



Comparison of Operative Time, Postoperative Pain, and Blood Loss Between Electrocautery and Scalpel for Abdominal Incisions in Repeat Cesarean Sections

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ABSTRACT

Introduction: There are many techniques of performing Caesarian section and each has its own advantages and disadvantages. The skin incision may be vertical, midline, Para median and the most common being pfannensteil incision. Electrocautery is an alternate method to open the skin by the use of an alternating current through tissue resistance to raise tissue temperature to achieve protein coagulation. **Objectives:** To compare the mean operative time, post-operative pain and blood loss. **Materials & Methods:** Total 100 women with singleton pregnancy (assessed on USG) of gestational age 37-41 weeks (assessed by LMP) undergoing cesarean section of 18-45 years of age were selected. Women with GDM, Primigravida, hepatic or renal impairment were excluded. Group A included women who had incision with electrocautery. Group B included women who had incision with scalpel. All operations in both groups were done by myself pg4 resident and operative time, post-operative pain and blood loss was measured. electrocautery verses scalpel in repeat caesarian sections for abdominal incisions. Study design was Randomized controlled trial. Settings were in Department of Obstetrics & Gynaecology, PIMS Hospital, Islamabad. Study duration was 30th June 2020 to 29th December 2020. **Results:** In my study, the mean operative time in Group A (diathermy group) was 66.92 ± 7.39 minutes while in Group B (scalpel group) was 86.98 ± 5.84 minutes (p -value = 0.0001). Mean blood loss in Group A (diathermy group) was 194.32 ± 56.01 ml while in Group B (scalpel group) was 418.96 ± 26.18 ml (p -value = 0.0001). Mean post-operative pain in Group A (diathermy group) was 1.84 ± 1.13 while in Group B (scalpel group) was 3.28 ± 1.37 (p -value = 0.0001). **Conclusion:** This study concluded that the diathermy incision is better than scalpel skin incisions in terms of incision time, blood loss and post-operative pain. **Keywords:** caesarean section, diathermy incision, blood loss.

INTRODUCTION

The caesarean section is the most common procedure performed on the women of reproductive age worldwide. Caesarean delivery is a major surgical procedure, after which substantial postoperative discomfort and pain can be anticipated. It is well documented that pain, inadequately relieved, is deleterious and can lead to number of complications in the postoperative period. There are many techniques of performing Caesarian section and each has its own advantage and disadvantage. The skin incision may be vertical, midline, Para median and the most common being pfannensteil incision.¹ Electrocautery is an alternate method to open the skin by the use of an alternating current through tissue resistance to raise tissue temperature to achieve protein coagulation.¹ The advantages are rapid haemostasis, rapid and precise tissue dissection and a reduced overall operative blood loss.² The complications for electrocautery include burns at the patient plate, explosion and fire, surgical smoke and ventricular fibrillation in patients with pacemakers.¹ Skin incisions are routinely made with stainless steel scalpel which are supposed to be more bloody and painful.³ The disadvantages of steel scalpel is lack of hemostasis leading to increase blood loss, indistinct tissue separation, increase in operative time, use of foreign material in the wound leading to infection risk and possibility of incidental injury to nearby assistants scrubbed in operation theater.

In Liaquat University Jamshoro Pakistan, Clinical trial on Diathermy and scalpel incision in Elective general surgery by surgery department shows that for group A the Mean incision time was 8.9025 sec/cm² (SD $\pm$ 1.3666 sec/ cm²) and for group B the mean incision

time was 7.3057 sec/cm² (SD $\pm$ 0.9677 sec/cm²). Mean incision blood loss in group A was also found to be significantly higher i.e. 1.8262 mL/cm² (SD $\pm$ 0.2984 mL/cm²) compared to group B patients i.e 1.1346 mL/cm² (SD $\pm$ 0.3399 mL/cm²). Postoperative pain on day one, two, and five was assessed by VRS. It was significantly higher in group A.⁴

Chalya et al in their study on diathermy versus scalpel incisions in elective midline laparotomy in general surgery at Tanzania showed the reduction in mean incision time with scalpel was statistically significant. The mean loss of blood for diathermy incisions was significantly less as compared to scalpel.⁵ In a study at a teaching hospital in Sola, patients were allocated consecutively to have either scalpel or cutting electrocautery incisions. The incision time was significantly shorter and the blood loss was significantly less with the electrocautery compared to the scalpel⁶

There are only a few studies conducted in Pakistan to compare electrocautery verses scalpel in abdominal surgeries. Caesarian section rate has increased over the last decade. The complications related to wound have also increased resulting in increased morbidity and increased use of hospital resources in a low income country. Our study results may provide better methodology that may be adopted in future for better outcome. The first successful Caesarean section to be performed in America took place in what was formerly Mason County, Virginia (now Mason County, West Virginia), in 1794. European travelers in the Great Lakes region of Africa during the 19th century observed Caesarean sections being performed on a regular basis. On March 5, 2000, in Mexico, Inés Ramírez performed a Caesarean section



on herself and survived, as did her son, Orlando Ruiz Ramírez. She is believed to be the only woman to have performed a successful Caesarean section on herself.

From 1910-1928, the cesarean delivery rate at Chicago Lying-in Hospital increased from 0.6% to 3%. The cesarean delivery rate in the United States was 4.5% in 1965. According to the National Hospital Discharge Survey, the cesarean rate rose from 5.5% in 1970 to 24.1% in 1986. It was predicted that if age-specific cesarean rates continued at the steady pattern of increase observed since 1970, 40% of births would be by cesarean in the year 2000.³⁴ Those predictions fell short, but not by much. The National Center for Health Statistics reported that the percentage of cesarean births in the United States increased from 20.7% in 1996 to 32% in 2007.³⁵ Increases in the primary cesareans with no specified indication were faster than in the overall population and appear to be the result of changes in obstetric practice rather than changes in the medical risk profile or increases in maternal request.³⁶

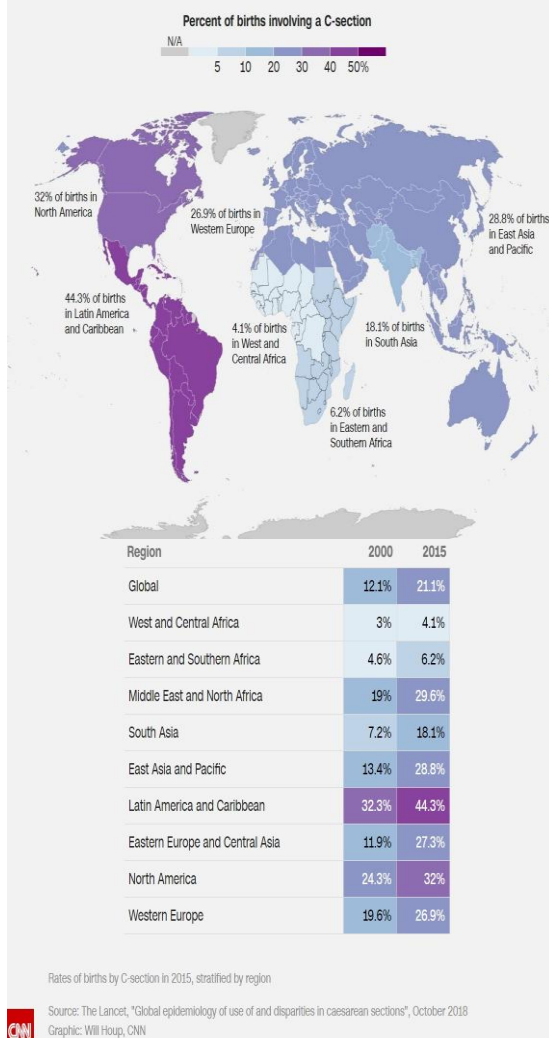
This has occurred despite several studies that note an increased risk for neonatal and maternal mortality for all cesarean deliveries as well as for medically elective cesareans compared with vaginal births.³⁷ The decrease in total and repeat cesarean delivery rates noted between 1990 and 2000 was due to a transient increase in the rate of vaginal births after cesarean delivery.³⁸ The cesarean delivery rate is approximately 21.1% for the most developed regions of the globe, 14.3% for the less developed regions,

and 2% for the least developed regions.³⁹ In a 2006 publication reviewing cesarean delivery rates in South America, the median rate was 33% with rates fluctuating between 28% and 75% depending on public service versus a private provider.⁴⁰ In 1988, when the cesarean delivery rate peaked at 24.7%, 36.3% (351,000) of all cesarean deliveries were repeat procedures. Although reports concerning the safety of allowing vaginal birth after a cesarean delivery had been present since the 1960s,⁴¹ Today, low-risk women giving birth for the first time who have a cesarean delivery are more likely to have a subsequent cesarean delivery.⁴² The cesarean rate for mothers aged 40-54 years in 2007 was more than twice the cesarean rate for mothers younger than 20 years (48% and 23%, respectively).⁴³

By 1985, almost 85% of all breech presentations (3% of term fetuses) were delivered by cesarean. In 2001, a multicenter and multinational prospective study determined that the safest mode of delivery for a breech presentation was cesarean delivery.⁴⁴ This study has been criticized for differences in the standards of care among the study centers that does not allow a standard recommendation.⁴⁵

The most recent recommendation from the American College of Obstetricians and Gynecologists (ACOG) regarding breech delivery is that planned vaginal delivery may be reasonable under hospital-specific protocol guidelines for both eligibility and labor management.⁴⁶

World regions with the highest, lowest C-section rates

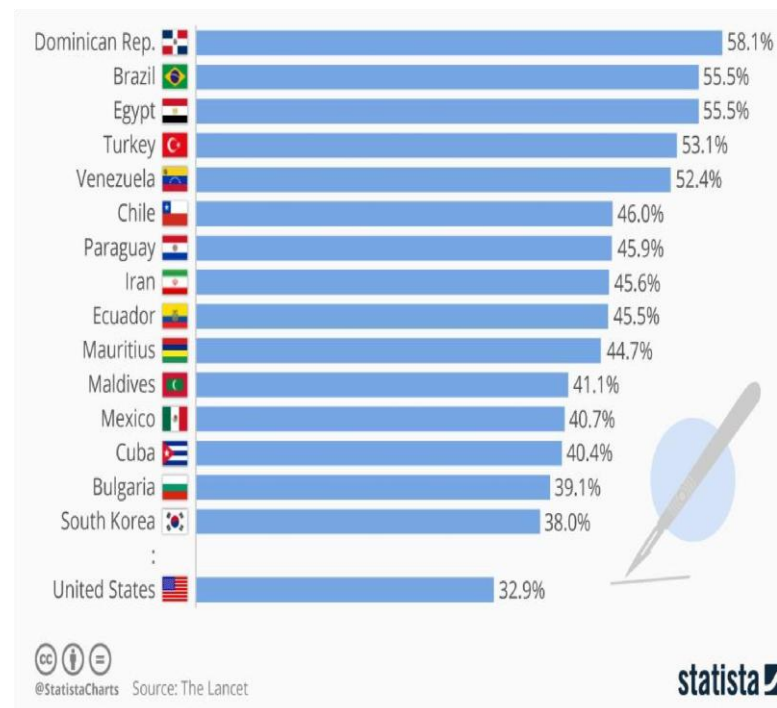


A study published by the Lancet in 2018 found that caesarean section rate is increasing rapidly around the world, labeling the pace of growth "alarming". At the turn of the century, 12% of global births were via C-section and by 2015, that had increased to 21%. World Health Organization who estimate that 10 to 15 percent of all births require the procedure due to complications and a rate higher than that is excessive. The research showed that C-sections are more in rich countries while it is not available in many poorer parts of the world. Its use was up to 10 times more frequent in the Caribbean and central Africa in 2015

while in South Sudan, it was barely used, accounting for just 0.6 percent of all births. The general rise in the procedure's popularity has been attributed to more women giving birth in medical institutions like hospitals. Other reasons it is becoming more common is due to women's fear of pain during childbirth, concerns about future sex-life and the perception that it is safe.

Niall McCarthy

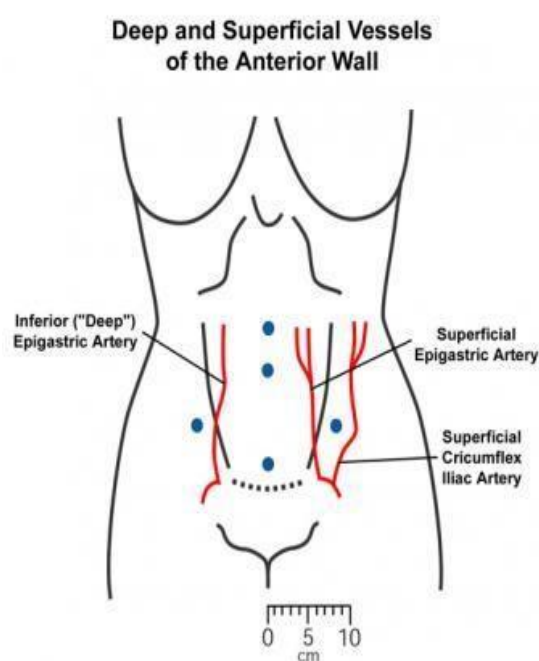
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Pakistan is among those countries where the number of caesarean section births has increased unusually in the past two decades. Secondary data from Pakistan Demographic and Health

Surveys (1990–2018) analysed and showed caesarean deliveries increased continuously from 3.2% in 1990–91 to 19.6% in 2017–18.⁴⁸

Figure 1: Location of deep and superficial vessels of the anterior abdominal wall. Blue circles indicate recommended locations for trocar placement.



Nerve supply:

Innervation of the abdominal wall is by the thoracoabdominal nerves, the ilioinguinal nerves, and the iliohypogastric nerves. The thoracoabdominal nerves travel caudad between the transversus abdominis and the internal oblique. These nerves innervate the flat muscles of the abdominal wall and the rectus muscle. Innervating the lower abdominal wall are the iliohypogastric nerves and the ilioinguinal nerves. Both of these

nerves arise primarily from the first lumbar nerve root. Damage to these nerves results in sensory changes in the mons pubis and the labia majora.

MATERIALS & METHODS

STUDY DESIGN: Randomized Controlled Trial.

SETTING: Department of Obstetrics & Gynecology, PIMS Hospital, Islamabad.

DURATION OF STUDY: 30th June 2020 to 29th December 2020.

After approval from ethical committee, randomized control trial was conducted in MCH center unit 1 Pakistan Institute of Medical Sciences. Patients were allocated randomly using computer gen into two equal groups.

In Group A incision with electrocautry, it is an isolated output electrosurgical generator that provides the power for cutting, desiccating and fulgurating tissue during surgery. Alternating current generated through a SSE2 L Valley lab Force FX. Different settings available which delivered specific amount of monopolar current. We used 45-50 watts in our procedure. **In Group B incision with scalpel,** Informed consent was taken from all women who fulfilled the inclusion criteria for the procedure to be undertaken. Detailed history for any comorbid illness and previous surgery and complete examination including BMI, anemia, jaundice and type of previous scar was done. Routine investigations included blood complete picture, liver function test, renal function test, blood sugar levels and hepatitis status in both groups.

DATA ANALYSIS PROCEDURE:

All the data was entered and analyzed by using SPSS version 24.0. Age, gestational age and parity, operative time, pain and blood loss were presented as mean and standard deviation. Frequency and percentage were calculated number of CS and type of anesthesia. Comparison of the mean operative time, pain and blood loss between both groups was analyzed by independent 't' test. P value ≤ 0.05 was considered as statistically significant. Effect modifiers like age, gestational age, number of CS and type of anesthesia were controlled by stratification. Post-stratification independent 't' test was applied and P-value ≤ 0.05 was taken as significant.

RESULTS

Age range in this study was from 18 to 45 years with mean age of 28.13 ± 6.02 years. The mean age of patients in group A was 28.18 ± 6.37 years and in group B was 27.76 ± 5.55 years. Majority of the patients 60 (60.0%) were between 20 to 30 years of age as shown in Table I. Mean gestational age was 38.76 ± 1.17 weeks. The mean gestational age in group A was 38.72 ± 1.11 weeks and in group B was 38.78 ± 1.23 weeks as shown in Table II. Mean parity was 2.21 ± 0.96 . The mean number of previous CS in group A was 2.14 ± 0.95 and in group B was 2.35 ± 0.98 as shown in Table III. Distribution of patients according to type of anesthesia is shown in Table IV. In my study, the mean operative time in Group A (diathermy group) was 66.92 ± 7.39 minutes while in Group B (scalpel group) was 86.98 ± 5.84 minutes (p-value = 0.0001). Mean blood loss in Group A (diathermy group) was 194.32 ± 56.01 ml while in

Group B (scalpel group) was 418.96 ± 26.18 ml (p-value = 0.0001). Mean post-operative pain in Group A (diathermy group) was 1.84 ± 1.13 while in Group B (scalpel group) was 3.28 ± 1.37 (p-value = 0.0001) as shown in Table V. Stratification of Operative time with respect to age, gestational age, number of CS and type of anesthesia is shown in Table VI. Stratification of blood loss with respect to age, gestational age, number of CS and type of anesthesia is shown in Table VII. Stratification of post-operative pain with respect to age, gestational age, number of CS and type of anesthesia is shown in Table VIII. All confounding variables like age, gestational age, number of CS and type of anesthesia have shown significant difference between different groups in terms of operative time, blood loss and post-operative pain.

Table-I: Age distribution for both groups (n=100).



Age (years)	Group A (n=50)		Table-II: Distribution of patients according to gestational age in both groups.					
	No. of patients	%age	No. of patients	GA (weeks)	%age	Group A (n=50)		Group B (n=50)
						No. of patients	%age	
20-30	26	52.0	34		68.0	60	60.0	
				37		09	18.0	10
31-45	24	48.0	16		32.0	40	40.0	
				38		11	22.0	16
Mean $\pm$ SD	28.18 $\pm$ 6.37		27.76 $\pm$ 5.55			28.13 $\pm$ 6.02		
				39		16	32.0	10
				40		13	26.0	11
				41		01	2.0	03
				Mean $\pm$ SD		38.72 $\pm$ 1.11		38.78 $\pm$ 1.23

Table-IV: Distribution of patients according to type of anesthesia.

Type	Group A (n=50)		Group B (n=50)
	No. of patients	%age	No. of patients

Table-III: Distribution of patients according to number of previous CS.

Number of CS	Group A (n=50)		Group B (n=50)		Total (n=100)	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
1	15	30.0	12	24.0	27	27.0
2	20	40.0	16	32.0	36	36.0
3	10	20.0	15	30.0	25	25.0
4	05	10.0	07	14.0	12	12.0
Mean ± SD	2.10 ± 0.95		2.35 ± 0.98		2.21 ± 0.96	

Table-V: Comparison of mean operative time, post-operative pain and blood loss with electrocautery verses scalpel in repeat caesarian sections for abdominal incisions.

Outcome	Group A (n=50)
	Mean ± SD



Operation time (minutes)	66.92 ± 7.39		86.98 ± 5.84	3-4	67.0	7.90
		Type of anesthesia		GA	68.72	8.76
Blood loss (ml)	194.32 ± 56.01		418.96 ± 26.18		0.0001	
				SA	65.91	6.43
Pain	1.84 ± 1.13		3.28 ± 1.37		0.0001	

Table VII: Stratification of blood loss with respect to age, gestational age, number of CS and type of anesthesia.

Table VI: Stratification of Operative time with respect to age, gestational age, number of CS and type of anesthesia.

respect to age, gestational age, number of CS and type of anesthesia.				Co-morbid conditions				Group A (n=50)	
								Blood Loss (ml)	
Co-morbid conditions		Group A (n=50)		Group B (n=50)		P-value		Mean	SD
		Operative (minutes)	time	Age (years)	Operative time (minutes)		20-30	182.15	33.50
							Mean	SD	Mean
Age (years)	20-30	68.31	7.56	85.31	6.65	0.0001			
	31-45	65.42	7.05	GA (weeks)		37-39	188.94	33.61	
				40-41	208.14	92.19			
GA (weeks)	37-39	68.08	7.65	86.83	6.17	0.0001			
	40-41	63.93	5.90	Number of CS		1-2	197.63	62.44	
				3-4	186.60	37.67			
Number of CS	1-2	66.89	7.28	87.54	6.11	0.0001			

Type of anesthesia	GA	239.22	68.58	416.82	23.53	0.0001	1.88	1.10
	SA	169.06	23.45	420.06	27.74	0.0001		

DISCUSSION

Table VIII: Stratification of Post-operative pain with respect to age, gestational age, number of CS and type of anesthesia.

Co-morbid conditions		Group A (n=50)		Group B (n=50)		P-value
		Post-operative pain		Post-operative pain		
		Mean	SD	Mean	SD	
Age (years)	20-30	1.81	1.23	3.15	1.37	0.0001
	31-45	1.88	1.05	3.56	1.36	0.0001
GA (weeks)	37-39	1.72	1.00	3.19	1.21	0.0001
	40-41	2.14	1.41	3.50	1.74	0.0001
Number of CS	1-2	1.83	1.22	3.54	1.32	0.0001
	3-4	1.87	0.92	2.95	1.40	0.0001
Type of anesthesia	GA	1.78	1.20	3.18	1.01	0.0001

Electrocauterization or electrocautery is routinely used in surgery to remove unwanted or harmful tissue, i.e., tissue dissection, burn and seal blood vessels, and to create a surgical incision. It is also used

increasingly to reduce or stop bleeding.¹⁵⁴ It is used to burn or destroy the tissue. However, electrocautery, which is available in all surgical theaters, is less frequently used for skin incisions due to fear of tissue damage, poor wound healing, postoperative pain, and excessive scarring.¹⁵⁵ I have conducted this study to compare the mean operative time, post-operative pain and blood loss with electrocautery verses scalpel in repeat caesarian sections for abdominal incisions.

In my study, the mean operative time in Group A (diathermy group) was 66.92 ± 7.89 minutes while in Group B (scalpel group) was 86.98 ± 5.84 minutes (p-value = 0.0001). Chalya et al in their study on diathermy versus scalpel incisions in elective midline laparotomy in general surgery at Tanzania showed the mean incision time with scalpel was 9.21 ± 1.40 sec/cm² in comparison to 7.84 ± 0.82 sec/cm² with diathermy incisions. The difference between the two groups with respect to the mean incision time was statistically significant. A randomized clinical trials, has shown that incision time was significantly longer for patients in scalpel group (p = 0.001).¹⁵⁶ In Liaquat University Jamshoro Pakistan, Clinical trial on



Diathermy and scalpel incision in Elective general surgery by surgery department shows that for group A the Mean incision time was 8.9025 sec/cm² (SD $\pm$ 1.3666 sec/ cm²) and for group B the mean incision time was 7.3057 sec/cm² (SD $\pm$ 0.9677 sec/cm²) for group B patients.⁴ Ly et al¹⁵⁷ in their systemic review and meta-analysis of fourteen randomized trials comprising of 2541 patients (1267 undergoing skin incision by cutting diathermy and 1274 by scalpel), found that diathermy may offer significant advantages in many variables including, operative blood loss, incision time and postoperative pain. A prospective non-randomized study¹⁵⁸ has shown significantly lesser incision time (6.6 min $\pm$ 3.1 min; t = 2.8; P = 0.006) compared to scalpel group. In a study at a teaching hospital in Sola, patients were allocated consecutively to have either scalpel or cutting electrocautery incisions. The incision time was shorter in the electrocautery group (P<0.001).⁶

My study has shown the mean blood loss in Group A (diathermy group) was 194.32 $\pm$ 56.01 ml while in Group B (scalpel group) was 418.96 $\pm$ 26.18 ml (p-value = 0.0001). In a randomized clinical trials, incisional blood loss also was more for patients in scalpel (p = 0.000).⁰⁷ Mean incision blood loss in scalpel group was also found to be significantly higher i.e. 1.8262 mL/cm² (SD $\pm$ 0.2984 mL/cm²) compared to diathermy group patients i.e 1.1346 mL/cm² (SD $\pm$ 0.3399 mL/cm²).⁴ Ly et al in their systemic review and metaanalysis of fourteen randomized trials comprising of 2541 patients (1267 undergoing skin incision by cutting diathermy and

1274 by scalpel), found significantly reduced amounts of blood loss (mean difference of 0.72 mL/cm (2); P < 0.001) as compared to scalpel incisions. The blood loss was less with the electrocautery compared to the scalpel (6.53 $\pm$ 3.84 ml vs. 18.16 $\pm$ 7.36 ml, P<0.001).⁶ A prospective nonrandomized study¹⁵⁸ had a significantly low blood loss (18.1 g $\pm$ 16.1 g vs. 35.8 g $\pm$ 16.9 g; t = 4.1; P = 0.0001).

Mean post-operative pain in Group A (diathermy group) was 1.84 $\pm$ 1.13 while in Group B (scalpel group) was 3.28 $\pm$ 1.37 (p-value = 0.0001). Pain perception was found to be markedly reduced during the first 48 h in group A (p = 0.000).¹⁵⁶ In Liaquat University Jamshoro Pakistan, postoperative pain on day one, two, and five was assessed by VRS. It was significantly higher in diathermy group.⁴ In one study by Kearns and colleagues¹¹ it was found that diathermy produces significantly less postoperative pain on the first and second postoperative day when compared to scalpel incisions. From the third postoperative day onwards, severity of pain after surgery became significantly different between the two groups. A prospective nonrandomized study¹² has shown that electrosurgery group also

CONCLUSION

This study concluded that the diathermy incision is better than scalpel skin incisions in terms of incision time, blood loss and post-operative pain. So, we recommend that diathermy should be used routinely in repeat caesarian sections for abdominal incisions for reducing the blood loss and post-operative pain

which will in turn improve their quality of life by reducing post-operative morbidity.

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