ORIGINAL RESEARCH PAPER

Surgery

A COMPARATIVE STUDY OF SCALPEL VERSUS DIATHERMY SKIN INCISION IN ABDOMINAL SURGERY

KEY WORDS:

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ABSTRACT

INTRODUCTION A "cut or slit" is called an incision to access the underlying structures. Traditionally, stainless steel scalpels are used to make incision 1 Historically, the cold steel scalpel (CSS) has been preferred tool for surgical incisions because of ease of use, accuracy and predictable tissue damage 2 Surgical diathermy was introduced at the beginning of the 20th century to preclude the drawbacks of surgical steel scalpels. The potential benefits of electrosurgery provide less blood loss, dry and quick tissue separation, and a possibly lower risk of unintended scalpel damage to operating employees .[3] **AIM AND OBJECTIVES** To compare the outcome of diathermy versus steel scalpel skin incision in abdominal surgery operations. **OBJECTIVES** To compare incision time between the two methods of skin incision. To compare incisional blood loss between the two methods of skin incision To compare the Postoperative wound infection between diathermy and scalpel incision. To compare the scar character between diathermy and scalpel incision. **MATERIALS AND METHODS STUDY PERIOD:** The study was conducted over a period of one year from September 2021 to August 2022. **STUDY TYPE:** A prospective comparative study **STUDY SAMPLE SIZE: Sample size:** 100 patients **ETHICAL CLEARANCE:** ETHICAL clearance was taken from the institutional Ethics Committee, Fakhruddin Ali Ahmed Medical College and Hospital, Barpeta. **RESULTS AND DISCUSSION** Study shows the mean incisional time for scalpel is 47.52 secs and significant reduction in diathermy clocking 26.82 secs. It was observed as data showing overall 3 soakage pads used in the diathermy group of 50 patients whereas in the scalpel group 1 soakage pad in 22 patients and 2 soakage pads in 21 patients. This study shows comparatively lesser wound infection in diathermy than in scalpel. It was observed as a minimal scar character in diathermy incision than in scalpel incision. **CONCLUSION** This present study concludes that diathermy is the ideal method of incision in abdominal surgeries, where both the blood loss and operating time are at a premium. Diathermy incisions gives less wound infection and minimal scar character than scalpel incision. These results suggest that the diathermy is safe and efficient and has tremendous potential in surgical fields, including abdominal surgery.

INTRODUCTION

A "cut or slit" is called an incision to access the underlying structures. Traditionally, stainless steel scalpels are used to make incisions.[1] Historically, the cold steel scalpel (CSS) has been a preferred tool for surgical incisions because of ease of use, accuracy and predictable tissue damage.[2] Scalpels and disposable knives have traditionally been used to make skin incisions during abdominal procedures; however, these incisions are more painful and cause more blood loss. Recently, electrosurgical skin incisions have become more popular than this technique.[4]Surgical diathermy was introduced at the beginning of the 20th century to preclude the drawbacks of surgical steel scalpels. The term used for surgical diathermy is electrosurgery or electrocautery. Diathermy was considered to be an efficient mode of dissection because of its convenience and hemostatic nature. It is not considered as an actual cutting incision as it involves the usage of high frequency alternating electric current. Diathermy is used mainly for three purposes- coagulation, fulguration, and cutting.[5] Electrosurgical technology offers two types of devices for energy delivery: monopolar and bipolar. In view of recent development, a prospective comparative study was conducted on patients comparing scalpel and diathermy skin incision on abdominal surgery in the Department of General surgery at Fakhruddin Ali Ahmed Medical College and Hospital, Barpeta, Assam.

MATERIALS AND METHODS

Source of data: Patients undergoing clean and clean contaminated elective surgical procedures at Fakhruddin Ali Ahmed Medical College and Hospital during the period from September 2021 to August 2022

Study design: A prospective comparative study

Period of the Study: The study was conducted over a period of one year from September 2021 to August 2022.

Method of collection of data: Sample size: 100 patients were included in the study.

Group A patients n=50 operated via scalpel incisions.
Group B patients n=50 operated via diathermy incisions using cutting mode.

Equal number of cases from both the groups were operated under the same surgical unit. Patients were counselled about the merits and demerits of both incisions and informed consent were obtained for the study. All the patients will be operated under spinal or general anaesthesia. Skin sutures were removed at postoperative day 10.

Inclusion Criteria:

1. Patients of both sexes
2. Patients in the age group between 14–80 years included in the study.
3. Elective abdominal surgery performed under general anaesthesia and spinal anaesthesia.
4. Clean and Clean contaminated surgery.

Exclusion Criteria:

1. Blood coagulation disorder.
2. Severe hepatic, renal, cardiovascular dysfunction, diabetes mellitus, hypertension, immunocompromised patients and pregnant women.

3. Patient with implants, pacemaker.
4. Patient not willing to give consent.
5. Dirty and contaminated wounds were excluded from the study

SAMPLE SIZE AND PROCEDURE:
All patients undergoing open inguinal hernioplasty, open appendicectomy, open cholecystectomy, and open choledocholithotomy were selected, with sample size (N = 100). Institutional approval of the study protocol was obtained and the patient included in the study were informed about the proposed study and informed consent was obtained from each patient.

Outcome of the study was evaluated under the following parameters:
a) Incision time will be recorded using seconds stopwatch that is time taken from initial skin incision to the next layer.
b) Incisional blood loss will be assessed by weighing the soakage pads.
c) Wound infection will be assessed by SOUTHAMPTON wound grading system.
d) Scar character will be assessed by MANCHESTER scar score.

METHODS OF ASSESSMENT
1. INCISION TIME: Incision time was defined as the time from the beginning of skin incision until subcutaneous tissue was reached with complete haemostasis. It was expressed in seconds. Incision time was recorded using seconds stopwatch clock.

2. INCISION BLOOD LOSS: Blood loss during skin incision was calculated by weighing pads used exclusively in making the incision and during haemostasis with each gram taken as equal to one millilitre of blood (i.e. 1g=1ml). Weighing the soakage pads before and after use is an important method of assessment of blood loss.

3. WOUND INFECTION: SOUTHAMPTON WOUND GRADING SYSTEM. In this study Appearance based on minor and major complication Minor complications includes erythema, erythema with sign of inflammation, clear or haemoserous discharge. Wound assessments were done on the 3rd day, 5th day, and 7th day.

4. SCAR CHARACTER: MANCHESTER SCAR SCORE SYSTEM. In Manchester Scar score, 5 is best and 18 is worse. Score has 5 categories.

1. Colour
2. Matte vs Shiny
3. Contour
4. Distortion
5. Texture Scar assessment done on 7th day, 1st month, 3rd month.

RESULTS AND OBSERVATIONS
Data Analysis and Interpretation: Data was entered into Microsoft Excel (Windows 7; Version 2007) and analyses were done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 22.0; SPSS Inc, Chicago). Descriptive statistics such as mean and standard deviation (SD) for continuous variables, frequencies and percentages were calculated for categorical Variables were determined. Association between Variables was analyzed by using Chi-Square test for categorical Variables. Unpaired t Test was used to compare the mean of quantitative variables between Cases and Controls. Bar charts and Pie charts were used for visual representation of the analyzed data. Level of significance was set at 0.05.

Table 1: Comparison of Incision Time (sec) between Study Groups (N=100)

Incision Time (sec)	Group	
	Diathermy (n=50) n (%)	Scalpel (n=50) n (%)
Mean (SD)	34.62 (13.31)	32.12 (11.49)
Unpaired t Test, P Value = 0.317, Not Significant		

This table compares the incisional time between Diathermy and Scalpel. Incisional Time is calculated by stop watch. The Mean incisional time for diathermy is 26.82 secs, The Mean incisional Time for scalpel is 47.52 secs. Patients were equally divided to avoid selection bias. Unpaired t Test shows significance with (P value less than 0.001)

Table 2: Comparison of Incision Blood Loss between Study Groups (N=100)

Blood Loss (Soakage Pads)	Group	
	Diathermy (n=50) n (%)	Scalpel (n=50) n (%)
0	47 (94.0)	1 (2.0)
1	1 (2.0)	22 (44.0)
2	2 (4.0)	27 (54.0)
Chi-Square Test, P Value <0.001, Significant		

This table compares the incisional blood loss between Diathermy and Scalpel. Incisional blood loss calculated by the number of Soakage pads used for Skin incision in the given time.Patients were equally divided to avoid selection bias. The Chi-Square Test shows significance with (P value = 0.001)

Table 3.1: Comparison of Southampton Grading between Study Groups (N=100)

3rd Day	Group	
	Diathermy (n=50) n (%)	Scalpel (n=50) n (%)
0	35 (70.0)	8 (16.0)
1	12 (24.0)	29 (58.0)
2	3 (6.0)	13 (26.0)
Chi-Square Test, P Value <0.001, Significant		

This table shows Southampton wound grading systems, 3rd day appearance between diathermy and scalpel incision , The Chi-Square Test shows significance with (P value = 0.001

Table 3.2: Comparison of Southampton Grading between Study Groups (N=100)

5th Day	Group	
	Diathermy (n=50) n (%)	Scalpel (n=50) n (%)
0	24 (48.0)	3 (6.0)
1a		1 (2.0)
1b	1 (2.0)	2 (4.0)
1c		
1	18 (36.0)	25 (50.0)
2	5 (10.0)	12 (24.0)
2a		2 (4.0)
2b	2 (4.0)	2 (4.0)
2c		1 (2.0)
3		2 (4.0)
Chi-Square Test, P Value = 0.001, Significant		

This table shows Southampton wound grading systems, 5th day appearance between diathermy and scalpel incision , The Chi-Square Test shows significance with (P value = 0.001)

Table 3.3: Comparison of Southampton Grading between Study Groups (N=100)

7th Day	Group	
	Diathermy (n=50) n (%)	Scalpel (n=50) n (%)
0	6 (12.0)	1 (2.0)
1a		
1b	4 (8.0)	5 (10.0)
1c		1 (2.0)
1	26 (52.0)	19 (38.0)
2	11 (22.0)	9 (18.0)
3	1 (2.0)	4 (8.0)
3a		1 (2.0)
3b		2 (4.0)
3c	1 (2.0)	
3d	1 (2.0)	3 (6.0)
4a		1 (2.0)
4b		4 (8.0)
Chi-Square Test, P Value = 0.001, Significant		

This table shows Southampton wound grading systems, 7th day appearance between diathermy and scalpel incision. The Chi-Square Test shows significance with (P value = 0.001)

Table 7: Comparison of Manchester Scar Score between Study Groups (N=100)

	Group		P Value
	Diathermy (n=50) Mean (SD)	Scalpel (n=50) Mean (SD)	
7th Day	4.48 (0.83)	5.32 (1.47)	0.001*
1st Month	4.70 (1.18)	5.72 (1.83)	0.001*
3rd Month	5.08 (1.73)	6.44 (2.48)	0.002*
Unpaired t Test, P Value *Significant			

This table shows Manchester Scar Score in various periods, 7th day,1st month,3rd month appearance between diathermy and scalpel incision ,The Chi-Square Test shows significance with 0.001,0.001,0.002 for 7th day,1st month,3rd month .At, 7th day after the procedure, the Mean Manchester Scar Score for the diathermy group was 4.48, for scalpel was 5.32. This difference was significant with p value of 0.001 At, 1st month after the procedure, the Mean Manchester Scar Score for the diathermy group was 4.70, for scalpel was 5.72. This difference was significant with p value of 0.001 At, 3rd month after the procedure, the Mean Manchester Scar Score for the diathermy group was 5.08, for scalpel was 6.44. This difference was significant with p value of 0.002.

DISCUSSION

The incisions were evaluated in terms of incision time, incisional blood loss and postoperative wound infection and scar assessment.

In present study we observed that the incision time is less in diathermy when compared with Scalpel. With data showing 26.84 sec Mean in diathermy group and 47.52 sec in Scalpel group. In present study we observed that the incision blood loss is less in Diathermy when compared with Scalpel. With data showing only 3 soakage pads used overall in Diathermy group for 50 patients, where as in scalpel 1 soakage pad in 22 patients and 2 soakage pads in 27 patients. Over all 76 soakage pads were used for 50 patients in the scalpel group.Wound infection grading. Siraj et al., It was noted that the overall frequency of wound infection in his study was 5%, of which, three cases were seen in the group I and two in group II (P = 0.17). [6] Similarly, Galal AN in 2007 noted the similar findings in 50 patients and stated that postoperative complications were insignificant in either group. [7] Groot et al. Researched on wound infection rate in abdominal and thoracic surgeries and compared the electro cautery and steel scalpel. They concluded that electrocautery does not increase the wound infection rate. [8] Kadyan et al., has shown that diathermy skin incision causes less postoperative wound infection when compared to scalpel incision102 Ahmad et al. also established a similar finding and said that postoperative infections are comparable in diathermy and scalpel groups. [9]

In our study wound infection was assessed by the SOUTHAMPTON wound grading system. The criteria used for assessment were normal healing, mild bruising or erythema, erythema with signs of inflammation, clear discharge, pus or purulent discharge, deep or severe wound infection,. Present study shows wound infection is less in diathermy when compared with scalpel on 3rd day 5th day and 7th day with respect to p value . 3rd day the Chi-Square Test shows significance with P value < 0.001 5th day the Chi-Square Test shows significance with P value = 0.001 7th day the Chi-Square Test shows significance with P value = 0.001 Scar scoring system. R Fearmonti et al., A Review of Scar Scales and Scar Measuring Devices This studies most of classification schemes, and methods of scar evaluation have focused on burn scars. [10]

In our study, scar character was assessed by the Manchester Score system. The score ranges from 5 to 18. A higher value implies that the scar is poor. In the present study we observed the presence of any colour, shine, contour, distortion and texture on 7th day,1st month , 3rd month. In our study, it was found that scar character was poor in scalpel and better in diathermy. In Diathermy group Mean score on 7th day was 4.48 with p value 0.001 Mean score on 1st month was 4.70 with p value 0.001 Mean score on 3rd month was 5.08 with p value 0.002 In Scalpel group Mean score on 7th day was 5.32 with p value 0.001 Mean score on 1st month was 5.72 with p value 0.001 Mean score on 3rd month was 6.44 with p value 0.002 In our study Scar character is better in diathermy incision and poor in scalpel with high score.

Incision time and blood loss Dixon et al., has shown that diathermy incision time is more rapid than scalpel incision. [11] Dixon and Watkin et al., studied in open cholecystectomy patients, which has much less time for incision time by diathermy compared to scalpel skin incision [12]Ayandipo et al., which has much less time for skin incision time by diathermy compared to scalpel skin incision. [13]Guru K et al., study showed less incisional time and blood loss in diathermy skin incision. [14] Shruti Pandey et al., Diathermy Versus Conventional Scalpel in Making An Abdominal Incision- A Comparative Study shows a better outcome in diathermy skin incision in incision time and blood loss. [15] Kearns et al., study shows no significant difference in wound or postoperative complications between the two groups. [16] Mclean et al., study showed that organisms can be cultured from most of the wounds in both of their study groups at the end of the operation. [17] The incidence of wound infection depends on the type of surgery. [18] Kadyan et al., has shown that diathermy incision is more rapid and blood loss is less than scalpel incision. [19]

CONCLUSION

This present study concludes that diathermy is the ideal method of incision in abdominal surgeries, where both the blood loss and operating time are at a premium. Diathermy incisions gives less wound infection and minimal scar character than scalpel incision. These results suggest that the diathermy is safe and efficient and has tremendous potential in surgical fields, including abdominal surgery.

REFERENCES

1. Ellis H. Incisions, closures and management of the wound. Maingot's Abdominal operations. 1997;10:395-426.
2. Lee BJ, Marks M, Smith DP, Hodges-Savola CA, Mischke JM, Lewis RD. Advanced cutting effect system versus cold steel scalpel: comparative wound healing and scar formation in targeted surgical applications. Plastic and Reconstructive Surgery Global Open. 2014 Oct;2(10).
3. Mukherjee MP, Patole MM. Scalpel versus diathermy skin incision: a randomised clinical trial. International Surgery Journal. 2019 Dec 26;7(1):258-62.
4. Ali M, Murtaza M, Aleem-ud-Din M, ud Din MB, Sarwar A, Aslam A. Comparison of Harmonic Scalpel versus conventional hemostasis in Thyroid surgery in terms of per-operative and postoperative outcome. The Professional Medical Journal. 2020 Jan 10;27(01):68-73.
5. Pattnaik MR, Prasad KG, Dey M, Vadhera A. Comparison of the outcome of diathermy versus scalpel skin incision in surgical cases. Indian Journal of Surgery. 2019 Feb;81(1):32-6.
6. Siraj A, Gilani AA, Dar MF, Raziq S. Elective midline laparotomy: Comparison of diathermy and scalpel incisions. The Professional Medical Journal. 2011 Mar 10;18(01):106-11.
7. Abul Nagah G, Tarek E, Lotfy H, Shehab W, Tarek A. Comparative study between using harmonic scalpel and electrocautery in modified radical mastectomy. Egyptian Journal of Surgery. 2007 Oct;26(4).
8. Groot G, Chappell EW. Electrocautery used to create incisions does not increase wound infection rates. The American journal of surgery. 1994 Jun 1;167(6):601-3.
9. Ahmad NZ, Ahmed A. Meta-analysis of the effectiveness of surgical scalpel or diathermy in making abdominal skin incisions. Annals of surgery. 2011 Jan 1;253(1):8-13.
10. Fearmonti R, Bond J, Erdmann D, Levinson H. A review of scar scales and scar measuring devices. Open Access J Plast Surg 2010;10:354-63.
11. Dixon AR, Watkin DF. Electrosurgical skin incision versus conventional scalpel: a prospective trial. Journal of the Royal College of Surgeons of Edinburgh. 1990 Oct 1;35(5):299-301.
12. Dixon AR, Watkin DF. Electrosurgical skin incision versus conventional scalpel: a prospective trial. Journal of the Royal College of Surgeons of Edinburgh. 1990 Oct 1;35(5):299-301.
13. Ayandipo OO, Afuwape OO, Irabor D, Oluwatosin OM, Odigie V. Diathermy versus scalpel incision in a heterogeneous cohort of general surgery patients in a Nigerian teaching hospital. Nigerian Journal of Surgery. 2015;21(1):43-7.
14. Arun Guru K. A Comparitive Study on Diathermy Vs Scalpel Skin Incisions in Abdominal Surgeries in Government Rajaji Hospital, Madurai (Doctoral dissertation, Madurai Medical College, Madurai).
15. PANDEY S, CHOUBEY RP, NARAIN IT. Diathermy Versus Conventional Scalpel in Making an Abdominal Incision: A Prospective Study. Journal of Clinical & Diagnostic Research. 2019 Oct 1;13(10).
16. Kearns SR, Connolly EM, McNally S, McNamara DA, Deasy J. Randomized clinical trial of diathermy versus scalpel incision in elective midline laparotomy. British journal of surgery. 2001 Jan;88(1):41-4.
17. McLean NR, Mackinlay J. " Op-site" as a post-operative dressing in general surgery. The British journal of clinical practice. 1981 Oct;35(10):356-8.
18. Pearlman NW, Stiegmann GV, Vance V, Norton LW, Bell RC, Staerkel R, Van Way CW, Bartle EJ. A prospective study of incisional time, blood loss, pain, and healing with carbon dioxide laser, scalpel, and electrosurgery. Archives of surgery. 1991 Aug 1;126(8):1018-20.
19. Kadyan B, Chavan S, Mann M, Punia P, Tekade S. A prospective study comparing diathermy and steel scalpel in abdominal incisions. Medical Journal of Dr. DY Patil University. 2014 Sep 1;7(5):558.