

# Retrospective Analysis of the Effect of Auricular Acupuncture on Pain and Gastrointestinal Motility Recovery After Laparoscopic Surgery for Colorectal Cancer

Xiaofan Li<sup>1</sup>, Ni Yang<sup>1</sup>, Lei Yu<sup>1</sup>, Lingzhi Nie<sup>1</sup>, Zhixin Xue<sup>2</sup>, Yansong Pu<sup>1</sup>, Min Wu<sup>3\*</sup>, Junyan Wang<sup>1\*</sup>

<sup>1</sup>Second Department of General Surgery, Shaanxi Provincial People's Hospital, Xi'an 710068, Shaanxi Province, China

<sup>2</sup>Department of Acupuncture and Moxibustion, Shaanxi Provincial People's Hospital, Xi'an 710068, Shaanxi Province, China

<sup>3</sup>Department of Scientific Research, Shaanxi Provincial People's Hospital, Xi'an 710068, Shaanxi Province, China

\*Corresponding authors: Min Wu, wumin175@126.com; Junyan Wang, Junyan1104@163.com

**Copyright:** © 2023 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

**Abstract:** *Objective:* To investigate the effect of auricular acupuncture on postoperative pain and gastrointestinal motility recovery after laparoscopic surgery for colorectal cancer. *Methods:* The clinical data of patients who underwent laparoscopic radical surgery for colorectal cancer in our hospital from April 2020 to December 2021 were collected. Based on the inclusion and exclusion criteria, 76 patients were included in the retrospective analysis. Depending on whether they received auricular acupuncture or not, the patients were divided into two groups: 46 patients in the experimental group (auricular acupuncture) and 30 patients in the control group. The differences between the two groups were analyzed. *Results:* The time to first flatus of the experimental group was significantly shorter than that of the control group ( $52.2 \pm 7.36$  h versus  $66.3 \pm 7.83$  h;  $P < 0.001$ ). Similarly, the time to first defecation of the experimental group was significantly shorter than that of the control group ( $76.3 \pm 7.76$  h versus  $86.1 \pm 10.79$  h;  $P < 0.001$ ). The time to first fluid intake of the auricular group was significantly shorter than that of the control group ( $90.4 \pm 8.92$  h versus  $107.3 \pm 9.66$  h,  $P < 0.001$ ). Compared with the control group, the experimental group scored significantly lower on the visual analogue scale on postoperative days 2 and 3 ( $P < 0.001$ ). *Conclusion:* Auricular acupuncture is an effective traditional Chinese medicine external treatment method. It can promote gastrointestinal motility recovery in patients after laparoscopic radical surgery for colorectal cancer and also reduce postoperative pain and discomfort. Furthermore, this therapy is easy to operate and well-accepted by patients. Therefore, it should be strongly promoted in clinical practice.

**Keywords:** Auricular acupuncture; Colorectal cancer; Laparoscopy; Pain; Postoperative gastrointestinal motility

**Online publication:** May 30, 2023

## 1. Introduction

Acupuncture, a traditional Chinese medicine therapy, has garnered widespread attention in research as a promising intervention for rapid postoperative recovery<sup>[1]</sup>. Postoperative pain is a crucial determinant of postoperative recovery, and studies have demonstrated that acupuncture can effectively alleviate pain and reduce the need for analgesics while mitigating the side effects of drugs<sup>[2]</sup>. In addition, acupuncture has shown potential in promoting the recovery of bowel function after surgery<sup>[3]</sup>, as evidenced by shorter bowel

transit times, reduced hospital stays, and lesser complications. Since postoperative patients often present with psychological issues, such as anxiety, depression, and sleep disturbances, acupuncture has emerged as a feasible solution to improving their emotional state and sleep quality while reducing related symptoms [4].

Auricular acupuncture, a form of acupuncture point therapy, is performed by applying pressure on precise areas of the ear to activate the body's nervous and meridian systems, thereby regulating bodily functions and treating illnesses. According to traditional Chinese medicine (TCM) theory, the ear acts as a reflex zone that corresponds to various parts and organs of the body, allowing stimulation of certain organs and parts through the application of pressure on the corresponding auricular points. The therapeutic technique of auricular acupuncture involves the use of specialized tools or fingers to apply pressure on auricular points, with targeted treatment that aligns with the patient's symptoms and constitution. This therapy is broadly utilized in managing a range of conditions, including headaches [5], insomnia [6], indigestion [7], depression [8], and smoking cessation [9]. Several studies have demonstrated the effectiveness of auricular acupuncture in mitigating pain [10] and alleviating symptoms like nausea, vomiting, and fatigue in cancer patients [11].

The efficacy of auricular acupuncture as a potential method for alleviating postoperative pain and promoting the recuperation of postoperative gastrointestinal motility in colorectal cancer remains undetermined. In order to address this gap in literature, we conducted a retrospective analysis of patient data from our hospital spanning between April 2020 and December 2021. Specifically, we compared the differences in postoperative outcomes between colorectal cancer patients who received auricular acupuncture and those who did not. The aim of this study was to evaluate the effect of auricular acupuncture on postoperative pain management and gastrointestinal motility recovery.

## **2. Data and methods**

### **2.1. Study population**

The clinical data of patients who underwent laparoscopic radical surgery for colorectal cancer in our hospital from April 2020 to December 2021 were collected, including gender, age, body mass index (BMI), whether neoadjuvant therapy was given, pathological stage of tumor, time of surgery, time to first defecation postoperatively, time to first flatus postoperatively, time to first fluid intake postoperatively, and postoperative days 1–5 visual analogue scale (VAS) score.

Inclusion criteria: (i) age 18–80; (ii) underwent laparoscopic radical surgery for colorectal cancer; (iii) first abdominal surgery; (iv) American Society of Anesthesiologists (ASA) class I–III.

Exclusion criteria: (i) combined organ resection or intermediate open surgery; (ii) those with stoma; (iii) severe cardiac, pulmonary, hepatic, or renal insufficiency; (iv) psychiatric disorders; (v) severe postoperative complications; (vi) second postoperative surgery; (vii) early inflammatory bowel obstruction; (viii) incomplete data, including the main observation indicators.

This study was reviewed by the ethical review committee of Shaanxi Provincial People's Hospital (2020R007), and the patients were informed of the details of the procedure.

### **2.2. Grouping and treatment methods**

Depending on whether they received auricular acupuncture or not, the patients were divided into two groups: the experimental (auricular acupuncture) group and the control group.

In the experimental group, auricular acupressure was performed using ear seeds. First, the corresponding auricular points (including the subcortex, shenmen, stomach, large intestine, small intestine, triple energizer, and sympathy) were located and cleaned with 75% ethanol or iodine swabs. Using forceps, vaccaria seeds were then placed on these points. The auricular points were pressed with light to heavy pressure until the sensations of heat, pain, swelling, numbness, and soreness appeared. Each acupoint was

pressed for 5 min each time and pressed again after an interval of 8 h. The intervention was stopped upon restoration of bowel movement after 5 days; other factors that caused abnormal bowel movement, such as early inflammatory bowel obstruction, were considered and excluded.

### 2.3. Efficacy observation indicators

The efficacy observation indicators of the patients were as follows: (i) time to first flatus and defecation postoperatively; (ii) time to first fluid intake postoperatively; (iii) VAS scores on postoperative days 1–5.

### 2.4. Statistical analysis

SPSS 23.0 was used for statistical analysis. Data including age, BMI, operation time, time to first flatus and defecation, and time to first fluid intake were in accordance with the normal distribution by Shapiro-Wilk test. These data were expressed as mean  $\pm$  standard deviation (SD). The differences in these data between the experimental group and the control group were compared using Student's *t*-test. The VAS scores that failed to conform to the normal distribution after normality test were expressed as medians (interquartile range), and Mann-Whitney U test was used to test the difference between the two groups. Count data including gender and whether neoadjuvant treatment was given were expressed by frequency, and the difference between the two groups was compared by chi-square ( $\chi^2$ ) test.  $P < 0.05$  indicated that the difference was statistically significant.

## 3. Results

### 3.1. General clinical data

A total of 76 patients (41 males and 35 females) were included in the study based on the inclusion and exclusion criteria. The experimental group consisted of 46 patients, while the control group consisted of 30 patients. The mean age of the patients was  $63.4 \pm 10.9$ . There were no significant differences between the two groups in their baseline characteristics: gender, age, BMI, whether neoadjuvant therapy was given, pathological stage of tumor, and duration of surgery (**Table 1**).

**Table 1.** Comparison of general clinical data of colorectal cancer patients between the two groups

Characteristic	Experimental group	Control group	<i>t</i> / $\chi^2$	<i>P</i>
Age (mean $\pm$ SD)	$61.7 \pm 10.9$	$66.1 \pm 10.6$	1.755	0.083
Gender (n, %)			0.00752	0.931
Female	21	14		
Male	25	16		
BMI (kg/m <sup>2</sup> ; mean $\pm$ SD)	$21.7 \pm 4.9$	$23 \pm 4.5$	1.181	0.241
Neoadjuvant therapy given			0.133	0.716
Yes	28	17		
No	18	13		
Tumor staging			0.217	0.897
I	16	9		
II	15	10		
III	15	11		
Duration of surgery	$2.99 \pm 1.04$	$3.1 \pm 0.83$	-0.475	0.637

### 3.2. Effect of auricular acupressure on gastrointestinal motility recovery

In order to determine the effect of auricular acupuncture on gastrointestinal motility recovery, we compared

the differences in terms of time to first flatus, time to first defecation, and time to first fluid intake after surgery between the experimental group and the control group (**Table 2**). The time to first flatus was significantly shorter in the auricular acupressure group than in the control group ( $52.2 \pm 7.36$  h versus  $66.3 \pm 7.83$  h;  $P < 0.001$ ). The time to first defecation ( $76.3 \pm 7.76$  h versus  $86.1 \pm 10.79$  h;  $P < 0.001$ ) and first fluid intake ( $90.4 \pm 8.92$  h versus  $107.3 \pm 9.66$  h;  $P < 0.001$ ) was also significantly shorter in the experimental group than in the control group. These results indicate that auricular acupuncture can markedly enhance the recovery of gastrointestinal motility and reduce the feeding time.

**Table 2.** Comparison of postoperative gastrointestinal motility recovery time between the two groups

	Gastrointestinal motility recovery time		
	Time to first flatus (h)	Time to first defecation (h)	Time to first fluid intake (h)
Experimental group	$52.2 \pm 7.36$	$76.3 \pm 7.76$	$90.4 \pm 8.92$
Control group	$66.3 \pm 7.83$	$86.1 \pm 10.79$	$107.3 \pm 9.66$
t	7.98	4.6	7.82
P	< 0.001	< 0.001	< 0.001

### 3.3. Effect of auricular acupressure on postoperative pain

We assessed the VAS scores from postoperative day 1 to day 5 (**Table 3**) and found that the experimental group had significantly lower VAS scores than the control group on postoperative days 2 and 3 ( $P < 0.001$ ), indicating that auricular acupuncture can substantially alleviate postoperative pain.

**Table 3.** Comparison of postoperative VAS scores between the two groups

	VAS score (median, interquartile range)				
	Day 1	Day 2	Day 3	Day 4	Day 5
Experimental group	8 (3)	4 (2)	4 (2)	4 (2)	3 (2)
Control group	8 (3)	6 (2)	6 (2)	4 (1)	3 (1)
U-value	559	173	161	603	605
P	0.159	< 0.001	< 0.001	0.339	0.351

## 4. Discussion

According to TCM theory, the ear has specific zones that reflect the organs in the body, which are known as auricular points. When a part of the body is ill, it often responds to the relevant auricular point. Thus, stimulating these points can prevent and cure diseases. Auricular acupressure is believed to regulate autonomic function by stimulating acupoints on the ear<sup>[12]</sup>. In the present study, we examined the effect of auricular acupressure on gastrointestinal recovery and pain following surgery for colorectal cancer. Based on TCM theory, auricular acupressure balances the sympathetic and parasympathetic nervous systems<sup>[13]</sup>, promotes gastrointestinal motility and digestive secretions<sup>[14]</sup>, inhibits visceral reflexes, increases pain threshold<sup>[15]</sup>, improves microcirculation, and promotes wound healing. We stimulated the following auricular points: subcortex, shenmen, stomach, large intestine, small intestine, triple energizer, and sympathy. Stimulating the subcortex acupoint regulates autonomic function and relieves pain<sup>[16]</sup>. Stimulating the shenmen acupoint promotes blood circulation, reduces inflammation, and relieves abdominal pain<sup>[17]</sup>. Stimulating the sympathy acupoint regulates sympathetic function, reduces anxiety, and alleviates pain. Stimulating the stomach, large intestine, and small intestine acupoints directly improves gastrointestinal recovery.

Postoperative pain affects sleep, bed activity, coughing, expectoration, and ultimately postoperative recovery. Multimodal postoperative analgesic management using intravenous analgesic pumps, nonsteroidal anti-inflammatory drugs (NSAIDs), epidural analgesia, peripheral nerve blocks, and incisional infiltration is currently advocated. Although analgesic pumps are used to relieve postoperative pain, they tend to cause significant gastrointestinal response and prolong postoperative gastrointestinal recovery. The use of NSAIDs, a simple and effective method, is currently recommended for the management of postoperative pain in colorectal cancer; however, literature has suggested an increased risk of anastomotic fistula [18,19]. It has been found that postoperative pain can be significantly reduced by targeting specific auricular points with analgesic and tranquilizing effects [20]. This finding coincides with the results of the present study. Our study showed that the pain experienced by the experimental group was relieved on postoperative days 2 and 3, suggesting that auricular acupuncture can effectively relieve postoperative pain.

Auricular acupuncture is a distinctive TCM method that is generally well-tolerated by patients. It is not only a safe and painless method that has minimal side effects and complications, but also a simple and convenient method that does not require specialized equipment or skills, as it can be self-administered with materials such as medicinal seeds. Moreover, it is an economical method that does not entail much cost or time. However, there are some precautions and contraindications to this method. For instance, the ears and fingers should be cleaned before use; moisture contact should be avoided during use; the medicinal seeds or other materials should be replaced promptly after use; and the intervention should be discontinued immediately in case of allergic reactions or other discomfort. Furthermore, it should be used cautiously or avoided in cases of skin infection or injury, pregnancy, and severe heart disease.

In conclusion, auricular acupuncture has a significant effect on pain and gastrointestinal motility recovery, especially in terms of time to first flatus and defecation after laparoscopic surgery for colorectal cancer. In addition to its low cost, it is safe and simple to operate. Moreover, it effectively promotes rapid postoperative rehabilitation of patients with colorectal cancer. Therefore, this method should be promoted in clinical practice.

## **Funding**

This study was supported by the Natural Science Foundation of Shaanxi Province (No. 2023-YBSF-086), Xi'an Science and Technology Plan Projects (No. 21YXYJ0091), Key Projects of Shaanxi Provincial Department of Education (No. 21JS041), and Shaanxi Provincial People's Hospital Science and Technology Talent Support Plan (No. 2022BJ-05).

## **Disclosure statement**

The authors declare no conflict of interest.

## **References**

- [1] Zhang W, Zhang H, Wang SM, et al., 2022, Perioperative Acupuncture Optimizes Surgical Outcomes: Theory, Clinical Practice and Future Perspectives. *Am J Chin Med*, 50(4): 961–978.
- [2] Usichenko TI, Henkel BJ, Klausenitz C, et al., 2022, Effectiveness of Acupuncture for Pain Control After Cesarean Delivery: A Randomized Clinical Trial. *JAMA Netw Open*, 5(2): e220517.
- [3] Yang WJ, Shao JK, Wang Y, et al., 2022, Effect of Acupuncture on Postoperative Ileus After Laparoscopic Elective Colorectal Surgery: A Prospective, Randomised, Controlled Trial. *E Clinical Medicine*, 49: 101472.
- [4] Yin X, Li W, Liang T, et al., 2022, Effect of Electroacupuncture on Insomnia in Patients with

- Depression: A Randomized Clinical Trial. *JAMA Netw Open*, 5(7): e2220563.
- [5] Chen Y, Liu B, Gong W, et al., 2020, Auricular Acupuncture for Migraine: A Protocol for Systematic Review and Meta-Analysis. *Medicine (Baltimore)*, 99(44): e23036.
- [6] Hoxtermann MD, Buner K, Haller H, et al., 2021, Efficacy and Safety of Auricular Acupuncture for the Treatment of Insomnia in Breast Cancer Survivors: A Randomized Controlled Trial. *Cancers (Basel)*, 13(16): 4082.
- [7] Zhou J, Li S, Wang Y, et al., 2017, Effects and Mechanisms of Auricular Electroacupuncture on Gastric Hypersensitivity in a Rodent Model of Functional Dyspepsia. *PLoS One*, 12(3): e0174568.
- [8] Gao J, Wu G, Zhao H, 2020, Auricular Acupuncture for Breast Cancer-Related Depression: A Protocol for Systematic Review and Meta-Analysis. *Medicine (Baltimore)*, 99(45): e22870.
- [9] Bier ID, Wilson J, Shakleton M, 2002, Auricular Acupuncture, Education, and Smoking Cessation: A Randomized, Sham-Controlled Trial. *Am J Public Health*, 92(10): 1642–1647.
- [10] Mao JJ, Liou KT, Baser RE, et al., 2021, Effectiveness of Electroacupuncture or Auricular Acupuncture Vs Usual Care for Chronic Musculoskeletal Pain Among Cancer Survivors: The PEACE Randomized Clinical Trial. *JAMA Oncol*, 7(5): 720–727.
- [11] Liu M, Sung L, Liao YS, et al., 2021, The Efficacy and Safety of Auricular Acupuncture Versus Electroacupuncture in Ameliorating Chemotherapy-Induced Nausea and Vomiting Among Patients Receiving Cisplatin-Based Regimens. *Medicine (Baltimore)*, 100(7): e24588.
- [12] Hou PW, Hsu HC, Lin YW, et al., 2015, The History, Mechanism, and Clinical Application of Auricular Therapy in Traditional Chinese Medicine. *Evid Based Complement Alternat Med*, 2015: 495684.
- [13] Kung YY, Yang CCH, Chiu JH, et al., 2011, The Relationship of Subjective Sleep Quality and Cardiac Autonomic Nervous System in Postmenopausal Women with Insomnia Under Auricular Acupressure. *Menopause*, 18(6): 638–645.
- [14] Tan Y, Zhao Y, He T, et al., 2016, Efficacy and Safety of Auricular Point Acupressure Treatment for Gastrointestinal Dysfunction After Laparoscopic Cholecystectomy: Study Protocol for a Randomized Controlled Trial. *Trials*, 17(1): 280.
- [15] Santoro A, Nori SL, Lorusso L, et al., 2015, Auricular Acupressure Can Modulate Pain Threshold. *Evid Based Complement Alternat Med*, 2015: 457390.
- [16] He BJ, Tong PJ, Li J, et al., 2013, Auricular Acupressure for Analgesia in Perioperative Period of Total Knee Arthroplasty. *Pain Med*, 14(10): 1608–1613.
- [17] Yeh M-L, Hung Y-L, Chen H-H, et al., 2013, Auricular Acupressure for Pain Relief in Adolescents with Dysmenorrhea: A Placebo-Controlled Study. *J Altern Complement Med*, 19(4): 313–318.
- [18] Haddad NN, Bruns BR, Enniss TM, 2017, Perioperative Use of Nonsteroidal Anti-Inflammatory Drugs and the Risk of Anastomotic Failure in Emergency General Surgery. *J Trauma Acute Care Surg*, 83(4): 657–661.
- [19] Kowalsky SJ, Zenati MS, Steve J, et al., 2018, Ketorolac Use May Increase Risk of Postoperative Pancreatic Fistula After Pancreaticoduodenectomy. *J Surg Res*, 221: 43–48.
- [20] Zhong Q, Wang D, Bai Y, et al., 2019, Effectiveness of Auricular Acupressure for Acute Postoperative Pain after Surgery: A Systematic Review and Meta-Analysis. *Chin J Integr Med*, 25(3): 225–232.

**Publisher's note**

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.