Communication from the ASGE Technology Committee

TECHNOLOGY STATUS EVALUATION REPORT

Echoendoscopes

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This document was reviewed and approved by the governing board of the American Society for Gastrointestinal Endoscopy.

The ASGE Technology Committee provides reviews of existing, new, or emerging endoscopic technologies that have an impact on the practice of GI endoscopy. Evidence-based methodology is used, using a MEDLINE literature search to identify pertinent clinical studies on the topic and a MAUDE (U.S. Food and Drug Administration Center for Devices and Radiological Health) database search to identify the reported adverse events of a given technology. Both are supplemented by accessing the "related articles" feature of PubMed and by scrutinizing pertinent references cited by the identified studies. Controlled clinical trials are emphasized, but in many cases, data from randomized, controlled trials are lacking. In such cases, large case series, preliminary clinical studies, and expert opinions are used. Technical data are gathered from traditional and Web-based publications, proprietary publications, and informal communications with pertinent vendors. Technology Status Evaluation Reports are drafted by 1 or 2 members of the ASGE Technology Committee, reviewed and edited by the committee as a whole, and approved by the Governing Board of the ASGE. When financial guidance is indicated, the most recent coding data and list prices at the time of publication are provided. For this review, the MEDLINE database was searched through October 2014 for articles related to echoendoscopes by using the keywords "endosonography" and "endoscopic ultrasound" paired with "gastrointestinal disease," "esophageal disease," and "biliary disease," "gastrointestinal cancer," "esophageal neoplasms," "colorectal neoplasms," gastric neoplasms," "pulmonary neoplasms," "pancreatic neoplasms," and "pancreatitis." Technology Status Evaluation Reports are scientific reviews provided solely for educational and informational purposes. Technology Status Evaluation Reports are not rules and should not be construed as establishing a legal standard of care or as encouraging, advocating, requiring, or discouraging any particular treatment or payment for such treatment.

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BACKGROUND

Endoscopic ultrasound (EUS) is a diagnostic and therapeutic modality that continues to expand its clinical applications. EUS processes high-frequency sound waves to create ultrasound (US) images. Echoendoscopes are able to image both intramural structures and structures adjacent to the GI tract and fall into 2 broad categories: radial ("sector") or linear ("convex array").[1] EUS miniprobes are radial US probes that can be advanced through the working channel of a gastroscope or adult colonoscope. This report focuses on currently available echoendoscopes and EUS processors and is an update of a previous Technology Status Evaluation Report.[2]

TECHNICAL CONSIDERATIONS

Echoendoscopes

Echoendoscopes comprise a US transducer attached to the tip of an endoscope. The transmitter energizes the transducer elements by precisely timed, high-amplitude voltages. The transducer contains piezoelectric crystals that change shape in response to the applied voltage. The piezoelectric crystals convert electrical energy to mechanical energy (sound waves). These sound waves are then transmitted to the target tissue, and the reflected sound waves are captured by the transducer and converted to electrical signals by the reverse piezoelectric effect. The US processor then interprets the electrical signals and produces a US image on the monitor. The real-time B-mode (brightness) produces a 2-dimensional image of the reflected sound waves. The variations in image brightness are a consequence of different amplitudes of sound-wave signals reflected from target organs.

Electronic echoendoscope transducers contain a variable number of piezoelectric crystals and have the ability

TABLE 1. Echoendoscopes

Instruments	Scanning angle/type of scan	Frequency, MHz	Tip diameter, mm	Insertion tube OD, mm	Channel diameter, mm	Tip deflection up/down
Olympus America						
GF-UE160-AL5	360° electronic radial	5, 6, 7.5, 10 (12 with EU-ME1, EU-ME2, and EU-ME2 Premier Plus)	13.8	11.8	2.2	130°/90°
GF-UCT180	180° electronic curvilinear	5, 6, 7.5, 10 (12 with EU-ME1, EU-ME2, and EU-ME2 Premier Plus)	14.6	12.6	3.7	130°/90°
GF-UC140P-AL5	180° electronic curvilinear	5, 6, 7.5, 10 (12 with EU-ME1, EU-ME2, and EU-ME2 Premier Plus)	14.2	11.8	2.8	130°/90°
TGF-UC180J	90° electronic curvilinear	5, 6, 7.5, 10 (12 with EU-ME1, EU-ME2 and EU-ME2 Premier Plus)	14.6	12.6	3.7	180°/90°
Bronchoscope						
BF-UC180F	60° electronic curvilinear	5, 7.5, 10, 12 (6 with EU-ME1, EU-ME2, and EU-ME2 Premier Plus)	6.9	6.3	2.2	120°/90°
Instruments	**Scanning angle/type of scan**	**Frequency, MHz**	**Tip Diameter, mm**	**Insertion tube, OD mm**	**Channel, mm**	**Tip deflection up/down**
Pentax Medical						
EG-3630UR	270° electronic radial	5, 7.5, 10	12.8	12.8	3.8	130°/130°
EG-3630UT	100° electronic curvilinear	5, 7.5, 10	12.1	12.1	2.4	130°/130°
FG-36UX	100° electronic curvilinear	5, 7.5, 10	12.1	12.1	2.4	130°/130°
EG-3830UT	100° electronic curvilinear	5, 7.5, 10	12.8	12.8	3.8	130°/130°
EG-3870UTK	120° electronic curvilinear	5, 6.5, 7.5, 9, 10	12.8	12.8	3.8	130°/130°
EG-3670URK	360° electronic radial	5, 6.5, 7.5, 9, 10	12.1	12.1	2.4	130°/60°
EG-3270UK	120° electronic curvilinear	5, 6.5, 7.5, 9, 10	10.8	10.8	2.8	130°/130°
Bronchoscope						
EB-1970UK	75° electronic curvilinear	5, 6.5, 7.5, 9, 10	6.3	6.3	2	120°/90°
Instruments	**Scanning angle/type of scan**	**Frequency, MHz**	**Tip diameter, mm**	**Insertion Tube OD, mm**	**Channel diameter, mm**	**Tip deflection up/down**
Fujifilm Endoscopy						
EG-530UR2	electronic radial 360°	5, 7.5, 10, 12	11.4	11.5	2.2	180°/90°
EG-530UT2	124° electronic convex	5, 7.5, 10, 12	13.9	12.1	3.8	160°/160°

OD, Outer diameter; *FOV*, field of view; *N/A*, not available.
*All echoendoscopes will operate with Hitachi 525 (5 MHz, 7.5 MHz only for linear; 10 MHz radial only), 6000, 6500, 5500, 900, and 8500 processors, but only Preirus and Noblus models are currently available for purchase.

to alter the focal distance and use tissue harmonic enhancement, which may improve the resolution of the image. The greater the number of piezoelectric elements used in the transducer is, the better the lateral resolution of the image. Echoendoscopes typically scan over a limited frequency range of 5 to 12 MHz, whereas miniprobes allow scanning at higher megahertz (up to 30 MHz). Scanning at higher frequencies limits the