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Electroacupuncture for ileus after laparoscopic colorectal surgery: a randomised sham-controlled study

Key Messages

1. Electroacupuncture at acupoints of Zusanli, Sanyinjiao, Hegu, and Zhigou is more effective than no acupuncture and sham acupuncture in stimulating early return of bowel function and reducing analgesic requirement after laparoscopic colorectal surgery.
2. Electroacupuncture is more effective than no acupuncture in reducing the duration of hospital stay.
3. Receipt of electroacupuncture is an independent predictor of shorter duration of ileus and hospital stay after laparoscopic colorectal surgery.

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Introduction

Ileus after colorectal surgery adversely influences patient recovery and prolongs hospital stay.[1] Laparoscopic colorectal surgery is associated with better short-term clinical outcomes (including more rapid return of gastrointestinal function) than open surgery.[2,3] Nonetheless, the duration of postoperative ileus (time to first bowel motion) can be up to 4 days after laparoscopic surgery and 5 days after open surgery. Further measures are warranted to enhance the gastrointestinal recovery and reduce the duration of hospital stay and hence costs.

Acupuncture is effective in managing postoperative nausea and vomiting and various functional gastrointestinal disorders.[4] Its role in treating postoperative ileus is less known. This randomised sham-controlled study aimed to evaluate the efficacy of electroacupuncture (EA) in reducing the duration of ileus and hospital stay after laparoscopic colorectal surgery.

Methods

This study was conducted from October 2008 to October 2010. The study protocol was approved by the Joint Chinese University of Hong Kong-New Territories East Cluster Clinical Research Ethics Committee. Consecutive patients aged >18 years who had the American Society of Anesthesiologists grading I to III and underwent elective laparoscopic resection of colonic and upper rectal cancer without the need of conversion were included. Patients who underwent laparoscopic resection of mid and low rectal cancer were excluded, as were those who underwent complex or combined laparoscopic procedures, had stomas created, developed intraoperative problems or complications, received epidural anaesthesia or analgesia, had a cardiac pacemaker, were allergic to acupuncture needles, or had received acupuncture previously.

A standard perioperative protocol (including preoperative mechanical bowel preparation) was followed. Laparoscopic surgeries were performed under general anaesthesia. After the surgery, patients were randomised to receive either EA (acupuncture and electrical current stimulation) or sham acupuncture (SA) by an experienced acupuncturist, or no acupuncture (NA). The patients randomised to the EA and SA groups underwent one session of treatment daily from day 1 to day 4, or till the time defaecation occurred, whichever was earlier. In the EA group, sterile acupuncture needles were inserted to a depth of 20 mm in the acupoints relevant to the treatment of abdominal distension and constipation, including Zusanli (stomach meridian ST-36), Sanyinjiao (spleen meridian SP-6), Hegu (large intestine meridian LI-4), and Zhigou (triple energiser meridian TE-6). Effective needling was indicated by a radiating sensation with paraesthesia known as *De Qi*. Electrical stimulation with a frequency of 100 Hz was then used. Each session of EA lasted for 20 minutes. In the SA group, shorter needles were placed 15 mm away from the acupoints at a shallower depth to avoid *De Qi*. Pseudostimulation was given by incorrectly connecting the output socket and thus no flow of electrical current. The postoperative management was standardised. Postoperative analgesia (pethidine 1 mg/kg) was given 4-hourly on demand. Early ambulation was encouraged. Oral feeding was resumed as early as possible. No gum chewing was allowed. Patients were discharged when they

tolerated diet and were fully ambulatory.

The primary outcome measure was the time to defaecation (number of hours after the end of laparoscopic surgery to the first observed passage of stool). The secondary outcome measures were the time to first passing of flatus, time elapsing till the patient tolerated solid diet, time till the patient walked independently, duration of hospital stay, visual analogue scale score for pain on the first 3 postoperative days, and receipt of postoperative analgesia. Data were recorded and measured by an independent research assistant according to the intention-to-treat principle. Two null hypotheses were tested using Student's *t*-test in a stepwise fashion. In the first, EA was hypothesised to be no more efficacious than NA in reducing the duration of postoperative ileus. In the second, EA was hypothesised to be no more efficacious than SA. Multivariate analysis with stepwise multiple linear regression was used to identify independent predictors of outcome. According to our previous randomised controlled trial on laparoscopic resection of rectosigmoid carcinoma, the mean time to first defaecation in the laparoscopic arm was 4 days, with a standard deviation of 1.7 days.[2] Assuming that the difference in mean time to first defaecation between the EA and NA groups is 1 day, a sample size of 55 patients in each group is needed to yield a power of 80% with a significance level of 0.025 (two pair-wise comparisons). Thus a sample size of about 165 patients is derived.

Results

Out of 208 patients, 43 were excluded after surgery for various reasons and 165 were randomised to receive either EA (n=55), SA (n=55), or NA (n=55). There was no withdrawal or drop-out, so all recruited patients were available for analysis. No adverse event related to the use of acupuncture was reported. The study groups were similar with respect to demographics, prevalence of underlying comorbidities, types of surgery performed, operation time, and operative blood loss (Table 1). There was no significant difference in the overall postoperative complication rates in the three study groups (P=0.318).

Compared to the NA group, the EA group had significantly shorter time to defaecation (P<0.001) and time to resume a normal solid diet (P=0.01) and earlier hospital discharge (Table 2). Compared to the SA group, the EA group also had significantly shorter time to defaecation (P=0.007). Other outcome measures including time to walk

Table 1. Baseline demographics of the three groups

Parameter	Electroacupuncture (n=55)	Sham acupuncture (n=55)	No acupuncture (n=55)
Mean±SD age (years)	67.4±9.7	67.4±10.7	68.5±10.6
No. of males/females	35/20	33/22	31/24
Mean±SD body mass index (kg/m^2)	22.8±2.9	22.9±3.4	23.4±3.1
American Society of Anesthesiologists grading (no. of patients)			
Grade I	17	14	11
Grade II	36	30	32
Grade III	2	11	12
No. (%) of patients with comorbidities	29 (52.7)	34 (61.8)	37 (67.3)
Types of surgery (no. of patients)			
Right hemicolectomy	15	12	17
Left hemicolectomy	12	12	10
Sigmoid colectomy	7	7	8
Anterior resection	21	24	20
Mean±SD operative time (minutes)	157.3±39.2	158.6±46.5	164.1±52.5
Median (range) blood loss (mL)	20 (0-200)	20 (0-200)	20 (0-600)
No. (%) of patients with complications	6 (10.9)	5 (9)	10 (18.2)

Table 2. Outcome measures in the three groups

Outcome (mean±SD)	Electroacupuncture (n=55)	Sham acupuncture (n=55)	No acupuncture (n=55)	P value (electroacupuncture vs no acupuncture) [Student's t-test]	P value (electroacupuncture vs sham acupuncture) [Student's t-test]
Time first passing flatus (days)	2.0±0.9	2.3±1.1	2.6±1.1	0.003	0.095
Time of first bowel motion (hours)	85.9±36.1	107.5±46.2	122.1±53.5	<0.001	0.007
Time to resume normal diet (days)	4.0±1.1	4.1±0.8	4.8±2.0	0.010	0.695
Time to walk independently (days)	2.8±1.5	3.3±1.1	3.8±1.8	0.001	0.028
Hospital stay (days)	6.5±2.2	6.8±1.7	8.5±4.8	0.007	0.491
Pain score					
Day 1	5.6±2.0	5.8±1.9	5.5±2.3	0.689	0.655
Day 2	3.2±1.6	4.6±2.0	4.2±2.0	0.004	<0.001
Day 3	2.1±1.2	3.4±2.2	3.2±1.8	<0.001	<0.001
Postoperative analgesic requirement (no. of injections of 50 mg pethidine)	2.7±2.3	5.2±4.7	5.0±4.5	0.001	0.001

independently, pain scores, and analgesic requirement were also significantly more favourable in the EA group. The duration of hospital stay, however, was similar in the EA and SA groups.

On multivariate analysis with stepwise multiple linear regression, the presence of complications was an independent predictor of longer time to defaecation (regression coefficient, 39.3; 95% CI, 18.8 to 59.7; P<0.001), whereas the use of EA predicted a shorter time to defaecation (regression coefficient, -27.8; 95% CI, -42.3 to -13.4; P<0.001). Independent predictors of shorter duration of hospital stay were absence of complications (P<0.001), the use of EA (P=0.002), and the use of SA (P=0.016).

Discussion

In the present study, EA was more effective than NA and SA in stimulating an early return of bowel function and reducing analgesic requirement after laparoscopic colorectal surgery. Furthermore, EA was an independent predictor of a shorter duration of postoperative ileus. On multivariate analysis, both EA and SA were independent predictors of shorter duration of hospitalisation, with EA being a stronger predictor. The EA and SA groups had similar length of hospital stay despite a shorter time to defaecation and ambulation in the EA group. The sample size and power of this study may not have been adequate to show significant differences between the EA and SA groups for all parameters.

This study had several limitations. First, the study population who underwent uncomplicated elective laparoscopic resection of colonic and upper rectal cancer constituted a highly selected group. Patients with mid and low rectal cancer or those undergoing complex or combined laparoscopic procedures were excluded. Complicated cases are more likely to develop prolonged ileus and morbidity after surgery, and it is uncertain whether EA could be effective in them. Second, a fast-track perioperative programme was not used,[5] as it was not the standard of care in our institution.[2] The combined effects of EA and fast-track programme on clinical outcomes after laparoscopic colorectal surgery warrant further research. Third, a cost-effectiveness analysis was not conducted to evaluate the economic impact of resorting to EA on the hospital system. Laparoscopic colorectal surgery is costly.[2] Further studies are needed to address whether faster recovery brought about by EA reduces the financial burden to the hospital/healthcare system.

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