



“A COMPARATIVE STUDY OF SKIN INCISIONS MADE BY ELECTROCAUTERY VERSUS STAINLESS STEEL SCALPEL IN ELECTIVE SURGICAL CASES”

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ABSTRACT **BACKGROUND:** An incision is a cut or slit to gain access to underlying tissue. Surgeons have been in search for ideal methods of skin incisions which will provide quick and adequate exposure with minimal blood loss. Traditionally incisions are made with scalpel. Many techniques have come up recently like electrocautery, laser, plasma scalpel, electron surgical aspirator.

KEYWORDS : electrocautery; scalpel; skin incision.

INTRODUCTION

The use of scalpel for surgical incisions dates back to 2100 BC. Obsidian, a naturally occurring volcanic glass was used to make incisions and has been found in Bronze Age settlement in Turkey. Ancient Egyptians made incisions for embalming with scalpels of sharpened obsidian. Since that time various types of scalpels have been used for making incisions.

Traditionally stainless-steel scalpels and disposable knives are used for various tissue and skin incisions. Surgeons have been in search for ideal method of skin incisions which would provide quick and adequate exposure with minimal blood loss. In recent times many techniques have come namely laser, plasma scalpel, electron surgical aspirator. Diathermy, laser and harmonic scalpels can be used instead of blade when opening deeper tissues as it is felt they can reduce blood loss and save operating time and reduce post operative pain.¹

Electrocautery (Diathermy) which is available in all surgical theaters is less frequently used for incisions because of fear of tissue damage, wound infection and scarring. Nevertheless it is frequently used by some surgeons.² Despite early concerns that use of Diathermy to incise skin and subcutaneous tissue might affect wound healing it provides superior haemostasis and does not appear to adversely influence wound healing.³ It is also considered efficient mode of dissection being haemostatic and convenient.⁴

As an alternative use of diathermy instead of scalpel for skin incisions is gradually gaining wide acceptance. The use of electrodes delivering pure sinusoidal current allows tissue cleavage without damaging to surrounding areas, this method heats cells within tissues so rapidly they vaporize leaving cavity within cell matrix, heat created disappears as steam rather than being transferred to adjacent tissues. As electrode is moved forward new cells are contacted and vaporized with the creation of incision. This explains absence of scarring and subsequent healing with less scarring.⁵

Many studies have been reported in literature which compared Electrocautery incision with scalpel incision and many of them showed Electrocautery incision is better than scalpel incision in terms of time taken and less pain.^{6,7,8,9} There is conflicting data to support opposite as well showing impaired healing and increased scarring with diathermy use.

Although Electrocautery as an alternative incision making tool has been adopted by many surgeons, it has still not cleared doubts in the minds of many surgeons as a cutting instrument for surgical incisions. This is due to lack of formal knowledge and training of basic principles of electrosurgery. Purposive significance of the present study is to compare these two methods in our hospital to evaluate Electrocautery as an effective alternative to scalpel.

AIM OF THE STUDY

The aim of the study is to compare effectiveness of scalpel and electrocautery on skin incisions.

OBJECTIVES

To compare the use of electrocautery and stainless-steel scalpel in making skin incisions with regards to

1. Incision time.
2. Early postoperative pain.
3. Wound complication rates.
4. Scar character.

MATERIAL AND METHODS

Study design: A prospective study.

Sample size: 86 cases.

Inclusion Criteria:

1. Patient between 14 to 60 years.
2. Any patient requiring skin incisions for surgical treatment.
3. Patients giving verbal written consent.
4. Incision length of 4-6 cm.

Exclusion Criteria:

1. Patients requiring incisions to be made over previous surgical scars.
2. Emergency surgical cases.
3. Patients on anti-coagulant therapy.
4. Pregnancy.
5. Immunocompromised patients.
6. Surgeries on infected wounds.

OBSERVATIONS AND RESULTS:

Table 1: Distribution Of Male And Female Patients In Two Study Groups (cautery And Scalpel)

Gender	Cautery group	%	Scalpel Group	%	Total	%
Male	24	55.81	30	69.77	54	62.79
Female	19	44.19	13	30.23	32	37.21
Total	43	100	43	100	86	100

Chi-square= 1.7922 P = 0.1811

The above table shows distribution of sex among Electrocautery group and scalpel group. Out of 86 patients included in this study, 54 patients (62.79%) were males and 32(37.21%) patients were females. Among 54 (62.79%) males, 24 (55.81%) were in electrocautery group and 30 (69.77%) were in Scalpel group. Among 32 (37.21%) females 19 (44.19%) were in Electrocautery group and 13 (30.23%) were in scalpel. There was NO SIGNIFICANT DIFFERENCE between two groups with respect to sex (P value = 0.1811).

Table 2: Comparison Of Two Study Groups (cautery And Scalpel) With Pain Scores At 6 Hours, 12 Hours And 24 Hours Time Points By Mann-whitney U Test

Time Points	Groups	N	Mean	SD	Sum of ranks	U-value	Z-value	P-value
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6 hours	Cautery group	43	6.88	0.85	1201.50	255.50	-5.7781	0.0001*
	Scalpel group	43	8.23	0.78	2539.50			
12hours	Cautery group	43	3.28	0.45	1194.00	248.00	-5.8429	0.0001*
	Scalpel group	43	4.28	0.63	2547.00			
24hours	Cautery Group	43	1.60	0.49	1037.00	91.00	-7.1989	0.0001*
	Scalpel Group	43	2.95	0.53	2704.00			

*p<0.05

The above table shows that the mean values of pain score among cautery group and scalpel group. Mean score at 6hrs, 12 hrs and 24 hrs for cautery group was 6.88, 3.28 and 1.60 respectively and similar values in scalpel group were 8.23, 4.28 and 2.95 at 6 hrs, 12 hrs and 24 hrs. The p value at 6 hrs is 0.0001 and is 0.0001 at 12 hrs and 0.0001 at 24 hrs which are SIGNIFICANT.

Table 3: Comparison Of Two Study Groups (cautery And Scalpel) With Wound Infection

Wound infection	Cautery group	%	Scalpel group	%	Total	%
Yes	2	4.65	2	4.65	4	4.65
No	41	95.35	41	95.35	82	95.35
Total	43	100	43	100	86	100

Chi-square=0.0000, p=1.0000

Above table shows that out of 86 cases, 4 (4.65%) developed infection of which 2 (4.65%) was done by electrocautery and 2 (4.65%) was done by scalpel. P-value is 1 which is NOT SIGNIFICANT.

Table 4: Comparison Of Two Study Groups (cautery And Scalpel) With Scar Character Scores By Independent T Test

GROUPS	n	Mean	SD	SE	T-value	P-value
Cautery Group	43	8.72	1.58	0.24	-4.9616	0.12*
Scalpel Group	43	9.15	1.51	0.22		

*p>0.05

The above table shows that the mean values of scar character scores among cautery group and scalpel group. Mean score for cautery group was 8.72 and 10.35 for scalpel group. The p value is 0.12 which is NOT SIGNIFICANT.

DISCUSSION

Since the first use of diathermy during surgery in England in 1910, advances in medical technology have produced better and safer diathermy equipment that have led to an expansion in the use of diathermy in various branches of medicine.

This smooth sine wave is passed through the tissue, producing a very hot cutting arc and resulting in a bloodless field during surgery with no collateral damage to the surrounding tissue.

Diathermy is used increasingly for hemostasis and tissue dissection. Despite this, few surgeons use diathermy to incise skin; this reluctance is partly attributable to the belief that electrosurgical instruments increase devitalized tissue within the wound, which consequently leads to increased wound infection, increased scar formation, and delayed wound healing. However, these concerns have not been substantiated by recent studies of skin incision, which have shown faster operating times, reduced blood loss, reduced early postoperative pain, better scar and lower analgesia requirements with diathermy compared with scalpel incision.

Diathermy has been accepted as an alternative to the cold scalpel and has led to the recognition of potential complications related to both instruments. So, our work was aimed to investigate this alternative method of incision with comparison to the scalpel incision with regards to advantages, like incision time, scar character as well as alleged complications i.e., early postoperative pain and wound infection. In this study, eighty-six patients underwent surgical interventions for various disorders. The incisions were created using electrocautery and steel scalpel, the cases being allotted to either group in a randomized manner. The incisions were evaluated in terms of time taken, postoperative pain, incidence of wound infection and scar

character. Out of these 86 cases, four patients developed wound infection, two each in cautery and scalpel groups. The difference between the two groups was not of any statistical significance pertaining to wound infection and scar character. Significant differences, in favor of cautery, were noticed in terms of time taken, post-operative pain.

Electrosurgery utilizes a high radio frequency (300 to 3000 kHz) electrical current to achieve haemostasis and divide tissue. Two surgical effects can be achieved with electrocautery, namely, cutting and coagulation. The cutting mode utilizes a continuous current, while the coagulating setting produces short bursts of current with relatively long gaps between bursts. The continuous current used for cutting produces intense heat so rapidly that the tissue cells explode into steam, leaving a cavity in the cell matrix.

The heat is dissipated into steam and therefore is not conducted through the tissues to dry out adjacent cells. The cutting mode is more effective as a cutting tool, but does not control small vessel bleeding very efficiently.

Haemostasis is achieved using the coagulation current by the occlusion of small vessels with coagulated blood and tissue. These effects are limited to the area immediately surrounding the active electrode where the current density is greatest; as the current flows further into the body it is distributed between more tissue. The electrical pathway is completed via a large electrode in contact with the skin, placed a significant distance from the site of incision. Theoretically, one might predict that the electrocautery, by promoting tissue damage, would lead to a greater frequency of wound problems, especially infection. In contrast, the cold scalpel has the advantage of minimal tissue damage but bleeding presents problem.

Various studies have demonstrated significant advantages to the use of electro surgical incision, including shorter incision time, reduced postoperative pain and cosmetically better scar. The findings of present study are supported by Kearns et al¹⁰, who compared electrocautery and scalpel methods in hundred patients undergoing elective midline incision. The cautery was associated with significantly lesser blood loss and was quicker. Similarly, there was no significant difference in terms of wound complications, including wound infection, as evidenced by present study.

CONCLUSION

Incisions by Electrocautery are not more prone for wound infection as was previously hypothesized. More over the pain associated with these incisions was lower in early postoperative period. Although, electrosurgical incisions were significantly superior to the scalpel incisions in terms of decreased incision time, potential complications related to both techniques should be weighed against their benefits before making a choice. Finally, a surgeon's preference and expertise may take precedence in making a decision against diathermy incisions but the gradual transition observed in recent years must carry on.

SUMMARY

1. Out of the total 86 cases 54 were male (62.79%) and 32 were females (37.21%) out of 54 male patients 24 were operate by cautery and 30 by scalpel. Out of 32 female patients 19 was operated by cautery and 13 by scalpel. There was no significant difference between the two groups with respect to sex. (p-value 0.1811).
2. Mean values of pain score for electrocautery incisions were significantly less at 6, 12 & 24 hrs.
3. The rate of wound infection was comparable between with cautery and scalpel incisions.
4. The post operative scar after one month of follow up was equivocal between cautery and scalpel groups.

REFERENCES

- 1) William E. G Thomas. Basic surgical skills and anastomoses. Williams NS, Christopher J. K Bulstrode and Ronan O' Connell, Editors. Bailey and Love's Short Practice of surgery, 26th edition; 2013:33-49.
- 2) Margret Farquharson, James Hollingshead, Brendan Moran; Surgery of skin and subcutaneous tissue. Farquharson's textbook of operative surgery. CRC Press Tenth edition 2015:15-30.
- 3) D' Souza, R E, Novell R. Laparotomy: elective and emergency. Richard Novell, Darryl M Baker, Nicholas Goddard, Editors. Kirk's general surgical operations Sixth edition Elsevier Churchill Livingstone 2013. 38-56.
- 4) Sheikh B. Safety and efficacy of electrocautery Scalpel utilization for skin opening in neurosurgery. Br J Surg Neurosurg 2004; 18:268-72.
- 5) Dixon AR, Watkin DFL. Electrosurgical skin incisions versus conventional scalpel: a prospective trail. FR Coll Surg Edinb 1990; 35:299-301.

- 6) Chyros E, Athanasakis E, Antonakasis S, Xynos E, Zoras Healing. A prospective study comparing diathermy and scalpel incisions in tension free inguinal hernioplasty. *Am, Surg* 2005;71[4]:326-9.
- 7) Chowdri NA, Wani NA, Ganai AA, Naqash. SH, Peer .GQ, Wani QA. Comparative study of electro surgical and scalpel incisions in general surgery *IJS*. 2002; 63:308-310.
- 8) Kerans SR, Connolly EM, Namara DA, Deasy J, Randomised clinical trial of diathermy versus scalpel incisions in elective mid line laparotomy. *BJS* 2001;88:41-44.
- 9) Polligner HS, Mostafa G, Horold KL, Austin CE, Kercher KW, Matthews BD. Comparison of wound healing characteristics with feedback circuit electrosurgical generators in a porcine model. *Am Surg* 2003;[12]:1054-1060.