

Vertical Abdominal Incisions--A Choice between Midline vs Paramedian

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Different abdominal incisions are used for exposure during different surgical procedures. Exploratory laparotomy in adults is carried out via a vertical abdominal incision in which the choices are midline and paramedian. This study was carried out to find out the better choice between these two incisions regarding their safety. This comparative clinical trial included 100 patients out of whom 50 had laparotomy done via midline incision and other 50 via paramedian (right). The methods employed for creation and closure of incisions were the standard and internationally recognized ones. The development of early complications (subcutaneous wound infection, deep wound infection and dehiscence) was noted during hospital stay. These patients were followed up and late complications (suture sinus and incisional hernias) were also noted. The results, which are comparable with other similar studies, showed that incidence of early complications was more in paramedian incision but midline incision is associated with more chances of development of incisional hernia.

Key Words: Vertical abdominal incision, Midline incision, Paramedian incision, Suture, Complications.

Many of the techniques involved in creating and closing surgical incisions are based on tradition. Exploration of the peritoneal cavity for both elective and emergency procedures requires a good exposure. Most commonly used incision for emergency and elective laparotomies is Midline. However Paramedian incision is also frequently used. These incisions also have different variations regarding their creation and closure¹. Some surgeons prefer the use of electric cautery while making the incision whereas others still prefer the conventional method of using the scalpel. While performing closure the Midline incision can be closed en-mass or in layers. Paramedian incisions are usually closed in layers with the main variation of closing or leaving open the peritoneum. Ratio of suture length to wound length in closure is also important, as different complications are associated with this ratio. Complications can be broadly divided into early (within a week) and late complications. Subcutaneous wound infection, deep wound infection and dehiscence are included in early complications. Suture sinus and incisional hernias are the late complications. Variables associated with complications include hypoalbuminemia, anemia, malnutrition, chronic lung disease and emergency procedure. The additional postoperative factors that were found to be significant were vomiting, prolonged intestinal paralysis, repeated urinary retention, and increased coughing.

Material and Methods:

This comparative clinical trial was carried out in Department of Surgery, Mayo hospital, Lahore from 1st July 1999 to 1st July 2000. Patients selected were those who presented in emergency or outpatient department with some intra-abdominal pathology and required a laparotomy for therapeutic purposes. They were followed up for a minimum of 4 months. A total of 100 consecutive patients were included in this study taking into

consideration the variables associated with complications i.e. Hypoalbuminemia, Anemia, Malnutrition, Chronic Lung Disease, and Emergency presentation. Additional postoperative factors including vomiting, prolonged intestinal paralysis, repeated urinary retention, and increased coughing were also considered. Patients with more than 3 major variables were not included in the study. Then the patients were distributed into two groups; half of them had laparotomy performed via Midline incision and other half via Paramedian incision (in this study only right paramedian incision was used).

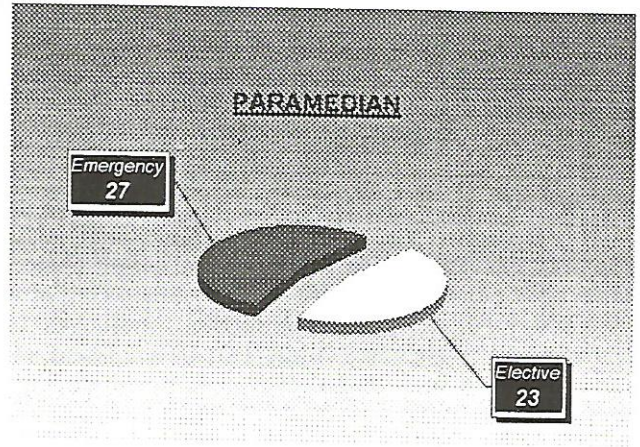
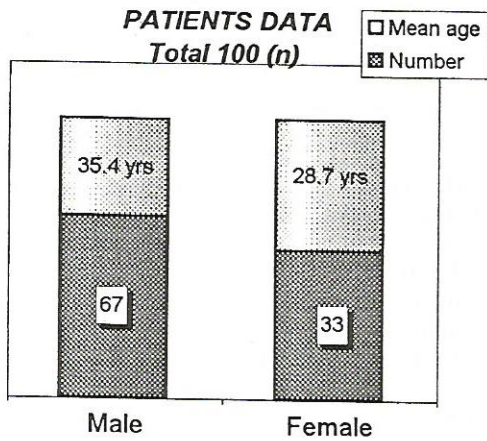
The 100 patients included in this study belonged to both sexes with a mean age of 32.7 years (graph no. 1). Both the incisions were used in both sexes without any discrimination (graph no. 2). Similarly both incisions were used for emergency as well as elective procedures (graph no.3).

Emergency cases were those who presented with Trauma (firearm injury abdomen, stab abdomen, or blunt trauma abdomen), Peritonitis (tuberculous perforation, typhoid perforation, or perforated appendix) or Intestinal obstruction (benign or malignant). Elective case mainly belonged to two categories: those presenting with intestinal obstruction (benign or malignant) or those who presented with malignancy other than GIT. (graph no.4).

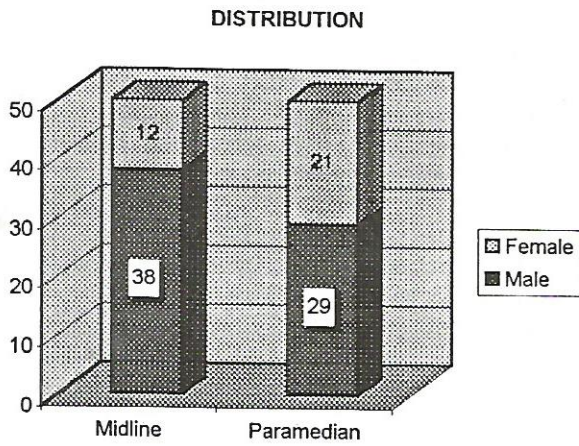
The methods used for laparotomy included use of both knife and cautery. Closure was done in a similar fashion for the chosen incision. Midline incision was closed en-mass with continuous non absorbable (Prolene No.1) suture whereas Paramedian incision was closed in layers with anterior rectus sheath closed continuous with non absorbable (Prolene No.1) suture. Suture Length: Wound Length was kept between 3-4. Skin was closed primarily in all cases. Incisions, which were closed with, interrupted prolene sutures (linea alba) or tension sutures were excluded from this study. Also patients in whom skin was not closed primarily were excluded.

Vertical Abdominal Incisions

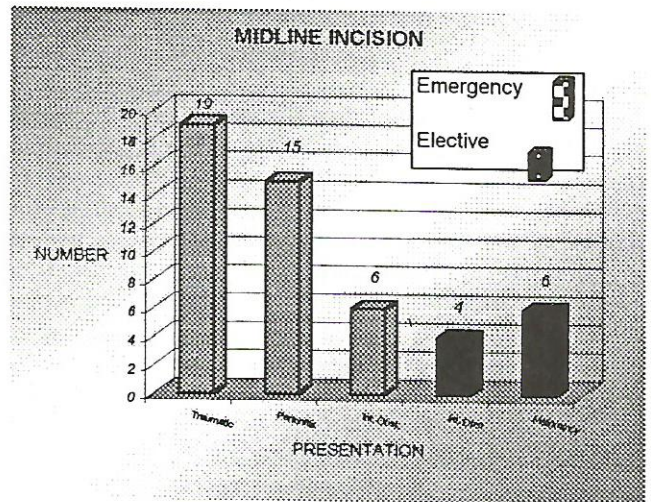
Graph No. 1: Age and Sex distribution.



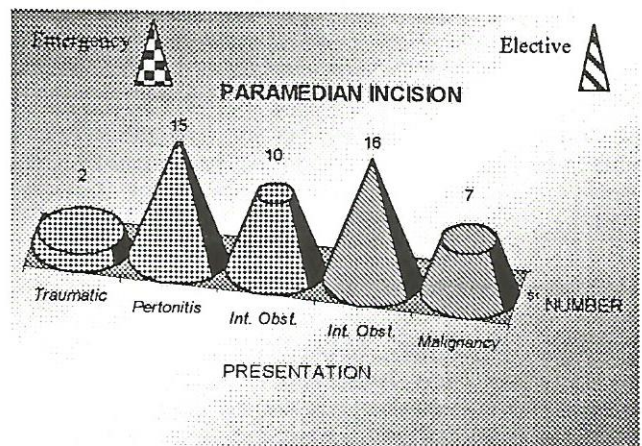
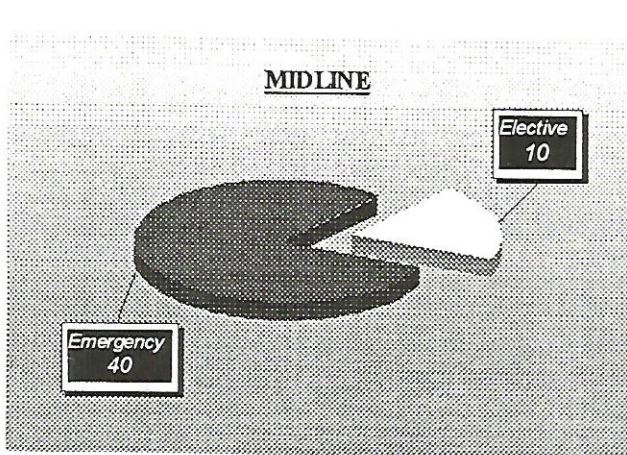
Graph No. 2: Choice of incision and sex distribution.



Graph No. 4: Presenting Disease for which Laparotomy was done.



Graph No. 3: Distribution of Selected Cases.



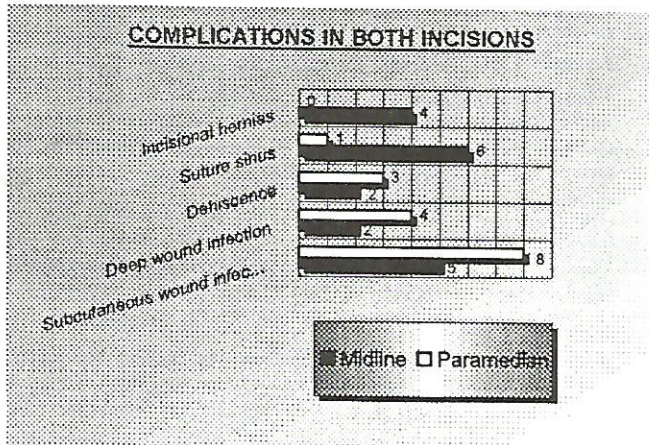
Results:

The patients were kept in the ward for a minimum of 7 days to note the early complications, with the mean hospital stay of 13.2 days. They were followed up for a minimum period of 4 months.

The complications that were noted during this time period were of both early and late types. Total number of early complications noted occurred in 18 patients (18%) and late complications in 11 patients (11%) (graph no. 5). It was noted that early complications mainly occurred in emergency case (75%).

In comparison between midline and paramedian incisions (graph no. 5) the early complications were noted more frequently in paramedian incision (66%) and late mainly in midline (90%) (patients developing wound dehiscence were those who developed deep wound infection except one and hence they do not affect the percentage). Wound infection was managed by early removal of stitches and twice daily dressings. Late complications were noted during follow up in the out patient department. Stitch sinus was managed by removal of the stitch under local anesthesia Patients with incisional hernia were managed on their own merit.

Graph No. 5: Complications seen in Midline vs Paramedian incision.



Discussion:

Traditional techniques involved in creating and closing a surgical incision have been scrutinized over the last several decades and randomized studies have addressed some of the steps in this process¹. Making a vertical incision is the most common and traditional method for doing an exploratory laparotomy. Incisions included in this variety are the midline, right or left paramedian and in paramedian a medial or lateral one². The creation of the incision can be carried out with a knife or cautery¹.

Healing of clean incised wounds is completed in four stages i.e. first stage of primary hemorrhage and acute inflammatory reaction, second stage of epithelization, third

stage of demolition of degraded products, and the final phase of organization³.

The method of closure varies. Midline incisions are usually closed en-mass using a non-absorbable suture; closure can be continuous or interrupted. Some surgeons close the midline incision in layers with inner layer of peritoneum and posterior rectus sheath closed with absorbable suture and outer layer of anterior rectus sheath closed with non-absorbable suture. Again closure can be continuous or interrupted. The use of absorbable suture for closure of midline incisions is rare but studies suggest that it is not followed by any significant change in complications^{4,5}. Paramedian incisions are closed in layers with inner layer closed with absorbable suture and outer layer (anterior rectus sheath) closed with non-absorbable suture, continuously or in interrupted manner.

There are many factors that influence the complications associated with closure. These can be broadly categorized as those related to surgery and patient factors. First category includes as causal factors, the length and urgency of primary surgery, the method used for making the incision, the disease for which surgery was done (emergency or elective), the type of closure, the type and length of suture material used, the technique employed i.e. continuous or interrupted closure and closure of skin. Patient factors include a combination of pathogenetic factors such as malignancy, diabetes, anemia, obesity, chronic lung disease, mal nutrition, and hypoproteinaemia. The additional postoperative factors that were found to be significant were vomiting, prolonged intestinal paralysis, repeated urinary retention, and increased coughing. The interaction of different causes increases the risk of wound rupture in all four stages of healing of the surgical wound.^{6,7}

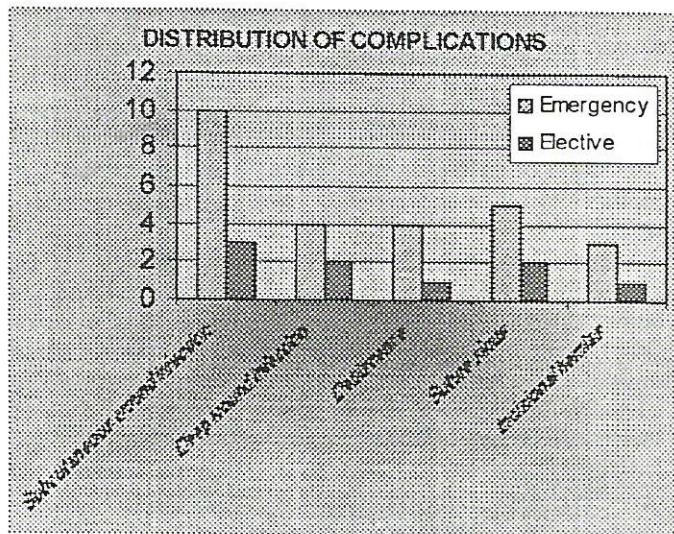
Issraelsson LA, on different studies carried out by him in Sweden has suggested that suture technique affects both early and late wound complications. It is a major determinant of incisional hernia in continuously sutured midline laparotomies. Simple adjustments in technique can considerably improve late operative results. The rate of incisional hernia is lower if the suture length: wound length ratio is 4 or more. However, a high ratio should not be achieved by suturing with a stitch length of 5 cm or more as this is associated with an increase in the rate of wound infection^{8,9,10}. Similar results in other studies suggest a continuous, monofilament, absorbable suture to be used to close a laparotomy incision^{5,11}.

The difference between development of incisional hernia between midline and paramedian incisions is quite marked. Kendall SW et.al have suggested in their study that lateral paramedian incision remains superior to the midline incision closed with the mass technique and its integrity is independent of the suture length to wound length ratio¹². Similar results have been shown in other studies^{13,14}.

Another important factor in development of early and late complications is the type of procedure, whether emergency or elective. Mingoli A et.al. have suggested that the rate of post operative wound infection and incisional hernia after an emergency midline laparotomy is higher than after elective procedures. However, it could be reduced with proper attention to the suture technique, i.e. mass and continuous suture, better preparation of the operative field and scrupulous sterility throughout the procedure in order to decrease the incidence of post-operative wound infection¹⁵.

In our study we have found that early and late complications occurred in both incisions but all of them were mostly associated with emergency procedures (graph no.6). The incidence of early complications was higher in paramedian incision than midline but late complications were mainly associated with midline incision. The complication of development of incisional hernia was only noted in midline incision. The suture length: wound length was kept between 3-4 and that did not affect our results. Various variables associated with complications are a potent risk factor and they should be kept in mind while closing a laparotomy wound.

Graph No. 6: Distribution of Complications in Emergency and Elective cases.



Conclusion:

The development of different early and late postoperative complications is related to the procedure, the choice of incision, the method employed for closure and patient

factors. We suggest that midline incision is superior to paramedian in its quick access and easy closure associated with lesser number of early postoperative complications. However the paramedian incision has the advantage that it is associated with negligible number of incisional hernias.

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