Original Article

# Application Progress Of Auxiliary Incision Based On Open Laparoscopy In The Treatment Of Colorectal Cancer

**Yuhao Qiu[1], Dahong Zhang[1] , Feng pi[1], Zhengqiang Wei[1]**

（1the First Affiliated Hospital of Chongqing Medical University, Chongqing, PR China）

Corresponding Author:Zhengqiang Wei, MD, Professor, Department of Gastrointestinal Surgery, the First Affiliated Hospital of Chongqing Medical University, No.1 You-yi Road, Yu-zhong District, Chongqing 400016, PR China.E-mail:384535713@qq.com

**DOI:** 10.47750/pnr.2023.14.02.256

## Abstract

The incidence of colorectal cancer is constantly increasing. With the improvement of residents' health need and the continuous development of surgery, more and more patients with colorectal cancer have a history of abdominal surgery. Complex abdominal adhesions put forward higher requirements for surgeons. The use of Veress puncture needle to establish pneumoperitoneum in laparoscopic-assisted colorectal cancer surgery leads to an increased incidence of puncture side injury.Open laparoscopy is an effective method to reduce puncture damages, but there are still some limitations. Combined with the fact that most laparoscopic assisted colorectal cancer operations require auxiliary incisions, advance incision seems to be a reasonable solution. Its application is not limited to patients with previous surgical history, but also can be routinely applied to all patients with colorectal cancer. Its efficacy and safety need to be verified by further clinical studies.

**Keywords:** colorectal cancer;robotic surgery;advance incision; auxiliary incision; laparoscopic colorectal resection; open laparoscopy.

## Introduction

Preface: Colorectal Cancer is one of the major diseases threatening human health. According to the latest data of the International Agency for Research on Cancer (IARC), there are about 1.8 million new cases of colorectal cancer worldwide every year, accounting for 10% of the incidence of cancer. At the same time, the death cases of colorectal cancer were about 694,000, accounting for 9.2% of the tumor mortality, ranking the second among all tumors [1]. The incidence and mortality of colorectal cancer in China have

increased compared with the previous period [2].At present, the incidence of colorectal cancer in China ranks the fourth among malignant tumors, with about 370,000 new cases per year, ranking the fourth among cancers with the highest mortality rate and about 180,000 deaths per year. The incidence is higher in men than in women and the age of onset is younger, with age (<60 years) accounting for about 30%.

Surgery is still the preferred treatment for non-metastatic colorectal cancer [3]. Jacobs first reported laparoscopic right hemicolectomy in 1991 [4]. Subsequently, the surgical method was gradually changed from traditional open surgery to laparoscopic surgery. However, with the improvement of residents' health need, surgical operations are increasingly popular, and more and more colorectal cancer patients have a history of previous abdominal operations, which undoubtedly increases the difficulty of laparoscopic surgery [5]. Therefore, some people try to use open laparoscopy technique to reduce puncture damages [6].

At the same time, because of the need to take out specimens, laparoscopic surgery for colorectal cancer requires auxiliary incisions, except for natural orifice specimen extraction surgery (NOSES) [7] and abdominoperineal radical operation of rectal cancer (Miles).

## 1.Application of open laparoscopy in laparoscopic surgery for colorectal cancer

In 1971, Hasson et al. [8] created open laparoscopy, which is mainly used for patients with abdominal surgery history and a clear history of peritonitis. The purpose is to prevent visceral injury caused by the adhesion between the viscera and the abdominal wall, which caused by using the Veress puncture needle to establish pneumoperitoneum or the subsequent first puncture hole [9, 10]. Open laparoscopy is also increasingly used in laparoscopic colorectal cancer surgery. Some researches have shown that the incidence of visceral and vascular injuries in the establishment of pneumoperitoneum with open method is lower than that with closed method [11]. However, the study of Dunne N et al. also showed that there was no significant difference in the incidence of complications between the use of the Veress puncture needle and the open method to establish pneumoperitoneum [12].

## 2.Application of open laparoscopy in robot-assisted laparoscopic surgery for colorectal cancer

In 2002, Weber PA et al. [13] reported that the robotic surgery system assisted colon surgery for benign diseases. Pigazzi A et al.[14]reported for the first time the Da Vinci robot-assisted anterior abdominal rectomy in 2006. Da Vinci robot surgery in colorectal cancer surgery has the advantages of wider vision, better visual perception, more flexible manipulator to improve operability [14]. Nagtegaal et al. [15] reported that robot surgery has better integrity when resecting the mesorectum, and the dissection of lymph node tissue is more thorough. But robot surgery is still laparoscopic surgery in essence. When building the robot system, it still can't solve the injury caused by abdominal adhesion and puncturing. Meanwhile, due to the lack of tactile feedback, there is the possibility of tissue damage caused by pulling

when handling complex adhesion [16]. There is still a lack of relevant research on whether there is a difference in safety and feasibility between the application of open laparoscopy in robotic laparoscopic surgery and laparoscopic surgery.

## 3. The emergence of laparoendoscopic single-site surgery has increased the practicability of open laparoscopy

Laparoscopic single-site surgery (LESS) was first performed in the department of gynecology. In 1969, Wheeless used one channel for tubal sterilization, and achieved the first LESS [17]. It provides a new idea for open laparoscopy based on the principle of single-site surgical operation. That is, before establishing other trocar holes, the abdominal condition can be observed and the abdominal adhesion can be separated through the incision of open laparoscopy and using the single-hole laparoscopic technique [18,19]. Through this method, for patients with complex abdominal adhesions, abdominal adhesions can be separated as much as possible before puncturing the trocar hole. This can almost avoid the occurrence of puncture injury and greatly improve the safety of the operation. The study of Okamoto H et al. [18] showed that there was no significant difference in feasibility, effectiveness and safety of single-hole laparoscopic separation of intestinal obstruction adhesion compared with traditional surgery,which demonstrated the safety of this surgical approach.

## 4. Application of extending the incision of open laparoscopy to make the auxiliary incision

The majority of open The majority of open laparoscopy choose the observation hole as the approach. For right hemicolectomy, the incision can be extended as an auxiliary incision to take out the specimen and complete the anastomosis [20]. However, for laparoscopic left hemicolon or rectal surgery, the incision position can not meet the needs of anastomosis. In view of this situation, the use of intraabdominal anastomosis[21] seems to be a solution, but it requires a high level of surgeon.

## 5.Application of the advance incision

Considering the advantages of open laparoscopy and the common characteristics of different auxiliary incisions for colorectal cancer surgery, the advance incision is a recommended surgical method. The advance incision can be regarded as the combination of open laparoscopy and auxiliary incision. That is, before using the endoscope system to puncture the observation hole Trocar, make an advance incision at the site where the auxiliary incision is to be made. The length of the incision was adjusted according to the tumor size as assessed by preoperative examination. Through the advance incision, the adhesion can be separated with the help of single-site laparoscopic technique before puncture the Trocar hole. Traditional auxiliary incisions are often performed before taking out specimens or anastomosis. The advance incision is the first step in surgery, and its existence runs through the whole process of surgery. It can be used as a unique large channel to achieve operations that cannot be completed by traditional laparoscopic surgery through advance incision. For example, for obese patients, traditional laparoscopic

surgery has difficulty in exposing the surgical field [22, 23]. The existence of advance incision allows us to place large gauze to block the small intestine during surgery to help expose the surgical field.

At the same time, for robot surgery, the advance incision also has unique advantages. Due to the large volume of the robot system, the operation of the assistant is limited to a certain extent [24]. But because of the existence of the advance incision, the assistant can achieve two-handed operation through the advance incision, which greatly increases the operability of the assistant. In robot-assisted colorectal surgery, because the process of making auxiliary incision requires repeatedly moving and building the robot system [25], which increases the surgical steps and prolongs the operation time [26, 27]. Through advance incision, the assistant can easily realize the process of specimen removal and placement of proximal stapler anvil, which greatly improves the convenience of robot surgery. At the same time, due to the difficulty of evacuation of the robot system, it is often impossible to open the abdomen rapidly in case of emergency conversion to open surgery, such as massive bleeding. The existence of advance incision enables the operator to achieve rapid hemostasis through this channel. The application of advance incision is not limited to patients with previous surgical history, but also can be routinely applied to all patients with colorectal cancer to improve the operability of surgery. However, there is still a lack of clinical research related to advance incision.

## 5.conclusion

To sum up, there are more and more patients with colorectal cancer who have a history of abdominal surgery. Complicated abdominal adhesions put forward higher requirements for surgeons. Compared with the establishment of pneumoperitoneum with Veress puncture needle, open laparoscopy is an effective method to reduce the puncture side injury, but there are still some limitations. Combined with the current situation that most laparoscopic assisted colorectal cancer surgery requires auxiliary incision, the advance incision seems to be a reasonable solution. However, its effectiveness and safety need further clinical research to verify.

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