

A comparative study of on-lay mesh repair and retro-rectus mesh placement in incisional hernia repair

¹Dr. Dinesh Kumar Sharma, ²Dr. Shiv Kumar Bunkar, ³Dr. Naresh Kumar, ⁴Dr. Rahul Yadav, ⁵Dr. Poornima Sharma

^{1,3,4}Resident Doctor, Department of General Surgery, JLNMC, Ajmer, Rajasthan, India

²Senior Professor and Unit Head, Department of General Surgery JLNMC, Ajmer, Rajasthan, India

⁵Assistant Professor, Department of Community Medicine, PDUMC, Churu, Rajasthan, India

Corresponding Author:

Dr. Poornima Sharma

Abstract

Background: Incisional hernia continues to be one of the common post-operative complication of abdominal surgery. Newer techniques have been added for hernia repair including prosthetic mesh repair and the laparoscopic repair, which have been reported to produce better results. This study aimed to compare on-lay mesh repair and retro-rectus mesh placement.

Material and Methodology: The current study was a prospective study conducted in the Department of General Surgery, J.L.N. Medical College & Attached Group of Hospital, Ajmer with an aim to evaluate and compare the efficacy of on-lay mesh repair and retro-rectus mesh placement for repair of incisional hernia in terms of VAS score for pain post-operatively, to compare the duration of the surgery, hospital stay between the two repair techniques and to compare the early and late complications between the two repair techniques on a total 50 patients (25 patients of onlay and 25 patients for retrorectus repair).

Results: There is significant lower complication i.e. blood loss, pain, seroma formation, surgical duct infection, sinus formation and recurrence in sublay mesh repair and blood loss is also significantly lower, while operative time and blood loss during surgery is higher in comparison to onlay mesh placement.

Conclusion: In our study there are significant lower complication in sublay repair than onlay repair. Thus, proved the sublay repair a better approach for the ventral hernia repair than the onlay repair.

Keywords: Hernia, surgical mesh, complication

Introduction

Hernia can be defined as “An abnormal protrusion of an organ or tissue through a defect in its surrounding walls”. An incisional hernia is a protrusion of tissue that forms at the site of a healing surgical scar. This type of hernia accounts for 15-20 percent of all abdominal hernias. It can be defined as, “any abdominal wall gap with or without a bulge in the area of post-operative scar perceptible or palpable by clinical examination or imaging”. It is only hernia considered to be truly iatrogenic. Incisional hernia continues to be one of the common post-operative complication of abdominal surgery. Such hernias can occur after any type of abdominal wall incision, although the highest incidence is seen with midline and transverse incisions. Despite the advances in the understanding of the anatomy and physiology of the abdominal wall, the choice of suture material and the knowledge of closure techniques, the incidence of incisional hernias continues to be 10-13% after laparotomy. Maximum incidence (63%) of incisional hernia occurs

during the first 24 months after surgery [1, 2, 3].

Several techniques for the repair of incisional hernia have been described from time to time. The initial method for such repair included anatomical repair, but it was associated with rate of recurrence [4, 5]. Subsequently, newer techniques have been added, including prosthetic mesh repair and the laparoscopic repair, which have been reported to produce better results [6, 7]. Mesh repair has become the gold standard in the elective management of the most incisional hernias. It can be categorized according to the way in which the mesh is placed as well as its relationship to the abdominal wall fascia. Mesh can be placed as an underlay deep to the fascial defect (intra-peritoneal or pre-peritoneal), as an inter-lay either bridging the gap between the defect edges, as an on-lay (superficial to the fascial defect) [8-10]. This study is planned to compare the efficacy of the two types of the repair techniques for the incisional hernia as mentioned above.

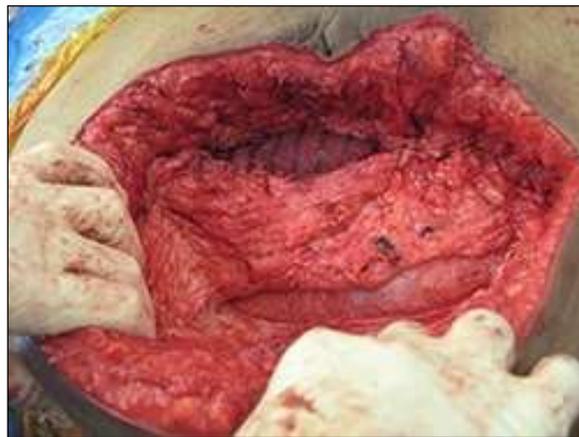


Fig 1: Open repair of ventral hernia with placement of mesh in the retrorectus space. Component separation/incision of the external oblique has been done lateral to the semilunar line to allow for midline closure without undue tension over the mesh

Materials and Methods

Study area: The study was conducted in the department of General Surgery, J.L.N Medical College & Attached Group of Hospital, Ajmer.

Study design: The study was a hospital based Prospective Randomized Control Interventional Study.

Study period: The study period was from January 2020 to June 2021.

Study universe: The participants for this study were patients of incisional hernia admitted to the department of General Surgery, J.L.N Medical College & Attached group of hospitals, Ajmer planned for incisional hernia repair.

Sample size

Total 50 patients were included in the study, 25 in each group. Patients were divided into two groups randomly. Group A included 25 patients managed by traditional on-lay mesh repair. Group B included 25 patients managed by retro-rectus mesh repair, the operating surgeon being same in all the cases.

Selection criteria

Inclusion criteria

- Patients of any age or sex with midline hernia upto 10 cm in diameter.
- Patients willing to participate and giving the informed consent.

Exclusion criteria

- Emergency surgery (incarcerated hernia).
- Parastomal hernia.
- Primary umbilical, Para umbilical, Spigelian hernias.
- Massive ventral hernias (>10 cm).
- Associated illness: HIV, Hepatitis B, TB, Uncontrolled diabetes, COPD.
- Patients not giving the informed consent.

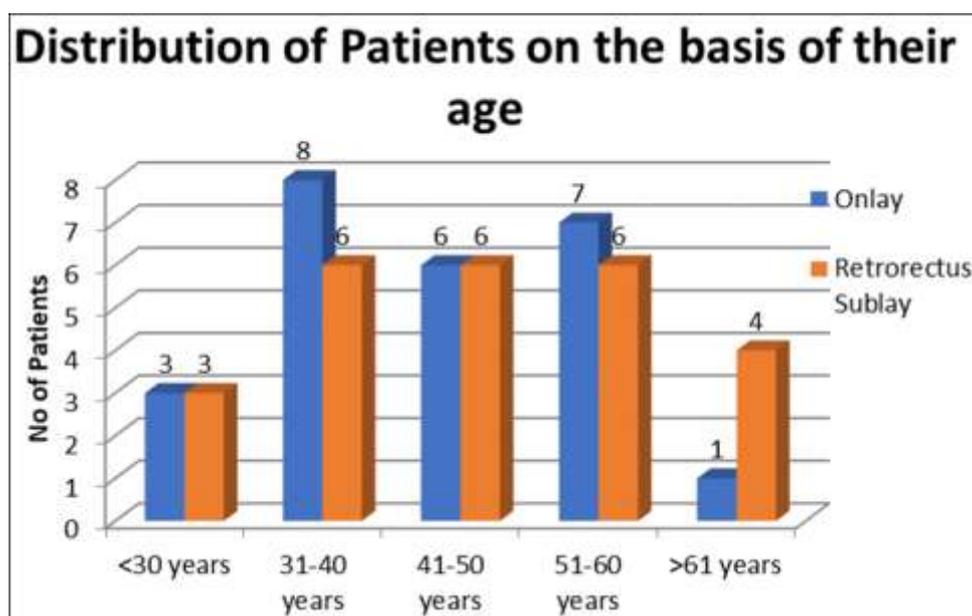
Sampling procedure

- Patients with incisional hernias seen in SOPD were interviewed and clinically assessed. The purpose of the study and the methods of treatment was carefully explained to the patients individually. They were allowed to ask question freely to ensure that they had understood.
- Those who met the inclusion criteria and consent to participate in the study were enrolled in study. The first patient was randomly allocated to one of the groups using the draw of lots methods. And the subsequent patient was allocated to the other group and so on till the sample size is achieved.

Results

Table 1: Distribution of Patients on the basis of their age

Age Group	Onlay (25)		Retrorectus Sublay (25)		p value
	No of Patients	Percentage	No of Patients	Percentage	
<30 years	3	12%	3	12%	-
31-40 years	8	32%	6	24%	0.529
41-50 years	6	24%	6	24%	-
51-60 years	7	28%	6	24%	0.747
>61 years	1	4%	4	16%	0.157
	Onlay		Retrorectus Sublay		p value
	Mean	SD	Mean	SD	
Mean age (in years)	43.32	±10.58	46.52	±12.14	0.325

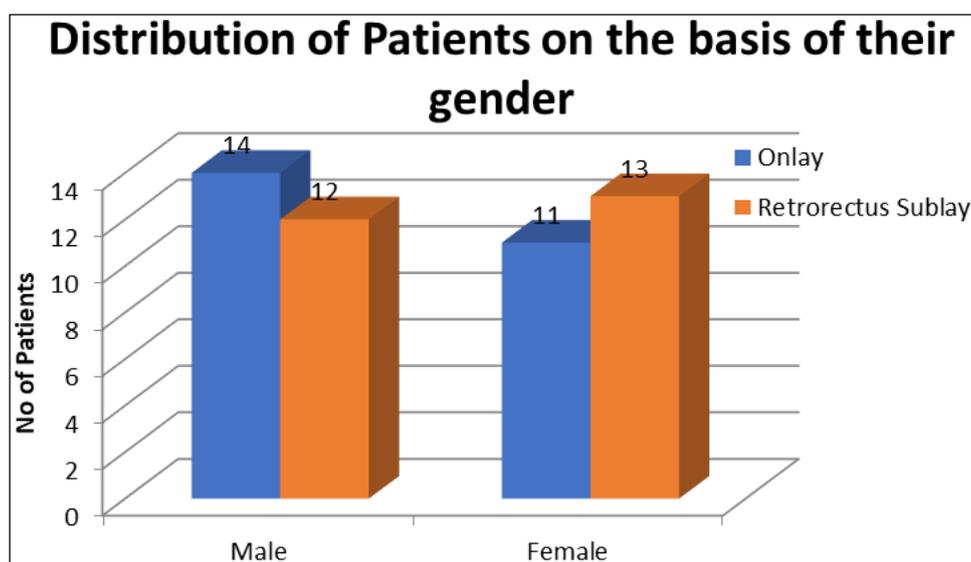


Graph 1

Table 1 and graph 1 shows the distribution of patients based on their age in both the groups, i.e., group of patients undergoing onlay mesh placement and group of patients undergoing retrorectus sublay mesh placement. In patients undergoing onlay mesh placement, most number of patients were in the age group of 31 to 40 years, i.e., 32% followed by the age group of 51 to 60 years with 28% of patients and the age group of 41 to 50 years with 24% of patients. Least number of patients were in the age group of more than 61 years, with only one patient. On the other hand in the patients undergoing sublay retrorectus mesh placement surgery, 24% of patients each were in the age group of 31-40 years, 41 to 50 years, and 51 to 60 years respectively. Least the number of patients were in the age group of less than 30 years with only 12% of sample size.

Table 2: Distribution of Patients on the basis of their gender

Gender	Onlay (25)		Retrorectus Sublay (25)		p value
	No of Patients	Percentage	No of Patients	Percentage	
Male	14	56%	12	48%	0.571
Female	11	44%	13	52%	

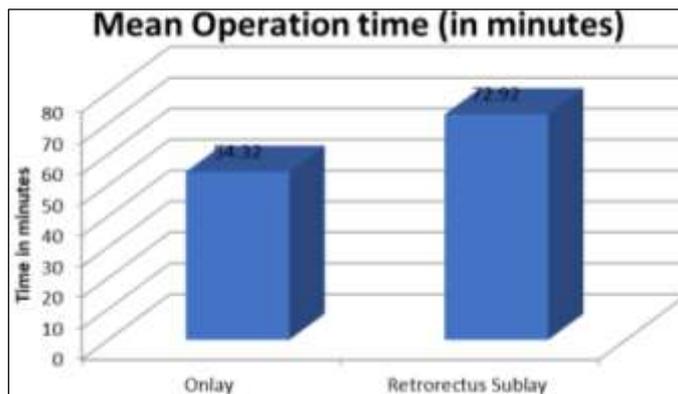


Graph 2

Table 2 and graph 2 shows the distribution of patients according to their gender. In patients that had undergone onlay mesh placement, 56% were male and 44% were female. On the other hand in patients that had undergone sublay retrorectus mesh placement 48% were male and 52% were female.

Table 3: Mean Operation time

	Onlay		Retrorectus Sublay		p value
	Mean	SD	Mean	SD	
Mean Operation time (in minutes)	54.32	±7.12	72.92	±9.37	0.000

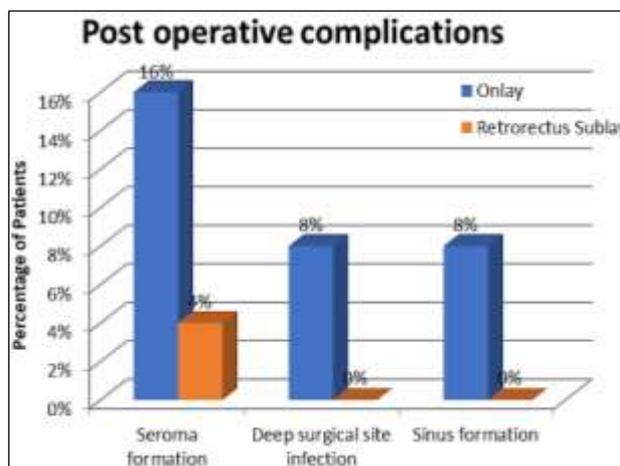


Graph 3

Table 3 and graph 3 shows that the mean operation time in sublay mesh placement was 72.92 ± 9.37 minutes which was statistically significantly higher than 54.32 ± 7.12 minutes which was the mean operative time in only mesh placement surgery (p value <0.05).

Table 4: Post-operative complications

Complications	Onlay (25)		Retrorectus Sublay (25)		p value
	No of Patients	Percentage	No of Patients	Percentage	
Seroma formation	4	16%	1	4%	0.158
Deep surgical site infection	2	8%	0	0%	0.149
Sinus formation	2	8%	0	0%	0.149

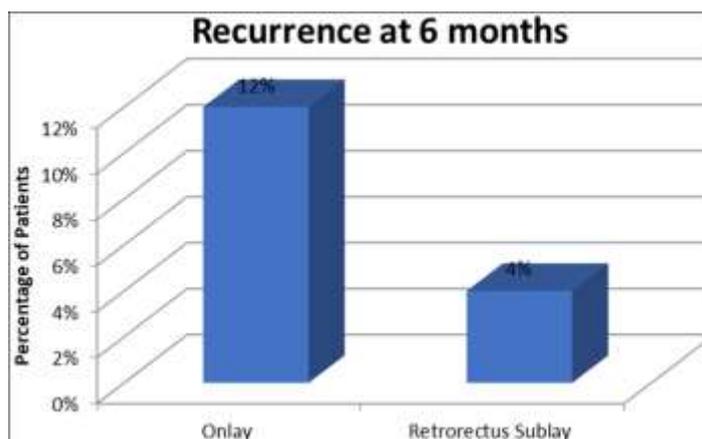


Graph 4

Table 4 and graph 4 represent the percentage of patients with various post-operative complications. In patients that had undergone only mesh placement 16% had developed seroma formation, 8% had developed deep surgical site infection and sinus formation, each. On the other hand, only one patient developed seroma formation post-surgery and no other complication was recorded in the patients that had undergone sublay mesh placement. However, the difference between the percentage of patients between the two groups was statistically non-significant (p value >0.05).

Table 5: Recurrence rate

	Onlay		Retrorectus Sublay		p value
	Mean	SD	Mean	SD	
Recurrence at 6 months	3	12%	1	4%	0.297



Graph 5

Above table represent the percentage of patients in which recurrence has occurred after 6 months. It was observed that in 12% and 4% patients the problem re-occurred in onlay mesh placement and sublay mesh placement respectively. However, the difference between the two was not statistically significant (p value > 0.05).

Discussion

The current study was compared with multiple studies for the purpose of discussion such as, Alobaidi MH *et al.* (45) which conducted the similar comparative study on 120 patients for ventral hernias repair. Similarly, Chitrabalam TG ^[1] conducted the similar study on 150 patients with ventral hernia. Dharmendra BL *et al.* (46) conducted the similar study with the similar number of patients, i.e., 50. Ibrahim R *et al.* (44) however conducted the review of six articles which were similar to our studies.

In the current study, in patients undergoing onlay mesh placement, most number of patients were in the age group of 31 to 40 years, i.e., 32% followed by the age group of 51 to 60 years with 28% of patients and the age group of 41 to 50 years with 24% of patients. On the other hand, in the patients undergoing sublay retrorectus mesh placement surgery, 24% of patients each were in the age group of 31-40 years, 41 to 50 years, and 51 to 60 years respectively. Moreover, the mean age of patients undergoing onlay mesh placement was calculated to be 43.32 ± 10.58 years and 46.52 ± 12.14 years (slightly higher) was the mean age of patient that had undergone retrorectus sublay mesh placement. On the other hand, Alobaidi MH *et al.* (45) reported the maximum patients between 51-60 years (33.3%). Dharmendra BL *et al.* (46) similar to us reported the mean age for onlay mesh patients as 43.56 years and for sublay mesh repair as 48.48 years without any statistically significant difference.

In the current study, 56% males and 44% female patients had undergone onlay mesh placement. On the other hand, 48% males and 52% females had undergone sublay retrorectus mesh placement. This suggested no gender predominance on the type of surgery. On the contrary, Alobaidi MH *et al.* (45) had reported majority of the patients were females in their study.

In the current study, the mean operation time in sublay mesh placement was around 73 minutes which was statistically significantly higher than the mean operative time in onlay mesh placement surgery (55 minutes). It is one of the major aspects that was studied in the current study and suggested the superiority of onlay mesh repair over the sublay mesh repair of the ventral hernias. However, Alobaidi MH *et al.* (45) too supported our finding and suggested higher operative time in sublay group (68-112 minutes) than the onlay group (50- 80 minutes). Chitrabalam TG *et al.* ^[1] also suggested the similar finding as ours where the mean duration of surgery in their onlay meshplasty group was 49 minutes and in their sublay meshplasty group was 73 minutes with a statistically significant difference. Dharmendra BL *et al.* (46) too supported our findings in which the average time taken for onlay mesh repair was 63 minutes whereas the average time taken for sublay mesh repair was found to 71 minutes with a statistically significant difference.

In the current study, when the post-operative complications were compared, it was seen that in patients that had undergone onlay mesh placement 16% had developed seroma formation, 8% had developed deep surgical site infection and sinus formation, each. On the other hand, only one patient developed seroma formation post-surgery and no other complication was recorded in the patients that had undergone sublay mesh placement. However, the difference between the two groups was statistically non-significant. Alobaidi MH *et al.* (45) like our results also found the seroma formations, wound infection, mesh infection, wound edge necrosis were seen more in onlay repair than sublay repair. Similarly, in the study by Chitrabalam TG *et al.* [1] various surgical aspects like satisfactory wound healing, grade of wound healing, mean asepis score and seroma formations were better in sublay repair patients than the onlay repair patients and was found to be statistically significant. Ibrahim R *et al.* (44) in their review article too suggested the lower seroma rate among those patients who had Sublay mesh repair compared to Onlay technique. Dharmendra BL *et al.* (46) too supported our findings by reporting lesser patients developing seroma formations post-operatively in patients undergoing Sublay repair.

In the present study, 8% of patients needed mesh removal post onlay mesh placement procedure whereas in none of patients mesh removal was done after sublay retrorectus mesh placement. This suggested that though the complications might occur more in onlay repair, the chances of mesh removal are not significantly increased in them.

In the current study, it was observed that the mean hospital stay of the patients that had undergone onlay mesh placement was statistically significantly higher than that of patients that had undergone retrorectus sublay mesh placement. Chitrabalam TG *et al.* [1] supported our findings with their results as the mean duration of post-op hospital stay in onlay meshplasty almost 10 days when compared to 5 days in sublay meshplasty. Dharmendra BL *et al.* (46) on the contrary showed the marginal difference in the duration of hospital stay in patients in onlay as well as sublay meshplasty, after surgery.

In the current study, the mean pain score calculated at day 7, 1 month and 6 months post-operatively was statistically significantly lower in sublay retrorectus mesh placement than and in patients that had undergone onlay mesh placement. Chitrabala TG *et al.* similar to our findings suggested that the difference in the mean pain score calculated using VAS scale for 2nd, 3rd and 7th postoperative days between both the groups was highly statistically significant.

In the current study, the mean blood loss was slightly higher in patients undergone sublay mesh placement than in patients undergone onlay mesh placement, however with no significant statistical difference. However this doesn't prove onlay mesh repair to be a better approach.

In the current study, it was observed that re-occurrence rate in onlay mesh placement was 12% and in sublay mesh placement, was 4% only. Though without a statistical significant difference, this aspect is a much favour in the support of sublay repair than the onlay repair. Alobaidi MH *et al.* (45), Chitrabalam TG *et al.* [10] and Dharmendra BL *et al.* (46) all supported our findings of decreased recurrence rate in sublay repair than onlay repair with or without statistically significant differences. Thus, proved the sublay repair a better approach for the ventral hernia repair than the onlay repair.

Conclusion

In our study there are significant lower complication in sublay repair than onlay repair. Thus, proved the sublay repair a better approach for the ventral hernia repair than the onlay repair. In our study, patients undergoing sublay retrorectus mesh placement surgery, 24% of patients each where in the age group of 31-40 years, 41 to 50 years, and 51 to 60 years respectively.

The mean age of patients undergoing onlay mesh placement was 43.32 ± 10.58 years, and those undergoing retrorectus sublay mesh placement was 46.52 ± 12.14 years. In patients that had undergone onlay mesh placement, 56% were male and 44% were female. In patients that had undergone sublay retrorectus mesh placement 48% were male and 52% were female. There is significant lower complication i.e. blood loss, pain, seroma formation, surgical duct infection, sinus formation and recurrence in sublay mesh repair and blood loss is also significantly lower, while operative time and blood loss during surgery is higher in comparison to onlay mesh placement.

References

1. Chitrambalam, Tharun Ganapathy *et al.* A comparative study between onlay and sublay meshplasty in ventral hernias: a randomized controlled trial. *International Surgery Journal*, [S.l.]. 2019 Mar;6(4):1264-1268. ISSN 2349-2902.
2. Mohamed RM, Rabie OM. Comparative study between onlay and sublay repair of ventral hernia. *Al-Azhar Assiut Med J.* 2019;17:96-102.
3. Singh Bhal, Jalthania, Mahender Kumar, Kumari Santosh. A comparative study of various techniques of incisional hernia repair in a tertiary care center at Bikaner (North-West Rajasthan). *International Surgery Journal*, [S.l.]. 2019 July;6(8):2909-2915.
4. Ahmed M, Mehboob M. Comparisons of Onlay versus Sublay Mesh Fixation Technique in Ventral Abdominal Wall Incisional Hernia Repair. *J Coll Physicians Surg Pak.* 2019 Sep;29(9):819-822. Doi: 10.29271/jcpsp.2019.09.819. PMID: 31455474.
5. Naz A, Abid K, Sayed AA, Baig N. Comparative evaluation of sublay versus onlay mesh repair for ventral hernia. *J Pak Med Assoc.* 2018;68:705-708.
6. Dhaigude BD, *et al.* Comparative evaluation of sublay versus onlay meshplasty in incisional and ventral hernias. *International Surgery Journal*, [S.l.] 2017 Dec;5(1):187-192.
7. Savitha S, Padmanabhan SR. A comparative study of onlay and retrorectus mesh repair in incisional hernia. *J Evid. Based Med. Healthc.* 2018;5(10):890-892. DOI: 10.18410/jebmh/2018/181
8. Haskins IN, Voeller GR, Stoikes NF, Webb DL, Chandler RG, Phillips S *et al.* Onlay with Adhesive Use Compared with Sublay Mesh Placement in Ventral Hernia Repair: Was Chevrel Right? An Americas Hernia Society Quality Collaborative Analysis. *J Am Coll Surg.* 2017 May;224(5):962-970.
9. Holihan JL, Bondre I, Askenasy EP, Greenberg JA, Keith JN, Martindale RG *et al.*; Ventral Hernia Outcomes Collaborative (VHOC) Writing Group. Sublay versus underlay in open ventral hernia repair. *J Surg Res.* 2016 May;202(1):26-32. Doi: 10.1016/j.jss.2015.12.014. Epub 2015 Dec 17. PMID: 27083944.
10. Ibrahim AH, El-Gammal AS, Mohamed Heikal MM. Comparative study between 'onlay' and 'sublay' hernioplasty in the treatment of uncomplicated ventral hernia. *Menoufia Med J.* 2015;28:11-6.