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Original Research Article

Observational study of scalpel versus electrocautery for subcutaneous incision in elective gynaecological surgeries

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ABSTRACT

Background: Considering higher rate of postoperative wound complications in Government set up hospitals, this study was an attempt to compare incision time, incisional blood loss, hospital stay, post-operative pain and postoperative wound complications when subcutaneous tissue is opened with either scalpel or electrocautery in elective gynaecological surgeries after keeping all other clinical and surgical variables same i.e. age, BMI, haemoglobin, incision depth and hospital stay.

Methods: This was a prospective observational comparative study conducted in one of the tertiary teaching hospital in Western Maharashtra, India over 12 months. All patients (n=100) were divided into 2 groups. Group A in which skin and subcutaneous tissue was dissected by using scalpel and Group B in which after skin, anterior abdominal wall was opened by using electrocautery. Data analyzed for indication, incisional blood loss, incision time, postoperative pain, wound complications and hospital stay.

Results: There were no significant association between preoperative diagnosis and the development of a post-operative wound complications. Mean incision blood loss was found to be significantly higher in group A compared to group B patients. Postoperative pain was significantly higher in group A (P value <0.05). Among wound complications, no statistically significant differences were seen regarding wound complications for the two groups.

Conclusions: Electrosurgical dissection for abdominal incision is safe, less time consuming and with less blood loss during subcutaneous incision and produces less postoperative pain. We conclude that the method of subcutaneous tissue incision was unrelated to the development of postoperative abdominal incision problems.

Keywords: Electrocautery, Gynaecological surgery, Scalpel, Wound complications

INTRODUCTION

Conventionally, scalpels have been used to make surgical incisions. However, since its introduction in the early part of the 20th century, electrosurgery has been widely used as an alternative tool for creating incisions. 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.¹ There are, however, concerns about use of electrosurgical knife as it was reported to be one of several variables contributing to postoperative abdominal wall incision infection, poor wound healing and adhesion

formation.^{2,3} Considering higher rate of wound complications in government set up after surgery, our study is a sincere attempt to compare postoperative wound complications when subcutaneous tissue is opened with either scalpel or electrocautery in elective gynaecological surgeries.

METHODS

Study design

This was a prospective observational comparative study conducted in one of the tertiary teaching hospital in

Western Maharashtra, India over 12 months. Candidates enrolled in this study were women of reproductive age group, who scheduled for elective abdominal gynaecological surgeries and willing to participate in study.

Inclusion criteria

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

Exclusion criteria

Pelvic malignancy, history of receiving antibiotics during the preceding 7 days, chronic medical illness like diabetes, asthma or tuberculosis, anaemia.

A medical history, a complete physical examination and routine laboratory tests were done. They were given a dose of 1gm ceftriaxone 1 hour prior to surgery. The abdominal skin and vagina was prepared with savlon and povidone iodine in the operating room after spinal/spinal + epidural anaesthesia. Operating surgeon was the person to decide by which method abdomen is to be opened and accordingly all patients were divided into 2 groups, group A and group B after surgery. In group A, scalpel was used to incise abdominal skin, subcutaneous tissue and rectus sheath and haemostasis was achieved by free tie of thread while in group B, after incising skin with scalpel, subcutaneous tissue and rectus sheath will be opened by electrocautery (At settings of 70 watt with monopolar current) and haemostasis was achieved by electrocautery. Subcutaneous tissue thickness was measured at the maximal depth prior to opening the fascia using a calibrated sterilized ruler. Incision time (the interval from the beginning of skin incision to the end of peritoneal incision) and blood loss during incision making is noted. Subcutaneous drain was kept in both groups if subcutaneous thickness is more than 4cm. Subcutaneous tissue was not approximated with suture in either group to maintain uniformity. These patients were evaluated clinically for pain twice daily during postoperative period (for 3 days) using numerical pain rating score.

Data was analyzed for indications, incisional blood loss, incision time, postoperative pain and wound complications like seroma (incision separation with abundant serous fluid), hematoma, fever, infection, dehiscence (separation of the subcutaneous tissues with skin) and hospital stay. A wound culture was performed if incision separation or purulent discharge occurred. The presence of a healing ridge with adequate tensile strength was used as an index of a healing wound while the Southampton grading system was used to denote the presence or absence of an infection.⁴ Wound healing was classified using the Southampton wound grading system; G0: normal wound healing, G1: normal healing with mild bruising or erythema, G2: erythema plus other signs of inflammation, G3: clear or serosanguinous discharge, and G4: purulent discharge. All patients were followed for up to 6 weeks after discharge and any readmission after discharge from the hospital was evaluated to detect the occurrence of late wound problems.

Statistical tests for analysis of data was performed using student 't' test and chi square test.

RESULTS

Total 100 patients were enrolled in this study. They underwent various elective gynaecological surgeries. Indications of surgeries are as shown in Table 1.

Table 1: Indications of surgery.

Indications	% (n=100)
Adenomyosis	12
Fibroid	29
Ovarian tumor	15
Dysfunctional uterine bleeding	28
Anterior sling for prolapse	3
Chronic pelvic inflammatory disease	3
HSIL ^a	2
Endometrial hyperplasia/polyp	7
Severe mental retardation	1

a- High grade squamous intraepithelial lesion.

Table 2: Clinical and surgical variables.

Clinical and surgical variable	Scalpel (n=51)	Electrocautery (n=49)	Significance* (P value)
Age (years)	42.18±7.4	39.72± 5.38	0.3
BMI wt/height ²)	22.23±3.01	22.36±2.66	0.81
Pre-operative HB	10.86±1.06	11.12±1.18	0.24
Post-operative HB	10.09±0.83	10.42±0.99	0.08
Incision depth	3.42±0.84	3.33±1.17	0.65
Hospital stay (days)	10.22±4.11	9.33±2.58	0.19

* Unpaired t test is used.

There were no significant association between preoperative diagnosis and the development of postoperative wound complications. 81% of incisions

were low transverse and 19 % were midline vertical. Out of those 81 patients, 15 (18.5%) were found to have some or other wound problems (8 patients of scalpel group and

7 patients from electrocautery group) and out of 19 patients of vertical incision 5 (26.3%) were having serous

discharge from wound (3 patients from electrocautery group and 2 patients from scalpel group).

Table 3: Comparative analysis of incision parameters for scalpel incision and electrocautery.

Parameter	Value [#]	Minimum	Maximum	P Value
Incisional time (Sec/cm²)				
Scalpel	15.94±7.77	6.57	45	0.07
Electrocautery	13.34±6.34	3.33	26.66	
Incisional blood loss (ml/cm²)				
Scalpel	0.28±0.10	0.12	0.56	0.02
Electrocautery	0.23±0.12	0.05	0.43	
Pain on the day of surgery				
Scalpel	7.06±0.68	5	8	<0.0000001
Electrocautery	4.66±0.47	4	5	
Day 1				
Scalpel	5.04±0.78	4	6	<0.0000001
Electrocautery	3.60±0.49	3	4	
Day 3				
Scalpel	3.76±0.84	2	5	<0.0000001
Electrocautery	2.33±0.47	2	3	

Data is presented as Mean±Standard deviation.

The clinical and surgical variables were similar in both groups of women as shown in Table 2. Table 3 shows comparative analysis of incisional parameters for scalpel incision versus electrocautery. Mean incision time was 15.94sec/cm² (SD±7.77sec/cm²) in group A and 13.34sec/cm² (SD ±6.34sec/cm²) for group B patients (P value 0.07, statistically non-significant). Mean incision blood loss was found to be significantly higher (P value

0.02) in group A i.e. 0.28ml/cm² (SD±0.1ml/cm²) compared to 0.23 ml/cm² (SD±0.12ml/cm²) in group B patients. Postoperative pain was assessed by numerical pain rating scale on day the day of surgery, day one, and day three. It was significantly higher in group A (P value <0.05). Mean hospital stay was 10.22 (SD±4.11) days in group A and 9.33 (SD±2.58) days among group B patients. This difference was not statistically significant (Table 1).

Table 4: Variables for women without and with post-operative abdominal incisional problems.

Variable	No wound problem (n=80)	Wound problem (n=20)	P Value
Age	40.65±7.47	40.5±5.15	0.9
BMI ^a	22.18±2.76	23.3±3.65	0.13
Pre-operative HB ^b (gm/dl)	11.04±1.13	10.73±1.06	0.26
Post-operative HB	10.3±0.94	9.96±0.95	0.15
Subcutaneous depth (cm)	3.24±0.95	3.85±1.14	0.01
Hospital stay (days)	8.31±0.75	15.5±3.95	<0.000001

a- Body mass index; b- Haemoglobin.

Table 5: Analysis of wound complications (n=100).

Wound complication	Scalpel (%)	Electrocautery (%)	Total	P value (Chi-square)
G0 (Healthy)	41 (80.39)	39 (79.6)	80 (80)	0.12
G1 (Erythematic)	0	1 (2.04)	1 (1)	
G2 (Erythema + other signs of inflammation)	0	0	0	
G3 (Serous discharge)	2 (3.9)	5 (10.2)	7 (7)	
G4 (Wound dehiscence/gape)	8 (15.6)	4 (8.16)	12 (12)	

Demographic and surgical variables for these women were presented in following table and are compared with those of women without wound morbidity. There were no cases of burst abdomen (fascial dehiscence). The mean hospital stay for these 20 women was 15.5 days, significantly prolonged over the entire group, as would be expected. Obese women had deeper subcutaneous tissues, which increased significantly ($P=0.01$) the likelihood of developing a postoperative wound problem.

Among wound complications, 10 (19.6%) patients from group A and 10 (20, 4%) patients from group B developed wound complications. Erythema of wound margin (G1) was found in one (2.04%) patients of group B. Overall no statistically significant differences were seen regarding wound complications for the two groups (Table 5).

DISCUSSION

After the introduction of halothane as an anaesthetic agent, electrocautery became increasingly used to control bleeding and for dissection of tissue planes. However, it is still infrequently used for making skin incisions due to fear of excessive charring and burning of skin which could impair wound healing. Wound healing is a complex process having role of several factors but in our study we have concentrated mainly on type of method used to open abdomen after skin and its effects on wound healing and wound complications. In recent years after introduction of advanced electrocautery units (pure sinusoidal current), there is increasing trend in the use of cautery for making skin incision. Many studies have been conducted on both method of incision, which showed less operating time, minimum loss of blood and reduced early pain and fewer requirements of analgesics in postoperative period after using electrocautery as a method to open abdomen compared to scalpel. In one experimental study, conducted on rats, it was shown that wound incisions made with a cold scalpel had more rapid tensile strengths as compared to diathermy or harmonic scalpels.⁵

According to study done by Talpur AA et al mean incision time was 8.9025sec/cm² for scalpel group and 7.3057sec/cm² for cautery group patients (statistically significant).⁶ Mean blood loss during incision making was 1.8262ml/cm² and 1.1346ml/cm² for scalpel group and cautery group patients respectively (statistically significant), but In present study, electrocautery mode of skin incision took less time i.e.13.34±6.34sec/cm² but p value 0.07 which is not statistically significant and it led to less loss of blood i.e. 0.23±0.12ml/cm² (P value 0.02, statistically significant) compared to scalpel incisions 0.28±0.10ml/cm². These parameters different from other studies in terms of statistically non-significant incision time.

Ly et al 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, operative blood loss, incision time and postoperative pain.⁷ They noticed significantly reduced amounts of blood loss (mean difference of 0.72 ml/cm² ($P<0.001$) and shorter incision time (mean difference of 36 seconds; $P<0.001$) with diathermy incisions as compared to scalpel incisions.

In present study, it was concluded that postoperative pain is significantly less in the electrocautery group and it is comparable with other study conducted by Ombolaji et al.⁴ Kearns also found that postoperative pain was significantly lower in the diathermy group for first 48 hours after operation which is consistent with present study.² There was no significant difference in pain of both groups on subsequent days (day 4 onwards). In their study Aird et al noted that electrocautery significantly reduced postoperative wound pain.⁸ Results of present study are consistent with other studies by Siraj et al, Gilmore et al and Shivagouda et al, which showed that elective laparotomy incisions made with electrocautery had significant benefits compared to scalpel incisions in terms of reduced early postoperative pain and analgesic requirements.⁹⁻¹¹

Among wound complications, in present study 10 (19.6%) patients from group A and 10 (20.4%) patients from group B developed wound complications which is comparable with study done by Talpur AA et al in which rate of wound complications were 18.18% patients of group A and 15.71% patients of group B, which is not statistically significant.⁶ Eren et al From Istanbul compared wound complications associated with scalpel and electrocautery in patients operated for gastrointestinal malignancies with different incision methods.¹² Their study revealed no significant statistical difference in wound infection. Not a single patient in both groups developed wound infection or dehiscence as reported by Gilmore and their colleagues, but wound discharge was noticed in the scalpel group in four patients that were treated conservatively with daily dressing for few days.¹⁰

CONCLUSION

Electrosurgical dissection for abdominal incision is safe, less time consuming. There is less blood loss during subcutaneous incision and dissection and produces less postoperative pain. We conclude that the method of subcutaneous tissue incision was unrelated to the development of postoperative abdominal incision problems in 100 women undergoing elective gynaecological surgeries.

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