

Open Mesh Repair in the Management of Umbilical Hernia: Onlay and Pre-Peritoneal: A Comparative Study

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Abstract

Background: Umbilicus is one of the weak areas of the abdomen and a common site of herniation. Umbilical hernias in adults are generally acquired hernias, more common in women, and in conditions like pregnancy, ascites, obesity etc. This study was performed to compare open onlay mesh repair and preperitoneal mesh repair in adult patients with umbilical hernia. The purpose of this study was to evaluate the outcomes in terms of operative time, surgical easiness, hospitalization, complications, and recurrence.

Methods: This study was conducted at department of general surgery, government medical college & associated group of hospital Kota, Rajasthan. A total of 50 patients were taken up for the study, these were divided into two groups for onlay and pre-peritoneal

mesh repair. Intra operative study was done regarding operative time (operated by the same surgeon through the course of study), ease of procedure and operative complications. Follow up was done to note the complications and recurrence for 6 months.

Results: The average operative time in onlay repair was 36.80 minutes and pre-peritoneal repair was 64.61 minutes. The onlay group had 20% and 16% of seroma formation and wound infection respectively, while the pre-peritoneal group had 4% seroma formation and 4% wound infection showing statistical significance.

Conclusion: The study found that pre-peritoneal mesh repair had less complication rates like seroma and wound infection compared to onlay repair. Although time taken for pre-peritoneal mesh repair was more, but

comparatively fewer complications are beneficial for the patients.

Keywords: Onlay, Pre-Peritoneal, Seroma, Wound Infection.

Introduction

A herniation is outlined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls. Umbilical and para-umbilical hernia incidence in general population ranges from 3% to 10%. Umbilical hernias occur commonly in infants. They close spontaneously by two years of age. Those that do not close even after 5 years of age are repaired surgically.¹ Umbilical hernias in adults are commonly acquired hernias. It is more common in childbirth, obese women, and middle-aged and elderly women². Obesity and multiparity are important predisposing factors not only in primary but also in recurrent cases^{3,4}. The contents of the hernial sac may be mainly preperitoneal fat tissue, the omentum, and the small intestine. Sometimes a combination of these organs may exist⁵. An umbilical hernia is more common in people with only one midline aponeurotic cruciate compared to a normal cruciate of all three lateral abdominal muscles.¹ Pain and swelling are the main symptoms. Gastrointestinal symptoms often appear when the omentum, stomach or transverse colon is pulled out. The overlying skin may become thinned, outstretched and develop dermatitis. Diagnosis is through clinical examination. Ultrasound scan can reveal details about the defect size, content of sac etc. Techniques of umbilical hernia repair surgery have evolved from simple suture repair of native myofascial tissue to use of prosthetics to reinforce the layers of the anterior abdominal wall. It is well established that the use of permanent prosthetic mesh reduces the overall risk of recurrence⁶. Though there is lack of harmony in

mesh placement⁷, by convention these locations can be (a) onlay - anterior to rectus sheath, (b) inlay - within the edges of an abdominal wall defect substituting for absent myofascial tissue, (c) sublay – between the rectus muscle and posterior rectus sheath (retro rectus) or between the posterior rectus sheath and peritoneum (preperitoneal), (d) underlay – posterior to the parietal peritoneum. Repair of the defect with mesh has significantly improved long term outcomes and is now recognized as the standard of care. However, there is a great discussion on the plane of mesh placement. Various studies have reported a range of complications like seromas, infections, mesh erosions etc. based on the plane of mesh placement. The placement of the onlay mesh is a relatively simple and fast procedure, especially in the hands of less experienced surgeons. However, dissection of the myofascial skin flap increases the risk of wound complications such as seroma and surgical site infection⁸. Although placement of the mesh in the retrorectal plane is considered by most authors the gold standard for ventral hernia repair, but the mesh cannot extend beyond the rectal sheath⁹. Even though preperitoneal repair requires careful separation of the parietal peritoneum from a stretched out and potentially scarred myofascial layer, mesh placed at this level is protected both from superficial wound complications and adhesion formation with intraperitoneal contents.

Aims and objectives of the study : The main aims and objectives of this study to evaluate the result of onlay and pre-peritoneal open mesh repair in umbilical hernias in adults regarding operative time, ease of procedure, hospital stay, complications and recurrence.

Materials and Methods

This study was conducted at department of general surgery, Govt medical college & associated group

of hospital Kota, Rajasthan. A total of 50(25 per group) patients were taken up for the study, these were divided into two groups for onlay and pre-peritoneal mesh repair. Study included operative time (operated by the same surgeon through the course of study), ease of procedure and operative complications. Follow up was done to note the complications and recurrence for 6 months.

Methodology

After admission, patients fulfilling the inclusion & exclusion criteria were taken into study after obtaining written informed consent and the data to be collected regarding clinical history, examination, diagnosis, investigations, details of previous operative procedure. Patients are randomly divided into two groups for onlay and preperitoneal mesh repair. Intraoperative studies were performed in terms of operative time (performed by the same surgeon during the study), ease of procedure, and intraoperative complications. Post-operative follow up was done to note the complications and recurrence for a period of 6 months. Success of the procedure was studied in terms of symptomatic relief for the patient, reduced hospital stays after procedure, low incidence of complications like seroma, wound infection and mesh infection and decrease rate of recurrence of hernia.

Statistical Analysis: Data was entered in computerised database and was analysed using relevant statistical tests. The study variable was presented as percentage. Data were analysed using SPSS software v.23.0 and Microsoft office 2007.

Investigations Needed:

CBC, Blood urea, Serum creatinine, Liver function tests, Blood sugars, Ultrasonography of abdomen, Chest X-ray, ECG

Inclusion Criteria: Patients 18 years and above presenting with umbilical hernia.

- Exclusion Criteria: 1. Patients less than 18 years
 2. Divarication of recti
 3. Patients medically unfit for surgery due to various co-morbidities
 4. Recurrent hernias

Results

Age Distribution: In our study different age groups who were operated for umbilical hernia were as followings, 2% of patients were below 20 years of age, 6% between 21-30 years, 34% between 31-40 years, 32% between 41-50 years, 16% between 51-60 years and 10% above 60 years of age. Most number of patients are in the 31-40 years group forming 34% of the total.

Sex Distribution

In this study, 17 of the patients were male making 34% of the study population; while 33 of the patients were female making up 66% of the study population.

Chief Complaints

Chief complaints	Distribution of chief complains	
	N	%
Swelling over umbilicus	38	76
Swelling over umbilicus, pain	9	18
Swelling over umbilicus, pain, & vomiting	3	6
Total	50	100

Chief complaints of the entire study group are depicted above, 75% or 48 patient’s complaint of swelling over the umbilicus only, 14% or 9 of the patient’s complaint of swelling and pain in the swelling and 11% or 3 patients’ complaint of swelling, pain and occasional vomiting

Content of the Hernia Sac

Content of the hernia	Distribution of content of the hernia	
	N	%
Omentum	27	54

Omentum and small bowel	11	22
Small Bowel	12	24
Total	50	100

54% of the total patients in the study had omentum as content, 22% of the patients in the study had both omentum and small bowel as content, 24% of the total number of patients had small bowel

Defect Size

The mean size of the defect in the study population was 2.52 cm.

Operative Time

The average operative time in onlay repair was 36.80 minutes and pre-peritoneal repair was 64.61 minutes. All the mesh repairs used in this study was done by a single surgeon so as to ensure valid comparison between the onlay and pre-peritoneal group.

Day of Discharge

The average post-operative day of discharge for onlay group was 6.4 days and for preperitoneal group was 5.6 days.

Post-Operative Complications

The commonest complications noted in our study are as followings

Post-Operative Complications	Distribution of Post-Operative Complications			
	Onlay		Pre-peritoneal	
	N	%	N	%
Chronic Pain	4	16	2	8
Seroma Formation	5	20	1	4
Wound Infection (SSI)	4	16	1	4
Mesh Infection	1	4	0	0
Enterotomy	0	0	1	4
Recurrence	1	4	0	0
Total	25	100	25	100

The above table shows a list of the most common complications seen in umbilical hernia mesh repair, 4 patients in onlay group complaint of pain post-operatively and on long term follow up (6 months) constituting 16%, while 2 patients in pre-peritoneal group complaint of post-operative pain, it was managed with reassurance and non-opioid analgesics when required. Seroma formation was one of the most common complications encountered in umbilical hernia mesh repair. In the onlay group, 5 patients developed seroma which was 20%, while in the pre-peritoneal group 1 patient developed seroma which was 4%. Seroma was dealt with by conservative management or evacuation and regular wound dressing depending on the quantity and symptoms.

Wound infection was found in 4 in onlay group (16%) while was found in 1 patient in pre-peritoneal group (4%). The wound infections were treated with antibiotics according to culture sensitivity reports, regular debridement and dressing and adequate control of sugars if diabetic.

Mesh infection was found in one patient of onlay group (4%) and none in preperitoneal group developed (0%). Mesh infection was treated with antibiotics according to culture and sensitivity reports and eventually underwent mesh removal and anatomical repair.

Accidental gut injury or Enterotomy was not seen in onlay group (0.0%). It was seen in 2 patients of the preperitoneal group constituting 8%. Enterotomies were repaired by primary closure in both cases with bowel rest and Ryle’s tube insertion. Since contamination was not much, mesh repair was done after closing the peritoneum. Recurrence was found in one patient with onlay mesh repair (4%) and not found in preperitoneal

repair. The patient underwent a second operation for the recurrence.

Discussion

Umbilical hernias are mainly found in infants and usually close by 2 years of age. If it does not close on its own after 5 years, surgical treatment is required. Umbilical hernia in adults occurs mainly in middle-aged women who have increased abdominal pressure due to pregnancy, ascites, or obesity.¹ Small hernias less than 2.5 cm in diameter often close successfully with primary tissue repair. However, larger hernias have a recurrence rate of up to 30-40% when tissue repair alone is performed.¹¹ Restoring ventral hernias with mesh instead of sutures significantly improves long-term outcomes and is considered the standard of care¹⁸. However, many studies demonstrate an increased risk for wound complications with mesh placements including infections, seromas and mesh erosions.¹⁹ The risks concerned depends on the plane of mesh placement. While mesh repair of umbilical hernia is considered standard, there is no harmony on the best location to place the mesh. This study compares two types of mesh repairs- onlay and pre-peritoneal in terms of duration of surgery, ease of procedure, post-operative complications like seroma, wound infection, mesh infection, chronic pain, enterotomy and recurrence.

Age

Most number of patients are in the 31-40 years group forming 34% of the total. 41-50 years age group constitutes 32% of the total number. 51-60 years age group makes up 16%, 21-30 years 6%, >60 years 10% and < 20 years 2%.

The youngest patient in the group was 19 years of age, the oldest was 76 years of age. This is comparable with the below studies.

Maximum no of cases	Biju K Varghese et al ¹⁵	Rajsiddharth B et al ¹⁶	Present study
Age group	51-60	31-40	31-40
Percentage	30 %	58.3 %	34 %

So, the finding was similar with Rajsiddharth B et al¹⁶

Sex

In our study, 17 patients were male making 34 % of the study population, while 33 of the patients were female making up 66% of the study population. Other studies have shown comparable results. Ellis H. et al.¹⁰ have obtained a 64.6% of female population in the study of 342 patients. Furat Shani Aoda et al¹⁷ showed 80.4% of female population. This is consistent with the literature showing female: male ratio of 3:1.^{12,13}

Chief Complaints

Swelling over the umbilicus has been the most consistent complaint found in all patients. Pain can be explained by the dragging sensation if omentum is content. Occasional vomiting with pain can be associated with intermittent obstruction. No strangulated hernias were considered. These symptoms are comparable to other studies.

Chief Complaints	Bantu Rajsiddharth Et Al ¹⁶	Present Study
Swelling over umbilicus	85 %	76 %
Swelling and pain	11.67%	18 %
Swelling, pain, vomiting	3.33%	6 %

Co-Morbidities

Five of the patients were found to be hypertensive forming 10% of the study group, while 9 patients were diabetics forming 18 % of the study group. Eight patients had a BMI over 30 and were found to be obese forming 16 % of the study group. One patient had

retroviral disease forming 1.67% of the study group. Many of the patients had more than 1 co-morbidity.

Contents of the Sac

The various findings were omentum alone, small bowel alone, and both omentum and small bowel as content of sac. These observations are comparable to other studies as shown.

Content	Biju K Varghese ¹⁵	Present Study
Omentum	71 %	54 %
Omentum and small bowel	21 %	22 %
Small bowel	8%	24 %

The mean size of the defect in our study population was 2.52 cm.

Mean Duration of Surgery

The average operative time in our study in onlay repair was 36.8 minutes and preperitoneal repair was 64.61 minutes. All the mesh repairs used in this study was done by a single surgeon so as to ensure valid comparison between the onlay and pre-peritoneal group. The difference can be included in the time it takes for dissection to create an anterior peritoneal space. Ensuring adequate hemostasis is another burden against time. Ease of use is largely subjective and depends on the surgeon's expertise, accessibility, quality of support, and conducive facilities. Godara et al.²⁰ reported avg duration of 49.35 minutes for Onlay and a mean duration of 63.15 minutes for Pre-peritoneal Mesh repair, while in John. J. Gleysteen et al²¹ series the mean duration for Onlay and Pre-peritoneal Mesh repair were 42 and 70.5 minutes respectively.

Duration of Post-Operative Hospital Stay

The duration of postoperative hospital stay is a measure of degree of morbidity by the surgery in terms of postoperative complications. Average post-operative hospital stay period in present series for onlay repair was

6.4 days, as compared to 5.6 days average stay for Pre-peritoneal Mesh repair. Raghuvveer et al¹⁴ reported an average duration of stay was 6.68 days for Onlay and 4.8 days for Pre-peritoneal Mesh repair.

Complications

The commonest complications noted in our study are seroma, chronic pain, wound and mesh infection, recurrence etc, which were comparable with other studies.

Seroma	Our study	Furat S Aoda et al ¹⁷
Onlay	20%	24%
Pre-peritoneal	4%	2%
Chronic pain	Our study	Biju K Varghese et al ¹⁵
Onlay	16%	3.9%
Pre-peritoneal	8%	0%
Wound infection	Our study	Forte et al. ⁹
Onlay	16%	33.3%
Pre-peritoneal	4%	4.3%
Mesh infection	Our study	Forte et al. ⁹
Onlay	4%	22.2%
Pre-peritoneal	0%	0.9%
Recurrence	Our study	de VriesRelingh et al ²²
Onlay	4%	23%
Pre-peritoneal	0%	0%

Conclusion

1. In case of umbilical hernia prior to surgery, it is important to identify the accompanying risk factors like diabetes, obesity, to prevent the complications like seroma formation, wound infection, chronic pain and the recurrence.
2. Even though time taken for surgery in onlay mesh repair is significantly less compared to pre-peritoneal mesh repair, but seroma formation and infection are found to be more commonly related with onlay mesh repair compared to pre-peritoneal mesh repair.

3. Ease of the procedure in performing onlay mesh repair over pre-peritoneal repair gives it the points over pre-peritoneal but associated complications limits its use.

5. On continuous 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

5. Come to an endpre-peritoneal mesh repair is superior to onlay mesh repair.

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