

EFFECT OF ACUPRESSURE ON THE SYMPTOMS OF POSTOPERATIVE PARALYTIC ILEUS AFTER CESAREAN SECTION: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Background: Post-operative ileus (POI) is a common complication after abdominal surgeries including cesarean section (CS), which is associated with undesirable effects on the mother and infant.

Purpose: This study aimed to determine the effect of acupressure on POI symptoms after CS.

Subjects and methods: This randomized controlled trial was conducted on a total of one hundred women who had elective CS, selected from El-Maragha central hospital, Suhag governorate. Their age ranged between 18-35 years, and their body mass index was ≤ 30 kg/m². They were randomized into two equal groups; the control group (n=50), who received only early mobilization protocol, 10 minutes, 3 times/ day, starting from the fourth hour after CS, and the acupressure group (n=50), who received two acupressure sessions applied to LI4 and ST36 in addition to the same early mobilization protocol as the control group.

Results: There was no statistically significant difference ($P > 0.05$) in sociodemographic characteristics between both groups. For the between-group comparison of POI parameters, there were statistically significant differences regarding the time of bowel sound presence ($P=0.001$), the first time to pass flatus ($P=0.001$), and the first time to defecate ($P=0.0002$). Also, the patients' feedback results indicated high overall satisfaction with the use of acupressure in managing POI symptoms, according to the women's replies to the survey's questions.

Conclusions: Acupressure is an effective, patient-accepted adjunct to the mobilization protocol in reducing POI symptoms after CS.

Keywords: Acupressure; Cesarean section; Postoperative ileus.

INTRODUCTION

Cesarean section (CS), a form of abdominal surgery, is frequently associated with delayed gastrointestinal (GI) motility, primarily, due to autonomic nervous system changes [1]. After bowel manipulation during the operation, the stomach, small intestine, and colon require 24 to 72 hours to recover their normal activity. During this period of impaired function, contractions become disorganized and may even be retrograde in nature. In addition to bowel manipulation, other surgical stressors, such as inflammatory responses, opioid administration, electrolyte abnormalities, and neural reflexes, have been suggested in delaying the return of normal bowel motility [2].

The resulting condition of inhibited GI movement post-CS is known as post-operative ileus (POI), a common complication after abdominal surgery, with a reported incidence of 10-30 % [3]. POI could lead to abdominal pain, nausea, vomiting, difficulties with oral intake, increased risk for aspiration, flatulence, prolonged hospitalization, and inability to effectively breastfeed and nurse the newborn [4].

Usual signs for normal GI movements are indicated by mild cramps, gas sounds, and the patient's feeling of hunger [5]. There is a lack of objective assessment of POI and its resolution, as bowel sounds auscultation requires frequent attention and does not necessarily indicate forward propulsion, and flatus is poorly reported by patients. A more reliable indication for distal colon function is defecation [6]. The management of POI revolves around supportive care measures. These measures may include intravenous fluid and electrolyte replacement, and often using a

nasogastric tube [7]. Also, chewing gum, early oral hydration, early mobilization [8] heat application [9], and acupressure are effective in the prevention or moderation of POI complications after abdominal surgeries, including CS [4].

The GI function could be impaired when surgical stimulation disturbs the harmony of the Qi flow. So, acupressure, aiming to improve the flow of Qi, is a manipulative therapy that uses the hands, fingers, palms, or special devices to apply pressure to different acupoints for regaining energy flow [9,10]. The suggested mechanism of acupressure to positively influence GI may involve affecting the vagal [11] and parasympathetic efferent pathways [12]. It can stimulate the nerve endings to release acetylcholine, which can work in GI mucosal lesions, promoting the pituitary release of adrenal cortex hormones that inhibit GI inflammatory responses [13].

Several studies have investigated the efficacy of acupressure in improving GI disorders [4,14,15,], including a study on women after CS, which confirmed that it is a non-invasive approach that can significantly improve GI motility [4]. In contrast, some review studies were less conclusive regarding the effectiveness of acupressure for POI [16]. Therefore, this study was done to investigate the effect of acupressure on POI symptoms after elective CS, hypothesizing that acupressure would improve the GI motility and reduce POI symptoms.

Material and methods

Study design and ethical approval

The study was conducted as a prospective randomized controlled trial to investigate the effect of acupressure on POI symptoms in women delivered by elective CS. The study was approved by the Ethics Committee of the Faculty

of physical therapy, Cairo University (No: P.T.REC/012/003732). The research study was carried out from June to December 2022. All women were given a full explanation and instructions about the assessment and treatment procedures, then written informed consent was signed by each participant before joining the study.

Participants

A non-probability, convenience sample was utilized to recruit hundred and fifteen women from the inpatient department of El-Maragha central hospital, Suhag Governorate. Women were directly interviewed and screened for eligibility. They were included if they delivered by elective CS, their age ranged from 18-35 years, and their body mass index (BMI) was $\leq 30 \text{ kg/m}^2$. The exclusion criteria included patients with ages <18 and <35 years, BMI $> 30 \text{ kg/m}^2$ [17], postoperative use of analgesics and opioids [18], presence of airway or vascular diseases [19], patients with blood loss more than 1000ml post-operative [20], patients who received a postoperative blood transfusion [20], patients with thyroid, nervous, hepatic, or muscular diseases, patients with mechanical obstruction of the intestine [3] and those who developed intraoperative CS complications [4].

All data and information of each woman participating in this study, including personal history, obstetric history, medical history, and past history were obtained and recorded in a data recording sheet before starting the treatment course.

Randomization and blinding

A computer-based randomization program (IBM, version 25 for Windows, Chicago, Illinois, USA) was used in creating random numbers to assign women to either the control group (n=50) or the acupressure

group (n=50). The allocation process was done by a research assistant, blinded to the study procedures.

Measurement procedures:

Assessment of study outcomes in both groups

The primary outcome of this study was the regaining of bowel movement, evidenced by enhanced POI symptoms, while the secondary outcome was the patient's feedback on acupressure application for POI. Evaluation of the primary outcome was done following the interventions (after the first acupressure session, and /or early mobilization protocol) for the women of both groups with the help of an independent assessor who recorded the duration (in hours) from the CS end-time to the first occurrence of the tested parameters [21]. For the patient's feedback, a survey comprised of specific questions was handed to each woman in the acupressure group and their replies were obtained and analyzed.

Evaluation of POI status

To assess POI symptoms, the time for bowel sound presence, the time taken to first pass flatus, and the time to first defecate were calculated in hours and recorded in the datasheet for each woman in both groups [22].

Evaluation of the patient's satisfaction

A group of questions was constructed as a survey to subjectively measure the degree of the patient's satisfaction with the acupressure application in POI. It included four main questions, which assessed the patient's past and present experience with acupressure; if she had enough explanation of the procedure, whether the session was painful, and her overall perspective on the current acupressure experience. The women replied

individually to each question after a full explanation of the purpose and items of the survey.

Treatment procedures

For women of both the control and acupressure groups, they followed an early mobilization protocol as soon as possible after the recovery from the anesthesia. The women were instructed to mobilize after sitting for 10 minutes in bed, starting from the fourth hour after the CS. The women walked three times a day, for approximately 10 minutes when they felt good [8].

Women in the acupressure group, additionally, received acupressure on the acupoints of “Zusanli” (stomach meridian ST-36), located on the anterior aspect of the lower leg, 3 cm (about 4 fingers) below the inferior border of the patella, one finger width lateral to the edge of the tibia, in a small notch next to the tibia and “Hegu” (large intestine meridian (LI-4), located on the dorsum of the hand, between the 1st and 2nd metacarpal bones, in the middle of the 2nd metacarpal bone on the radial side [4, 22, 23]. The patients received two sessions of acupressure, 3 hours after CS, then 3 hours following the first session. During the session, each point was treated with two minutes of pressure, followed by 30 seconds of rest for 10 minutes for a total of 20 minutes, performed in an anti-clockwise direction using moderate pressure of the thumb finger [24].

Data analysis

Sample size

To achieve a power analysis of 80 % with an α level of 0.05, a sample size of 90 females was determined. The sample size was estimated, depending on the primary outcome that was the return of bowel function, to be 45 for

each group, based on 90% of power, 0.05 type I error and 0.6 effect size. To compensate for a possible dropout rate of 10%, the optimal sample size was estimated as 100 women, 50 women for each group. The sample size calculation was performed using G*POWER statistical software version 3 based on previous study by Abadi et al. [4].

Statistical analysis

Data were analyzed using the statistical package for social science (SPSS), version 25 (IBM, Chicago, Illinois, USA). Initially, the Shapiro-Wilk test was used to examine data normality and indicated that the data were normally distributed. Quantitative data were expressed as mean $\pm$ standard deviation (SD), minimum and maximum values, and qualitative data were presented by frequency distribution (number and percentage).

The independent T-test (unpaired T-test) was used to compute the difference in the variables between the two groups after the interventions. The level of significance was selected at P- value < 0.05, indicating meaningful results.

Results

A hundred and fifteen women with post-elective CS paralytic ileus were assessed for eligibility. However, fifteen of them were excluded; ten of them did not meet the inclusion criteria, two of them with a history of bronchial asthma, three have developed postpartum hemorrhage, one woman received blood transfusion, four women received opioids analgesics and five women refused to participate in the study. Consequently, a hundred women met the requirements for incorporation and completed the assessment and treatment procedures as well as the final analysis, Figure 1.

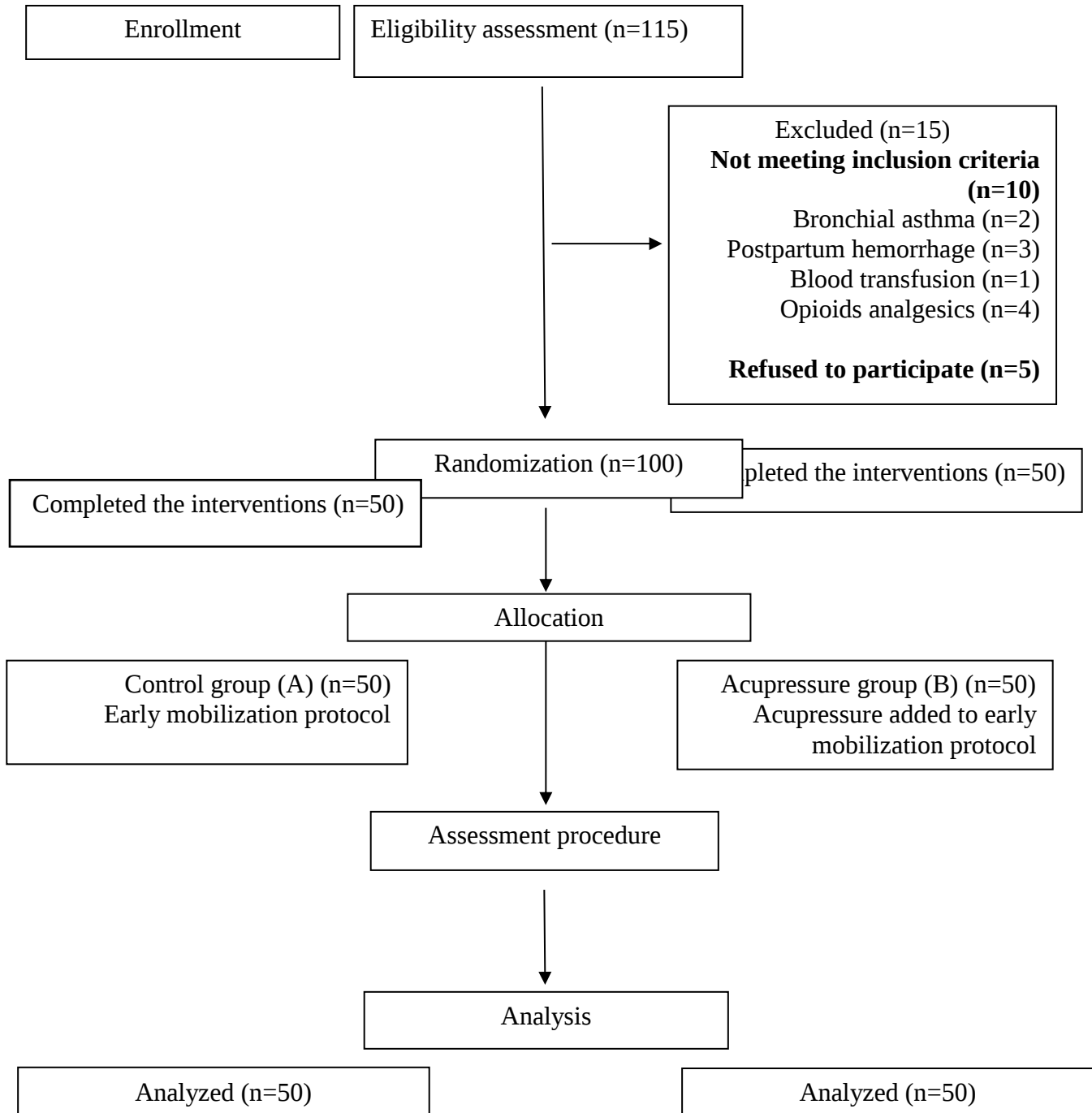


Figure 1. Flow chart of women throughout the study.

Patients' basic characteristics

Regarding women's general (sociodemographic) data, there were no

statistically significant differences between the two groups ($t=1.93$; $P=0.12$) regarding age, height, weight,

or BMI mean values, Table 1. In terms of the participants' working status, 30% (n=15) of the acupressure group were employed, while for the control group, 24% (n=12) were employed. In the acupressure group, 26% (n=13) of women were from urban areas versus 46% (n=23) in the control group. Most women included in the acupressure and the control group had no special habit (98% vs. 100%, respectively). Regarding the history of previous CS deliveries, 32% (n= 16) of women in the acupressure group had no history of CS, versus 38% (n=19) in the control group.

For medical history, the percentages of women having positive medical history were 16% (n=8) for the acupressure group and 24% (n=12) for the control group, while for the family history, the percentages of women having positive family history of diabetes mellitus and/or hypertension in the acupressure and control groups were 30% (n=15) and 14% (n=7), respectively. 26% (n=13) of women in both groups had a form of abdominopelvic surgery, Table 1.

Table 1. Socio-demographic characteristics of women in both groups.

Variables	Acupressure group (n=50)	Control group (n=50)	T- test	P- value*
	Mean ± SD (minimum-maximum)			
Age	26.9 ± 4.2 (19-35)	25.7 ± 3.3 (19-35)	1.5	0.13
Height	153.9 ± 12.6 (150-164)	158.9 ± 5.7 (150-179)	1.9	0.12
Weight	70.5 ± 3.9 (59-79)	72.8 ± 6 (60-90)	1.3	0.18
BMI	28.9 ± 0.9 (26.2-30)	29.1 ± 0.9 (26-30)	1	0.32
	N (%)			
Working status				
Working	15 (30%)	12(24%)		
Not working	35(70%)	38(76%)		
Social class				
Urban	13(26%)	23(46%)		
Rural	37(84%)	27(54%)		
Special habits				
Yes	1(2%)	0		
No	49(98%)	50(100%)		
History of previous CS				
Never	16(32%)	19(38%)		
Once	21(42%)	28(56%)		
Twice	11(22%)	1(2%)		
≥ 3 times	2(4%)	2(4%)		
Medical history				
Positive	8(16%)	12(24%)		
Negative	42(84%)	38(76%)		

Family history		
Positive	15(30%)	7(14%)
Negative	35(70%)	43(86%)
Surgical history		
Positive	13(26%)	13(26%)
Negative	37(74%)	37(74%)

SD, standard deviation; BMI, body mass index; *, significant results at p-value < 0.05; N(%): number of participants (percentage); CS, cesarean section.

Comparison of dependent variables

The POI parameters

As indicated by the unpaired t-test, there were highly statistically significant differences ($P \leq 0.001^*$) between both groups regarding the mean values of the first time to bowel sound presence, the first time to pass flatus, and the first time to defecate, Table 2

Table 2. POI parameters post-interventions in both groups.

Variables	Groups (n=50 for each)		Z-value	P-value*
	Acupressure	Control		
	Mean $\pm$ SD	Mean $\pm$ SD		
Time to bowel sound presence (hrs.)	6.2 $\pm$ 1.2	10.9 $\pm$ 1.5	- 6.13	0.001*
Time to first pass flatus (hrs.)	11.7 $\pm$ 2.3	18.5 $\pm$ 3.7	- 5.91	0.001*
Time to first defecate (hrs.)	22.2 $\pm$ 3	25.1 $\pm$ 4.3	- 3.85	0.0002*

SD, standard deviation; hrs., time in hours; *, highly significant results at p-value ≤ 0.001 .

Evaluation of the patient's satisfaction

Regarding the previous CS history, 74% (n=37) of women in the acupressure group had undergone at least one CS. None of the women has previously tried acupressure for regaining GI motility, so, none of them answered the question describing their impression of that experience. All women (n=50, 100%) stated that they clearly understood the procedures discussed and explained by the

physiotherapist. For the women's feeling of pain during or after the acupressure intervention, three women (6%) reported feeling pain, two of them were of a moderate degree, and a woman had mild pain. Overall, half of the women (n=25) described their current experience with acupressure as excellent, while the other half described it as good. Questions asked, together with the numbers, and percentages of the women's responses to each survey question are presented in Table 3

Table 3. Women's feedback on acupressure (n=50).

Item number	Survey item	N (%)
Q1.	History of previous CS deliveries	

	Yes	37 (74%)
	No	13 (26%)
Q2.	Previous acupressure experience	
	Yes	0 (0%)
	No	50 (100%)
Q3.	Impression on the previous acupressure experience	
	Useful	50 (100%)
	Not- useful	0 (0%)
Q4.	Application of acupressure in the current delivery	
Q4a.	Detailed discussion and explanation of the procedures	
	Yes	N/A
	No	N/A
Q4b.	Feeling pain during/ post-intervention	
	Yes	3 (6%)
	No	47 (94%)
Q4c.	The severity of pain felt during/ post-intervention	
	Mild	1 (33.3%)
	Moderate	2 (66.7%)
	Severe	0 (0%)
Q4d.	Overall feedback on current acupressure experience	
	Poor	0 (0%)
	Acceptable	0 (0%)
	Good	25 (50%)
	Excellent	25 (50%)

N(%): number of responses (percentage); CS, cesarean section; N/A, not applicable.

Discussion

Postoperative paralytic ileus is a frequently reported problem that occurs following abdominal surgeries, especially CS, with profound consequences for both the infant and the mother [4]. This study was conducted to explore the effect of acupressure on POI in women post-elective CS. The study results revealed a significant improvement in all POI parameters, with a more accelerated regaining of normal GI motility in the patients who received acupressure sessions, added to a mobilization protocol, compared to the control group, who underwent only the mobilization protocol. Also, the women's responses to the survey questions regarding their current experience with acupressure application have reflected an elevated level of satisfaction among women. No

adverse effects were reported except for feeling pain of a mild to moderate degree in only three women either during or after the intervention.

Certain criteria were identified to spot the return of normal intestinal motility and bowel function when assessing POI patients. These criteria involve the time taken till the presence of bowel sounds, the time to first pass flatus, and the time to first defecate [22]. Thus, these parameters were the ones of choice to evaluate the women in both groups. Early mobilization protocol was chosen to be applied for all women in both groups since it has been adopted as a part of standardized care for patients following abdominal surgeries [25]. On the other hand, acupressure, a non-invasive approach, is known to have the same effects as other acupoint-stimulating techniques on improving GI motility, thus, it was

selected to be the study group intervention. The use of certain acupoints in the present study was based on previously published studies [4,22,23,26].

Both groups had an improvement in the three POI parameters. The positive findings observed following early mobilization could be due to the effect of ambulation, as a form of physical activity, on increasing the GI and abdominal wall tone. Moreover, peristalsis is encouraged through the increase of sympathetic firing of the intestinal muscles, causing augmented intestinal motility [27]. The same results were stated by Herman et al., who found a significant improvement in the GI peristalsis post-CS in the early ambulation study group, compared to the controls [28]. Similarly, Koesarthie et al conducted a study to evaluate the impact of an early-mobility program on the recovery of bowel function following open abdominal surgery during the first 72 hours postoperative [29]. Their results showed better bowel function recovery on the 2nd and 3rd day, compared to the non-ambulation group [29].

Alternatively, the acupressure group has demonstrated better results for bowel and GI functions, indicated by a more accelerated occurrence of the three POI parameters, compared to the control. Previous research has attributed the augmented effect of acupressure application to its effect on GI hormones [30]. Acupressure can stimulate multiple GI hormones such as gastrin and pancreatic polypeptide that regulate the contractions of gastric smooth muscles in the small intestine and shorten the time for gastric emptying, leading to early passage of flatus [31]. Another mechanism for improving POI is the anti-inflammatory effect exerted by acupressure. That

mechanism was supported by Yang et al., who conducted a study on mice and found that stimulating acupoint by electroacupuncture could suppress intestinal inflammation by reducing the production of inflammatory cytokines [21].

The current study findings were congruent with Chao et al. who investigated the beneficial effects of ST-36 (Zusanli) acupressure on postoperative GI function in patients with colorectal cancer. All patients had more increase in bowel sounds over time, and earlier passage of flatus with a greater improvement of bowel motility in the experimental group than the control group within the period of 2-3 days postoperatively [15]. Additionally, Abadi et al. found that acupressure had potential positive impacts on attenuating POI symptoms after CS and concluded that it could be used as a non-invasive cost-effective approach for reducing POI incidence and severity post-CS [4]. Likewise, Sun et al. conducted a study to evaluate the effectiveness of acupuncture in post-CS flatulence on the second day after CS. Acupuncture was administered at the bilateral Zusanli (ST36), Shangjuxu (ST37), Yinlingquan (SP9), Sanyinjiao (SP6), Zhigou (TE6), and Hegu (LI4) acupoints. The results indicated successful passage of gas 30 minutes after the removal of acupuncture needles [1].

Moreover, Tseng et al. stated that applying acupressure on ST-36 acupoint decreased the time to first pass flatus and improved abdominal bloating in patients with hemicolectomy [14]. Another study by You et al., evaluated acupressure effects on flatulence and defecation after hepatectomy and found that the first flatulence occurred earlier in the acupressure group and that they were discharged earlier [32]. A recent study by Kirca and Gül has confirmed

the same findings. In their study, the times to pass flatus and to first defecate were significantly shorter in the acupressure group (19 and 23 hours, respectively) than in the control group (34 and 27, respectively). So, they reported acupressure as an easy, non-invasive method that could prevent flatulence and constipation caused by the decreased motility of GIT [24].

The influence of stimulating different acupoints, including ST-36, SP-6, and PC-6, by acupressure has been explored by Chen et al. in postoperative colorectal cancer patients and hysterectomy cases. Stimulating ST36 by electro-acupuncture was observed to restore the normal gastric waves and motor activities, impaired by the abnormal gastric distension [12]. This could be explained by enhancing vagal activity, partially mediated via the opioid pathway [12].

In contrast to these results, Abu-Bakr et al. analyzed the effect of ST-36 acupressure on gut motility and flatus time in postoperative patients with subarachnoid block anesthesia and they found no significant differences between the two groups regarding the time of flatus passage and concluded that ST-36 acupressure did not affect flatus time [9]. Also, neither Abadi et al. nor Hsiung et al. found a statistically significant difference in the time to first defecate between acupressure and non-acupressure groups [4, 26].

Acupressure has been identified, by many researchers [4, 22, 23], as a non-pharmacological alternative approach that is non-invasive, simple, and cost-effective, with many positive effects on a variety of women's health issues [4], and more specifically, on POI parameters [22, 23]. However, to better assess clinical practice and improve patient care, the patient's feedback and perspectives should be considered [33]. For this

purpose, the researchers of the current study designed a survey to collect the women's feedback on their experience with acupressure to manage POI.

None of the women in the acupressure group had previously tried acupressure for POI post-CS though 74% of them had undergone at least CS once. Nevertheless, the overall satisfaction of all women with their current experience was significantly high, reflecting their agreement with the acupressure application, its effects, and the total experience. Similar feedback was obtained from hundred and forty patients, referred to the Center of Integrative Medicine at Mayo Clinic when asked about items related to the duration of acupuncture sessions and their willingness to have additional treatment even if not covered by insurance. Many of them reported the need for longer durations, but the majority were shown to be satisfied with the present level of practice [33].

The present study provides statistically significant data to document the effect of acupressure on a prevalent problematic condition that occurs following one of the commonest abdominal surgeries, CS. The evaluation of the study variables was done according to standardized criteria for identifying the return of GI motility. Also, the patient's feedback was taken into consideration for future improvement in the level of clinical practice. Nonetheless, this study has limitations. The criteria for assessing gastric motility and bowel functions are still subjective despite being mentioned in the literature. Another limitation is the lack of validated surveys to evaluate the patient's perspective regarding acupressure, which would be of value in analyzing the responses and using them in enhancing healthcare practice.

Conclusion

It could be concluded that applying acupressure on specific acupoints in addition to a mobilization protocol can accelerate the return of normal bowel function and GI motility post-CS. Also, acupressure is deemed acceptable by women with POI who were treated by acupressure sessions.

Abbreviations

CS: Cesarean section.

GI: Gastrointestinal.

POI: Postoperative ileus.

BMI: Body mass index.

SD: Stander deviation.

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