

PARAMEDIAN INCISION MODIFICATIONS: RESULTS OF A RANDOMIZED TRIAL

By

Dr. Moussa Helmy Moussa M.D.

Ahmed Maher teaching hospital

Four modified techniques to close the fascia after paramedian laparotomy were compared in a prospective randomized trial. The four techniques were lateral paramedian incision (group A); vertical muscle – splitting incision (group B); laparotomy done via medial incision of the anterior rectus sheath and lateral incision of the posterior rectus sheath (group C) or vice versa (group D). In order to determine the necessity for incising both layers of the rectus sheath laterally to provide the shutter mechanism which is held responsible for the wound integrity. More medial incision of the anterior sheath significantly reduced the time required to perform the incision ($P < 0.02$) and tended to reduce wound sepsis rate (9.3%, 5%, 2.6% and 12.5% in groups A, B, C and D respectively). However, this was achieved at the cost of a higher incisional hernia rate (0%, 2.5%, 5.3% and 7.5% in groups A, B, C and D respectively, $P < 0.02$). The criteria used to assess the results were the occurrence of wound infection and wound dehiscence in the early post-operative period, and the occurrence of incisional hernia one year after operation.

We conclude that lateral incision of both the anterior and the posterior layers of rectus sheath is necessary to obviate the risk of wound hernia later on.

Keywords: Lateral paramedian incision, incisional hernia, wound closure, laparotomy.

INTRODUCTION

Lateral paramedian incision (one of the modifications of the classical paramedian incision) in which the anterior and posterior rectus sheaths were incised just medial to the lateral border of the sheath in the hope that the wide shutter mechanism would diminish the incidence of wound dehiscence and incisional hernia^(1,2), the wound being splinted by the rectus muscle. Superiority of this approach over the conventional paramedian and mid-line incision was demonstrated by clinical trial⁽³⁾ and subsequently it was demonstrated that the intrinsic strength of lateral paramedian incision was independent of the material employed to suture it⁽⁴⁾. The confidence in this incision was confirmed in over 850 documented cases with no wound dehiscence and an incisional hernia rate of less than 0.4% over a minimum follow-up period of 12 months⁽⁵⁾. Furthermore, a recent independently conducted clinical trial confirmed the excellent results which may be expected with this incision^(6,24).

However, the lateral paramedian incision possesses two drawbacks, which may render it unacceptable to some surgeons. Firstly, it unquestionably takes longer time to perform than conventional incision as a consequence of the extensive dissection of the rectus muscle from the anterior sheath. This makes it inappropriate for cases with life – threatening haemorrhage and may also explain the second disadvantage, namely the higher incidence of wound infection⁽⁷⁾. Both disadvantages might potentially be overcome if it could be demonstrated that it was unnecessary to divide both the anterior and the posterior sheaths laterally such that one lateral layer would suffice to provide the shutter mechanism.

In an attempt to determine which is the important layer we conducted a prospective randomized controlled clinical trial in which we compared the different modifications of the paramedian incision, doing so we hoped to determine whether or not it is important to incise both layers or one layer laterally, or muscle – splitting

method, and if not, which one provides the incision with its inherent strength^(8,9).

PATIENTS AND METHODS

From August 1998 to January 2002, all patients admitted for elective and emergency abdominal surgery other than life-threatening haemorrhage were considered for this study. Patients with previous vertical abdominal incisions or other incisions which might encroach on the proposed wound were excluded. During this time 175 patients were prospectively randomized to undergo abdominal laparotomy via one of the four modifications of the paramedian incision. In group A – patients: the anterior and the posterior rectus sheaths were incised just medial to the lateral border of the sheath, while in group B patients: the anterior rectus sheath, the rectus abdominis muscle and the posterior rectus sheath were incised vertically at a point 2cm from the mid-line (vertical muscle-splitting incision). In group C- patients: the anterior rectus sheath was incised vertically at a point 2cm from the mid-line then after lateral mobilization of the rectus abdominis muscle, the posterior rectus sheath was incised vertically at a point just medial to the lateral border of the rectus sheath as for the lateral paramedian incision. In contrast, patients in group D underwent a lateral incision of the anterior sheath, dissection of the rectus muscle laterally and incision of the posterior sheath 2cm from the mid-line. Patients were randomized to groups A, B, C and D using a blind card system at the induction of anaesthesia. At completion of the operative procedure, all wounds were closed with continuous No. 1 vicryl® (polyglactin 910) to the posterior rectus sheath, continuous No. 1 prolene to the anterior rectus sheath and interrupted silk sutures to the skin in groups A, C and D^(10,11). In group B all layers were closed as one mass ligature by continuous No. 1 prolene and interrupted No. 1 vicryl® inbetween, the bristly ends of prolene were buried, as described by Targat⁽¹²⁾. Tension sutures were not used and drains were brought out through separate incisions.

For each patient a standard sheet was completed including age, sex, diagnosis, operative details, past medical history as they suffered from chronic obstructive pulmonary disease or diabetes mellitus, previous use of corticosteroids, antibiotics and cytotoxic drugs, radiotherapy and presence of malignancy, haemoglobin and albumin levels. Prophylactic antibiotics were administered and were continued for a minimum of 48 hrs postoperatively. Wounds were examined daily and sutures removed on the day a firm healing ridge was palpable.

In the first four weeks after operation special attention was paid to the development of wound infection or wound dehiscence. A wound infection was defined as a purulent discharge from the wound spontaneously or after surgical drainage and when pathogenic microorganisms were

grown on culture media from wound fluids.

A wound dehiscence was considered to be present when a new operative closure of the fascia was necessary.

One year after the operation all patients who were still alive were again examined, and checked for any incisional hernias presence.

RESULTS

From August 1998 to January 2002, 175 patients were randomized to undergo one of the four described incisions. Fourteen patients were lost to follow-up and not considered further, leaving 43 patients in group A (lateral paramedian incision), 40 patients in group B (vertical muscle-splitting incision), 38 patients in group C (medial incision of anterior sheath, lateral incision of posterior sheath) and 40 patients in group D (vice versa). Of eight patients who developed burst abdomen, three patients died within thirty days of the original operation, but burst abdomen could not be solely blamed for death in any of them.

Indications for surgery and relevant clinical details are shown in tablets 1-3, from which it is seen that there is no significant difference between the four groups with regard to factors which might predispose to abdominal wound dehiscence. As expected, time taken to perform the incision was significantly greater when a lateral dissection of the anterior rectus sheath was performed.

In the early post-operative period, there were twelve significant wound infections in this study (those giving rise to the generation of culture-positive pus which delayed the patients' discharge from hospital). Of these patients with significant wound infection, four cases occurred in the lateral paramedian group (9.3%), two cases in group B (5%), one case occurred in group C (2.6%) and five cases in group D (12.5%). Although these figures indicate a trend towards a higher rate of wound infection where a lateral dissection of the anterior rectus sheath was performed, this just fails to achieve statistical significance ($\chi^2 = 2.25$, P n.s.).

With a minimum follow-up of one year and maximum of three years no wound dehiscences nor incisional hernias were observed in the 43 patients of group A. In contrast, over the same period of follow-up one case of incisional hernia out of 40 patients were detected in group B, but without any case of wound dehiscence. In group C, 2 out of 38 incisional hernias and one wound dehiscence, and 3 of 40 patients incisional hernias in group D. A highly significant difference exists between wound dehiscence / hernia rate in the lateral paramedian group and the combined results of the two variants ($\chi^2 = 10.8$, $P < 0.02$).

Table (1): Patients details and indications of surgery Values inbetween brackets are percentages.

	Group A	Group B	Group C	Group D
☒ Age range (years)	14-70	15-72	11-75	19-68
☒ M:F ratio	20 : 27	20 : 24	19 : 22	18 : 25
• Elective cases	36 (76.6)	34 (77.3)	32 (78.1)	33 (76.7)
• Acute cases	11 (23.4)	10 (22.7)	9 (21.9)	10 (23.3)
- Biliary diseases	22 (46.8)	20 (45.5)	14 (34.2)	18 (41.8)
- Pancreatic diseases	0	1 (2.3)	2 (4.9)	2 (4.5)
- Peptic ulceration	8 (17)	8 (18.1)	6 (14.7)	9 (21.6)
- Colon cancers	5 (10.6)	7 (15.9)	10 (24.3)	7 (16.1)
- Small bowel obstruction	1 (2.2)	1 (2.3)	2 (4.9)	1 (2.2)
- Gastric cancer	10 (21.2)	4 (9.1)	5 (12.1)	1 (2.2)
- Appendicitis	1 (2.2)	3 (6.8)	2 (4.9)	5 (11.6)

Table (2): Pre-operative details Values inbetween brackets are percentages

	Group A	Group B	Group C	Group D
* Cardiovascular diseases	3. (6.3)	2 (4.6)	2 (4.8)	3 (6.9)
* Diabetes	2 (4.2)	2 (4.6)	1 (2.4)	0
* Jaundice	4 (6.3)	2 (4.6)	2 (4.8)	3 (6.9)
* Uraemia	0	1 (2.3)	1 (2.4)	1 (2.3)
* Steroids	1 (2.1)	1 (2.3)	1 (2.4)	2 (4.6)
* Malignancy	1 (2.1)	0	0	1 (2.3)
• Serum albumin < 3gm%	2 (1.7)	2.4 (2.3)	2.6 (2.3)	2 (1.7)
• Mean Hb (gm ± s.d.)	13.7 ± 1.7	13.7 ± 1.9	13.7 ± 1.8	13.7 ± 1.8

Table(3): Peroperative details Values inbetween brackets are percentages.

	Group A	Group B	Group C	Group D
☒ Clean	8 (17.0)	8 (18.1)	7 (17.0)	5 (11.6)
☒ Potentially contaminated	33 (70.2)	30 (68.3)	29 (70.3)	32 (74.4)
☒ Contaminated	6 (12.8)	6 (13.6)	5 (12.7)	6 (15.0)
☒ Time taken to open (min) ± s.d.	11.5 ± 4.1	7.5 ± 4.3	8.5 ± 3.5	11.8± 4.5
☒ Range (min)	6 - 25	2-15	2 - 20	5 - 24

DISCUSSION

The lateral paramedian incision has been criticised on two counts. Firstly, it takes longer time to perform than conventional incision, with a mean of 11.5 min in the present study. Most of this time occupied largely by dissection of the anterior rectus sheath from the underlying muscle but it is our contention that this is more than compensated for by not having to resuture a wound dehiscence or incisional hernia⁽¹³⁾. Secondly, this dissection of the anterior rectus sheath, gives the relatively high rate of wound infection, so the use of prophylactic antibiotics reduces infection rate of the lateral paramedian incision to a level comparable with that for other incisions when such prophylaxis is employed^(14,15,16,17). In addition, bearing in mind tissue reaction induced by catgut, with the consequent predisposition to sepsis which may ensue, further reduction in wound sepsis rates may occur if, as originally suggested by Ellis and Heddle^(18,19), closure of the posterior sheath is demonstrated to be unnecessary also the reported incidence of burst abdomens decreased from 11% to an acceptable 1.2%^(8,20,21). Results of exploration of this principle into the lateral paramedian incision have recently been reported by Ellis' group with fascinating results⁽²²⁾. Intrinsic strength of the lateral paramedian incision was confirmed even when the posterior sheath incision was not sutured. This is in accordance with the conclusion of this study in which lateral incision of the posterior rectus sheath is found to be an important component contributing to the integrity of this incision. It would be of interest to know whether non-suture of the lateral incision in the posterior rectus sheath might also diminish the incidence of wound infection with this incision in the light of the fact that wound dehiscence and incisional hernia are not seen even when the lateral posterior sheath incision is not sutured⁽²⁵⁾. In the published reports, the incidence of wound dehiscence and incisional hernia varies between 0.5% and 3%^(18,20) with different abdominal incisions, on the contrary, by doing lateral paramedian incision, there were no cases of wound dehiscence nor incisional hernia (0%) for long follow-up period as shown in our study.

This study was designed to determine the different types of paramedian incisions and their effect on the post-operative results as regards wound sepsis, time taken to open, post-operative wound dehiscence and incisional hernia. Medial dissection of the anterior rectus sheath produced fewer wound infections than lateral dissection. In addition, it also greatly reduced time taken to perform the incision. Unfortunately this is at the cost of an increased wound hernia rate. Similarly, medial dissection of the posterior rectus sheath is also associated with significantly more wound complications. Thus, incision of the anterior or posterior sheath, in a plane more medial than that generally employed for the lateral paramedian incision, failed to

confer any advantage other than reducing time taken to perform the incision. Such modifications carry an increased risk of wound dehiscence and incisional hernia. We conclude that lateral paramedian incision depends on lateral incision of both the anterior layer and the posterior layer of the rectus sheath in order to provide the wide shutter mechanism which obviate risk of wound separation.

In the near future we shall be more and more nearer to solve the problem of burst abdomen completely.

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