Surgery for rectal cancer is associated with high rates of local recurrence compared with surgery for colonic cancer. Total mesorectal excision (TME) is now accepted widely as an important contributor in reducing this specific risk. As advocated by Heald and colleagues, 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. 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.

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 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 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, 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 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 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, although it must be acknowledged that this is based solely on observational data. 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.

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.

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. LLND remains technically demanding, because the autonomic nerves need to be preserved, to avoid urinary and sexual dysfunction.
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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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

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)?

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

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