行政院國家科學委員會專題研究計畫成果報告

電針在下腹部手術後疼痛緩解效應的評估

Assessment on Electroacupuncture Stimulation Effect to Pain Relief After Operation of Lower Abdomen

計畫編號：NSC 88-2314-B-039-011
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主持人：林昭庚　　中國醫藥學院中國醫學研究所

一、中文摘要

雖然麻醉技術日新月異，但是麻醉藥物所產生的副作用仍然無法避免。本研究以電針足三里穴，評估手術後疼痛之緩解效應。將一百位接受下腹部手術的女性隨機分為四組：第一組僅做病患自控式止痛器(PCA)處理；第二組以偽電針(無電刺激)與 PCA 處理；第三組以低頻率電針(2Hz)與 PCA 處理；第四組以高頻率電針(100Hz)與 PCA 處理。在麻醉前以電針處理 20 分鐘。所有的病患在手術後接受病患自控式止痛法。術後記錄下列評估項目(1)病患第一次要求成癮性止痛藥的時間間隔。(2)病人自控式止痛法(PCA)嗎啡止痛藥輸入體內的劑量。(3)疼痛等級(VAS score)。結果顯示：偽電針、低頻以及高頻電針組，PCA 需求的時間分別延長為 8、17 及 18 分鐘。在術後 24 小時內，偽電針、低頻率及高頻率電針組的鴉片總需求量分別減少 21、43 及 61%。在術後 24 小時內，低頻率與高頻率電針組對噁心、昏眩副作用的產生明顯低於其他兩組。依據臨床試驗結果，我們也發現在減緩疼痛方面，電針也有安慰劑的作用。本研究結果顯示低頻率及高頻率電針能減少下腹部手術後麻醉之需求。

關鍵詞：電針、手術後疼痛、病患自控式止痛器、視覺類比類刻度尺

Abstract

Despite the availability of newer analgesic drugs and techniques, concerns remain regarding the side effect profiles of both opioid and nonopioid analgesic techniques. We have studied the effects of electroacupuncture (EA) at the classical acupuncture points (Zusanli, ST-36) on postoperative pain relief. One hundred healthy consenting women undergoing lower abdominal surgery randomly assigned to four treatment regimens: Group (n=25) PCA only; group (n=25), PCA + sham-EA (no electrical stimulation); Group (n=25), PCA + low-EA (2Hz of electrical stimulation); Group (n=25), PCA + high-EA (100Hz of electrical stimulation). Electroacupuncture groups were begun 20 min before anesthesia. All patients received patient-controlled analgesia (PCA) after operation. Postoperative pain relief was evaluated by recording (1) the time for PCA requested the first required, (2) total amount of analgesics requirements by PCA (3) pain-rating VAS scale. The time for PCA requested was prolonged by 8, 17, and 18min with sham-, low- and high-EA, respectively. During the first 24h, the total opioid requirement was decreased by 21, 43 and 61% with sham-, low- and high-EA, respectively. The incidence of nausea and dizziness during the first 24h after surgery were significantly reduced in the low-EA group and high-EA group compared with the other two treatment groups. According to the results of clinical trial, we also found the fact that electroacupuncture exerts a placebo effect with respect to its pain relieving

quality. Low-EA and high-EA could reduced the postoperative analgesics requirements in patients undergoing lower abdominal surgery.

Keywords: Electroacupuncture,
Postoperative pain,
Patient-controlled analgesia,
Visual analogue scale.

二、緣由與目的

Morphine and opioid drugs are the standard analgesics used in the treatment of postoperative pain. These agents, however, have undesirable side effects including nausea, vomiting, constipation, alteration of mental status, respiratory depression and the risk of addiction. Currently intravenous (I. V.) patient-controlled analgesia (PCA) is widely used for the management of acute postoperative pain (White 1988; Parker et al. 1991). However, opioid related side effects still occur with PCA despite the reduced dose used by this technique (White 1987; Parker et al. 1991). Peripheral electrostimulation either by electroacupuncture (EA) or transcutaneous nerve stimulation (TENS) have been shown to have analgesic effect in the relief of postoperative pain (Galloway et al. 1984; Stubbing and Jellicoe 1988; Christensen et al. 1989). Martelete et al. (1985) showed that patient given EA needed only half the dose of opioid compared to nonacupuncture group. However, their study lacked placebo control and there was no objective assessment of pain. The present study was undertaken to evaluate whether the frequency of the electrical stimulation is a factor in the efficacy of EA for the relief of postoperative pain.

三、結果與討論

The study design is summarized in Table 1 and the demographic data which were comparable among all 4 groups are show in Table 2. The time for the first PCA dose required was 18.0 min, 27.9 min, and 28.1 min for the Sham-EA, Low f-EA and High f-EA respectively which were all significantly longer than the control group and the values of both active EA groups were better than the Sham-EA group (Fig. 1). The number of PCA demand in the 24 hr. was significantly less in the High f-EA (7.9+/-5.9) and the Low f-EA (11.7+/-7.1) groups compared to those of the control (20.5+/-9.2) and the Sham-EA (16.1+/-7.4) as shown in Table 3. There was also highly significant difference in the dose of PCA delivered among the 4 groups with the lowest dose used in the High f-EA group (Table3). All patients obtained adequate pain relief without significant difference in the VAS scores (Fig. 2); however, comparing to the control group the total amount of morphine required in 24 hour was reduced by 21%, 43% and 61% with the Sham-EA, Low f-EA and High f-EA groups respectively. The incidence of nausea and dizziness were significantly lower in both of the active EA groups compared to the other two groups (Table 4). No patient had respiratory depression (respiratory rate< 10 min or S_aO2< 90 mmHg).

The mechanism of acupuncture analgesia (AA) is still unclear, although many studies reported a close relationship between AA and neurotransmitter (Sjolund et al. 1977; Peng et al. 1978; Cheng and Pomeranz 1981). Hughes et al. (1975) reported isalation of endogenous opioid-like the mammalian brain tissue and human cerebrospinal fluid, which can act as an analgesic on the opioid receptors. Promeranz and Chiu (1976) suggested that the analgesic effect of acupuncture was due to the release of endorphines. Han et al. (1980)

reported that EA at 2Hz could induce secretion of -endorphine, which produced analgesic effect with the combination of and opioid receptors. Although the mechanism of acupuncture analgesia is still not clearly defined, it appears to exert its beneficial effects through several different modes of action.

According to traditional Chinese medicine, the so-called Zusanli (ST-36) point on the foot is alleged to be one of the most effective pain-relieving acupoints for lower abdominal problem. On the other hand, Lin (1996) showed that EA stimulation of 2Hz and 100Hz frequencies resulted in different subtype receptors of opioid or serotonin mediating analgesic effect. Therefore, we elected to use 2Hz and 100Hz frequencies stimulation in the present clinical investigation.

The time for the first requirement of narcotics was prolonged by 8min, 17min, and 18min with sham-, low- and high-EA, respectively. The result demonstrated the incidence of postoperation pain could be delayed by electroacupunture therapy.

The most patients reported that their postoperative pain was "adequately" treated, and there were no significant differences among the four groups. Few patients complained that the electrical stimulation produced by the electroacupuncture device was uncomfortable. In addition, 69% of the high-EA, 35% of the low-EA and 18% of the sham-EA patients felt that EA therapy decreased their postoperative pain.

The results of this study clearly demonstrated that the opioid-sparing effect of electroacupuncture is dependent on the frequency of the electrical stimulation. The number of doses of opioid medication in the first 24h was significantly less in the high-EA group than in the low-EA group. The morphine requirement in the high-EA group was decreased by 31% compared with low-EA group in the first 24h. Our results also showed that EA exerts a significant placebo effect with respect to its pain relieving qualities. Therefore the single-blind, sham-controlled study design can eliminate the impact of patient bias on the results. The study results suggested that a placebo effect contributed to the analgesic action of EA therapy (Groups versus); however, the total number of PCA demands and the opioid analgesic dose requirements in the low-EA and sham-EA groups were significantly different. Electroacupuncture decreased the incidences of nausea and dizziness, after surgery, presumable secondary to the decreased dosage of opioid analgesic required in the postoperative period.

In conclusion, electroacupuncture was used as an adjunct to PCA, it produced a significant decrease in the postoperative analgesic requirement, which was related to the frequency of the electrical stimulation. We found that higher frequency of electrical stimulation provided the better results. In addition, the use of EA resulted in decrease the incidence of opioid-related side effects after lower abdominal surgery.

四、計畫成果自評

本報告與原計畫相符並已達成預期目標。
本篇報告預計發表於國外相關學術期刊。

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Figure 1. Comparisons of the time intervals for the first analgesia request among the
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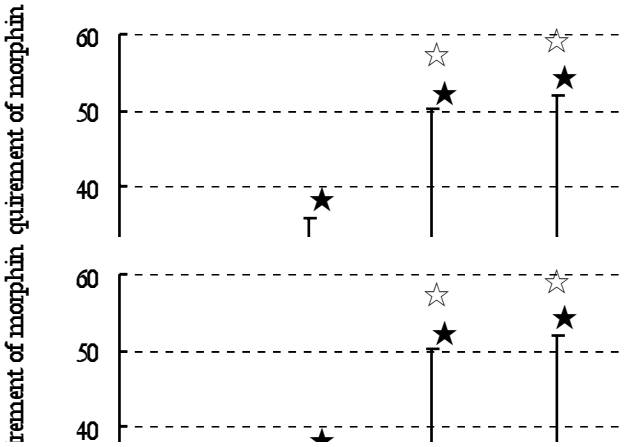

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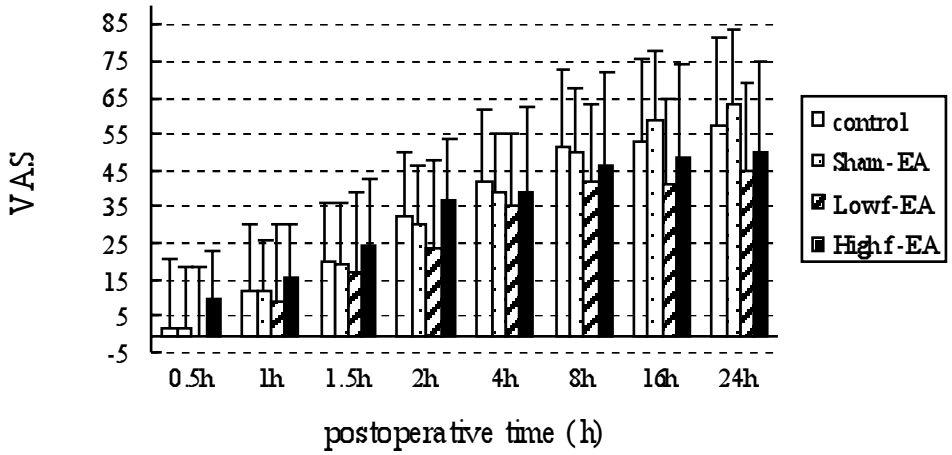

Table 1. Postoperative pain treatment groups included a standard treatment (PCA- only) and three electroacupuncture groups.

Group	Postoperative pain therapy
I (PCA - only)	Intravenous PCA alone with morphine.
II (sham - EA)	PCA with morphine + sham - EA (no electrical stimulation, but the functional indicator lights on)
III (low f - EA)	PCA with morphine + low f - EA (2Hz, 0.5mA electrical stimulation)
IV (high f - EA)	PCA with morphine + high f - EA (100Hz, 0.5mA electrical stimulation)

Table 2. Demographic data for each of the four treatment groups.

	GroupI (PCA only)	Group (PCA+sham-EA)	Group (PCA+low f-EA)	Group (PCA+high f-EA)
Age(yr)	39±8	41±12	38±7	42±13
Weight(kg)	51±14	55±10	54±11	51±17
Duration of anasethesia (min)	113±38	110±19	121±14	115±21
Duration of operation (min)	101±13	105±20	110±21	102±15

Values are mean ± S.D. (n=25)

Table 3. Postoperative analgesic requirements in each treatment group.

	Group I (PCA only)	**Group Ⅱ (PCA+sham-EA)**	**Group Ⅲ (PCA+low f-EA)**	**Group Ⅳ (PCA+high f-EA)**
Time for the first dose of morphin after operation (min)	10.6 ± 5.9	18.0 ± 7.9 *	27.9 ± 12.3 +§	28.1 ± 13.8 +§
PCA demands in the first 24h				
1 - 8 h	9.0 ± 3.6	7.0 ± 3.6*	5.1 ± 4.0 +§	3.3 ± 3.2+‖◇
8 - 16 h	8.2 ± 5.3	5.8 ± 3.8	4.0 ± 2.6 +§	2.8 ± 2.1 +‖◇
16 - 24 h	3.2 ± 2.4	3.3 ± 2.1	2.6 ± 2.1	1.8 ± 1.6+‖
Total in 24h	20.5 ± 9.2	16.1 ± 7.4 *	11.7 ± 7.1 +§	7.9 ± 5.9+‖◇
Morphine delivered (10 x mg)				
1 - 8 h	16.1 ± 7.1	12.8 ± 6.6 *	9.2± 7.1+§	6.1 ± 5.9 +‖◇
8 - 16 h	15.5 ± 9.4	10.8 ± 7.7 *	7.6 ± 5.4 +§	5.4 ± 3.8 +‖◇
16 - 24 h	6.5 ± 4.8	6.6 ± 4.1	5.0 ± 4.2	3.5 ± 3.2+‖
Total in 24h	38.1 ± 16.0	30.2 ± 14.4 *	21.8 ± 14.7 +§	15.0 ± 10.7+‖◇

Values are mean ± S.D. (n=25)
＊p＜ 0.05, ＋p ＜ 0.01 versus Group Ⅰ.
§p ＜ 0.05, ‖p ＜ 0.01 versus Group Ⅱ.
◇p ＜ 0.05, versus Group Ⅲ.

Table 4. Postoperative side effects in the four treatment groups.

	Group I (PCA only)	Group II (PCA+sham-EA)	Group III (PCA+low f-EA)	Group IV (PCA+high f-EA)
Number of opiod-related side effects				
Nausea	11 (44)	10 (40)	4 (16) *§	6 (24) *§
Vomiting	0 (0)	1 (4)	1 (4)	0 (0)
Dizziness	14 (56)	16 (64)	7 (28) *§	10 (40) *§
Pruitis	2 (8)	0 (0)	1 (4)	1 (4)

Values are mean (%)

*** p < 0.05, versus Group I.**

§ p < 0.05, versus Group II.