

ARTICLE

The effect of transcutaneous electrical acupoint stimulation (TEAS) on gastrointestinal function and inflammatory response after endoscopic tumor resection

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Abstract

Objective: To explore the effect of transcutaneous electrical acupoint stimulation (TEAS) on gastrointestinal function and inflammatory response in patients undergoing endoscopic tumor resection, and to explore the mechanism of TEAS in organ protection. **Methods:** Ninety-two patients undergoing painless endoscopic tumor resection in our hospital were randomly divided into a TEAS control group and a TEAS treatment group. The incidence of SIRS, inflammatory factors, immunoglobulin, and the first anal exhaust time were evaluated before and 48 hours after surgery. SPSS statistical method was used to analyze the evaluation indexes of the two groups before and after treatment. **Results:** TEAS treatment significantly reduced the levels of IL-6 in peripheral blood 2 days after surgery, and increased the levels of IgG and IgM in peripheral blood 48 hours after surgery. There was no significant difference in the expression levels of TNF- α and IL-10 between the two groups. TEAS can promote the recovery of postoperative intestinal function, mainly in postoperative defecation, and shorten the recovery time of postoperative exhaust function and the length of hospital stay. Perioperative transcutaneous electrical acupoint stimulation can reduce the occurrence of postoperative complications. **Conclusion:** TEAS can improve gastrointestinal function, inhibit postoperative inflammatory response, promote the recovery of intestinal function, shorten the length of hospital stay, and inhibit the occurrence of postoperative complications after endoscopic tumor resection. This provides a new method and new concept for traditional Chinese medicine treatment of patients with gastrointestinal tumors after endoscopic resection.

Keywords: Transcutaneous electrical acupoint stimulation; Intestinal neoplasms; Comfort Endoscopy; Gas-

trointestinal function

1. Background

The value of acupuncture and moxibustion has been gradually recognized internationally. Some scholars have proposed that the therapeutic mechanism of acupuncture and moxibustion may be through the neural, endocrine and body fluid network mediated by the central nervous system, and then affect the target organs. Transcutaneous electrical acupoint stimulation can achieve the same effect as acupuncture [1] [2]. Endoscopic submucosal dissection (ESD) is a new treatment method in recent years, which avoids the pain of open surgery and organ resection. ESD mainly treats benign and malignant lesions of the lower gastrointestinal tract. The common symptoms were 1 pain 2 fever 3 nausea and vomiting 4 postoperative hiccups. This study mainly used transcutaneous electrical acupoint stimulation of Zusanli and other acupoints to observe the effect on inflammatory response and gastrointestinal function after endoscopic resection of gastrointestinal tumors, and compared with the conventional treatment group, to provide better curative effect for clinical treatment.

2. Methods

2.1 Materials and Methods

2.1.1 General Information

All cases were from the Department of Spleen and Stomach Diseases of Shouguang Hospital of Traditional Chinese Medicine. The patients were randomly divided into a control group and a TEAS treatment group by double-blind method, with 51 cases in each group. “Patients with unanticipated massive bleeding, significantly prolonged operative time, and other serious complications during treatment were excluded.”

Table 1 Comparison of basic data between the two groups of elderly patients undergoing painless gastrointestinal endoscopy

Group	Case number	Gender [example (%)]		Age($\bar{x}\pm s$)	American Society of Anesthesiologists classification [case (%)]		BMI (kg/m2, $\bar{x}\pm s$)
		Male	Female		I	II	
Control	51	31 (60.78)	20 (39.22)	49.63 $\pm$ 6.25	29 (56.86)	22 (43.14)	23.58 $\pm$ 2.12
TEAS treatment group	51	20 (39.22)	31 (60.78)	49.06 $\pm$ 6.93	30 (58.82)	21 (41.18)	23.59 $\pm$ 2.16
Statistics		$\chi^2=0.183$		$t=0.593$	$\chi^2=0.086$		$t=0.725$
P value		0.641		0.552	0.761		0.426

2.1.2 Statistical treatment

All data were statistically processed by SPSS19.0 software package, and all values were expressed as $\pm S$ (mean $\pm$ standard deviation). Chi square test was used for count data, and t test was used for measurement data

2.2 Treatment Methods

In this study, the subjects were randomly divided into a control group and a TEAS treatment group using a double-blind method. In the TEAS treatment group, TEAS was applied to Shangjuxu (ST 37) and Zusanli (ST 36) for 30 min each time, twice a day. The control group also adopted the method of patch, but the machine was not powered.

2.3 Measurement indicators

2.3.1 Biochemical indicators

Venous blood samples were collected 2 hours before operation and 48 hours after operation to determine the levels of interleukin, monocyte chemotactic protein, interleukin-10, immunoglobulin G and immunoglobulin M.

2.3.2 General items

The first postoperative exhaust and defecation time, recovery time of full-flow diet, hospitalization time, postoperative gastrointestinal symptoms, etc. were monitored and recorded on the first and third postoperative day. The common symptoms of patients in the two groups were counted on the 1st, 3rd and 5th day after operation. The common symptoms included fever, pain and hiccup after operation.

3. Results

3.1 Perioperative TEAS can inhibit the production of postoperative inflammatory factors

In order to explore the effect of perioperative TEAS on postoperative inflammation, the inflammatory indexes of venous blood 24 hours before and 48 hours after the operation showed that TEAS treatment could inhibit the levels of IL-6 and MCP-1 in peripheral blood 24 hours after the operation, and increase the levels of IgG and IgM in peripheral blood 1 day after the operation. However, there was no significant effect on the levels of TNF- α and IL-10.

Table 2 Effects of perioperative transcutaneous electrical acupoint stimulation on postoperative inflammation level in patients($\bar{x}\pm s$)

Group	Case number	Time	IL-6	TNF- α	IL-10	IgM	IgM
TEAS treatment group	51	T ₁	24.0 $\pm$ 5.3	8.99 $\pm$ 0.86	33.2 $\pm$ 4.3	1.26 $\pm$ 0.30	11.86 $\pm$ 0.32
		T ₂	37.4 $\pm$ 5.9	8.03 $\pm$ 0.56	39.3 $\pm$ 3.9	2. 22 $\pm$ 1.15	18.73 $\pm$ 0.12
Control	51	T ₁	23.9 $\pm$ 5.2	9.09 $\pm$ 1.16	32.8 $\pm$ 6.3	1.46 $\pm$ 0.23	12.86 $\pm$ 0.28
		T ₂	51.3 $\pm$ 6.2	9.02 $\pm$ 1.12	31.5 $\pm$ 5.3	1.28 $\pm$ 0.33	15.46 $\pm$ 0.22

3.2 Perioperative transcutaneous electrical acupoint stimulation can promote the recovery of postoperative intestinal function, shorten the length of hospital stay and reduce the occurrence of postoperative complications

In order to further verify the effect of TEAS on the common complications of common patients after surgery. The common symptoms, the first defecation time, the first anal exhaust time and the length of hospital stay were detected on the 1st, 3rd and 5th day after operation. Compared with the control group, we found (Table 2) that TEAS could reduce postoperative infection, relieve postoperative pain, and inhibit the occurrence of postoperative hiccups. TEAS can promote the recovery of postoperative intestinal function, mainly in postoperative defecation, and shorten the recovery time of postoperative exhaust function and the length of hospital stay. The VAS score was lower in group II than in group I at 12, 24, 36, 48 and 72 hours after operation ($p < 0.05$). The total number of postoperative analgesics in group II was less than that in group I ($p < 0.05$). The recovery time of intestinal peristalsis in the control group and the intervention group were (80.6 ± 6.5) h and (70.8 ± 4.5) h, respectively, and the difference was statistically significant ($P < 0.05$). The degree of nausea in group II was lower than that in group I within 24 and 48 hours after operation ($p < 0.05$), and there was no significant difference in vomiting.

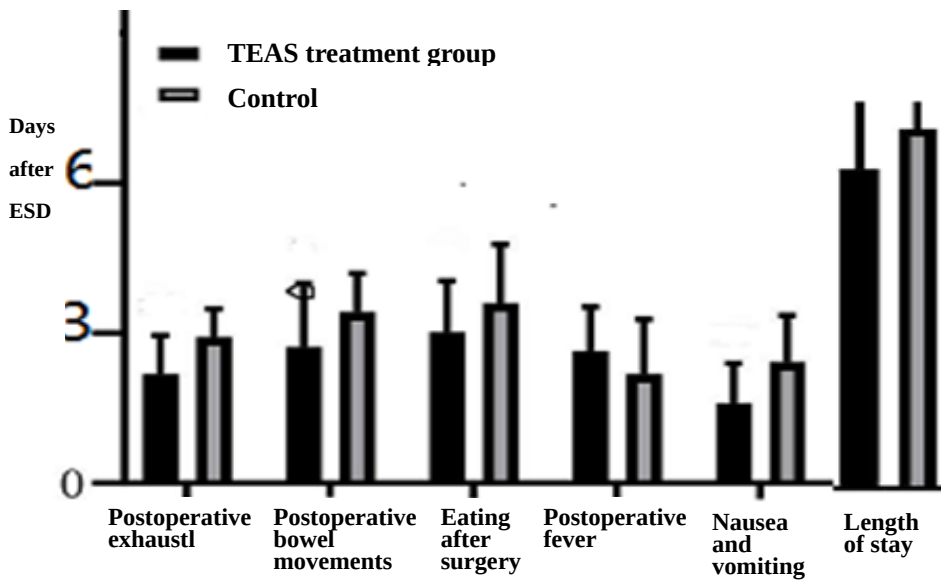


Figure 1. The intestinal function and length of hospital stay were compared between the two groups.

4. Discussion

The patients with early gastrointestinal cancer have the imbalance of Yin and Yang, deficiency of qi, and mutual accumulation of phlegm and blood stasis. After the operation, the spleen is in dereliction of its duties, the qi of spleen and stomach is severely damaged, and the water and grain essence cannot move in the normal way. Clinical symptoms are often manifested as pale complexion, fatigue, and low speech. Yu Qingsheng et al. systematically

observed and studied patients after gastric surgery and found that in the early stage after gastric surgery, patients had weak temper such as fatigue, shortness of breath, fatigue, lazy speech, pale complexion, pale tongue, white skin, and weak pulse. Moreover, abdominal distension, abdominal pain, vomiting, anal exhaust and defecation are the manifestations of qi stagnation. Therefore, the TCM syndrome after early cancer surgery is distinguished as the combination of deficiency and excess, that is, the coexistence of spleen deficiency and solid organs. The TCM syndrome type of the patients in the early postoperative period was the deficiency of essence and the excess of standard. "The spleen is the origin of acquired life" and "the spleen is the source of qi, blood and biochemistry", and the focus of tonic is on the spleen and stomach. "The six Fu organs should be used in general, and the six Fu organs should be reduced to be smooth." The attack focuses on cleaning the six Fu organs and their filthiness. And according to this Jianpi Tongli method. Regulating the spleen and stomach and improving the spleen and stomach is a key step in the treatment of gastric cancer after surgery. Research on promoting the recovery of gastrointestinal function Traditional Chinese medicine believes that the operation damages the body's vital qi, which is unfavorable for qi deficiency and blood circulation. It is easy to cause blood stasis, obstructed qi production, stagnation of Fu qi, or stasis of dampness and heat, and stagnation of heat and poison in six fu organs. And after the operation, it destroys the normal operation of qi machinery, causes the dysfunction of ascending and descending, and causes gastrointestinal motility dysfunction. Many scholars have made dialectics and treatment based on the characteristics of pathogenesis and clinical manifestations after the operation, determined the syndrome type, formulated the treatment rules and methods, selected the prescription, and achieved good results, which can not only promote the early recovery of gastrointestinal function and the improvement of immune function. It can reduce the occurrence of postoperative complications. It also helps to prevent and treat tumor recurrence.

The value of acupuncture and moxibustion has been gradually recognized internationally. Some scholars have proposed that the therapeutic mechanism of acupuncture and moxibustion may be through the neural, endocrine and body fluid network mediated by the central nervous system, and then affect the target organs. Zusanli is one of the most widely used acupoints in clinical practice. It has been recorded in *Huangdi Neijing*, *Shengji Zonglu*, *Acupuncture Dacheng* and other ancient books. It is not only an important acupoint for strengthening health care, but also used for diseases of multiple systems with remarkable clinical effects.

Zusanli point comes from the book of *Miraculous Pivot*, *Benshu*, formerly known as Sanli, which belongs to the stomach meridian of foot Yangming. It is located three cun below the outer knee. Zusanli is the he-sea point of Yangming. As recorded in *Miraculous Pivot: Nine Needles and Twelve Sources*, "the point entering is he-sea" refers to this point being the Yangming meridian qi, which is full of meridian qi and has excellent effect. In *Miraculous Pivot: Five Evils*, it is pointed out that "when the pathogenic factors are in the spleen and stomach, the muscles will suffer from pain, Yang qi is in excess, and Yin qi is insufficient, and hunger will be good in heat; if both of them are insufficient, there will be cold and heat. Shangjudeficiency acupoint is located in the stomach meridian of foot Yangming and three cun below the acupoint of Zusanli, which can relieve and

treat abdominal pain, abdominal distension and gastroenteritis, and restore gastrointestinal function. Modern studies have shown that the regulation of gastrointestinal function by acupuncture at Zusanli may be achieved by brain-gut peptide hormones, which are important hormones in the gastrointestinal tract, such as cholecystokinin, somatotropin and so on. It can regulate gastrointestinal function, improve gastrointestinal microcirculation, increase protective factors, reduce harmful factors, protect gastrointestinal mucosa, and re-establish cells. A number of studies have shown that Zusanli acupoint is widely used in postoperative complications with good curative effect. Zusanli acupoint is stimulated in combination with Shangjuxu acupoint to promote the recovery of human body's healthy qi and promote the rebalancing of Yin and Yang [3].

The regulation of gastrointestinal function by acupoint stimulation is closely related to the mechanism of gastrointestinal nervous system and endocrine system. Stimulation of different acupoints can stimulate the gastrointestinal nervous system, improve the release of autonomic neurotransmitters, activate adrenergic and noradrenergic fibers, regulate the secretion of 5-hydroxytryptamine and angiotensin, and promote the recovery of gastrointestinal motility and the repair of mucosal tissue [4,5]. Zusanli and Shangjuxu belong to the stomach meridian of Foot-yangming, which have the effect of regulating the spleen and strengthening the stomach. They are the main acupoints for the treatment of gastrointestinal diseases. Acupuncture at bilateral Zusanli and Shangjuxu and retaining needles for 30min after deqi can effectively improve postoperative gastrointestinal dysfunction. Increased β -endorphin release in the body; It can prevent PONV by activating adrenergic and noradrenergic nerve fibers to change the transmission of 5-HT₃. It can inhibit the secretion of vagus nerve and gastric acid, reduce gastrointestinal mucosal injury, avoid gastric gas reflux, promote gastrointestinal peristalsis, and improve gastrointestinal function. Transcutaneous acupoint stimulation can promote the recovery of gastrointestinal function after gastrointestinal surgery in the elderly, reduce the length of hospital stay, improve the efficacy of gastrointestinal function recovery and TCM syndrome treatment.

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