Magnetic anchoring guidance system for video-assisted thoracic surgery: the 2018 update

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Introduction

The skill of the surgeon to visualise the operating field and the dedicated instruments has been the cornerstone of the revolution of minimally invasive thoracic surgery. The endoscopic lens allows the surgeon to have an adjacent-up, enlarged and illumined view of the operating field. The development of reduced thoracoscope, 3D systems, high-definition cameras has further refined video-assisted thoracic surgery (VATS), making it harmless, more easily adaptable and less aggressive. Nevertheless, there are some drawbacks. Firstly, the assistant or the mechanical robotic arm occupy important extrathoracic space. Secondly, the thoracoscope stays in a port or part of the uniportal incision (1). The magnetic surgical devices could be attracted, and the magnetic elements attract dirt with a ferrous content (2). Also, the possible position of the scope and the directions of vision are limited due to the fixed thoracoscope position. A possible answer would be the project of a wireless remote VATS camera with wireless image transmission internalised in the pleural space and fixed to the trunk (1,3).

Technical characteristics of the magnetic anchoring guidance system (MAGS)

MAGS endoscopes are made of an earth magnet highly resistant to demagnetisation (neodymium-iron-boron) (4). While initially designed for abdominal surgery, the MAGS offers unique benefits even to VATS surgery. MAGS endoscope contains an inner unit (a camera tailored with permanent magnets) and an outside magnet. The inner unit is introduced through a small skin incision, is attracted by the external magnet on the skin and fixed on the intrapleural surface against the force of gravity. The position of the endoscope could be moved by the external magnet manually. With magnetic linkage, the MAGS could decrease the risk of fencing and offer various points of views. Camera translation is achieved merely by touching the outside magnet and tilting is controlled by several stratagems as a manual compress on the abdominal wall. Nevertheless, this approach is unfitting for the use in the pleural space, as the thoracic wall is incompressible mainly being maintained by the rib cage. Different research groups proposed various designs of MAGS endoscopes (5).

MAGS and minimally invasive thoracic surgery

The MAGS appears to be more appropriate for the pleural environment since the rigidity of the chest provides more stability for magnetic anchorage. Nonetheless, placing the magnets on the external surface of the thorax allow a lesser instrument fencing and a large viewing angle. The advance of LED illumination and a wireless antenna for the transmission of the signal consent the insertion of many MAGS into the chest cavity to offer a broad view (4). While the MAGS prototype works well in a piggy cadaver, this model is less compatible with the VATS approach. While the new projects pose many advantages over current flexible endoscopic systems and traditional rod lens, some other elements should be added for enhanced applicability in the clinical establishing. Structures being contemplated for inclusion involve a hands-free controller of endoscope movements, assembled evacuation of surgical smoke and lens cleaning system, an unfailing camera sterilisation method, and a non-ferromagnetic device set for utilising alongside the MAGS endoscope. Successful challenges will be vital for the future of MASG endoscopes in VATS (5).

Conclusions

MAGS is introduced into the chest wall through the surgical incision and magnetically anchored to the internal chest wall. MAGS promise to increase the quality of VATS performances and the advantages for the patients. The main advantage of MAGS is the not interference with other instruments omitting the cables associated with endoscopes. Future MAGS thoracoscope is still under development, and so far, demonstrated excellent results in rotating, sliding and offering various angles and viewing directions (6).

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