

Original Article

Diathermy versus Scalpel for Abdominal Incisions in Caesarian Section

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Abstract

Objective: To compare the mean incision time, blood loss and post-operative pain with diathermy versus scalpel in caesarian sections for abdominal incisions. **Methods:** This is a prospective randomized study was conducted in the Department of Gynaecology & Obstetrics, of a tertiary hospital in Bangladesh from January 2022 to December 2022 for a period of 12 months. Total 436 women with singleton pregnancy of gestational age 37-41 weeks undergoing cesarean section of 20-40 years of age were selected and randomly divided into two groups of 218 women in each. Patients were randomized to have either scalpel or diathermy incisions. The duration used in making the skin incision was noted. Blood loss, postoperative pain, duration of wound healing and the occurrence of surgical site infection were also noted. **Results:** The mode of presentation was predominantly elective. The incision time was shorter in the Group A (Diathermy group) 3.7 ± 1.3 minutes while in Group B (Scalpel group) was 5.4 ± 1.7 minutes ($P < 0.001$). The blood loss was less with the diathermy compared to the scalpel (4.45 ± 2.27 ml vs. 7.32 ± 3.47 ml, $P < 0.001$). The cumulative numerical rating scale score for pain was 12.75 (standard deviation [SD] 6.07) and 17.65 (SD 9.59) in the diathermy and scalpel groups respectively ($P < 0.001$). There was no statistically significant difference in wound infection and wound closure (epithelialization time) ($P = 0.207$). **Conclusions:** 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, Blood loss.

Introduction: The term 'diathermy' is of Greek origin (*dia* through, *thermy* heat). Diathermy is a method whereby a high-frequency electric current, usually within the range of 300 – 3000 kHz, is passed through the tissue either for the destruction and removal of diseased tissues with diminished bleeding.¹ The first surgical diathermy machine was designed by W.T. Bovie in 1928 to facilitate tumour removal and haemostasis in neurosurgery.² A diathermy machine converts electricity from the mains supply (240 V, 50 Hz) into high frequency current at radio wave frequencies,³ thus minimizing the risk of electrical shocks. Diathermy is an integral part of many modern surgical procedures. The caesarean section (CS) is the

most commonly performed surgery in the female of reproductive age. There are many techniques of performing Caesarian section. Every technique has its own advantage and disadvantage. The skin incision may be vertical, midline, Para median and the most common being pfannenstiel incision.⁴ Electro cautery is an alternate method to open the skin by the use of an alternating current.⁴ Electro cautery is time saving method with rapid hemostasis, rapid and precise tissue dissection and a reduced overall operative blood loss.⁵ Skin incisions are routinely made with stainless steel scalpel which are supposed to be more bloody and painful.⁶ The disadvantages of steel scalpel include more blood loss, indistinct tissue separation, more

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operative time. Despite the introduction of electro cautery (diathermy) about a century ago,^{7,8} it is still used mostly for underlying dissection and hemostasis.⁹ Skin incisions with electro cautery are not frequent because of the fear of deep burns; poor wound healing and excessive scarring.¹⁰ These presumptions stem from experimental and clinical studies that yielded varied reports.¹¹⁻¹³ This study compared diathermy and scalpel incisions in patients with caesarian section. The indices observed were the incision time, incisional blood loss and postoperative pain. The safety of diathermy in our environment was also considered.

Methods:

This prospective randomized clinical study was conducted in the Department of Gynaecology & Obstetrics, of a tertiary care hospital in Bangladesh between January 2022 and December 2022. An approval was obtained from the hospital ethical committee. After taking written consent 436 women fulfilling following selection criteria; singleton pregnancy, elective caesarian section (1-4 caesarian sections), gestational age at term (37-41 weeks), age 20-40 years were included in this study. Patients were excluded from this study with history of pacemaker, history of steroids intake, gestational diabetes, anemia (Hb <10gm/dl), severe hepatic or renal impairment and bleeding disorder. Patients were divided randomly into two equal groups; 218 patients in each group. Group A included woman who had incision with diathermy. Group B included women who had incision with scalpel. All CS was carried out by a same surgeon of more than 3 years of experience. An observer noted the time from skin incision till the opening of abdomen namely peritonium incision. At the end of the procedure sponges were counted and weighed to see the total blood loss during the procedure. All women were evaluated for post-operative pain and pain intensity was calculated according to numeric rating scale at 12 hours. Post-operative pain on day one, two, and three was assessed by Verbal Rating Scale (VRS). The patient and the assessor of the pain score (intern) were both blinded to which participant had scalpel or diathermy skin incision at surgery. After the operation (Nelbufen HCl -2) injection was given IM (intramuscular) stat. and Ketorolac 30mg injection IM was given 12 hourly for 1 day. After that oral analgesic (Ketorolac 10mg) was given for 7 days. On 3rd POD (post-operative day) all patients was

discharged from hospital with the advice for follow-up on 7th POD. Antibiotic injection was given to all patients according to the hospital protocol. On 7th OPD wound was checked and stitches was removed if the incision mark is dry & healthy. Patients with wet incision site and stich points was advised for next follow-up after 3 days with check dressing and antibiotic coverage for this time. Most of the patients was experienced with stich-off on 10th POD. Some patients was found with wound infection was admitted in hospital and treated with daily dressing and injectable antibiotic with proper addressing to associate co-morbidities like diabetes mellitus, poor nutrition. Stich off was done after proper wound healing. Few patients were experienced with wound dehiscence, sub-rectal haematoma was advised for admitted in hospital. After removal of sub-rectal haematoma wound was closed under anaesthesia. Wound dehiscence was managed with regular dressing and debridement. Secondary wound closure was done after development of healthy granulation tissue. All the data was collected and compiled manually in data collection sheet. All the data was entered and analyzed by using SPSS computer program. Age, gestational age (GA) and parity, operative time, pain and blood loss were presented as mean and standard deviation. 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 and number of CS were controlled by stratification.

Results:

A total of 436 patients was eligible for inclusion in this study during the period. Age, gestational age (GA) and parity described in table 1. Age range in this study was from 20 to 40 years with mean age of 27.83 ± 7.05 years. The mean age of patients in group A was 27.37 ± 7.28 years and in group B was 27.67 ± 7.16 years. Mean gestational age was 37.47 ± 1.21 weeks. The mean gestational age in group A was 37.57 ± 1.13 weeks and in group B was 36.67 ± 1.27 weeks. Mean parity was 2.15 ± 0.78 . Operative time, pain and blood loss were presented as mean and standard deviation in both groups that was statistically significant shown in table 2.

Table 1: Baseline characteristics of the patients:

Variable	Group A	Group B	Subtotal	%
Age				
20-30	169	175	344	78.91
31-40	49	43	92	21.09
GA (weeks)				
37-39	167	170	337	77.29
40-41	51	48	99	22.71
Parity				
1-2	155	161	316	72.50
3-4	63	57	120	27.50
Total	218	218	436	100

Most of the patients were in 20-30 years age group 344 (78.91%).

Most of the patients were in 37-39 weeks gestational age group 337 (77.29%).

Most of the patients were in 1-2 pregnancy group 316 (72.5%).

Table 2: Patient characteristics in the two groups:

Outcome	Group A (diathermy) Mean $\pm$ SD	Group B (scalpel) Mean $\pm$ SD	P-value
Incision time (s)	3.7 $\pm$ 1.3	5.4 $\pm$ 1.7	0.0001
Incisional blood loss (ml)	4.45 $\pm$ 2.27	7.32 $\pm$ 3.47	0.0001
Pain	12.74 $\pm$ 6.07	17.65 $\pm$ 9.59	0.0001

Table 3: Distribution of frequency of wound infection & wound healing time:

Outcome	Group A	Group B	(%)	P-value
Primary wound healing	213	211	97.3	0.226
Delayed wound healing	05	07	2.7	0.197
Wound infection	02	05	1.6	0.207

The wound healing time was comparable in both groups of patients with a delay in wound healing occurring in 5 (2.29%) patients in group A and 7 (3.21%) patients in group B. In addition of wound infection; in group A, 2 patients was experienced with wound infection and in group B, the number was 5. In group B, 1 patient was found with subrectal haematoma and 1 was experienced with wound dehiscence.

Discussion:

In this study, the mean operative time in Group A (diathermy) was 3.7 ± 1.3 minutes while in Group B (scalpel) was 5.4 ± 1.7 minutes (p -value = 0.0001). Chalya *et al*¹⁴ 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. That is closely similar to this study. 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 ($p = 0.001$).⁹ 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 7.3057 sec/cm² (SD $\pm$ 0.9677 sec/cm²) for group B patients.¹⁵ Mean blood loss in Group A (diathermy) was 4.45 ± 2.27 ml while in Group B (scalpel) was 7.32 ± 3.47 ml (p -value = 0.0001). 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).¹⁵ In another comparative study on genera surgery for skin incision; the blood loss was less with the electrocautery compared to the scalpel (6.53 ± 3.84 ml vs. 18.16 ± 7.36 ml, $P < 0.001$).¹⁶ The results are closely related to this study. In this study mean post-operative pain in Group A (diathermy) was 12.74 ± 6.07 while in Group B (scalpel) was 17.65 ± 9.59 (p -value = 0.0001). Post-operative pain on day one, two, and three was assessed by Verbal Rating Scale (VRS). It was significantly higher in scalpel group. Talpur *et al*¹⁵ monitored post-operative pain on day one, two, and five and found significantly higher pain in scalpel group. The result is similar to this study. In a double-blind randomized clinical trial on diathermy vs. scalpel skin incisions in general surgery

found markedly reduced pain perception during the first 48 hours in diathermy group ($p = 0.0001$).¹⁷ A prospective nonrandomized study¹⁸ has shown that electrocautery group also had a significantly lesser postoperative pain score at 6 h, 12 h, and 24 h. In one study by Kearns and colleagues¹⁹ 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. In this study delayed wound healing for wound infection was compared favorably (2.29% & 3.21%) with a study by Ayandipo *et al*²⁰ found the rate was (5.1% & 8.1%). The conclusion was that it was not statistically significant. The overall outcome in this study in terms of early and late wound complications is comparable with other similar studies.^{21,22}

Limitations:

1. The duration of this study was only one year.
2. Single centered & single surgeon study.

Conclusion: The use of diathermy for skin incisions is associated with reduced incisional time, blood loss and postoperative pain. In diathermy wound healing time and wound infection is less compared with scalpel.

Recommendation:

In caesarian section, we recommend that diathermy should be used routinely for abdominal incisions for reducing the blood loss and post-operative pain without increasing wound complication and delaying healing which will in turn improve their quality of life by reducing post-operative morbidity.

Authors contributions:

The authors were contributed in various parts of the research from concept and design, acquisition of data, analysis & interpretation of data and drafting of the manuscript.

Declaration of Conflicts:

The authors declare that, there is no conflict of interest regarding the publication of this article.

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