

## Original Research Article

# A prospective study of diathermy versus scalpel skin incision in abdominal surgery

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### ABSTRACT

**Background:** Various methods of skin incision have been identified in the recent past. Traditional skin incisions were made with stainless steel scalpel but recently electrocautery instruments like harmonic scalpel are also in use. With rise of seropositive cases, we aimed to evaluate whether the electrocautery can replace scalpel in operation theater, to avoid unfortunate injury to surgeons with scalpel. So we compared the usefulness of diathermy skin incision vs. scalpel skin incision in general surgical patients.

**Methods:** This prospective study designed to include 120 patients admitted in the Department of General Surgery, Sri Guru Ram Das Institute of Medical Sciences and Research, Vallah, Sri Amritsar and who were undergoing elective abdominal surgical procedures namely cholecystectomy, appendectomy and inguinal hernia repair etc. Patients were randomly allocated into 2 groups of 60 patients each. In Group A, incision were made with electrocautery on cut mode and power set to 60-70. In group B, skin incisions were made with scalpel.

**Results:** No statistical difference was found between group A and group B with regard to time of administration of pain killer injection, seroma formation, discharge being noticed from wound in both groups. Moreover the results were statistically non-significant for vascularity, pigmentation and pliability of wound observed.

**Conclusions:** We concluded that electrocautery can effectively and efficiently replace scalpel in operation theater.

**Keywords:** Diathermy, Scalpel, Skin incision

### INTRODUCTION

There has been a continuous surge in identifying various methods of skin incision and in the recent years, electro surgical instruments have achieved great attention in this regard. Diathermy has been used for making the skin incision. Traditionally skin incision has been made with stainless steel scalpel. Scalpel skin incision produces a clean, incised wound with minimal tissue destruction but these incisions are more bloody and painful. Diathermy is regularly used for tissue dissection, cutting and haemostasis, but, its use for making skin incision is not so popular in day to day practice. Cutting diathermy also

produces an incised wound with an added advantage of achieving quick hemostasis and saving operative time.<sup>1</sup>

Various studies have been undertaken to evaluate the efficacy of electrocautery over scalpel in making skin incision and the results are varying; some showing better results with electrocautery while some showing similar results.<sup>2,3</sup>

The following study was undertaken in Department of Surgery, Sri Guru Ram Das Institute of Medical Sciences and Research, Vallah, Sri Amritsar to compare diathermy skin incision and scalpel skin incision in general surgical

operations conducted under general anesthesia. The study aims to verify and compare the usefulness of diathermy skin incision vs. scalpel skin incision in general surgical patients.

**Aims and objectives**

- To compare post-operative pain and wound infection in group A and group B.
- Follow up (up to 4 months) to evaluate cosmesis, scar status and whether any evidence of keloid or hypertrophic scar.

**METHODS**

This prospective study conducted from January 2016 to November 2017 was designed to include 120 patients admitted in the department of General Surgery, Sri Guru Ram Das Institute of Medical Sciences and Research, Vallah, Sri Amritsar and who were undergoing elective abdominal surgical procedures namely cholecystectomy, appendectomy and inguinal hernia repair.

**Inclusion criteria**

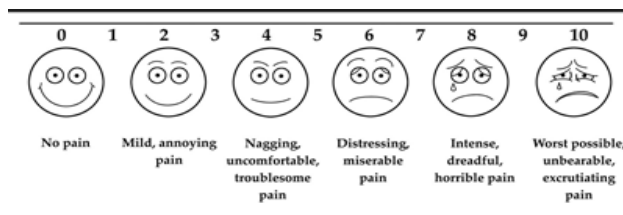
All clean and clean contaminated abdominal operations included in this study.

**Exclusion criteria**

Exclusion criteria were blood coagulation disorders, immunocompromised patients and pregnant women.

Patients were randomly allocated into 2 groups of 60 patients each. In Group A, incision were made with electrocautery on cut mode and power set to 60-70. In our institute we use Johnson and Johnson D 400 electrocautery unit. In group B, skin incisions were made with scalpel.

Post-operative wound pain was measured using visual analogue scale after 6, 12, 24 and 48 hours. If pain score was more than 4, injection diclofenac sodium 50 mg intramuscular given. Below given visual analog scale (VAS) was used where patients were asked to mark a number pertaining to his degree of pain being experienced.



**Figure 1: VAS score.**

During post-operative period (up to 7 days) the following parameters were noted:

- Seroma
- Hematoma
- Purulent discharge

Upon follow up, surgical scars were evaluated by using the Vancouver scar scale to assess the cosmesis of surgical scar at 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> month.

All the procedures were carried under standardized general anesthesia. Premedication was given inj. ceftriaxone (1 gm) 15 minute before procedure. Closure of the abdominal layers was done with continuous vicryl no 1 suture, interrupted with 2-0 ethilon with curved cutting needle for skin closure.

The results were finally analyzed using SPSS version 19 and compared for the two groups using Chi-square test, and percentage of type of complication at incision site were measured.

**RESULTS**

Results of present study are described below. The Table 1 shows mean scores and standard deviation of patients in group A and group B.

**Table 1: Mean and SD of visual analog scale.**

VAS at different time intervals	Group A		Group B	
	Mean	SD	Mean	SD
<b>0 hour</b>	8.03	0.93	8.40	0.68
<b>6 hour</b>	5.47	1.11	5.92	0.74
<b>12 hour</b>	4.89	1.21	4.63	1.10
<b>24 hours</b>	3.41	1.15	3.32	1.31
<b>48 hours</b>	2.63	1.01	2.41	0.71

**Table 2: Painkiller injection given at different time intervals.**

Injection given at:	Group A		Group B		P value
	No.	%	No.	%	
<b>0 hour</b>					
Yes	60	100.00	60	100.00	
No	0	0.00	0	0.00	
<b>6 hour</b>					
Yes	60	100.00	60	100.00	
No	0	0.00	0	0.00	
<b>12 hour</b>					
Yes	60	100.00	60	100.00	
No	0	0.00	0	0.00	
<b>24 hour</b>					
Yes	60	100.00	60	100.00	
No	0	0.00	0	0.00	
<b>48 hour</b>					X <sup>2</sup> :2.00;
Yes	8	13.33	14	23.33	df:1
No	52	86.66	46	76.67	p=0.157

As shown in Table 2 there is no significant statistical difference between group A patients and group B patients for requirement of injectable pain killers as the p values is more than 0.05.

**Table 3: Seroma observed at different days.**

Seroma at:	Group A		Group B		P value
	No.	%	No.	%	
<b>Day 1</b>					
Yes	0	0	0	0	
No	60	100.00	60	100.00	
<b>Day 2</b>					
Yes	0	0	0	0	
No	60	100.00	60	100.00	
<b>Day 3</b>					
Yes	0	0	0	0	
No	60	100.00	60	100.00	
<b>Day 4</b>					
Yes	8	13.33	6	10.00	X <sup>2</sup> :0.323; df:1
No	52	86.66	54	90.00	p=0.570
<b>Day 5</b>					
Yes	8	13.33	6	10.00	X <sup>2</sup> :0.323; df:1
No	52	86.66	54	90.00	p=0.570
<b>Day 6</b>					
Yes	8	13.33	6	10.00	X <sup>2</sup> :0.323; df:1
No	52	86.66	54	90.00	p=0.570
<b>Day 7</b>					
Yes	8	13.33	6	10.00	X <sup>2</sup> :0.323; df:1
No	52	86.66	54	90.00	p=0.570

**Table 4: Discharge observed at different days.**

Discharge at:	Group A		Group B		P value
	No.	%	No.	%	
<b>Day 1</b>					
Yes	0	0	0	0	
No	60	100.00	60	100.00	
<b>Day 2</b>					
Yes	0	0	0	0	
No	60	100.00	60	100.00	
<b>Day 3</b>					
Yes	0	0	0	0.00	
No	60	100.00	60	100.00	
<b>Day 4</b>					
Yes	8	13.33	6	10.00	X <sup>2</sup> :0.323; df:1
No	52	86.66	54	90.00	p=0.570
<b>Day 5</b>					
Yes	8	13.33	6	10.00	X <sup>2</sup> :0.323; df:1
No	52	86.66	54	90.00	p=0.570
<b>Day 6</b>					
Yes	8	13.33	6	10.00	X <sup>2</sup> :0.323; df:1
No	52	86.66	54	90.00	p=0.570
<b>Day 7</b>					
Yes	8	13.33	6	10.00	X <sup>2</sup> :0.323; df:1
No	52	86.66	54	90.00	p=0.570

The Table 3 shows that the p value is 0.570 which is more than 0.05. Therefore there is no statistical difference in group A and group B patients for seroma formation.

As shown in Table 4 that there is no statistical difference between the discharges of wound in both scalpel and cautery groups as the p value as shown by Chi-square is more than 0.05.

**Table 5: Vascularity observed at different months of follow up.**

Vascularity at:	Group A		Group B		P value
	No.	%	No.	%	
<b>Month 1</b>					
0	52	86.66	54	90.00	X <sup>2</sup> :0.323; df:1 p=0.570
1	8	13.33	6	10.00	
2	0	0.00	0	0.00	
3	0	0.00	0	0.00	
<b>Month 2</b>					
0	52	86.66	54	90.00	X <sup>2</sup> :0.323; df:1 p=0.570
1	8	13.33	6	10.00	
2	0	0.00	0	0.00	
3	0	0.00	0	0.00	
<b>Month 3</b>					
0	54	90.00	56	93.33	X <sup>2</sup> :0.436 df:1 p=0.509
1	6	10.00	4	6.67	
2	0	0.00	0	0.00	
3	0	0.00	0	0.00	
<b>Month 4</b>					
0	60	100.00	60	100.00	
1	0	0.00	0	0.00	
2	0	0.00	0	0.00	
3	0	0.00	0	0.00	

**Table 6: Pigmentation observed at different months of follow up.**

Pigmentation at:	Group A		Group B		P value
	No.	%	No.	%	
<b>Month 1</b>					
0	52	86.66	54	90.00	X <sup>2</sup> :3.37; df:2 p=0.185
1	8	13.33	2	6.66	
2	0	0.00	1	3.33	
<b>Month 2</b>					
0	54	90.00	54	90.00	X <sup>2</sup> :2.40; df:2 p=0.301
1	6	10.00	4	6.66	
2	0	0.00	2	3.33	
<b>Months 3</b>					
0	54	90.00	54	90.00	X <sup>2</sup> :2.40; df:2 p=0.301
1	6	10.00	4	6.66	
2	0	0.00	2	3.33	
<b>Month 4</b>					
0	54	90.00	52	86.66	X <sup>2</sup> :4.44; df:2 p=0.109
1	6	10.00	4	6.66	
2	0	0.00	4	6.66	

As shown in Table 5 there is no statistical difference between the vascularity of wound in both scalpel and electrocautery group. As the p value as shown by Chi-square is more than 0.05.

As shown in Table 6 there is no statistical difference between the pigmentation of wound in both scalpel and electrocautery group. As the p value as shown by Chi-square is more than 0.05.

**Table 7: Pliability observed at different months of follow up.**

Pliability at:	Group A		Group B	
	No.	%	No.	%
<b>Month 1</b>				
0	54	90.00	56	93.33
1	2	3.33	2	3.33
2	0	0.00	0	0.00
3	2	3.33	2	3.33
4	0	0.00	0	0.00
5	2	3.33	0	0.00
<b>Month 2</b>				
0	54	90.00	56	93.33
1	2	3.33	2	3.33
2	0	0.00	0	0.00
3	2	3.33	2	3.33
4	0	0.00	0	0.00
5	2	3.33	0	0.00
<b>Month 3</b>				
0	56	93.33	56	93.33
1	4	6.66	4	6.66
2	0	0.00	0	0.00
3	0	0.00	0	0.00
4	0	0.00	0	0.00
5	0	0.00	0	0.00
<b>Month 4</b>				
0	60	100.00	60	100.00
1	0	0.00	0	0.00
2	0	0.00	0	0.00
3	0	0.00	0	0.00
4	0	0.00	0	0.00
5	0	0.00	0	0.00

As shown in Table 7 there is no statistical difference between the pliability of wound in both scalpel and electrocautery group. As the p value as shown by Chi-square is more than 0.05.

## DISCUSSION

With time, many techniques have been developed to incise skin, to excise lesions or to approach deeper tissues or organs. Surgeons have been always in search of an ideal method of making skin incision which would provide quick and adequate exposure with minimum loss of blood. Electrocautery mainly used for hemostasis and

less often for skin incision. This reluctance for use of electrocautery is attributed to the belief that electrocautery causes devitalization of tissue within the wound which consequently lead to wound infection, delayed wound healing and wound scar formation. The fear of injury tissues was first unfolded when this technique was used by Peterson in reconstructive and cosmetic faciomaxillary surgery, Mann and Klippel in pediatric surgery, Kamer in rhytidoplasty, Tobin in blepharoplasty, with minimum scarring and excellent results.<sup>4-7</sup> This study compared the above two methods for creating surgical incision in terms of wound complications and effect on hospital stay. To exclude confounding variables there were similar type of patients in both groups in terms of distribution of age, sex ratio, diagnosis, co-morbid, type of procedure performed; even skin closure technique and type of suture material used were also same in each group. Patients with co-morbid conditions like diabetes mellitus and hypertension were the included in this study to observe that weather the diseases have an effect on wound healing, but no significant difference was found; complication rates were similar as in other studies that had patients without co-morbid.<sup>8,9</sup> The most compelling reason for the routine use of cutting diathermy for skin incisions, therefore, is removal of the scalpel from the operating theatre and elimination of an important cause of injury. We did not find any difference in the rate of wound complications between cutting diathermy and scalpel in our study. It may be that cutting diathermy produces heat so quickly that tissue vaporization occurs, as opposed to the charring and necrosis associated with coagulation diathermy that may predispose to wound complications. In our study 60 patients were randomized in to two groups, incision was taken with either scalpel or electrocautery depending on the group allotted, and evaluated post operatively for pain, requirement of analgesic doses and post-operative wound complications. This study showed no difference between the two groups in post-operative pain, analgesic requirement and no difference in wound complication. Arid et al also found out similar results to our study in which they observe similar pattern requirements of analgesia in both electrocautery and scalpel groups, whereas in contrast to our study Ghansham et al found that there is decrease postoperative pain in diathermy group as compare to scalpel group.<sup>3,10</sup>

Shivagouda et al studied that postoperative seroma, hematoma formation in similar in both electrocautery and scalpel group as in our study that also showed there is no significant difference between scalpel and electrocautery groups.<sup>11</sup>

In our study we did assessment of the scar using Vancouver scar scale (vascularity, pigmentation, pliability, height) all the criteria of the scale were comparable in both the scalpel and electrocautery group.

In our study, we did not find difference in visual analogue score between both scalpel and diathermy groups but study done by Kadyan et al found that there is decrease in visual analogue score in first 24 hours or early post-operative pain but in Shamim study there is decrease pain perception in first 48 hours in diathermy group.<sup>2,12</sup>

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## REFERENCES

1. Dixon AR, Watkin DF. Electrosurgical skin incision versus conventional scalpel: a prospective trial. *J Royal Coll Surgeons Edinburgh.* 1990;35:299-301.
2. Shamim M. Diathermy VS. Scalpel skin incisions in general surgery: double-blind, randomized, clinical trial. *World J Surg.* 2009;33:1594-9.
3. Aird LN, Bristol SG, Phang PT, Raval MJ, Brown CJ. Randomized double-blind trial comparing the cosmetic outcome of cutting diathermy versus scalpel for skin incisions. *Br J Surg.* 2015;102:489-94.
4. Peterson A. The use of electrosurgery in reconstructive and cosmetic maxillofacial surgery. *Dental Clin North Am.* 1982;26:799-823.
5. Mann W, Klippel CH. Electrosurgical skin incision. *J Pediatr Surg.* 1977;12:725-6.
6. Kamer FM, Cohen A. High frequency needle dissection rhytidectomy. *Laryngoscope.* 1985;95:1118-20.
7. Tobin HA. Electrosurgical blepharoplasty: a technique that questions conventional concepts of fat compartmentalisation. *Ann Plastic Surg.* 1985;14:59-63.
8. Longaker MT, Gurtner, Geoffrey C. Diathermy or Surgical Scalpel for Abdominal Skin Incisions: What Is the Impact On Clinical Practice? *Ann Surg.* 2011;253:14-5.
9. Özgün H, Tuncyurek P, Boylu S, Erpek H, Yenisey C, Köse H, et al. The right method for midline laparotomy: what is the best choice for wound healing? *Acta Chirurgica Belgica.* 2007;107:682-6.
10. Ghansham. Incision Pain: A Comparison Between Use of Diathermy Versus Scalpel in Patients Undergoing Elective Abdominal Surgery. *J Surg Pak.* 2016;21:54-7.
11. Shivagouda P, Gogeri BV, Godhi AS, Metgud SC. Prospective randomized control trial comparing the efficacy of diathermy incision versus scalpel incision over skin in patients undergoing inguinal hernia repair. *Recent Res Sci Tech.* 2010;2:44-7.
12. Kadyan B, Chavan S, Mann M, Punia P, Tekade S. A prospective study comparing diathermy and steel scalpel in abdominal incisions. *Med J DY Patil Univ.* 2014;7:558-63.

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