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Research Paper

The Effect of Electrocautery on the Amount of Bleeding, Wound Infection and Length of Hospital Stay in Cesarean Section Surgery

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ABSTRACT

Background and Aim: This study aims to investigate the impact of using and not using electrocautery during cesarean section surgeries on bleeding levels and morbidity complications in pregnant mothers. This study aims to determine the efficacy of electrocautery in reducing bleeding and the related side effects associated with this type of surgery.

Materials and Methods: This study was a clinical trial conducted on 110 pregnant women at educational hospitals affiliated with Qom University of Medical Sciences, Qom City, Iran. Patients were randomly divided into two groups: An intervention group (using a cautery) and a control group (not using a cautery). The sample size comprised 55 individuals in each group, considering the possibility of attrition. Information including age, gestational age, body mass index (BMI) and medical history were extracted and recorded from the patient's files. Follow-ups were conducted the next day, 10 days, and 40 days after the cesarean section. Data were analyzed using appropriate statistical tests in the SPSS software, version 20.

Results: No statistically significant differences were found between the two groups in terms of patients regarding the mean age, gestational age, BMI, number of pregnancies, type of cesarean section, length of hospital stay, history of pregnancy-induced hypertension, and underlying diseases (P>0.05). In patients' follow-ups, no wound infections were found in either group, and the frequencies of bleeding between the two groups on days 1, 10 and 40 showed no statistically significant differences (P>0.05).

Conclusion: The levels of morbidity and bleeding associated with the use or non-use of electrocautery in cesarean sections showed no statistically significant difference.

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Introduction

One of the most common gynecological surgeries is a cesarean section. The number of studies conducted has increased significantly worldwide compared to recent decades [1, 2]. According to previous studies, the number of cesarean sections in the United States and Europe is more than one million [3, 4].

The rate of emergency and elective cesarean sections in 2018 was reported to be approximately 31.9% (1.2 million births) in the United States and approximately 52% (0.7 million births) in Turkey [5, 6]. It should be noted that most emergency cesarean sections are performed due to lack of progress in vaginal delivery, unreliable fetal heart rate, poor general condition of the mother, and fear of labor pain, which is considered one of the sporadic cases of elective cesarean section [3, 7]. Therefore, one of the vital aspects for patients undergoing cesarean section is the reduction in the intensity and duration of pain during the postoperative and recovery periods. A 15-cm Pfannenstiel incision was made in cesarean section [8]. A surgical scalpel or electrocautery blade made skin and subcutaneous tissue incisions. Electrocautery is often used to create subcutaneous incisions. One of the main concerns about using this method is the concerns about wound healing and patient aesthetics, which, although it has been considered by many physicians and is considered very important by patients, according to recent research, no significant difference has been observed regarding these concerns [9, 10].

Electrocautery is a metal blade used to stop and control bleeding from small vessels during incision because it produces a large amount of electrical heat, which leads to vascular occlusion [11, 12]. Several studies have investigated and compared the effects and complications of scalpels and electrocautery blades regarding incision speed, blood loss, postoperative pain, wound healing, and complication rates in various surgical operations. However, until the past several years, limited information has existed on using scalpels or electrocautery blades in the cesarean section [10, 13-16]. Recent randomized controlled trials have reported significant advantages of electrocautery-induced incisions at the time of inducing epidural skin incisions, blood loss, and postoperative pain compared to cold scalp incisions in women undergoing cesarean section [17-19]. According to some studies [10, 11] that used electrocautery for skin incisions, a scalpel was used to create the skin incision in this study. Since limited studies are conducted in this field, we decided to conduct a study to investigate the effect of cautery use on bleeding, wound infection, and length of hospital stay in cesarean sections of patients referred to Khayerin Salamat Hospital, Qom City, Iran, from 2022 to 2024.

Materials and Methods

The present study was a clinical trial. The study population included pregnant women with indications for cesarean section who were referred to the Khayerin Salamat Hospital. Considering the study power of 90%, the type I error of 5%, and the difference in pain values in the two groups of 1.44 and the standard deviation of 1.13 and 1.37 in the Mahmood study [20], the minimum sample size required for the study was 36 people in each group. Assuming a dropout rate of 15%, the study sample size was increased by 55 people. Therefore, in this study, we examined and intervened with 110 participants. Non-probability consecutive sampling was used in this study. The patients were randomly assigned to two intervention and control groups by block assignment. The size of each block was 4. Therefore, we had six blocks of four: AABB, ABAB, BBAA, BABA, ABBA and BAAB. The selection of each block was also random and performed using a dice roll. For example, if the number 3 came up on the dice roll, block BBAA was considered. Therefore, the first two patients were assigned to treatment B and the following two to treatment A. The inclusion criteria included G1 or G2 patients who had undergone cesarean section, patients who used cautery during cesarean section, and patients who did not use cautery during cesarean section.

The inclusion criteria included pregnant mothers with no history of diabetes during or before pregnancy, no severe preeclampsia, and no prolonged rupture of the membranes. The exclusion criteria also included pregnant mothers who had given birth naturally. To collect information and select a statistical sample, all patients who had undergone cesarean section between 2022 and 2023 were divided into two groups: A and B and 55 patients in each group (using and not using cautery). The information required for the study included age, gestational age, body mass index (BMI), number of pregnancies, number of cesarean sections, type of cesarean section, type of cesarean section, duration of cesarean section, length of hospital stay, history of underlying diseases before pregnancy, and history of diseases during pregnancy. These were extracted from the patient records, and if necessary, the patients were contacted, the considered questions were asked, and finally, recorded in researcher-made questionnaires. In the cautery group, electrocautery was used to cut the skin and establish hemostasis (for 3 sec-

onds per stroke). All surgical procedures (skin-to-skin) and hemostasis were performed without electrocautery in the no-cautery group. Follow-up of the mothers who underwent surgery was performed clinically or by telephone on 1, 10 and 40 days after the cesarean section. A surgeon performed all procedures. After data collection, the data were analyzed using SPSS software, version 20 and the chi-square, Fisher exact and t-tests.

Results

A total of 110 pregnant mothers were divided into two equal groups. The demographic and obstetric variables of the patients were compared between the two groups, and the results are presented in Table 1.

The average length of hospital stay in both groups was about 1.5 days and the frequency of wound infection was such that no wound infection was found in any of the patients on the day after cesarean section and in the next 10 and 40 days in both groups. The frequency of bleeding was such that on the first day, 2.7% in the experimental group and 3.6% in the control group had bleeding; on the 10th day, 1.8% in the experimental group and 2.7% in the control group had bleeding, and on the 40th day, no bleeding was observed. The results show that the frequency of bleeding was lower in the experimental group than in the control group. Still, no statistically significant difference was found between the two groups regarding the frequency of bleeding on the days of the patient's follow-up (Table 2).

Discussion

Several studies have investigated and compared the effects and complications of scalpels and electrocautery blades regarding incision speed, blood loss, postoperative pain, wound healing, and complication rates in various surgical operations. However, in the past several years, there has been limited information on using a scalpel or electrocautery blade in cesarean section [10, 13-16]. According to some recent randomized controlled

Table 1. C-Section with vs without cautery: Demographic/clinical profiles in Qom, 2022

Variables		No. (%)/Mean±SD		P
		Group		
		Control	Experimental	
Age (y)	<19	14(12.7)	12(10.9)	0.892
	20-34	33(30)	34(30.9)	
	≥35	8(7.3)	9(8.2)	
BMI (kg/m²)	<19	6(5.5)	9(8.2)	0.206
	20-25	42(38.2)	33(30)	
	25-30	7(6.4)	11(10)	
	>30	0	2(1.8)	
Gestational age		0.58±38.9	0.68±38.7	0.298
Parasitic		0.5±1.52	0.5±1.45	0.466
Number of cesarean sections	Once	6(5.5)	7(6.4)	0.768
	Twice	49(44.5)	48(43.6)	
	More than 2 times	0	0	
Number of cesarean sections	Elective	55(50)	55(50)	1
	Emergency	0	0	
Duration of cesarean sections		1.83±32.98	1.91±32.74	0.51

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Table 2. C-Section case vs control: LOS, infection, bleeding by patient factors, Qom 2022

Variables		No. (%)/Mean±SD		P
		Group		
		Control	Experimental	
Length of hospital stay		0.4±1.27	0.47±1.34	-0.414
Wound infection	Day 1	0	0	0.696
	Day 10	0	0	
	Day 40	0	0	
Blooding	Day 1	4(3.6)	3(2.7)	0.647
	Day 10	3(2.7)	2(1.8)	
	Day 40	0	0	

Data are presented as No. (%) or mean±SD.

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trial studies, significant advantages of electrocautery incision at the time of inducing epidural-cutaneous incision, blood loss and postoperative pain have been reported compared to incision induced by cold scalp in women undergoing cesarean section [17-19]. Considering some studies [10, 11] that used electrocautery for skin incision in their research, this study aimed to investigate the morbidity rate of using and not using cautery in cesarean section surgery in patients referred to Khayerin Salamat Hospital from 2022 to 2024. The study results showed that less bleeding was observed in patients who used cautery. Also, no statistically significant difference was found between the two groups and no wound infections were observed. However, no significant difference was observed in morbidity between the two groups with and without using cautery in the patients' follow-up.

Other studies include the following. Ağar et al. conducted a randomized controlled trial to compare electrocautery and surgical scalpel use in creating subcutaneous incisions regarding blood loss and postoperative pain in women undergoing cesarean section. A total of 149 women who underwent cesarean section were selected as the study population and underwent surgery using epidural anesthesia, transverse Pfannenstiel skin incision with a cold scalpel blade, and subsequent subcutaneous incisions to the peritoneum with a cold scalpel blade or electrocautery. According to their results, the groups were similar regarding maternal age, physical characteristics and gestational age. In the electrocautery group, blood loss and pain were significantly lower 6 and 12 hours after surgery. Their study showed that the use of electrocautery to create subcutaneous incisions was associated with less blood loss and postoperative pain. At the same time, these complications were significantly higher in the group with incisions using a cold scalp [3].The results of this study are similar to the results of our research.

In line with these results, a study was conducted in 2021 to compare the mean operative time, pain, and postoperative blood loss with scalp and electrocautery in cesarean sections with abdominal incisions. Their study was a randomized controlled trial conducted at the MCH Center PIMS Islamabad for 6 months, from June 2020 to December 2020. In their study, 100 pregnant women with a gestational age of 37-41 weeks who had undergone surgery between the ages of 18 and 45 years were selected and randomly divided into two groups of 50. Women with gestational diabetes, first pregnancy, or liver or kidney failure were excluded from the study. Group A included women who underwent an electrocautery incision, and group B included women who underwent a scalpel incision. The same surgeon performed all surgical procedures in both groups, and operative time, pain, and postoperative blood loss were measured. Based on the results of their study, the mean operative time in group A (electrocautery group) and group B (scalp group) was 66.92±7.39 minutes and 86.98±5.84 minutes, respectively (P=0.00001). The mean blood loss in groups A and B was 194.32±56.01 mL and 418.96±18.26 mL, respectively. Also, the mean postoperative pain in groups A and B was 1.84±1.13 and 3.28±1.37, respectively. Therefore, according to the results of the present study, incisions caused by electrocautery are associated with fewer complications and morbidity [20], which confirms the results of our study.

Significant results have been published based on a study conducted to investigate the rate of postoperative wound infection, neonatal effects, and the effect of the time of skin-to-peritoneal incision between diathermy and surgical scalpel during cesarean section. This research was a retrospective study conducted in 2020 in educational hospitals. Their study included 74 patients with the inclusion criteria defined in the study. However, 6 patients in the electrocautery group were excluded from the study due to a lack of regular visits. In the control group, which included 37 patients, the incision method was a surgical scalpel, while in the second group, with 31 patients, the incision method was diathermy. The main criteria examined in the present study were operation time, postoperative infection rate, scar characteristics, neonatal Apgar score, and need or lack of need for neonatal intensive care unit care. According to the results of their study, no significant difference was observed between neonatal Apgar scores, wound infection rate, and surgical time at 1 and 5 minutes [21].

Therefore, their study recommended diathermy as a suitable alternative to scalping in Pfannenstiel incisions. CM Moreira et al. conducted a randomized, controlled clinical pilot study in an educational hospital. After admission to the hospital and the decision to undergo cesarean section, the study population was randomly divided into two intervention groups (using electrocautery for coagulation) or a non-intervention group. The patient's condition was evaluated regarding infection, hematoma, and blood loss during the postpartum discharge period, that is, on the third, seventh, tenth and thirtieth days. The obtained data were analyzed and the risk ratio was calculated. According to the results of their study, no significant difference was observed between the two groups. Only 2.8% of all patients in the intervention group had surgical wound complications during their hospital stay. At the same time, this rate reached 23% and 15.4% in the intervention and non-intervention groups, respectively, on the seventh to tenth days after discharge [22]. Considering the results of other studies and our study, no definitive answer is found for the use or non-use of electrocautery in patients undergoing cesarean section.

Conclusion

The results of our study showed that the use or non-use of cautery in cesarean sections does not play a role in reducing morbidity and bleeding in patients during postoperative follow-ups.

Ethical Considerations

Compliance with ethical guidelines

This study complied with all ethical principles of research. This study was approved by the Research Ethics Committee of Qom University of Medical Sciences, Qom, Iran (Code: IR.MUQ.REC.1401.148).

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Authors' contributions

All authors equally contributed to this study.

Conflict of interest

The authors declared no conflict of interest.

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