

A Comparative Study of Skin Incisions Made By Electrocautery versus Stainless Steel Scalpel in Elective Surgical Cases

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Abstract

Original Research Article

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. The aim of the study is to compare effectiveness of stainless steel scalpel and electrocautery on abdominal skin incisions. The Study compared electrocautery incisions with the traditional scalpel incisions for abdominal operations. Two groups of 43 patients each were compared prospectively. In one of them electrocautery was used for incisions and in another traditional scalpel was used and Parameters measured included time needed to complete the incision with all necessary haemostasis, early post operative pain, wound complications like Infection and scar character. Electrocautery was found quicker to scalpel in making incisions, associated with less pain. Two groups did not differ much with respect to wound complications and cosmesis. Electrocautery can be used as an alternative to scalpel for making incisions with advantages of less time, less post operative pain without affecting wound healing, incidence of wound infection and cosmesis.

Keywords: Electrocautery, scalpel, skin incision.

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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. Modern scalpel blades are usually made of hardened and tempered steel, stainless steel or high carbon steel. 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, and 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]. An electrocautery machine can also be used to treat a variety of benign cutaneous lesions with good cosmetic outcome [3]. 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 too adversely influence wound healing [4]. It is also considered efficient mode of dissection being haemostatic and convenient [5]. In last decade, a rising awareness of dangers of sharps in a medical environment has led to development of various methods of protecting health care workers from accidental cut and puncture wounds. Scalpel blade injuries are among the most frequent of sharp injuries second only to needle pricks. Scalpel injuries account for 7 to 8 percent of all sharp injuries [6]. The use of Electrocautery in lieu of conventional sharp instruments has the advantage as a precautionary measure, thereby avoiding and possibly even completely replacing the scalpel from operative fields looks an attractive option [7]. As an alternative use of diathermy instead of scalpel for skin incisions is gradually gaining wide acceptance. Electrocautery Incision is not a true cutting incision. 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 [7]. 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 [8-11]. There is conflicting data to support opposite as well showing impaired healing and increased scarring with diathermy use [12]. This has generated enough debate and recently there has been renewed interest to study diathermy with scalpel incisions. More over recent introduction of harmonics, plasma scalpels also instigated researchers to compare their efficacy and safety with diathermy [13]. 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.

MATERIALS AND METHODS

Source of data

Patients admitted in the surgery department of Karnataka institute of medical sciences, Hubli are the subjects of this study. Methods of collection of data: Methodical entry of records of patients admitted and treated in Karnataka institute of medical sciences, Hubli. Data is entered in preformat made for the study, is collected for the study. Place of study: Department of General Surgery, Karnataka institute of medical sciences, Hubli Duration of study: 18 months (December 2015 to June 2017) Study design: A prospective study. Sample size: 86 cases. Inclusion criteria: Patient between 14 to 60 years. Any patient requiring skin incisions for surgical treatment. Patients giving verbal written consent. 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.

Procedure

A total of 86 patients were included in our study. After preliminary investigation, confirmation of diagnosis and pre anesthetic check-up, patients was taken up for the required procedure. Written informed consent was taken from all patients for the procedure to be undertaken and for the study. The cases studied were divided into the following groups. 1. Electrocautery 2. Stainless steel scalpel Technique: Common procedures

for both techniques: All patients received intravenous antibiotic prophylaxis: one gram of ceftriaxone was given one hour before surgery. Time was recorded using a second's stopwatch. The time taken from initial skin incision to subcutaneous fat with total haemostasis was recorded. Incision length was recorded after 24-48 hours when the primary dressing was removed. Pain was assessed using the visual analogue scale. All patients received eight hourly intramuscular injection of diclofenac sodium for pain relief. Wound infection was defined as the discharge of pus or fluid containing pathogenic organisms at any stage after operation. Documentation was done by sending this discharge for culture. Scar character was assessed using modified Manchester scar scale after one month of follow up. All cases were done in a single surgical unit under controlled conditions. The ALAN – ELSY 360 L electrosurgical units was used for electrocautery incisions. Current intensity for cutting was in the range of 30-40. For coagulation the current intensity with 30-50.

Technique of Electrocautery (diathermy) Incisions

Diathermy incisions were performed using a small flat blade pen electrode, set on cutting mode and delivering a 120 watt (max) sinusoidal current. Electrosurgical cutting in performed without pressure or mechanical displacement. The skin blood vessels are usually small and hemostasis is usually satisfactory after the application of pressure 'Bleeders' were controlled by using diathermy, on coagulation mode, and applied to a hemostat accurately placed on the vessel to avoid skin necrosis and blistering. If wounds needed to be extended, they were incised using the blade point only, sweeping in an outward direction through dermal and epidermal layers.

Technique of scalpel incisions

Incisions made by the scalpel were by the traditional method with hemostasis by means of forceps coagulation using the ALAN – ELSY 360 L electrosurgical units.

Methods of study

A prospective study of 86 cases was conducted and the results were analyzed and tabulated. Descriptive statistics were used to calculate mean, SD and percentage. The amount of incision time, wound infection, postoperative pain and scar character in both groups was compared using statistical methods.

RESULTS

1. Distribution of incision length between electrocautery and scalpel groups (Table 1)
2. Distribution of incision time in cautery and scalpel groups (Table 2)
3. Comparison of scar character scores between electrocautery and scalpel groups (Table 3)
4. Comparison of wound infection in cautery and scalpel groups (Table 4)

Table-1: Comparison of two study groups (Cautery and Scalpel) with mean incision length by independent t test

Groups	n	Mean	SD	SE
Cautery group	43	4.89	0.64	0.10
Scalpel group	43	5.04	0.55	0.08

Above table shows that the mean incision length was 4.89 cms in electrocautery group and 5.04 cms in scalpel group. There was NO SIGNIFICANT

DIFFERENCE between two groups with respect to mean incision length (P value = 0.2671).

Table-2: Comparison of two study groups (Cautery and Scalpel) with mean incision time

Groups	n	Mean	SD	SE
Cautery group	43	3.40	0.64	0.10
Scalpel group	43	4.34	0.87	0.13

*P<0.05

Above table shows that the mean incision time in cautery group was 3.40 seconds and 4.34 seconds in scalpel group. There was SIGNIFICANT

DIFFERENCE in between two groups in favor of cautery (p-value 0.0001).

Table-3: Comparison of two study groups (Cautery and Scalpel) with scar character scores

Groups	n	Mean	SD	SE
Cautery group	43	8.72	1.58	0.24
Scalpel group	43	9.15	1.51	0.22

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.

Table-4: 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

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.

DISCUSSION

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, and reduced early postoperative pain, better scar and lower analgesia requirements with diathermy compared with scalpel incision. The use of electrosurgery has gained popularity in recent years. Advent of newer electrosurgical instruments has simplified the management of complex surgical procedures. 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, postoperative pain. When an electric current is applied to tissues via a suitable electrode, a small intense arc of energy forms between the electrode and the tissue and produces three main effects: dehydration, coagulation, and section or cutting. The findings of present study are supported by Kearns *et al.* [10], 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. However, their study showed that cautery was associated with significantly less early postoperative pain and lower analgesic requirements on patient controlled analgesia which is in concordance with present study. The study by Chryso E et al⁸, where either electrosurgical scalpel or steel scalpel were employed for skin and underlying tissues incision while carrying out prosthetic mesh inguinal hernioplasties. Their results showed no difference in terms of wound infection. Their results differed from the present study in that insignificant difference was found in terms of total operative time. The study by Dixon *et al.* [7] compared conventional scalpel and cautery incision. They concluded that the cautery was consistently quicker and highly effective and that no difference between the two groups was found with regard to wound complications like 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.

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