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A Comparative Study of Onlay and Preperitoneal Mesh Repair in Management of Umbilical and Para-Umbilical Hernia

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Abstract:

Background: The study was conducted to compare the onlay mesh repair with the preperitoneal mesh repair in adult patients with paraumbilical / umbilical hernias.

Aim: The study compares the operative time, the hospital stay and postoperative complications and recurrence in onlay and preperitoneal mesh repair for umbilical hernia. It is a non randomized clinical trial.

Method: 44 patients underwent mesh repair by onlay or preperitoneal. These patients were more than 18 years but less than 70 years of age. All the other hernias like groin hernia, incisional hernia, epigastric hernia, recurrent hernia and divercation of recti were excluded. A detailed history with demographic parameters were noted. Local examination and routine labs were done. After written informed valid consent patients underwent onlay or preperitoneal. In the postoperative period patients were monitored for immediate and long term complications upto 6 months. The results were statistically were analysed and tabulated into results.

Results and discussion: Like most of the studies our results showed that operative time for preperitoneal is more than onlay repair. Althoughin our study the time of drain removal was almost same in contrast to the result of most studies where drain in the onlay repair group was removed before preperitoneal repair group. Patients of the preperitoneal group were discharged before the onlay group just like the result of most studies. Pain score (VAS) showed preperitoneal group had less pain on day 3 compared with onlay group but both had similar pain score on day 1. Complications like seroma formation, surgical site infection and chronic pain was more in the onlay group as compared to preperitoneal group. There was no case of recurrence in our study.

Conclusion: Umbilical hernias are less as compared to inguinal hernia and incisional hernia. Obesity remains the main risk factor and it occurs most commonly in middle age group 31–50 years. A mesh repair with non absorbable polypropelene mesh is the treatment of choice nowadays. A preperitoneal mesh repair demonstrates better outcomes in terms of hospital stay, severity of pain after day 3 and complications like seroma formation and surgical site infection as compared to onlay mesh repair. On long term follow up, a preperitoneal mesh repair shows less incidence of chronic pain and recurrence though more long term follow up warranted to validate the result.

Keywords: Umbilical Hernia; preperitoneal mesh repair; polypropelene mesh.

Introduction

A hernia is an abnormal protrusion of a viscus or part of a viscus through an abnormal opening in the walls of its containing cavity.[1]

As a result of man's erect posture anterior abdominal wall is the site of variety of hernias through a weak spot. Umbilicus is one of the weak areas of the abdomen and a common site of

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herniation.In adults the hernial site is rarely located at umbilicus, it is either above [supra-umbilical] or occasionally below the umbilicus [infra-umbilical] hence referred to as para-umbilical hernia. Umbilical hernia in adults are usually acquired and is more common in females than males. The average age of presentation is between 30 to 40 years.[2]

Obesity is the most common risk factor. The acquired type of umbilical hernia does not resolve spontaneously and are prone to complication, hence should be treated as early as possible. Nowadays, synthetic mesh repair is the treatment of choice which has reduced the rate of recurrence drastically.[3]

Mesh repair can be done in various ways like onlay, inlay or sublay (Pre-peritoneal and rectorectus). Controversy exist among surgeons regarding the use of either type of meshplasty; due to differences in the ease of performing surgery, time of surgery, hospital stay, complications occurring in the post operative period and recurrence. Nowadays laparoscopic mesh repair can be done instead of open mesh repair but need expertise and is not cost effective in Indian set up. So this prospective study had been performed focussing mainly on adult umbilical and para-umbilical hernia managed by open meshplasty in the given hospital set up and above mentioned parameters were compared in two groups namely onlay (ON) and preperitoneal(PR) meshplasty technique for hernia repair.

Anatomy

The umbilical ring is a fibrotic opening in the linea alba which measures about 8–10 mm in diameter[4] The fibroligamental layer is constituted by four ligaments. The round ligament of liver descends from above and the three other ligaments ascend from below to converge into the same point of the umbilical ring. These are median and two medial umbilical ligament, which are the obliterated remnants of urachus and the two umbilical arteries respectively. This creates relatively weak area in the fascia superiorly. Posterior to fibro ligamental layer lies the fascia transversalis. At the level of umbilical region, this fascia may show condensation, which is known as Ritchets fascia or fascia umbilicus. This thickened fascia may cover the umbilical ring entirely or partially. So when this fascia is absent or located outside the limits of umbilical ring or it only partially covers the ring, the area appears much weaker and is predisposed to hernia formation.

Thus, there are two structures, the round ligament and Ritchets fascia that protects the umbilical area. If both are absent, the floor of the umbilical ring is relatively unsupported. The herniation through such a ring has been called direct umbilical hernia, where the Ritchets fascia partly covers the ring, the superior and inferior edges may form a fold or recess through which hernia may occur. This is called as indirect umbilical hernia.

Such indirect hernia descends into the umbilical ring from superior fascial fold or ascends into the umbilical ring from inferior fascial fold.

There are tendinous intersections along rectus muscle. The lower most is a critical spot for development of para-umbilical hernias. Severe contractions of powerful lower part of rectus muscle as during labour leads to tear at this spot, thus causing hernia.

Closure of the umbilical ring is spontaneous in most of the cases by the age of 2 years and represent the only hernia in the body that is genetically programmed to close. arrested closure results in a clinically significant umbilical hernia. clear indication for repair in children include hernia which are not closed spontaneously by the age of 2 years in symptomless children and children presented with incarceration or the presence of symtoms. Para-umbilical hernias are mostly acquired and do not tend to get close spontaneously. It is more common in middle age >35 years and old age. Female: Male ratio is approximately 5:1. It is more commonly seen in obese and multiparous women.

Symptoms: Pain and the swelling are the main symptoms. Traction on omentum stomach or transverse colon often gives rise to GIT symptoms.

Materials and Methods

This study includes 44 cases of adult umbilical and para-umbilical hernia who were admitted and treated at a Government Medical College and Hospital, Aurangabad (Mahrashtra, India) between December 2014 to October 2016. This study was a prospective cohort study

Inclusion Criteria

1. Patients presenting with umbilical and para-umbilical hernia above 18 years and less than 70 years.

Exclusion Criteria

1. Patients less than 18 years and above 70 years

2. Patient with Groin hernia, Incisional hernia, Epigastric hernia, Divarication of recti, Recurrent hernia.

A detailed history was obtained from the patient or his relatives. The demographic parameters like age, sex, occupation of the patients as well as their weight, height, BMI were noted. During the local examination of the swelling, the size, site, reducibility, cough impulse and the condition of the overlying skin were examined and noted. A routine laboratory investigations were done. paients were distributed in 2 groups based on the type of meshplasty done either Onlay or Preperitoneal.

Onlay technique involves primary closure of the fascia defect and placement of a mesh over the anterior fascia, avoiding direct interaction with the abdominal viscera. Technically easy to perform. Large subcutaneous dissection, seroma formation, superficial location of the mesh, which places it in jeopardy of contamination if incision becomes infected and repair is usually under tension, which leads to chronic pain or discomfort. all above factors leads to high rate of recurrence in this group as high as 28%.

Sublay repair involves placement of the mesh below the fascial component. It includes **preperitoneal or retrorectus** placement of the mesh. It is highly desirable to have the mesh placed beneath the fascia the natural forces of the abdominal cavity act to hold the mesh in place and prevent migration. This technique has reported less complications like seroma formation, surgical site infection as this space protects the mesh from superficial wound infection and intra peritoneal content.it is Surgically more challenging and complex to perform. Dissection of this plane can risk damaging the muscle, blood supply, nerves to the rectus abdominis.[5]

Postoperative monitoring was done for any immediate complications and long term follow up was done to look for any recurrence.

Statistical Test used

For comparison of quantitative data of two groups unpaired t-test was used with the help of SPSS (Statistical Software for Social Sciences) Version 23 software and for comparison in within group paired t-test was used. P-value was checked at 5% level of significance.

Results

Table 1: Operative Time

Procedure	Expert	Time	Trainee	Time
Onlay	11	51 ± 10 Min	13	71 ± 7 Min
Preperitoneal	13	61 ± 11 Min	07	80 ± 11 Min

Table 2: Day of Drain removal

Avg day of drain removal	J Gleysteen *et al.*	Godara R *et al.*	Present study
Onlay	4 days	5 days	5.8 ± 1.7 day
Preperitoneal	6 days	7 days	5.2 ± 1.2 days

(*p* value=0.458)

Table 3: Duration of mean Hospital stay in each study

Duration of mean hospital stay	J Gleysteen *et al.*	De Vries Reilingh *et al.*	Bantu raj siddharth *et al.*	R Godara *et al.*	Present study
Onlay	7.9	8.2	7.5	4.6	9.7 ± 3.4 days
Preperitoneal	5.9	6.1	5.9	6.8	7.8 ± 2.2 days

Table 4: Pain Score

Procedure	At Day 1	AT DAY3
Onlay	6.91 ± 0.9	3.61 ± 0.6
Preperitoneal	6.78 ± 0.7	3.13 ± 0.6

p value=0.402 *p* value =0.002

Table 5: Incidence of complications

Complication	Preperitoneal	Onlay	Preperitoneal	Onlay	*p* value
Seroma formation	4	7	20	29.1	0.726
Surgical site infection	1	4	5	12.5	0.461
Chronic pain	3	8	7.6	18	0.450
Recurrence	0	0	—	—	—

Fig. 1: Paraumbilical Hernia

Fig. 2: Preperitoneal Mesh Placement

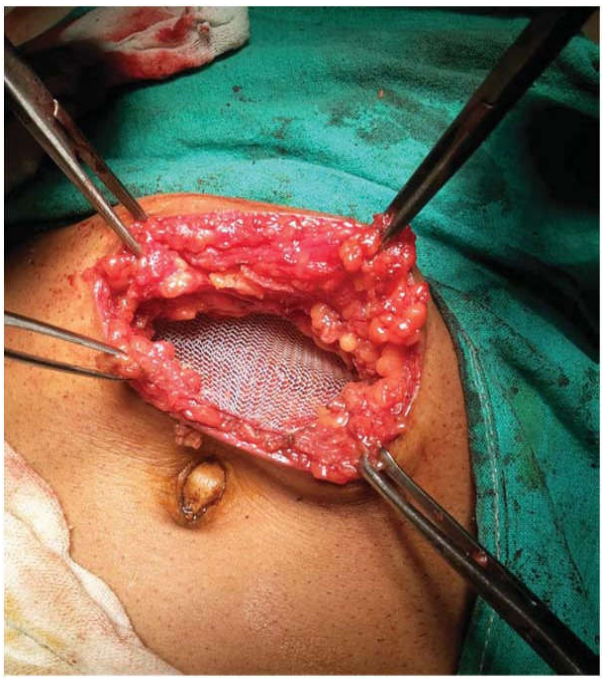

Fig. 3: Onlay mesh repair

Fig. 4: Postoperative day 10 showing Surgical site infection in onlay repair patient

Fig. 5: Patient with preperitoneal repair had healthy scar at 6 months

Discussion

Umbilical and para-umbilical hernia incidence in general population ranges from 3% to 10%. In present study incidence of umbilical and para-umbilical hernia was 8.7%.

Which is comparable with other studies and literature. In the present study 70.5% of umbilical hernias were para-umbilical, out of which supraumbilical hernia patient were more common than infraumbilical. The present study shows that incidence is highest in the age group of 35–50 years and mean age of incidence is 44 years. These findings correlate with the international figures. The Male to Female ratio in present study was 1:1. This finding was in contrast to most of the literature.

In this study, percentage of female population was 50%. Reason for high incidence in middle age female according to most of the literature is high incidence of obesity with multiparity in this age group. It was

found that, majority patients had more than one risk factor, main risk factor being obesity. Out of 44 cases, 81.8% of the patients were obese, 31% were multiparous, 5% had chronic cough due to COPD. Moschcowitz, A.V.[6] (1915), hypothesized that all conditions causing an increase in intra abdominal pressure like obesity, ascitis, smoking, chronic cough leads to development of umbilical hernia.

In the present study out of 44 patient, 24 patient underwent onlay mesh repair while rest 20 patient underwent preperitoneal mesh repair (Table 2).

In present study separate sub groups made in each group i.e. mesh repair done by expert (experience of 3 years and above) and by trainee surgeon (experience of less than 3 years). Mean time taken for the meshplasty by expert was 51 ± 10 min for Onlay and 61 ± 11 min for Preperitoneal (p value = 0.042), which shows there was significant time difference between the two procedures. Similarly operative time by trainee for Onlay was 71 ± 7 Min and for preperitoneal was 80 ± 11 Min (*p* value = 0.035), which is also a significant time difference to perform two procedures. This time difference observed between the 2 groups may be due to more dissection needed for creating preperitoneal space plus securing reasonable hemostasis in the preperitoneal repair. This proves preperitoneal repair is technically a more challenging and complex surgery than Onlay mesh repair. It also emphasize expertise also a significant factor to determine time of surgery.

Bantu Rajsiddharth *et al.*[7] which shows that the mean operative time for onlay was 45 min and for preperitoneal was 60 min, which was comparable with the findings of our study. J. Gleysteen *et al.*[8] showed that the mean duration of Onlay repair was 42 min as compared to preperitoneal repair with mean operative time was 70 min.

R Godara *et al.*[9], study the mean duration of surgery in Onlay was 49 ± 8 min while in sublay was 63 ± 15 min (*p* value <0.001). The difference was highly significant.

Duration of hospital stay indicates the degree of morbidity in terms of post operative complication. Also more the hospital stay more are the chances of wound infection. The Mean duration of hospital stay in "onlay" group was 9.33 days as compared to "preperitoneal" group with 8.40 days ($p < 0.041$). Thus the difference is statistically significant proving that average hospital stay and thus postoperative morbidity and complication is less in preperitoneal repair.

J Gleysteen *et al.*[8] 2009, stated that average hospital stay for onlay was 7.9 days as compared to pre-peritoneal repair was 5.9 days. De Vries Reilingh et al.[11] 2004, quotes "The mean duration of surgery in their study was 8.2 days in onlay while 6.1 days for preperitoneal repair."

Bantu rajsiddharth *et al.*[7] 2015, this study shows mean duration of onlay repair was 7.5 days and 5.9 days for preperitoneal repair.

One study showing contradictory results is R Godara et al.[9] 2005, in this study mean hospital stay in onlay was 4.6 days while in Preperitoneal repair was 6.8 days.

In present study in "onlay" group average day of drain removal was 5.75 days as compared to pre-peritoneal group where drain removal on 5.5 days (*p* value=0.45).

J Gleysteen *et al.*[8] 2009: Stated that in Onlay repair drain remained for 4 days while in sublay repair drain remained for 6 days.

Seroma formation is most common complication in umbilical hernia. In present study, 29.1% (7 cases) had seroma formation in the Onlay group as compared to 20% (4 cases) in the Preperitoneal group. (p value = 0.726). The Onlay mesh repair had more cases of seroma formation, due to more subcutaneous dissection to place the mesh which leads to formation of more devitalised tissue and subcutaneous fat necrosis.

Shahidaparveen *et al.*[10] 2015, reported 28% (14 cases) seroma formation in onlay repair was compared to 16% in sublay repair.

Bantu Rajsiddharth *et al.*[7] 2015, stated that Onlay repair showed seroma formation in 20% patient and preperitoneal repair showed 10% cases with seroma formation.

The surgical site infection is more frequent following Umbilical hernia repair than other hernia repair because umbilical skin may not be cleaned of all bacteria even with the use of modern antiseptic solution. A recent study reported a 19% infection rate following open umbilical hernia repair despite giving preoperative prophylactic antibiotic. Surgical site infection includes wound infection and wound dehiscence and can be superficial wound infection or deep mesh infection. It is prevented by suction drain, Injectable antibiotics, regular sterile dressing. In present study there were 5 patient (11.3%) that reported with surgical site infection, 4 patients (12.5%) were of onlay group and 1 patient (5%) of preperitoneal group (*p* value= 0.46). It shows onlay group is more susceptible for surgical site infection. Deep mesh

infection was not reported during our study in any of the two groups. John J Gleysteen *et al.*[8] 2009 published a study which reported wound infection in onlay group was 12% while in preperitoneal group was around 4%. Bantu Rajsiddharth *et al.*[7] 2015 reported wound infection of 13% in onlay group while 6% in preperitoneal group.

Mesh removal is considered in case of deep mesh infection which is not controlled by higher antibiotics and regular dressing. It further leads to increased chances of hernia recurrence. In present study no such case of mesh removal was reported in either of the 2 groups.

Postoperative pain was gauged using VAS score. In present study, equal doses of analgesic injection tramadol on day of surgery and injection diclofenac from post operative day one given till the time patient stop complaining of pain. VAS score measured at day one and day three. Pain score was compared in 2 groups at post operative day one and three.

At day 1

Average pain score for onlay and preperitoneal group was 6.91 and 6.73 respectively. (p > 0.648). This shows there was no significant difference in pain at day 1 in either of the two procedure.

At day 3

Average pain score for Onlay and Preperitoneal group was 3.58 and 3.13 respectively. Which was statistically significant (p > 0.048)

Thus we concluded, there is significant reduction in pain in preperitoneal repair on Day 3.

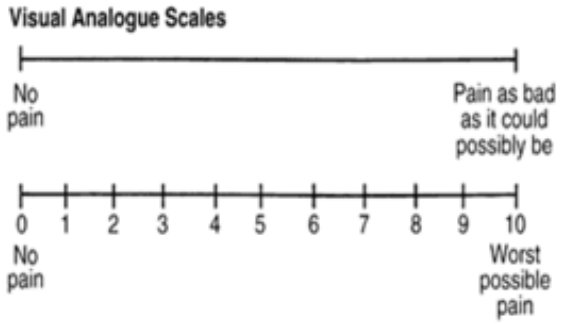

Fig. 6: Visual Analogue Scales

Chronic pain is a late complication in hernia surgery. In present study 10 patients (22.7%) complained of chronic pain after meshplasty on follow up (after 6 months), 7 patients (29%) of onlay repair in comparison to 3 patient (15%) of preperitoneal repair group. (p value >0.45). Bantu Rajsiddharth *et al.*[7] 2015, states chronic pain was complained by 7 patient (11.6%). Out of these 6 (20%) were in Onlay group while one patient (3.33%) in pre-peritoneal repair group (p value < 0.05).

Conclusion

A preperitoneal mesh repair demonstrates better outcomes in terms of hospital stay, severity of pain after day 3 and complications like seroma formation and surgical site infection as compared to onlay mesh repair. On long term follow up, a preperitoneal mesh repair shows less incidence of chronic pain and recurrence though more long term follow up warranted to validate the result.

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