https://doi.org/10.31925/farmacia.2023.5.22 **ORIGINAL ARTICLE**

RISK FACTORS FOR POSTOPERATIVE INCISIONAL INFECTION AND ANTI-INFECTIVE EFFECTS OF JEFUYIN DECOCTION IN PATIENTS WITH COLORECTAL CANCER

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Abstract

To investigate the risk factors for postoperative incision infection in colorectal cancer surgery patients, a study was conducted in which 240 patients were included. Study participants were randomly divided into two groups. According to doctor's advice, patients in the control group received routine treatment and care, while patients in the experimental group received traditional Chinese medicine fumigation with Jefuyin decoction. Incision infection rates in patients in the two groups were compared. In addition, enrolled patients were divided into infection group and non-infection group according to the occurrence of postoperative incision infection. Risk factors attributed to infection included diabetes, a history of abdominal surgery, preoperative radiotherapy and chemotherapy, and the presence of a stoma, while subcutaneous drainage was a protective factor. Study results show that patients treated with Jefuyin Decoction had a shorter recovery time, showing that its clinical use is promising for preventing incision infections.

Rezumat

Pentru a evalua factorii de risc asociați infecției postoperatorii a inciziei la pacienții operați de cancer colorectal, a fost realizat un studiu în care au fost incluse 240 de persoane. Participanții la studiu au fost împărțiți în mod aleator în două grupuri. Pacienții din grupul control au primit tratament și îngrijire de rutină, în timp ce pacienții din grupul experimental au primit fumigații din medicina tradițională chineză cu decoct de Jefuyin. Au fost comparate ratele de infecție ale inciziei la pacienții din cele două grupuri. Factorii de risc asociați infecției au inclus diabetul, istoricul de chirurgie abdominală, radioterapie și chimioterapie preoperatorie sau prezența unei stome. Rezultatele studiului au arătat că pacienții tratați cu decoct de Jefuyin au avut un timp de recuperare mai scurt, demonstrând că utilizarea sa clinică este promițătoare pentru a preveni astfel de infecții.

Keywords: colorectal cancer; incision infection; risk factors; traditional Chinese medicine fumigation

Introduction

Currently, colorectal cancer (CRC) is a clinically common malignancy of the gastrointestinal tract [1]. The prevalence and mortality of CRC are the third highest among all malignant tumours world-wide. With the improvement of people's quality of life (QOL) over the years and the change in dietary structure, the incidence and mortality of CRC have been increasing rapidly in recent years, especially in urban areas. In China, the prevalence of CRC is higher in the economically developed southeastern coastal regions than in other regions [2]. Currently, the main clinical treatment for CRC is surgical tumour resection. Other adjuvant measures are also used [3]. As the number of surgeries increases, patients' own conditions become more complex, which causes great difficulty in performing surgery. In addition, the incidence of incisional infections is increasing. There are multiple and complex factors of post-operative incision infection in patients, such as their own condition, operation time, incision length and type of surgery. Once the incision becomes infected, the surgical wound pain will worsen, the surgical healing will be delayed, and the cost of hospitalization will increase. In addition, the patient's medical experience will obviously be worse, and even medical disputes will arise [4]. Therefore, every surgeon must actively explore how to reduce the incidence of incision infection in order to achieve faster and better recovery of patients after surgery.

Over the past 12 years, the incidence of incisional infections in China has ranged from 0.2% to 33%, with an average of 4.5%. However, there is an increasing trend in recent years. After internal fixation of fractures, the incidence of incision infection reaches as high as 9.7%. At present, the domestic and foreign prevention of incision infection is usually carried out by preoperative, intraoperative and postoperative interventions, such as preoperative Jefuyin decoction, general adjustment, preventive use of antibiotics, strict intraoperative aseptic operation, and use of appropriate surgical methods and incisions [5]. There are studies on postoperative antibiotic use, observation of dressing changes and nutritional support. However, there are no reports of traditional Chinese medicine fumigation as a preoperative intervention [6]. Traditional Chinese medicine fumigation has been used in clinical practice for a long time and has achieved excellent efficacy. In the biography of Bianquecanggong in the Records of the Historian, the statement was recorded that the disease occurred in dermatoglyphic and could be cured by medicinal hot compress. In addition, the historical event that hot medicinal compress therapy was partially performed and the agents of eight minus were mixed, boiled and then alternately compressed on two lateral thoraxes to cure the cadaverous syncope of Crown Prince Guo was described [7]. In Qian Jin Yao Fang, Simiao Sun recorded that Empress Dowager Liu suffered a stroke so that she couldn't speak, and Yinzong Xu treated the disease with fumigation therapy using a large dose of milkvetch root divaricate saposhnikovia root soup. In modern Chinese medicine, fumigation therapy is often used for dermatoses, rheumatism, post-operative external injuries and health care. However, there are few studies on the prevention of incisional infection by fumigation therapy [8]. Based on the warm heat effect of fumigation, fumigation of traditional Chinese medicine can have a sustained antibacterial effect after transdermal absorption. In addition, it can reduce the use of antibiotics, antibiotic resistance and the use of chlorine disinfectant. Fumigation of Traditional Chinese Medicine is more environmentally friendly, safer and has significant clinical application values.

The study compared and analysed the conditions of patients with and without postoperative incision infection. The risk factors for postoperative incision infection were investigated. In addition, the effects of fumigation therapy with Jefuyin Decoction on the incision infection rate were discussed to evaluate the efficacy and safety in reducing the postoperative infection rate in patients. The aim of the research was to provide a safe, economical and effective traditional Chinese medicine external treatment method to reduce the postoperative incision infection rate, hospital length of stay and hospital cost, improve therapeutic effects, optimise patient experience and reduce medical disputes.

Materials and Methods

Research objects

A total of 240 with colorectal cancer treated in Liuyang Traditional Chinese Medicine Hospital, China between January 2020 and June 2022 were randomly included in the study. They were randomly divided into the control group (120 cases) and the experimental group (120 cases). This study had been approved by ethics committee of Liuyang Traditional Chinese Medicine Hospital, China.

Inclusion criteria: Patients who decided to receive surgical treatment after diagnosis; Patients and their family members who had signed informed consent forms and volunteered to participate in the research; Both male and female patients aged between 18 and 70.

Exclusion criteria: Patients with infectious and open wounds on Jefuyin Decoction; Patients with serious cardiovascular and cerebrovascular diseases, liver and kidney diseases, and blood system diseases; Patients with allergic constitution and febrile diseases; Patients with severe diabetes; Female patients during pregnancy, lactation, and menstrual period; Patients with mental disorders; Patients without undergoing surgical treatment after the inclusion; Patients without receiving treatment after the inclusion according to the established treatment protocol; Patients without any assessable postoperative records.

Intervention methods

Based on routine treatment and nursing, the patients in the experimental group were treated with traditional Chinese medicine fumigator. According to the doctor's advice, the patients in the control group were performed with routine treatment and nursing and treated with fumigation by warm boiled water 1 day before the surgery. The fumigation lasted for 20 minutes each time with the temperature ranging between 45°C and 50°C. The patients in the experimental group received fumigation treatment with Jefuyin Decoction from specialist nurses 1 day before the surgery. Both routine treatment and nursing and warm boiled water fumigation were also performed on the patients in the experimental group. Room temperature was kept at about 23°C to 25°C. Besides, doors and windows were closed and a folding screen was used to block patients' private body parts. During the treatment of the patients in the experimental group, 50 g dense fruit pittany root-bark (*Dictamnus dasycarpus*, *Rutaceae*, *Dictamnus*), 50 g amur cork-tree (*Phellodendron amurense*, *Rutaceae*, Phellodendron), 50 g atractylodes rhizome (*Atractylodes macrocephala*, *Asteraceae*, *Atractylodes*), 50 g argy wormwood leaf (*Artemisia argyi*, *Asteraceae*, *Artemisia*), 50 g agastache rugosa (*Pogostemon cablin*, *Lamiaceae*, *Pogostemon*), 50 g light yellow sophora root (*Sophora tonkinensis*, *Fabaceae*, *Sophora*), and 5 g sandalwood (*Santalum album*, *Santalaceae*, *Santalum*) were soaked for 30 minutes and then added with 3,000 mL water. After

that, it was boiled with strong fire for 15 minutes and then boiled with mild fire for 30 minutes. Next, the residue was filtered and the juice was kept. Then, 5 g borneol (Hubei Guangji Pharmaceutical Co., Ltd., China) was added and the medicine juice was fumigated in an intelligent fumigator (Shanghai Zhenkang Medical Technology Co., Ltd., China). All the Chinese medicinal materials used in this study were all purchased from Guangji Pharmacy (Hubei Guangji Pharmaceutical Co., Ltd., China).

Assessment criteria for postoperative incision infection

Based on Diagnostic Criteria for Nosocomial Infection (trial) issued by the Ministry of Health of the People's Republic of China in 2001, incision infection was assessed with the following methods. The Jefuyin Decoction and subcutaneous tissues at patients' incision sites were evaluated by the attending doctor every day, which was carried out immediately after the surgery and came to the end before discharge.

Superficial surgical incision infection: the infection occurred within 30 days after the surgery. In terms of clinical diagnosis, patients were diagnosed with incision infection if they met one of the following conditions: redness, swelling, fever, and pain appeared on the surface of patients' incisions. Alternatively, purulent substances were secreted at surgical incisions. Superficial incision infection was diagnosed by clinical doctors. As to etiological diagnosis, bacterial culture was positive based on clinical diagnosis. It was noted that the following symptoms were not included in the category of incision infection: wounds caused by unexpected injuries, mild inflammatory reaction or a small amount of secretion in style sutured during the surgery, incision fat liquefaction with clear liquid.

Deep surgical incision infection refers to the infections related to incision or deep incision soft tissues occurring within 30 days after implant-free surgery and within 1 year after implant surgery. As for clinical diagnosis, patients who met the above rules and suffered from one of the following symptoms were diagnosed with incision infection: during incision drainage, pus appeared or pus was extracted when deep incision puncture was performed (except for postoperative infectious drainage liquid), purulent secretion appeared at the incisions opened by surgeons or those rupturing spontaneously. Alternatively, patients got fever and local incision pain or tenderness occurred. After a second surgery, histopathological examination, or imaging examination, there were abscesses or other signs of infection deep in incisions. Deep incision infection was diagnosed by clinical doctors. As for etiological diagnosis, bacterial culture of secretion was positive.

Observation indexes

According to Diagnostic Criteria for Nosocomial Infection (trial), all included patients were divided into the infection group and non-infected group. The clinical data of the patients in the two groups during the perioperative period were compared. Besides, the following items were selected and analysed, including age, gender, body mass index (BMI), whether patients suffered from diabetes or hypertension, whether patients had histories of smoking, abdominal surgery, and preoperative radiotherapy and chemotherapy, preoperative blood serum albumin level, haemoglobin (Hb) level, whether intestinal obstruction or perforation occurred, American Society of Anaesthesiologists (ASA) scores, surgical sites, surgical methods, whether organ resection was carried out, operation opportunity, whether surgical stoma occurred, whether subcutaneous drainage was performed, operation time, intraoperative blood loss, whether intraoperative blood transfusion occurred, and postoperative pathological detection of tumour staging. The correlation between various factors and incision infection at surgical sites was observed. One-factor analysis was used to confirm the risk factors of incision infection for the further multi-factor Logistic regression analysis. Analysed indexes were: (A) General clinical data included age, gender and BMI; (B) Preoperative clinical data included whether patients suffered from diabetes and hypertension and had a history of smoking, abdominal surgery and preoperative radiotherapy and chemotherapy, preoperative blood serum albumin level, preoperative Hb level, and whether preoperative intestinal obstruction and perforation occurred; (C) Intraoperative clinical data included ASA scores, surgical sites, surgical methods (laparotomy or operative laparoscopy), whether organ resection was performed, operation opportunity (limited operation or emergency surgery), whether surgical stoma occurred, whether subcutaneous drainage was indwelled, operation time, intraoperative blood loss, and whether blood transfusion was carried out during the perioperative period; (D) Postoperative clinical data included tumour staging; and (E) Surface floras of underarm Jefuyin Decoction were selected for bacteriological culture before and after the fumigation and the 3rd day after the surgery. Besides, the types of infected bacteria were summarized and the incision infection rate and average duration of hospital stay between the patients in the experimental group and the control group were compared.

Classification criteria

Grouping criteria for BMI. According to the obesity criteria for Asian people, the included patients were divided into a BMI $\geq$ 25 kg/m^2 group and a BMI < 25 kg/m^2 group.

Grouping criteria for anaemia. Hb (haemoglobin) data of the last preoperative blood routine test for patients were recorded. The haemoglobin analysis was conducted using a haemoglobin analyser (Aikon Biotech Co., Ltd., China). According to the criteria for anaemia (Hb < 120 g/L for males and Hb < 110 g/L for females), whether patients suffered from anaemia was assessed.

Grouping criteria for preoperative albumin level. Blood serum albumin level of the last preoperative blood routine test for patients was recorded. The biochemical analysis was performed using an automatic biochemical analyser (Thermo Fisher Scientific, America). According to the diagnostic criteria for hypoproteinaemia (plasma-albumin level lower than 35 g/L), whether patients suffered from hypoproteinaemia was assessed.

Grouping criteria for ASA scores. According to the uniform criteria of ASA, patients were graded for anaesthesia tolerance [9].

Surgical methods and classification. CRC surgery mainly included transabdominal or laparoscopic anterior rectal resection, abdominoperineal combined rectal resection, exocytosis anastomosis for low rectal cancer, sigmoidectomy, left colon resection, right colon resection, and total/subtotal resection of large intestine. According to surgical sites, surgical methods were divided into the following treatment methods.

Rectum surgery (RS). RS included Hartmann surgery, abdominoperineal resection (APR), anterior rectum resection (including low rectal pull-out anastomosis), and partial rectosigmoid resection.

Left colon surgery (LCS). LCS included sigmoidectomy, left colon resection, other left colon resections, partial resection of transverse colon and subtotal/total resection of large intestine.

Right colon surgery (RCS). RCS included ileocecal excision, right colon resection, and other partial resections of right colon.

Grouping criteria for tumour node metastasis (TNM). According to American Clinical Guidelines for the Treatment of Rectal Cancer (the 8th edition in 2017) issued by American Joint Committee on Cancer (AJCC), tumour staging was performed [10].

Statistical methods

SPSS 22.0 software (IBM, USA) was adopted for data processing and analysis. Enumeration data were expressed as percentages (%) and measurement data were expressed as mean ± standard deviation ($x \pm s$). Differences between the two groups were compared using the t-test. A comparison of continuous indices between the two groups was performed by analysis of variance. In addition, the presence or absence of postoperative incisional infection was used as the dependent variable, while other clinical factors were used as independent variables. One-factor analysis and logistic regression multi-factor analysis were used in the research. A value of $p < 0.05$ indicated that the difference was statistically significant.

Results and Discussion

Basic clinical data

According to the inclusion and exclusion criteria, a total of 240 patients with CRC were finally included in the research, including 152 males and 88 females. They were aged between 36 and 78 an average BMI of 23.4 ± 4.7 kg/m^2. All included patients were randomly divided into the experimental group (120 cases) and the control group (120 cases). There were no statistical differences in gender, age at different stages, and the distribution of the number of people with different BMI values between the patients in the two groups ($p > 0.05$), as shown in Figure 1 below.

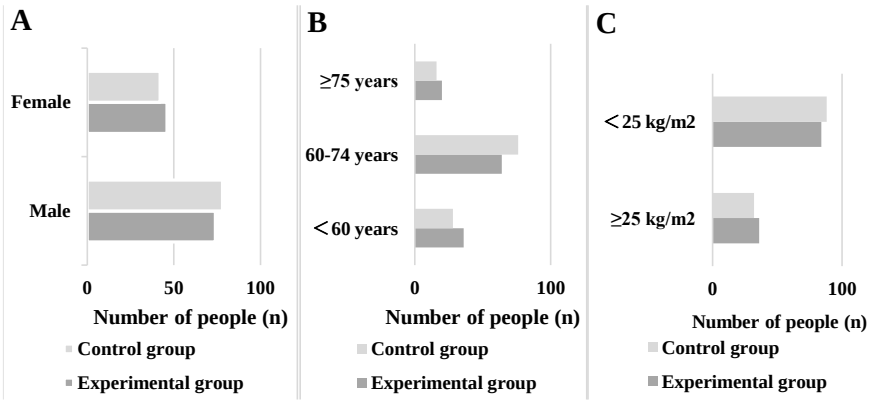

Figure 1

Basic data on patients (A. Gender. B. Age. C. BMI)

Preoperative clinical data

According to the examination results within 1 week after the surgery, a total of 6 patients suffered from incision infection in the experimental group, while there were 15 patients suffering from incision infection in the control group. In the two groups, there were a total of 21 patients with incision infection. To reduce the influences of other factors, 21 patients without incision infection were randomly selected for comparative analysis. According to the results, there were no significant differences in the distribution of the number of people with hypertension, anaemia, hypoproteinaemia and smoking history ($p > 0.05$). Fourteen patients in the infected group had diabetes mellitus,

which was significantly higher than 5 patients in the non-infected group ($p < 0.05$). Eleven patients with intestinal obstruction/perforation were significantly higher than 3 patients in the non-infected group ($p < 0.05$). Ten patients had a history of abdominal operation, which was significantly higher than 3 patients in the non-infected group ($p < 0.05$). Pre-operative chemoradiotherapy in 15 patients was significantly higher than that in the non-infected group in 6 patients ($p < 0.05$), as shown in Figure 2.

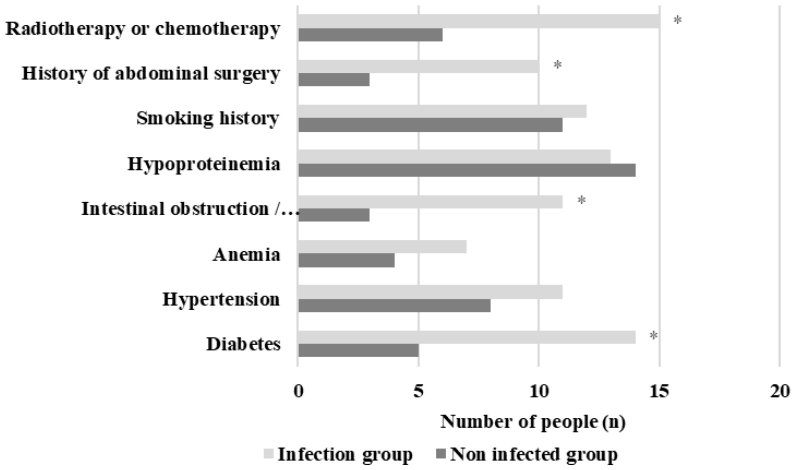

Figure 2

Comparison of preoperative clinical data

* $p < 0.05$ Compared with the non-infected group

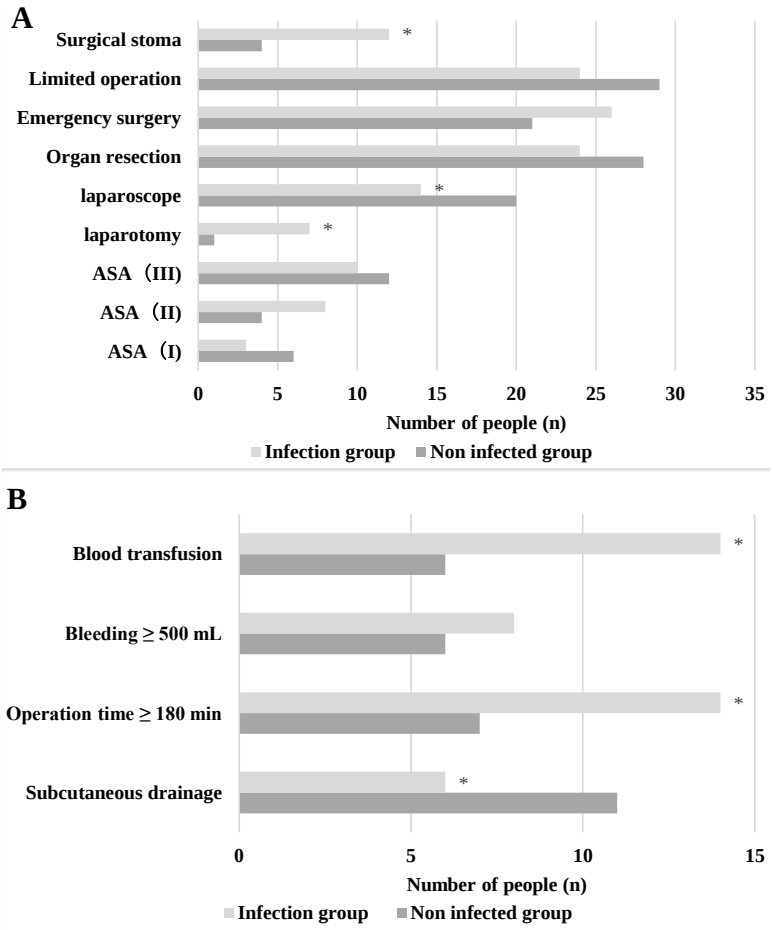

Figure 3

Comparison of intraoperative clinical data (A: ASA scores, laparotomy, laparoscope, organ resection, emergency surgery, limited operation, surgical stoma; B: blood transfusion, bleeding, operation time, subcutaneous drainage)

* $p < 0.05$ compared with the non-infected group

Intraoperative clinical data

According to the results of the analysis of intra-operative clinical data, there were no significant differences in the distribution of the number of people with ASA scores, organ resection, operation opportunity, intraoperative blood loss, and tumour staging ($p > 0.05$). In the infected group, 7 patients underwent open surgery, 14 patients underwent laparoscopic surgery, and in the non-infected group, 1 patient underwent open surgery and 20 patients underwent laparoscopic surgery ($p < 0.05$); There were 12 patients in the infected group and only 4 patients in the non-infected group ($p < 0.05$), as shown in Figure 3A. Regarding the incidence of subcutaneous drainage, there is a significant decrease in the incidence in the infected group (6 cases) compared with the non-infected group (11 cases) ($p < 0.05$). In the infected group, there is a significant increase in the patients with more than 180 minutes of operation time (14 patients) and with blood transfusion (14 patients) compared with those in the non-infected group (7 patients and respectively 6 patients) ($p < 0.05$) as shown in Figure 3B

Postoperative clinical data

After postoperative pathological examination, the statistical results showed that there were no differences in the distribution of the number of patients with various TNM stages between the two groups ($p > 0.05$) (Figure 4).

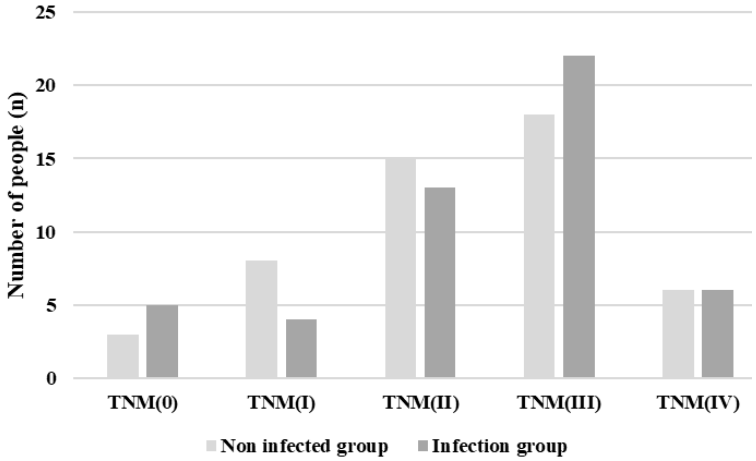

Figure. 4

Comparison of postoperative clinical data

Analysis of the risk factors of incision infection

According to the above comparison and analysis of the basic, preoperative, intraoperative and postoperative clinical data between the patients in the two groups, the differences in histories of diabetes, abdominal surgery, preoperative radiotherapy and chemotherapy, preoperative intestinal obstruction or perforation, operative laparoscopy methods, whether stoma was carried out, operation time, blood transfusion during perioperative period, and subcutaneous indwelling drainage between the two groups there was significant difference between the two groups ($p < 0.05$). The above items were the independent protective factors of postoperative incision infection ($p < 0.05$). Hence, these items were performed with Logistic multi-factor regression analysis. According to the results, histories of diabetes and abdominal surgery, preoperative radiotherapy and chemotherapy, and whether stoma was carried out were all the risk factors of post-operative incision infection ($p < 0.05$). Subcutaneous drainage was the independent protective factor of incision infection ($p < 0.05$) (Table I).

Table I

Results of Logistic multi-factor regression analysis

Influencing factors	β	S.E.	Wald	OR	P	95% confidence interval (CI)	
						Upper limit	Lower limit
History of diabetes	1.232	0.573	4.107	3.248	< 0.05	1.006	9.521
History of abdominal surgery	2.937	0.462	36.491	17.103	< 0.01	6.938	43.268
Preoperative radiotherapy and chemotherapy	1.893	0.831	4.584	6.995	< 0.01	1.204	40.891
Preoperative intestinal obstruction or perforation	-0.005	0.057	0.022	0.984	0.886	0.913	1.228
Surgical methods	0.221	0.557	0.073	1.192	0.548	0.392	4.583
Stoma	3.196	0.751	17.488	24.573	< 0.01	5.427	109.637
Subcutaneous drainage	-1.098	0.483	6.204	0.291	< 0.01	0.639	0.008
Operation time	0.205	0.592	0.039	1.086	0.726	3.173	0.952
Intraoperative blood transfusion	-0.596	0.749	0.872	0.505	0.474	2.094	0.287

Intervention effects of different surgical methods

Among all patients suffering from postoperative incision infection, there were 12 patients with *Escherichia coli*, 3 with *Klebsiella pneumoniae*, 7 with *Enterococcus faecalis*, 6 with *Enterococcus faecium*, 6 with *Staphylococcus aureus*, 8 with *Enterobacter cloacae*, 8 with *Pseudomonas aeruginosa*, 7 with *Fungus*, and 5 with other infectious symptoms (Figure 5). After fumigation intervention treatment with Jefuyin Decoction, the average course of disease of the included patients was 12.6 ± 4.3 days, which was significantly shortened than that of patients without fumigation intervention treatment with Jefuyin Decoction (16.5 ± 5.2 days) ($p < 0.05$) (Figure 6).

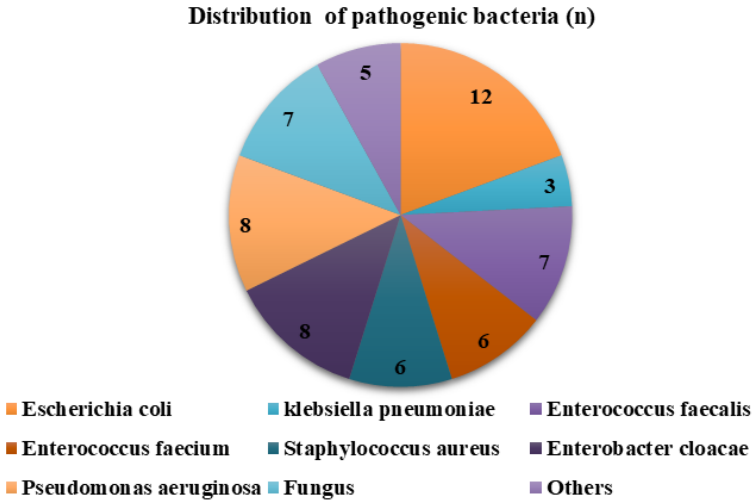

Figure 5

Distribution of infectious pathogenic bacterium

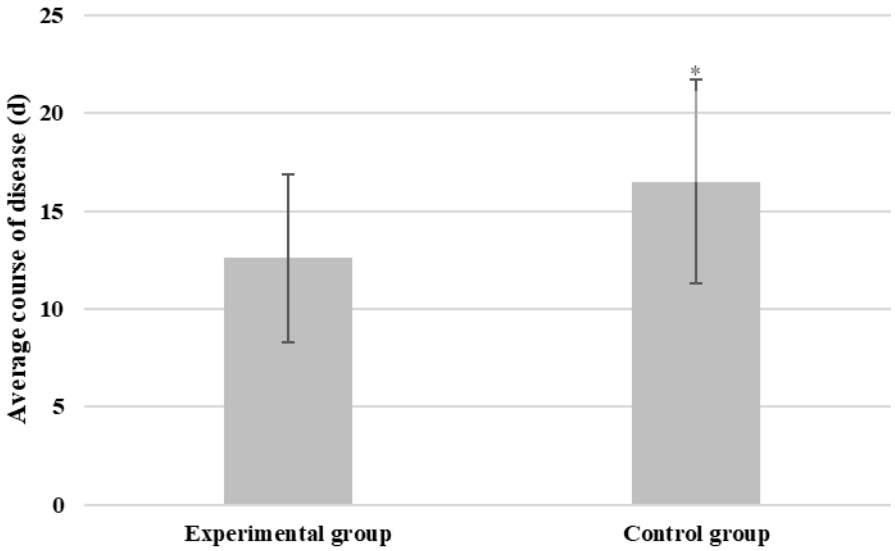

Figure 6.

Comparison of the duration of hospital stay between the two groups

* Compared with the experimental group, $p < 0.05$

Post-operative incision infections are very common in CRC. In recent years, the incidence of CRC has shown an increasing trend, and it occurs more frequently in young people in China. The main clinical treatment method for CRC is surgical treatment, which is combined with postoperative adjuvant chemotherapy to improve the therapeutic effect [11]. Incisions are usually infected after radical resection of CRC. The infection rate is much higher than that of conventional abdominal surgery. Therefore, postoperative incision infection is the focus of attention in the peri-operative period of CRC [12]. In clinical practice, it is found that daily dressing changes and debridement should be performed for patients with postoperative incision infection, which is time-consuming and laborious. This increases workload. Worse, severe infection can lead to systemic infection and shock. In addition, the length of hospital stay is prolonged, placing a greater economic burden on patients and their families. Traditional treatment requires patients'

wounds to be cleaned and dressed, which is very painful for them. Patients with intermediate and advanced incisional infections have to take a large number of chemotherapeutic drugs that inhibit cell proliferation at a later stage. Therefore, chemotherapy can't be given until the wounds have healed. Anti-infective treatment should be given before chemotherapy [13]. In this study, the risk factors for postoperative incision infection were analysed, and then fumigation intervention treatment was performed using Jefuyin Decoction to provide reference values for future postoperative incision healing and to prevent incision infection in CRC patients.

The research compared and analysed the differences in some indicators between patients with and without incisional infection. According to the results, there was statistical significance in the differences in history of diabetes and abdominal surgery, preoperative radiotherapy and chemotherapy, preoperative bowel obstruction or perforation, operative laparoscopy methods, whether stoma was created, subcutaneous indwelling drainage, operation time, and perioperative blood transfusion between patients in the two groups ($p < 0.05$). Logistic multifactorial regression analysis was then performed on the various indices listed above. According to the results, history of diabetes and abdominal surgery, preoperative radiotherapy and chemotherapy, and whether a stoma was created were all risk factors for postoperative incisional infection ($p < 0.05$). Tan *et al*. [14] showed in their study that the incision infection rate was remarkably high in diabetic patients undergoing CRC surgery ($p < 0.05$). According to an international study on abdominal autologous breast reconstruction, there was a risk of delayed postoperative wound healing in patients with a history of previous abdominal surgery [15]. Xie *et al*. [16] pointed out in their study that chemo-radiotherapy was the risk factor for postoperative lung infection. According to the meta-analysis of surgical site risk factors after CRC surgery, stoma was another risk factor for surgical site infection [17]. The results of the above studies were all consistent with the results of this study. Furthermore, sub-cutaneous drainage was shown to be the independent protective factor against postoperative incisional infection ($p < 0.05$). Many previous relevant studies have suggested that subcutaneous drainage is beneficial for postoperative wound healing [18-20].

In addition, some patients were treated with Jefuyin Decoction fumigation. The therapeutic effects on patients in the two groups were compared. It was found that post-operative infection was significantly less severe in the experimental group than in the control group. In addition, the course of the disease was significantly shortened ($p < 0.05$). Some foreign studies have used vancomycin and ceftriaxone solutions to prevent postoperative spinal infections. Bathing the implant in an antibiotic solution was shown to be an effective method of local prevention of deep infection during spinal surgery [21]. The result of a study on the use of saline rinsing of local antibiotics at incisions after open appendectomy for infection prevention showed that rinsing appeared to reduce the incidence of incisional infection ($p < 0.05$) [22], which was consistent with the research result. It was concluded that the fumigation intervention with homemade Jefuyin decoction could effectively prevent incisional infection and had clinical application values.

Conclusions

Multi-factor logistic regression analysis showed that a history of diabetes and abdominal surgery, pre-operative radiotherapy and chemotherapy, and whether a stoma was created were all risk factors for post-operative incisional infection. Subcutaneous drainage was the independent protective factor against post-operative incision infection. Postoperative fumigation with Jefuyin Decoction could effectively improve postoperative incisional infection and appeared to shorten the course of the disease. Because different surgeons made different diagnoses for incision infection, some research results may be biased to some extent. The research factors are limited because of the integrity of the clinical data. Follow-up studies should include more factors for more in-depth investigation. In general, a history of diabetes and abdominal surgery, preoperative radiotherapy and chemotherapy, and whether a stoma was created were all risk factors for postoperative incisional infection. Jefuyin decoction had effective anti-infection effects and prospects for clinical application.

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Conflict of interest

The authors declare no conflict of interest.

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