

# Comparison of Surgical Incision Outcome in Scalpel Incisions and High Frequency Electrocautery in a Tertiary Care Hospital

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## Abstract

**Introduction:** Scalpels have been the gold standard for skin incisions despite having disadvantages like lack of hemostasis which can be overcome with the use of electrocautery. Since, its introduction electrocautery has been indispensable in the operating room. Despite this major advantage of electrocautery, beliefs exist that it can cause devitalization of tissues leading to wound infection, delayed wound healing and scar formation.

**Purpose:** The purpose of this study is to evaluate the efficacy of electrocautery over scalpel in making skin incisions.

**Materials and Methods:** Eighty cases requiring surgical incisions were enrolled and divided into two groups- scalpel group and electrocautery group. Post-operatively the two groups were compared on the basis of intra-operative bleeding, pain, complications, and scar formation.

**Results:** There was no significant difference in pain, 6 h post-operatively, between the two groups. While, intra-operative bleeding and complications like serous discharge was found to be more in the scalpel group. Skin incisions made with electrocautery produced cosmetically acceptable scar.

**Conclusion:** Skin incisions with high frequency electrocautery are more advantageous than using a traditional scalpel for the same.

**Key words:** Electrocautery, Post-operative complications, Scalpel incisions

## INTRODUCTION

The first surgery using electrocautery was performed by Dr. Harvey Cushing in 1926. Ever since, irrespective of the procedure, electrosurgical instruments have become indispensable in the operating room.<sup>[1]</sup> Before this, scalpel was considered the gold standard for surgical incisions, but it came with its own set of disadvantages. Electrosurgical instruments like high frequency electric knife, obviates these inherent disadvantages of scalpel, that is, lack of hemostasis, accidental injury to surgeon, infection risk, pain, fear of burns, and scarring.<sup>[2,3]</sup>

Numerous studies have been done that shows benefits of use of electrocautery in skin incision.<sup>[4-7]</sup> This study was done to assess the same by comparing outcome of electrosurgical and scalpel incision.

## MATERIALS AND METHODS

A prospective study was conducted under surgery department of a tertiary care hospital. 80 cases requiring surgical intervention (hernia, thyroid, varicose veins, and fibroadenoma) were enrolled for the study which was done during the period of June 2015 to October 2016 following ethics committee approval.

Patients between 18 and 60 years of age, requiring all clean wound surgery cases were included following Informed consent. Clean contaminated and complicated cases and those with severe/uncontrolled comorbid medical conditions (severe hepatic/renal/cardiovascular

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dysfunction, diabetes mellitus, hypertension, and immunocompromised status) were excluded from the study.

The 80 study subjects were then randomized into two groups, that is, Group A and Group B each containing 40 subjects. Where, Group A (study group) included skin incision made with electrocautery needle using pulse sine wave current and power setting of 70 watts and Group B (control group) included skin incision made with scalpel; bleeding controlled by forceps coagulation using pulse sine wave on power supply 30 watts. Hemostasis achieved with forceps coagulation.

The patient's characteristics of the two groups were well matched. All the procedures were carried out under standardized spinal/general anesthesia according to the procedure. Intravenous Cefotaxime 1 g was given 2 h before procedure and just before incision as a premedication.

Post-operative pain was measured using pictorial visual analog scale at 6, 12, 24, and 48 h.<sup>[4]</sup> If pain score was more than 4, injection Diclofenac 50 mg intramuscular was given.

#### Pain Score Cautery Group

- $5 \pm 1$  (moderate) pain score experienced in first 6 h post op
- $3 \pm 1$  (mild) pain score experienced in 12 h
- $0 \pm 1$  pain score is experienced in 24–48 h.

#### Pain Score in Scalpel Group

- $7 \pm 1$  (severe) pain score experienced in first 6 h
- $4 \pm 1$  (moderate) pain score experienced in 12 h
- $2 \pm 1$  (mild) pain score experienced in 24 h
- 1 (mild) pain experienced even after 48 h in scalpel group.

Bleeding at the time of incision was observed. Post-operative complications were noted during hospital stay and measured. At 1 month post-operative period, surgical scars were evaluated by using the Vancouver scar scale (VSS) to evaluate the cosmesis of the scar.<sup>[6]</sup>

The results were finally analyzed and compared for the two groups using Mann-Whitney U Test in Quasi Experimental study and percentage and type of complication at incision site were noted.

## RESULTS

The age of the patients varied from 20 to 60 years. Maximum number of cases belonged to the age group of 30–60 years. The mean age in study group was  $40.4 \pm 8.58$  years and in control group was  $41.8 \pm 10.6$  years. In

both study and control group, males were predominant that is 76.67% of the patients while 23.33% were female [Table 1].

Comparison of post-operative pain between scalpel group and cautery group was done by visual analogue scale. Larger difference in average pain score among cautery group and scalpel group was seen at 6 h,  $5 \pm 1$  and  $7 \pm 1$ , respectively. Overall, patients in cautery group had less pain than those in scalpel group [Table 2].

Intra-operative bleeding at time of incision as observed by the surgeon was seen to be more in scalpel group than the cautery group. In the cautery group, bleeding was minimal to absent.

There were no major complications in either group. Patients with minor complications, like serous fluid collection, were seen. There were 04 (7.2%) such patients in cautery group with average discharge of 5 ml and 22 (60.6%) patients with an average of 15 ml serous discharge in scalpel group [Table 3].

**Table 1: Age and sex distribution**

	Scalpel	Cautery
No of patients	40	40
Range of age in years	20–60	20–60
Male: Female ration	31:9	3:1
Age Distribution		
Age in years		
20–30	6	8
30–40	19	12
40–60	15	20
Total	40	40

**Table 2: Post-operative pain assessed using visual analogue scale**

Pain score	Cautery	Scalpel
6 h	$5 \pm 1$	$7 \pm 1$
12 h	$3 \pm 1$	$4 \pm 1$
24 h	$1 \pm 1$	$2 \pm 1$
48 h	0	1

**Table 3: Post-operative complications**

	Post-operative discharge from wound	
	Cautery	Scalpel
Collection in wound		
Present	4	22
Absent	36	18
Discharge type	Serous	Serous
Amount	5ml	15 ml
Infection	Nil	Present
Total	40	40

One-month post-operative scar was assessed using the VSS. All cases from cautery group healed by primary intention while two cases of scalpel group healed by secondary intention. In scalpel group, two cases of hypopigmentation and six cases of hyperpigmentation were seen whereas only of each were seen in the cautery group [Table 4].

## DISCUSSION

Scalpels have been considered as the gold standard for making surgical incisions as it allowed surgeons to make incision of desired depth without damaging neighboring tissues.<sup>[8,9]</sup> Scalpel use came with a number of disadvantages like lack of hemostasis, accidental injury to surgeon, risk of infection, and pain.<sup>[2-4]</sup> Electrocautery obviates these drawbacks of scalpel and also reduces intra-operative time, avoids use of foreign material (ligatures), and potential for tumor metastasis through lymphatic channels.<sup>[10]</sup> Electrocautery is mainly used for hemostasis and less often for skin incision due to the belief that electrosurgical instruments can cause devitalization of tissue which can subsequently lead to wound infection, delayed wound healing and scar formation.<sup>[5]</sup> Numerous studies were undertaken to evaluate the efficacy of electrocautery over scalpel in making skin incision and the results were varying.

According to, systematic review and meta-analysis of cutting diathermy versus scalpel for skin incision, which included 416 cases in electrocautery group and 414 in the scalpel group, there was no significant difference in post-operative scores at 24 h.<sup>[11]</sup> Even in our study, at 24 h, there was no noteworthy difference. Although in our study, we did note a larger difference in average score for pain at 6 h [Table 2].

In our study, intra-operative bleeding assessment was based on observation by the surgeon, according to which bleeding was significantly lesser among the electrocautery group when compared to scalpel group. Similar results were seen in studies by Ly *et al.* and Siraj *et al.*<sup>[11,12]</sup>

**Table 4: Post-operative scar assessment**

	Scar score in 1 month post-operative	
	Cautery	Scalpel
Vascularity	Normal	Normal
Pigmentation		
Normal	38	32
Hypopigmentation	1	2
Hyperpigmentation	1	6
Pliability	normal	normal
Height	flat	Flat<2 mm in 3 cases
Primary intension	40	38
Secondary intension	0	2

As mentioned earlier, no major complications were seen in either of the groups. Minor complications, like serous fluid collection, were seen more in the scalpel group with respect to both incidence and amount of fluid collected [Table 3]. A similar result was obtained in a study by Priya *et al.* in Maharashtra, India.<sup>[13]</sup>

Post-operative scar assessment in our study found not much of a significant difference in electrocautery and scalpel group [Table 4]. Comparable results were reported by Kumar *et al.* and Priya *et al.*<sup>[9]</sup>

Numerous studies done suggested that wounds created with electrocautery have reduced tensile strength, increased infection rate and a bigger zone of wound necrosis than those made with scalpel. This assumption was squashed by a multicenter collaborative trial that was conducted in 2001, included 964 patients found no difference in rate of wound complications between scalpel and electrocautery use.<sup>[11]</sup>

## CONCLUSION

Skin incisions made with electrocautery are quicker and associated with less bleeding than those by scalpel. It is also a cosmetically acceptable technique. Use of electrocautery shows no increased risk of infection and also has benefits with respect to post-operative pain. All of this along with safety advantage to the surgeon makes electrocautery an attractive option.

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## REFERENCES

- Prakash LD, Balaji N, Kumar SS, Kate V. Comparison of electrocautery incision with scalpel incision in midline abdominal surgery-a double blind randomized controlled trial. *Int J Surg* 2015;19:78-82.
- Glover JL, Bendick PJ, Link WJ. The use of thermal knives in surgery: Electrosurgery, lasers, plasma scalpel. *Curr Probl Surg* 1978;15:1-78.
- Murthy SM, Goldschmidt RA, Rao LN, Ammitati M, Buchmann T, Scanlon EF. The influence of surgical trauma on experimental metastasis. *Cancer* 1989;64:2035-44.
- Kearns SR, Connolly EM, McNally S, McNamara DA, Deasy J. Randomized clinical trial of diathermy versus scalpel incision in elective midline laparotomy. *Br J Surg* 2001;88:41-4.
- Johnson CD, Serpell JW. Wound infection after abdominal incision with scalpel or diathermy. *Br J Surg* 1990;77:626-7.
- Gupta AK, Dall TS, Bansal D. A prospective study of diathermy versus scalpel skin incision in abdominal surgery. *Int Surg J* 2019;6:3554-8.
- Wilson AP, Gibbons C, Reeves BC, Hodgson B, Liu M, Plummer D, *et al.* Surgical wound infection as a performance indicator: Agreement of common

- definitions of wound infection in 4773 patients. BMJ 2004;25:720-4.
- 8. Sharma N, Chauhan A, Sharma V, Gupta A, Pathania S. Harmonic scalpel, the tool for new age laparoscopic cholecystectomy. Int Surg J 2018;5:2327-30.
  - 9. Shahmoradi MK, Mehri J, Taheri HR. Comparison of hemorrhoidectomy using harmonic scalpel and electrocautery: A randomized controlled trial. Int J Surg Open 2020;27:39-42.
  - 10. Kumar V, Tewari M, Shukla HS. A comparative study of scalpel and surgical diathermy incision in elective operations of head and neck cancer. Indian J Cancer 2011;48:216-9.
  - 11. Ly J, Mittal A, Windsor J. Systematic review and meta-analysis of cutting diathermy versus scalpel for skin incision. Br J Surg 2021;99:613-20.
  - 12. Siraj A, Farooqdar M, Gilani AA, Raziq S. A study on comparison of diathermy and scalpel incisions in elective midline laparotomy. Prof Med J 2011;18:106-11.
  - 13. Priya N, Lamture YR, Luthra L. A comparative study of scalpel versus surgical diathermy skin incisions in clean and clean-contaminated effective abdominal surgeries in AVBRH, Wardha, Maharashtra, India. J Datta Meghe Inst Med Sci Univ 2017;12:21-5.

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