Qiu WQ, Jiang JY. Effect of acupoint injection of Neostigmine on gastrointestinal function after cholecystectomy. J Acupunct Tuina Sci, 2015, 13(6): 368-372
DOI: 10.1007/s11726-015-0884-0

Clinical Study

Effect of acupoint injection of Neostigmine on gastrointestinal function after cholecystectomy

穴位注射新斯的明对胆囊切除术后患者胃肠功能的影响

Qiu Wei-qing (邱卫清), Jiang Jun-yan (蒋俊燕)
Department of Hepatobiliary Surgery, Quzhou Hospital of Chinese Medicine, Zhejiang 324000, China

Abstract

Objective: To observe the effect of acupoint injection with Neostigmine Methylsulfate at Zusanli (ST 36) on gastrointestinal function of patients after laparoscopic cholecystectomy.

Methods: Totally 120 patients undergone laparoscopic cholecystectomy were randomized into an acupoint injection group, a muscular injection group, and a blank control group at 1:1:1 by random number table, 40 cases in each group. The blank control group was intervened by conventional post-operation treatment, the acupoint injection group was by acupoint injection with Neostigmine Methylsulfate 2 mL at bilateral Zusanli (ST 36) in addition to the treatment given to the blank control group, and the muscular injection group was by muscular injection with Neostigmine Methylsulfate 2 mL in addition to the treatment given to the blank control group. The two injection groups both received injection twice a day, totally for 3 d at most. The restored time of bowel sounds, initial flatulence time, defecation time and clinical efficacy were observed.

Results: After treatment, there were significant differences in comparing the restored time of bowel sounds among the three groups (F=17.30, P<0.05), the acupoint injection group and muscular injection group were significantly different from the blank control group (P<0.05), and there was a significant difference between the acupoint injection group and muscular injection group (P<0.05); there were significant differences in comparing the initial flatulence time among the three groups (F=19.12, P<0.05), and the acupoint injection group was significantly different from the muscular injection group and the blank control group (P<0.05); there were significant differences in comparing the initial defecation time among the three groups (χ^2=21.23, P<0.05), while the difference between the acupoint injection group and muscular injection group was statistically insignificant (P>0.05). The total effective rate was 87.5% in the acupoint injection group, versus 72.5% in the muscular injection group and 60.0% in the blank control group, and there were significant differences among the three groups (P<0.05).

Conclusion: Acupoint injection with Neostigmine Methylsulfate at Zusanli (ST 36) can shorten the restored time of bowel sounds and flatulence time in patients undergone laparoscopic cholecystectomy, and the efficacy is more significant compared to muscular injection with Neostigmine Methylsulfate.

Keywords: Acupoint Therapy; Hydro-acupuncture; Points, Zusanli (ST 36); Neostigmine; Laparoscopes; Cholecystectomy; Postoperative Complications

【摘要】目的：观察足三里穴位注射新斯的明对腹腔镜胆囊切术后患者胃肠功能的影响。**方法：**将 120 例腹腔镜胆囊切除术患者根据随机数字按照 1:1:1 比例分为穴位注射组、肌肉注射组及空白对照组，每组 40 例。空白对照组给予术后常规治疗，穴位注射组在常规治疗基础上加用双侧足三里穴位注射新斯的明注射液 2 mL，肌肉注射组在常规治疗基础上加用肌肉注射新斯的明注射液 2 mL。两组均每日治疗 2 次，最多治疗 3 d。观察三组患者术后肠鸣音恢复时间、肛门首次排气时间、排便时间及临床疗效。**结果：**治疗后，三组患者术后肠鸣音恢复时间比较，差异具有统计学意义(F=17.30, P<0.05)，穴位注射组、肌肉注射组与空白对照组差异均有统计学意义(P<0.05)，穴位注射组与肌肉注射组差异有统计学意义(P<0.05)；三组患者术后肛门首次排气时间比较，差异具有统计学意义(F=19.12, P<0.05)，穴位注射组与肌肉注射组及空白对照组差异具有统计学意义(P<0.05)；三组患者术后首次排便时间比较，三组差异具有统计学意义(χ^2=21.23, P<0.05)，穴位注射组与肌肉注射组差异无统计学意义(P>0.05)。穴位注射组总有效率为 87.5%，肌肉注射组为 72.5%，空白对照组有效率为 60.0%，三组总有效率差异具有统计学意义(P<0.05)。**结论：**足三里穴位注射新斯的明能够缩短腹腔镜胆囊切除术患者术后肠鸣音恢复时间及肛门排气时间，其效果优于肌肉注射新斯的明。

【关键词】穴位疗法；水针；穴，足三里；新斯的明；腹腔镜；胆囊切除术；手术后并发症
【中图分类号】R245.9　　**【文献标志码】**A

Author: Qiu Wei-qing, bachelor, vice chief nurse.
E-mail: qiuwq1972@sina.com

Laparoscopic cholecystectomy (LC) has gradually become the first choice in operations for diseases of biliary tract, but, the post-operative complications such as gastrointestinal disfunction, majorly presenting abdominal distension, abdominal pain, prolonged flatulence, have severely affected the recovery[1-2]. Therefore, it's of great significance to adopt effective methods to promote the recovery of gastrointestinal function and prevent the complications for patients undergone LC. Currently, modern medicine usually encourages patients to get off bed earlier to promote the recovery, but most patients can not follow this suggestion because of the pain. Based on traditional Chinese medicine theory, this study observed the effect of injection of Neostigmine Methylsulfate at Zusanli (ST 36) on the recovery of gastrointestinal function after LC. The report is given as follows.

1 Clinical Materials

1.1 Inclusion criteria

Patients undergone LC for biliary diseases including gallstone coupled with chronic cholecystitis, polyp of gallbladder, gallstone, acute attack of chronic cholecystitis coupled with gallstone; without a history of gastrointestinal dysfunction before LC; aged 20-70 years old, without a predilection for gender.

1.2 Exclusion criteria

Operation cost over 180 min or bleeding amount over 200 mL; coupled with diseases that may cause gastrointestinal dysfunction, such as diabetes and hypothyroidism; serious primary diseases involving cardiocerebrovascular system, liver, kidney, and hemotopoietic system.

1.3 Statistical method

The SPSS 17.0 was adopted for data analyses. According the data types, the measurement data were expressed as ($\bar{x}$ ±s), and the enumeration data were present as rate or composition ratio. When the measurement data followed normal distribution and homogeneity of variance, One-way ANOVA analysis would be adopted and the least significant difference (LSD) was used for between-group multiple comparisons; when the data didn't follow normal distribution or the homogeneity of variance, Kruskal-Wallis H test would be used, and the clinical efficacies were compared by using rank-sum test. $P<0.05$ indicated a statistical significance.

1.4 General data

Totally 120 patients undergone LC were recruited from Department of Hepatobiliary Surgery, Quzhou Hospital of Chinese Medicine between February 2014 and January 2015. SAS 9.0 software was used to generate 120 random numbers at a ratio of 1:1:1. The subjects were coded according to the random number and randomized into an acupoint injection group, a muscular injection group, and a blank control group, 40 cases in each group. In the acupoint injection group, patients were aged 26-68 years old, symptom duration lasted 2-28 d before operation, and operation duration lasted 44-121 min. In the muscular injection group, patients were aged 25-69 years, pre-operation symptoms lasted 3-32 d, and operation duration lasted 43-132 min. In the blank control group, patients were aged 25-67 years old, pre-operation symptoms lasted 2-28 d, and operation duration lasted 45-132 min. There were no significant between-group differences in comparing the general data (all $P>0.05$), indicating the comparability (Table 1).

Table 1. Comparison of general data

Group	n	Gender (case)		Average age ($\bar{x}$ ±s, year)	Symptom duration ($\bar{x}$ ±s, day)	Average operation duration ($\bar{x}$ ±s, minute)
		Male	Female			
Acupoint injection	40	18	22	43.2±5.8	11.5±2.3	54.33±16.78
Muscular injection	40	17	23	42.8±7.0	12.9±3.8	53.79±15.23
Blank control	40	19	21	43.3±5.0	12.1±2.5	54.02±15.71

2 Treatment Methods

2.1 Blank control group

Patients in the blank control group received ordinary post-operative interventions, including anti-inflammation, fluid replacement, analgesia, gastro-intestinal decompression, nutritional support, and conventional nursing care.

2.2 Acupoint injection group

In addition to the ordinary interventions given to the blank control, acupoint injection was used in this group.

Acupoint: Bilateral Zusanli (ST 36).

Medication: Neostigmine Methylsulfate injection produced by Henan Runhong Pharmaceutical Co., Ltd. (National Approbation No. H41022269).

Method: Acupoint injection was performed 2 h after the operation. When the patient was at a supine position, Zusanli (ST 36) was perpendicularly quickly inserted by using a disposable syringe with 2 mL (1 mg) Neostigmine Methylsulfate injection after standard sterilization. The needle was slowly pushed in and then applied with mild thrusting-lifting manipulations at a proper depth for obtaining needling sensation. The

solution was then injected into the point when there was no withdrawal blood, 1 mL for each point. The treatment was given twice a day, totally for 3 d at most. The treatment would be terminated if there was defecation during the study.

2.3 Muscular injection group

In addition to the interventions given to the blank control group, muscular injection was used in this group. Same dose of Neostigmine Methylsulfate injection as that for acupoint injection was used to muscular injection, twice a day, totally for 3 d at most. The treatment would be terminated if there was defecation during the study.

3 Observation of Therapeutic efficacy

3.1 Observation items

3.1.1 Restored time of bowel sounds

A specialist was in charge of the observation and recording when the patient was back to ward, including abdominal auscultation at upper left, lower left, upper right, and lower right zooms every 2 h. If bowel sounds were detected at two zooms, and the frequency was 3 times per minute or above, then the bowel sounds would be considered recovered, and the recovery time was recorded.

3.1.2 Initial flatulence and defecation time

The initial flatulence and defecation time was observed and recorded by the patient or the family members.

3.2 Criteria of therapeutic efficacy

The therapeutic efficacy in the recovery of gastrointestinal function was evaluated by using Rome Ⅱ Criteria[3].

Cured: Initial flatulence or defecation in 24 h after the operation, bowel sounds 3-5 times per minute, normal flatulence, defecation once per day, normal diet and body temperature, without abdominal distention.

Markedly effective: Initial flatulence or defecation in 48 h after the operation, bowel sounds 1-2 times each minute, normal flatulence, defecation once two days or irregular defecation, with slight abdominal distention.

Improved: Initial flatulence or defecation in 72 h after the operation, bowel sounds 0-2 times each minute, delayed flatulence, no defecation, liquid diet or no diet, bloating abdomen.

Invalid: No flatulence in 72 h after the operation, no bowel sounds, obvious abdominal distension, nausea, vomiting, and gastrointestinal decompression was necessary.

3.3 Treatment results

3.3.1 Gastrointestinal function

After treatment, there were significant between-group differences in comparing the restored time of bowel sounds ($F=17.30$, $P<0.05$). The restored time in the acupoint injection group was significantly different from those in the muscular injection group and blank control group ($P < 0.05$). There were significant between-group differences in comparing the initial flatulence time ($F = 19.12$, $P < 0.05$). The initial flatulence time of the acupoint injection group was significantly different from those of the muscular injection group and blank control group ($P<0.05$), and there was a significant difference between the muscular injection group and blank control group ($P<0.05$). For the comparison of initial defecation time, Kruskal-Wallis H test was used because of the abnormal distribution of the data, and the differences showed statistically significant ($\chi^2=21.23$, $P<0.05$). The initial defecation time of the acupoint injection group was insignificantly different from that of the muscular injection group ($P>0.05$), (Table 2).

3.3.2 Comparison of clinical efficacy

The total effective rate was 87.5% in the acupoint injection group, versus 72.5% in the muscular injection group and 60.0% in the blank control group, and there were significant between-group differences according to rank-sum test ($P<0.05$). Further analysis indicated that the total effective rate of the acupoint injection group was significantly different from those of the muscular injection group and blank control group ($P < 0.05$), and there was a significant difference between the muscular injection group and blank control group ($P<0.05$), indicating that the acupoint injection group can produce a more significant efficacy compared to the other two groups (Table 3).

Table 2. Comparison of restored time of bowel sounds, initial flatulence and defecation time ($\bar{x}$ ±s, hour)

Group	n	Restored time bowel sounds	Initial flatulence time	Anal defecation time
Acupoint injection	40	30.13±5.76[1)]	36.76±10.33[1)]	45.20±8.33[2)]
Muscular injection	40	39.92±6.43[2)]	45.52±9.82[2)]	49.42±11.46[2)]
Blank control	40	43.69±5.10	54.39±11.08	61.90±13.37

Note: Compared with the muscular injection group and blank control group, 1) $P<0.05$; compared with the blank control group, 2) $P<0.05$

Table 3. Comparison of clinical efficacy (case)

Group	*n*	Cured	Markedly effective	Improved	Invalid	Total effective rate (%)
Acupoint injection	40	5	14	16	5	87.5[1)]
Muscular injection	40	3	10	16	11	72.5[2)]
Blank control	40	1	6	17	16	60.0

Note: Compared with the muscular injection group and blank control group, 1) $P<0.05$; compared with the blank control group, 2) $P<0.05$

4 Discussion

LC has become a very popular microinvasive operation in China. Because it brings little damage and interference to internal organs and patients can recover quickly afterwards, LC has become the first operation choice for biliary tract diseases. However, the increased excitement of gastrointestinal sympathetic nerves, inhibited gastrointestinal function, and subsequent decreased gastrointestinal peristalsis and tension led by operation anesthesia, peritoneal stimulation, and traction during operation are possible to cause corresponding complications[4-8]. Therefore, it's of great significance to restore gastrointestinal function in promoting the post-operative recovery. The current common methods for restoring gastrointestinal function are majorly focused on symptoms, but usually receive little positive response, because gastrointestinal dysfunction is a complicated syndrome. Traditional Chinese medicine holds that operational damage and anesthesia may cause deficient essence and qi, damaged qi and blood in Zang-fu organs, blocked qi and blood circulation, irregular qi activities, dysfunction of the six Fu organs and gastrointestinal dysfunction lead to clear qi can't ascend and the turbid qi can't descend, and then consequently lead to abdominal distention, nausea and vomiting, and belching, etc. Therefore, gastrointestinal dysfunction should be treated by reinforcing the healthy qi and unblocking the Fu organs.

By combining acupuncture and medication, acupoint injection treats diseases through producing a triple effect of acupuncture, acupoint, and medication. As the He-Sea point of the Stomach Meridian of Foot Yangming and the lower He-Sea point of stomach, Zusanli (ST 36) was selected in this study, to tonify the middle jiao and supplement qi, promote blood circulation and unblock collaterals. It's found that Zusanli (ST 36) can produce a bilateral regulatory effect on gastrointestinal smooth muscles: it can enhance the movement of smooth muscles when the muscles are in loose state but inhibit the movement when the muscles are in tension[9-10]. Stimulating Zusanli (ST 36) after abdominal operation or chemotherapy can improve the function of Zang-fu organs, restore gastrointestinal peristalsis, promote the expelling of the accumulated gas from intestines, and recover the intestinal function[11-12]. Neostigmine Methylsulfate injection is an acetylcholinesterase inhibitor, and it can enhance the contraction of gastrointestinal smooth muscles and peristalsis by inhibiting the activities of acetylcholinesterase.

The study results have shown that acupoint injection with Neostigmine Methylsulfate at Zusanli (ST 36) promoted the recovery of gastrointestinal function after LC, produced a higher total effective rate compared to muscular injection with Neostigmine Methylsulfate, and shortened the restored time of bowel sounds and flatulence. Therefore, acupoint injection with Neostigmine Methylsulfate at Zusanli (ST 36) can be taken as an effective approach for the recovery of gastrointestinal function after LC.

Conflict of Interest

The authors declared that there was no conflict of interest in this article.

Statement of Informed Consent

Informed consent was obtained from all individual participants included in this study.

Received: 8 June 2015/Accepted: 30 June 2015

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Translator: Hong Jue (洪珏)

