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Development and validation of a new generation of flexible endoscope for NOTES.

Swanström L, Swain P, Denk P.

Division of Minimally Invasive Surgery, Legacy Health System, 1040 NW 22nd Avenue, Suite 560, Portland, OR 97210, USA. lswanstrom@aol.com

BACKGROUND: The concept of intraperitoneal flexible endoscopy has created much interest and investigation. Both gastroenterologists with a surgical leaning and surgeons with advanced endoscopy interests are researching the feasibility of this new approach. Current flexible scopes and instruments are extremely limited for use in natural orifice transluminal endoscopic surgery (NOTES). We describe the development of an endoscopic system specifically designed for endoluminal and NOTES procedures and demonstrates benefits and efficacy in benchtop and cadaver models. TECHNIQUE: In conjunction with industry, an 18-mm 4-channel rigidizing access device was designed. Measurements of the strength (torsional and lifting) of standard endoscopes and the new scope were made. The new device and instruments are used in 8 cadavers to document its feasibility in a variety of specific tasks: endoluminal plication, upper abdomen and lower abdomen visualization, bowel manipulation, solid organ retraction, cholecystectomy, and enterotomy closure. RESULTS: Benchtop comparison between a standard scope and the new scope showed equal maneuverability but the newer scope had greater force delivery at the tip (0.042 vs 1.96 lb, $P < .001$) and greater instrument application force (0.09 vs 0.23 lb, $P < .002$). Introduction of the scope was possible in all cadavers but difficult in cadavers <60 kg. Intragastric manipulation was feasible and exiting the stomach was possible although it required a 2-cm gastrotomy. The scope system was maneuverable in both lower quadrants without difficulty. The upper abdomen was viewable, with variable success in steering the scope between left and right quadrants. The entire gastrointestinal tract was able to be visualized in most cadavers. The scope generated sufficient force to lift and manipulate intraabdominal structures. Cholecystectomy was successful in 5 of 5 attempts. CONCLUSION: A new flexible access endoscope with 4 large access channels showed utility in a cadaver model-satisfying some of the requirements for performance of NOTES procedures.

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MeSH Terms

MeSH Terms:

- Cadaver
- Cholecystectomy
- Endoscopes*
- Endoscopy, Digestive System*
- Enterostomy
- Equipment Design
- Equipment Failure Analysis
- Feasibility Studies
- Female
- Humans
- Male
- Suture Techniques/instrumentation*

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