

# Scalpel Versus Diathermy for Midline Abdominal Incisions

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## ABSTRACT

**Objective** To compare the incision time, blood loss, post-operative complications (wound infection) and post-operative pain in midline laparotomies incisions made using scalpel versus diathermy.

**Study design** Randomised controlled trial.

**Place & Duration of study** Department of General Surgery Ward 26, Jinnah Postgraduate Medical Center (JPMC) Karachi, from June 2012 to June 2013.

**Methodology** A total of 220 patients were enrolled in the study after taking informed consent. These patients were randomly assigned to Group A (Scalpel incision group) and Group B (Diathermy incision group) using opaque labeled envelopes. The surgeon was informed of the type of incision before the surgery started.

**Results** There was a significant statistical difference in terms of incision time ( $p = 0.001$ ), blood loss ( $p=0.014$ ), post-operative pain ( $p=0.001$ ,  $0.012$  and  $0.021$  on day 1, 2 and 3 respectively) and post-operative analgesics requirement ( $p=0.021$ ). On the other hand there was no significant statistical difference in terms of postoperative complications (wound infection) and length of hospital stay.

**Conclusion** Diathermy incision in midline laparotomy was significantly superior to the scalpel because of reduced incision time, less blood loss, less early postoperative pain and reduced analgesic requirements.

**Key words** Laparotomy-incision, Diathermy, Scalpel.

## INTRODUCTION:

Access through the abdominal wall for open surgery must be made by an incision of sufficient length that allows the surgeon to have good view of the operative field and to permit the entry of hands and instruments.<sup>1</sup> The mid line incision is preferred incision for the exposure of the intra-abdominal contents, relative ease to perform surgery and quick access.<sup>2,3</sup>

Laparotomies are associated with a number of complications like wound dehiscence, wound

infections and incisional hernias.<sup>4,5</sup> Pain is one of the notorious complications of midline laparotomy in the immediate postoperative period. Thus a good pain control will not only alleviate the distress but leads to the reduced stress response.<sup>6</sup>

Traditionally, the skin incisions are made by scalpels. These incisions are more painful and lead to more blood loss. Surgical diathermy in recent times, gaining popularity as an alternative method of opening the abdomen. In diathermy, the high frequency current that passes through the tissues excites the molecules and creates energy.<sup>7</sup> Diathermy incisions are not true cutting incisions.<sup>8</sup> Diathermy current leads to heating of cells within the tissues so rapidly that they vaporize producing cavity in the cell matrix, and the heat created during this process vanishes rather than being transferred to the nearby tissues.

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This comparative randomized study was conducted in our setup to compare the efficacy and safety of surgical diathermy incision with that of scalpel incision to alleviate the fear of surgeon in making incisions using diathermy.

#### METHODOLOGY:

This comparative study was conducted in Surgical ward 26, JPMC from June 2012 to June 2013. Patients between 16 to 60 year of age clean with or clean contaminated surgeries were included. A total of 220 patients were enrolled after taking informed consent. These patients were randomly assigned into two groups; Group A (Scalpel incision group) and Group B (Diathermy incision group) using opaque labeled envelopes. The surgeon was informed of the type of incision before the surgery started.

The length and depth of incision at the end of the procedure were measured in centimeters. Incision area was calculated as the product of the length and width of skin incision. The time from the start of the skin incision to completion of the peritoneal incision with complete hemostasis, was recorded. Blood loss during skin incision was calculated by weighing the swabs used exclusively in making the incision and during hemostasis, with each gram taken as equal to one milliliter of blood (i.e. 1 g = 1 ml). No suction evacuation of blood was done while making the skin incision. The amount of blood was calculated as ml/cm<sup>2</sup>. Postoperative pain was assessed according to a visual analogue scale (VAS) from 0 (no pain) to 10 (worst pain imaginable) on each postoperative morning for three days.

The data were analyzed using SPSS version 17.0 Descriptive statistics were applied to calculate mean and standard deviation for age, and frequency for gender. The amount of wound related blood loss, incision time and the severity of wound related pain in both the groups were compared using Student t-

test, while post-operative infection in two groups compared using Fisher's Exact test.

#### RESULTS:

During the study period 325 patients underwent exploratory laparotomy (either elective or emergency) of which 105 patients failed to fulfill the selection criteria and therefore excluded from the study. Thus the remaining 220 patients were enrolled. Among these patients 122 were males (55.4%) while 104 females (46.8%), with the male to female ratio of 1.8 :1.

Group A (Scalpel Group) had 60 males and 50 females (M:F=1.2:1) patients whereas Group B (Diathermy Group) consisted of 57 males and 53 females (M: F=1.07:1). Mean age in scalpel group was 45.4 ± 12.4 year, while it was 43.3 ± 11.2 year in diathermy group. There was no significant difference between the two groups in terms of age. The mean time taken for incision in Group A was 8.20 ± 1.42 sec/cm<sup>2</sup> while in Group B it was 6.84 ± 0.82 sec/cm<sup>2</sup>. The difference between the two groups in terms of operative time was statistically significant (p = 0.001). The incisional blood loss was 1.53 ± 0.20 ml/cm<sup>2</sup> and 1.43 ± 0.20 ml/cm<sup>2</sup> in Group A and Group B respectively (p = 0.014).

The mean values of pain score of each day that is from day one to day three for Group A were 3.92, 3.00, 2.40 in comparison to 2.42, 1.5, 1.01 for Group B. This showed that the VAS pain score was significantly reduced in Group B. The mean amount of analgesics requirement (dose) in 72 hours was significantly less (p=0.021) in Group B. There was neither significant difference in terms of post-operative wound infection nor in length of hospital stay in both the Groups (table II).

#### DISCUSSION:

Traditionally scalpel were used for various skin incisions,<sup>9</sup> but with the invention of surgical diathermy

**Table I: Scalpel and Diathermy Groups Patients' Characteristics**

Patients' Characteristic	Group A (Scalpel Group)	Group B (Diathermy Group)	P-Value
Number of patients	110	110	
Mean age (year)	45.4 ± 12.4	43.3 ± 11.2	0.345
Sex (male : female)	1.2 : 1	1.07 : 1	0.633
Mean incision time (sec/cm <sup>2</sup> )	8.20 ± 1.42	6.84 ± 0.82	0.001
Post-operative wound infection (%)	13.8	12.1	0.245
Mean length of hospital stay (days)	11.34 ± 8.20	10.78 ± 6.5	0.844

Table II: Postoperative Pain Scores

Postoperative Day	Group A (Scalpel Group)	Group B (Diathermy Group)	P-Value
Day 1	3.92	2.42	0.001
Day 2	3.00	1.50	0.012
Day 3	2.40	1.01	0.021
Postoperative analgesic consumption (doses)	7.2 ± 0.66	3.63± 0.48	0.020

in the beginning of 20<sup>th</sup> century it has increasingly been used for the tissue dissection and hemostasis.<sup>10,11,12</sup> Many surgeons are reluctant in making incision for the skin and fascia using diathermy.<sup>11,13,14</sup> There is perceived fear of devitalization of tissues within the wound which may delay wound healing leading to more scarring. This has been challenged by the current and recent research work which suggested diathermy to be safe option with no added risk.<sup>15-16</sup>

Franchi et al conducted a large (n=964) multicentric study which also supported our study results.<sup>17</sup> Kern's et al who compared electrosurgical and scalpel in 100 patients undergoing midline laparotomies indicated the diathermy incision has significant advantage over the conventional scalpel in terms of incision time, less early post-operative pain and less analgesics requirements which supported our results.<sup>18</sup>

A study by Chyrous and colleague where either the diathermy or scalpel were used for inguinal hernioplasties, supports our study results only in terms of incision related time.<sup>19</sup> Pearlman et al compared the two methods of making incision for open cholecystectomy also supported the results of our study.<sup>20</sup> Furthermore a study conducted by Stolz also favors the results of our study.<sup>21</sup> Our study showed that diathermy incision is superior to scalpel incision therefore diathermy can be used as an alternative to scalpel for incision. The present study did not show any statistically significant difference in terms of post-operative complication (wound infection, and length of hospital stay) which is consistent with other studies.<sup>22,23</sup>

#### CONCLUSION:

Surgical diathermy was safe and effective method of making incisions in midline laparotomies as it had significant advantages over the scalpel in terms of short incision time, less blood loss, reduced post-operative pain and analgesics consumption.

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