Zagazig University Medical Journal
www.zumj.journals.ekb.eg
https://doi.org/10.21608/zumj.2024.234154.2873 Volume 30, Issue 1.6, September 2024, Supplement Issue
Manuscript ID ZUMJ-2310-2986 (R1) DOI 10.21608/ZUMJ.2023.245285.2986

ORIGINAL ARTICLE

Postoperative Surgical Site Occurrence Following Component Separation Versus Onlay Mesh Hernioplasty for Midline Incisional Hernias

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Submit Date: 29-10-2023
Revise Date : 07-11-2023
Accept Date: 08-11-2023

ABSTRACT

Background: Incisional hernias (IH) occur through a weakness at the site of abdominal wall closure. This may be laparotomy or laparoscopic trocar site incisions or parastomal hernia. This study aimed to evaluate the incidence of postoperative surgical site occurrence following component separation and onlay mesh hernioplasty for midline incisional hernias. **Subjects and Methods:** This prospective controlled clinical trial was conducted at the gastrointestinal tract (GIT) and laparoscopic surgery unit Faculty of Medicine at Zagazig University General Surgery Hospitals. The study included 30 patients of Incisional hernia (IH). Patients in this study were divided into two groups: Group (A) included 15 patients underwent component separation techniques (CST) and Group (B) included 15 patients underwent onlay technique. **Results:** the mean operative time in component separation group (114.6±20min) was longer than in onlay group (105.7±26.3min), without statistically significant difference p=0.64. The component separation technique was associated with significantly longer hospital stay compared to only mesh repairs (3±4.6versus 2±0.7; p<0.05). The only mesh repairs was associated with significantly longer time to drain removal compared to component separation technique (14±3.9 versus 10±4.67; p<0.05). The patients with only repairs takes significantly longer time to return to normal activity (97.0±3.8days) compared to those with component separation technique (69.2±6.0 days). Follow up period extended to 6 months. All of seroma needed no surgical interference and managed conservatively. **Conclusion:**The current study showed that both component separation and onlay mesh hernioplasty were safe and effective in the treatment of midline incisional hernias.

Keywords: Incisional hernias, Component Separation, Mesh Hernioplasty.

INTRODUCTION

An estimated 10% of instances after abdominal procedures result in an incisional hernia, a common long-term consequence. On the other hand, since most are asymptomatic, the incidence is likely higher [1].

Obesity, diabetes, emergency surgery, postoperative wound dehiscence, smoking, and infection are risk factors for incisional hernia development [2].

Based on the size (actual fascial gap), incisional hernias are categorized as small (less than 5 cm in width or length), medium (5–10 cm in width or length), and large. (>10 cm in width or length) [3].The contemporary onlay IH repair allows making benefit from both Myofascial advancement provided by component separation and from onlay prosthetic reinforcement provided by mesh fixation [4].

Open mesh repair is the standard procedure for incisional hernia repair. The mesh can be placed between the subcutaneous tissues of the abdominal wall and the anterior rectus sheath Onlayrepair [5].Pain, infection, and increased intra-abdominal tension are the most frequent side effects after hernia traditional repair with mesh. These complications might result in adhesion, intestinal obstruction, and recurrence [6].

Mesh migration and shrinking are additional possible issues that may arise after mesh hernia repair (contraction) [7].

Reconstructive procedures have become more common as a result of the development of hernia surgery. The restoration of a functioning abdominal wall through autologous tissue healing reinforced by mesh reinforcement should be the aim of most, if not all, herniorrhaphes[8].

Common consequences of incisional hernia repair include surgical site infection (SSI), recurrence, mesh infection, wound dehiscence, seroma, and enterocutaneous fistulae [9].

In 1990, Ramirez and colleagues developed the "component separation" theory to heal abnormalities in the abdominal wall. By translating muscle layers through a release incision made in the external oblique aponeurosis, 1-2 cm lateral to the rectus sheath, they intended to expand the surface area of the abdominal wall. A distinct dissection plane is formed, apart from the abdominal wall's neurovascular plane. Through this surgery, a bi-pedicled innervated fasciomuscular flap was produced that could be mobilized medially to span a significant waistline defect up to 20cm in breadth [10].Large complex hernias and polluted patients showed comparatively favorable outcomes with the Component Separation Technique (CST). Given the circumstances, CST appears valuable because there are no other alternatives [11].This study aimed to evaluate the incidence of postoperative surgical site occurrence following component separation and onlay mesh hernioplasty for midline incisional hernias.

METHODS

This prospective controlled clinical trial was conducted at the gastrointestinal tract (GIT) and laparoscopic surgery unit Faculty of Medicine at Zagazig University General Surgery Hospitals during the period from April 2023 to October 2023. The study included 30 patients of Incisional hernia (IH) (13 males and 17 females). The patient or a first-degree relative provided written informed permission, and the research ethics committee approved the study (IRB # 10744/26-4-2023) of Faculty of Medicine, Zagazig University. The inclusion criteria were age 18-60 years old of both genders. Midline incisional hernias with defect size (5 cm -10 cm). The exclusion criteria were patients medically unfit for surgery. Defect size <5 cm or <10cm. Complicated midline incisional hernia. All patients underwent history taking, Clinical examinations including general and local examinations, Details of medical therapy (type, dose, and frequency).

Laboratory investigations including complete blood count, viralmarkers, coagulation profile. Kidney function and Liver function. For individuals older than 40, an echocardiogram and electrocardiogram (ECG) were ordered. Imaging studies including Plain chest X-Ray, pelvis-abdominal Ultrasound, and pelvi-abdominal CT.

Preoperative preparations:

This study were split into two groups, with Group A consisting of 15 patients who had component separation techniques (CST) and Group B included 15 patients underwent onlay technique.

Low molecular weight heparin was given for high risk group. Patients were given 2gm. Ceftriaxone slow intravenous injection 30 minutes preoperatively. In every scenario, use polypropylene mesh. On the operation table, patients were positioned supine. In both pairs (A and B) underwent onlay technique: All surgical procedures were performed under general anesthesia with the patient lying supine on the operating table. Following skin prep and dressing, the abdomen was accessed through an elliptical vertical incision that included the previous scar. Following adhesive lysis and hernia reduction, bilateral subcutaneous flaps were elevated to enable a minimum of 8 cm of mesh overlap for the midline closure. Following the debridement of the hernia sac from the fascial margins, tension is measured as the fascia is approximated using traumatic clamps. The goal was to overlap the fascia over itself approximately 1–2 cm when brought together in the midline without tension.

Surgical technique:

In group A (component repair):

As tension was present Selective myofascial advancement was then used to release this tension after the midline was approximated. For myofascial advancement, we used a traditional, step-by-step components release technique. We first started with a unilateral posterior rectus sheath release and reassessed the tension at the midline (Figure 1). We loosened the posterior sheath on the opposing side and reassessed the tension at the midline if it persisted. Using cautery, the posterior rectus sheath fasciae were cut 1-2 cm lateral to the lineaalba throughout the length of the abdomen wall to accomplish the releases (Figure 2).

In the event where tension persisted after bilateral posterior rectus sheath releases, we performed a unilateral external oblique release 1-2 cm lateral to the lineasemilunaris along the length of the abdominal wall. We only released the external obliques bilaterally if tension persisted after unilateral release, which emphasizes the importance of assessing the level of tension at the midline following each step (**Figure 3A**). A running permanent monofilament suture was then used to repair the defect in the midline. If tension permits, a second layer of slowly absorbable suture was positioned over the closure to imbricate the midline, allowing the lineaalba to be recreated (**Figure 3B**). A substantial, macroporous, mid-weight polypropylene mesh was subsequently positioned across the abdominal wall, ensuring that all lateral releases were covered. The entire damaged area is covered with mesh using multiple 2/0 proline sutures (**Figure 3C**). Then 2-4 large closed-suction drains were placed in the subcutaneous space and the skin is closed in two layers (**Figure 3D**). Abdominal binder was wrapped around patient trunk after surgery. Operative data of all patients were recorded, including duration of the procedure, intraoperative complications, and associated procedure.

In group B (onlay mesh repair):

Dissection was carried out at least 5 centimeters surrounding the defect in the subcutaneous plane. Following that dissection, the extra sac was removed and the contents were decreased back into the abdomen. Continuous no. 1 polypropylene sutures were used to repair the hernial defect in the midline. The polypropylene mesh covered the entire dissected aponeurosis, overlapping in all directions by 5 cm surrounding the healed defect. After that, 2/0 polypropylene sutures were used to secure the mesh to the underlying aponeurosis. Next, a suction drain emerged ahead of the mesh. Both the epidermis and the subcutaneous tissue were closed.

Follow up:

All patients were given postoperative care in the ward and were given IV analgesia in the form of pethidine 100 mg, hospital stay ranged between 5 to 21 days. Patients were followed up for a period ranged from 3-6 months; every week for the 1st month then every two weeks for two months and then monthly, also follow-up on a request basis was available.

Statistical analysis

All data throughout history, clinical examination, laboratory and imaging investigations and outcome measures were collected, tabulated and analyzed using Statistical Package for the Social Sciences (SPSSversion 20.0) software for analysis.

RESULTS

Table 1shows that operative time was longer in Group (A). However, this difference is statistically insignificant.Blood losswas more in Group (B) with significant difference both groups.

Table 2shows that there is significant difference between the periods of hospital stay and time to drain removal of both groups. Hospital stay and time to drain removal were longer in Group (B)**.**

Table 3 shows that return to normal activity took longer time for Group (B). There is significant difference between both groups**.**

Tables 4show follow up results for the patients. Follow up period extended to 6 months. All of seroma needed no surgical interference and managed conservatively. Two patients, of Group (B), needed surgical interference and debridement without need of

mesh removal. One case in Group (B) and 2 cases in Group (A) had postoperative ileus and managed conservatively. No bowel injuries were reported in both groups. Dehisance has significant difference in both groups. Two cases were in Group (B) and one case in Group (A).

Table (1): Operative data: operative time

	Group (A) N =15	Group (B) N =15	t- test	p-value
Operative time (minutes) Mean ± SD	114.6 ± 20	105.7 ± 26.3	1.46	0.64
Blood loss(ml) (mean ±SD)	462.5±164.22	495.00±156.36	0.345	0.02

Table (2): Periods of hospital stay and time to drain removal in both groups:

	Group (A) N =15	Group (B) N =15	t- test	p-value
Hospital stay (days) Mean ± SD	3 ± 4.6	2 ± 0.7	2.08	0.04
Time to drain removal(days) Mean ±SD	10±4.67	14±3.9	3.087	0.004*

Table (3): Return to normal activity (days)

	Group (A) N =15	Group (B) N =15	t- test	p-value
Mean ± SD Range	69.2 ± 6.0 21 - 80	97.0 ± 3.8 31 - 100	1.52	0.13

Table (4): Post-operative complications

	Group (A) N =15		Group (B) N =15		t- test	p-value
	No.	%	No.	%		
Seroma	3	20%	4	26.6%	4.62	0.03
Wound infection	1	6.7%	3	20%	1.56	0.21
Post-operative ileus	2	13.3%	1	6.7%	0.01	0.91
Bowel injury	0	0.0%	0	0.0%	0.0	1.00
Hematoma	1	6.7%	2	12.6%	0.0	1.00
Dehisance	1	6.7%	2	12.6%	0.06	0.8

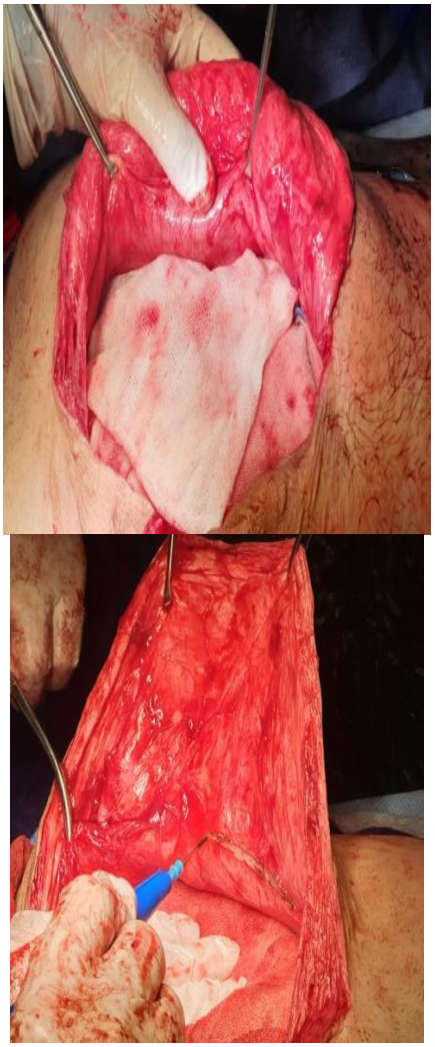


Figure (1): Posterior rectus sheath release**.**

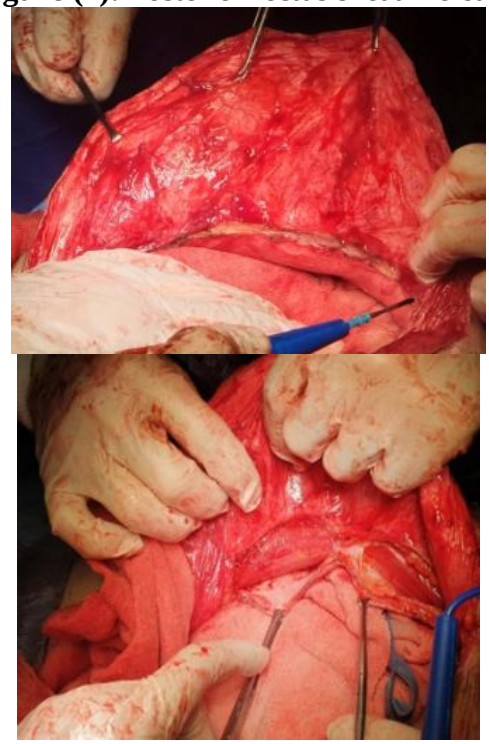
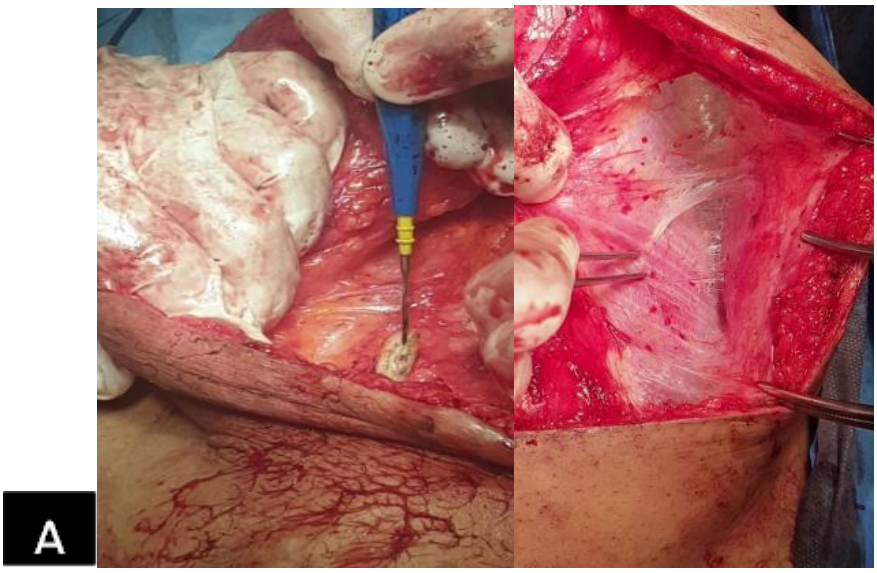
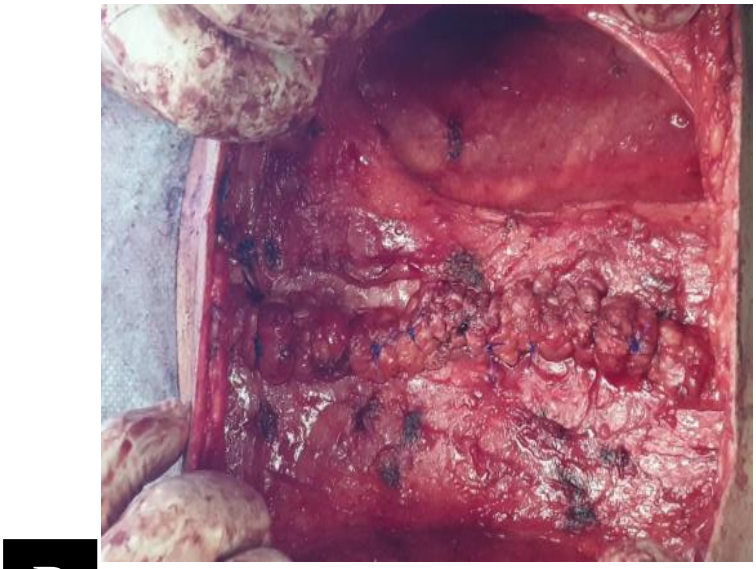


Figure (2): Posterior rectus sheath release along abdominal wall.





B

C

D

Figure (3): A; External obliques release. B; Midline closure with sutures. C: app roximation of sheet edges, D; Mesh placement over the abdominal wall including all releases. E; Skin closure after drain placement

DISCUSSION

Regarding operative time, the current study showed that the mean operative time in component separation group (114.6±20min) was longer than in onlay group (105.7±26.3min), without statistically significant difference p=0.64.

In contrast to the current study Akhnokh et al [12] compared the outcome of onlay classical repair and component separation technique in 30 large incisional hernias, the study enrolled 15 patients in each group, and revealed that there was no significant difference in all baseline data. The study revealed that the mean of operation time was 121.33 in onlay group and 153.27 in component separation group, with highly statistically significant difference. The disagreement with our results may be due to the difference in mean age, BMI, size and duration of IH as well as difference in surgeon experience. As well, Mohammed et al [13] compared between Repairs of sublay and onlay mesh for incisional hernias both groups were matched in baseline data. The mean operative time in sublay group was 112.2 minutes and in onlay group was 98.2 minutes, which was a little bit lower with the current study.

Regarding blood loss, the current study showed that the onlay mesh repairs was associated with significantly higher blood loss compared to component separation technique (495.00±156.36 versus 462.5±164.22; $p<0.05$).

Lower than the current study Saroha et al [14] revealed that after midline abdominal incisional hernia repair using component separation approach, the average surgical blood loss was 422 ml. According to the study, patients with a higher defect size also experienced a longer surgical recovery period and more blood loss.

Larger the current study Alsoudany et al [15] the amount of blood loss among onlay group ranged from 500-1000 ml (742+123) ml, which is slightly less than among sublay group B which ranged from 500- 1200 (779.5+156) ml, probably related to the extent of dissection.

Regarding hospital stay, the current study showed the component separation technique was linked to a noticeably longer hospital stay than onlay mesh replacements (3 ± 4.6 versus 2 ± 0.7; $p<0.05$).

However, Akhnokh et al [12] revealed that there was no statistically significant difference between the onlay group's and the component separation group's mean hospital stay (days), which was 5.61.

Moreover, Arslan&Erdogdu[16]

demonstrated that the length of hospital stay for component separation with mesh (median 5 days) and component separation without mesh did not differ statistically (median 4 days) and primary prosthetic repair (median 5 days) methods in midline abdominal incisional hernia.

Furthermore, Abu-Quora et al [17] the study included two well-matched groups in terms of baseline data and evaluated component separation approach with or without mesh treatment among 40 patients with extensive midline incisional hernias. When comparing component separation without mesh group to component separation with mesh group, there was a statistically significant increase in post-operative hospital stays lasting longer than 14 days.

Regarding time to drain removal (days), the current study showed the onlay mesh repairs was associated with significantly longer time to drain removal compared to component separation technique (14±3.9 versus 10±4.67; $p<0.05$).

In agreement with the current study Akhnokh et al [12] revealed that when comparing the onlay group to the component separation technique, there was a substantial difference in the amount and time of drain removal.

Moreover, Ahmed et al [18] showed that in the sublay group, the average drain removal time was 4.3 days, but in the onlay group, it was 13.6 days, this was comparable with the current study. Similarly, Mohammed et al [13] showed that the mean time of drain removal in sublay group A was 5.9 days while in onlay group was 14.17 days.

Regarding return to normal activity, the current study showed that the patients with onlay repairs takes significantly longer time to return to normal activity (97.0 ± 3.8 days) compared to those with component separation technique (69.2 ± 6.0 days).

The lower bleeding and complications in the component separation technique, resulted in considerable reduction in the length of hospital stay and drain, which shortened the time needed to resume regular activities.

Regarding postoperative complications, the current study showed that six-month follow-up period was included Seroma developed in 4patients of onlay group as compared to 3 patients of component separation group. All of seroma needed no surgical interference and managed conservatively. 4 patients developed wound infection, 3 of onlay group and 1 of component separation group. Two patients, of onlay group, needed surgical interference and debridement without need of mesh removal. One case in onlay group and two cases in component separation group had postoperative ileus and managed conservatively. No bowel injuries were reported in both groups. Dehisance has significant difference in both groups. Two cases were in onlay group and one case in component separation group.

In agreement with the current study Akhnokh et al [12] revealed that showed that wound complications occurrence was (73.3%) in onlay group and (20.0%) in component separation group, with highly statistically significant difference. Wound infection was (9.1%) in onlay group and (33.3%) in component separation group. One case in component separation group had hematoma. Seroma was (90.9%) in onlay group and (33.3%) in component separation group with statistically significant difference. The present study showed that, the rate of recurrence in onlay was (13.3%) and (6.7%) in component separation group, with no statistically significant difference.

However, Arslan&Erdogdu[16] showed that there was no statistical difference in postoperative complications between component separation with mesh (23.3%), component separation without mesh (20%) and primary prosthetic repair (20%) methods in midline abdominal incisional hernia. Furthermore, there was no statistically significant difference in the recurrence between primary prosthetic repair, component separation without mesh (20%), and component separation with mesh (10%) (13.3%).

Moreover, Ahmed et al [18] showed that after the drain was removed, seroma development was observed in 4 patients (20%) in the onlay group but not in any patients in the sublay group. In both groups, the additional problems following surgery were similar. No patient in the sublay mesh group or the onlay mesh group experienced a hernia recurrence during the six-month follow-up period. Similarly, Mohammed et al[13] demonstrated that, while seroma formation following drain removal was observed in six patients in the onlay group, it was not observed in any patients in the sublay group (10%). The other postoperative complications were comparable in both groups. During 6 months of follow-up, hernia recurrence occurred in 1 patient in sublay group (1.7%) and in 3 patients in onlay group (5%).

Furthermore, Abu-Quora et al [17] revealed the component separation procedure without mesh group significantly increased the incidence of seroma and post-operative infection (35% and 25% respectively) than patients in component separation technique with mesh group (15% and 10% respectively). Compared to component separation approach without mesh group (10%), chronic pain considerably increased in patients in the mesh group (25%) patients. When compared to component separation approach with mesh group patients (10%), recurrence was considerably higher in the former group (40%) than in the latter.

Being a single center study, the current investigation was constrained by its small sample size and relatively short follow up period.

Declaration of interest

The authors report no conflicts of interest. The authors along are responsible for the content and writing of the paper.

Funding information

None declared

CONCLUSION

The current study showed that both component separation and onlay mesh hernioplasty were safe and efficient in the management of hernias caused by midline incisions. Longer operating times were linked to component separation technique, bleeding, shorter hospital stays, shorter drain duration, lower rate of complications and consequently shorter duration to return to normal activity compared to only mesh hernioplasty in the treatment of midline incisional hernias.

We would recommend that this study be extended to involve a bigger sample size and longer time for follow up to provide us with ample results relied upon it to add further to the accuracy of the results. In addition, further studies must be done to analyze the various component separation techniques with and without mesh and management strategies when reported surgical site occurrences the exact repercussions on postoperative complications.

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Citation:

Shehata, M., Habeeb, T., Abdulhafed Amrajaa, H., Sallam, A. Postoperative Surgical Site Occurrence Following Component Separation Versus Onlay Mesh Hernioplasty For Midline Incisional Hernias. *Zagazig University Medical Journal*, 2024; (2873-2884): -. doi: 10.21608/zumj.2023.245285.2986