

COMPARATIVE STUDY OF ELECTROCAUTERY INCISION WITH SCALPEL INCISION IN ABDOMINAL SURGERIES

Sundararajan Govindaraju¹, Saravanakumar Ganesan², S.Sabarinath³

¹Associate Professor, Department of Surgery, Government Theni Medical College, Tamilnadu, India

²Associate Professor, Department of Surgery, Sivagangai Medical College, Tamilnadu, India

³Assistant Surgeon, Department of General Surgery, Government Hospital, Rameswaram, Tamilnadu, India

Received : 12/10/2023
Received in revised form : 20/11/2023
Accepted : 02/12/2023

Keywords:

Electrocautery incision, Scalpel incision, Abdominal surgeries, Diathermy, Analgesic dose, Postoperative pain.

Corresponding Author:

Dr. Sundararajan Govindaraju,
Email: drgsrajan@yahoo.co.in

DOI: 10.47009/jamp.2023.5.6.247

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (6); 1200-1203



Abstract

Background: Surgical diathermy is an environment-friendly method for skin incision. Despite its numerous advantages, many surgeons are sceptical of its use because of concerns regarding scarring, infection rates, and wound restoration. This study aimed to compare electrocautery incisions with scalpel incisions in patients undergoing abdominal surgery for blood loss during incision, postoperative incision-site pain, and wound infection. **Materials and Methods:** This randomised controlled trial included 100 patients who underwent elective or emergency abdominal surgery at the Government Theni Medical Hospital, Theni, for 24 months (April 2021 to April 2022). The subjects were randomly divided into case and control groups, with 50 participants in each group. Parameters including age, sex, diagnosis, procedure, postoperative wound inspection, and postoperative pain were recorded. **Result:** The mean age in group A was 53.48±5.58 years, and in group B, it was 51.24±11.05 years. There were no significant differences in age or sex between groups. In both groups, most complications were observed in the seroma, followed by the purulent collection. In comparing the groups, higher pain scores were observed at 6 h and 12 h (group A=7.02±0.65, group B=7.44±0.97), with a statistically significant p-value of 0.006. In contrast, the lower pain scores at 24 h (p=0.278) were statistically insignificant. The patients in group B had a higher mean analgesic dose of 2.16±0.71, but the difference was not statistically significant (p=0.285). **Conclusion:** Diathermy is associated with less postoperative pain and fewer complications than scalpel incision.

INTRODUCTION

Conventionally, scalpels and disposable knives carry out pore and skin incisions for laparotomy surgical procedures. Incisions are associated with greater blood loss and pain. An alternate trend has recently been from this approach to electrosurgical skin incisions.^[1] Surgical diathermy was introduced at the establishment of the twentieth century to overcome the drawbacks of surgical metal scalpels. Time is typically associated with surgical diathermy, as in "electrosurgery" or "electrocautery". Diathermy was viewed as an environmentally friendly mode of dissection because of its convenience and holistic nature. It is not regarded as a real cutting incision, as it entails the utilisation of a high-frequency alternating electric current. Diathermy is broadly used for three purposes: coagulation, fulguration, and reduction.^[2] Reduced blood loss, dry and rapid separation of the tissue, and a viable reduced risk of unintended injury triggered with the aid of the scalpel

to working personnel are the doable advantages of electrosurgery.^[3,4]

In diathermy, a workable, gradient-structured contemporary is surpassed through the tissue at a high frequency (greater than 100000 Hz) to excise the tissue, resulting in precise tissue lysis. It can thicken (modulated mode) or cut tissue (sinusoidal pattern). This principle supports the use of diathermy electrodes without causing adjacent tissue injury. This technique heats cell phones inside tissues so that they vaporise, leaving a cavity within the cell matrix. The generated warmth evaporates as steam and is used as a substitute for being transferred to adjoining tissues. As the electrode moves forward, new cells contact and vaporise by creating an incision. This clarifies the absence of scarring and successive recovery with much less scarring.^[5,6] Despite its countless advantages, the concept of diathermy as a slicing instrument as an alternative to a conventional scalpel for making a surgical incision has met with scepticism from the majority of surgeons because of

its pointless scarring, improved wound infection fee and reduced wound restoration have declined the sizable use of surgical diathermy for pores and skin incisions.^[7,8]

Many randomised clinical trials have been conducted to compare diathermy incision with scalpel incision over the pores and skin in midline laparotomy, and many of them confirmed that diathermy incision is higher than scalpel incision in terms of the time taken for incision, less pain, better wound healing, and minimal blood loss.^[9,10] Despite this proof in many randomised medical trials supporting diathermy use in pores and skin incisions, many surgeons in many hospitals are unwilling to use diathermy for making skin incisions. This finding compares diathermy and scalpel skin incisions regarding incision time, blood loss, wound persona, and scar assessment during stomach surgery.

This study aimed to compare electrocautery incisions with scalpel incisions in patients undergoing abdominal surgery for blood loss during incision, postoperative incision-site pain, and wound infection.

MATERIALS AND METHODS

This randomised controlled trial was conducted at the Government Theni Medical Hospital, Theni, for 24 months (April 2021 to April 2022). The study was conducted after obtaining approval from the local institutional ethical committee and obtaining patient consent.

Inclusion Criteria

Patients who underwent either elective or emergency abdominal surgery were included.

Exclusion Criteria

Patients on corticosteroid therapy, those with factors that may affect wound healing (such as anaemia), those with an active wound infection anywhere in the body, and those with previously operated scars were excluded.

One hundred patients were randomly divided into case and control groups, with 50 participants in each group. The patients underwent skin and deeper tissue incisions using a diathermy pen electrode (Alan electrocautery brand ELSY 360 M). It was set in pure cutting mode and delivered a 417 kHz sinusoidal current. Controls underwent a scalpel incision to the peritoneum using a disposable blade.

All patients underwent surgery under spinal or general anaesthesia. All patients received 1 g ceftriaxone 30 min before surgery preoperatively and repeated 12 hourly for three days. An injection of tramadol 100 mg was given hourly for two days. The subcutaneous layers were closed with vicryl, and the skin with a 2-0 ethilon. The skin sutures were removed on day ten after checking the tensile strength was checked. Parameters including age, sex, diagnosis, procedure.

RESULTS

The mean age in group A was 53.48±5.58 years, and in group B, it was 51.24±11.05 years. There was no significant difference in age between the two groups (p=0.102). The gender distribution in group A consisted of 39 males and 11 females, while in group B, there were 34 males and 16 females. There were no significant differences in sex between the groups (p=0.412) [Table 1].

In group A, 27 patients underwent laparotomy, 12 underwent hernioplasty, three patients APR, three patients umbilical hernia repair, two each underwent subtotal gastrectomy and hemicolectomy, and one patient underwent feeding jejunostomy. In Group B, 28 patients underwent laparotomy, 10 underwent hernioplasty, three patients APR, three patients umbilical hernia repair, two each underwent subtotal gastrectomy and hemicolectomy, and three patients underwent feeding jejunostomy.

In group A, most complications were observed in the seroma (eight patients), followed by purulent collection (four patients). Similarly, the fewest patients had haematomas (2 patients). In group B, most complications were observed in the seroma (11 patients), followed by purulent collection (7 patients). On comparing the two groups, most complications were observed in group B [Table 2].

In comparing the groups, higher pain scores were observed at 6 h and 12 h (group A=7.02±0.65, group B=7.44±0.97), with a statistically significant p-value of 0.006. In contrast, the lower pain scores at 24 h (p=0.278) were statistically insignificant. The patients in group B had a higher mean analgesic dose of 2.16±0.71, but the difference was statistically insignificant (p=0.285) [Table 3].

Table 1: The mean age and gender between groups

	Group A	Group B	P value
Age (Mean ± SD)	53.48±5.58	51.24±11.05	0.102
Gender (Male/Female)	39/11	34/16	0.412

Table 2: Complications of the patients between group

Complications		Group A	Group B
Haematoma	Yes	2	6
	No	48	44
Seroma	Yes	8	11
	No	42	39
Purulent Collection	Yes	4	7
	No	46	43

Table 3: The mean number of analgesic doses of the patients in the group

		Group A	Group B	P value
Pain Score	6 hours	7.02±0.65	7.44±0.97	0.006
	12 hours	6.02±0.654	6.44±0.97	0.0061
	24 hours	4.26±0.87	4.16±0.817	0.278
Number of Analgesic Doses		2.08±0.69	2.16±0.71	0.285

DISCUSSION

At the beginning of the twentieth century, diathermy was added to overcome the inborn impediments of a scalpel, such as the desire for haemostasis riding to undesirable blood loss, indistinct tissue planes, improved agent time, use of suture fabric within the wound using to disease hazard, and possible for tumour metastasis.^[3,11,12] With the advent of modern electrosurgical units capable of conveying immaculate sinusoidal currents, this approach is becoming substantially popular because of its quick haemostasis, faster dismemberment, and reduced ordinary agent blood loss. Specialists have been trying to find the best method for making pores and skin cuts to provide a rapid and satisfactory presentation with the least amount of blood misfortune. Electrocautery is used for haemostasis and less commonly for pore and skin entry points.^[13,14] Previously, when unstable anaesthetic explosives were in use, electrosurgical units had restricted use because of the explosive risks related to anaesthetic specialists. After the invention of non-exclusive anaesthetic operators such as halothane, electrosurgical instruments such as diathermy have been used step-by-step for tissue dissection, barring for pores, and skin entry factors.

This reluctance to use electrocautery is attributed to the belief that electrosurgical gadgets cause devitalised tissue inside the wound, which consequently leads to wound infection, delayed wound healing, and scar formation. The worry of damaged tissues used to be first unfolded when this method was once used with the aid of Peterson in reconstructive and beauty faciomaxillary surgical procedure, Mann and Klippel in paediatric surgical operation, Kamer in rhytidoplasty, Tabin in blepharoplasty, with minimum scarring and extraordinary effects.^[8,15] Dixon and Watkin described skin incisions in accepted surgical remedies in the patient's present process of inguinal herniorrhaphy and cholecystectomy.¹⁶

Huang et al. conducted an experimental and medical study, suggesting that a diathermy incision results in slower wound healing and increased contamination than a scalpel incision.¹⁷ Similarly, a study with the aid of Nandukar et al. stated that the use of electrocautery resulted in substantially decreased mean incision time (27±10.1 s vs 38.8±8.8 s; p<0.001) and notably reduced blood loss (2.6 ml versus 3.4 ml; p=0.021) when in contrast with a scalpel.^[9]

In our study, the mean age in group A was 53.48±5.58 years and in group B was 51.24±11.05 years. Thirty-nine patients in group A were males,

and 11 patients were females. In group B, 34 patients were males, and 16 were females. In both groups, most patients underwent laparotomy (Group A=27, Group B=28) followed by hernioplasty (group A=12, Group B, 10). Comparing the pain score between groups, at 6 hours, group A has a 7.02±0.65 pain score, and group B has a 7.44±0.97. At 12 h, group A had a pain score of 6.02±0.654, and group B had a 6.44±0.97 pain score. At 24 h, group A had a pain score of 4.26±0.87, and group B had a pain score of 4.16±0.817. In comparison, group A had a higher pain score than group B at 6 h and 12 h after surgery, and at 24 h, the pain score was equal in both groups. In this study, complications such as haematoma, seroma, and purulent collection developed. In group A, two patients developed a hematoma, eight patients had a seroma, and four patients had purulent collections. In group B, six patients developed a haematoma, 11 patients had a seroma, and seven patients had purulent collections. There were more complications in Group B than in Group A. The mean analgesic dose in group A (2.08±0.69) was less than in group B (2.16 ±0.71).

Guru et al. compare diathermy and scalpel skin incisions regarding incision time, blood loss, wound character and scar assessment in midline laparotomy surgeries. They concluded that diathermy is a safe and efficient incision technique with tremendous potential in surgical fields, including abdominal laparotomy surgeries. In our study, diathermy was also found to be safer than scalpel.^[2]

Nandukar et al. compared diathermy and scalpel incisions in elective abdominal surgeries to determine variations in incisional time, blood loss during incision, postoperative pain, and wound complications. They concluded that electrocautery incisions were safe, less time-consuming, reduced blood loss, and had less postoperative pain, similar to our study, which shows diathermy associated with less postoperative pain.^[9]

Talpur et al. examined the incisional time, blood loss during incision, postoperative wound complications, and pain with both methods of skin incision. Diathermy is associated with less postoperative pain and complications than scalpel incision. Diathermy should be a method of choice in general elective surgery.^[12] In line with the study by Talpur et al., our study shows that the diathermy group is associated with less postoperative complications and pain.

CONCLUSION

We conclude that diathermy is associated with less postoperative pain and fewer complications than

scalpel incision. They are safe, less time-consuming, and have lower blood loss than scalpel incisions.

REFERENCES

1. Ali M, Murtaza M, Aleemudin M, Ud Din MB, Sarwar A, Aslam A. Comparison of Harmonic Scalpel versus conventional hemostasis in Thyroid surgery in terms of perioperative and postoperative outcome. *Prof Med J* 2020;27:68–73. <https://doi.org/10.29309/tpmj/2019.27.01.3278>.
2. Guru A, Sathiah V. A comparative study on diathermy vs scalpel skin incisions in abdominal surgeries at a tertiary care teaching hospital. *Int J Contemp Med Surg Radiol* 2020;5:D17-D21. <https://doi.org/10.21276/ijcmsr.2020.5.4.4>.
3. Mukherjee MP, Patole MM. Scalpel versus diathermy skin incision: a randomised clinical trial. *Int Surg J* 2019;7:258. <https://doi.org/10.18203/2349-2902.isj20195981>.
4. Dandapani MG, Rajamanikkam B, Narayanan M. A randomised comparative study of diathermy and scalpel incisions in subacute appendicitis. *Int Arch Integ Med* 2019;6:59-66. https://www.iaimjournal.com/storage/2019/07/iaim_2019_06_07_07.pdf
5. Lodhi F, Asrar R, Akram M, Hussain R. Incidence of abdominal wound dehiscence [midline vs paramedian incision closed with vicryl no. 1]. *Annals of King Edward Medical University*. 2001;7:38-40.
6. Shukla HS, Kumar V, Tewari M. A comparative study of scalpel and surgical diathermy incision in elective operations of head and neck cancer. *Indian J Cancer* 2011;48:216. <https://doi.org/10.4103/0019-509x.82904>.
7. Vadodariya BP, Shah NJ, Patel M. Comparative randomised controlled clinical trial of diathermy versus scalpel incision in midline laparotomy. *Int Surg J* 2018;6:28. <https://doi.org/10.18203/2349-2902.isj20185110>.
8. Gupta M, Soni S, Saini P. A prospective study of scalpel skin incision versus diathermy in patients undergoing inguinal hernioplasty. *J Evol Med Dent Sci*. 2017 May 15;6:3136-8. <https://doi.org/10.14260/Jemds/2017/676>.
9. Nandukar VS, Kumar M, Prakash, Suma. Diathermy versus scalpel incisions in elective abdominal surgery: a comparative study. *Int Surg J* 2018;5:3124. <https://doi.org/10.18203/2349-2902.isj20183734>.
10. Hajibandeh S, Hajibandeh S, Maw A. Diathermy versus scalpel for skin incision in patients undergoing open inguinal hernia repair: A systematic review and meta-analysis. *Int J Surg* 2020;75:35–43. <https://doi.org/10.1016/j.ijssu.2020.01.020>.
11. Shamim M. Diathermy vs. Scalpel skin incisions in general surgery: Double-blind, randomized, clinical trial. *World J Surg* 2009;33:1594–9. <https://doi.org/10.1007/s00268-009-0064-9>.
12. Talpur AA, Khaskheli AB, Kella N, Jamal A. Randomized, clinical trial on diathermy and scalpel incisions in elective general surgery. *Iran Red Crescent Med J* 2015;17. <https://doi.org/10.5812/ircmj.14078>.
13. Badawy A. Electrosurgery In Laparoscopy. *Egyptian J Fertil Steril*. 2011;15:2-5.
14. Al Hamzawi NK, Al Baaj SM. Large rhinophyma treated by surgical excision and electrocautery. *Case Rep Surg* 2019;2019:1–3. <https://doi.org/10.1155/2019/2395619>.
15. Chalya PL, Mchembe MD, Mabula JB, Gilyoma JM. Diathermy versus Scalpel incision in elective midline laparotomy: A prospective randomized controlled clinical study. *East Cent Afr J Surg* 2013;18:71–7. <https://doi.org/10.4314/ecajs.v18i1>.
16. Dixon AR, Watkin DF. Electrosurgical skin incision versus conventional scalpel: a prospective trial. *J R Coll Surg Edinb*. 1990;35:299–301. PMID: 2283608.
17. Huang J, Yu Y, Wei C, Qin Q, Mo Q, Yang W. Harmonic scalpel versus electrocautery dissection in modified radical mastectomy for breast cancer: A meta-analysis. *PLoS One* 2015;10:e0142271. <https://doi.org/10.1371/journal.pone.0142271>.