Use of a flexible robotic transgastric natural orifice transluminal endoscopic surgery (NOTES) platform in a cadaver to test access, navigation, maneuverability, and stability

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Abstract

Background The advancement of natural orifice transluminal endoscopic surgery (NOTES) depends on the availability of a suitable platform. A 2008 Natural Orifice Surgery Consortium for Assessment and Research (NOSCAR) Working Group identified access, navigation, maneuverability, and stability to withstand instrument forces as the essential requirements for a successful NOTES platform [1]. No single NOTES platform can adequately achieve all four of these key capabilities. In this study, the authors tested a novel flexible endoscopic robotic platform in a cadaver to determine how it performs with respect to these specific requirements.

Methods A highly maneuverable multichannel flexible robotic endoscopic platform developed for NOTES was used transgastrically in an adult cadaver to test the platform's ability to reach multiple intraabdominal targets. The device was under the control of the surgeon throughout the test. The surgeon was blinded to a control laparoscopic view. At each target organ, the platform was maneuvered via a joystick to provide different camera views and tool access orientation appropriate for the surgical tasks of each procedure. Standard endoscopic tools were used in the platform's two working channels to demonstrate the platform's

ability to withstand the forces generated during tissue manipulation and clipping.

Results The platform reached each target organ site without difficulty, relying on the endoscopic view only. The platform's unique ability to maintain stability in two- and three-dimensional space resisted forces exerted by tools in the tool channels used for tissue manipulation and clipping. Endoscopic visualization allowed the surgeon to reposition the platform easily to gain a different camera view or tool access orientation about an organ (see video in Supplementary material).

Conclusion The authors demonstrated that the four capabilities identified by NOSCAR can be provided by the flexible robotic endoscopic platform. These essential capabilities for the clinical implementation of NOTES were addressed specifically by this platform. The provision of these capabilities in a single device may further the advancement and adoption of NOTES.

Keywords Endoscope · Laparoscopy · Natural orifice endoscopic surgery · NOTES · Robotics

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Reference

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