Research Article

A comparative study of 50 cases (25 each) of On-lay versus pre-peritoneal hernioplasty in incisional hernia

Hemang Ashokbhai Panchal^{1*}, Rakesh A. Makwana²

¹Assistant Professor, Department of Surgery, GMERS Medical College and Hospital, Sola, Ahmedabad, Gujarat, India

²Assistant Professor, Department of Surgery, Civil Hospital, Asarwa, Ahmedabad, Gujarat, India

Received: 06 February 2016

Revised: 2 April 2016

Accepted: 12 April 2016

*Correspondence:

Dr. Hemang Ashokbhai Panchal,
E-mail: dr_hapanchal@yahoo.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: An incisional hernia is a bulge or protrusion that occurs near or directly along a prior abdominal surgical incision. The objective of this study was to make comparison between On-lay and Pre-peritoneal method of hernioplasty in incisional hernia in term of operative time, post-operative morbidity, complications, hospital stay, return to routine work, and recurrence rate.

Methods: The present study, prospective and observational, was carried out in surgery department of B.J. Medical College, Ahmedabad, Gujarat, India from October 2010 to August 2012. 50 cases of incisional hernia were randomly placed in On-lay and Pre-peritoneal group. Observations were made with regards to duration and ease of operation, wound complications, hospital stay, morbidity and recurrence. Patient's information was recorded in the performa containing demographic details, method of repair, intra operative, early post-operative and late post-operative complications.

Results: Out of 50 patients enrolled, mean age in On-lay group is 49.16 years. While in pre-peritoneal group mean age is 40.68 years and female to male ratio of incisional hernia is 2.57:1. In pre-peritoneal meshplasty postoperatively seroma formation is (24%), post-operative stay is 9.24 day, wound infection (8%), while in On-lay meshplasty seroma formation is (52%), and stay is 12.28 day, wound infection (36%). Recurrence and mesh removal rate is more in our series in On-lay repair.

Conclusions: In view of less post-operative complications like seroma, wound infection, mesh removal and early returns to routine work & less recurrence ;pre-peritoneal meshplasty is better repair for incisional hernia compared to on-lay meshplasty; in our study.

Keywords: Incisional hernia repair, Pre-peritoneal meshplasty, On-lay meshplasty, Incisional hernioplasty

INTRODUCTION

An incisional hernia is a bulge or protrusion that occurs near or directly along a prior abdominal surgical incision.

Incisional hernia appears within the 1st year after the operation and that 80% appears within first two years. Modern rates of incisional hernia range from 2 to 11%. Out of this 20% of patients undergoing laparotomy develops incisional hernia.¹

Incisional hernias can occur after any type of abdominal wall incision, although the highest incidence is seen with midline incisions, the most common incision for many abdominal procedures.²

Any condition that inhibits natural wound healing will make a patient susceptible to development of an incisional hernia, such conditions include infection, obesity, smoking, immunosuppressive medications, wound tension, malnutrition, poor technique, connective tissue disorders.³

Even the smallest incisional hernia has the potential for incarceration and therefore repair should be considered. Hernias that are less likely to incarcerate include upper abdominal hernias and less than 1 cm diameter and more than 7 to 8 cm sized hernia, where loop of bowel can move in and out of sac without restriction and therefore less likely to become incarcerated.⁴

Repair of ventral hernias have always been a challenging procedure for the surgeons because of the distorted anatomy following previous surgery.

Various surgical techniques including open tissue repair, double breasting, darning, open and laparoscopic meshplasty have been used to repair the incisional hernias. In spite of ventral hernias repair being done in large numbers there is still unclear consensus about the best repair.

METHODS

The study was prospective and observational and carried out in surgery department of B. J. Medical College, Ahmedabad, Gujarat, India. From October 2010 to August 2012. Patient's information was collected in patient information sheet. Informed and written consent was taken. 50 cases of incisional hernia were randomly placed in On-lay and pre-peritoneal group. Observations were made with regards to duration and ease of operation, wound complications, hospital stay, morbidity and recurrence.

Study profile

Group A: Patients included in On-lay meshplasty group. (The prosthetic mesh placed between the subcutaneous tissues of the abdominal wall and the anterior rectus sheath e.g. On the rectus sheath).

Group B: Patients included in pre-peritoneal meshplasty group. (The prosthetic mesh placed in the pre-peritoneal plane e.g. Sublay/retro-muscular plane).

Inclusion criteria

- All the patients with incisional hernia between 15 and 60 years without sex discrimination

Exclusion criteria

- All the patients with chronic obstructive pulmonary Disease (COPD) like asthma
- Patients with abdominal malignancy and cirrhosis with end stage liver disease
- Patients with age less than 18 years and more than 65 years
- Patients with size of hernia larger than 12 cm in its largest dimension

The operative procedures of this study are

- Patients planned for surgery subjected for pre-operative fitness, pre-operative preparation includes written and informed consent for anaesthesia and surgery, shaving from nipple to knee, and catheterization. Prophylactic antibiotics given 30 minutes before surgery, cefotaxim (Cephalosporin group) 1 gm i.v. and repeated if surgery continues more than 3 hours. As we conducted study in government hospital, so as per government supplies of drug we used the cefotaxim in injectable form.
- Surgery done under spinal anesthesia and sometimes in general anesthesia.

In both methods, previous scar cutting incision made, subcutaneous dissection till defect in sheath identified.

The On-lay technique in which the mesh is placed over the abdominal wall closure in the subcutaneous prefascial space was refined and popularized by Chervil.⁵

Pre peritoneal (Sub-lay) method; French group, rives and colleagues, devised and popularized this technique in which the mesh is placed over the closed posterior rectus sheath and peritoneum after creating pre peritoneal space.⁶ We have used prolene mesh in both, size according to the defect size. Out of 50, 37 patients 15×15 cm prolene mesh was used and in 13 patients 10×10 cm prolene mesh was used. Same as drug prolene mesh was also supplied by government free of cost to the patient.

In both methods, negative suction drain kept in subcutaneous plane to prevent seroma and depending upon type and character, it will be removed on successive post-operative day.

Abdomen closed in layer using Prolene for mesh fixation and sheath closure, vicryl for peritoneum, muscle approximation and subcutaneous tissue closure. Skin closure was done by ethilon suture.

Post-operative management

Intra venous fluid as per the need, intra venous antibiotics (Cefoperazone+Sulbactam 1.5 gm) given for 5 days and analgesic (Diclofenac sodium aqueous in i.v. form) given for 3 days and then as per need.

The patient was switched over from i.v. to oral antibiotics (Tab Cefixime+Clavulinate) for 5 days and oral analgesic anti-inflammatory (Diclofenac sodium+serratiopeptidase) 5 days and then as required.

First dressing was done on the 72 hours post operatively, and stitches were generally removed between 7th to 10th days as per wound status.

Patients were advised to follow up on the 15 days, 1st, 3rd, 6th months, and yearly post operatively. We followed up patients for 18 months.

On follow up examination for scar, any complication like chronic pain, recurrence was made. All the data recorded.

Pain assessment

Chronic pain; Pain persisting >3 months

Various pain scaling system (10) available like

- Categorical rating scale (CRS)
- Visual analogue scale (VAS)
- Verbal numerical rating scale (VNRS)

But for simplicity and better patient compliances we had selected VAS for pain evaluation. This scale ranges from 1 (no pain) to 10 (worst possible pain)

Figure 1: Visual analogue scale for pain assessments.

Scoring

- P0 score: (no pain)
- P1 score: 1-3 (mild pain)
- P2 score: 4-6 (moderate pain)
- P3 score: 7-10 (severe pain)

Data assessment and chi square test done by computer software Epi Info 7.0 wherever required.

RESULTS

Table 1: General description of both methods.

No. of patients	n = 50	
Age (year)	On-lay (n=25)	Pre-peritoneal (n=25)
Mean	49.16 years	40.68 years
Range	18 to 65 years	
Sex		
Male	6 (24%)	8 (32%)
Female	19 (76%)	17 (68%)
Hernial defect size		
Average	02 to 12 centimeters	
operative time		
Average	88.8 minutes	97.6 minutes
hospital stays in day		
Average	12.28 days	9.24ays

- The study range from 18 to 85 years age group.
- 74% patients were between 31-60 Age groups.
- Mean age in On-lay group is 49.16 years. While in Pre-peritoneal group mean age is 40.68 years.

Table 2: Age wise distribution.

Age	On-lay	Pre-peritoneal	Total
01 to 20	00	01	01
21 to 30	04	03	07
31 to 40	04	11	15
41 to 50	05	04	09
51 to 60	08	05	13
61 to 70	03	01	04
71 to 80	00	00	00
81 to 90	01	00	01
Total	25	25	50

Table 3: Sex wise distribution.

Method	Female	Male
On-lay	19 (76%)	6 (24%)
Pre-peritoneal	17 (68%)	8 (32%)

Figure 2: Sex wise distribution.

- In On-lay group 76% (n=19) and in Pre-peritoneal group 68% (n=17) patients are female.
- Female forms (n=36) 72% of total study group and female to male ratio is 2.57:1 showing that incidence of incisional hernia is more in female.

Table 4: Distribution according to type of incision in past.

Method	Incisions			
	Midline	Mac burney	Pfannenstiell	Others
On- lay	18 (72%)	2 (8%)	1 (4%)	4 (16%)
Pre-peritoneal	22 (88%)	1 (4%)	2 (8)	0 (0%)

In the study, 80% (n=40) patients having previous midline scar, 6% (n=3) patients having Mac burney and Pfannenstiel incision scar while 8% (n=4) having other incision scar namely Kocher's, Chevron, laparoscopic port and lumbar incision scar.

Figure 3: Distribution according to type of incision in past.

Table 5: Distribution according to previous surgery.

Method	Past surgery	
	Gynecological	Laprotomy+others
On-lay	14 (56%)	11 (44%)
Pre-peritoneal	15 (60%)	10 (40%)
Total	29(58%)	21(42%)

Figure 4: Distribution according to previous surgery.

- In the study, (n=29) 58% patients undergone gynecological procedure in past and that leads to incisional hernia, while (n=21) 42% incisional hernia occurred due to surgery for the other cause.
- Surgery on female pelvic organs is most common primary procedure where incisional hernia occurred.

Size of hernial defect and no. of hernial defect

- Average defect size varies from 2 to 12 cm.
- 10% (n=5) Patients having two or more hernia defects.

Table 6: Pain at 6th post-operatively.

Pain	P0+P1 (no+mild pain)	P2+P3 (moderate+severe pain)
On-lay	21	4
Pre-peritoneal	25	0

$X^2 = 2.44$; $DF = 1$; $P = 0.11 (>0.05)$

- In the study 21/25 patients of on-lay repair having mild or no pain and 4/25 having moderate or severe pain at post op 6th day. While 25/25 patients of pre-peritoneal repair having mild or no pain and 00/25 having moderate or severe pain at post op 6th day. P value is >0.05 , however this difference is statistically not significant.
- Results showing pain is not making difference between two methods in post-operative period 6th day onwards.

Table 7: Complications wise distribution.

Complications	On-lay	Pre-peritoneal
Early		
Seroma	13 (52%)	06 (24%)
Wound infection	09 (36%)	02 (8%)
Late		
Recurrence	1(4%)	0 (00%)
Return to routine work	30 days	15-20 days
Mesh removal rate	8%	00%

Seroma

- In this study, 13/25 patients in on-lay method, while 6/25 patients in pre-peritoneal method develops seroma.
- $\chi^2 = 4.15$, $df = 1$, $p = 0.04 (<0.05)$, p value <0.05 , the difference is statistically significant which denotes pre-peritoneal method having less seroma formation as compared to on-lay method.

Wound infections

- In this study, 09/25 patients in On-lay group and 02/25 patients in pre-peritoneal group develops wound infection in post-operative period. $X^2 = 4.19$, $DF = 1$, $p = 0.04 (<0.05)$ p value <0.05 , the difference is statistically significant which denotes pre-peritoneal method having less wound infection as compared to On-lay method.

Return to routine work

- All the patients were followed up at 15 days, 1st, 3rd, 6th month and then 6 monthly every year. The patients operated by pre-peritoneal method were able to do their routine work within 15-20 days' time, while those operated by On-lay method were able to do their routine work at 1 month.
- However after 3 months in both methods, no significant difference seen in context to pain and both are pain free.

Mesh removal rate

- In the study mesh removal rate in On-lay group is 8% while in pre-peritoneal group is 00%. Mesh removal rate is higher in on-lay meshplasty. In on-lay group wound infection rate is higher (36%) as compared to pre-peritoneal group. Persistent wound infection leads to mesh infections which ultimately require mesh removal.
- in this study 2 (8%) in on-lay group mesh removal required and out of this 1 (4%) patient developed recurrence in 36 months follow up period.

Recurrence

- In this study, 01/25 patients in on lay method and 00/25 patients in pre-peritoneal method develop recurrence at 18 months follow up.
- $\chi^2=0.00$, $DF=1$, $p=1.00(>0.05)$, p value >0.05 , the difference is statistically not significant which denotes both method is comparable at 6 month follow up in relation to recurrence. From the data, recurrence rate in the study in on-lay meshplasty is 4% (4 times higher), while in pre-peritoneal meshplasty is 0%.
- However for better assessment and comparison larger sample size and longer follow-up required.

DISCUSSION

Incisional hernia estimated 2 to 10% after abdominal operations. Hernias less than 2½ cm in diameter are successfully closed with primary tissue repairs.⁷ Various techniques including anatomical and prosthetic repair used, but results have been disappointing with a high incidence of recurrence of about 30-50% after anatomical repair and 1.5-10% with prosthetic mesh repair.⁴

The introduction of mesh had been revolutionized hernia surgery with tension free repair concept. Although various surgical procedures adopted for repair, but placement of mesh remains most efficient method of dealing with incisional hernia.⁸

The prosthetic mesh can be placed between the subcutaneous tissue of abdominal wall and anterior rectus sheath (On-lay) as well as in pre peritoneal plane (Sub-lay). Infact as per literature, the best position for inserting the material has not been conclusively established; but

limited studies have shown that meshes implanted on the abdominal Apo neurotic layer showed better and early incorporation (higher collagen deposition, capillary density and cell accumulation) and increased tensile strength reflecting tighter anchorage to the abdominal wall.

The pre peritoneal mesh repair was first described by Renestopa, Rives J and Wantz G. This technique is considered by many surgeon as gold standard for open repair of incisional hernia.⁹⁻¹¹

Hernia recurrence is distressing to patient and embarrassing to surgeons. Nowadays tension free repair using prosthetic mesh has decreased recurrence to negligible. Despite excellent results increased risk of infection with placement of a foreign body and cost factor still exist; however, operating time and hospital length of stay are shortened. Primary tissue repair is associated with higher unacceptable recurrence rate, now a days, tension free mesh repair is ideal hernia repair technique.⁴

- The mean total time taken in "pre peritoneal groups was 97.6±20 minutes compared with 88.8±15 minutes in 'On-lay' group, and according to Ibrahim AH et al the mean total time taken for surgery in the On-lay group was 75-90 (83.41±10.24) minutes compared with 80-100 (89.52±7.25) minutes in the Sub-lay group comparable to our study.¹³
- The difference of time can be due to more dissection time needed for creating preperitoneal space & Securing hemostasis. Ease of operation is largely subjective (surgeon factor being constant) and depends on surgeon's experience, exposure and planning, quality of assistance, conducive facilities like light, cautery, instruments quality and sutures etc.
- Average defect size varies from 2 to 12 cm. 10% (n=5) patients having two or more hernia defects.
- Duration of hospital stay indirectly indicate the degree of morbidity in terms of postoperative complication. The mean duration in pre peritoneal groups was 9.24 day compared to 12.28 days in On-lay group. As per Ibrahim AH et al study mean duration of hospital stay in the On-lay group ranged from 3 to 9 (4.63±0.35) days, whereas it was 1-4 (2.62±0.74) days in the Sub-lay group.¹³
- In pre peritoneal group the complication rates in the study by Manohar et al reveals 2% wound infection, 10% seroma formation and 2% recurrence. The study of Leber et al showing 4% wound infection, 3% seroma and 17% recurrence while Hamy et al study reveals 4% wound infection and 3.1% recurrence rate. We have in our study 02/25 (08%) wound infection, 6/25 (24%) seroma formation, mesh removal is 00%, 00/25(0%) recurrence in pre peritoneal method in post-operative period.¹⁴⁻¹⁶ We have observed quite high wound infection rate and

seroma formation while got less recurrence rate as per above study.

- The study of Rana KVS et al showing seroma formation of 22% of patients and wound infection 16% and study of deVries Relingh TS et al reported a recurrence rate of incisional hernia following On-lay technique it was 28.3%.^{17,18} In post-operative period in our study, 09/25 (36%) patients develops wound infection, 13/25 (52%) patients develops seroma, mesh removal rate is 8% in and 01/25 (4%) patients having recurrence On-lay method. we having very high seroma formation and wound infection rate as compare to other similar studies.
- It is found that most of the patients operated by Pre-Peritoneal method were able to do their routine work within 15-20 days' time, while those operated by On-lay method were able to do their routine work at 1 month. However after 3 months in both methods, no significant difference seen in context to pain and both are pain free. The patient can resume to their routine work more early in pre-peritoneal method as compared to that operated by On-lay method.

CONCLUSION

When the two methods of incisional hernia repair i.e., pre peritoneal method and On-lay method, are compared on the basis of various parameters like; patient safety, intra operative complications and post-operative complications; we found that the pre peritoneal method of hernioplasty was better than the On-lay method of hernioplasty in incisional hernia repair. The complications, for which, surgeon is worried during the hernioplasty recurrence of hernia was less in pre peritoneal hernioplasty as compared to the On-lay hernioplasty. Hence, we advocate the pre-peritoneal hernioplasty as a method of choice in incisional hernia repair as it counts more on patient safety and less recurrence as compared to the On-lay hernioplasty in our study.

ACKNOWLEDGEMENT

Author and co-author has worked on this paper and no granting given for the study.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

REFERENCES

1. Maingot's text book, abdominal operations 11th edition, chapter 4; 71-81.
2. Bucknall TE, Cox PJ, Ellis H. Burst abdominal and incisional hernia: a prospective study of 1, 129 major laparotomies. Br Med J. 1982;284:931-3.
3. Kingsnorth A, Leblanc K. Hernias: inguinal and incisional. Lancet. 2003;362:1561-71.
4. George CD, Ellis H. The results of incisional hernia repair : a twelve year review. Ann R coll surg Eng. 1986;68(4):185-7.
5. Chevrel JP. Traitement des grandes eventrations medians par plastic en paletot et prothese. Nouv Presse Med. 1979;8:695-6.
6. Rives J, Lardennois B, Pire JC, Hibon J. Les grandes eventrations: importance du 'volet abdominal' et des troubles respiratoires qui lui sont secondaires. Chirurgie. 1973;99:547-63.
7. Bauer JJ, Harris MT, Gorfine SR, Krel I. Rives stoppa procedure for large incisional hernias. Experience with 57 patients. Hernia 2002;6:120-3.
8. Luijendijk RW, Hop WC, vandenTol MP, deLange DC, Braaksma MM, IJzermans JN, et al. A comparison of suture repair with mesh repair for incisional hernia. N Engl J Med. 2000;10:343(6):392-8.
9. Stoppa RE. The treatment of complicated groin and incisional hernias. World Journal of Surgery. 1989;13:545-54.
10. Rives J. Major incisional hernia. In chewal JP (ed) surgery of the abdominal wall. Springer paris. 1987;116-44.
11. Wantz GE. Incisional hernioplasty with Mersilene. Surg Gynecol Obstet. 1991;172:129-37.
12. Pain Community centre. Pain Assessment Tools. Available at <http://www.paincommunitycentre.org/article/pain-assessment-tools>.
13. Ibrahim AH, El-Gammal AS, Heikal MMM. Comparative study between 'onlay' and 'sublay' hernioplasty in the treatment of uncomplicated ventral hernia. Menoufiya Medical Journal. 2015;28(1):11-6.
14. Manohar CS, Ramdev K. Management of incisional hernia by peritoneal mesh repair. International Journal of Basic Medical Sciences. 2010;3(1).
15. Geoffrey EL, Jane LG, Albert IA, Reed WP. Long-term complications associated with prosthetic repair of incisional hernia. Arch Surg. 1998;133(4):378-82.
16. Hamy A, Pessaux P, Tephane S, Radriamananjio S, Regenet N, Arnaud JP. Surgical treatment of large incisional hernia by an intraperitoneal Dacron mesh and an aponeurotic graft. J Am Coll Surg. 2003;196(4):531-4.
17. Relingh TSV, Geldere DV, Langenhurst B, Dejong D, Wilt GJV, van GH. Repair of large midline incisional hernias with polypropylene mesh: Comparison of three operative techniques. Hernia 2004;8(1):56-9.
18. Rana KVS, Singh G, Deshpande NA, Bharathan VK, Sridharan S. Postoperative complications of mesh hernioplasty for incisional hernia repair and factors affecting the occurrence of complications. Med . Journal of D.Y. Patil Uni. 2013;6(1):25-31.

Cite this article as: Panchal HA, Makwana RA. A comparative study of 50 cases (25 each) of on-lay versus pre-peritoneal hernioplasty in incisional hernia. Int Surg J 2016;3:757-62.