

Diathermy Versus Conventional Scalpel in Making an Abdominal Incision: A Prospective Study

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ABSTRACT

Introduction: Scalpel incisions produce nominal harm to neighboring and adjacent tissues. Diathermy is considered to be an efficient mode of incision and its use is widespread, but due to scarring potential, advanced wound contamination rate and poor wound healing, the extensive use of surgical diathermy for incisions.

Aim: To compare the use of electrocautery and conventional scalpel in making an abdominal incision with respect to blood loss, operating time, wound infection rate and post-operative pain.

Materials and Methods: This was a prospective study in which patients above 16 years of age were included and all patients undergoing abdominal surgery were randomly allocated to two arms of the study. In Group A, incision by conventional scalpel and in group B, incision by diathermy were made. Incisions were of three types i.e., Kocher's incision were 4, Midline were 22

and Pfannestiel were 44. Data was collected and entered in the Microsoft excel sheet and analysed for blood loss, operating time, wound infection rate and post-operative pain.

Results: Total number of patients included in this study was 70. Age of the participants were in range of second to seventh decade, youngest being 19 years and the oldest being 73 Years of age. Male and female ratio was 1:6. Time taken for incision and blood loss in group B is less than group A respectively. ($p=0.009$, $p=0.001$) in all types of incision. Rate of complications following electrocautery incision were also low and no haematoma or seroma were noted in those wounds.

Conclusion: Diathermy technique is compatible with conventional scalpel being safe, effective and simple. Less blood loss was noted with clearer field of dissection, as compared to one created by conventional steel scalpel. Because of the faster haemostasis, the mean time of making an incision was also less in case of diathermy.

Keywords: Electrosection, Incision, Scalpel incision, Wound infection

INTRODUCTION

Conventionally skin incisions have regularly been performed with scalpels. In present days there is a change in trend from this method to electrosurgical skin incisions [1]. Cautery is considered to be an efficient mode of dissection device being haemostatic & convenient. Reduced blood loss, dry and rapid separation of the tissue, and a possible decreased risk of unintentional damage caused by the scalpel to working personnel are the possible advantages of electrocautery [2,3]. Despite its several advantages, the idea of Diathermy as a cutting instrument instead of a conventional scalpel for making a surgical incision has met with skepticism by majority of the surgeons, because of its unnecessary scarring, elevated wound infection rate and reduced wound healing have condensed the extensive use of surgical diathermy for skin incisions [4,5]. Hence, the present study was conducted with an aim to compare the use of electrocautery and conventional scalpel in making an abdominal incision with respect to blood loss, operating time, wound infection rate and post-operative pain.

MATERIALS AND METHODS

The prospective study was conducted in the department of Surgery, Kalra Hospital from May 2011 to June 2012. All the patients undergoing elective abdominal surgery during the above period were included in the study. All patients of both sex above 16 years of age, requiring elective abdominal surgery, who agreed to regular follow-up visit and consented to be part of the study, were included. Patients with history of receiving antibiotics in preceding seven days, patient with previous surgical scar, those who receiving immuno-supportive therapy or undergone radiation therapy were excluded. Patient diagnosed with chronic pain syndrome or undergone treatment for pain management and pregnant women were also excluded. Institutional ethical

clearance was obtained prior to conduction of study (NBE/Thesis/2048/2012/14169) and written informed consent was obtained. The candidates were divided into two groups- Group A, in which abdominal incision was made with a scalpel and Group B, in which abdominal incision was made with diathermy (setting of 70 watt with monopolar current was used). The incisions were of three types i.e., Kocher's incision were 4, Midline were 22 and Pfannestiel were 44. A detailed history and clinical examination followed by investigations leading to confirmation of diagnosis and routine pre-anaesthetic investigations for fitness of the patient was undertaken. All patients received one dose of Inj. Ceftriaxone 1 gm I/V and Inj. Amikacin 500 mg I/V, as pre-operative and three doses as post-operative prophylaxis. The abdominal skin was prepared with povidone iodine. Incision time was calculated from the time of making incision to the time of opening peritoneum with complete homeostasis, with a stop watch and blood loss during incision was calculated using dry surgical mops which were weighed pre-operatively as well as post-operatively in a sterile manner, using weighing scale with 2 gram resolution. Pain assessment was done with Visual Analogue Score (VAS). Pain was represented on a 10 cm straight line, extremes of which corresponded to no pain at one end and the worst pain imaginable on the other end. All patients received eight hourly intramuscular diclofenac sodium injections for pain relief. VAS score was measured at 8, 14 and 24 hours respectively. All the patients were followed up in 2nd and 4th week after discharge to record any wound infections.

STATISTICAL ANALYSIS

Data was entered into Microsoft excel data sheet and analysed using SPSS 22 version software. Categorical data was represented in the form of frequencies and proportions. Unpaired t-test was used as test of significance for qualitative data.

RESULTS

Patient included in the study were in second to seventh decade of life, youngest being 19 years and the oldest 73 years of age. Male to female ratio was 1:6. There was predominance of females as pfnestiel incision is mainly used for hysterectomy and lower abdomen and pelvis approaches. Outcome parameters with respect

to different types of incisions are shown in [Table/Fig-1-3]. There was statistically significant increase in the mean time taken for incision in Group A when compared with Group B in case of pfnestiel incision (310.18 ± 72.63 and 231.5 ± 112.45 respectively; $p=0.009$ [Table/Fig-3]).

	Technique	N	Mean	Std. deviation	Median	Minimum	Maximum	T-value	p-value*
Time taken in seconds	Scalpel	2	273	72.12	273	222	324	0.753	0.530
	Electrocautery	2	199	118.79	199	115	283		
Blood loss in gm	Scalpel	2	31.5	4.95	31.5	28	35	1.317	0.318
	Electrocautery	2	20	11.31	20	12	28		
Length (cm)	Scalpel	2	11.7	1.84	11.7	10.4	13	0.405	0.724
	Electrocautery	2	10.8	2.55	10.8	9	12.6		
Thickness (cm)	Scalpel	2	3.8	0.28	3.8	3.6	4	1.807	0.216
	Electrocautery	2	4.2	0.14	4.2	4.1	4.3		
VAS At 8 Hrs	Scalpel	2	7.5	0.71	7.5	7	8	2.24	0.155
	Electrocautery	2	5	1.41	5	4	6		
At 14 Hrs	Scalpel	2	5.5	0.71	5.5	5	6	2.817	0.106
	Electrocautery	2	3.5	0.71	3.5	3	4		
At 24 Hrs	Scalpel	2	3	0	3	3	3	NA	NA
	Electrocautery	2	2	0	2	2	2		

[Table/Fig-1]: Outcome parameters comparison between two groups in respect to Kochers incision.

*unpaired t-test

	Technique	N	Mean	Std. deviation	Median	Minimum	Maximum	T-value	p-value*
Time taken in seconds	Scalpel	11	222.82	93.5	201	120	440	0.935	0.361
	Electrocautery	11	186.91	86.43	160	74	300		
Blood loss in gm	Scalpel	11	24.18	13.46	22	8	58	3.403	0.003
	Electrocautery	11	8.91	6.35	10	2	20		
Length (cm)	Scalpel	11	14.29	2.61	14.8	9.6	18	0.873	0.393
	Electrocautery	11	15.61	4.28	15	8	22		
Thickness (cm)	Scalpel	11	2.75	0.72	2.8	1.5	3.8	0.150	0.893
	Electrocautery	11	2.8	0.84	2.7	1.8	4.3		
VAS At 8 Hrs	Scalpel	11	6.45	1.69	7	3	8	1.950	0.065
	Electrocautery	11	5.09	1.58	4	3	8		
At 14 Hrs	Scalpel	11	3.91	1.51	3	2	7	2.685	0.014
	Electrocautery	11	2.27	1.35	2	1	4		
At 24 Hrs	Scalpel	11	1.91	1.14	2	0	4	2.982	0.007
	Electrocautery	11	0.73	0.65	1	0	2		

[Table/Fig-2]: Outcome parameters comparison between two groups in respect to Midline incision.

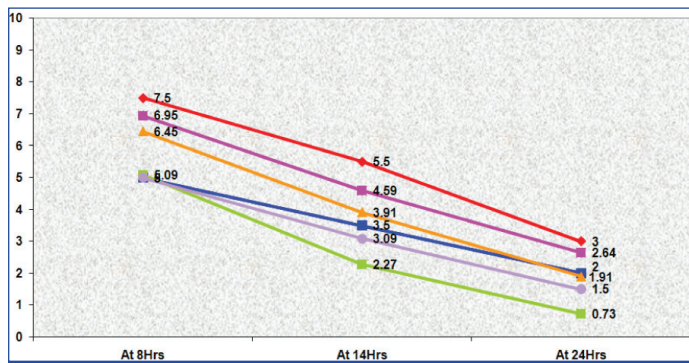
*unpaired t-test

	Technique	N	Mean	Std. deviation	Median	Minimum	Maximum	T-value	p-value*
Time Taken in seconds	Scalpel	22	310.18	72.63	317	180	434	2.757	0.009
	Electrocautery	22	231.5	112.45	222.5	74	444		
Blood Loss in gm	Scalpel	22	31.91	9.06	33	12	48	5.225	<0.001
	Electrocautery	22	14.91	12.28	10	2	40		
Length (cm)	Scalpel	22	12.45	1.35	12.3	9.8	15	0.000	0.985
	Electrocautery	22	12.45	1.86	12.2	9.8	16.4		
Thickness (cm)	Scalpel	22	3.98	0.61	4.1	2.9	5	0.477	0.631
	Electrocautery	22	3.89	0.64	3.8	2.9	5.3		
VAS At 8 Hrs	Scalpel	22	6.95	1.17	7	4	8	4.729	<0.001
	Electrocautery	22	5	1.54	5	3	8		
At 14 Hrs	Scalpel	22	4.59	1.01	4.5	3	6	3.820	<0.001
	Electrocautery	22	3.09	1.54	2	2	6		
At 24 Hrs	Scalpel	22	2.64	1.14	2.5	0	5	3.039	0.004
	Electrocautery	22	1.5	1.34	1	0	4		

[Table/Fig-3]: Outcome parameters comparison between two groups with respect to Pfnestiel incision.

*unpaired t-test

Similarly, mean blood loss was statistically higher in Group A when compared with Group B (31.91 ± 9.06 and 14.91 ± 12.28 gm respectively; $p < 0.001$) [Table/Fig-3]. Only one patient each, developed wound infection in the scalpel and the electrocautery groups. Change in VAS score with respect to different type of incision at different interval of time is shown in [Table/Fig-4].



[Table/Fig-4]: Change in VAS w.r.t time in different incisions and techniques

DISCUSSION

Initial studies with diathermy suggested that, electrosurgical incisions showed excessive scarring and poor wound healing. With the use of sinusoidal current, better control of energy dispensed was developed. In the present study, mean incision time and amount of blood loss was significantly reduced in electrocautery group in comparison to the scalpel group. These findings are in concordance with the study conducted by Nandurkar VS et al., in which statistically significant increase was noted in the mean time taken for incision in scalpel group when compared with electrocautery group (36.8 ± 8.8 and 27.0 ± 10.1 respectively; $p < 0.001$) [1]. Our findings also corroborated with Chau JK et al., (210.33 ± 68.82 in electrocautery group and 239 ± 82.99 in scalpel group) and by Dixon AR and Watkin DF, (90 ± 22 in electrocautery group and 126 ± 25 in scalpel group) [6,7]. Similarly mean blood loss was statistically higher in Group A when compared with Group B (3.4 ± 1.5 mL and 2.6 ± 1.5 mL respectively; $p = 0.021$) [1]. These findings are also similar to Talpur AA and Khaskheli AB, who in their study reported statistically significant reduction in mean incision time and mean blood loss with electrocautery when compared with scalpel [8].

Similarly, Ly J et al., in their systemic review and meta-analysis of fourteen randomised trials comprising of 2541 patients (1267 undergoing abdominal wall incision by cutting diathermy and 1274 by scalpel), noticed significantly reduced amounts of blood loss (mean difference of 0.72 mL/cm² ($p < 0.001$) and shorter incision time (mean difference of 36 seconds; $p < 0.001$) with diathermy incisions as compared to scalpel incisions [9]. The average pain score in present study was found to be lower in electrocautery group in all the incisions; however it was statistically significant in pfannestiel incision. These findings are similar to the findings by Nandurkar VS et al., which concluded that post-operative pain is significantly less (p -value 0.021) in the electrocautery group on day 1 [1]. Our findings are also similar to other published studies by Ayandipo OO

and Afuwape OO, and Kearns SR et al., Aird LN and Brown CJ, also noted that electrocautery significantly reduced post-operative wound pain [2,10,11]. Other studies whose results are in agreement with the present study were by Siraj A et al., Gilmore M et al., and Shivagouda P et al., which showed that elective laparotomy incisions made with electrocautery had major benefits in terms of reduced early post-operative pain [12-14]. Only one patient in each group, developed wound infection in the scalpel and the electrocautery groups which was not statistically significant. These findings are similar to studies conducted by Nandurkar VS et al., and Talpur AA et al., [1,8].

LIMITATION

Small sample size is major limitation of the study.

CONCLUSION

Electrosection proves to be safe and efficient than conventional scalpel method in terms of patient comfort, by causing less post-operative pain. Electrosection is the ideal method of incision in high risk patients, where both the blood loss and operating time are at premium.

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