Int Surg 2015;**100**:417–422
DOI: 10.9738/INTSURG-D-14-00091.1

Single-incision Plus One Port Laparoscopic Total Mesorectal Excision and Bilateral Pelvic Node Dissection for Advanced Rectal Cancer—A Medial Umbilical Ligament Approach

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We prove the safety and feasibility of single-incision plus 1 port (SILS+1) laparoscopic total mesorectal excision (TME) + lateral pelvic lymph node dissection (LPLD) via a medial umbilical approach for rectal cancer. Only a few reports have been published about single-incision multiport laparoscopic low anterior resection with LPLD. Recently, minimally invasive surgery such as single-incision plus 1 port (SILS + 1) for advanced rectal cancer has been reported as safe and feasible. To our knowledge, this is the first reported case of SILS + 1 used for LPLD. A wound protector was inserted through a 30-mm transumbilical incision. Next, a single-port access device was mounted to the wound protector and 3 ports (5 mm each) were placed. A 12-mm port was inserted in the right lower quadrant. Super-low anterior resection of the rectum and bilateral LPLD and temporary ileostomy were performed with SILS + 1, with a blood loss of 50 mL and a total surgical time of 525 minutes. The time for right lateral dissection was 74 minutes; the time for left lateral dissection was 118 minutes. The total number of dissected lymph nodes was 57 and the number of lateral lymph nodes dissected was 21 (8 left pelvic lymph nodes, 13 right pelvic lymph nodes). No postoperative anastomotic insufficiency or voiding dysfunction was observed. We have documented the safety and feasibility of SILS + 1-TME + LPLD via a medial umbilical approach for rectal cancer.

Key words: Laparoscopic low anterior resection – Lateral pelvic node dissection – Reduced port surgery – Single-incision laparoscopic surgery

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Single-incision laparoscopic surgery (SILS) has been successfully introduced for colectomy.[1] But for mid- to low-rectal procedures, such as total mesorectal excision, it can be technically complicated. Only a few reports have been published about single-incision laparoscopic low anterior resection without lateral pelvic node dissection (LPLD).[2–6] LPLD continues to be performed in Japan for advanced rectal cancer, with the aim of minimizing local recurrence and improving survival. According to advocates of LPLD, the overall incidence of metastases to lateral lymph nodes ranges from 8.6% to 27.0%, and such nodes are not cleared in patients who undergo total mesorectal excision (TME) only.[7–9] Recently, minimally invasive surgery such as single-incision plus 1 port (SILS + 1) for advanced rectal cancer has been reported as safe and feasible.[10] However, laparoscopic LPLD for advanced rectal cancer has not been widely performed. Laparoscopic approaches may offer decreased surgical trauma, fewer perioperative complications, and faster postoperative recovery compared with conventional open surgery, with similar survival rates. In this study, we report a surgical technique using SILS + 1 via a medial umbilical approach for both low anterior resection and bilateral LPLD for advanced rectal cancer.

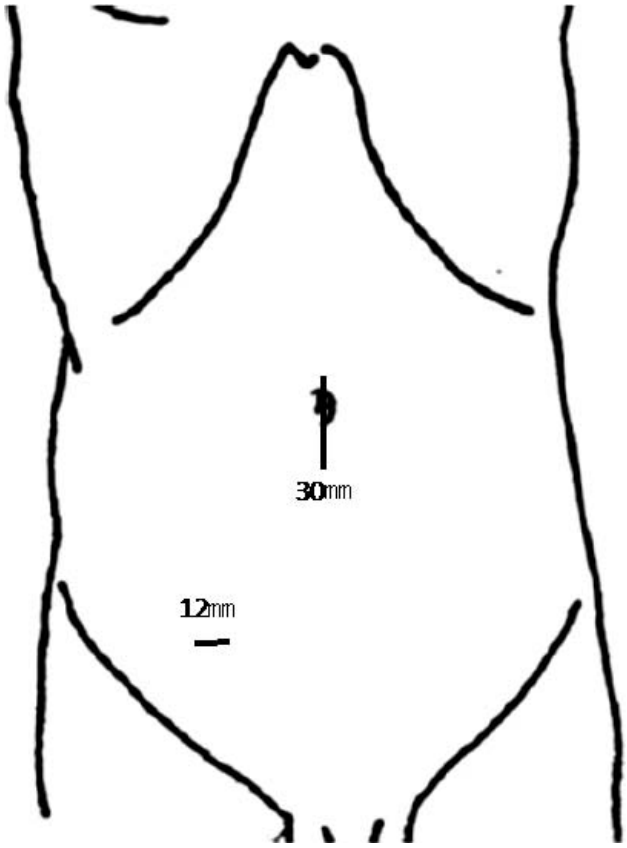

Fig. 1 Position of incision for SILS + 1 laparoscopic low anterior resection.

Patient and Methods

A 68-year-old man with a body mass index of 24 underwent surgery by 2 colorectal surgeons who had hundreds of experiences with laparoscopic colorectal surgery.

Surgical technique

Under general anesthesia, the patient was placed in the modified lithotomy position. First, a wound protector (Lap protector LP; Hokkou Shoji, Japan) was inserted through a 30-mm transumbilical incision. Next, a single-port access device (EZ-access, Hakkou Shoji, Japan) was mounted to the wound protector and 3 ports (5 mm each) were placed. A 12-mm port was inserted in the right lower quadrant (Fig. 1). The operative procedures and instruments were the same as for our usual laparoscopic low anterior resection of the rectum with a flexible 5-mm scope. We routinely perform low anterior resection with TME of the rectum before LPLD and colorectal anastomosis. For left-sided LPLD, patient position is lithotomy with left side up. For right side, patient position is lithotomy with right side up.

Surgical landmarks for LPLD

The surgical landmarks to identify before incision of the peritoneum are shown in Fig. 2. In developing the space of Retzius, the peritoneum is incised from a point lateral to the medial umbilical ligament and extending inferolaterally across the vas deferens to a point about 3 cm from the common iliac vessels. The vas deferens is preserved in this process. The anatomy is easily assessed to identify important landmarks such as the ureter, internal iliac vessels, and hypogastric nerves. The operator's second arm is used to retract the bladder medially and apply tension to the superior vesical artery, thus separating the bladder from the lateral nodal packet. In this process, taping or retraction of the ureter becomes unnecessary (Fig. 3).

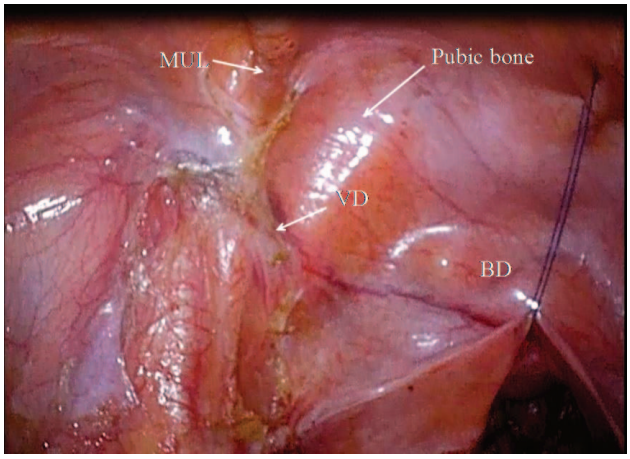

Fig. 2 Surgical landmarks to be identified at the start of surgery, including medial umbilical ligament (MUL), vas deferens (VD), and bladder (BD).

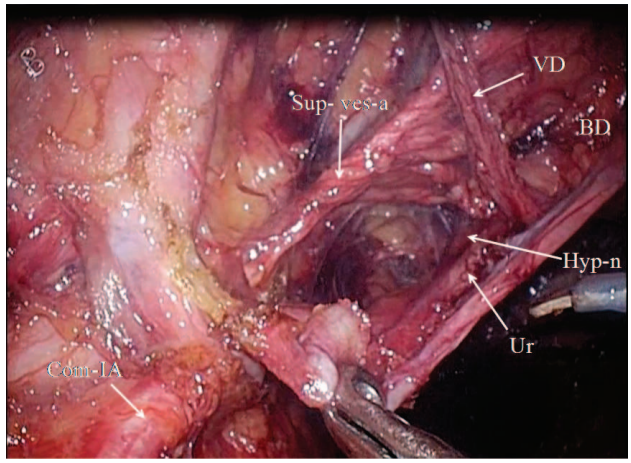

Fig. 3 Retracting the peritoneum medially and developing the space of Retzius. The retracted peritoneum included ureter (Ur) and hypogastric nerve (Hyp-n). Sup-ves-a: superior vesical artery. Com-IA: common iliac artery.

External iliac dissection

We started at the proximal limit of dissection, which was the external iliac artery. The external iliac artery and vein were identified and skeletonized using blunt dissection. Dissection was carried around the medial and posterior borders of the vessel until the obturator internus muscle on the pelvic side wall came into view. The plane between the vein and the pelvic side wall was developed until the external iliac artery and vein were completely skeletonized. In the process of dissecting the lymphatic packet off of the external iliac vein, the surgeon encountered an accessory obturator vein coursing from the external iliac vein to the obturator foramen. Once recognized, the lymphatic packet could be dissected off this accessory vein. Multiple small perforating vessels are almost always present coursing from the pelvic side wall musculature to the pelvic node packet. These were easily secured with bipolar electrocautery and sharp dissection. Superiorly and posteriorly, the dissection was very close to the hypogastric vein. The proximal limit was marked by the crossing of the ureter where the lymphatic packet was divided (Fig. 4).

Obturator and internal iliac dissection

Using the operator's second arm to retract the bladder further, the plane between the lymphatic packet and bladder was developed. The lymphatic tissue surrounding the internal iliac vessels was dissected. The obturator packets were carefully dissected en bloc to expose the obturator nerve. The nerve was easily exposed by sweeping the lymphatic packet in a direction parallel to the nerve. The nerve was preserved and dissected distally toward the obturator foramen. During this portion of the surgery, the second arm could be adjusted to further retract the bladder medially to maintain tension in the tissue planes. The lymphatic packet could be dissected off the obturator artery and vein or, alternatively, these vessels could be secured with clips or cautery and taken with the lymph node packet with no consequence to the patient. The obturator vessels can be found to travel toward the obturator foramen medial to the nerve (Fig. 5). A final view of the left LPLD is shown in Fig. 6.

Results

In our case, super-low anterior resection of the rectum plus Japanese D3 dissection (s-LAR+D3) (preservation of the left colic artery, Japanese D3 dissection)[11] and bilateral LPLD and temporary ileostomy were performed with SILS + 1, with a blood loss of 50 mL and a total surgical time of 525 minutes. The time for right lateral dissection was 74 minutes; the time for left lateral dissection (performed more slowly for instruction purposes) was 118 minutes. The total number of dissected lymph nodes was 57 and the number of lateral lymph nodes dissected was 21 (8 left pelvic lymph nodes, 13 right pelvic lymph nodes). No postoperative anastomotic insufficiency or voiding dysfunction was observed.

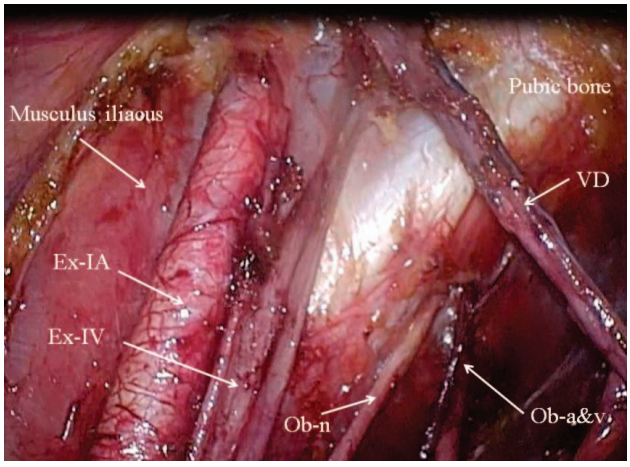

Fig. 4 Dissection of lymph nodes surrounding the external iliac vessels and obturator vessels.Ex-IA: external iliac artery. Ex-IV: external iliac vein. Ob-n: obturator nerve.Ob-a: obturator artery. Ob-v: obturator vein.

Discussion

Many surgeons have adopted laparoscopic techniques in recent years. Reduced port surgery aims to reduce the size and number of ports to preserve the view afforded by the laparoscope while making the surgery less invasive. Some reports have successfully mentioned advantages in reducing the number of laparoscopic ports, including better cosmetic results, reduced postoperative pain, and shorter recovery time; however, there are some technical complexities, such as instrument crowding, insufficient counter traction.[11–16] For rectal cancer, cases

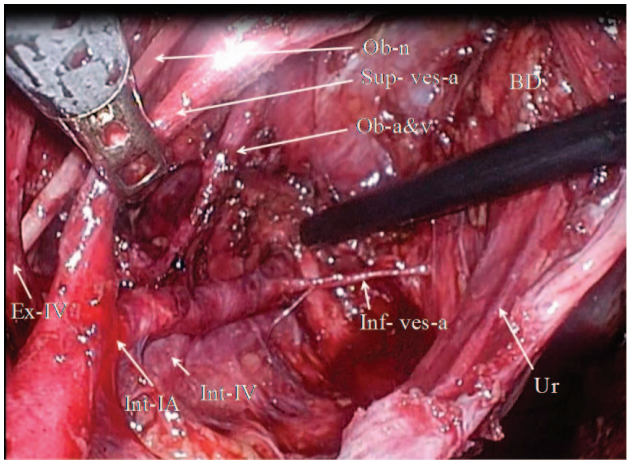

Fig. 5 Dissection of lymph nodes surrounding the obturator vessels and internal iliac vessels.Int-IA: internal iliac artery. Int IV: internal iliac vein. Inf-ves-a: inferior vesical artery.

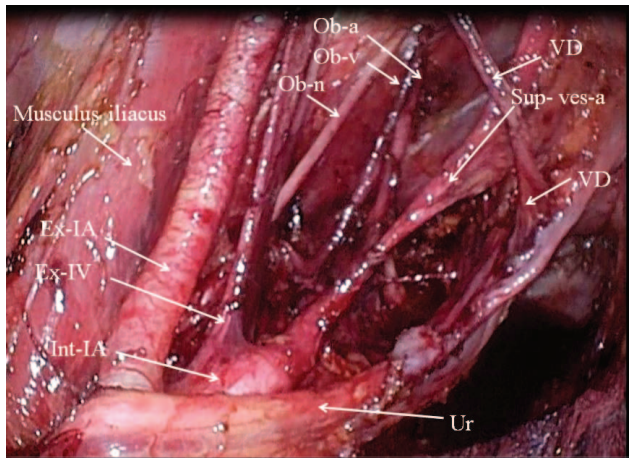

Fig. 6 Final view of left-sided LPLD.

where laparoscopic surgery was performed using SILS + 1[10] and where TME + LPLD was performed with multiport laparoscopic surgery[17] have been reported, both of which take advantage of laparoscopy.

However, to our knowledge, this is the first reported case of SILS + 1 used for bilateral LPLD. In SILS + 1, LPLD needs to be performed using 2 clamps. This is potentially problematic due to the difficulty of extending vital structures such as the ureter and nerves while maintaining the visual field. When multiport laparoscopic LPLD is performed, the ureter and nerves are detached and taped.[18] This technique is reliable and effective but has a problem that, in SISL + 1 using only 2 clamps, tape obstructs the operative field and inhibits operation of the clamps. In addition, using only 2 clamps makes it difficult to further extend the taped tissues.

To overcome these problems, we adopted the medial umbilical ligament approach described in this report. This approach makes it possible to detach the ureter and hypogastric nerves still attached to the peritoneum, eliminating the need for tape. In the case of left LPLD, placing the patient in the right lateral decubitus position makes it easy to develop the operative field because gravity works effectively. Another advantage is that lymph nodes in the internal iliac artery region can be easily detached in the direction of the pelvic sidewall by entering the paravesical space while grasping the medial umbilical ligament. This operation results in an en bloc LPLD. In the case of right LPLD, the patient is placed in the left lateral decubitus position and the surgeon stands on the patient's left side. In this position, the surgeon can also perform it with no particular problems.

We discuss surgical time, blood loss, and number of dissected lymph nodes. Hirano *et al* have reported that they performed SILS+1 anterior resection for rectal cancer in 15 patients, with a median surgical time of 276.5 minutes.[10] Sourrouille *et al* performed SILS or SILS+1 low anterior resection for rectal cancer in 13 patients, with a median surgical time of 290 minutes.[19] These 2 reports described rectal operation without LPLD. Our results with TME for rectal cancer using SILS + 1 is acceptable compared with those previous reports. In regard to LPLD, Park *et al* have reported that they performed multiport laparoscopic unilateral LPLD in 16 patients, with a median surgical time of 321.9 minutes (range, 220 to 510 minutes) with a median number of nodes dissected of 9.1 (range, 3 to 19).[17] Konishi *et al* performed multiport laparoscopic unilateral LPLD in 14 patients and reported a median surgical time of 413 minutes (range, 277 to 596 minutes), a median blood loss of 25 mL (range, 5 to 1190 mL), and a median number of lateral lymph nodes of 23 (range, 14 to 33).[18] These 2 reports described rectal operation with unilateral LPLD. Furuhata *et al* have reported that they performed multiport laparoscopic LPLD for low rectal cancer in 18 patients, with a mean surgical time of 603.7 minutes.[20] Our results with TME + bilateral LPLD using SILS + 1 compare favorably with those of multiport laparoscopic LPLD.

In conclusion, we have documented the safety and feasibility of SILS + 1-TME + LPLD via a medial umbilical approach for rectal cancer. This procedure is a promising alternative method for the treatment of some patients with rectal disease. Further studies are needed to prove the advantages of SILS + 1-TME + LPLD over conventional laparoscopic low anterior resection.

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