



# Scalpel versus Electrocautery Skin Incision for Elective Inguinal Hernioplasty – A Randomised Control Trial

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## KEYWORDS

Electrocautery, Inguinal hernioplasty, Scalpel, Skin incision, Pain management, Cosmetic outcome

## ABSTRACT:

**Background:** Electrocautery reduces incision time and provides a nearly bloodless surgical field, allowing for faster dissection and lowering the risk of infection through instrument handling. Despite its advantages, concerns about scarring and wound infection rates have limited its use in some surgeries.

**Objective:** To evaluate the safety and effectiveness of skin incisions made with a scalpel versus electrocautery in patients undergoing elective inguinal hernioplasty.

**Methods:** This prospective, randomized controlled study was conducted at Aarupadai Veedu Medical College and Hospital, Puducherry, involving 80 patients scheduled for elective inguinal hernioplasty. Participants were randomly divided into two groups: Group A (scalpel, n=40) and Group B (electrocautery, n=40). Primary outcomes measured included postoperative wound healing and complications, while secondary outcomes were incision time, intraoperative blood loss, postoperative pain, and duration of hospital stay.

**Results:** The average age of participants was 47.65 years, with no significant differences between groups in terms of age, gender, residence, or physical characteristics. The electrocautery group had significantly shorter incision times and less intraoperative bleeding compared to the scalpel group ( $p < 0.05$ ). Additionally, patients in the electrocautery group experienced significantly lower pain scores and required fewer doses of analgesics at various postoperative intervals ( $p < 0.05$ ). There were no significant differences between the groups in terms of postoperative wound complications or hospital stay duration. The electrocautery group also had significantly better cosmetic outcomes, indicated by lower Manchester scar scores at 2 weeks, 1 month, and 3 months follow-ups ( $p < 0.05$ ).

**Conclusion:** Electrocautery for skin incisions in elective inguinal hernioplasty is superior to the scalpel, offering advantages such as shorter incision times, less bleeding, reduced postoperative pain, fewer analgesic needs, and better cosmetic outcomes without increasing the risk of postoperative complications or lengthening hospital stays. These findings advocate for the broader use of electrocautery in similar surgical procedures.



## Introduction

Traditionally, a scalpel is used for surgical skin incisions, which can cause bleeding and potentially obscure the operative field.(1) In contrast, electrocautery provides benefits such as shorter incision times and a bloodless surgical field. It is widely used for dissection because it achieves hemostasis quickly and allows for faster dissection.(2,3) Additionally, electrocautery reduces the risk of infections transmitted to surgeons and nurses during instrument handling compared to scalpels.(4) When used for skin incisions in elective inguinal hernia surgery, electrocautery has been shown to minimize postoperative discomfort and complications like seroma, hematoma, and wound dehiscence, thereby shortening hospital stays.(5)

The introduction of electrocautery in surgery in the early 20th century significantly reduced various intraoperative and postoperative complications.(6–8) Despite its widespread use for dissection in many operations, surgeons often still opt for scalpels for skin incisions due to concerns about scarring and increased wound infection rates.(9–11) Given the many advantages of electrocautery, such as a relatively bloodless operative field, better hemostasis, reduced postoperative pain, and fewer postoperative wound complications, its use should be extended to include skin incisions. Further studies comparing the benefits and drawbacks of scalpel and electrocautery incisions are necessary to improve patient care.(12–14) Examining these techniques in clean cases like elective inguinal hernioplasty will help establish a foundational theory for further research on various other surgeries.

## Materials and Methods

The study was conducted in the Department of General Surgery at Aarupadai Veedu Medical College and Hospital, Puducherry, using a prospective randomized controlled design. Participants were patients aged 18-80 years undergoing elective inguinal hernioplasty. Those with coagulopathies, immunocompromised status, severe cardiovascular or renal dysfunction, or malignancy were excluded. The study spanned two years and involved 80 participants, with 40 in each group, based on a sample size calculation from a similar study by Prakash et al. Group A had scalpel incisions, and

Group B had electrocautery incisions. Participants were selected through convenience sampling and randomly assigned to groups using a random sample number generator. Data collected included postoperative wound healing and complications, incision time, intraoperative blood loss, postoperative pain, and hospital stay duration.

Statistical analysis involved summarizing data as mean, standard deviation, frequency, and percentage, represented in tables, figures, pie charts, and bar diagrams. Continuous data were analysed using unpaired t-tests, and categorical data were analysed using chi-square tests.

## Results

In this study, 80 patients with a mean age of 47.65 years were included, with no significant differences in age, gender distribution, residence, physical characteristics (weight, height, BMI), or hernia-related factors (side of hernia, recurrent hernia status, and inguinal hernia type) between the groups.

The electrocautery group experienced significantly shorter incision times, less intraoperative bleeding, lower mean pain scores at various intervals, and required fewer analgesic doses compared to the scalpel group ( $p < 0.05$ ). There were no significant differences in postoperative wound complications or total hospital stay duration between the groups. However, the electrocautery group had significantly lower Manchester scar scores at follow-ups at 2 weeks, 1 month, and 3 months postoperatively ( $p < 0.05$ ).

## Discussion

In elective inguinal hernioplasty, choosing between a traditional scalpel and electrocautery for skin incisions is crucial for patient outcomes and surgical efficiency. The scalpel, long favored for its precision and familiarity among surgeons, often results in increased bleeding and a potentially obscured operative field. Electrocautery, on the other hand, offers advantages such as reduced intraoperative bleeding, quicker dissection rates, and improved hemostasis, leading to a bloodless surgical field and potentially fewer postoperative complications like pain, seroma, hematoma, and wound dehiscence. Despite these benefits, concerns about scarring and infection rates have limited its use for skin incisions.



This study, conducted at Aarupadai Veedu Medical College and Hospital in Puducherry, included 80 patients aged 18-80 undergoing elective inguinal hernioplasty. The patients were randomly assigned to either the scalpel group (Group A) or the electrocautery group (Group B). The study aimed to compare the outcomes of these two techniques in terms of postoperative pain, wound healing, and overall patient recovery. The participants had a mean age of 47.65 years, with no significant differences between the groups in terms of age, gender, residence, or physical characteristics like weight, height, and BMI.

The incision times in Group A was  $5.5 \pm 1.1$  and in Group B was  $4.2 \pm 1.2$ . There was a statistically significant difference in incisional time between the scalpel skin incisions with the diathermy incision ( $p < 0.01$ ). In a similar study by Chauhan H et al.(15) found significantly shorter incision times and less blood loss with electrocautery. The amount of intraoperative bleeding, in Group A was  $39.5 \pm 5.5$  and in Group B, it was  $9.4 \pm 0.8$ . There was a statistically significant difference in amount of blood loss till aponeurosis between the scalpel skin incisions with the diathermy incision ( $p < 0.01$ ). In a similar study by Prakash L et al.(16) documented significantly lower blood loss per unit wound area with electrocautery, with no significant differences in postoperative pain or wound infection rates.

The postoperative pain assessed by VAS at 6, 12, 24, 36, 48, 72 hrs and 7 days postoperatively, the results analyzed with chi-square test resulted in significant differences between the two groups showing lower post operative pain scores in Group B. The mean pain score at 6 hours for Group A is  $6.9 \pm 0.7$  and for Group B is  $5.0 \pm 0.7$ ;  $p = 0.01$ ). The mean pain score at 12 hrs for (Group A is  $6.8 \pm 0.7$  and for Group B is  $4.9 \pm 0.7$ ; the p value is ( $p = 0.01$ ), The mean pain score at 24 hrs for (Group A is  $5.8 \pm 0.7$  and for Group B is  $3.9 \pm 0.7$  ;the p value is  $p = 0.01$ ). The mean pain score at 36 hrs for (Group A is  $5.9 \pm 0.7$  and for Group B is  $3.8 \pm 0.7$ ; the p value is  $p = 0.01$ ) The mean pain score at 48 hrs for (Group A is  $5.5 \pm 0.6$  and for Group B is  $3.6 \pm 0.5$ ; the p value is  $p = 0.01$ ). The mean pain score at 72 hrs for (Group A is  $4.6 \pm 0.6$  and for Group B is  $2.4 \pm 0.6$ ; the p value is  $p = 0.01$ ). The mean pain score on 7<sup>th</sup> post operative day for (Group A is  $2.7 \pm 0.5$  and for Group B is  $1.6 \pm 0.5$ ; the p value is  $p = 0.01$ ). In a similar study by Ahmad H et

al.(17) reported significantly lower mean postoperative pain after 24 hours with electrocautery compared to scalpel.

The mean analgesics requirements for Group A were  $2.0 \pm 0.7$  and for electrocautery was  $0.6 \pm 0.5$ . The parenteral analgesics requirements showed significant differences ( $p = 0.01$ ). Additionally, there were no significant differences in postoperative wound complications or hospital stay duration between the groups. The mean Manchester Scar Scale at 2 weeks during follow up for Group A was  $7.8 \pm 0.7$  and for Group B was  $6.8 \pm 0.7$ ; the p value is  $p = 0.01$ . The mean values calculated during follow up at 1 month for Group A was  $10.0 \pm 0.8$  and Group B was  $7.5 \pm 0.8$  the p value is  $p = 0.01$ . The mean values calculated during follow up at 3 months time for Group A was  $9.6 \pm 0.6$  and Group B was  $7.1 \pm 0.7$ ; the p value is  $p = 0.01$ . These findings show electrocautery group had better cosmetic outcomes, which are consistent with previous studies. For example, Zarei F et al.(18) suggest that electrocautery incisions are as safe as scalpel incisions for herniorrhaphy concerning scar complications and wound infection.(19,20) A more detailed study including intraoperative parameters may provide more comprehensive conclusions.

Electrocautery for skin incisions in elective inguinal hernioplasty is superior to the scalpel in terms of shorter incision times, less bleeding, reduced postoperative pain, fewer analgesic requirements, and better cosmetic outcomes, without increasing the risk of postoperative complications or extending hospital stays. These results support the broader adoption of electrocautery for similar surgical procedures to enhance patient care and surgical efficiency.

## Conclusion

In conclusion, electrocautery provides a preferable alternative to scalpel incisions for elective inguinal hernioplasty due to its association with shorter incision times, reduced bleeding, lower pain levels, decreased analgesic requirements, and better cosmetic results, without increasing the risk of postoperative complications or extending hospital stays. These findings support the use of electrocautery as a more efficient and patient-friendly technique in inguinal hernioplasty.



Further studies with larger sample sizes could validate these findings and help in standardizing the approach.

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Table 1: Comparison of mean parameters between the groups

	Scalpel		Electrocautery		p-value
	Mean	SD	Mean	SD	
Age (in years)	49.9	13.9	45.7	15.6	0.201
Height (in cm)	166.0	7.4	166.6	7.7	0.960
Weight (in kg)	75.2	8.8	72.8	9.2	0.620
BMI (in kg/m <sup>2</sup> )	27.8	3.4	26.5	2.5	0.210
Total time of Incision (in minutes)	5.5	1.1	4.2	1.2	0.001*
Amount of bleeding (in ml)	39.5	5.5	9.4	0.8	0.001*
Total number of doses of analgesia	2.0	0.7	0.6	0.5	0.001*
Hospital stay (in days)	3.9	0.9	3.6	1.0	0.140
Number of days for suture removal	8.2	1.6	7.0	1.2	0.001*

Table 2: Comparison of the variable between the groups

		Scalpel		Electrocautery		Chi-square (p-value)
		Count	%	Count	%	
Gender	Female	11	27.5	14	35.0	1.210 (0.320)
	Male	29	72.5	26	65.0	
Residence	Rural	27	67.5	23	57.5	1.330 (0.36)
	Urban	13	32.5	17	42.5	
Recurrent hernia	No	27	67.5	34	85.0	1.220 (0.960)
	Yes	13	32.5	6	15.0	
Inguinal hernia	Direct	17	42.5	12	30.0	1.350 (0.240)
	Indirect	23	57.5	28	70.0	
Side	Left	19	47.5	16	40.0	0.450 (0.490)
	Right	21	52.5	24	60.0	
Postop wound complications	No	37	92.5	38	95.0	0.213 (0.644)
	Yes	3	7.5	2	5.0	



Table 3: Comparison of the mean VAS score between the groups

	Scalpel		Electrocautery		p-value
	Mean	SD	Mean	SD	
VAS 6hr	6.9	0.7	5.0	0.7	0.001*
VAS 12hr	6.8	0.7	4.9	0.7	0.001*
VAS 24hr	5.8	0.7	3.9	0.7	0.001*
VAS 36hr	5.9	0.7	3.8	0.7	0.001*
VAS 48hr	5.5	0.6	3.6	0.5	0.001*
VAS 72hr	4.6	0.6	2.4	0.6	0.001*
VAS 7day	2.7	0.5	1.6	0.5	0.001*

Table 4: Showing the mean Manchester scar scale between the groups

Manchester Scar Scale	Scalpel		Electrocautery		p-value
	Mean	SD	Mean	SD	
Follow-up 2 weeks	7.8	0.7	6.8	0.7	0.001*
Follow-up 1 month	10.0	0.8	7.5	0.8	0.001*
Follow-up 3 months	9.6	0.6	7.1	0.7	0.001*