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Comparison between Cutting Diathermy and Surgical Scalpel for Skin Incision during Cesarean Section

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ABSTRACT

Introduction and aim: Caesarean section (C-section) is one of the commonest surgeries accomplished all over the world, and it has several surgical methods. This work aimed to study the safety and efficacy of cutting diathermy for skin incision during C-section in comparison to surgical scalpel.

Methodology: This was a prospective randomized comparative study that was performed in the Obstetrics and Gynecology department, Al-Azhar university hospitals (New Damietta) in the interval between September 2019 to October 2020.

Results: The visual analogue scale (VAS) score in the diathermy-group was statistically significantly lower as in comparison to the scalpel-group at 2, 6, 12 and 24 h post-operative. Also, there was an increase in the VAS score in the two groups at 2, 6, and 12 hours' post-operative as in comparison to the first hour post-operative. This difference didn't achieve a statistically significant difference except at 12 hours (0.005 and 0.001) in the diathermy-group and scalpel-group respectively.

Conclusion: The utilization of diathermy for skin incision in C-section in this work was accompanying with decreased incisional bleeding, incisional period, surgical period and post-operative pains. It had no impact on wound closures (epithelialization) and wasn't accompanied with any postponement in wounds healing. It was pronounced safely in this work if performed in the suitable way and method with slight or no side-effects.

Keywords: Cutting Diathermy; Surgical Scalpel; Incision; Cesarean Section.



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INTRODUCTION

Cesarean section (C-Section) is the birth of alive baby by an operative incision through the frontal abdomen wall and uterus and formerly was accompanying with severe maternal morbidities and mortalities ⁽¹⁾. C-section is a common main operative procedure performed all over the world, and it has several surgical methods. The operative methods for executing a C-section birth have altered occasionally, for different surgeon, and these variations were included in the uterine as well as skin incision ⁽²⁾. The skin incisions can be midline, vertical, paramedian, transverse lower abdomen, Pfannenstiel, Joel-Cohen, Pelosi, Maylard, Mouchel or Cherney ⁽³⁾. Electro-surgery is supposed to decrease the operative time owing to advantageous homeostatic intervention. While, electro-surgery is as well accompanying with possible complications involving external or internal burns, seromas, and operative scar infection ⁽⁴⁾. The profits of electro-surgery comprise reduced bleeding, dry and fast separations of the tissues, and a potential reduction in the danger of accidental injuries made by the scalpel to operating staffs. As well electro-surgical sealed vessels established clinical comparable bursting pressure in comparison to titanium clips, vascular staples, and sutures, and significant high pressure in comparison to the scalpel in vessels in the range from 4 to 7mm diameter ⁽⁵⁾. The electrodes utilized in performing diathermy incisions produce a pure sinusoidal current which generates a cleavage in tissues plane with no damages to the nearby area; this is one of the causes of lesser damages imposed to the tissue causing a minimal scar creation ⁽⁶⁾. Operative scalpels are conventionally utilized in performing skin incisions, diathermy incisions, on the other hand, are less common between surgeons; it was assumed that the usage of a high temperature can cause significant post-operative pains and poorer wounds healing ⁽⁷⁾. There was an extensive usage of diathermy for hemostasis but worry about creation of big scars and inappropriate tissues healing has limited their utilization in performing skin incision ⁽⁸⁾.

PATIENTS AND METHODS

This was a prospective randomized comparative work which was done in the dep. of Obstetrics and Gynecology Al-Azhar university hospitals (New-Damietta) throughout the interval from Sep.2019 to Oct. 2020.

Inclusion criteria we included in our work the gravid females proposing elective C-section in the in-patient wards of department of Obstetrics & Gynecology of Al-Azhar university hospitals (New-Damietta) from September 2019 to October 2020. Post-operatively, all applicants were reserved under following-up for one day to evaluate the post-operative pains, then, subsequent to hospital discharge, they joined the out-patient clinic throughout the 1st-wk for wound assessing.

Exclusion criteria: Pregnant women who need a vital C-section birth, DM, anemia, cardio-pulmonary disorder, hepatic impairments, anomalous renal function and gravid females on anti-coagulant treatment.

Randomization: cases have been randomized into 2 groups (scalpel and diathermy) and distribution of cases into scalpel or diathermy-group have been performed by Research Randomizer. Allocation was made by cases envelopes upon the patients' entrance in the operation room. A number of 200 patients were employed into the research. In group-A; 100 cases have diathermy skin incisions, while in Group-B; 100 cases have scalpel skin incisions.

Patient preparation:

For all patients, the following has been done: After selection, counseling, explaining the nature of the study to all contributors, an

informed written agreement was attained and approval of the research by the local ethics committee was obtained.

Thorough history taking: included age, parity and detailed obstetric and gynecologic history was taken from these patients (period of marriage, smoking habit, education level (primary, high-school or university), occupation.

Complete clinical examination: included general and full obstetric examination. General examination included the assessment of vital data, assessment of pallor, cyanosis and jaundice and cardiac and chest examinations to exclude any contraindications for anesthesia. Abdominal examination included assessment of fundal level for fetal dating.

Investigations: Routine and special investigations were done as: Liver functions test: Alanine Amino transferase (ALT) and aspartate Amino transferase (AST), Blood urea level and creatinine, blood grouping, complete Blood Count and blood glucose level. All C-section operations were done under a general or spinal anesthesia. Rendering to every group, the skin and sub-cutaneous tissues have been incised with a scalpel or diathermy pen electrode switched to cut mode producing pure alternating current of 357 kHz with low transverse incisions. A coagulation diathermy has been utilized for hemostasis, although big sub-cutaneous veins have been held and ligated in cases of the two groups. The closing was in layers (peritoneum, uterus, muscle and sheath). The sub-cutaneous tissues were sewed with vicryl 2-0, and the skin was sewed sub-cuticularly, with proline 2-0 with no sub-cutaneous drains. The incision period was from the start of the skin incisions until the exposures of rectus cover was reached with full hemostasis and incisional bleeding being the bleeding that happened severely throughout the time of skin incisions and this was determined as the variances among the dry and the wet weights of the swabs (1mg= 1-mL). A post-operative analgesia was managed through the intra-muscular route via the diclofenac sodium (75 mg/dose), a one dosage was used for all of the cases on admissions at the post anesthesia care unit, and other dosages have used rendering to the pain's severity. The outcome of the study includes: The post-operative pains, which was determined via the VAS with rating out of 10, built on the 1st day after postoperatively. The incision time which includes the period taken to perform the skin incisions and accomplish hemostasis. Incisional bleeding which was measured by weighting swabs utilized throughout the incision period until hemostasis was accomplished. Wound healing and complications as: Hematoma is abnormal collection of blood usually in sub-cutaneous or in a potential space in abdominal cavity usually potential for secondary infection, seroma it is localized well circumscribed swelling with drainage of yellow fluid due to collection of liquefied fat, serum and lymphatic fluid under the incision, skin necrosis: necrosis is the cells deaths in alive tissues made by exterior influences like infections, traumas, or toxins, necrosis is nearly always detrimental to the patients' health and may be fatal, wound dehiscence is a post-operative separation of the abdominal musculo-aponeurotic layers in which a wound ruptures along a surgical incision and infection. Wound infection was classified rendering to Southampton wound-classification system: G0, ordinary healing; G1, ordinary healing with mild bruising or erythema; G2, erythema plus other symptoms of inflammations as heat, pains, redness, swelling, and functions losing; G3, clear or serosanguinous discharge; G4, purulent discharge; G5, deep or severe wounds infections with or with no tissues break-down; hematoma needing aspirations.

Pain Assessment Scales

Visual Analogue Scale (VAS): VAS is a measure tool that tries to determine characteristics or attitudes that are supposed to range across a range of values and could not be simply be straightly determined ⁽⁹⁾.

Statistical analysis and data interpretation: Data analysis was performed via IBM SPSS-22.0. Qualitative data have been introduced as

numbers and percentages. Quantitative data have been introduced as median (minimum and maximum) for nonparametric data and mean, SD for parametric data afterward test of normality via Kolmogorov-Smirnov testing. Significance of the results was considered at 0.05 level. Qualitative data: Chi-Square testing for comparing of two or more groups. Monte Carlo testing as correction for Chi-Square testing when >25% of cells have count <5 in tables (>2*2). Fischer Exact testing has been utilized as correction for Chi-Square testing when >25% of cells have count <5 in 2*2tables. Non-Parametric tests: Mann-Whitney U test was utilized for comparing 2 independent groups.

RESULTS

This table shows that the VAS score in the diathermy-group was statistically significant lower as in comparison to the scalpel-group at 2, 6, 12 and 24 h post-operative. Also, there was an increase in the VAS score in the two groups at 2, 6, and 12 h post-operative as in comparison to the first hour post-operative. This difference didn't achieve a statistically significant difference except at 12 hours (0.005 and 0.001) in the diathermy-group and scalpel-group respectively. The VAS at 24 hours was lower than the VAS score at 12 hours in the two study groups, but it didn't show a statistically significant difference as in comparison to the first hour post-operative. The median VAS score in the diathermy-group at 1-h post-operative was 1 with range between 0 and 1 while in the scalpel-group was 1 with range between 0 and 2 weeks with a non-significant change among the studied groups ($p=0.072$). The median VAS score in the diathermy-group at 2 h post-operative was 1 with range between 1 and 2 while in the scalpel-group was 2 with range between 1 and 3 with a significant change among the studied groups ($p=0.024$). The median VAS score in the diathermy-group at 6 hours' post-operative was 2 with range between 1 and 4 while in the scalpel-group was 4 with range between 2 and 4 with a significant change among the studied groups ($p=0.008$). The median VAS score in the diathermy-group at 12 hours' post-operative was 5 with range between 4 and 8 while in the scalpel-group was 6 with range between 5 and 8 with a significant change among the studied groups

($p=0.001$). The median VAS score in the diathermy-group at 24 hours' post-operative was 3 with range between 2 and 4 while in the scalpel-group was 4 with range between 2 and 4 with a significant change among the studied groups ($p=0.015$). Table (1)

As shown in this table, the median volume of bleeding during incision in the diathermy-group was 11.5 ml (range 9 to 15 ml) which was statistically significantly lower as in comparison to the scalpel-group (median amount was 22 ml with range between 18 and 26 ml). The median incision time in the diathermy-group was 86 seconds (range 65 to 99 sec) which was statistically significantly lower as in comparison to the scalpel-group (median duration was 133 seconds with range between 120 and 154 seconds). The median operation time in the diathermy-group was 44 minutes (range 37 to 52 minutes) that revealed no statistically significant difference as in comparison to the scalpel-group (median duration was 46 minutes with range between 40 and 56 seconds). Table (2)

The median required dose of diclofenac analgesia during the first day after C-SECTION in the diathermy-group was 2 ampoules with range between 2 and 3 ampoules while in the diathermy-group was 3 ampoules with range between 2 and 3 ampoules with a nonsignificant change among the studied groups ($p=0.248$). Table (3)

This table shows that the duration of wound healing in the diathermy-group was 4 days (range 4 to 5 days) which was statistically significantly lower as in comparison to the scalpel-group (median duration of 8 days with range between 7 and 9-day) ($p < 0.001$). A nonsignificant change was found in the post-operative complications among the two groups. Wound infection was reported in 3% and 5% of the cases in the diathermy and scalpel-group respectively. Wound ecchymosis was reported in 1% of the cases in the diathermy-group only. Wound hematoma was reported in 2% of the cases in both groups. Wound seroma was reported in 1% and 2% of the cases in the diathermy and scalpel-group respectively. Table (4)

Table (1): Analysis of VAS score following surgery in the two study groups

Variables	Diathermy (Number=100)	Scalpel (Number=100)	p-value
At 1 hour (Median and range)	1(0-1)	1(0-2)	P=0.072
At 2 hours (Median and range)	1(1-2)	2(1-3)	P =0.024*
P1	0.436	0.724	
At 6 hours (Median and range)	2(1-4)	4(2-4)	P=0.008*
P1	0.085	0.062	
At 12 hours (Median and range)	5(4-8)	6(5-8)	P=0.001*
P1	0.005*	0.001*	
At 24 hours (Median and range)	3(2-4)	4 (2-4)	P=0.015*
P1	0.094	0.062	

P1: significance in relation to first hour value; *: significance at ($p < 0.05$)

Table (2): Analysis of operative data in the two studied groups

Variables	Diathermy (Number=100)	Scalpel (Number=100)	Test	P value
Volume of bleeding (ml) (during incision)(Median and range)	11.5 (9-15)	22 (18-26)	z= - 6.154	<0.001*
Incision time (sec) (Median and range)	86 (65-99)	133 (120- 154)	z= - 8.219	<0.001*
Operation time (min)(Median and range)	44 (37- 52)	46 (40- 56)	z= - 1.217	0.325

Table (3): Analysis of post-operative analgesia in the two study groups

Variables	Diathermy (Number=100)	Scalpel (Number=100)	Test	P value
Doses of analgesia (Diclofenac 75mg/dose) (During 24 hours) (Median and range)	2 (2-3)	3 (2-3)	1.254	0.248

Table (4): Complications of the cases within the study groups

Variables	Diathermy (Number=100)	Scalpel (Number=100)	Test	p
Duration of wound healing (days)	4 (4-5)	8 (7-9)	8.229	<0.001*
Wound infection	3 (3%)	5 (5%)	1.365	0.269
Wound ecchymosis	1 (1%)	0 (0%)	0.548	0.477
Wound hematoma	2 (2%)	2 (2%)	0.001	1.0
Wound seroma	1 (1%)	2 (2%)	1.006	0.317

DISCUSSION

A C-section is a frequent surgery specified when complications happen throughout gestation or labor like assumed embryonic distress, breech presentations, failures to progress in labor in macrosomia or in some patients of preceding C-section⁽¹⁰⁾. C-section is accompanying with considerable short- and long-term mother and newborn dangers like bleeding, thrombosis and embolisms, infections and sepsis, and injuries to the bladder and bowel⁽¹⁰⁾.

This prospective randomized study included 200 females who underwent C-section who were recruited from dep. of Obstetrics and Gynecology Al-Azhar university hospitals (New-Damietta). The cases were classified into two groups; the first group underwent skin incisions by cutting diathermy and the second group underwent skin incisions by scalpel. The median volume of bleeding during incision in the diathermy-group was 11.5 ml (range 9 to 15 ml) which was statistically significantly lower as in comparison to the scalpel-group (median amount was 22 ml with range between 18 and 26 ml) ($p < 0.001$). Our results came in the same line with AbdElaal *et al.*⁽¹¹⁾ who showed that a diathermy incisions were accompanying with significant bleeding than scalpel incisions; the mean bleeding in the diathermy-group was 12.44 ± 1.83 mL, while in the scalpel-group was 22.34 ± 4.80 mL.

Within the same line, Elbohoty *et al.*⁽²⁾ revealed a high significant alteration in bleeding ($P < 0.001$) among the studied groups, preferring the usage of diathermy. The decreased incisional bleeding in the diathermy-group was in harmony with other researches: Ayandipo *et al.*⁽⁶⁾ this was because of the coagulative influence of diathermy on the micro-circulation of the area directly adjoining the zone of the incisions⁽¹²⁾.

In the current study, we reported that the median incision period in the diathermy-group was 86 seconds (range 65 to 99 sec) which was highly statistically significantly lower as in comparison to the scalpel-group (median duration was 133 seconds with range between 120 and 154 seconds) ($p < 0.001$). This was in agreement with AbdElaal *et al.*⁽¹¹⁾ who showed a significant quicker incision period in the diathermy-group in comparison to the scalpel-group, with a 56.5 sec variance and this similarly was in accordance with that of Priya *et al.*⁽¹³⁾, and both revealed a significantly short incision period in the diathermy-group. Within the same line, Elbohoty *et al.*⁽²⁾ revealed a high significant change in skin to peritoneum incision period, ($P < 0.001$) among the studied groups, preferring the usage of diathermy. On the other hand, our results disagree with those of Prakash *et al.*⁽¹⁴⁾ as they revealed that there was no additional benefit with diathermy skin incisions regarding the incision period. This inconsistency was most perhaps because of the smaller sample size in their work ($n=82$ cases).

In the current study, the median operation time in the diathermy-group was 44 minutes (range 37 to 52 minutes) which was slightly shorter as in comparison to the scalpel-group (median duration was

46 minutes with range between 40 and 56 seconds), but it didn't achieve a statistically significant difference. This was in agreement with Gupta *et al.*⁽¹⁵⁾ who reported that the mean operating time was found to be less in the electrocautery group in comparison with scalpel-group, the difference is statistically insignificant with a P value of < 0.0001 . Also, AbdElaal *et al.*⁽¹¹⁾ showed that the surgical period in their work revealed a significant change among diathermy and scalpel being shorter in diathermy.

In the current work, the VAS score in the diathermy-group was statistically significantly low in comparison to the scalpel-group at 2, 6, 12 and 24 h post-operative. This was in accordance with AbdElaal *et al.*⁽¹¹⁾ who reported that regarding the pains intensities, VAS exhibited significant changes among scalpel and diathermy at 1, 4, 8, 16 and 24 h post-operatively, where the pain score was lesser in the diathermy cases with a variance of 11.6, 11.6, 14.9, 12.1, 10.5 respectively. Our results also came in the same line with Ragesh *et al.*'s report⁽¹⁶⁾, which matched the post-operative pains in their cases having knife or diathermy skin incisions throughout a hernia operation⁽¹⁷⁾. As well, in agreement with Priya *et al.*⁽¹³⁾, our findings pointed to a significantly decreased post-operative pains in the diathermy-group, this is because of the thermal influence of diathermy on the sensory nerve fibres, with the following disruptions of transmissions of nerve impulses. In another study by Hussain and Hussain⁽¹⁷⁾, it was reported that post-operative pain is significantly lesser for diathermy-group. Kearns as well revealed that post-operative pain was significantly low in the diathermy-group for first 2 days postoperatively which is agreed with our findings⁽¹⁸⁾. In opposite to our results, Fortelny⁽¹⁹⁾ matched the diathermy incision with scalpel incision for midline laparotomy, and concluded that both methods are identical in post-operative pains.

In the present work, the duration of wound healing in the diathermy-group was 4 days (range 4 to 5 days) which was statistically significantly lower as in comparison to the scalpel-group (median duration of 8 days with range between 7 and 9 days) ($p < 0.001$). Our results were in agreement with Elbohoty *et al.*⁽²⁾ who found that the number of days desired for healing were significantly less in the diathermy-group ($P < 0.001$). However, this disagreed with AbdElaal *et al.*⁽¹¹⁾ who showed that the mean period for a full wound healing was analogous for the two methods; this was in agreement with Ayandipo's report which revealed that there was no change in the period of wound healing among both incisions. We also contradict with Aird *et al.*⁽²⁰⁾.

In the current study, the median required doses of diclofenac analgesia during the 1st day after C-section in the diathermy-group was 2 ampoules with ranged between 2 and 3 ampoules while in the diathermy-group was 3 ampoules with ranged between 2 and 3 ampoules with a non-significant change among the studied groups ($p=0.248$). This disagreed with Elbohoty *et al.*⁽²⁾ who revealed that the number of analgesic dosages desired were significantly less in the diathermy-group (P value < 0.001). This could be explained by the high expenditure of analgesic in both groups included in this study.

In the current study, a non-significant change was found in the post-operative complications among both groups. Wound infection was reported in 3% and 5% of the cases in the diathermy and scalpel-group respectively. Wound ecchymosis was reported in 1% of the cases in the diathermy-group only. Wound hematoma was reported in 2% of the cases in both groups. Wound seroma was reported in 1% and 2% of the cases in the diathermy and scalpel-group respectively. This was in agreement with Gupta *et al.* (17) who showed that there was non-significant change among electrocautery and steel scalpel in post-operative complication rate. The incidence of post-operative complications was less in electrocautery group. 6 patients developed complications in the electrocautery group whereas 8 patients developed complications in the scalpel-group. However, the difference was statistically insignificant. Moreover, the result that there weren't any differences in the wound infections was in agreement with the Aird *et al.* (20) study; their report matched the two methods in performing skin incision throughout a bowel resection and showed that cutting diathermy was a cosmetically suitable method for abdominal skin incisions with no any increase in danger of wound infections.

Conclusion: the utilization of diathermy for skin incision in C-section in this work was accompanying with decreased incisional bleeding, incisional period, surgical period and post-operative pains. It has no impact on wound closures (epithelialization) and wasn't accompanying with any postponement in wound healing. It was pronounced safely in this work if performed in the correct method and manner with slight or no side effects.

Financial and Non-Financial Relationships and Activities of Interest

None to be declared.

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