



# **Comparison between Laparoscopic and Open Repair of Umbilical and Paraumbilical Hernia: A Randomized Controlled Trial Study**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

**Background:** Laparoscopic repair of umbilical and paraumbilical hernia has largely replaced conventional (Open) repair. The purpose of the study was to compare the effectiveness of laparoscopic vs. open repair of umbilical & para umbilical hernia in a tertiary care government hospital.

**Methods:** A total 50 patients of age >18 years diagnosed with umbilical and paraumbilical hernia who underwent laparoscopic and open hernia repair from May2018 to Nov 2020 were enrolled and divided into two groups of 25 patients in each. The patients were followed up in the post-operative period in the wards during daily rounds till the time of discharge; 1 and 6 months after discharge and yearly.

**Results:** The mean age for open group was 44.24±7.68years while the mean age for laparoscopic group was 50.0±11.82years. Operative time was more in laparoscopic repair (81.68±18.37min) as compared to open (55.44±16.54min). Post-operative pain (VAS score) was greatest in the open group in comparison to lap group at 6 hr, 24 hr, day 8 and at 1month. Postoperative overall

complication rate (Infection, seroma and recurrence) was 12% in the laparoscopic group and 28% in the open group. Recovery was faster with laparoscopic repair with a mean postoperative hospital stay of 3.28days as compared to 5.88days for open mesh repair. Patients treated with laparoscopic repair were early return to routine activity and work.

**Conclusion:** The laparoscopic approach appears to be safe, effective and acceptable. It is a complex but very efficient method in experienced hands and it offered a significant advantage over open repair.

*Keywords: Laparoscopy; open repair; umbilical; paraumbilical; hernia; VAS score; recurrence.*

## 1. INTRODUCTION

An umbilical hernia is a ventral hernia located at or near the umbilicus. The European Hernia Society classification for abdominal wall hernias defines the umbilical hernia as a hernia located from 3 cm above to 3 cm below the umbilicus [1]. It is the second most common type of hernia in an adult following inguinal hernia [2]. The incidence of umbilical hernias has been reported to be as high as 2% in the adult population and comprises 10% of all hernia repairs performed annually [3]. A para-umbilical hernia is a protrusion of a viscous or part of it through the linea alba abutting superiorly or inferiorly on the umbilicus. However, umbilical and para umbilical hernia are frequently encountered in surgical practice & account for 10-12% of abdominal wall hernias [4]. Female sex, obesity, multiparity and cirrhosis are the most important pre disposing factors [5].

Although umbilical hernias occur at the umbilical ring and may be present at birth or develop later in life [6]. Surgical treatment can consist of primary suture repair or placement of prosthesis Mesh for large defect (>2cm) using Open or Lap method [7]. Over the last decade, the repair of ventral hernia has been used with increasing frequency. It is base on principle of Rives Stoppa repair in which mesh is placed deep to the hernia defect and fixed with mesh coverage to healthy abdominal wall fascia using point fixation and full-thickness permanent suture [8,9]. The present study compared the laparoscopic repair of umbilical and paraumbilical hernia with open repair in terms of complications like post-operative infection, recurrence, seroma, postoperative pain, mean hospital stay, mean operative time and return to work.

## 2. MATERIALS AND METHODS

After obtaining Institutional Ethical Committee approval and written informed consent from all the patients, this hospital based randomized

controlled trial study was conducted in the Department of General Surgery at Tertiary Care Centre of Central India from May 2018 - November 2020. Total 50 healthy patients of age above 18 years diagnosed with uncomplicated umbilical and paraumbilical hernia and were willing to participate in the study and had given consent were included. Patients with complicated umbilical / para umbilical hernia, coagulopathy, severe cardio-pulmonary disease, ascites, deranged renal function and patients not willing for surgical intervention were excluded from the study.

The diagnosis was made by history, clinical examination and ultrasound examination in selected cases of umbilical and paraumbilical hernia. All patients were evaluated for systemic diseases or precipitating causes. Patients were admitted to surgical ward one day prior to operation for routine preoperative investigations like CBC, renal and liver function test, RBS, chest X- ray, abdominal x- ray standing and 12 lead ECG, ultrasound of abdomen and pelvis. Patients were kept nil by mouth 8 hours prior to surgery. On the day before surgery, parts were prepared and beta scrubbed. After pre-operative investigations, patients were taken up for surgical intervention. Randomization of patients was done by allotting patients to lap group and open group alternately.

At time of induction of anaesthesia antibiotics, 1 gm cefotaxime and 500 mg of metronidazole was given. Patients were administered general anaesthesia. Open mesh repair done by onlay (above the fascia closure) or sublay(below the fascia closure) or retro rectus(Retro muscular space) or intraperitoneal meshplasty where we used dual PTFE composite mesh. The mesh was placed in intraperitoneal position at least 4 cm beyond the fascial margin and secured with Prolene 1-0 interrupted mattress sutures. Whereas in Laparoscopic hernia repair a barrier-coated mesh was fashioned with at least 4 cm of overlap around the defect. The mesh was rolled,

placed into the abdomen, and secured to the anterior abdominal wall with tackers.

Post-operatively injection diclofenac 75 mg 12 hourly was used as analgesic for 24 hours and additional doses of analgesic were given as required and noted. In the postoperative period dressing was assessed every 12 hourly and changed if soaked. Suction drain was removed usually by postoperative day 3 and kept in-situ for more days if discharge was >30ml/day. Postoperatively, deep-breathing exercises were encouraged. Early ambulation was done once the patient was able to bear the pain. Skin sutures removed on 10th day and in few cases after 10th day. On discharge, patients were advised to avoid carrying heavy weight. The patients were followed up in the post-operative period in the wards during daily rounds till the time of discharge; 1 month after discharge; 6 months after discharge and yearly. All patients were carefully monitored and followed up for operating time, visual analogue scale (VAS) to evaluate postoperative pain, complications (wound infection, seroma and recurrence), hospital stays and return to activity.

## 2.1 Statistical Analysis

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two sample t-tests for a difference in mean involved independent samples or unpaired samples.

Paired t-tests were a form of blocking and had greater power than unpaired tests. A chi-squared test ( $\chi^2$  test) was any statistical hypothesis test where in the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test. Unpaired proportions were compared by Chisquare test or Fischer's exact test, as appropriate. P-value  $\leq 0.05$  was considered for statistically significant.

## 3. OBSERVATIONS AND RESULTS

A total 50 patients of umbilical and paraumbilical hernia who underwent laparoscopic and open hernia repair from May2018 to Nov 2020 were enrolled and divided into two groups of 25 patients in each group. The mean age for open group was  $44.24 \pm 7.68$  years while the mean age for laparoscopic group was  $50.0 \pm 11.82$  years, ( $p = 0.0467$ ). In both groups, the most common age group was 41-50 years. Among the study subjects 31 were males and 19 were females as shown in Table 1.

In lap group most of the patients (18; 72.0%) had Proceed mesh while in open group maximum patients (15; 60%) had Prolene mesh. The mean operating time for laparoscopic repair was  $81.68 \pm 18.37$  min while that for the open group was  $55.44 \pm 16.54$  min which was statistically significant with p value of  $<0.0001$ .

Post-operative pain (VAS score) was greatest in the open group in comparison to lap group at 6 hr, 24 hr, day 8 and at 1month as shown in Table 2.

**Table 1. Demographic profile of the patients**

Parameters		Lap	Open	Total	P value
Age group	31-40	5	8	13	0.0467
	41-50	10	11	21	
	51-60	6	6	12	
	>61	4	0	4	
Sex	Male	12	19	31	0.0414
	Female	13	6	19	

**Table 2. Distribution of mean VAS at 6 hr, 24 hr, day 8 and at 1 month**

Postoperative pain	Lap	Open	P value
VAS at 6 hr	$2.6 \pm 1.63$	$5.64 \pm 2.05$	$<0.0001$
VAS at 24 hr	$1.60 \pm 1.04$	$3.72 \pm 2.01$	$<0.0001$
VAS Day 8	$0.12 \pm 0.33$	$1.04 \pm 1.20$	0.0006
VAS 1 month	$0.04 \pm 0.20$	$0.16 \pm 0.37$	0.1638

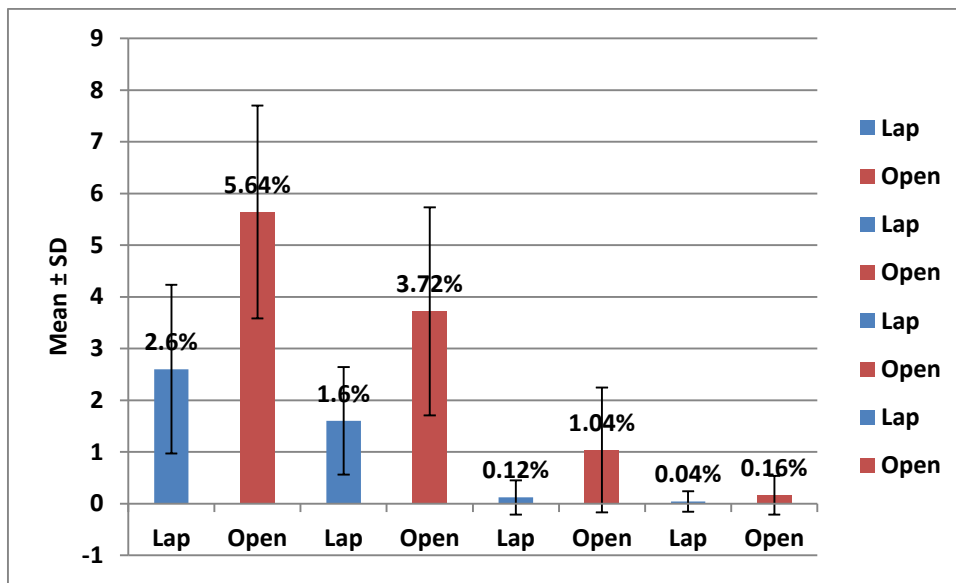


Fig. 1. Distribution of VAS score at 6 hr, 24 hr, 8 days and 1 month

Postoperative overall complication rate (Infection, seroma and recurrence) was 12% in the laparoscopic group and 28% in the open group. The comparison between two groups in regards to post-operative complications (Fig. 1) were found to statistically insignificant, ( $P > 0.05$ ). There was no mortality in either group.

Recovery was faster with laparoscopic repair with a mean postoperative hospital stay of 3.28 days and compared to 5.88 days for open mesh repair, and was statistically significant as shown in Table 3.

#### 4. DISCUSSION

In the present study the mean age for open group was 44.24 years while the mean age for the laparoscopic group was 50.00 years which is comparable with the previous studies [10,11]. There were 31% males and 19% females, this is possibly because our hospital is a referral centre and demographic data does not represent the population data at large. There are more than a dozen randomized controlled trials (RCTs) reported in the last 20 years, comparing both the repairs [Table 4].

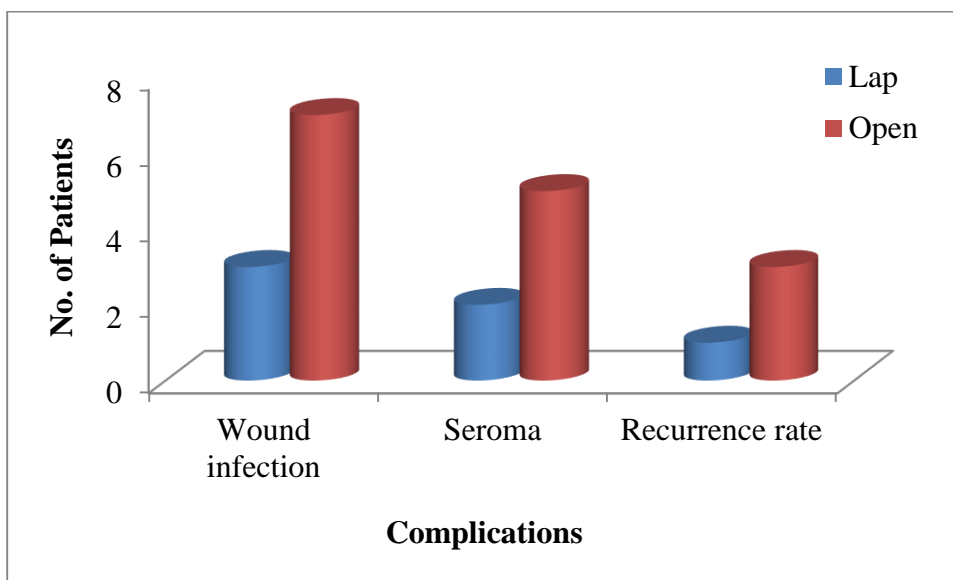
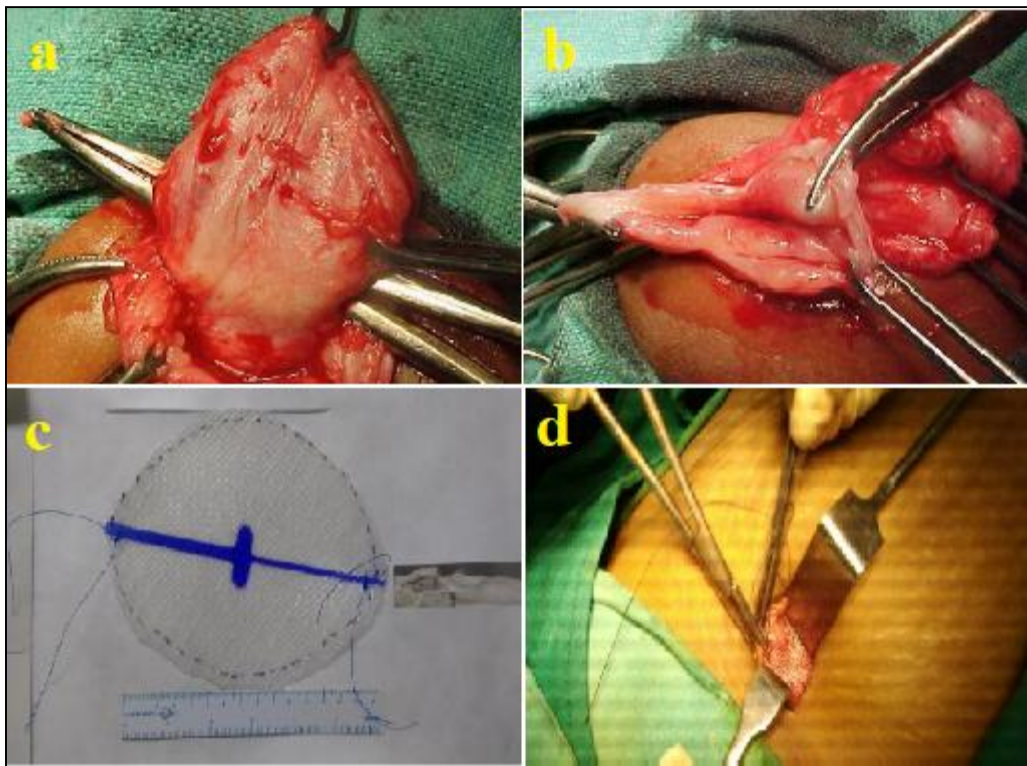


Fig. 2. Post-operative complications

**Table 3. Independent samples T-test to compare mean values between surgical procedures**

Post operative parameters (Day)	Lap	Open	P value
Time to return to routine activities	1.52±0.50	4.40±1.15	<0.0001
Post-op Hospital stay	3.28±0.97	5.88±2.00	<0.0001
Total Hospital stay	4.52±1.08	7.32±2.03	<0.0001
Time to return to work	11.44±1.91	22.96±2.33	<0.0001



**Fig. 3. a) Dissection of sac' b) Open of sac; c) Measuring the size of mesh according to defect size; d) Open mesh fixation**



**Fig. 4. a) Omentum protruding through defect (Intraperitoneal view); b) Area of Defect After reducing content; c) IPOM (mesh fixed with tacker)**

**Table 4. Comparison of present study with other similar studies**

Reference	Patients (n)		Operating time (min)		Length of stay (days)		Post-operative complications (%)					
	Open	Lap	Open	Lap	Open	Lap	Infections		Seroma		Recurrence	
Team	Open	Lap	Open	Lap	Open	Lap	Open	Lap	Open	Lap	Open	Lap
Holzman et al.	16	20	98	128	5	1.6	6	5	0	5	13	10
Ramshaw et al.	174	79	82	58	2.8	1.7	3	0	-	-	7	0
Misra et al.	33	33	75	86	1.47	3.43	33.3	6.06	3.03	12.1	3.3	6.2
Pring et al.	30	24	43.5	42.5	1.47	1.33	16.67	3.3	33.3	16.67	4.16	3.3
Asencio et al.	45	39	101.88	70	3.46	3.33	0	0	5.12	28.89	7.9	9.8
Itani et al.	73	73	-	-	4	3.9	24.66	5.47	24.66	8.2	8.2	12.5
Present study	25	25	55.44	81.68	7.3	4.5	28	12	20	8	12	4

Similar to the present study males were higher in Korukonda et al. [11] and Gonzalez et al. [12] study. Operating time of hernia repair varies considerably between surgeons and also between surgical centers and reduces with experience. The operating time decreases once the surgeon attains proficiency in laparoscopic hernioplasty and masters the anatomy. In current study most of the open cases were completed surgery within 55.44 minutes while in the lap group it took 81.68 minutes which was statistically significant and concordant with many other studies [10,11,13].

The comparison of pain at the end of 24 hours and at the time of discharge between the two groups shows that pain was higher in those cases of umbilical and para-umbilical hernias that were treated by open repair with a statistically significant p value of <0.0001. This finding is comparable with the study conducted by Purushotham et al [10] and Korukonda et al [11]. Chronic pain experienced at 1 month by patients was significantly higher in open hernia repair group 0.16 as compare to laparoscopic repair group 0.04. Younger age group and female patients were found to have more pain compared to the rest which was similar to study done by Purushotham et al [10]. The elevated pain in young patients is attributed to their higher level of activity and more critical expectations for the postoperative course [14]. Women perceive more post-operative pain than men. The mechanism remains unclear but it has been attributed to biological, hormonal, psychological and physiological differences.

Immediate resumption of normal activities is recommended after hernia surgery as long as the patient can carry out the activity comfortably [10]. It has been reported that after laparoscopic hernia repair patients tends to return to normal activity earlier than after conventional repair [5]. In present study laparoscopic repair patients were able to perform routine activities by the 2nd day whereas most of the patients in the open group were able to perform routine activities by the 5th day only. The comparison of duration of hospital stay in days between the two groups' shows that duration was higher in open hernioplasty with 5.88 days as compared to lap group 3.28 days. These findings are correlated with the earlier studies [10-13,15].

In 1970s and 1980s, patients often took two to three months off work after open hernia repair. In the past 2 decades, the reported convalescence

period following umbilical hernia repair has been decreasing [10]. Fear of hernia recurrence is the main concern of patients with respect to early return to work. Patients with active and heavy work duties took a median sick leave of 7 weeks. The impact of occupation on convalescence seems to be universal in all countries. Patients should be advised and encouraged to return to work once they feel comfortable [10]. The decision of returning to work is mainly based on patients' own assessment of their physical condition. As prolonged sick leave may result in loss of income or even the job, economic consideration is a major impetus in returning to work early. Most patients managed to return to work within 3 weeks following ambulatory umbilical hernia repairs. A sick leave of 3 weeks appears to be appropriate for most patients after uncomplicated ambulatory umbilical hernia repair [5]. A significant benefit of laparoscopic hernioplasty is an earlier return to work [16]. This translates into a significant economic savings to the society because of fewer working days lost proved that patients who underwent laparoscopic hernia repairs regained their physical performance faster and returned to full activity earlier than those after conventional hernia repairs. In the present study, in lap group, the mean time to return to work (day) was 11.44 as compared to open group, was 22.96 (day) which was comparable with the study done by Purushotham et al [10].

We had infection rate of 28% in open repair and 12% in laparoscopic group, seroma rate was 20% in open repair and 8% in laparoscopic group and recurrence rate was 12% in open repair and 4% in laparoscopic group. Thus it was found to have lower incidence of complications (wound infection, seroma and recurrence) in lap repair as compared to open repair. These findings are in accordance with the previous studies [11,13,17]. In case of multiple defects of the linea alba laparoscopy is useful in diagnosis and treatment. Laparoscopic umbilical and paraumbilical hernia repair with mesh is reasonable alternative to conventional repair for defect that requires a mesh. The patient benefits in terms of less hospital stay, less pain and early return to routine activity and work makes it superior to open repair.

Cost factor was not studied as study was conducted in a government run hospital, all the facilities including mesh and instruments were available free of cost. Due to SARS-CoV-2 (COVID 19) pandemic and lockdown in the year

2020, cases are registered in lesser numbers than expected. Therefore, the sample size was small. Further studies and meta-analysis are suggested for interested researchers.

## 5. CONCLUSION

Laparoscopic hernia repair offered a significant advantage over open repair such as early recovery and reduced hospital stay, lesser analgesic dose requirement, early resumption of normal activities and better quality of life in consideration with bodily pain. Furthermore, the laparoscopic approach appears to be safe, effective and acceptable. The advantages of laparoscopic repair of umbilical and paraumbilical hernia are smaller incisions and less scar problems; broader coverage of hernia defect; less postoperative hospital stays and early return to work; less post-operative pain, especially late; less chances of seroma formation; lower incidence of mesh and wound complication; better acceptable cosmetic result and low incidence of recurrence. In addition, the laparoscopic hernia repair is a complex but very efficient method in experienced hands. To achieve the best possible results, it requires an acceptance of a learning curve, structured well-mentored training and high level of standardization of the operative procedure.

## CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the authors.

## ETHICAL APPROVAL

The study was approved by the institutional ethics committee.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Muysoms FE, Miserez M, Berrevoet F, Campanelli G, Champault GG, Chelala E et al. Classification of primary and incisional abdominal wall hernias. *Hernia* 2009;13(4):407-14.
2. Dabbas N, Adams K, Pearson K, Royle G. Frequency of abdominal wall hernias: is classical teaching out of date? *JRSM Short Rep.* 2011;2(1):5.
3. Colon MJ, Kitamura R, Telem DA, Nguyen S, Divino CM. Laparoscopic umbilical hernia repair is the preferred approach in obese patients", *The American Journal of Surgery* 2013;205:231-236.
4. Misra MC, Bansal VK, Kulkarni MP, Pawar DK. Comparison of laparoscopic and open repair of incisional and primary ventral hernia: results of a prospective randomized study. *Surg Endosc.* 2006; 20(12):1839-45.
5. Stirler VM1, Schoenmaeckers EJ, de Haas RJ, Raymakers JT, Rakic S. Laparoscopic repair of primary and incisional ventral hernias: the differences must be acknowledged. A prospective cohort analysis of 1,088 consecutive patients. *Surg Endosc.* 2014;28(3):891-5.
6. Zens TJ, Rogers A, Cartmill R, Ostlie D, Muldowney BL, Nichol P, Kohler JE. Agedependent outcomes in asymptomatic umbilical hernia repair. *Pediatric surgery international.* 2019;35(4):463-8.
7. Wagner JP, Brunnicardi FC, Amid PK, Chen DC. Inguinal hernias. *Schwartz's Principles of Surgery.* 10th ed. New York: McGraw-Hill Education. 2015:1495-516.
8. Rives J, Pire JC, Flament JB, Palot JP, Body C. Treatment of large eventrations. New therapeutic indications apropos of 322 cases. *Chirurgie; memoires de l'Academie de chirurgie.* 1985;111(3):215-25.
9. Buddha PV, Padmini G. A Comparative Study of Open Vs Laparoscopic Repair in Umbilical and Para Umbilical Hernias. *OSR Journal of Dental and Medical Sciences (IOSR-JDMS)* 2019;18(3):32-36.
10. Purushotham B, Madhu S. Comparative study between laparoscopic and open repair of umbilical and para umbilical hernia. *International Surgery Journal.* 2015;2(2):204-13.
11. Korukonda S, Amaranathan A, Ramakrishnaiah VP. Laparoscopic versus open repair of Para-umbilical Hernia-A prospective comparative study of short term outcomes. *Journal of clinical and diagnostic research: JCDR.* 2017;11(8): PC22.
12. Gonzalez R, Mason E, Duncan T, Wilson R, Ramshaw BJ. Laparoscopic versus open umbilical hernia repair. *JSLs: Journal of the Society of Laparoendoscopic Surgeons.* 2003;7(4):323.



13. Carbajo MA, del Olmo JC, Blanco JI, de la Cuesta C, Martin F, Toledano M, Perna C, Vaquero C. Laparoscopic treatment of ventral abdominal wall hernias: preliminary results in 100 patients. JLS: Journal of the Society of Laparoendoscopic Surgeons. 2000;4(2):141.
14. Callesen T, Bech K, Nielsen R, Andersen J, Hesselfeldt P, Roikjaer O, & Kehlet H. Pain after groin hernia repair. British Journal of Surgery. 1998;85:1412-1414.
15. Chari R, Chari V, Eisenstat M, Chung R. A case controlled study of laproscopic hernia repair. Surgical endoscopy. 2000;14(2): 117-9.
16. Andersson B, Hallén M, Leveau P, Bergenfelz A, Westerdahl J. Laparoscopic extraperitoneal inguinal hernia repair versus open mesh repair: a prospective randomized controlled trial. Surgery. 2003;133(5):464-72.
17. DeMaria EJ, Moss JM, Sugerman HJ. Laparoscopic intraperitoneal polytetrafluoroethylene (PTFE) prosthetic patch repair of ventral hernia. Surgical endoscopy. 2000;14(4):326-9.

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