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A Comparative Analysis of Cutting Diathermy and Scalpel Techniques for Skin Incisions in Uncomplicated Inguinal Hernias

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Abstract

INTRODUCTION

Diathermy is electrically induced heat or high-frequency electromagnetic currents as a form of physical therapy and in surgical procedures—the earliest observations on the reactions of high-frequency electromagnetic currents upon the human organism. However, most surgeons still make skin incisions with a scalpel and divide the four deeper structures with coagulation diathermy fear of deep burns. The resultant scarring continues with diathermy compared with the scalpel, which produces a clean, incised wound with minimal tissue destruction. This study is undertaken to alleviate the fear of using electrocautery for skinincisions in surgical community.

MATERIALS AND METHOD

This is a randomized control study conducted in the Department of Surgery, Shri Dharmasthala Manjunatheswara University, Dharwad from Study period June 2021 to may 2022. Where in 60 sealed envelopes containing 30 each, group A or group B prepared. 60 Cases undergoing hernia repair for inguinal hernia. Patients mentioning that the skin would be incised with either scalpel or electrocautery was taken. Later sealed envelope were put lottery in operation theatre and one envelop is selected for that particular patient and operation is carried out as per the group norms.

Results

Post operative pain is assessed by visual analogue scale at 6, 12, 24 hrs after the surgery. In our study results are analyzed with Mann Whitney U Test. Results are shown in Table 2. There is no significant difference between two groups. Dose of analgesic i.e. injection Diclofenac 50mg IM are recorded in both groups post operatively, results are shown in table 3. Results analyzed using Mann Whitney U test. Dose requirements are similar in two groups. Overall wound complications are assessed for 7 days post operatively. In our study we assessed complications like seroma, hematoma and purulent collection. Seroma in both groups are comparable. Although scalpel group shows more hematoma [20%], difference is not statistically significant. Purulent collection in post operative wound is similar in two groups.

CONCLUSION

Although results are similar in both groups, we still recommend the use of electrocautery forskin incision, as it is an alternative, attractive and easily available new method. Traditional fear of wound strength and devitalization are not reflected in this study. On the basis of this study we

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recommend a wider use of electrocautery in all surgical procedures for skin incision as this technique is quite safe.

Keywords: Inguinal Hernias, Cutting Diathermy, Scalpel Techniques

INTRODUCTION

Incision is a cut or slit to gain access to underlying structures. Cauterization is a medical term describing burning of tissue to remove or close a part of it. [1]

Traditionally incisions are made with stainless steel scalpel. These incisions are supposed to be more bloody and painful. To overcome this problem many advancedtechniques have come viz, laser and cavitron but the above said methods are costly and there is relative unavailability of these instruments in peripheries. [2]

Electrocautery which is available in all surgical theaters is less frequently used for skinincisions for the fear of tissue damage, post operative pain & scarring. [3]

Recent advances and studies have shown that electrocautery can be used for skin incision without any postoperative complications like wound infection, scarring and less post operative pain. [4]

Diathermy is electrically induced heat or high-frequency electromagnetic currents as a form of physical therapy and in surgical procedures—the earliest observations on the reactions of high-frequency electromagnetic currents upon the human organism [5]. Diathermy is produced by three techniques: ultrasound (ultrasonic diathermy), short-wave radio frequencies in the range 1–100 MHz (shortwave diathermy) or microwaves typically in the 915 MHz or 2.45 GHz bands (microwave diathermy), the methods differing mainly in their penetration capability. It exerts physical effects and elicits a spectrum of physiological responses [6].

Cutting diathermy incision with an electrode delivering sinusoidal current allows tissue cleavage by rapid cell vaporization pure without damage to surrounding areas. However, most surgeons still make skin incisions with a scalpel and divide the four deeper structures with coagulation diathermy fear of deep burns. [7] The resultant scarring continues with diathermy compared with the scalpel, which produces a clean, incised wound with minimal tissue destruction. Diathermy skin incisions are less popular among surgeons, as it has been hypothesized that the application of extreme heat may result in significant post-operative pain and poor wound healing. [8]

This study is undertaken to alleviate the fear of using electrocautery for skinincisions in surgical community.

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MATERIALS AND METHOD

This is a randomized control study conducted in the Department of Surgery, Shri Dharmasthala Manjunatheswara University, Dharwad from Study period June 2021 to may 2022.

Inclusion criteria:

All cases of elective uncomplicated inguinal hernia repair for standardization of results.

Exclusion Criteria:

1. Preoperative use of analgesics for more than 3 days per week for more than 3months.
2. Pediatric [less than16 yrs.] and geriatric [>65yrs] patients.
3. Patients with chronic pain >3 months.
4. History of alcohol or narcotic abuse.
5. Severe hepatic, renal, cardiac dysfunction.
6. Diabetes mellitus and immunocompromised status.
7. Previous scars, recurrent hernia cases.

Where in 60 sealed envelopes containing 30 each, group A or group B prepared. 60 Cases undergoing hernia repair for inguinal hernia.

Informed consent from patients mentioning that the skin would be incised with either scalpel or electrocautery was taken. Later sealed envelope were put lottery in operation theatre and one envelop is selected for that particular patient and operation is carried out as per the group norms. The observer was blinded to the type of incision used and was give his observation based on the predefined criteria.

Sample Size: 60 Cases

1) In 30 cases incision was taken with electrocautery over skin (group A).
2) In 30 cases incision was taken with conventional scalpel (group B).

Tissue dissection was done with electrocautery in both groups and Lichtenstein tension free hernioplasty was performed in all.

METHOD:

In Group A-Skin incision is taken with electrocautery needle using pulse sine wave current and power setting of 70 watts. Haemostasis will be achieved with forceps coagulation. In Group B-Skin incision is taken with scalpel, bleeding controlled by forceps coagulation using pulse sine wave on power supply 30 watts.

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All standardized incision will be made on medial 3/5th of groin region, 2.5cms above and parallel to inguinal ligament. All the procedures arecarried under standardized spinal anesthesia. Premedication is given with injection Ciprofloxacin 100 ml intravenous, two hours before procedure.

Closure of abdominal layers are done with continuous vicryl 2-0 for external oblique aponeurosis, intermittent chromic catgut 2-0 for subcutaneous tissue and mattress suture with polyamide(sutupac) for skin closure.

STATISTICAL ANALYSIS:
The results are finally analyzed and compared for the two groups using Mann-Whitney U Test and percentage of type of complication at incision site are measured.

Results

60 patients with inguinal hernia are randomized prospectively to either electrocautery group or scalpel group for skin incision. There were no significant demographic difference between two groups noted [Table -1]. Mean age of patients in group A i.e..Electrocautery group is 47.8±16.21 and in group B i.e. Scalpel group is 47.7±13.95.

Table -1: AGE (MEAN±SD)

	EC	**SC**
Age in years	47.8±16.21	47.7±13.95

t = 0.034, DF = 58, P = 0.97

Table 2: PAIN SCORE (MEAN±SD)

Time	**EC**	**SC**	**Mann-Whitney U test (Adjusted for ties)**
6 hrs	6.6±0.81	6.7±0.53	P = 0.475
12 hrs	3.8±0.83	3.7±0.64	P = 0.556
24 hrs	2.5±0.86	2.4±0.51	P = 0.762

Post operative pain is assessed by visual analogue scale at 6, 12, 24 hrs after the surgery. In our study results are analyzed with Mann Whitney U Test. Results are shown in Table 2. There is no significant difference between two groups.

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Table 3: Doses of analgesic

	Doses of analgesic (Mean±SD)
EC	1.8 ± 0.66
SC	1.6 ± 0.48

P = 0.499, Mann-Whitney U test (Adjusted for ties)

Dose of analgesic i.e. injection Diclofenac 50mg IM are recorded in both groups post operatively, results are shown in table 3. Results analyzed using Mann Whitney U test. Dose requirements are similar in two groups.

Table 4: Hematoma

Group	**Yes**	**No**	**Total**
EC	1 (3.3%)	29	30
SC	6 (20%)	24	30

X2 with Yate‘s correction = 2.588 DF = 1 P = 0.108

Overall wound complications are assessed for 7 days post operatively. In ourstudy we assessed complications like seroma, hematoma and purulent collection. Results are shown in table 4.

Table 5: Seroma

Group	**Yes**	**No**	**Total**
EC	9(30%)	21	30
SC	10(33.3%)	20	30

X2 with Yate‘s correction = 0.077 DF = 1 P = 0.108

Table 6: C PURULENT COLLECTION

Group	**Yes**	**No**	**Total**
EC	4 (13.3%)	26	30
SC	5 (16.6%)	25	30

X2 with Yate‘s correction = 0, DF = 1, P = 1

DF = Degrees of freedom

2

X = Chi-square

t = student‘s _t‘

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Seroma in both groups are comparable. Although scalpel group shows more hematoma [20%], difference is not statistically significant. Purulent collection in post operative wound is similar in two groups.

DISCUSSION

Various studies were undertaken to evaluate the efficacy of electrocautery over scalpelin making skin incision and results are varying.

Some showing better results with electrocautery, some showing similar results. Early studies with primitive diathermy machines suggested that electrosurgical incisions were associated with just such charring and poor wound healing. Subsequent animal studies suggested increased wound infection rates but no difference in wound bursting strengths. [9]

It has been suggested that local tissue heating increases subcutaneous oxygen tension, thus enhancing the resistance of the surgical wounds to infection.

Chyoss E. et al, compared diathermy and scalpel incision in tension free Inguinal hernioplasty at department of general surgery in University hospital Herakhion Greece. Total 125 patients undergoing hernioplasty were randomized into either scalpel (n -60) or diathermy (n-57) groups. Among them 8 had bilateral hernia in which 5 of them were allotted to scalpel group and 3 to diathermy group. [10]

Parameters measured included blood loss during skin incision and underlying tissue dissection, post operative pain and requirement of analgesics, presence of wound dehiscence and wound infection (on day of discharge, on day of stapler removal andafter 1 month).

Results were analyzed and were found that blood loss is minimal and amount did not differ between two groups. Diathermy group received less analgesics with no differencenoted in wound strength and infections were totally absent in both groups. [11]

B.Sheik et al, neurosurgery department, King Faisal University**,** Saudi Arabia, performed a study stating safety and efficacy of electrocautery incision for skin opening in neurosurgery. In 177 patients for neurosurgical procedures, skin incision has been performed using micro needle electrosurgical instrument and steel scalpel. [12]

Results of the study stated that blood loss is less with electrocautery incision, only two patients had wound infection and dehiscence and all other had normal wound healing. The study recommends use of electrocautery for neurosurgical procedures to incise skin whenever blood loss is expected. [12]

P.N.Mekaet al, compared the superiority of electrocautery over scalpel incision in various abdominal surgeries. Study included 60 patients, age ranged from 15 to 60 years. Patients are

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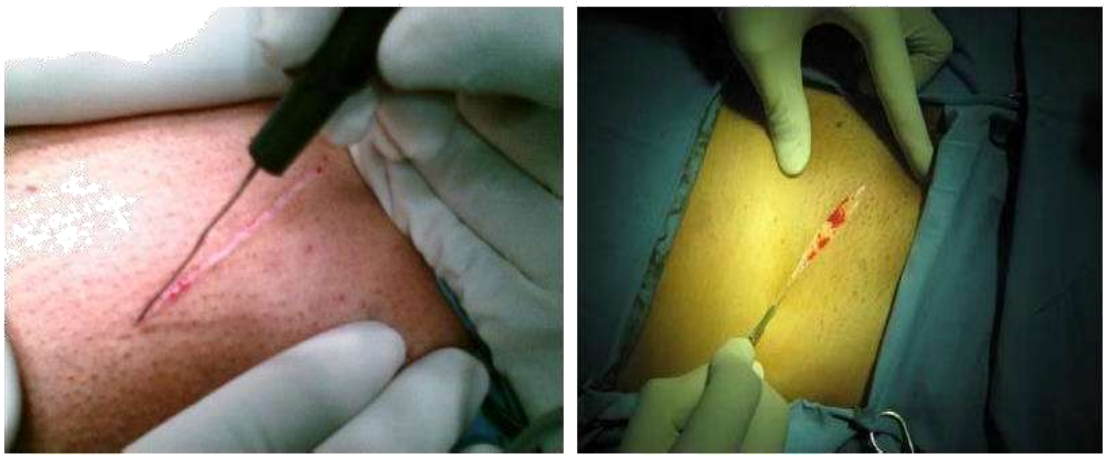
randomized into two groups, electrocautery group and scalpel group for various abdominal incisions like flank incision, Kocher‘s incision and midline incision. They were compared for blood loss, time taken for procedure, wound infection and cosmetic appeal. [13]
In the study they have found that less blood loss, less pain score and less time for incision in electrocautery group. Post operative wound infections were comparable in two groups and cosmetic appeal is superior in electrocautery group. In conclusion they have stated that electrocautery incision are easily learned, highly effective technique and associated with less complication. Study recommends the use of electrocautery incision over skin. [13]

Franchi M. et al, department of Obstetrics and Gynecology, University of Insubria, Italy performed study on use of cold scalpel and electrocautery for midline abdominalincision. [14]

In this study patients undergoing midline laparotomies for malignancy are divided into two groups according to the methods used to perform abdominal midline incision with scalpel or diathermy. Total 964 patients are included in the study, 531scalpel group and 433 electrocautery group.

Univariate analysis done for analysis of results showed higher incidence of wound complication in scalpel group (8 from scalpel group and 1 from electrocautery group). But after adjusting confounding variables (age, BMI) no difference was found betweentwo groups. In conclusion of study they stated that choice of incision is surgeon‘s preference since there is no difference between two groups. [15]



A B

Fig 1. Incision with A) Electro cautery B) Scalpel

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Fig 2 incision wound site after A) Electrocautery B) Scalpel

Figure 11 a

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Fig 4 Wound complications A) Hematoma B) Seroma

CONCLUSION

Although results are similar in both groups, we still recommend the use of electrocautery forskin incision, as it is an alternative, attractive and easily available new method. Traditional fear of wound strength and devitalization are not reflected in this study. Most importantly recent increase in blood borne infections like Hepatitis C, Hepatitis B, and Human immune deficiency virus infection makes exclusion of scalpel from operative field. On the basis of this study we recommend a wider use of electrocautery in all surgical procedures for skin incision as this technique is quite safe.

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