

# Analysis of rectal injuries resulting from laparoscopic peritoneal vaginoplasty (Luohu operation)

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## Summary

**Objective:** To explore the causes of rectal injuries during laparoscopic peritoneal vaginoplasty (Luohu operation) and assess measures that can be taken to increase safety of the operation. **Materials and Methods:** Data of patients with rectal injuries that occurred during Luohu vaginoplasty were analyzed retrospectively. **Results:** Three hundred and six patients received Luohu vaginoplasty. Rectal injuries occurred in 13 patients (4.2%). All patients recovered after intraoperative repair or postoperative rectovaginal fistula repair, performed within three to six months. Full display of the anatomical structures at the bottom of the pelvic cavity and successful construction of the vaginal tunnel are the two most important requirements for reducing the risk of rectal injury in laparoscopic vaginoplasty. In repair of fistulae postoperatively, it is important that resection of tissues or scars around the fistulae be avoided in order to reduce the chance of a injuries caused by diverting colostomy or colostomy closure. **Conclusion:** Laparoscopic vaginoplasty is a generally safe procedure, but rectal injury can occur. Retaining the tissues or scars around the rectovaginal fistula can be successfully repaired, either when they are recognized during the operation or within a few months postoperatively.

**Key words:** Laparoscope; Peritoneal vaginoplasty (Luohu operation); Rectal injury; Rectovaginal.

## Introduction

Artificial vaginoplasty is widely used in treating congenital aplasia of the uterus and upper part of the vagina, also known as Mayer-Rokitansky-Küster-Hauser (MRKH) syndrome. About 0.15 million women in China reportedly have the MRKH syndrome. Fortunately, increasing numbers of hospitals and clinicians now can provide vaginoplasty. Several methods are used for artificial vaginoplasty, including vaginal reconstruction with sigmoid colon or ileum, which have provided satisfactory results and are widely accepted by patients and clinicians [1]. Laparoscopic peritoneal vaginoplasty (Luohu's operation) has the advantages of other laparoscopic operations, and it provides a fully exposed surgical field, maintains a relatively stable environment in the pelvic cavity, reduces the risk of pelvic and abdominal adhesions, provides cosmetically acceptable abdominal incisions, and helps alleviate patients' psychological stress [2].

The authors performed Luohu vaginoplasty in 306 patients (150 Luohu operation I and 156 Luohu operation II) between November 2001 and October 2012. Rectal injuries occurred in 13 of the patients. They have now analyzed their experience with the operations and considered preventive measures that might increase their safety.

## Materials and Methods

### General information

All the patients were unmarried. Their mean age was  $24.5 \pm 3.2$  SD years. No abnormalities were found with preoperative gynecologic examinations, and all the patients had normally developed external genitalia. The vaginal vestibules were 0.5-2.5 cm deep. Ultrasonic examination did not reveal ovarian tumors in all patients, but rudimentary uterus was found in 296 patients and infantile uterus in ten patients. The chromosome karyotype of all patients was 46XX.

### Operation

The bowel was prepped for three days prior to the operation, and oral intestinal antibiotics were prescribed. Patients took a no-residue diet the day before the operation and fasted during the last 12 hours. They were given a cleansing enema the night before and the morning of the operation. The operation was carried out under intravenous anesthesia with endotracheal intubation, and with patients in head-low hip-high lithotomy position. Luohu operation II was performed from January 2008. Ten-mm trocars were inserted through an umbilical site and through an incision at McBurney's point; a third trocar (five-mm) was inserted through an incision in the left lower abdomen. The pelvic cavity was explored carefully for evaluation of the rudimentary uterus, connective tissue cords, bilateral ovaries and oviducts, relaxation of the perineum, and location of the anterior rectal wall (in order to define the extent and location of the bladder rectum lacunae).

Revised manuscript accepted for publication January 19, 2015

### *Luohu operation I*

For this operation, the authors designed a peritoneal push rod, 55 cm long and 1.8 cm in diameter, with a 30° angle between its head (1.8 cm) and body. A hole ten-cm away from the rod's end allowed the insertion of a metal stick, ten-cm long and 0.5 cm in diameter, for help in manipulating the rod and keeping its head upwards. The operation was laparoscopically assisted. An epidural needle for administration of block anesthesia was inserted through the middle of the vaginal vestibule to the bladder rectum lacunae until the needle point could be seen, but the peritoneum remained intact. Two hundred milliliters of physiologic saline solution, containing six units of pituitrin and 0.1 ml of epinephrine, were injected to form a water cushion at the pelvic peritoneum. The needle was withdrawn slowly during the injection to make sure the tissues for formation of a vaginal tunnel were filled with the solution. A pair of large, curved pliers were inserted through the hole into the vaginal vestibule to divide the gap between the bladder and rectum. The gap was further detached digitally to form a vaginal tunnel, with two- to three-finger capacity and extension beyond the pelvic peritoneum. The peritoneum at the end of the vaginal tunnel was detached completely.

The laparoscope was inserted through the trocar located at McBurney's point. The trocar at the umbilical site was withdrawn, the incision was extended to 18 cm, and the peritoneal push rod was inserted through the incision into the abdominal cavity. The push rod was manipulated through the vaginal tunnel in order to push the pelvic peritoneum at the bladder rectum lacunae toward the opening of the tunnel at the vaginal vestibule through the vaginal tunnel. The peritoneum at the end of the push rod and the mucosa at the outer side of the vaginal tunnel were sutured with 3/0 absorbable line. A cruciate incision was made on the peritoneum, and the push rod was withdrawn through the tunnel to form the vaginal introitus. Purse-string sutures of synthetic thread (size 1) were placed along the rudimentary uterus, pelvic peritoneum, and anterior rectal wall to form the upper end of the vagina. The bottom of the pelvis was closed. A condom filled with vaseline gauze was placed in the vaginal tunnel to help form the vagina, and the bilateral labia minora was sutured sufficiently to prevent the condom from slipping out.

### *Luohu operation II*

Laparoscope-assisted examinations were performed as in the Luohu operation I. A puncture needle (size 22, without needle core) for epidural anesthesia was inserted through the gap between the bladder and rectum toward the peritoneum beyond the fiber cord. Two hundred milliliters of physiologic saline solution, containing six units of pituitrin and 0.1 ml of epinephrine, were injected to form a water cushion until the peritoneum became thin, white, and bulging toward the pelvic cavity. The needle was withdrawn slowly during the injection to ensure that the gap was filled with the solution. A pair of medium-sized, curved pliers were inserted through the vaginal vestibule mucosa to divide the gap between the bladder and rectum, forming a vaginal tunnel of two- to three-finger capacity and extending beyond the pelvic peritoneum. A suction flusher was used to help guide formation of the vaginal tunnel from the pelvic peritoneum posterior to the fiber cord to the peritoneum at the vaginal vestibule. A mould (size 1), 2.2 cm in diameter, was inserted through the tunnel to push the bladder upward and form a bulge of the peritoneum. The peritoneum and tissues at the bottom of the pelvic cavity at the end of the mould were incised to create a tunnel connecting the vaginal vestibule and the abdominal cavity. Another mould (size 2-6), 2.5 to 3.5 cm in diameter, was used to gradually dilate the tunnel. The peritoneum was pushed through the tunnel and treated as described in the Luohu operation I.

## **Results**

### *Rectal injuries*

Thirteen patients incurred rectal injuries related to the operations. Eleven had a single perforation in the anterior rectal wall, one had two lesions in the anterior wall, and one had damage in the anterior rectal wall outside the pelvic peritoneum and inside the abdomen cavity. The perforations detected in the anterior rectal wall during the operation were of two to five cm; those discovered later were of 0.5 to 2.5 cm. All the patients were treated successfully. In one patient, the laparoscopic procedure was converted to a laparotomy, and a sigmoid colon vaginoplasty was performed. One patient received immediate repair, but a rectovaginal fistula was found seven days later; she recovered after a laparoscope-assisted ileal vaginoplasty was performed. Seven patients recovered after immediate repair followed by Luohu vaginoplasty. Three patients, who also received immediate repair, then Luohu vaginoplasty, developed rectovaginal fistulae, requiring repair a half year later. The patient with two rectal injuries (one inside the abdomen cavity and one outside), had laparoscope-assisted repair of the upper fistula and repair of the lower fistula through the vagina.

### *Treatments for rectal injuries diagnosed during the vaginoplasty*

If rectovaginal fistula was identified during the operation, the fistula was fully exposed and digitally pushed up from the anus (for larger fistula, an Allis clamp was used to stretch the edge of the fistula). The rectal wall around the fistula was sutured with intermittent sutures, leaving the rectal mucosa intact. Another intermittent, inverting embedding suture was placed to reinforce the first layer of the sutures. The levator ani muscle around the vagina was stretched with an Allis clamp, and the closure was reinforced by the placement of additional interrupted mattress sutures. The edge of the peritoneum at the bottom of the pelvic cavity was stretched downward and anastomosed with vestibular mucosa to cover the vaginal wall. Postoperatively, the patients were asked to take a no-residue diet for five to seven days and to scrub the perineum twice daily; antibiotics for five to seven days were prescribed. Several days after the operation, the vaginal tunnel was expanded (by means of digital manipulation rather than with the use of the mould).

### *Treatments for rectal injuries diagnosed after the vaginoplasty*

Some patients noticed leakage of gas or stool from vagina soon after the operation, suggesting the existence of rectal injuries. However, the fistulae could not be fixed immediately because of inflammation and edema, so they were repaired three to six months later. After vaginoplasty, the patients took a low-residue diet for ten days to reduce the

volume of stool. Intestinal anti-inflammatory agents were administered orally, and the patients were asked to rinse the vaginal tunnel with Iodophor (0.1%) one to two times/day and scrub the perineum. Endoscopic examination of the vaginal tunnel was strictly limited in order to avoid expansion of the fistula. In preparation for the reparative operation, the patients took low-residual food for three days, then a liquid diet the day before the operation. Intestinal antibiotics were administered for three days before the operation. The vaginal tunnel was rinsed once every day for three days, and a cleansing enema was given the night before and on the morning of the operation.

For the operation, the patients were placed in the lithotomy position and given lumbar or sacral anesthesia. The fistula on the posterior wall of the vaginal tunnel was fully exposed. The surgeon pushed the fistula up with his index finger through the anus. Dilute epinephrine solvent was injected into the vaginal mucosa around the fistula to form a cushion, which helped divide the tissues and reduce bleeding. With a sickle-shaped surgical blade, a circular incision 0.5 cm from the fistula was made into the fascial layer. The edge of the incision was pulled up with tissue forceps, and the mucosa and tissues of the rectal wall around the fistula were outward divided for about two cm with the sickle-shaped surgical blade. The vaginal mucosa was also inward divided, for about two mm. The scars at the edge of the fistula were not resected. Purse-string sutures (size 1 suture silk) were placed along the edge of the fistula, with the rectal mucosa remaining intact. For fistula larger than two cm, interrupted mattress sutures also were placed. To reinforce the first layer of the closure, interrupted embedding sutures (size 1 suture silk) were placed on the submucosal connective tissues. The vaginal mucosa was sutured with absorbable thread (0/3), and an Iodophor-soaked gauze roll was placed in the vaginal tunnel. The patients were asked to take a no-residue diet for five to seven days and to scrub the perineum twice daily. Antibiotics for five to seven days were prescribed. Several days later, the vaginal tunnel was expanded (by means of digital manipulation rather than with the mould).

## Discussion

Laparoscopic peritoneal vaginoplasty (Luohu operation) has become a widely used treatment for congenital aplasia of the vagina and uterus (MRKH syndrome). The procedure has several advantages over the modified laparoscopic Vecchietti vaginoplasty [3]: it is not restricted by length of the sigmoid colon or mesenteric vessels, it does not cause organ damage; unlike sigmoid colon vaginoplasty, it does not have the smell of intestinal secretions, it is not restricted by the development of vestibular mucosa or the position of the urethral orifice, and it does not have complications, such as recurrent urinary tract infections. However, other complications, such as

rectal injury, may be associated with the laparoscopic peritoneal operation. In this series, rectal injury occurred in 13 of 306 (4.2%) patients during the formation of the vaginal tunnel. Rectal injury with laparoscopic peritoneal vaginoplasty usually occurs below the peritoneal reflection. In the present series, the injury was located below the reflection in 12 patients and both above and below the reflection in one patient. Treatment for rectal injuries below the peritoneal reflection may include colostomy, repair of rectal fistula, presacral open drainage, and rinsing of the distal rectum. Colostomy can help prevent infection, presacral drainage can reduce the risk of abscess in the gap around the rectum, and rinsing the distal rectum can minimize contamination with stool and the abnormal migration of intestinal flora. However, Cleary *et al.* [4] have reported that patients with small rectal injuries and mild contamination, who were treated with immediate primary repair of the fistula, did not have increased rates of disability rate and mortality. In another study, Levine *et al.* [5] retrospectively analyzed data from 30 patients with rectal injuries located below the peritoneal reflection. They concluded that colostomy is not indicated for patients who do not have injury to main organs, those with OIS score lower than II, and those who have been treated within eight hours after the injury; these patients can be treated with primary repair. Gonzalez *et al.* [6] have reported that patients do not benefit from presacral drainage or distal rectum rinse.

Repair of rectovaginal fistulae is very difficult due to their anatomic characteristics. Failure of the primary operation increases the difficulty of the second operation, and failure of the second operation reduces the success rate of the third operation to about 55% [7-9]. Thus, the present authors believe that it is important that the primary operation be successful. Reconstruction of the anterior rectal wall to restore the "high pressure area" in the rectum and anal canal is critical in the repair of rectovaginal fistulae. In the authors' operations, they found that tissues around the fistulae were very weak, so they removed only necrotic adjacent tissues; normal tissue was not detached. Also, in order to maintain good blood supply to the tissues and reduce the tension on them, they did not resect scars. In contrast to intestinal fistula, which can cause general peritonitis or even death, rectovaginal fistulae, which are not located in the abdomen cavity, usually do not cause serious systemic consequences. Thus, the authors did not construct colostomies in any of their patients. One advantage of avoiding colonoscopy is that patients do not have the risk of injury or morbidity associated with diverting colostomy or colostomy closure.

Pushing the peritoneum down is critical in laparoscopic peritoneal vaginoplasty. The pelvic peritoneum at the bladder rectum lacunae is commonly chosen to minimize the injury caused by the procedure. Surgeons must be very careful to avoid pushing the anterior rectal wall down along with the

peritoneum; thus, the rectal wall must be identified clearly before the peritoneum is resected. In the present authors' operations, the peritoneum generally appears thin and off-white, whereas if the rectal wall is also pushed down, the tissues below the head of the push rod are thicker and light red. If pushing the anterior rectal wall down cannot be avoided, the peritoneum above the head of the push rod should be resected and sutured, and the anus should be examined after the operation in order to avoid suturing the rectal wall together with the vestibular tunnel entrance mucosa. The entire operation must be carried out with laparoscopic assistance and the surgeon should frequently touch the devices (such as the end of the suction tube), which have been inserted by the assistants through the trocar, and guide the detaching and expansion of the gap between the bladder and rectum in order to fully divide the peritoneum at the bottom of pelvic cavity.

Luohu vaginoplasty is a relatively uncomplicated procedure, but other methods of vaginoplasty are available if the Luohu operation fails. Clear display of the anatomical structures at the bottom of the pelvic cavity and successful construction of the vaginal tunnel are the two most important requirements for reducing the risk of rectal injury during vaginoplasty. Rectovaginal fistulae should be repaired during the operation if they are recognized; if not recognized until later, they should be repaired within three to six months if possible. Tissues around the fistula should not be detached, and the scars should not be resected in order to avoid injuries that might require colostomy.

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