Feasibility and Functional Outcome of Laparoscopic Intersphincteric Rectal Resection for Ultra-Low Rectal Cancer

Preliminary Clinical Study

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Abstract
Aim-Background: The Aim of this study is to evaluate the feasibility and analyze the functional outcome of laparoscopic intersphincteric resection (LISR) in ultra-low rectal cancer. The preservation of anal function following curative operations for low rectal cancer is becoming increasingly important. Laparoscopic intersphincteric resection of the rectum is the utmost sphincter saving operation for rectal cancer. The rectum is laparoscopically resected along with the internal anal sphincter, providing an adequate distal margin for even the ultra-low tumours of the rectum.

Methods: Between 2008 and 2012, nine patients, 2 with a T3 tumour that received preoperative chemoradiotherapy and 7 patients with a non-fixed T2 rectal adenocarcinoma, underwent LISR by a single surgeon. Preoperative tumour staging included endorectal ultrasonography (ERUS) and pelvic MRI. Patients with multiple distant metastases, tumour invasion into adjacent organs and invasion into the external anal sphincter and/or levator ani, were excluded from LISR. Covering ileostomy in seven patients was reversed with a satisfactory functional outcome in each case.

Results: All patients underwent LISR with curative intent. There was no postoperative mortality. Complications included anal stenosis, prolapse of the neorectum and pelvic hematoma. The overall quality of life and functional outcome were deemed satisfactory.

Conclusion: In selected patients, intersphincteric rectal resection may provide an acceptable functional outcome for ultra-low rectal cancer patients, without a permanent stoma.

Key words: Ultra-low rectal cancer, Laparoscopic intersphincteric excision of the rectum, Sphincter saving procedures

Introduction
Until two decades ago, rectal tumours that could be palpated by an examiner’s finger were treated by abdominoperineal resection (APR). The development of circular stapling devices enabled low anterior resections for tumours 3 cm from the dentate line. Tumours situated lower than 3 cm rarely allow staple placement across the optimal distal margin. Hence, abdominoperineal resection (APR) remains the most widely accepted treatment modality for ultra-low tumours. However, due to the obvious drawbacks of APR, the optimal surgical procedure for these tumours remains controversial; intersphincteric resection (ISR) has drawn increasing attention as it provides anus preservation and a satisfactory tumour margin. Several retrospective studies have shown satisfactory sphincter control after intersphincteric rectal resection for rectal cancer [1-9]. In addition, applying laparoscopy to this sphincter-saving procedure offers the well-known benefits of the approach.

Purpose
Sphincter-preserving operations for rectal cancer are ideally required to a) secure adequate tumour margins and b) maintain anal sphincter function. However, for tumours situated extremely low in the rectum, transection of the rectum at a sufficiently low level to secure a safe distal margin may prove extremely difficult or impossible. Low anterior rectal resection with removal of the internal sphincter is an option for ultra-low rectal cancer. The objective of this study was to describe the technique, evaluate the feasibility and analyze the functional outcome of laparoscopic intersphincteric resection in ultra-low rectal cancer.

Materials And Methods
Surgery included total mesorectal excision with internal sphincter removal and anastomosis to the dentate line. Preoperatively, all patients underwent endorectal ultrasonography (ERUS) by the operating surgeon, in order to confirm the depth of invasion...
and subsequent need for preoperative chemoradiation. If ERUS and/or MRI showed tumour invasion to the external sphincter or the levator ani, patients were excluded from LISR and an abdominoperineal resection (APR) was performed [4]. Moreover, patients were excluded from LISR if multiple distant metastases or tumour invasion into adjacent organs were shown preoperatively.

From 2008 to 2012, nine patients with a rectal tumour below 3 cm from the anal verge were treated by curative LISR, by a single surgeon. Patients with T3 or N1 tumours and no invasion of the external anal sphincter or levators, received preoperative external beam radiation with sensitizing chemotherapy (Volumetric Modulated Arc Therapy. 50.40 cGy in 28 fractions of 1.8 cGy each, over 6 weeks, concurrent with continuous infusion 5-FU and LV on the first and last 5 days during radiotherapy) [10-12]. T2N0 tumours in patients that underwent LISR were not treatable by local excision due to tumour size, unclear preoperative node status or patient compliance. A temporary diverting ileostomy was carried out in all patients, which was closed after 6 - 10 weeks if no adjuvant therapy had been administered. Where postoperative chemotherapy was deemed necessary, the stoma was maintained for the duration of the adjuvant therapy and subsequently closed 6 weeks after completion. Follow-up assessment was performed on an outpatient basis. Sphincter function was evaluated clinically every 3 months after stoma closure, for one year [13]. Five patients have currently completed the 1-year follow-up and 2 are still under evaluation of sphincter function. All patients were interviewed on frequency of bowel movements, ability to defer defaecation, soiling, urgency, and overall quality of life related to defaecation. Function was assessed using the Wexner Continence Score. The present clinical study has been approved from the institutional review board.

Surgical Technique
Laparoscopic intersphincteric rectal resection was initiated by placing the patient in the modified lithotomy position with the buttocks slightly projecting from the end of the operating table. The right arm was placed alongside the body and the left arm at a 70° angle to the operating table. Shoulder and right lateral supports were fixed to the table. The scope trocar was placed by the Hasson technique through the umbilicus. Two 5mm trocars were introduced along the right midclavicular line, one at the right McBurney site and the other in the mid right abdominal region. A third 5mm operative port was placed in the mid left abdominal region, along the left mid-clavicular line. Routine exploration of the abdominal cavity was carried out, and any adhesions were divided. The patient was placed in a steep Trendelenburg and right lateral position, the sigmoid was elevated to the abdominal wall, and the sigmoid mesentery was exposed. The peritoneum was incised along the right anterior border of the aorta, from the sacral promontory to the inferior border of the pancreas. The splenic flexure, the distal transverse colon and the left colon were completely mobilized from the sub-retroperitoneal fascia to ensure a subsequent tension-free anastomosis. The inferior mesenteric artery was dissected and ligated 1 cm away from the aorta with endoclips or an endoscopic linear cutter, after identifying the left ureter and the left sympathetic trunk. Thus, removal of the sigmoid mesentery and lymph nodes around the inferior mesenteric artery was achieved. The peritoneal incision was extended caudally and anteriorly, Denonvillier’s fascia was dissected, and the seminal vesicles and prostate gland or the posterior wall of the vagina were exposed. The mesorectum was dissected laterally and posteriorly down to Waldeyer’s fascia. The lateral ligaments of the rectum were gradually divided with the harmonic scalpel from the inner boundaries of the inferior hypogastric nerve fibres. Sharp dissection between the visceral and parietal pelvic fascia down to the level of the levators (or upper aspect of the anal canal), allowed removal of the rectum and its mesentery as an intact unit, and a total mesorectal excision (TME) was thus achieved. The hypogastric nerves, once identified, were kept out of harm’s way.

After completion of the laparoscopic abdominal phase, the anal portion of the operation was initiated: The patient was moved to the Loyd–Davies position. The anal canal was exposed with self-retaining retractors (Lone Star Retractor System™ / Lone Star Medical Products Inc., Houston, TX) and the tumour was identified under direct vision. The rectum was irrigated with 5% povidone-iodine to prevent cancer cell dissemination in the surgical field. Using electrocautery, a circular incision was performed at the dentate line. Mobilization of the rectum progressed proximally along the intersphincteric plane, up to the levator ani. Once the plane of dissection achieved during the abdominal phase was met, access into the abdominal cavity was accomplished.

The sigmoid and rectum, including the total mesorectum, were pulled out of the perineal wound and resected. Invasion of tumour cells [4] on the dissected plane was histologically evaluated by microscopic examination of a frozen-section specimen. In the case of tumour invasion, the procedure was converted to an abdominoperineal resection (APR). If no invasion