] (Figure 2).

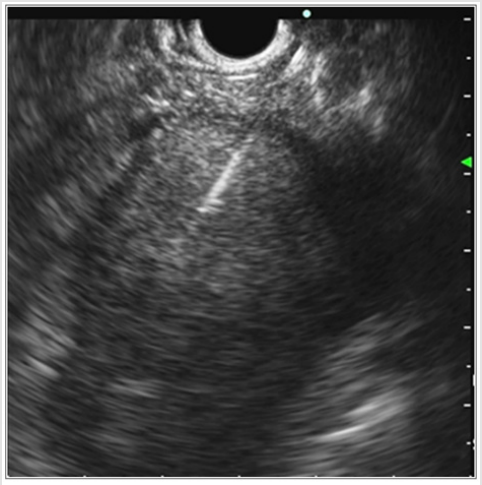
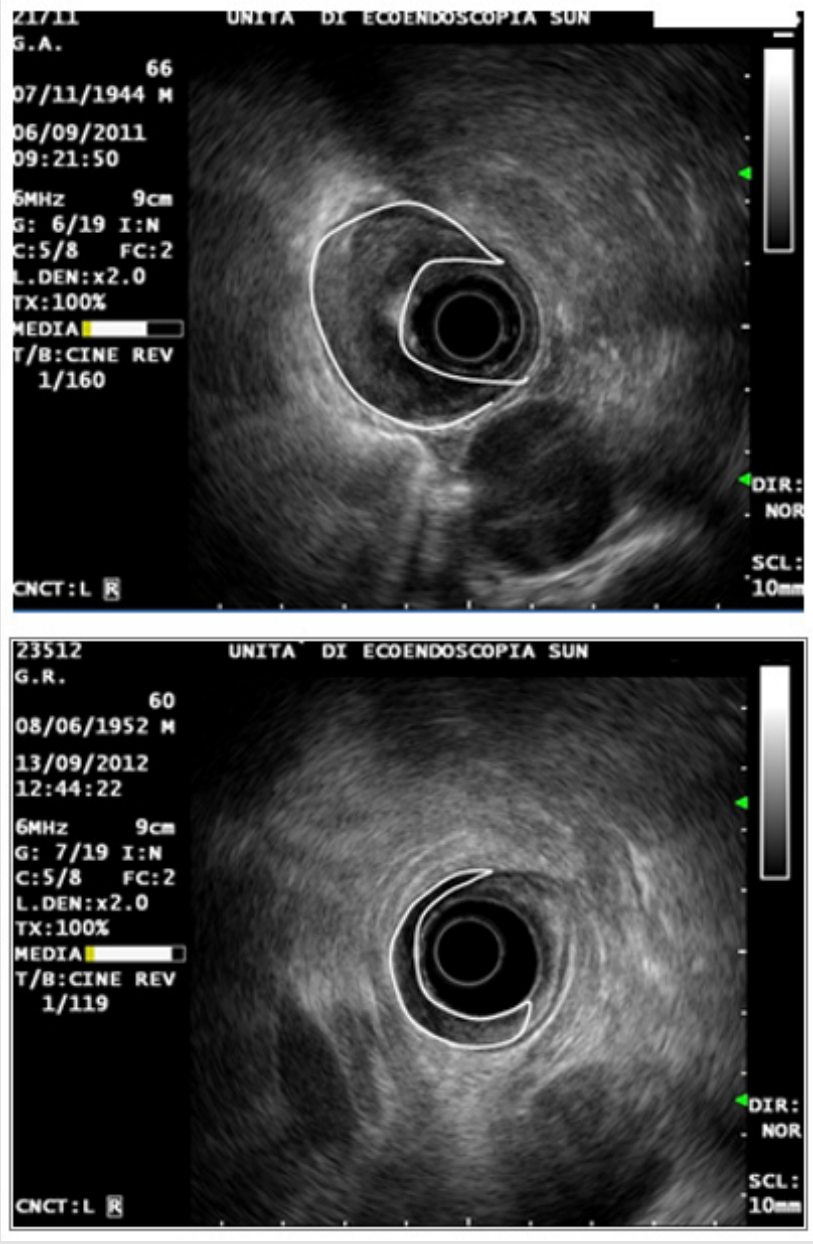


Figure 2: Fine-needle aspiration (FNA) of a solid pancreatic mass suspected to be a pancreatic neuroendocrine tumor (PNET).

Therapeutic Indications

EUS-guided biliary drainage (EUS-BD) is recommended over percutaneous drainage after failing ERCP by ESGE guidelines [9]. Meta-analyses confirm high technical (~97%) and clinical (~91%) success [10-12]. Comparative studies consolidate EUS-BD as the preferred rescue strategy [13,14]. For pancreatic fluid collections, EUS-guided drainage using LAMS is now standard, with success rates >90% [12,15]. Studies suggest that coaxial double-pigtail stents (DPPS) within LAMS may reduce bleeding and occlusion [13-15]. EUS-guided celiac plexus neurolysis provides effective pain relief in pancreatic cancer, while investigational approaches include brachytherapy, fiducial placement, and ablation techniques [20] (Figure 3).



Note: Adapted from Isenberg G, Gastrointest Endosc. 1998; 48:15-163.

Figure 3: Endoscopic ultrasound (EUS) image demonstrating restaging of esophageal carcinoma after neoadjuvant therapy. Tumor response is defined as a reduction >50% of the maximal cross-sectional area of the lesion (outlined).

Discussion

EUS has matured into a multipurpose platform: high-resolution imaging, reliable tissue acquisition, and therapeutic interventions. FNB-first strategies for pancreatic lesions improve diagnostic adequacy and facilitate advanced pathology [5,6,21]. CE-EUS and elastography enhance lesion targeting, while AI offers a glimpse of real-time decision support [16-18]. Therapeutically, EUS-BD has become an evidence-based alternative to percutaneous drainage [9-14], and LAMS have transformed outcomes for pancreatic fluid collections [12-15]. Challenges include operator dependence, procedure-related risks, and device availability outside expert centers. Nevertheless, EUS is increasingly indispensable in gastrointestinal oncology.

Conclusion

EUS is a cornerstone of modern gastrointestinal oncology. Its applications in cancer staging, tissue acquisition, and minimally invasive therapy are supported by strong evidence and international guidelines. Future perspectives include routine FNB, wider integration of CE-EUS and elastography, AI-assisted workflows, and expansion of therapeutic EUS in referral centers.

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