Endoscopic surgery

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Lack of three-dimensional vision To perform minimal access surgery with safety , the surgeon must operate using an imaging system that provides a two-dimensional (2D) representation of the operative site. The endoscope o ff ers a whole new anatomical landscape, which the surgeon must learn to navigate without the usual ‘open approach’ clues that make it easy to judge depth. The instruments are longer and sometimes more complex to use than those commonly used in open surgery . This results in the novice being faced with significant problems of hand–eye coordination. There is a well-described learning curve for novice surgeons and experienced ‘open’ surgeons when adopt - ing the minimally invasive approach. Simulation training and mentoring are required to attain competence. Three-dimensional (3D) imaging systems are available b ut are expensive and currently are not commonplace. Many sur - geons feel that endoscopic 3D technology does not yet o ff er the technical enhancement necessary to improve safety . Indeed, - 3D technology has been associated with ergonomic problems - such as headache without quantifiable benefit in terms of accu - racy and time to perform directed tasks. Future improvements in these systems carry the potential to enhance manipulative ability in critical procedures, such as knot tying and dissection of closely overlapping tissues. There are , however, some draw - backs, such as reduced display brightness and interference with normal vision because of the need to wear specially designed glasses for some systems. It is likely that brighter projection displays will be developed; however, the need to w ear glasses is not easily overcome. These factors currently limit stereoscopic straight stick endoscopic surgery , which has largely been super - seded by the development of robotic technology incorporating 3D vision. Minimal access surgery can be more technically demanding and slower to perform than conventional open surgery . On occasion, a minimally invasive operation is so technically demanding that both patient and surgeon would be better served by conversion to an open procedure. Prolonged anaesthetic and operative times may negate a number of the beneficial e ff ects of minimal access surgery and increase the risk of respiratory and wound complications as well as compression neuropathy and venous thromboembolism. It is vital for surgeons and patients to appreciate that the decision to convert to an open operation is not a complication but, instead, usually implies sound surgical judgement in favour of patient safety . Control of bleeding and haemostasis Haemostasis may be di ffi cult to achieve endoscopically because blood may obscure the field of vision with reduced image quality owing to light absorption. Experienced surgeons may be able to manage a degree of bleeding via an endoscopic approach; however, this requires a significant degree of experience and skill to be achieved safely . Such scenarios are also reliant on an experienced assistant able to reduce visual loss through optimal camera positioning. It should be remembered that a situation of controlled conversion can easily become uncontrolled, negating any benefit a minimally access approach would have achieved. Advanced electrosurgery/diathermy and laser technology have improved dissection precision and haemostatic e ffi cacy in endoscopic surgery . Ultrasonic dissection and tissue devices continue to evolve with incremental technical improve ments and surgeons are increasingly familiar with their use. Some devices now combine the functions of three or four sep ara te instruments, reducing the

need for instrument exchanges during a procedure. This flexibility , combined with the abil ity to provide a clean, smoke-free field, facilitates dissection, improves haemostasis and reduces operating times . Loss of tactile feedback Minimal access surgery is associated with some loss of tactile feedback, although this is less with straight stick endoscopy than with robotic procedures. This is an area of ongoing research in haptics and biofeedback systems. Early work suggested that laparoscopic ultrasonography might be a substitute for the need to ‘feel’ in intraoperative decision-making. Rather than producing tactile feedback, endoscopic ultrasound provides a visual representation of structures that in open surgery would rely on palpation for accurate localisation and appraisal. Widely used examples include appraisal of nodal disease in cancer surgery and biliary tract exploration. Tissue extraction Large pieces of tissue, such as the lung or colon, may have to be extracted from the body cavity following resection. In some circumstances this significantly increases the surgical trauma of the procedure that could otherwise be carried out via two or three small port incisions. Although tissue ‘morcellators, mincers and liquidisers’ can be used in some circumstances, morphology and cannot be used in surgery for malignancy . Typically , extraction is performed by enlarging one incision so as to facilitate remov al without disruption to the specimen. Strategies to reduce surgical trauma have been considered. These include removal of lung via a subxiphoid approach so as to reduce intercostal neuropraxia or natural orifice extraction of abdominal resection specimens. However, such approaches are themselves associated with di ff erent complications such as herniation and injury to structures outside the direct operative field. While tumour implantation and localisation at port sites initially raised important questions about the future of the laparoscopic treatment of malignancy , large-scale trials have shown concer ns to be minimised by appropriate tissue han - dling, separating any tumours by bagging, irrigation and pro - tecting the extraction site. Cost Initially high consumable costs and factors such as surgical learning curve and high conversion rates led to increased costs of minimal access approaches compared with their open equivalents. This is now largely no longer the case for straight stick endoscopic surgery such as laparoscopy and thoracoscopy . Indeed, despite higher direct consumable costs, improvements in outcomes, hospital stay and general upscaling of the proce - dural volume have resulted in improved cost-e ff ectiveness for many minimal access procedures. Future reductions in the costs of image-processing technol - ogy will result in a wide range of transformed presenta tions fusion becoming available. It should ultimately be possible for a sur - - geon to access any view of the operative region accessible to a camera and present it stereoscopically in any siz e or orienta - - tion, superimposed on past images taken in other modalities. Such augmented reality systems continue to improve and are - discussed in more detail below . Summary box 10.2 Limitations of minimal access surgery /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

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