

The Early History of Interventional Endoscopic Ultrasound



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KEYWORDS

- Endoscopic ultrasound • Fine-needle aspiration • Gastrointestinal

KEY POINTS

- It has been a fascinating journey for endoscopic ultrasound (EUS) over the past approximately 30 years.
- Technological advances in the field of EUS have emerged, especially in the past decade, that have rapidly expanded the therapeutic potential of EUS, largely through the innovations of accessory technology that could not have happened without innovative changes to echoendoscopes.
- As interventional EUS continues to evolve, further expansion into previously uncharted areas will most certainly happen.

Endoscopic ultrasound (EUS) was developed by the Olympus Corporation in the late 1970s and 1980s in an attempt to improve ultrasound imaging of the pancreaticobiliary system. During this time period, prototypes were evaluated and studied primarily in Europe, in London, Munich, and Amsterdam. The initial EUS prototype was a 180° mechanical radial scanning instrument. There were just a few individuals performing EUS for most of the 1980s, including Lok Tio in Amsterdam at the Academic Medical Center, Thomas Rösch in Munich, and Charles Lightdale in New York. At that time, studies were performed largely to assess the potential role of EUS for evaluating gastrointestinal (GI) tract tumors and pancreaticobiliary disorders. These studies in the early days of EUS correlated EUS images with surgical resection specimens. It became clear toward the end of the 1980s that EUS was here to stay as it began to enter mainstream GI, with indications starting to appear for staging of GI tract tumors and pancreaticobiliary disorders.

By the early 1990s, there were 3 main centers in the United States performing EUS procedures: Charles Lightdale at Memorial Sloan Kettering Cancer Center, Michael Sivak at University Hospitals Case Medical Center, and Robert Hawes at the Indiana University (IU) Medical Center.

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On a personal note, I arrived at the IU Medical Center to be their first EUS fellow with my mentor, Robert Hawes, in July 1993. Little did I know that my advanced year of therapeutic endoscopy training would bring me into the early period of therapeutic or interventional EUS. I will continue to share my own personal experience as I go forward in this article accounting the early years of therapeutic EUS.

In the early 1990s, Pentax Medical, in cooperation with Hitachi, developed the first linear-array EUS system. My first introduction with the Pentax linear echoendoscope came in 1993 during my EUS training in my advanced fellowship at IU. The Pentax representative, Bob Enerson, would bring the system (including scope and processor) to us in return for evaluating its clinical utility. These were exciting times for me because I was just beginning to master radial endosonography and the opportunity to look at EUS imaging in the linear perspective was fascinating to me. Linear endosonography brought a whole new landscape to EUS and the detailed imaging and the ability to track a needle in real time across the image plane into a target lesion was phenomenal.

It was at this time that Pentax started to partner with Wilson-Cook Endoscopy to develop an EUS fine-needle aspiration (FNA) needle that could be placed through the accessory channel of the linear EUS scope. The year was 1993 and IU was approached by Wilson-Cook to use their needle prototypes in return for evaluating its clinical utility. This needle began as an adaption of the Howell-type aspiration needle fashioned to the tip of a long plastic catheter, which was capable of going through the linear scope. This first EUS FNA needle, although it had limitations, was able to obtain cytology from the lymph node. Several renditions using various needle gauges were tested. Based on this early work with the EUS FNA needle, Robert Hawes and Maurits Wiersema published the first EUS-guided FNA report performed in the United States and it was only a short time behind the first EUS FNA performed in the world, which was done by Peter Vilman in Denmark in 1992.¹⁻³

The advent of EUS-guided FNA forever changed the landscape of EUS, shaping this emerging new technology from a purely diagnostic procedure to one that could do much more. With the development of EUS FNA, many reports on its clinical utility for sampling suspicious GI lesions and adjacent organs, including the liver, bile ducts, and pancreas, flooded the GI literature for more than a decade. During the 1990s many studies were published on the clinical utility of EUS-guided FNA for diagnosing many different types of GI malignancies. Further studies in the new millennium solidified the role of EUS FNA as the first-line modality for diagnosing pancreatic cancer.

EUS-guided FNA has further evolved into EUS-guided tissue acquisition and is now the procedure of choice for sampling GI tract lesions, such as subepithelial lesions and other structures adjacent to the GI tract, including lymph nodes, the pancreas, and liver, to name a few.

It was in 1995, as a junior faculty member at the IU Medical Center, that I had the chance to look beyond EUS FNA and attempt some of the earliest interventional/therapeutic techniques. Several studies demonstrated for the first time in 1995 and 1996 the feasibility of performing a pancreatogram or cholangiogram under EUS guidance.^{4,5} This intrigued me, and during my time at IU, I worked with my colleagues there toward developing EUS-guided access techniques. This began initially as an attempt to access the pancreatic duct in a patient status post-Whipple having a failed endoscopic retrograde cholangiopancreatography (ERCP).⁶ Although our first attempt at a “rendezvous procedure” failed due to the lack of the necessary tools to be successful at this, it demonstrated that we were now able to access the pancreatic duct and obtain pancreatograms in failed ERCP cases. Around the same time, EUS-guided cholangiography demonstrated that we could do the same with the common bile duct.

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