

USE OF SCALPEL VERSUS ELECTRO-CAUTERY FOR SUBCUTANEOUS INCISION IN ELECTIVE GYNAECOLOGICAL SURGERIES: A PROSPECTIVE OBSERVATIONAL COMPARATIVE STUDY

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Abstract

Background: The potential benefits of electrosurgery include reduced blood loss, dry and rapid separation of the tissue, and a possible decrease in the risk of accidental injury caused by the scalpel to operative personnel. Many studies in the past have evaluated perioperative blood loss, postoperative wound pain and wound healing and wound infections in a selected group of patients, mainly with midline laparotomy incisions. This study was done to compare these two methods in elective gynaecological surgeries for the greater interest of the patients. The objective is to compare the outcome of electrocautery versus scalpel use for subcutaneous tissue incision in elective gynaecological surgeries. **Materials and Methods:** It is a Prospective Cohort Study in 176 patients scheduled for elective gynaecological abdominal surgeries - 88 samples taken in each group, i.e., N₁= 88 as control group (scalpel) and N₂ = 88 as study group (Diathermy). **Result:** Mean pre-operative haemoglobin, mean post-operative haemoglobin and incisional depth were almost same in both the groups. But incisional time was significantly shorter in cautery group. Reduced incisional blood loss noted where cautery was used for incision which was statistically significant. Post-operative pain was also significantly less in cautery group. Rates of wound complications were almost similar in both groups, like Surgical Site Infection (SSI) and Superficial Wound Dehiscence. **Conclusion:** Incision Time, Incisional Blood Loss, Post-operative Pain and Wound Complications are lower with Diathermy than with Scalpel for skin incision.

INTRODUCTION

Surgical wound healing and cosmesis are among the most important aspects for the patients undergoing Elective Gynaecological operations. Conventionally, subcutaneous tissue incisions are usually made with scalpel. Nowadays, diathermy is proved most valuable and versatile aid to surgical technique. It is most commonly used to achieve haemostasis by means of coagulation, but by varying the strength of the current it results in cutting effect. The passage of high frequency electric current through the tissues to produce a required clinical effect is called as electrosurgery. Diathermy heat cells within tissues rapidly that they vapourise leaving the cavity with in cell matrix, heat created disappears as steam instead of being spread to adjacent tissue. The moving electrode contracts and vaporizes the new cells and an incision is created.

The potential benefits of electrosurgery include reduced blood loss, dry and rapid separation of the tissue, and a possible decrease in the risk of accidental injury caused by the scalpel to operative personnel.

Many studies in the past have evaluated perioperative blood loss, postoperative wound pain and wound healing and wound infections in a selected group of patients, mainly with midline laparotomy incisions.^[1-8]

In a comparative study done by Priya N et al,^[3] 100 patients were studied over 2 years, showed that shorter time for skin incision, lesser blood loss during surgery and lesser wound complication in cases of diathermy incision, and has more significant pain reduction as compared to scalpel group.

In a study done by Ragesh K.V et al, Patients with diathermy skin incision were having less post-operative pain which was assessed by visual

analogue scale when compared with scalpel incision since the p value was 0.01 which is significant (<0.05).^[9-11]

Research Hypothesis: Incision Time, Incisional Blood Loss, Post-operative Pain and Wound Complications are lower with Diathermy than with Scalpel.

After reviewing the advantages and limitations of electrocautery over scalpel and considering high rate of wound complications in hospital set up after surgery, a sincere attempt has been made in this study to compare these two methods in elective gynaecological surgeries for the greater interest of the patients.

Objectives

General objectives

Elective gynaecological surgeries have conventionally used scalpels to make surgical incisions, whereas, electro-surgical knife has advantages like reduced blood loss and shorter incision time.

In this study our objective was to compare both the methods critically.

Specific Objectives

To compare the outcome of electrocautery versus scalpel use for subcutaneous tissue incision in elective gynaecological surgeries regarding Primary and Secondary outcomes.

Primary Outcomes:

1. Wound Incision Time
2. Incisional Blood Loss
3. Postoperative Pain
4. Postoperative Wound Complications

Secondary Outcomes:

1. Time to Heal Wound

MATERIALS AND METHODS

Place of Study: Department of Obstetrics and Gynaecology in MGM Medical College and LSK Hospital, MG University, Kishanganj, Bihar - 855107

Study Design: Prospective Cohort Study in patients scheduled for elective gynaecological abdominal surgeries.

Period of Study: March 2021 to August 2022 (18 Months).

Inclusion Criteria

All patients scheduled for elective gynaecological abdominal surgeries for benign diseases willing to participate in the study.

Exclusion Criteria

Pelvic malignancy, History of receiving antibiotics during the preceding 7 days, Chronic medical illness like diabetes and hypertension, Haemoglobin <9gm/dl, Immunocompromised patients, Emergency surgeries, Surgically scarred tissue, Patient with pacemaker device.

Sample Size: To calculate the sample size in this study, we have considered blood loss as the primary variable, keeping incision time as minimum as

possible. A previous study (Ref: Prakash, Balaji, Suresh, Kate, JIPMER) based on the comparison of electrocautery and scalpel incision, explore the statistical significance of mean difference in blood loss as almost 17 ml and standard deviation as 11 ml with P value <0.0001. therefore, using 95% confidence interval (Z=1.96). with margin of error as 5 units, the sample size enumeration can be expressed as follows-

$$N = 2 \left\{ \frac{Z_{\alpha} (\sigma_1 - \sigma_2)}{E} \right\}^2 = \left\{ \frac{2 \cdot 1.96 \times 17}{5} \right\}^2 = 88$$

88 samples can be taken in each group.

ARMS

- GROUP A (CASE-GROUP) - Patients in which subcutaneous tissue is separated by electrocautery
- GROUP B (CONTROL-GROUP) - Patients in which subcutaneous tissue is separated by using scalpel.

Allocation

Alternate Sampling Method: - Every alternate patient was allocated to Group A & Group B

Laboratory Investigations

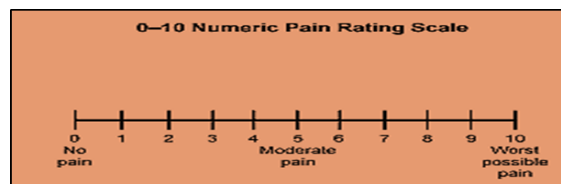
The standard pre-operative investigations were performed.

Study Tools

- Instruments for hysterectomy or laparotomy,
- Sterilized calibrated ruler,
- Pre-weighted gauge packs,
- Electrocautery,
- Stopwatch,
- Thermometer,
- Electrocautery (at settings of 70 watt with monopolar current)

Incisional Blood Loss: Blood loss during skin incision was calculated by weighing the pre-weighted gauge packs used exclusively in making the incision and during haemostasis.

Post Operative Pain: Assessed on the day of the operation, 1st day and 3rd day of the operation on a fixed time using Numerical Pain Rating Scale (NPRS).



Numerical Pain Rating Scale (NPRS)

Statistical Analysis Plan: Data is collected and statistically analysed using SPSS (STATISTICAL PACKAGE FOR SOCIAL SCIENCE) 19 (SPSS Inc, Chicago, IL, USA).

Chi-square tests is used for categorical data and Man-Whitney U test or Student -test is used for continuous data. Statistical significance in all evaluations will be defined as p value <0.05.

RESULTS

Table 1: Distribution on the Basis of Socio- Economic Status

Status	Scalpel Or Control Group (N=88)	Cautery Or Cautery Group (N=88)
Lower (IV-V)	58(65.78%)	65(73.68%)
Middle (III-II)	26(28.96%)	18(19.73%)
High (I)	4(5.26%)	5(6.57%)

p value is 0.37 which is not significant at $p < 0.05$.

Table 2: Distribution on the basis of residence

Residence	Scalpel (Group-A) Control group N=88	Cautery (Group-B) Case group N=88
Urban	33(38.15%)	40(44.73%)
Rural	55(61.84%)	48(55.26%)

p value is 0.28 which is not significant at $p < 0.05$.

Table 3: Pre- operative haemoglobin (in mg/dl) in scalpel group and cautery group

Pre-operative Haemoglobin	Scalpel group or Control group (n=88)	Cautery group or Case group (n=88)	P value
MEAN \pm SD	10.31 \pm 0.96	10.03 \pm 0.94	0.051 (not significant)

Since p-value $> \alpha$, H0 is accepted.

Table 4: Post-operative haemoglobin (in gm/dl) in case and control group

Post-operative hemoglobin	Scalpel group or Control group	Cautery group or Case group
MEAN	9.52	9.59
\pm SD	\pm 1.014	\pm 0.977

Since p-value $> \alpha$, H0 is accepted.

Table 5: comparison of incision time between scalpel (control) group and cautery (case) group

Incision Time in seconds/cm2	Scalpel group or Control group (N=12)	Cautery group or Case group (N=12)
Mean \pm SD	15.20 \pm 2.20	13.71 \pm 2.53

Since p-value $< \alpha$, H0 is rejected.

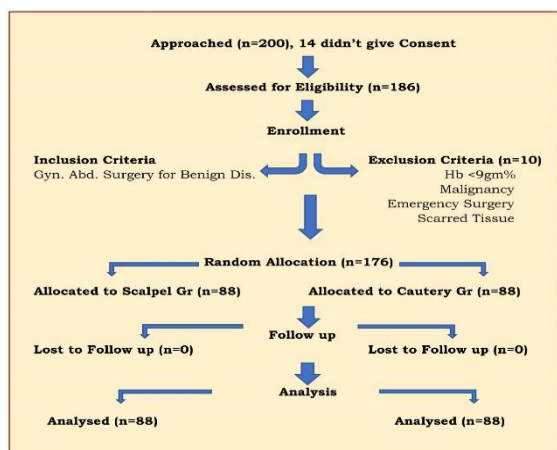
Table 6: Comparison of pain in the day of operation as per numerical pain rating score (NPRS)

Pain score	Scalpel or control group (n=88)	Cautery or case group (n=88)
NO PAIN (0)	0	0
MILD PAIN (1-3)	2(2.6%)	9(10.52%)
MODERATE PAIN (4-6)	40(44.7%)	42(47.36%)
SEVERE PAIN (7-10)	46(52.3%)	37(42.1%)
MEAN \pm SD	6.56 \pm 1.51	5.8 \pm 1.57

Table 7: analysis of wound complications in noted in case and control group as per southampton wound grading system

Grade	Scalpel group or control group (n=88)	Cautery group or case group (n=88)
G0	75(85.5%)	71(80.26%)
G1	1(1.31%)	3(3.94%)
G2	1(1.31%)	2(2.63%)
G3	4(3.94%)	9(9.21%)
G4	7(7.89%)	3(3.94%)

p value is 0.29 which is not significant at $p < 0.05$.



DISCUSSION

Most of the patients belonged to lower socio-economic group (according to B.G. Prasad Scale). There were 73.68% in the case group as compared to 65.78% in the control group, having no statistically significant difference, p value being 0.37.

In the case group, 44.73% of the individuals were urban population as compared to 38.15% in the control group. However, there was no statistically significant difference between the two. P value was 0.28.

Mean pre-operative haemoglobin value in group A that is scalpel group or control group was 10.31 ± 0.96 gm/dl and in group B, that is cautery or case group, it was 10.03 ± 0.94 gm/dl. There was no statistically significant difference between two groups, p value being 0.05.

Mean post-operative haemoglobin value in group A that is scalpel group or control group was 9.52 ± 1.014 gm/dl and in group B, that is cautery or case group, it was 9.59 ± 0.977 gm/dl. There was no statistically significant difference between two groups, p value being 0.64. There was no significant change in haemoglobin post operatively in two groups.

Mean incision time was less in group B, that is 13.71 ± 2.53 sec/cm² as compared to Scalpel group A, i.e., 15.20 ± 2.20 sec/cm² and this was statistically significant, the p value being 0.00003.

These findings are also comparable to findings reported by Nandurkar V et al,^[12] and that was significantly reduced mean incision time with cautery (27 ± 1 sec vs 38 ± 8.8 sec; p value < 0.001).

Similarly, Talpur et al,^[2] who in their study reported statistically significant reduction in mean incision time and mean blood loss with electrocautery when compared with scalpel (7.3057 sec/cm² versus 8.9025 sec/cm² and 1.1346 ml/cm² versus 1.8262 ml/cm² respectively).

Ly et al,^[1] in their systemic review and meta-analysis of fourteen randomized trials comprising of 2541 patients (1267 undergoing abdominal wall incision by cutting diathermy and 1274 by scalpel), found that diathermy may offer significant advantages in many variables including incision time. They noticed significantly shorter incision time (mean difference of 36 seconds; P<0.001) with diathermy incisions as compared to scalpel incisions.

As per our study, pain is significantly less in case group or cautery group. The mean pain score on the day of the operation was 5.8 ± 1.57 and 6.56 ± 1.51 in case and control group respectively, p value being .064.

Pain on the 1st post-operative day, pain score was 3.03 ± 1.124 and 4.48 ± 1.45 in, (p value being <0.0001).

On 3rd post-operative day, pain score was 2.33 ± 0.84 and 2.67 ± 1.29 (p value <0.001) respectively in case and control group.

Similarly, the study done by Patil BV et al showed that pain is significantly less with electrocautery, p values being <0.00001.

Nandurkar VS et al,^[12] in their study concluded that post-operative pain was significantly less in cautery group (p value 0.02).

The result of present study is comparable with other study conducted by Ombolaji et al.

In the study done by Patil BV et al. 76 (19.6%) patients from scalpel group and 10 (20.4%) patients from cautery group developed wound complications which is comparable our study.

CONCLUSION

Results showed that

- Mean pre-operative haemoglobin, mean post-operative haemoglobin and incisional depth were almost same in both the groups.
- But incisional time was significantly shorter in cautery group.
- Reduced incisional blood loss noted where cautery was used for incision which was statistically significant.
- Post-operative pain was significantly less in cautery group.
- Rates of wound complications were almost similar in both groups, like Surgical Site Infection (SSI) and Superficial Wound Dehiscence.
- Wound seroma was noted more in case group, though it was statistically insignificant.

We followed up the patients after 6 weeks for delayed wound complications, but only two (2) patients of control group presented with hypertrophic scar, no other delayed wound complications were noted in either group.

Considering all the observations made in this study, it is concluded that:

- Incision time and Incision related blood loss - are more in scalpel group when compared to diathermy group.
- Post-operative pain was similar in both diathermy and scalpel groups.
- Diathermy can be effectively used as an alternative to scalpel for skin incision as there is no significant difference in post-operative wound complications in both groups.

Limitations

Strength and Limitations of the Study:

In the present study, two different techniques for skin incision (Scalpel and Cautery) were compared where demographic data are comparable – this is the Strength of this study.

But, Limitations are there too:

- The study has been done in a single center; hence the generalization is not possible.
- Some cases were not included in the present study, like;
 - Patients undergoing emergency gynaecological surgeries,
 - Patients with comorbidities like diabetes, hypertension and
 - Patients with surgically scarred tissue.
- Complications are more seen in these cases.
- The sample size was small. Only 176 cases are not enough for this kind of study. Randomized Control Studies (RCTs) with larger number of patients are needed to verify the findings and come to a definite conclusion.
- Sample size including different ethnic groups would have been better.

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