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# Modified Transvaginal-Assisted Single-Incision Laparoscopic Radical Surgery for Rectal Cancer in Women



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## Introduction

At present, the treatment effect of laparoscopic radical operation for rectal cancer with multi hole method (usually five holes) has been accepted and widely practiced in the world. Under the premise of ensuring the radical operation of laparoscopic rectal cancer, for more invasiveness, surgeons have been trying various new attempts, including single incision laparoscopic surgery, hole reduction laparoscopic surgery, natural orifice transluminal endoscopic surgery (NOTES) [1], natural orifice specimen extraction surgery (NOSES) [2], robot surgery [3] and so on. Among them, the single incision laparoscopic for rectal cancer radical operation requires only a small incision in the abdomen (usually the umbilicus). The laparoscopic lens, holding forceps, and ultrasonic scalpel are put into the abdominal cavity with a round port for the operation, which can bring about such advantages as small incision, less postoperative pain, and cosmetic result. However, in the same time it also brings about a lot of troubles as follow: first, the "chopsticks effect".

The three instruments are close to each other in the same direction, causing mutual interference during operation and loss of the operation triangle, and hence resulting in difficult operation. Second, it is difficult to expose the operation region during operation. In the multi hole operation, there are two levels in the exposure for the right hand (usually the ultrasonic knife) of the operator: one is the exposure in the adjacent area for the ultrasonic knife, which is usually completed by the surgical assistant cooperation, which we call "area exposure". The other is the exposure close to the ultrasonic knife, which is usually completed by the left hand of the operator through

the holding clamp, combined with the ultrasonic knife, which we call it "closer exposure". In the single incision laparoscopic rectal cancer surgery, because of no assistant cooperation and no area exposure, the intraoperative exposure is more difficult. Third, poor effect of drainage. At present, as to the drainage of single incision laparoscopic rectal cancer surgery, some place a drainage tube through the umbilical incision, while some others make a small incision to place a drainage tube, both of which are not good choices. In order to restore the triangle in operation and the two levels in exposure, some use suture to pass through the mesorectum and then pass through the abdominal wall to pull the rectum [4]. Some use magnet, at one end, a small clip is used to clamp the rectum and at the other end, a magnet is placed [5]. At the same time, a magnet is put on the abdominal wall to realize the pulls in different directions outside the abdominal wall by means of magnetic force. But these methods have not been widely used because of their poor effect.

NOSES (natural orifice specimen extraction surgery) technology is a new technology which is recently developed in China and applied to laparoscopic rectal cancer surgery. It is an abdominal non-incision surgery, after which the intra-abdominal operative procedures are performed with laparoscopic instruments, Da Vinci robot, TEM or soft endoscopy equipment, then extract the specimen through the natural orifice (rectum, vagina, mouth). The difference between NOSES and the conventional laparoscopic operation is that the specimen is taken out through the natural orifice, avoiding the auxiliary incision in the abdominal wall to take out the specimen, and only

a few tiny scars in the abdominal wall are left after the operation. At present, the organs in which operation can be undergone include colon and the rectum, stomach, small intestine, liver, gallbladder, pancreas and spleen, urinary and gynecological tumors. Its advantages are obvious. First of all, the pain of patients after operation is significantly reduced due to the lack of an incision. Secondly, problems such as incision infection, incision hernia, incision tumor implantation, and metastasis can be avoided. Thirdly, it can result in good cosmetic effect to patients, especially women and those special professionals such as actors and athletes.

NOSES has been standardized in China, and a domestic and international alliance has been established, including experts from the United States, Russia, Europe, Japan, and South Korea. An international consensus of NOSES [6] has been published in Gastroenterology Report in January 2019. In addition, the monograph of NOSES, namely "Natural Orifice Specimen Extraction Surgery - Abdominal Pelvic Tumor", has been published in different languages in English, Russian, Japanese and Korean. As a member of the international NOSE Alliance, I have applied NOSES in more than 100 cases of patients with rectal cancer. Nearly half of the patients are women. After the removal of tumor, we cut the posterior vault of the vagina to take out the specimen and then sew it up on the premise of aseptic and tumor free operation.

In order to solve the difficulties in the operation of single hole laparoscopic rectal cancer in female patients, enlightened by NOSES, we make a small incision in the posterior vault of vagina, and then a trocar is placed. Meanwhile, an assistant is standing between the two legs of the patient, using a pair of holding forceps to cooperate with the operator, resulting in less "chopsticks effect" and restored operation triangle. What's

more, the exposure of the two levels is restored too, which makes the operation convenient. In some cases, we can take specimen from the posterior vault of the vagina to facilitate NOSES. In this way, the operation of laparoscopic rectal cancer operation becomes more convenient and easy to master. We have successfully completed more than 30 cases since 2015 by means of NOSES. Compared with the conventional laparoscopic surgery, no significant differences and complications in vaginal incision but less postoperative pain and faster recovery are found [7]. Therefore, we believe that it may be a good choice to apply transvaginal-assisted single-incision laparoscopic radical surgery for rectal cancer in women.

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