Recent Development in Minimally Invasive Colorectal Surgery

Dr. CC CHUNG

Consultant Surgeon and Chief of Lower GI Surgery, Pamela Youde Nethersole Eastern Hospital
President, Hong Kong Society for Coloproctology

The development of minimally invasive surgery (MIS) in colorectal disease began with the first report of laparoscopic assisted colectomy in 1991. There is now a wealth of evidence indicating the laparoscopic approach confers definite short term benefits to patients. Even for colorectal cancer, a common malignant condition worldwide, evidence from randomised trials and large prospective studies fail to demonstrate any detriment in oncological parameters such as disease recurrence and patient’s survival consequent to a laparoscopic approach. As oncological feasibility is no longer a concern, MIS is increasingly developed and practised in patients with various colorectal conditions. This article attempts to summarise the recent development of MIS in the field of coloproctology.

MIS for Rectal Cancer

As dissection deep down in the pelvis is technically demanding, early reports on laparoscopic rectal cancer surgery were dominated by high anterior resection (i.e. resection for tumours around rectosigmoid junction) and sphincter-ablatting resection (i.e. abdomino-perineal resection); in the latter case the lateral or circumferential margin is usually dictated by the perineal surgeon rather than the laparoscopic surgeon. Progress in technology and skills, however, has finally led to the extension of MIS techniques to distal rectal cancer with sphincter preservation. Although the number of randomised studies is still limited, the available evidence from large prospective series demonstrates its safety in experienced hands and an oncological clearance comparable to that of the open counterpart.

In the last decade, MIS has been gradually incorporated into the clinical pathway of rectal cancer management. Investigators have shown that MIS in patients with prior neoadjuvant chemo-irradiation is safe and carries similar short term benefits as in patients without chemo-irradiation. Even for tumour within 5cm from the anal verge, successful sphincter-preserving excision has been described using a combined laparoscopic and transanal technique.

MIS in Obstructive Colorectal Tumours

Like other advanced laparoscopic procedures, laparoscopic colectomy was only described and practised in elective, “cold” cases before the turn of the century. The presence of intestinal obstruction, a common acute surgical emergency complicating colorectal malignancy, was generally considered as a contraindication for laparoscopic approach owing to limited access and poor exposure as a result of distended bowel. The advent of self-expanding endoluminal prosthesis (SEMS) yet another minimally invasive ‘device’, provided a logical solution and had tremendous impact in this surgical scene. Initially used as a palliative alternative for treating inoperable colon cancer, SEMS was subsequently used to decompress the acutely obstructed colon and serve as a ‘bridge’ to subsequent elective, laparoscopic resection. A recent randomised controlled study focusing on this combined, ‘endo-laparoscopic’ approach was just finished, and the results suggested significantly more patients in the ‘endo-laparoscopic’ group (as compared to conventional group who received emergency laparotomy) underwent successful one-stage operation, with fewer patients ending up in permanent stoma. Most importantly, this ‘endo-laparoscopic’ approach allows patients with acute malignant large bowel obstruction to enjoy the full benefits of minimally invasive surgery.

In another prospective study SEMS was also found to be useful in patients with locally advanced, stenotic rectal cancer, in whom neoadjuvant chemo-irradiation is planned. These patients might have otherwise required temporary faecal diversion before definitive surgery for fear of impending obstruction aggravated by radiotherapy.

NOTES and Robotics in Colorectal Surgery

Clearly much of the development in MIS is brought about by advancement in technology. For instance, hand-assisted devices were developed with a view to shorten operating time and to facilitate dissection in locally advanced, bulky tumours, though data from the literature so far remain conflicting. Possibly inspired by transanal endoscopic microsurgery championed by Buess, investigators have tried to develop other kinds of natural orifice transluminal endoscopic surgery (NOTES). Some of these procedures involve a ‘hybrid’ technique, combining laparoscopic and transluminal techniques; the first report of using this...
kind of hybrid technique to perform 'incisionless' colectomy with intra-corporeal anastomosis in humans was just lately reported\(^2\). At the same time there is a recent enthusiasm for transanal endoscopy operation (TEO), as the new device is system-compatible with most MIS suites. This minimally invasive technique is suitable for benign tumours or early invasive cancer in the rectum.

Another recent development in this field related to technology is robotic-assisted colorectal resection. Hashizume et al from Japan were the first to publish their experience with telerobotic-assisted colorectal resections in 2002\(^2\). The first Da Vinci surgical system in China was installed in November 2005 in Hong Kong, with the first telerobotic-assisted laparoscopic abdomino-perineal resection performed in August 2006\(^2\). So far 5 centres in Hong Kong have installed or are planning to install the robotic system. Undoubtedly, the system can benefit the surgeons by providing excellent 3-D vision and ergonomics, but at the expense of inferior tactile feedback. Whether these benefits can be translated into better patient outcomes in a cost-effective way still needs further evaluation.

Conclusion

Minimally invasive colorectal surgery has gone a long way since 1991. As we unfold the history, laparoscopic colectomy, from what initially a highly specialised operation performed only by a small group of privileged surgeons in research or university centres, has evolved to become now a more or less standard procedure in many centres throughout the world. The development was further catalysed by progress in technology, which has brought in new elements and concepts of MIS besides laparoscopy, as well as revolutionised significantly the management of certain colorectal conditions. The indication and applicability of MIS technique continue to broaden.

Minimally invasive colorectal surgery will continue to flourish in the coming decades. This is reflected by the establishment of various endo-laparoscopic operating suites\(^2\), robotic surgery centres, and training centres on laparoscopic surgery and NOTES. The next generation of colorectal surgeons will be entering a new era - the era of endo-laparoscopic surgery and robotic-assisted laparoscopic surgery. And this will be soon approaching.

References

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