ORIGINAL ARTICLE

Scalpel versus diathermy of midline skin incisions: comparison of mean pain scores on second post operative day

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Abstract

Objective: To determine the mean post-operative pain in scalpel versus diathermy opening of midline laparotomies.

Methods: The randomised controlled study was conducted at Civil Hospital and Dow University of Health Sciences, Karachi, from May to November 2010, and comprised patients undergoing midline laparotomy. Patients were equally divided into two groups; those who received incision with diathermy were placed in group A, and those who received incision with scalpel in group B. Mean post-operative pain scores were recorded using numerical analogue scale on second post-operative day. SPSS 16 was used for statistical analysis.

Results: Of the 58 patients, there were 29(50%) in each group. The overall mean age of the patients was 31.8±12.8 years. Besides, 40(68.9%) patients were male. The mean post-operative pain scores at 48 hours in diathermy group was 1.48±0.68 while in scalpel group it was 2.17±0.46 ($p<0.05$).

Conclusion: The use of diathermy for midline laparotomy incision had significant advantage over scalpel in reducing pain on second post-operative day.

Keywords: Scalpel, Diathermy, Midline laparotomy, Post-operative pain. (JPMA 67: 1502; 2017)

Introduction

The midline incision is the preferred incision due to adequate exposure of intra-abdominal contents, quick access, and relative ease to perform.[1-3] Laparotomies are associated with a number of complications like wound dehiscence, wound infection and incisional hernias.[1,4,5] Midline laparotomy incision is generally chosen by surgeons because of its ease, speed and excellent view.[6]

Pain is one of the common complications of midline laparotomy that troubles the patient in the immediate post-operative period and can increase patient's morbidity.[7]

A good pain control will not only alleviate patient's distress but lead to reduced stress response important in patients with compromised cardiovascular functions.[8] Pain relief is imperative as it lightens patient's anxiety and helps in rapid uncomplicated recovery.[9]

The severity of post-operative pain is influenced by numerous factors such as anaesthesia, analgesia and the technique of surgery, including the method of incision of tissues. Scalpel or diathermy abdominal incisions are the two ways of accessing the abdominal cavity. Traditionally, the most common method of making the incision is by using the scalpel.[10] But over the years with the easy availability, lessened bleeding and minimised risk of superficial infections, diathermy is gaining popularity.[11,12] More research is still advised to see the wound complications of scalpel and diathermy incisions.[13]

The current study was planned to compare the mean pain scores on second post-operative day in scalpel versus diathermy skin incisions of midline laparotomies.

Patients and Methods

This randomised controlled trial study was conducted at Civil Hospital and Dow University of Health Sciences, Karachi, from May to November 2010, and comprised patients undergoing midline laparotomy.

The first enrolled patient received incision with diathermy, the second with scalpel and so on. It means that odd number patients received incision with diathermy (group A) and even number patients received incision with scalpel (group B).

The sample size was calculated using the software OpenEPi version 3.01[14]; we used 80% power of test, 95% confidence interval (CI), with an average pain score of 1.08±1.142 in diathermy group versus 1.99±1.291 in scalpel group.[15] The sample size calculated was 58 patients, 29 in each group.

All patients aged over 18 years of either gender undergoing midline laparotomy were included in the

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study. The patients who presented as emergency cases with acute abdomen were also included.

Patients who had penetrating abdominal injuries or blunt abdominal trauma were excluded. Patients having co-morbidities like ischaemic heart disease, diabetes mellitus, hypertension or who were shifted to intensive care unit (ICU) were also excluded.

The patients were enrolled after being assessed by a senior postgraduate trainee doctor along with the consultant on call. Informed consent for the use of personal data for research was taken from each patient.

After primary assessment, all patients were subjected to uniform baseline investigations which included complete blood count, blood glucose, serum urea, creatinine and electrolyte levels, bleeding indices, chest X- Ray in erect posture and electrocardiogram (ECG) where indicated. Nasogastric decompression and foley's catheterisation were carried out. Two wide-bore cannulas (18-gauge) were passed and resuscitation with isotonic solution (normal saline or ringer's lactate) was given until the urine output became 0.5ml/kg/hour. Then the patients were shifted for the surgery to the operation theatre. Standard general anaesthesia via endotracheal tube was given to all. Prophylactic parenteral antibiotics (ceftriaxone 1gm and metronidazole 500mg) were given at the time of induction of anaesthesia. Patients of both groups underwent elective midline laparotomy by senior postgraduate trainee doctors under the supervision of consultant.

The standard diathermy and scalpel incision techniques were followed in respective groups. The same immediate post-operative pain management was given to all patients. Parenteral analgesic (diclofenac sodium 75mg intramuscularly 8-hourly) was given for two days to the patients of both groups.

Post-operative pain was measured by numerical analogue scale. Patients were asked to mark on the line where they think their pain was, and then it was matched with a standard 10cm scale to determine the value in centimetres. Zero end of the line represented "no pain" while 10 indicated "worst pain". Those who required additional analgesics despite standard post-operative treatment were excluded and similar numbers of patients were enrolled to achieve the desired sample size. Mobility status of the patients was also noticed at the time of determination of post-operative pain scores at 48 hours.

Patients were examined in the ward by trainee doctor who was unaware of the study group. The data was entered by independent observer. The questionnaire was used to document all findings. It included demographic information, hospital registration number, study group of patient (i.e. A or B), and post-operative pain scores after 12, 24, 36 and 48 hours of surgery on numerical analogue scale.

Age, gender and method of incision (scalpel and diathermy) were taken as independent variables.

Mean pain score in the morning of second post-operative day was taken as dependent variable.

SPSS 16 was used for statistical analysis. Frequencies and percentages were used to summarise categorical variables like gender distribution and mobility status of patients. Mean and standard deviation were computed for continuous variables like age and pain scores. The repeated measured analysis of variance (ANOVA) test was applied to compare the difference of pain scores between the diathermy and scalpel groups at different time intervals. $P<0.05$ was considered statistically significant.

The study received ethical approval from Civil Hospital Karachi. Written informed consent was obtained from all patients.

Result

Of the 58 patients, there were 29(50%) in each group. The overall mean age was 31.8±12.8 years (range: 19-70 years). Besides, 45(77.6%) patients were aged ≤ 35 years; 24(82.8%) in group A and 21(72.4%) in group B. The mean age was 29.9±11.3 in group A and 33.6±14.1 years in group B (p=0.267).

Table-1: Post-operative pain scores of the patients in group A and B.

Time	Group A (Diathermy Group) Mean (SD)	Group B (Scalpel Group) Mean (SD)	P-Values*
At 12 hours	2.2 ±0.64	3.5 ±0.78	< 0.0001
At 24 hours	1.9 ±0.59	2.76 ±0.73	< 0.0001
At 36 hours	1.6 ±0.62	2.24 ±0.51	< 0.0001
At 48 hours	1.48 ±0.68	2.17 ±0.46	< 0.0001

SD: Standard deviation.

Table-2: Comparison of mean post-operative pain after 48-hours of surgery according to mobility in both groups.

Types	Mobility	Mean (±SD)	P-Values
Group A (n=29)	Mobilised	2.5 (±0.33)	<0.0001
	Not-mobilised	3.3 (±0.40)	
Group B (n=29)	Mobilised	1.8 (±0.50)	0.015
	Not-mobilised	3.0 (±0)	

SD: Standard deviation.

Moreover, 40(68.9%) patients were male and 18(31.1%) were female. Overall male-to-female ratio was 2.2:1. In group A, 19(65.5%) patients were males and 10(34.5%) were females while in group B, 21(72.4%) were males and 8(27.6%) were females.

Pain was evaluated using numerical analogue scale. When using an ANOVA with repeated measures with a Greenhouse-Geisser correction, the mean scores for pain were significantly different between diathermy and scalpel groups ($F= 52.6$, $p<0.0005$). Post hoc tests using the Bonferroni correction revealed that there was statistically less pain in diathermy group as compared to scalpel group at 12 hours, 24 hours, 36 hours and 48 hours (Table-1).

After 48 hours of the operation, overall 53(91.4%) patients were mobilised whereas 5(8.6%) were confined to their bed. In group A, 28(96.6%) patients were mobilised compared to 25(86.2%) in group B. In group A, mean pain score was 2.5±0.33 and 3.3±0.40 among mobilised and non-mobilised patients, respectively. In group B, the mean scores were 1.8±0.50 and 3±0 among mobilised and non-mobilised patients, respectively (Table-2).

In multivariate linear regression, there was significant association found between mean score on second post-operative day and method of skin incision. The mean pain score was significantly lower for patient in diathermy group compared to patients in scalpel group ($p=0.000$). However, there was no significant association found for age and gender with mean pain score on second post-operative day ($p>0.05$).

Discussion

The result of our study showed a significant reduction in mean pain scores after 48 hours in patients of diathermy incision group as compared to scalpel group. In literature, several studies have shown that use of diathermy for incision is associated with less blood loss, post-operative pain and operation time.[16,17]

In accordance with previous studies, in our study majority of the patients were young and male. Usually, patients with acute (non-traumatic) abdominal conditions are mostly young males.[15,18]

Midline laparotomy is the preferred technique of exploring abdomen in acute abdominal conditions.[1,2] Surgical scalpel and diathermy are the two most popular methods among surgeons to create surgical incision.[10] However, among various complications, post-operative pain after laparotomy is of major concern.[7] It can lead to delayed recovery and rehabilitation due to respiratory dysfunction.[19]

In randomised controlled trial between knife and diathermy incision technique, Hussain and Hussain[20] determined post-operative pain by measuring peak expiratory flow rates as an objective measure of post-operative pain and concluded that peak expiratory flow rates were better in the diathermy group. In our study pain perception was significantly reduced in the diathermy group as compared to scalpel group which is favourably compared with the similar studies.[21,22]

In our study among average pain scores diathermy group after 48 hours of surgery was 1.82 as compared to the scalpel group (2.63), which is nearly comparable to study conducted by Shamim[15] and Kearns et al.[16] In systematic analysis and meta-analysis as well, the authors suggested that there is no difference in the wound infection between diathermy and scalpel skin incision and diathermy significantly reduce post-operative pain.[23] Ly J. et al. found in their study that at 24 hours the post-operative pain scores were not significantly different between cutting diathermy and scalpel groups.[24] Some of the clinical studies have reported the reduced post-operative pain at 48 hours by using cutting diathermy for skin incisions.[15-17]

Chrysos et al.[25] assessed the role of scalpel and diathermy skin incision with regard to parenteral analgesic requirements. They found less parenteral analgesics in diathermy group. Moreover, a higher proportion of patients in the scalpel group continued to need oral analgesics on the second post-operative day compared to patients in the diathermy group. Hence, they favoured the diathermy incision technique in their study.

Conclusion

The diathermy incision was found to be safe for surgeons and patients. It produced decreased post-operative pain. Significant difference in mean post-operative mean pain on day 2 was observed. We encourage further studies in this aspect to strengthen the reliability of this method. It may be promoted as a hospital policy if found worthwhile.

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