

# An Observational Study Comparing Electrocautery and Scalpel Incisions in Terms of Wound Healing and Complication Rates

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## ABSTRACT

**Background:** The method of surgical incision plays an important role in determining intraoperative efficiency, wound healing, and postoperative complications. Electrocautery and scalpel are commonly used techniques, each with distinct advantages and limitations.

**Aim:** To compare electrocautery and scalpel techniques in surgical incisions with respect to wound healing and complication rates.

**Materials and Methods:** This hospital-based observational study was conducted in the Department of General Surgery at Meenakshi Medical College Hospital and Research Institute, Kanchipuram, over a period of one year. A total of 75 patients undergoing elective surgical procedures were included. Based on routine clinical practice, patients were grouped into electrocautery (n = 38) and scalpel (n = 37). Outcomes assessed included intraoperative blood loss, postoperative pain using Visual Analogue Scale, wound healing time, duration of surgery, and postoperative complications. Statistical analysis was performed using SPSS, and a p value < 0.05 was considered statistically significant.

**Results:** Electrocautery was associated with significantly lower blood loss ( $85.4 \pm 20.6$  ml vs  $132.8 \pm 28.4$  ml;  $p = 0.001$ ) and shorter operative time ( $48.2 \pm 9.6$  minutes vs  $56.7 \pm 11.2$  minutes;  $p = 0.001$ ). Postoperative pain scores were also significantly lower ( $p = 0.001$ ). However, wound healing was slightly delayed in the electrocautery group ( $10.8 \pm 2.4$  days vs  $9.6 \pm 2.1$  days;  $p = 0.02$ ). Complication rates were higher in the electrocautery group but not statistically significant.

**Conclusion:** Electrocautery offers better intraoperative efficiency and reduced pain, whereas scalpel incisions may provide better wound healing outcomes.

**Keywords:** Electrocautery, scalpel, surgical incision, wound healing, postoperative complications, observational study

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## Introduction

Surgical incision is a fundamental step in operative procedures, and the method used for creating the incision plays a crucial role in determining wound healing, postoperative pain, and complication rates. Traditionally, the scalpel has been the standard instrument for making surgical incisions due to its precision and minimal tissue damage. However, with advancements in surgical technology, electrocautery has gained widespread acceptance as an alternative technique for tissue dissection and hemostasis [1].

Electrocautery utilizes high-frequency electrical current to cut tissue while simultaneously coagulating blood vessels, thereby reducing intraoperative bleeding. This dual function offers advantages such as improved visibility in the surgical field, reduced operative time, and decreased need for ligation. On the other hand, the scalpel produces a clean incision with minimal lateral thermal damage, which is believed to promote better wound healing and reduce tissue necrosis [2].

Despite the advantages of electrocautery, concerns have been raised regarding its potential impact on

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wound healing. Thermal injury caused by electrocautery may lead to increased tissue necrosis, delayed healing, and a higher risk of postoperative complications such as infection and wound dehiscence. In contrast, scalpel incisions are associated with less tissue trauma and may result in better healing outcomes [3].

Several studies have compared electrocautery and scalpel techniques in terms of intraoperative and postoperative outcomes. While some studies have reported reduced blood loss and shorter operative time with electrocautery, others have highlighted better wound healing and lower complication rates with scalpel incisions. The evidence remains variable, and the choice of technique often depends on surgeon preference and the type of surgical procedure [4–6].

Wound healing is a complex biological process influenced by multiple factors, including the method of incision, tissue handling, and patient-related factors. Postoperative complications such as infection, hematoma, and delayed healing can significantly affect patient recovery and increase healthcare burden. Therefore, evaluating the impact of different incision techniques on healing and complications is essential for optimizing surgical outcomes [7].

In routine clinical practice, the choice between electrocautery and scalpel is often based on observational clinical judgment rather than controlled allocation. Hence, studying these techniques in an observational setting provides valuable insights into their real-world effectiveness.

Therefore, the present study was undertaken to compare electrocautery and scalpel techniques in surgical incisions with respect to wound healing and postoperative complication rates in an observational study setting.

### Materials and Methods

This hospital-based observational study was conducted in the Department of General Surgery at Meenakshi Medical College Hospital and Research Institute, Kanchipuram, Tamil Nadu, over a period of one year. The study aimed to compare the outcomes of electrocautery and scalpel techniques in surgical incisions with respect to wound healing and postoperative complication rates.

A total of 75 patients undergoing elective surgical procedures requiring skin incision were included in the study. Patients aged between 18 and 60 years and classified as American Society of Anesthesiologists (ASA) physical status I or II were considered eligible. Patients with uncontrolled diabetes mellitus, immunocompromised status, existing wound infection,

or those undergoing emergency surgeries were excluded from the study.

All patients underwent detailed preoperative evaluation including history taking, clinical examination, and necessary laboratory investigations. Based on routine surgical practice and surgeon preference, patients were assigned to either the electrocautery group (Group A) or the scalpel group (Group B). No randomization was performed as this was an observational study.

In Group A, surgical incisions were made using electrocautery, while in Group B, incisions were made using a scalpel. Standard surgical protocols and aseptic precautions were followed in all cases. Hemostasis and wound closure techniques were performed as per standard institutional practice.

Postoperative outcomes were assessed and compared between the two groups. The parameters evaluated included intraoperative blood loss, postoperative pain using the Visual Analogue Scale, wound healing assessed on follow-up, and postoperative complications such as infection, hematoma, and wound dehiscence.

All data collected during the study were systematically entered into Microsoft Excel and subsequently analyzed using Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics including mean, standard deviation, frequencies, and percentages were used to summarize the variables. Comparative analysis between groups was performed using the independent t test for continuous variables and the Chi square test for categorical variables. A p value of less than 0.05 was considered statistically significant.

### Results

A total of 75 patients undergoing elective surgical procedures were included in the study to compare electrocautery and scalpel techniques in surgical incisions.

**Table 1: Demographic Characteristics of Study Participants (n = 75)**

Variable	Electrocautery (n = 38)	Scalpel (n = 37)	p value
Mean age (years)	41.3 ± 10.8	40.6 ± 11.1	0.78
Male	23 (60.5%)	22 (59.5%)	0.92
Female	15 (39.5%)	15 (40.5%)	

The mean age and gender distribution were comparable between the electrocautery and scalpel groups. The differences were not statistically significant (p = 0.78).

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for age and  $p = 0.92$  for gender), indicating both groups were similar at baseline.

**Table 2: Intraoperative Blood Loss**

Parameter	Electrocautery	Scalpel	P value
Mean blood loss (ml)	85.4 ± 20.6	132.8 ± 28.4	0.001

The mean intraoperative blood loss was significantly lower in the electrocautery group compared to the scalpel group. This difference was statistically significant ( $p = 0.001$ ), indicating better hemostasis with electrocautery.

**Table 3: Postoperative Pain Scores (VAS)**

Time	Electrocautery	Scalpel	p value
6 hours	3.6 ± 1.1	4.8 ± 1.3	0.001
24 hours	2.9 ± 0.9	4.1 ± 1.2	0.001

Postoperative pain scores were significantly lower in the electrocautery group at both 6 and 24 hours. The differences were statistically significant ( $p = 0.001$ ), suggesting better postoperative comfort with electrocautery.

**Table 4: Wound Healing (Days to Healing)**

Parameter	Electrocautery	Scalpel	P value
Mean healing time (days)	10.8 ± 2.4	9.6 ± 2.1	0.02

Wound healing was slightly delayed in the electrocautery group compared to the scalpel group. The difference was statistically significant ( $p = 0.02$ ), indicating faster healing with scalpel incisions.

**Table 5: Postoperative Complications**

Complication	Electrocautery	Scalpel	P value
Infection	5 (13.2%)	2 (5.4%)	0.23
Hematoma	3 (7.9%)	2 (5.4%)	0.65
Wound dehiscence	2 (5.3%)	1 (2.7%)	0.56
No complications	28 (73.6%)	32 (86.5%)	-

Postoperative complications were more frequent in the electrocautery group; however, the differences were not statistically significant ( $p > 0.05$ ).

**Table 6: Duration of Surgery**

Parameter	Electrocautery	Scalpel	P value
Mean duration (minutes)	48.2 ± 9.6	56.7 ± 11.2	0.001

The duration of surgery was significantly shorter in the electrocautery group compared to the scalpel group. This difference was statistically significant ( $p = 0.001$ ), indicating improved operative efficiency with electrocautery.

### Discussion

The present observational study compared electrocautery and scalpel techniques in surgical incisions with respect to intraoperative parameters, wound healing, and postoperative complications. The findings suggest that electrocautery offers advantages in terms of reduced blood loss and operative time, while scalpel incisions may provide better wound healing outcomes.

In the present study, baseline characteristics such as age and gender distribution were comparable between the two groups, with no statistically significant difference ( $p = 0.78$  and  $p = 0.92$ ). This indicates that both groups were similar and suitable for outcome comparison. Similar observations were reported by Kearns SR et al [8], who emphasized the importance of comparable baseline characteristics in studies evaluating surgical techniques.

The present study demonstrated significantly lower intraoperative blood loss in the electrocautery group (85.4 ± 20.6 ml) compared with the scalpel group (132.8 ± 28.4 ml), with a statistically significant difference ( $p = 0.001$ ). This finding is consistent with Dixon AR et al [9], who reported that electrocautery provides effective hemostasis by simultaneous cutting and coagulation, thereby reducing intraoperative bleeding.

Postoperative pain scores were also significantly lower in the electrocautery group at both 6 hours (3.6 ± 1.1 vs 4.8 ± 1.3) and 24 hours (2.9 ± 0.9 vs 4.1 ± 1.2), with statistically significant differences ( $p = 0.001$ ). Similar findings were reported by Chalya PL et al [10], who observed that electrocautery is associated with reduced postoperative pain due to decreased tissue handling and nerve stimulation.

The duration of surgery was significantly shorter in the electrocautery group (48.2 ± 9.6 minutes) compared with the scalpel group (56.7 ± 11.2 minutes), and this difference was statistically significant ( $p = 0.001$ ). This finding is supported by Ahmed A et al [11], who reported improved operative efficiency with electrocautery due to reduced bleeding and better visualization of the surgical field.

However, wound healing was slightly delayed in the electrocautery group (10.8 ± 2.4 days) compared with the scalpel group (9.6 ± 2.1 days), and the difference was statistically significant ( $p = 0.02$ ). This may be

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attributed to thermal tissue damage caused by electrocautery. Similar observations were reported by Sharma AK et al [12], who highlighted that thermal injury associated with electrocautery can delay the wound healing process.

With regard to postoperative complications, the present study showed a higher incidence of complications such as infection, hematoma, and wound dehiscence in the electrocautery group; however, these differences were not statistically significant ( $p > 0.05$ ). Comparable findings were reported by Kumar S et al [13], who noted that although complication rates may be slightly higher with electrocautery, the differences are often not statistically significant.

The balance between surgical efficiency and wound healing remains an important consideration. Pollinger HS et al [14] emphasized that while electrocautery offers advantages in reducing operative time and blood loss, careful technique is required to minimize thermal damage and optimize healing outcomes.

Furthermore, recent studies have highlighted the importance of technique selection based on clinical outcomes. Sinha R et al [15] reported that both electrocautery and scalpel techniques are effective, but the choice should be individualized based on surgical requirements. Similarly, Gupta A et al [16] emphasized that optimizing surgical technique can improve patient outcomes and reduce complications.

Overall, the findings of the present study suggest that electrocautery is advantageous in terms of intraoperative efficiency and reduced blood loss, whereas scalpel incisions may be preferable for optimal wound healing. The choice of technique should be individualized based on clinical context and surgeon expertise.

### Conclusion

The present observational study demonstrated that both electrocautery and scalpel techniques are effective methods for surgical incisions. Electrocautery was associated with significantly reduced intraoperative blood loss ( $85.4 \pm 20.6$  ml vs  $132.8 \pm 28.4$  ml;  $p = 0.001$ ) and shorter duration of surgery ( $48.2 \pm 9.6$  minutes vs  $56.7 \pm 11.2$  minutes;  $p = 0.001$ ), indicating improved operative efficiency. Postoperative pain was also significantly lower in the electrocautery group ( $p = 0.001$ ). However, wound healing was slightly delayed in patients undergoing electrocautery ( $10.8 \pm 2.4$  days vs  $9.6 \pm 2.1$  days;  $p = 0.02$ ). Although postoperative complications were more frequent in the electrocautery group, the differences were not statistically significant ( $p > 0.05$ ). Overall, electrocautery offers advantages in terms of reduced

blood loss and operative time, while scalpel incisions may be preferable for better wound healing outcomes.

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