Leading article

Robotic surgery for rectal cancer with lateral lymph node dissection

T. Watanabe[1] and K. Hata[2]

[1]Department of Surgical Oncology and Vascular Surgery and [2]Department of Surgical Oncology, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo, Japan 113-8655 (e-mail: toshwatanabe@yahoo.co.jp)

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Surgery for rectal cancer is associated with high rates of local recurrence compared with surgery for colonic cancer[1]. Total mesorectal excision (TME) is now accepted widely as an important contributor in reducing this specific risk[2]. As advocated by Heald and colleagues[3], the mesorectal lymph nodes are excised wholly without disturbing the mesorectum, but even with this technique the local recurrence rate remains high, especially in patients with locally advanced lower rectal cancer. In Western countries, preoperative radiation therapy became widely used in the treatment of locally advanced rectal cancer to reduce rates of local recurrence further[4]. In turn, chemoradiation therapy (CRT) replaced radiotherapy following the findings of several studies showing evidence of superiority in favour of CRT in achieving local control[5].

In Japan, an alternative strategy has been adopted. Instead of preoperative CRT, radical surgery is the standard treatment of choice for locally advanced lower rectal cancer. This involves TME plus lateral lymph node dissection (LLND) with autonomic nerve preservation. One RCT[6,7] comparing TME with TME plus LLND showed that addition of LLND did not increase urinary or sexual dysfunction compared with TME alone. On the other hand, previous studies[8,9] showed that preoperative radiotherapy increased postoperative rates of urinary and sexual dysfunction. Preoperative radiotherapy also increases rates of defaecatory dysfunction, and in the Dutch trial[10], which compared TME and TME plus preoperative radiotherapy, irradiated patients had significantly increased rates of faecal incontinence (62 *versus* 38 per cent) and the need to wear a pad (56 *versus* 33 per cent) compared with non-irradiated patients.

In terms of local recurrence, a multicentre observational study[11] involving 1977 patients with rectal cancer, of whom 830 had LLND, reported that LLND reduced this risk by 50 per cent and improved the 5-year survival rate by 8 per cent compared with TME alone in patients with T3–4 lower rectal cancer. A study[12] involving 5789 patients with rectal cancer using the Japanese nationwide database also showed that LLND was effective in improving the outcomes of patients with lower rectal cancer. Today, Japanese guidelines recommend LLND for T3 and T4 tumours located distal to the peritoneal reflection[13], although it must be acknowledged that this is based solely on observational data[12]. At present, only one prospective randomized trial (JCOG0212) has compared TME with LLND *versus* TME alone. The short-term results were published in 2012, and the long-term results are now undergoing final analysis with the expectation that this will clarify oncological and functional advantages and disadvantages of LLND[6].

An important question is whether LLND is as effective as preoperative CRT in terms of the effects on recurrence as well as complications and functional outcomes. Few studies have addressed this issue. No RCT has directly compared LLND with CRT, and only a few studies with small numbers of patients have compared radiotherapy and LLND[14,15].

LLND was introduced in the era of exclusive open surgery, but has never achieved worldwide adoption, mainly because it is challenging technically and alternative strategies have become more popular, particularly in the West. Although there may have been some enthusiasm that this could be overcome by laparoscopic surgery, the drawbacks inherent in this approach, such as use of straight and inflexible devices, unstable intraoperative views with handheld two-dimensional cameras, and uncomfortable ergonomic positions for surgeons, have meant that this procedure has not gained wide acceptance. Robotic surgery offers a number of advantages over conventional laparoscopic surgery that potentially overcome these drawbacks, including increased freedom in the movement of instruments, enhanced dexterity, three-dimensional field of vision and more intuitive instrument manipulation. These technical advantages seem to be particularly useful in rectal cancer surgery, especially in the performance of LLND[16]. LLND remains technically demanding, because the autonomic nerves need to be preserved, to avoid urinary and

sexual dysfunction, while performing complete lymphadenectomy in the narrow pelvic region. The technical advantages of robotic surgery may therefore help to achieve complete and thorough lymphadenectomy.

A technique for robotic surgery in the treatment of rectal cancer has been developed to accomplish TME and LLND, using six ports and a dual-docking method. Following the completion of TME, LLND is performed (*Video S1*, supporting information). In relation to this second phase of the procedure, the ureter is mobilized and taped, and the hypogastric nerve taped to preserve the pelvic plexus. The obturator lymph nodes between the internal iliac vessels and the pelvic wall are then dissected. The obturator nerve branches are preserved, and the obturator artery and vein dissected, allowing clearance of internal iliac lymph nodes between the internal iliac artery and the pelvic plexus.

Standardization of the surgery, magnification, three-dimensional vision and the greater freedom of instrument manipulation offered by robotic surgery have greatly simplified this procedure. It has now been completed in 40 consecutive operations at this centre**.** In the same way that TME became standardized through organized training, the same could be applied to robotic LLND at centres that are now familiar with robotic rectal cancer surgery. Such a programme might overcome objections regarding heterogeneity of the quality of surgery. This would make an international multicentre trial feasible using the best surgical techniques to see whether CRT and TME is really superior to TME with LLND.

Disclosure

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References

1 Kuipers EJ, Grady WM, Lieberman D, Seufferlein T, Sung JJ, Boelens PG *et al.* Colorectal cancer. *Nat Rev Dis Primers* 2015; **1**: 15065.

2 MacFarlane JK, Ryall RD, Heald RJ. Mesorectal excision for rectal cancer. *Lancet* 1993; **341**: 457–460.

3 Heald RJ, Husband EM, Ryall RD. The mesorectum in rectal cancer surgery – the clue to pelvic recurrence? *Br J Surg* 1982; **69**: 613–616.

4 van Gijn W, Marijnen CA, Nagtegaal ID, Kranenbarg EM, Putter H, Wiggers T *et al.*; Dutch Colorectal Cancer Group. Preoperative radiotherapy combined with total mesorectal excision for resectable rectal cancer: 12-year follow-up of the multicentre, randomised controlled TME trial. *Lancet Oncol* 2011; **12**: 575–582.

5 Bosset JF, Collette L, Calais G, Mineur L, Maingon P, Radosevic-Jelic L *et al.*; Trial EORTC Radiotherapy Group Trial 22921. Chemotherapy with preoperative radiotherapy in rectal cancer. *N Engl J Med* 2006; **355**: 1114–1123.

6 Fujita S, Akasu T, Mizusawa J, Saito N, Kinugasa Y, Kanemitsu Y *et al.*; Colorectal Cancer Study Group of Japan Clinical Oncology Group. Postoperative morbidity and mortality after mesorectal excision with and without lateral lymph node dissection for clinical stage II or stage III lower rectal cancer (JCOG0212): results from a multicentre, randomised controlled, non-inferiority trial. *Lancet Oncol* 2012; **13**: 616–621.

7 Saito S, Fujita S, Mizusawa J, Kanemitsu Y, Saito N, Kinugasa Y *et al.*; Colorectal Cancer Study Group of Japan Clinical Oncology Group. Male sexual dysfunction after rectal cancer surgery: results of a randomized trial comparing mesorectal excision with and without lateral lymph node dissection for patients with lower rectal cancer: Japan Clinical Oncology Group Study JCOG0212. *Eur J Surg Oncol* 2016; July 30. pii: S0748-7983(16) 30680-1. doi: 10.1016/j.ejso.2016.07.010. [Epub ahead of print].

8 Bruheim K, Guren MG, Skovlund E, Hjermstad MJ, Dahl O, Frykholm G *et al.* Late side effects and quality of life after radiotherapy for rectal cancer. *Int J Radiat Oncol Biol Phys* 2010; **76**: 1005–1011.

9 Marijnen CA, van de Velde CJ, Putter H, van den Brink M, Maas CP, Martijn H *et al.* Impact of short-term preoperative radiotherapy on health-related quality of life and sexual functioning in primary rectal cancer: report of a multicenter randomized trial. *J Clin Oncol.* 2005; **23**: 1847–1858.

10 Peeters KC, van de Velde CJ, Leer JW, Martijn H, Junggeburt JM, Kranenbarg EK *et al.* Late side effects of short-course preoperative radiotherapy combined with total mesorectal excision for rectal cancer: increased bowel dysfunction in irradiated patients – a Dutch Colorectal Cancer Group study. *J Clin Oncol* 2005; **23**: 6199–6206.

11 Sugihara K, Kobayashi H, Kato T, Mori T, Mochizuki H, Kameoka S *et al.* Indication and benefit of pelvic sidewall dissection for rectal cancer. *Dis Colon Rectum* 2006; **49**: 1663–1672.

12 Akiyoshi T, Watanabe T, Miyata S, Kotake K, Muto T, Sugihara K; Japanese Society for Cancer of the Colon and Rectum. Results of a Japanese nationwide multi-institutional study on lateral pelvic lymph node metastasis in low rectal cancer: is it regional or distant disease? *Ann Surg* 2012; **255**: 1129–1134.

13 Watanabe T, Itabashi M, Shimada Y, Tanaka S, Ito Y, Ajioka Y *et al.*; Japanese Society for Cancer of the Colon and Rectum. Japanese Society for Cancer of the Colon and Rectum (JSCCR) Guidelines 2014 for treatment of colorectal cancer. *Int J Clin Oncol* 2015; **20**: 207–239.

14 Nagawa H, Muto T, Sunouchi K, Higuchi Y, Tsurita G, Watanabe T *et al.* Randomized, controlled trial of lateral node dissection *vs.* nerve-preserving resection in patients with rectal cancer after preoperative radiotherapy. *Dis Colon Rectum* 2001; **44**: 1274–1280.

15 Watanabe T, Tsurita G, Muto T, Sawada T, Sunouchi K, Higuchi Y *et al.* Extended lymphadenectomy and preoperative radiotherapy for lower rectal cancers. *Surgery* 2002; **132**: 27–33.

16 Yamaguchi T, Kinugasa Y, Shiomi A, Tomioka H, Kagawa H. Robotic-assisted laparoscopic *versus* open lateral lymph node dissection for advanced lower rectal cancer. *Surg Endosc* 2016; **30**: 721–728.

Supporting information

Additional supporting information may be found in the online version of this article:

Video S1 Robotic surgery for rectal cancer and lateral lymph node dissection (MP4 file)

Snapshot quiz

Snapshot quiz 16/14

VIDEO AVAILABLE ONLINE

Question: What is happening to the ampulla of Vater on endoscopy (*Fig. 1*), and what is the cause, which was later removed at operation (*Fig. 2*)?

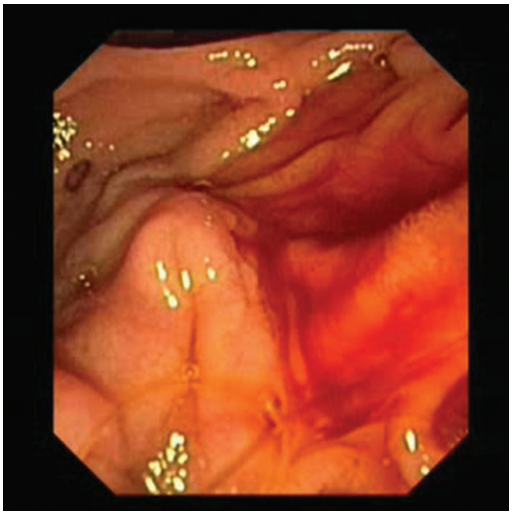

Fig. 1

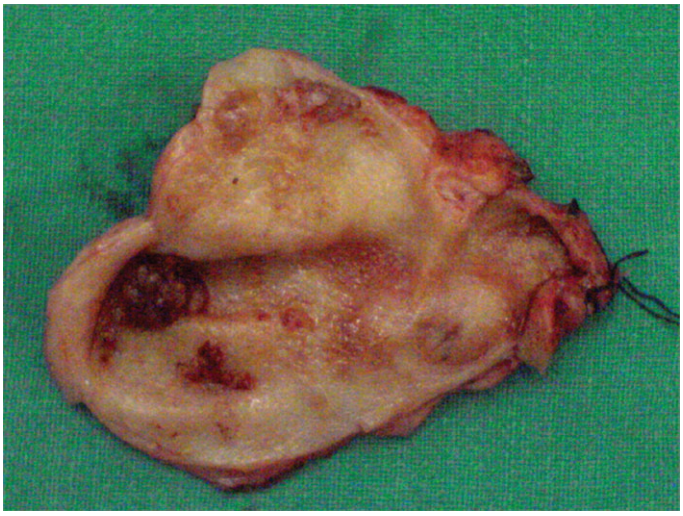

Fig. 2

The answer to the above question is found on p. 1894 of this issue of *BJS*.

Vashishtha N[1*], Singhal D[1*], Tandon R[2]: Departments of [1]Surgical Gastroenterology and [2]Gastroenterology and Hepatology, Pushpawati Singhania Research Institute and Hospital, Press Enclave Road, Sheik Sarai Ph II, New Delhi 110017, India (e-mail: drrakeshtandon@hotmail.com)
*Present address: Department of Surgical Gastroenterology, Max Superspeciality Hospital, New Delhi

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