Onlay Classical Repair versus Component Separation Technique in Large Incisional Hernias: Early Complications and Recurrence

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Background: Ventral abdominal wall hernias present a formidable and growing challenge that complicates 11% to 23% of all abdominal laparotomies. Herein, we present technical details, evaluate and compare outcomes of Onlay technique and open perforator preserving anterior component separation in a series of patients undergoing large midline incisional hernia repair.

Objective: To compare between two techniques for repair of huge incisional hernias regard complications (Seroma, infection, wound dehiscene and early recurrence).

Patients and methods: This was a prospective, comparative study that was conducted at Ain Shams University Hospital, For 12 months with minimal follow up 6 months. There were two groups of patient, each Groups 15 patients, Group A for onlay classical repair technique and group B for open perforator preserving anterior component separation technique (CST).

Results: Our study revealed that, the mean of operation time was 121.33 in Group A and 153.27 in Group B, with highly statistically significant difference. The mean of Hernia size was 91.10 in Group A and 105.87 in Group B. The mean of hospital stay (days) was 5.61 in Group A and 5.40 in Group B with no statistically significant difference. Our study revealed that, wound complications occurrence was (73.3%) in Group A and (20.0%) in Group B, with highly statistically significant difference. Wound infection was (9.1%) in Group A and (33.3%) in Group B. One case in Group B had hematoma. Seroma was (90.9%) in Group A and (33.3%) in Group B with statistically significant difference. The present study showed that, the rate of recurrence in Group A was (13.3%) and (6.7%) in Group B, with no statistically significant difference.

Conclusion: Post-operative Wound complications and wound seroma in classical repair significantly increased than component separation, but Wound infection significantly increased in component separation than classical repair. Only one case in component separation had Hematoma. No significant difference was found as regard the rate of recurrence between the two groups. Operation time was higher in component separation than classical repair.

Key words: Component separation technique, large incisional hernias, complications.

Introduction

Incisional hernia (IH) is one of the most common postoperative complications following abdominal surgery. Incisional hernia refers to abdominal wall hernia at the site of a previous surgical incision. Midline incisional hernias are more common than other sites. It can be a definite hernia with all the hernia components of the defect, sac, and content. Or, it can be a weakness of the wall with shallow sac and occasional bulge of content. It is a common surgical problem.[1]

Incisional hernia is classically repaired by direct closure of the defect with insertion of a prosthetic mesh. Many sites were proposed for insertion of the mesh: on lay (on aponeurosis of anterior rectus sheath), Inlay (extraperitoneal position) and sublay (Retromuscular position).[2]

The most common adverse events following hernia classical repair with mesh are pain, infection, increase intra abdominal tension lead to recurrence, adhesion, and bowel obstruction. Some other potential adverse events that can occur following hernia repair with mesh are mesh migration and mesh shrinkage (Contraction).[3]

Evolution of hernia surgery has led to popularization of reconstructive techniques. The goal of most, if not all, herniorrhaphies should be restoration of a functional abdominal wall with autologous tissue repair strengthened by mesh reinforcement.[4]

In 1990, Ramirez and colleagues introduced the concept of 'component separation' for closure of abdominal wall defects.. Their idea was to increase the surface of abdominal wall by translation of muscular layers through a release incision which was done in external oblique aponeurosis 1–2 cm lateral to the rectus sheath. A clear plane of dissection is created away from neurovascular plane of abdominal wall. This procedure allowed for creation of bipedicled innervated fasciomuscular flap which could be mobilized medially to bridge a large defect up to 20 cm width at the waistline.[5]

Component separation technique (CST) achieved relatively good results in large complex hernias and contaminated cases. So, CST seems to be valuable under these conditions as there are no reasonable alternatives.[6]

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Aim of the work

The aim of study to compare between two techniques (On-lay classical repair and component separation) repair of large incisional hernias regard complications (Seroma, infection, wound dehiscene and early recurrence).

Patients and methods

This prospective, comparative study was conducted on 30 patients, diagnosed with large incisional hernia at Ain Shams University Hospital throughout one year with minimal follow-up of 6 months.

Ethical consideration

Informed consent was obtained from all participants and this study was approved by the local ethics committee on research involving human subjects of Ain Shams University, Faculty of Medicine.

Inclusion criteria

Age 18-60 years old. Primary incisional hernias. Medically fit operation (ASA 1,2). Defect size > 5cm.

Exclusion criteria

Risky patients (ASA 3.4.5). Defect size <5 cm. Recurrent hernia.

Study tools

All patients were subjected to: History taking including age, sex, comorbid diseases and surgical history. Clinical Examination (General and Local). Laboratory investigations (CBC, Viral Marker, bleeding profile, kidney function, liver function. Imaging studies (Ultrasound, CT pelvi-abdominal oral and IV contrast when diagnosis not clear).

All Surgeries were done with spinal or general anesthesia.

The coverage of pre-operative antibiotic prophylaxis was routinely preferred, usually using cephalosporins as well as prevention of deep venous thrombosis of limbs and pulmonary embolism in patients, at risk

Pharmacological prevention compression stocking early movement on head.

Operative technique: Elliptical skin incision around Scar to excised: Sac was dissected until reaching the hernia defect. Elevation of skin flaps to expose rectus sheath and external oblique muscle aponeurosis. Opening and lysis of adhesion was done, after reducing hernia content.

Group A: Edges of midline defect were approximated by suture of prolene 1_0 with combined continuous and interrupted type. Good homeostasis was done. Prophetic prolene mesh was fixed to rectus sheath and external oblique aponeurosis to covering at least 5 cm from closed defect in all directions.

Group B: For component separation: Identification of medial and lateral edges of rectus muscle on both sides. Incision of external oblique muscle 2 cm laterally to linea semilinaris from costal margin superiorly to symphysis pobis inferiorly. Dissection of plane between external oblique muscle and internal oblique muscle. Advancement of muscle flap containing the rectus muscle together internal oblique muscle and transversus abdominis to meet the other side and close the midline.

Fixation of mesh at edge of lateral end of excised external oblique after reduction of content

Data Collection: Is following data are collected from patients

Patient characteristic (Age. sex. BMI, size of defect, co-morbidity).

Operative details (Timing of operation, hospital stay).

Post operative follow up (Mean collection drain fluid, hospital stay time of drain removal).

Complication (Seroma, haematoma, infected wound, early recurrence)

Follow up

Patients in this study were followed up:

The patients will be followed up once weekly for one month for follow up of wound and drain and detection of early complication

And another follow up visit after six month to detect early recurrence and other possible complications.

Statistical analysis

Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 20. The qualitative data were presented as number and percentages while quantitative data were presented as mean, standard deviations and ranges when their distribution found parametric. The comparison between two groups with qualitative data were done by using Chi-square test and/or Fisher exact test was used instead of Chi-square test when the expected count in any cell was found less than 5. The comparison between two independent groups with quantitative data and parametric distribution was done by using Independent t-test. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following: $P > 0.05$ = non significant (NS). $P \leq 0.05$ = significant (S). $P < 0.001$ = highly significant (HS).

Results

There were 13 Cases were male and 17 were female and their ages ranged from 18 to 60 years (Mean 46.13 years) the mean BMI were 28.90 ± 3.97.

Table 1: Comparison between Group A (no. =15) and Group B (no. =15) regarding Age (years), Sex, BMI, (kg/m2) and Occupation

		Group A		Group B		Test value	P-value	Sig.
		No.= 15		No.= 15				
Age (years)	Mean ± SD	46.67 ± 12.18		45.60 ± 12.09		0.034●	0.973	NS
	Range	21 – 56		25 – 58				
Sex	Female	9 (60.0%)		8 (53.3%)		0.136*	0.713	NS
	Male	6 (40.0%)		7 (46.7%)				
BMI, (kg/m2)	Mean ± SD	28.29 ± 4.08		29.50 ± 3.92		-0.826●	0.416	NS
	Range	22 – 34		23 – 35				
Hernia size (cm2)	Mean ± SD	91.10 ± 40.11		105.87 ± 42.87		-0.974	0.338	NS
	Range	40 – 165		50 – 190				
Occupation		**No.**	**%**	**No.**	**%**			
Light work		8	53.3%	9	60.0%	0.136*	0.713	NS
Physical work		7	46.7%	6	40.0%			

P-value >0.05: Non significant(NS); P-value <0.05: Significant(S); P-value< 0.01: highly significant(HS).

*: Chi-square test, •: Independent t-test.

Table 2: Comparison between Group A (no. =15) and Group B (no. =15) regarding Co morbidities, ASA risk group and Current smoke

Co morbidities		Group A		Group B		Test value	P-value	Sig.
		No.	%	No.	%			
Cardiovascular	No	11	73.3%	12	80.0%	0.186*	0.666	NS
	Yes	4	26.7%	3	20.0%			
Respiratory system	No	13	86.7%	13	86.7%	0.240*	0.624	NS
	Yes	2	13.3%	2	13.3%			
Diabetes	No	14	93.3%	14	93.3%	0.370*	0.543	NS
	Yes	1	6.7%	1	6.7%			
Steroid use	No	14	93.3%	14	93.3%	0.370*	0.543	NS
	Yes	1	6.7%	1	6.7%			
Smoking								
No		8	53.3%	6	40.0%	0.536	0.464	NS
Yes		7	46.7%	9	60.0%			
ASA risk group								
I		6	40.0%	5	33.3%	0.834	0.659	NS
II		7	46.7%	6	40.0%			

P-value >0.05: Non significant(NS); P-value <0.05: Significant(S); P-value< 0.01: highly significant(HS).

*: Chi-square test, •: Independent t-test.

Table 3: Comparison between Group A (no. =15) and Group B (no. =15) regarding Operation time, (min), Hospital stay (days) and Time of drain removed and Amount of drain removed

		Group A	Group B	Test value•	P-value	Sig.
		No.= 15	No.= 15			
Operation time, (min)	Mean ± SD	121.33 ± 26.48	153.27 ± 31.12	-3.027	0.005	HS
	Range	90 – 165	110 – 200			
Hospital stay (days)	Mean ± SD	5.61 ± 2.33	5.40 ± 1.81	0.280	0.782	NS
	Range	2 – 8.5	2.4 – 8			
Time of drain removed	Mean ± SD	11.40 ± 2.6	8.50 ± 1.3	14.929	0.011	S
	Range	6 – 16	6 – 12			
Amount of drain removed	Mean ± SD	150.00 ± 25.00	130 ± 20.21	5.806	0.023	S
	Range	130 – 200	100 – 180			

P-value >0.05: Non significant(NS); P-value <0.05: Significant(S); P-value< 0.01: highly significant(HS).

*: Chi-square test, •: Independent t-test.

Table 4: Comparison between Group A (no. =15) and Group B (no. =15) regarding Wound complications and Recurrence

		Group A		Group B		Test value	P-value	Sig.
		No.	%	No.	%			
Wound complications	No	4	26.7%	12	80.0%	8.571	0.003	HS
	Yes	11	73.3%	3	20.0%			
Wound infection		1	6.7%	1	6.7%	0.000	1.000	NS
Hematoma		0	0.0%	1	6.7%	1.034	0.309	NS
Seroma		10	66.7%	1	6.7%	11.627	0.000	HS
Recurrence	No	13	86.7%	14	93.3%	0.370	0.543	NS
	Yes	2	13.3%	1	6.7%			

P-value >0.05: Non significant(NS); P-value <0.05: Significant(S); P-value< 0.01: highly significant(HS).

*: Chi-square test, •: Independent t-test.

Discussion

Incisional hernia (IH) is defined by the European Hernia Society as 'any abdominal wall gap with or without a bulge in the area of postoperative scar perceptible or palpable by clinical examination or imaging'. Any surgical incision can lead to the occurrence of IN even the incision of laparoscopic trocar.[7]

IHs typically develops within first 5 years of surgery; however, their development may be delayed. A number of factors contribute to the evolution of a small IH into a large one over a period of time. According to the size of defect, European Hernia Society classifies IHs as: Small: <5 cm in width or length. Medium: 5–10 cm in width or length. Large: >10 cm in width or length.[8]

There is no actual definition for giant IH but probably suggests those with a defect of 15 cm or more.[9]

Large hernias are accompanied by a marked reduction of muscle–aponeurotic tissue of the abdominal wall, muscle atrophy of the abdomen with a large loss of their anatomical and physiological features that determine severe visceral and respiratory impairment. The low intra-abdominal pressure changes the function of the diaphragm promoting its lower and progressive lethargy. As a result, patients may have respiratory problems due to the synergism that changed the abdominal wall, the incoordination between the chest wall, diaphragm, and abdominal muscles.[10]

The tendency of incisional hernia is to progressively increase the traction of the lateral rectus muscles, caused by the antagonist action of the lateral muscles of the abdomen, with the consequent enlargement of the hernia fibrotic ring, small resistance offered by the hernia sac, and the herniated contents of their own weight. In large hernias, the amount of viscera which progressively stretches and holds the hernia sac is such that it can form a 'second abdomen'.[11]

By time, the viscera adopts to locate extra-abdominal as the mesentery extends and becomes thickened by difficulty of venous and lymphatic return. In addition, loss of balance between visceral and parietal tonus leads to chronic bowel dilation. The growth of loops and its mesentery and retraction of the abdominal cavity cause the intestines to lose

their 'right to housing' hindering the reintroduction into the cavity – in particular when trying to reconstruct the normal anatomy of the abdomen by approximation of the rectus muscles in the midline – conditions to produce exaggerated increase of intra-abdominal pressure with serious systemic consequences, particularly respiratory.[12]

For open hernia repair, there are numerous options for mesh placement. Onlay repair places the mesh on the anterior fascia, which typically involves dissection of flaps and primary closure of the fascia below the mesh. Inlay repair places the mesh in the hernia defect and secures the mesh circumferentially to the edges of the fascia. Sublay repair refers to retrorectus or preperitoneal mesh placement. It is also commonly referred to as a Rives-Stoppa or retromuscular repair. Finally, underlay repair is when the mesh is placed in the intraperitoneal position and secured to the anterior abdominal wall.[13]

The aim of study was to compare between two techniques for repair of huge incisional hernias regard complications (Seroma, infection, wound dehiscene and early recurrence).

This was a prospective, comparative study that was conducted at Ain Shams University Hospital, For 12 months with minimal follow up 6 months. There were two groups of patient, each Groups 15 patients, Group A for onlay technique and group B for component separation.

In this study, diabetic patients were (6.7%) In Group A and Group B each.

Our study revealed that, the mean of operation time was 121.33 in Group A and 153.27 in Group B, with highly statistically significant difference. The mean of Hernia size was 91.10 in Group A and 105.87 in Group B. The mean of hospital stay (days) was 5.61 in Group A and 5.40 in Group B with no statistically significant difference.

According to Abu-Quora et al. (2022)[14] who aimed to compare between component separation technique with or without mesh repair in the treatment of large incisional hernia. The patients were divided into two equal groups: Group A had component separation technique with mesh, while group B had component separation technique without mesh. They showed that the post-operative hospital stay included less than 7 days, 7- 14 days and more than 14 days represented as 15%,60% and 25% respectively in group A, but it represented as 10%,50% and 40% respectively in group B. This corresponded to results of Scheurlein et al., (2018).[15]

Hospital stay after operation was affected by complications like wound infection, seroma, fistula, paralytic ileus and concomitant surgical procedure as closure of colostomy.[16]

Our study revealed that, wound complications occurrence was (73.3%) in Group A and (20.0%) in Group B, with highly statistically significant difference. Wound infection was (9.1%) in Group A and (33.3%) in Group B. One case in Group B had hematoma. Seroma was (90.9%) in Group A and (33.3%) in Group B with statistically significant difference.

Abd El-Aziz et al. (2018)[13] reported that, the incidence of seroma in their study was 22.5%, making it the most common complication following the repair of IH. Seroma formation was followed by surgical site infection (SSI) (15%) as the second most common complication. The type of surgery (Elective vs. emergency) was significantly associated with the rate of SSI in their study. SSI was seen in four (10%) patients who underwent previous emergent operations, whereas the other two (5%) patients who developed SSI had underwent previous elective operation. As both of these factors are related to wound care, they warrant better intraoperative and immediately postoperative services. Mesh infection is a devastating complication of IH repair which may result in sepsis, requiring mesh extraction or fistula formation; however, neither mesh infection nor enterocutaneous fistula were seen in their study.

Common complications following ventral hernia repair include infection, seroma, wound dehiscence, and the formation of enterocutaneous fistulae.[17] Each of these complications conveys morbidity and the risk for additional sequelae. Each also relates to the management of the wound and to risks associated with the use of repair materials. A wound dehiscence, for example, may lead to exposure of the repair material; in case of permanent synthetic mesh, it will most likely require removal because of continued risk for infection.[18]

Memon et al., (2013)[18] who aimed to determine the outcomes of large and giant incisional hernia repair with onlay mesh as well as the risk factors of recurrence and surgical site infection at a tertiary care hospital in developing country. They reported that the incidence of surgical site infection in our study was 21.67%, making it the most common complication following the repair of incisional hernia. This is consistent with literature, with wound infection as the most common complication following incisional hernia repair. Diabetes mellitus, emergency surgery, contaminated surgery and recurrent incisional hernia were the only significant predisposing factors for SSI in their study. Surgical site Infection was followed by seroma formation (1.67%) as the second most common complication.[19]

Studies have reported rates of infection following ventral hernia repair ranging from 4% to 16%, compared with only 2% following other clean surgical procedures.[20,21]

Memon et al., (2013)[18] reported that, mesh Infection is a devastating complication of Incisional hernia repair which may result in sepsis, requiring mesh extraction or fistula formation. In their study two patients developed this complication.

Cobb et al. (2009)[22] observed a rate of 10.2% of mesh infections in their retrospective study. Since majority of the cases of mesh infection require mesh explantation, the authors concluded that mesh infection after incisional hernia surgery conveys significant morbidity and should be avoided.

Abu-Quora et al. (2022)[14] showed that there was a significant increase in seroma and infection in group B (Had component separation technique without mesh) than group A (Had component separation technique with mesh), while there was significant increase in chronic pain in group A than group B. Wound complications including seroma, hematoma, infection, necrosis and chronic pain 15%, 10%, 10%, 5% and 25% respectively in group A, while in group B the wound complications in this study represented35%, 10%, 25%, 10% and 10% respectively, which corresponds to results in Slater et al. (2015).[23]

Risk factors of infection after component separation are obesity, smoking, diabetes mellitus (DM), and immunosuppression.[17]

The present study showed that, the rate of recurrence in Group A was (13.3%) and (6.7%) in Group B, with no statistically significant difference.

Abd El-Aziz et al. (2018)[13] reported that, the rate of recurrence in the onlay group in their study was 5% (mean follow-up: 12 months), which is significantly lower compared with an average of 18.3 and 20% for the onlay technique of repair reported in Mohebali et al.[24,25] but little bit higher in the study of Karan et al. (2013).[26] The discrepancy in results can be because of patient factors and follow-up time.

Memon et al., (2013)[18] reported that, the recurrence rate following repair of ventral incisional hernia in their study is 6.6%. This Low recurrence rate in their study can be attributed to a number of factors. Firstly, the mean duration of follow up (Mean 29.45 ± 5 months) in their patients was shorter than similar studies from around the world. Memon et al (2008) although having a shorter follow up period than us had a recurrence rate similar to us (7%). Secondly, only 18.3% of their patients had already undergone any previous repair of Incisional hernia, whereas 28.3% and 100% of the patients had undergone one or more previous incisional hernia repairs in the studies conducted by de Vries Reilingh et al (2003)[5] (Recurrence rate: 28%) and Afifi (2005)[27] (Recurrence rate: 14.6%), respectively. This effect of increase in recurrence rate after subsequent incisional hernia repairs is well documented in literature.[28]

Venclauskas et al. (2010)[29] and de Vries Reilingh et al (2003)[5] reported recurrence rates of 10.5% and 23% in their onlay groups with mean follow ups of 12 and 30 months, respectively. This discrepancy can be because of patient factors and follow up time as mentioned before.

Abu-Quora et al. (2022)[14] reported that, there was an insignificant difference between group A (Had component separation technique with mesh) and group B (Had component separation technique without mesh) according to readmission and reoperation within 30 days. The total readmission and reoperation within 30 days was 30% and 55% in group A and group B respectively. The differentiation due to wound complications, GIT complications and recurrence were 20%, 10% and 0%in group A respectively, and 35%, 10% and 10% in group B respectively. This agreed with the results of Albalkiny and Helmy (2018)[30].

Abu-Quora et al. (2022)[14] showed that there was a significance increase in total recurrence of hernia in group B patients than patients in group A. The total hernia recurrence was 10% and 40% in group A and group B respectively. All recurrences in group A were minor hernia, while in group B 15% had minor recurrent hernia, and 25% had major recurrent hernia which corresponds to the results of Slater et al. (2015).[23]

A popular method that potentially decreased recurrences after CST was augmentation of the repair with mesh prosthesis. However, concerns with mesh implantation were infection or erosion of the prosthesis after these contaminated procedures, necessitating reoperation for its removal.[31]

Recurrence is caused by early degradation of the mesh, early removal of the mesh (as necessary following infections), or mesh failure.[32] Mesh failure is caused by central mesh fracture or fixation/ suture line failure.[33] Central mesh failure occurs in lightweight, but not in heavyweight meshes. Suture line failure is common and is due to surgeon inexperience or fixation technique dependent. This is why so much effort is being made to find superior fixation techniques.[34]

Parker et al. (2002)[35] reported 0% recurrence after laparoscopic repair of large incisional hernias with follow up of 41 months.

Conclusion

Post-operative Wound complications and wound seroma in only classical repair and component separation classical repair significantly increased than component separation, but wound infection significantly increased in component separation than classical repair. Only one case in component

separation had hematoma. No significant difference was found as regard the rate of recurrence between the two groups. Operation time was higher in component separation than classical repair.

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