

## Outcome of Various Skin Incisions in Abdominal Surgeries: A Randomized Controlled Study

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### Abstract

One hundred and forty patients were studied in prospective, randomized trial in order to determine whether a vertical, transverse or oblique abdominal incision is the more satisfactory in producing sound wounds. Thirty-five patients were randomized between vertical midline and para-median, transverse and oblique incisions respectively, and followed up for 6 months post-operative. All these patients are compared among all four groups based on age, sex, BMI, length of incision, direction of incision, type of closure, suture material used and chronic illness. All the values are statistically insignificant indicating there is no significant difference in the predisposing factors among the groups.

In our study Para median incision is found to be the most difficult of all the four types of incisions. Time taken for closure is found to be significantly more in Para median incision. Immediate post-operative pain is significantly less in patients with transverse incisions.

Wound infection is found to be more in patients with midline incisions but the results are not statistically significant. No significant difference in wound dehiscence in all the groups. Wound sinus formation is found to be more in patients with

midline incisions but the results are not statistically significant. No significant difference in wound dehiscence in all the groups. Healing time is found to be significantly prolonged in patients with transverse incisions. No significant difference in scar hypertrophy among the groups. Incisional hernias are seen to be more in midline group but the result is not statistically significant.

**Keywords:** Incision; Laparotomy; Hernia; Infection.

### Introduction

A significant proportion of the population has undergone one or the other forms of surgical procedures at one or more points in the life time of an individual. Surgery has become an integral part of global health care, with an estimated 234 million operations performed yearly. The World Bank in 2002 reported that an estimated 164 million disability-adjusted life years, representing 11% of the entire disease burden were attributable to surgically treatable conditions.<sup>1</sup>

The measures used to close the abdomen may vary from surgeon to surgeon depending on training, circumstance and comfort level. However basic principles govern all abdominal closures.

The ideal method of abdominal wound closure should be technically simple and should be free from the post-operative wound complications like wound infection, wound dehiscence, incisional hernia, suture sinus formation and should leave a reasonably aesthetic scar.

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Wound infection and wound dehiscence are two of the most common complications after surgery which predispose an incisional hernia likely to develop within months or perhaps a few years.<sup>2</sup> The reported incidence of incisional hernia varies widely between 0.5 per cent to 13.9 per cent of patients undergoing abdominal operations.<sup>3</sup>

Many factors influence the surgeon's choice when making an abdominal incision. Surgery and organ involved, matters the most important factor. However, there are many occasions when either a vertical or transverse incision would be appropriate and only personal preference or convention selects the route of final choice. There have been few prospective, randomized trials objectively comparing the healing and complications of these options.

This study aims to identify the parameters which influence the outcome of various methods of abdominal wall closure for a period of 6 months.

### Aim

- To compare vertical and horizontal/oblique skin incisions in elective abdominal surgeries

### Objectives

To compare the outcome of vertical and horizontal/oblique skin incisions in elective abdominal surgeries

- With regard to following parameters
- Difficulty levels while incising and closure
- Post-operative pain
- Surgical site infection
- Wound dehiscence
- Scar hypertrophy
- Incisional hernia

### Materials and Methods

This study is a hospital-based time bound prospective comparative study. All the patients undergoing elective abdominal surgeries in JSS hospital during the study period which include October 1st 2017 to 31st December 2019 fulfilling the inclusion and exclusion criteria were included in the study. A preformed proforma was prepared. The relevant data was collected and entered.

**Sample size:** 140 cases A total of 140 patients were analyzed using suitable statistical methods. Of

these 140, 35 patients belong to vertical midline incision group, 35 to vertical paramedian incision group, 35 to transverse incision group, rest 35 to oblique incision group.

Data was analyzed using the Students *t*-test, Chi-square Analyzis and *p* - value of <0.05 was considered significant.

### Inclusion Criteria

- All patients undergoing elective abdominal surgeries of age above 14 years

### Exclusion Criteria

- Laparoscopic abdominal surgeries
- Emergency abdominal surgeries
- Post-operative patients presenting with incisional hernia for which elective abdominal surgeries planned.

### Results and Discussion

In our study vertical midline, vertical para median, transverse and oblique abdominal incisions are compared. A total of 140 patients are included in the study with 35 patients in each group.

All these patients are compared among all four groups based on age, sex, BMI, length of incision, direction of incision, type of closure, suture material used and chronic illness. All the values are statistically insignificant indicating there is no significant difference in the predisposing factors among the groups (Tables 1-3).

**Table 1:** Age Distribution

Type of incision	Mean age (in years)
Midline	54.1 ± 12.9
Para median	53.8 ± 13.5
Transverse	44 ± 12.8
Oblique	37.3 ± 15.9
<i>p</i> -value = 0.152	

**Table 2:** Distribution of cases according to BMI

Type of incision	Mean BMI
Midline	22.3 ± 1.6
Para median	22.1 ± 1.5
Transverse	22.5 ± 1.8
Oblique	21.4 ± 1.1
<i>p</i> -value = 0.312	

**Table 3:** Distribution of incision closures based on the suture material used

Type of suture material	Midline	Para median	Transverse	Oblique
SNM	23	26	24	24
	66%	74%	68%	68%
SAM	9	7	9	9
	25%	35%	26%	26%
SAP	3	2	2	2
	35%	6%	6%	6%

*p*-value = 0.99

SNM: Synthetic Nonabsorbable Monofilament

SAM: Synthetic Absorbable Monofilament

SAP: Synthetic Absorbable Polyfilament

In our study Para median incision is found to be the most difficult of all the four types of incisions. A similar study conducted by Donaldson D R et al.<sup>4</sup> also concluded that this technique is more complex resulting in increased opening time and bleeding is found to be significantly more in patients who have transverse incisions. A similar study conducted by Greenall M J<sup>5</sup> stated that transverse incision is accompanied by more blood loss than midline incision. Time taken for closure is found to be significantly more in Para median incision. Immediate post-operative pain is significantly less in patients with transverse incisions. A similar randomized trial conducted by Armstrong et al.<sup>6</sup> showed a significant reduction in post-operative pain in patients that received a transverse incision. Surgical site infection is found to be more in patients with midline incisions but the results are not statistically significant (Table 4).

**Table 4:** Comparison based on Surgical Site Infection

Type of incision	Surgical Site Infection
Midline	4 (11%)
Para median	2 (6%)
Transverse	2 (6%)
Oblique	1 (3%)

*p*-value: 0.521

No significant difference in wound dehiscence in all the groups (Table 5). A similar study conducted by Brown S.R. and Tieman. J<sup>7</sup> also concluded that there is no significant difference in the wound dehiscence among vertical and transverse group. None of nine randomized trials was able to show as significant difference in wound dehiscence rates after different types of abdominal incisions. Only Waldhausen et al.<sup>8</sup> reported a 1.7% wound dehiscence rate after midline and a 0.25% rate after transverse incisions in a retrospective study in a paediatric setting (*p* <

0.001) (19). When reviewing all data, the transverse incision seems to cause less wound dehiscence than the midline and paramedian incisions, but numbers are too small to speak of an actual trend. Healing time is found to be significantly prolonged in patients with transverse incisions (Table 6).

**Table 5:** Comparison based on wound dehiscence

Type of incision	Wounds dehised
Midline	8 (23%)
Para median	6 (17%)
Transverse	8 (22%)
Oblique	8 (23%)

*p*-value: 0.917

**Table 6:** Comparison of healing time

Healing time	Midline	Para median	Transverse	Oblique
Normal	5 (14%)	16 (46%)	2 (8%)	15 (43%)
Prolonged	30 (86%)	19 (54%)	33 (92%)	20 (57%)

*p*-value: <0.0001

No significant difference in scar hypertrophy among the groups. A similar study conducted by Proske et al.<sup>9</sup> have significantly favoured transverse incision cosmetically. No significant difference in chronic scar pain among the groups (Table 7).

**Table 7:** Comparison based on scar hypertrophy

Type of incisions	Scar hypertrophy
Midline	5 (14%)
Para median	3 (9%)
Transverse	2 (6%)
Oblique	1 (3%)

*p*-value: 0.327

Incisional hernias are seen to be more in midline group but the result is not statistically significant. A similar study conducted by Lip et al.<sup>10</sup> reported an incisional hernia rate of 14% for midline incisions and 1% for transverse incisions (*p* < 0.05). A comparison of midline with oblique incisions was performed in two studies. A retrospective study by Blomstedt et al.<sup>11</sup> reported a 14% hernia rate after midline and a 4% hernia rate after oblique incisions (Table 8).

**Table 8:** Comparison based on development of incisional hernia

Type of incision	Incisional hernia
Midline	6 (17%)
Para median	1 (3%)
Transverse	2 (6%)
Oblique	1 (3%)

*p*-value: 0.062

Three prospective randomized clinical trials compared lateral paramedian with midline incisions and found no incisional hernias after the lateral paramedian incision. The difference with the midline incision was significant in all three studies. In our study the insignificant incisional hernias in midline group is probably because of less Follow-up period of 6 months.

### Conclusion

Although the midline incision is easy and fast, there should be caution with its use, because of the high incidence of incisional hernia. A significant reduction of incisional hernia can be accomplished by the use of a unilateral transverse incision, or by the use of the lateral paramedian incision. Although these incisions take more time to perform, the unilateral transverse incision should be the preferred incision for small unilateral operations, while the lateral paramedian incision should be used for most major elective laparotomies. The use of midline incision should be limited to emergency surgery and exploratory surgery in which unlimited access to the entire abdominal cavity is necessary or useful.

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