

# COMPONENT SEPARATION TECHNIQUE FOR LARGE INCISIONAL HERNIA WITH AND WITHOUT MESH REPAIR

## (Comparative Study)

By

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### ABSTRACT

**Background:** Component separation technique is an ideal method to repair large incisional hernia with wide fascial gap, as it allows sliding of the abdominal wall layers giving length to close the abdomen after return abdominal contents without tension and return of midline linea alba.

**Objective:** To compare between component separation technique with or without mesh repair in the treatment of large incisional hernia.

**Patients and Methods:** The current study included 40 patients with large midline incisional hernia had repaired the hernia by component separation technique at the Department of Surgery, Al-Azhar University Hospitals during the period from November 2018 to October 2020. 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.

**Results:** There were significant increase in seroma and post-operative infection in group B (35% and 25% respectively) than patients in group A (15% and 10% respectively). Chronic pain significantly increased in group A patients (25%) than group B (10%). Recurrence significantly increased in group B patients (40%) than group A patients (10%).

**Conclusion:** Post-operative hernia recurrence, wound seroma and infection in group B patients were higher than group A, but chronic pain is higher in group A.

**Keywords:** Component separation, Incisional hernia.

### INTRODUCTION

Incisional hernia is the most common complication and the most common indication for reoperation after laparotomy (Pauli and Rosen, 2013). It results in functional impairment, in addition to obvious cosmetic concerns with abdominal bulge (Mazzocchi et al., 2011).

The most important aim of abdominal wall reconstruction in patients with fascial defect is to prevent bowel herniation, incarceration, perforation and death which achieved by strong, stable and dynamic repair (Khansa and Janis, 2014).

Posterior component separation involves release of transversus abdominis

muscle by making plane between transversus abdominis muscle and fascia transeversalis, which can be dissected laterally up to psoas muscle (*Novistky et al., 2012*). Separation of the abdominal wall components can be achieved anteriorly by performing external oblique muscle release (anterior components separation) with lipo-cutaneous flaps (*Sleiwah and McAllister, 2019*).

The mesh used for repair is preferred to be large (30x30) light weighted, macroporous and polypropylene mesh, which is suitable for clean and clean contaminated fields but it should be placed not in direct contact with intestine to avoid adhesion and obstruction (*Yang, 2013*).

**The aim of the study was to** compare between component separation technique with mesh repair and component separation technique without mesh repair in the treatment of large incisional hernias the time of operation, post-operative hospital stay, post-operative complications, readmission and reoperation within 30 days and recurrence rate.

## PATIENTS AND METHODS

This prospective study was carried on 40 patients who underwent component separation technique for large incisional hernia at the Department of Surgery, Al-Azhar University Hospitals during the period from November 2018 to October 2020. The study protocol was approved by the ethical committee and informed consent was taken from every patient. The patients included were divided into two equal groups: Group A component separation technique with mesh repair,

and group B component separation technique without mesh repair.

### Inclusion criteria:

1. Hernia after midline incision.
2. Reducible hernia.
3. Primary hernia or recurrent for one time.
4. Defect ranges from 100-200 cm<sup>2</sup>.
5. Body mass index (BMI) up to 40.

### Exclusion criteria:

1. Non-midline hernia.
2. Irreducible hernia.
3. Recurrent more than once.
4. Defect more than 200 cm<sup>2</sup>.
5. BMI more than 40.
6. Chronic obstructive pulmonary disease.

### Preoperatively:

History was taken from all the patients including; age, sex, comorbid diseases and surgical history. Clinical examination was done generally for the whole body like BMI and locally for the incisional hernia. Routine investigations; blood investigations and radiological investigations as abdominal ultrasound. Written consent from all patients, who accepted to be included in the study and the patients, who refused to be included in the study took the same medical service.

### Operatively:

- A. Type of the operation.
- B. Concomitant surgical procedure:
  1. Revision of colostomy.
  2. Closure of entero-cutaneous fistula.

3. Cholecystectomy.
- C. Reasons for surgical field contamination.
- D. The placement of mesh reinforcement.
- E. Time of the operation.

#### Postoperatively:

##### A. Short term outcome:

1. Post-operative hospital stay.
2. Readmission and reoperation within 30 days
3. Complications
  - Wound complications: infection, cellulitis, seroma, hematoma, necrosis of skin and subcutaneous and abscess formation.

- GIT complications: paralytic ileus and fistula.
- Pneumonia and urinary tract infection.

##### B. Long term outcome:

Recurrence.

##### Statistical methods:

Data were analyzed using statistical package for social science (SPSS) software computer program, version 15. Data were described using mean and standard deviation (SD) and frequencies according to the type of the data (quantitative or categorical respectively). Chi-square test was used for comparison of qualitative variables. P-value  $\leq 0.05$  was considered significant.

## RESULTS

The Mean $\pm$ SD of the age of patients in group A was 46.70 $\pm$ 13.914, while the Mean $\pm$ SD of the age of patients in group B was 50.85 $\pm$ 15.709. Nine patients out of 20 (45%) in group A were males, while in group B were 7 out of 20 (35%). On the other hand, 11 patients out of 20 (55%) in group A were females, while in group B were 13 out of 20 (65%). Patients in group A with diabetes mellitus, hypertension and smoking were 7 (35%), 9 (45%) and 6 (30%) respectively, while in group B were 11 (55%), 6 (30%) and 5 (25%) respectively. There was an insignificant difference between group A and B according to the cause of incisional hernia with P-value $>0.05$ . incisional hernia

resulted from exploration after blunt trauma in 7 out of 20 (35%) in group A, while was 6 out of 20 (30%). Incisional hernia resulted from exploration due to penetrating trauma was 2 out of 20 (10%) in both groups A and B. Incisional hernia resulted from exploration due to intestinal obstruction was 4 out of 20 (20%) and 6 out of 20 (30%) in group A and group B respectively. Incisional hernia resulted from exploration due to peritonitis was 3 out of 20 (15%) in group A, while was 5 out of 20 (25%) in group B. Incisional hernia resulted from exploration due to perforated peptic ulcer was 4 out of 20 (20%) in group A, while was 1 out of 20 (5%) in group B (**Table 1**).

**Table (1): Number and percentage of patients according to age, sex, history of co-morbid diseases and surgical history**

Groups	Age			Sex		Co-morbidity			Surgical history				
	20-39 Y	40-59 Y	60-80 Y	Male	Female	Diabetes Mellitus	Hypertension	Smoking	Trauma		Intestinal obstruction	Peritonitis	Perforated peptic
									Blunt	Penetrating			
Group A	7 (35%)	10 (50%)	3 (15%)	9 (45%)	11 (55%)	7 (35%)	9 (45%)	6 (30%)	7 (35%)	2 (10%)	4 (20%)	3 (15%)	4 (20%)
	Mean±SD 46.70±13.914												
Group B	6 (30%)	8 (40%)	6 (30%)	7 (35%)	13 (65%)	11 (55%)	6 (30%)	5 (25%)	6 (30%)	2 (10%)	6 (30%)	5 (25%)	1 (5%)
	Mean±SD 50.85±15.709												
P value	> 0.05			> 0.05		> 0.05			> 0.05				

The normal range of BMI were 4 out of 20(20%) in group A, On the other hand they were 3 out of 20 (15%) in group B. The pre-obese patients represented 7 out of 20 (35%) in group A, while they were 4 out of 20 (20%) in group B. The obese class I patients were 4 out of 20 (20%) and 6 out of 20 (30%) in group A and

group B respectively. In group A the obese class II patients were 5 out of 20 (25%), while they were 7 out of 20 (35%) in group B. There was insignificant difference between group A and B according to BMI with P-value>0.05 (**Table 2**).

**Table (2): Number and percentage of patients according to BM**

Groups	Group A		Group B		P value
	Number	Percentage	Number	Percentage	
Normal rang (18.5- 24.9)	4	20%	3	15%	>0.05
Pre obese (25- 29.9)	7	35%	4	20%	
Obese class I (30- 34.9)	4	20%	6	30%	
Obese class II (35- 39.9)	5	25%	7	35%	
Total	20	100 %	20	100 %	

There was an insignificant difference between group A and B according to the type of operation with P-value>0.05. The open anterior component separation technique was performed in 2 patients out of 20 (10%) in group A, while it was performed in 4 out of 20 (20%) in group B. 4 patients out of 20 (20%) in group A

had open perforator sparing anterior component separation, while they were 7 out of 20 (35%) in group B. Open posterior component separation technique was done in 14 out of 20 (70%) and 9 out of 20 (45%) in group A and group B respectively (**Table 3**).

**Table (3): Number and percentage of patients according to the type of operation**

Groups	Group A		Group B		P value
	Number	Percentage	Number	Percentage	
Open anterior component separation	2	10%	4	20%	>0.05
Open perforator sparing anterior component separation	4	20%	7	35%	
Open posterior component separation	14	70%	9	45%	
Total	20	100 %	20	100 %	

No revision of colostomy was done in patients in group A, while there were 5 patients out of 20 (25%) in group B. No entero-cutaneous fistula was done in group A, but there were 2 patients out of 20 (10%) in group B. Cholecystectomy was done in 3 out of 20 (15%) in group A,

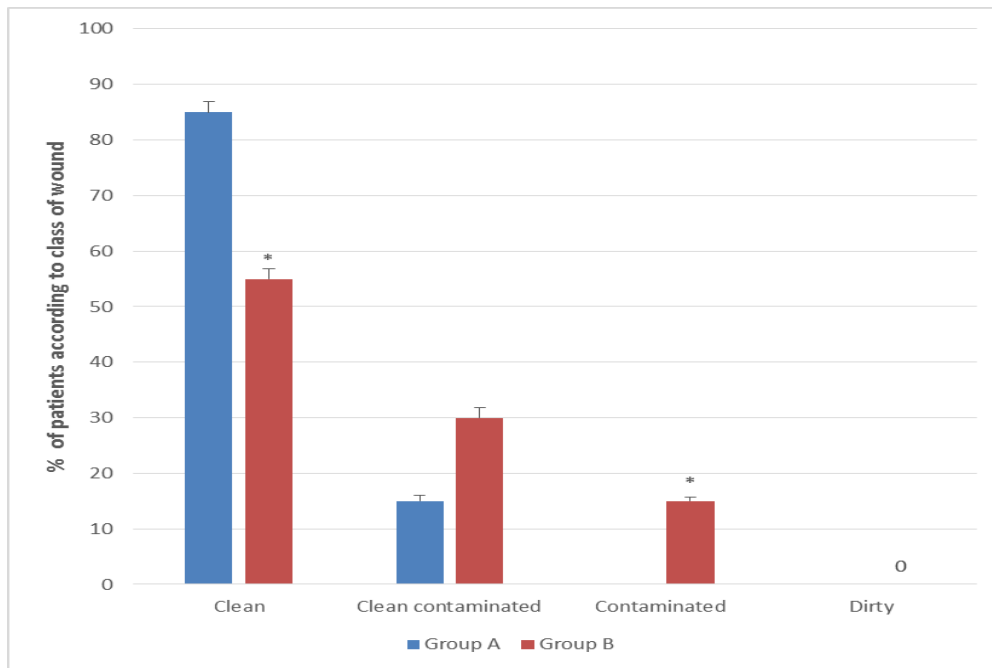
while it was 2 out 20 (10%) in group B. Most of patients didn't have concomitant surgical procedure with CST which represented 17 out of 20 (85%) in group A and 11 out of 20 (55%) in group B (Table 4).

**Table (4): Number and percentage of patients according to presence or absence of Concomitant surgical procedure and its type if present**

Groups		Group (A)		Group (B)	
		Number	Percentage	Number	Percentage
Yes	Revision of colostomy	0	0%	5	25%
	Closure of entero-cutaneous fistula	0	0%	2	10%
	Cholecystectomy	3	15%	2	10%
NO		17	85%	11	55%
Total		20	100 %	20	100 %

The surgical wound was clean in 17 out of 20 (85%) in group A, while it was 11 out of 20 (55%) in group B. The clean contaminated wound represented 3 out of 20 (15%) in group A and 6 out of 20

(30%) in group B. There was no contaminated wound in group A, but there were 3 out of 20 (15%) in group B. There was no dirty wound in both groups A and B (Figure 1).



**Figure (1): Percentage of patients according to class of wound**

Only 2 cases out of 20 (10%) had on lay mesh in group A, while 18 out of 20 (90%) had sub lay mesh. Mean  $\pm$  SD for

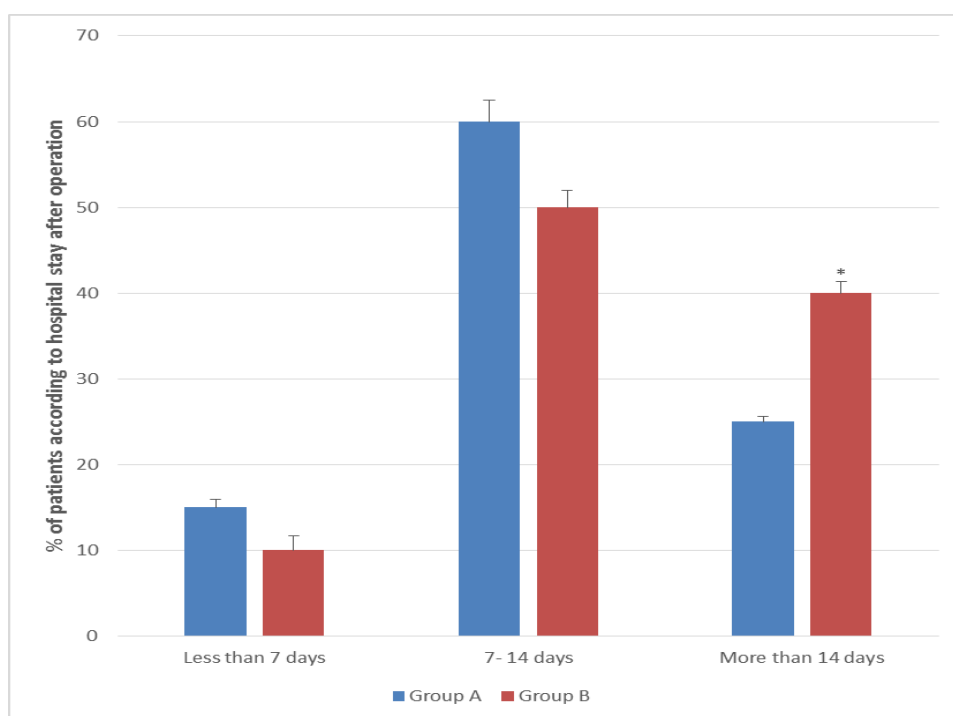
the time of operation in group A patients was  $254 \pm 1.65$  minutes, while in group B it was  $212 \pm 2.16$  minutes (**Table 5**).

**Table (5): Number and percentage of mesh placement**

Groups	Group (A)		Group (B)	
	Number	Percentage		
Onlay	2	10%	NO	
Sublay	18	90%		
Total	20	100%	20	100%

Three out of 20 (15%) in group A stayed in hospital less than 7 days, while it was 2 out of 20 (10%) in group B. 12 patients out of 20 (60%) in group A stayed in hospital for 7 to 14 days post-operatively, while it was 10 out of 20

(50%) in group B. 5 out of 20 (25%) stayed more than 14 days post-operatively in group A, but it was 8 out of 20 (40%) in group B. There was significant increase in post-operative hospital stay more than 14 days in group B than group A (**Figure 2**).



**Figure (2): Percentage of patients according to hospital stay after operation**

There was a significant increase in seroma and infection in group B than group A, while there was a significant increase in chronic pain in group A than group B. In group A the wound complications asseroma, hematoma, infection, necrosis and chronic pain are 3 (15%), 2 (10%), 2(10%), 1 (5) and 5 (25%) respectively, while they were 7 (35%), 2 (10%), 5 (25%),2 (10%) and 2

(10%) respectively in group B. Paralytic ileus was 4 out of 20 (20%)in group A, while it was 3 out of 20 (15%) in group B. Intestinal fistula occurred in 2 out of 20 (10%) in both groups A and B. Medical complications as pneumonia, UTI and retention were 0 (0%), 2 (10%), 3 (15%) respectively in group A, while they were 1 (5%), 1 (5%), 2 (10%) respectively in group B (**Table 6**).

**Table (6): Number and percentage of patients with complications if present**

Groups		Group A		Group B		p value
		Number	Percentage	Number	Percentage	
Wound complications	Seroma	3	15%	7	35%	<0.05*
	Hematoma	2	10%	2	10%	>0.05
	Infection	2	10%	5	25%	<0.05*
	Necrosis	1	5%	2	10%	>0.05
	Chronic pain	5	25%	2	10%	<0.05*
GIT complications	Paralytic ileus	4	20%	3	15%	>0.05
	Fistula	2	10%	2	10%	
Medical complications	Pneumonia	0	0%	1	5%	>0.05
	UTI	2	10%	1	5%	
	Retention	3	15%	2	10%	

There was an insignificant difference between group A and group B according to Readmission and reoperation within 30 days. The total of readmission and reoperation in group A is 6 out of 20 (30%) due to wound complications, GIT complications and recurrence was 4 (20%),

2 (10%) and 0 (0%) respectively. On the other hand, total of readmission and reoperation in group B is 11 out of 20 (55%) due to wound complications, GIT complications and recurrence was 7 (35%), 2 (10%) and 2 (10%) respectively (**Table 7**).

**Table (7): Number and percentage of patients with readmission and reoperation with related causes**

Groups	Group A		Group B		P value
	Number	Percentage	Number	Percentage	
Wound complications	4	20%	7	35%	>0.5
GIT complications	2	10%	2	10%	
Recurrence	0	0%	2	10%	
Total of readmission and reoperation	6	30%	11	55%	

There was a significance increase in total recurrence of hernia in group B patients than patients in group A. The total recurrence in group A is 2 out of 20 (10%) and that all of them are minor and 1 (5%) occurred 1-3 months post-operative and

1(5%) occurred 3-6 months post-operatively. In group B total recurrence is 8 out of 20(40%) with 5 (25%) and 3 (15%) was major and minor recurrence respectively (**Table 8**).

**Table (8): Number and percentage of patients according to time and extent of recurrence**

Groups		Group A		Group B		p value
		Number	Percentage	Number	Percentage	
Time to recurrence	Less than 1 month	0	0%	2	10%	>0.05
	1-3 months	1	5%	5	25%	
	3-6 Months	1	5%	1	5%	
Extent of recurrence	Major	0	0%	5	25%	0.01*
	Minor	2	10%	3	15%	>0.05
Total of recurrence		2	10%	8	40%	0.03*

## DISCUSSION

The present study 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 *Scheuerlein et al.*, (2018). Hospital stay

after operation was affected by complications like wound infection, seroma, fistula, paralytic ileus and concomitant surgical procedure as closure of colostomy (*Desai et al.*, 2016).

The current study showed that there was a significant increase in seroma and infection in group B than group A, 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 represented 35%, 10%, 25%, 10% and 10% respectively, which corresponds to results in *Slater et al. (2015)*.

Risk factors of infection after component separation are obesity, smoking, diabetes mellitus (DM), and immunosuppression (*Breuing et al., 2010*). Operative factors, i.e. operative approach, duration of surgery degree of soft tissue disruption, intraoperative contamination, choice of prosthetic material and its location within the abdominal wall, previous surgical site infection, performance of other procedures via the same incision at the time of repair, longer operative time, lack of tissue coverage of the mesh and enterotomy and enter cutaneous fistula (*Sanchez et al., 2011* and *Albino et al., 2013*). Mesh-related factors are used of larger mesh sheets, microporous meshes and ePTFE mesh (*Sanchez et al., 2011*).

Skin necrosis can occur as a result of interruption skin blood supply from the intercostal arteries due to excess subcutaneous undermining. Skin necrosis can be avoided by minimizing subcutaneous undermining and disruption of cutaneous blood supply and by perforator preservation (*Clarke, 2010* and *DiCocco et al., 2010*).

Chronic pain is a common complication due to combination of mesh associated inflammation, nerve damage from mesh fixation, nerve entrapment or damage, visceral adhesions to the mesh

and fixation points and tension in the repair (*Sanders and Kingsnorth, 2012*).

The current study showed that GIT complications included paralytic ileus and fistula represented 20% and 10% respectively in group A, while in group B represented 15% and 10% respectively, which agreed with results in (*Romanowska and Pawlak, 2018*).

In this study, there was an insignificant difference between group A and group B 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)*.

Skin necrosis occurred in anterior component separation technique due to excessive dissection in musculocutaneous plane resulting in perforator vessel damage, earlier intra-abdominal catastrophe, and tight skin sutures were the causes for skin necrosis by hampering the blood supply of skin (*Saroha et al., 2020*).

The present study 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)*.

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 (*Slater et al., 2013*).

Recurrence is caused by early degradation of the mesh, early removal of the mesh (as necessary following infections), or mesh failure (*Ditzel et al., 2013*). Mesh failure is caused by central mesh fracture or fixation/suture line failure (*Barzana et al., 2012* and *Petro et al., 2015*). 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 (*Reynvoet et al., 2014*).

## CONCLUSION

Post-operative hernia recurrence, wound seroma and infection in group B significantly increased than group A, but chronic pain significantly increased in group A than group B.

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## إصلاح فتق جراحی كبير عن طريق فصل طبقات جدار البطن مع تركيب شبكة أو بدونها (دراسة مقارنة)

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**خلفية البحث:** تقنية فصل طبقات جدار البطن هي طريقة مثالية لإصلاح الفتق الجراحی الكبير مع وجود فجوة لفافة واسعة، حيث تسمح بانزلاق طبقات جدار البطن مما يعطي الطول لغلق البطن بعد عودة محتويات البطن دون شد وعودة خط الوسط الى مكانه.

**الهدف من البحث:** المقارنة بين تقنية فصل طبقات جدار البطن مع تركيب شبكة اوبدون تركيب شبكة في علاج الفتق الجراحی الكبير.

**المرضى وطرق البحث:** تضمنت الدراسة 40 مريضاً يعانون من فتق جراحی كبير بخط الوسط اصلاح الفتق بتقنية فصل طبقات جدار البطن وقد تم تقسيم المرضى إلى مجموعتين متساويتين وقد كان لدى مرضى المجموعة (أ) تقنية فصل طبقات جدار البطن مع تركيب شبكة، بينما كان لدى مرضى المجموعة (ب) تقنية فصل طبقات جدار البطن بدون تركيب شبكة.

**نتائج البحث:** كانت هناك زيادة كبيرة في التورم المصلى والعدوى بعد الجراحة في مرضى المجموعة (ب) بنسب 35% و 25% على الترتيبين مرضى المجموعة (أ) بنسب 15% و 10% على الترتيب. وقد ازداد الألم المزمن بشكل ملحوظ في مرضى المجموعة (أ) بنسبة 25% عن

مرضى المجموعة (ب) بنسبة 10%. وازداد معدل تكرار حدوث الفتق بشكل كبير في مرضى المجموعة (ب) بنسبة 40% عن مرضى المجموعة (أ) بنسبة 10%.

**الاستنتاج:** تكرار حدوث الفتق بعد الجراحة و التورم المصلي والعدوى في مرضى المجموعة (ب) أعلى من مرضى المجموعة (أ)، لكن الألم المزمن أعلى في مرضى المجموعة (أ).

**الكلمات الدالة:** فصل طبقات جدار البطن والفتق الجراحي.