International Surgery Journal
Rubby SA et al. Int Surg J. 2017 Jan;4(1):170-176
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20164427

Original Research Article

A prospective study comparing laparoscopic and open ventral hernia repair

Shaikh Afzal Rubby, Purushothaman Rangaswamy*, Praveen Sundar

Department of General Surgery, ESIC Medical College and Hospital, Coimbatore, Tamil Nadu, India

Received: 16 November 2016
Accepted: 05 December 2016

***Correspondence:**
Dr. Purushothaman Rangaswamy,
E-mail: purush.rangaswamy999@gmail.com

ABSTRACT

Background: Ventral hernias (VH) occur as a result of weakness in the musculo-fascial layer of the anterior abdominal wall. The most popular classification is congenital, acquired, incisional and traumatic .A successful series of laparoscopic repair for VH was done by LeBlanc in 1993.Operative costs may be optimized with selection of the mesh and optimal use of trans-abdominal suture and fixation devices. This original article reveals recent advances and progression in laparoscopic ventral hernia repair technique even in patients with incisional and umbilical hernia.
Methods: A prospective study conducted in PSG Institute of Medical Sciences and Research for the period 2011-2012 comparing open versus laparoscopic ventral hernia repairs. A total of 20 laparoscopic and 20 open ventral hernia cases were compared.
Results: A total of 40 cases were studied of which 20 were open and 20 were laparoscopic repairs.
Conclusions: Laparoscopic repair of ventral hernia is showing promising results and is being widely practiced nowadays. Postoperative pain is less, hospital stay is shorter and there is a lower short term complication when compared to open repairs. There is lesser incidence of wound infection; movement of bowel is sooner, shorter hospital stay and faster resumption of routine activities.

Keywords: Incisional hernia, Laparoscopic mesh repair, Open mesh repair, Ventral hernia

INTRODUCTION

A ventral hernia is defined as a fascial defect located in the abdominal wall. Primary ventral hernias have been classified as umbilical, epigastric, Spighelian and lumber hernias, and secondary ventral hernias are incisional hernias that have developed from previous postoperative scars.[1] Ventral hernia repair is a common surgical procedure. Mostly, ventral hernias are small umbilical and epigastric hernias, but almost 30% of these procedures are incisional hernia repair is and around half of these have been done laparoscopically.[2]

Once the patient develops ventral hernia, it inevitably increases in size with time and surgery becomes more and more difficult and hence the repair should not be delayed. With the increase in the number of abdominal surgeries and the use of various incisions associated with surgeries, there is an increase in the incidence of incisional hernia. The surgeons became aware that certain incisions were followed by increased incidence of incisional hernia, because of this awareness, consideration was given to the choice of incision, suture materials that are being used, type of wound closure etc.., Moreover ventral hernias can become irreducible, obstructed, strangulated due top various reasons which markedly increases the risk to patient's life. The treatment of ventral hernia has evolved over many decades. Primary suture repairs were done in the beginning which carried an unacceptably high recurrence

rates. As open mesh repair was introduced instead of open suture repair, the overall recurrence rate significantly decreased from 63% to 32%.[3] Even for small hernia defects the recurrence rate dropped significantly from 67% to 17% when mesh was used for the first time it was documented that mesh repair reduced recurrence rate, and tension-free repair with mesh was accepted as the new gold standard .the again with the advent of laparoscopic surgeries further advances have happened in the types and technique of surgical repair.[3]

Laparoscopic ventral hernia repair has gained roaring popularity and success among surgeons and patients when compared to open repair ever since the first case performed by Leblanc K in 1993.[4] It carried various advantages among which was less post-operative pain, decreased hospital stay and was cosmetically appealing too.[5-7] It has been proved in various studies that there is definitely an advantage of using prosthesis instead of traditional anatomical repair.[8] But this has to be done by long incisions and by raising flaps, which are not needed in laparoscopic techniques. There are various studies going on comparing laparoscopic and open repairs and few of them suggest that recurrence rate is quite similar for both, around 9%.[9-13] Ventral hernia is considered complicated when it undergoes

- Irreducibility
- Obstruction
- Strangulation or gangrene

Very large hernia with skin changes and ulceration are also considered complicated.

The aim of this article is to compare the effectiveness and safety of laparoscopic and open repair of ventral hernia and to discuss important controversial issues for both procedures like

- Patient selection
- Technique and operative care for laparoscopic repair of ventral hernia
- Operative time of laparoscopic repair of ventral hernia
- Intra operative and post-operative complications
- Post-operative pain and amount of different drugs used
- Time until resumption of diet and movement
- Post-operative morbidity
- Length of hospital stay
- Cost effectiveness and mesh selection
- Recurrence and re-recurrence after both procedures

METHODS

A prospective study conducted in PSG Institute of Medical Sciences and Research for the period 2011-2012 comparing open versus laparoscopic ventral hernia repairs. A total of 20 laparoscopic and 20 open ventral hernia cases were compared.

- Indications for laparoscopic repair of ventral hernia
- Ventral hernia around three cm in size
- Obesity and recurrent incisional hernia even with small size
- Swisschess type of hernia (because clearer laparoscopically)

Contraindications

- Multiple scars on the abdominal wall, which make intraperitoneal access difficult.[15]
- Large defect where 3-5 cms meshes overlap is not possible intra-abdominally.[14]
- Patient with large amount of redundant skin and fat on the abdominal wall are better suited for abdomino plasty procedures.[15]
- Infection and peritonitis
- Acute and sub acute intestinal obstruction
- Severe cardio pulmonary disease
- Portal - hypertension

Risk factors

Morbid obesity, prostatism, chronic of wound infection, large incision and malnutrition are considered as risk factors for ventral hernia and incisional hernia.[17]

Evaluation of laparascopic repair of ventral hernia

Laparoscopic repair of ventral hernias was done at a time when laparoscopic appendectomy and cholecystectomy had shown definite benefit over open procedures. Although technically demanding and time consuming, it is safe and feasible with introduction of different prosthetic measures and great improvement in the laparoscopic techniques, it is hoped that an improvement in the complication rate could be realized.[17,18] Increasing application of laparoscopic surgery all over the world indicates that these goals might indeed be achieved. There are many controversies but laparoscopic surgery continues to evolve with regard to laparoscopic repair of ventral hernias and there is more data in the literature available as compared to the past due to the increased popularity of this procedures.[16]

Operative procedures

Open technique

Operations were performed under spinal anaesthesia with the patient in supine position and arms at the side of the patient. Ryles tube and urinary catheter was placed depending on the localization of the hernia. One dose of prophylactic antibiotic was administered ½ hour before skin incision.

Steps of Onlay technique

- Incision
- Dissection of hernia sac all around
- Sac wall is opened
- Adhesions are identified and other small hernia defects if present are dissected
- Adhesiolysis is done
- The hernia defect is closed with non-absorbable sutures (interrupted or continuous)
- The mesh is prepared. It is kept at five cms from the suture in all directions. The mesh is fixed without tension with non-absorbable sutures.
- Drain is kept in the subcutaneous plane and wound is closed in layers.

End points

- Type of presentation was assessed and noted.
- Time taken was calculated in minutes from the start of procedure.
- Postoperative pain was calculated using the visual analogue scale at 1, 2, 3, 4, 5 post-operative days.
- Complications relating only to the hernia repair were taken into account excluding the anaesthesia complication.
- Hospital stay was calculated in days from the date of surgery.
- Return to normal work was also calculated in days from the date of surgery to the actual day of work or return to daily normal activities.
- Any recurrence or complications following surgery was noted by frequent follow ups.

Laparoscopic ventral hernioplasty

The advent of laparoscopic ventral hernia repair began in 1993 with the first being performed by LeBlanc. Ever since the introduction of laparoscopic ventral hernia repairs there has been an increased demand for this technique due to its appreciated advantages like decreased post-operative morbidity and lower recurrence. The difference of open repair from the laparoscopic one is the need for adequate soft tissue dissection which provides enough space for mesh placement. But this extensive dissection may result in increased bleeding and chances of hematoma and wound infection. But in laparoscopy the technique followed is placement of the mesh just onto the peritoneum. This gives an advantage that the intra-abdominal pressure holds the mesh in place. The added advantage of laparoscopic technique is in identifying small fascial defects termed as "Swiss-Cheese" defect which can be easily missed using a laparotomy. This is important as these are sites of hernia recurrence.

Additional strength for mesh fixation is provided by full thickness fixation sutures along with application of tacks. Vant R et al. highlighted that the trans-fascial fixation sutures were 2.5 times stronger than tacks being applied alone. Recurrence can be avoided as far as possible if the mesh remains in situ with adequate overlap over the defect. One noted problem following transfascial sutures is chronic pain which occurs in approximately 1-3% of patients and is likely to improve within 6-8 weeks.

General anaesthesia is used in laparoscopic surgery. It requires keen monitoring of vitals and proper fluid and electrolyte balance. Patient is placed in Supine position

Port position

The abdomen is painted and draped. Light cable, tubes, monopolar and bipolar cables, suction tubes and veress needle are verified light is checked and white balancing done. Pheumoperitoneum is created by port and ten mm ports are placed according to baseball diamond concept. Ports are placed under vision. Thorough diagnostic laparoscopy is performed, if in case adhesions are present it is released. Hernia sac contents are reduced. Hernia defect is assessed thoroughly. A marking of the defect. The prosthesis has to cover five cms around the defect in all direction. Mesh is taken with absolute asepsis and must have no contact to the skin. Then the mesh is rolled and pushed into the peritoneal cavity through the ten mm port. Then the prosthesis is unrolled and fixed by means of Tacker, Protack or Endoanchor to abdominal wall without dissecting the peritoneum. This technique is called intra peritioneal repair using dual layar mesh. After mesh fixation, the omentum is placed over the bowel loops. This done to prevent contact of mesh with bowel on completion of surgery, the ports are taken out under vision and the camera port has to be removed last. Ten mm port sites are closed in layers to prevent port site hernias.

Ventral hernia and operation characteristics

The most frequent content of the hernia sac was omentum, there were no intra operative complications such as bowel or vascular injury requiring conversion to open technique and significantly there was not much blood loss, no patient required blood transmission. A closed suction tube was put more often for open procedures. The majority of incisional hernias in the lower abdomen were due to gynaecological operations and primary ventral hernias were located at or around umbilicus.

Comparison of laparpscopic and open mesh repairs

Various studies have compared open and laparoscopic ventral hernia repairs. In a recent meta-analysis done by Park et al, comparison was done between laparoscopic and open ventral hernia repairs among 712 patients.[20] It was found that likelihood of perioperative complication was 58% lesser in laparoscopic repair when compared to open repair. It was also observed that compared to open,

laparoscopic surgeries were associated with reduced hospital stay (2 versus 4 days).

In terms of perioperative complications, recurrence and duration of hospitalization, laparoscopy seems evidently to be equal or better than open. But further randomized control trials are needed to prove the same. Cobb et al, recently reviewed laparoscopic repairs, showed a recurrence rate of 3.8% and 536% with full thickness sutures when compared to tack fixation. In our review the open intra-peritoneal underlay repair, laparoscopic repair with full thickness transmuscular fixation sutures and laparoscopic repair with racks also had similar recurrence rates, 4.5, 4.5 and 4.44% respectively.

Post-operative complications of ventral hernia repairs

- Wound infection
- Mesh infection
- Seroma formation recurrence
- Chronic pain
- Post-operative morbidity

Visual analogue scale was used to assess the pain. The patient is instructed to indicate the point in the image to indicate how much pain they are experiencing. One end indicates "No Pain" and the other end indicated "worst pain" scoring was done according to the severity of the pain on various post-operative days.

Analysis was done using SPSS for windows. The results were expressed with a mean and standard deviation. Differences between the treatment groups were analysed with person 2 test and variance was analysed. Person 2 test was done for each type of hernia and its complications. ANOVA was performed for dependent variables (operating time, hospital stay, Visual analogue scale, return to normal work). It was considered to be significant if the probability value was less than 0.05.

RESULTS

A total of 40 cases were studied of which 20 were open and 20 were laparoscopic repairs. In this study the youngest age was 27 years and the oldest patient was 75 years. Majority (50%) of the patients were in the 4th to 6th decade.

Table 1: Sex of the patient.

Sex	Frequency	Percent
Male	7	18%
Female	33	82%
Total	**40**	**100%**

There were 33 females and 7 males out of 40 patients. The ratio of Male:Female = 4.7:1. The Majority of the cases were either para-umbilical hernias or incisional hernia that developed from previous lower midline scar.

Table 2: Mean operative time laparascopy/open surgeries.

Duration of surgery	N	Mean	Std. deviation	Std. error
Open	20	111.60	27.881	6.34
Laparoscopy	20	170.00	50.731	11.344
Total	**40**	**140.80**	**50.085**	**7.916**

Mean operating time laparoscopy was 170 minutes and for open surgery 111 minutes. Hence laparoscopically done cases take longer duration than open cases.

P-value comparing both groups - 0.0005 (Significant). Pain score pain was assessed using visual analogue scale (1-10). 0 represent no pain, 10 represents maximum pain.

Table 3: Mean pain score in open/laparascopic surgery.

Duration of surgery	N	Mean	Std. deviation	Std. error
Open	20	3.80	0.696	0.156
Laparoscopy	20	2.35	0.489	0.109

The mean pain score of all patients in open group was 3.80. The mean pain score of all patients in laparoscopy group was 2.35. P-Value comparing both the groups - 0.0005 (significant).

Table 4: Duration of stay in the hospital.

Duration of surgery	N	Mean	Std. deviation	Std. error
Open	20	6.45	1.605	0.359
Laparoscopy	20	4.10	1.714	0.383
Total	**40**	**5.28**	**2.025**	**0.320**

The duration of stay was calculated from the day of surgery. The mean duration of stay in the hospital: Open - 6.45 days, laparoscopy - 4.10 days; P-value comparing both groups - 0.0005 (significant).

The incidence of complications is almost 50% in open surgeries while it is around 20% in Laparoscopic surgeries.

Table 5: Complications.

Complication	Open	Laproscopy
Wound infection	3	1
Seroma/collection	5	1
Flap necrosis	3	0
Respiratory infection	2	1
Mesh rejection	0	0
Abdominal wall cellulities	0	1

Table 6: Complications: cross tabulation.

Complication	Frequency	%	Cummulative percent
Seroma and wound infection	1	2.5	2.5
Abdominal wall cellulitis	1	2.5	5.0
Flap necrosis	2	5.0	10.0
Flap necrosis and seroma	1	2.5	12.5
Nil	26	65.0	77.5
Respiratory presentation	3	7.5	85.0
Seroma	1	2.5	87.5
Seroma and wound infection	1	2.5	90.0
Seroma collection	2	5.0	95.0
Wound infection	2	5.0	100.0
Total	**40**	**100.0**	

Return to daily activities

In our study, patients operated with laparoscopy returned to daily activities within 10 days of surgery, whereas it took 22 days for the patients in open group. P-Value comparing both the groups - 0.0005 (significant).

Table 7: Return to daily activities.

Duration of surgery	N	Mean	Std. Deviation	Std. Error
Open	20	12.55	3.706	0.829
Laparoscopy	20	6.40	1.536	0.343
Total	**40**	**9.48**	**4.188**	**0.662**

DISCUSSION

The techniques of laparoscopic surgery for ventral hernia repair are still evolving. In this study, 20 open ventral hernia repairs were compared with 20 laparoscopic repairs.

Table 8: Comparison with other studies.

Observation	Holzman[19] lap/ open		Park[20] lap / open		Carbajo[21] lap/ open		Ramshaw[22] lap/ open	
Operating time (mins)	128	98	95	78	87	112	58	82
Length of stay (days)	1.6	05	3.4	6.5	2.2	9.1	1.7	2.8
Postoperative complication rate (%)	23	31	18	37	20	50	15	26
Infection rate (%)	05	06	00	02	00	18	00	03
Seroma rate (%)	05	00	04	02	13	67	00	00
Follow-up (months)	10	19	24	54	27	27	21	21
Recurrence (%)	10	13	11	35	00	07	03	21
Patients	20	16	56	49	30	30	79	174

Time taken for surgery

In most previous studies that compared open and laparoscopic repairs of ventral hernias. It was reported that the operating time was longer in laparoscopic than open repair. According to the present study, the time taken for laparoscopic repair is significantly higher than the other studies. Whereas the time taken for open hernia repairs is similar to other studies. The reasons for this can be due to the complexity of the hernias in the cases operated. To conclude, Laparoscopy has taken a longer time in comparison to open repair. P-Value is significant-0.0005 (significant)

Post-operative pain

In all the studies that were compared to the present one, laparoscopic repairs had significantly lesser post-operative pain compared to the open repairs. Visual Analogue scale was used to assess pain in our study. In open group was found to be 3.80 and laparoscopic group was 2.35. P-Value is significant (0.0005).

Duration of hospital stay

In all of the studies compared, the laparoscopically treated patients were discharged earlier than the open repair patients.

Complications

- One patient in the Laparoscopy group had wound infection and three patient in open group had wound infection
- Seroma collection was seen in one laparoscopic case and five open case
- Three patients in open group had flap necrosis
- One patient in laparoscopic group and two patients in open group had respiratory infection

One patient in laparoscopic repair had abdominal wall cellulitis which was managed conservatively. The complication rates were higher in the open group in all

the studies, providing conclusively that Laparoscopy is associated with lesser complications.

CONCLUSION

Laparoscopic repair of ventral hernia is showing promising results and is being widely practiced nowadays. Postoperative pain is less, hospital stay is shorter and there is a lower short term complication when compared to open repairs. There is lesser incidence of wound infection, movement of bowel is sooner, shorter hospital stay and faster resumption of routine activities.

Laparoscopy also directs visualization of the hernia defects which are not clinically apparent and there is a possibility to treat multiple hernias located in various quadrants of the abdomen through the same incision, which is not possible by open technique. Open hernias are associated with more post-operative pain, longer stay in the hospital and more incidences of complications. Change of seroma formation definitely more in open surgeries due to extensive dissection of the anatomical planes.

However there are certain instances where there is a preference to a specific procedure. In cases where there is a huge defect or in patients who have lax abdominal wall, open procedure fares better over laparoscopy as the rectus can be repaired better using open technique. And additional procedures like abdominoplasty are also possible, which cannot be done in laparoscopy.

And Laparoscopic repair warrants the use of general anaesthesia while open repairs can be usually done using spinal anaesthesia. The total cost of the procedure was observed to be more in Laparoscopic repair because of the higher cost of the mesh used and longer operating time. So laparoscopic repair is considered as first choice for ventral hernia repair. Patient satisfaction was greater in Laparoscopic repair because of earlier return to work and better cosmetic results. In view of early favourable results, Laparoscopic ventral hernia repair is a viable option although a longer follow-up with prospective randomized controlled studies are required to establish the definitive role of Laparoscopic ventral hernia repair.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Muysoms FE, Miserez M, Berrevoet F. Classification of primary and incisional abdominal wall hernia. Hernia. 2009;13:407-14.
2. Danish Ventral Hernia. Available at www. herniedatabasen.dk. Accessed 15 September 2010.
3. Burger JW, Luijendijk RW, Hop WC. Long- term follow up of a randomized controlled trial of suture versus mesh repair of incisional hernia. Annals Surg. 2004;240:578-83.
4. Blanc KA, Booth WV. Laparoscopic repair of incisional abdominal hernias using expanded poltertrafloroehylene: preliminary findings. Surg Endoscopy. 1993;3:39-41.
5. Marria EJ, Moss JM, Sugerman HJ. Laparoscopic intraperitoneal polytetrafioroethylene (PTFE) prosthetic patch repair of ventral hernia, Surgical Endoscopy. 2000;14:326-9.
6. Raftopolos I, Vanuno D, Khorsand J, Kouraklis G, Lasky P. Comparison of open and laparoscopic repair of large ventral hernias. J Society Laparoscopic Surg. 2003;7:227-32.
7. Wright BE, Niskanen BD, Peterson DJ, Ney AL, Odland MD, Vancamp J, Zera RT, Rodriguez JL. Laparoscopic ventral hernia: are there competitive advantages over traditional methods of repair? Annals Surg. 2002;68:291-5.
8. Luijendijk RW, Hop WC, Den MP, Lange DC, Braaksma MM, Ijzermans JN, et al. A comparison of suture repair with mesh repair for incisional hernia. New England J Med. 2000;343:392-8.
9. Aura T, Habib , Mekkaoui M, Brassier D, Elhadad A. Laparoscopic tension free repair of anterior abdominal wall incisional and ventral hernias with an intra-peritoneal gore-tex mesh: prospective study and review of literature. J Laparoscopic Advanced Surg Techniques. 2002;12:263-7.
10. Heniford BT, Park A, Ramshaw BJ, Voeller G. Laparoscopic repair of ventral hernias. Nine years experience with 850 consecutive hernias. Annals Surg. 2003;238:391-400.
11. Blanc KA, Booth VW, Whitaker JM, Bellanger DE. Laparoscopic and ventral herniorraphy: our initial 100 patients. Journal Minimal Access Surg. 2001;5:41-5.
12. Carbajo MA, Martin D, Olmo JI, Toledano M, Cuesta C, Ferraras C, et al. Laparoscopic approach to incisional hernia. Surg Endoscopy. 2003;17:118-22.
13. Arnauad JP, Teuch JJ, Pessaus P, Hedhity Y. Surgical treatment of prostoperative incisional hernias by intraperitoneal insertion of decron mesh and an aponeurotic graft: a report on 250 cases. Archives Surg. 1999;134:1260-2.
14. Zinner MJ, Ashley SW. Maingot's abdominal operations. 11th edition. McGraw Hill Education; New York, NY. 2012:1138-1143.
15. Bruce Ramshaw :Mastery of Surgery. 5th edition. Lippincott Williams and Wilkins. Netherland. 2012:1947-1964
16. Pradeep CK, Sharma A, Mehrotra M, Khullar R, Soni V, Baijal M. Laparascopic repair of ventral/incisional hernias. J Minimal Access Surg. 2006:2:192-8.
17. Muysoms F, Deater E, Vander MG, Claeys D. Laparoscopic intra peritoneal repair of incisional and ventral hernias. Acta Chir Belg. 2004;104:705-8.

18. Laparoscopic ventral hernia repair: an accelerated systematic review. Available at http:// www. surgeons. org/ asernip-s. Accessed on 12 July 2014.
19. Holzman MD, Purut CM, Reintgen K, Eubanks S, Pappas TN. Laparsocopic ventral and incisonal hernio plasty. Surg Endosc. 1997;11:32-5.
20. Park A, Birch DW, Lovrics P. Laparoscopic and open incisional hernia repair: a comparision study, surgery. 1998;124:816-21.
21. Carbajo MA, Martin D, Olmo JC, Blanco JI, Cuesta C, Vaquero C, Inglada I. Laparoscopic treatment vs open surgery in the solution of major incisional and abdominal wall hernias with mesh. Surg Endosc. 1999;13:250-2.
22. Ramshaw BJ, Esartia P, Schwab J, Mason EM, Wilson RA, Duncun TD. Comparison of Laparoscopic and open ventral herniorrhaphy. Am Surg. 1999;65:827-31.

Cite this article as: Rubby SA, Rangaswamy P, Sundar P. A prospective study comparing laparoscopic and open ventral hernia repair. Int Surg J 2017;4:170-6.