COMPARISON STUDY BETWEEN ONLAY AND UNDERLAY MESHPLASTY FOR INCISIONAL HERNIA

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ABSTRACT

BACKGROUND

Hernia is among the oldest known afflictions of humankind, and surgical repair of the inguinal hernia is the most common general surgery procedure performed today.[1] Incisional hernia is one of the most common long-term complications of abdominal surgery. Various studies with sufficient follow-up have reported the incidence of incisional hernia after laparotomy to be up to 20%.

METHODS

This prospective study was conducted on 40 cases of incisional hernia admitted in the Department of General Surgery, Hi-Tech Medical College and Hospital, Bhubaneswar, from September 2016 to September 2018 over a period of 2 years

RESULTS

50% of patients were in the age group of 41-60 years and 30% were between 21 and 40 years of age. There was no statistically significant difference in the age of patients in Group A and Group B. ($p > 0.05$). Incidence of incisional hernia was 82.5% following emergency surgery and 17.5% after elective surgery. Site of incisional hernia was infraumbilical in 60% and supraumbilical in 40% of patient in Group A as compared to 40% infraumbilical and 60% supraumbilical in Group B. Various complications observed in Group A were retention of urine, seroma and chest infection in 20% of cases each. Chest infection was observed in 15% of patients in Group B.

CONCLUSIONS

Underlay mesh repair for incisional hernia was better than onlay mesh repair procedure because of shorter post-operative hospital stay, lesser complications and cost effectiveness.

KEYWORDS

Hernia, Seroma, Supra Umbilical, Infra Umbilical.

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BACKGROUND

Hernia is defined as the protrusion of a viscous or part of viscous from the cavity in which it is contained. More precisely it is the protrusion of a loop or knuckle of an abdominal organ or tissue through a weakness in the abnormal wall.[2] Hernias are of various types inguinal, spigelian hernia, lumbar hernia, obturator hernia, epigastric, umbilical, paraumbilical, diaphragmatic hernia, hiatus hernia, incisional hernia. Incisional hernias arise through a defect in the musculofascial layers of the abdominal wall in the region of a postoperative scar.[3]It can occur after any type of abdominal wall incision, although the highest incidence is seen with midline incision.[4] Many incisional hernias are asymptomatic. However, incisional hernias can also be an important source of morbidity. Apart from discomfort and pain, incisional hernia may lead to serious conditions such as incarceration (6-15%) or strangulation of bowel (2%).[5,6] If not promptly reduced, these conditions can be fatal. The literature describes variable incidence of incisional hernia following abdominal surgeries. The reported incidence is 2-11% following all laparotomies whereas the incidence rises to 23% after post-operative wound infection.[7,8.9]

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Aims and Objective

- To study different techniques for repair of incisional hernias and compare between onlay and underlay meshplasty.
- To study regarding operative time, ease of procedure, hospital stay and complications.

METHODS

Study Design

This prospective study was conducted on 40 cases of incisional hernia admitted in the Department of General Surgery, Hi-Tech medical college and hospital, Bhubaneswar, from September 2016 to September 2018 over a period of 2 years. A detailed history, examination and investigations of the patients were done. The patients were selected and randomly divided into two groups comprising of 20 cases i.e. Group A and Group B for the purpose of operative procedures. Group A: Onlay meshplasty technique. Group B: Underlay meshplasty technique.

Inclusion Criteria

Patients had incisional hernia and were willing for operation.

Exclusion Criteria

1. Patient came with incisional hernia within six months of previous operation.
2. Patient had ascites due to any cause.
3. Patient with previous abdominal operations for malignancy of abdominal organs.
4. Patient presented with obstructed hernias.

A written consent of the patient was taken before the surgery after duly explaining the procedure, risk involved and about anaesthesia. All the cases were examined pre-operatively by anaesthesiologist. The patient was kept fasting overnight. The part was shaved (if required) on the morning of the surgery. An intravenous line was established in all the cases. Preanaesthetic medications were given as advised by the anaesthesiologist. Intravenous antibiotic was administered half an hour before the surgery.

Techniques of Repair

Through a transverse or vertical elliptical skin incision, hernial sac and its neck was defined. Sac was opened at the neck and contents of the sac separated and replaced in the abdominal cavity. Redundant sac along with the overlying fibrous sheath and skin excised. Further, repair of the defect was done as under.

Group-A (Onlay Mesh Technique)

Defect in fibrous sheath and peritoneum was closed in single layer using non-absorbable continuous 1-0 polypropylene suture. Mesh was placed within subcutaneous plane and it was fixed at its margins with the underlying sheath and muscle about 5 cms away from the suture line of fibrous sheath by interrupted 2-0 polypropylene suture.

Group-B (Underlay Mesh Technique)

Posterior rectus sheath was separated on both sides of rectus abdominis up-to lateral margin of muscle. Medial margins of posterior rectus sheath and peritoneum were approximated using 2-0 polyglactin continuous sutures. Mesh was placed over the closed posterior rectus sheath and peritoneum. Mesh was than fixed to rectus muscle about 4-5 cms away from the suture line of posterior rectus sheath and peritoneum. Rectus muscle were then allowed to fall into their natural position over the mesh. Anterior rectus sheath was closed by continuous 1-0 polypropylene suture.

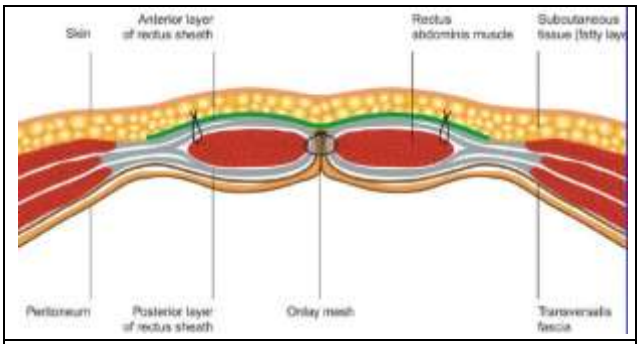

Figure 1. Anatomical Description of Onlay Meshplasty

Figure 1A. Onlay Meshplasty in a Case of Incisional Hernia (Intra-Op)

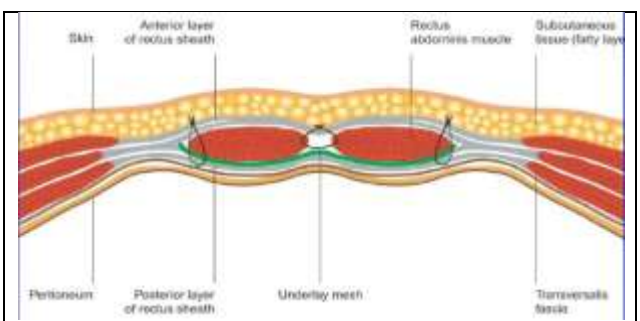

Figure 2. Anatomical Description of Underlay Meshplasty

Figure 2A. Underlay (Retrorectus) Mesh Plasty in a Case of Incisional Hernia (Intra-Op)

Haemostasis was done. If required, drain was placed in subcutaneous plane. Abdominal incision was closed in layers. Post-operatively same antibiotic was continued till

patient accepted oral supplements. Oral antibiotic was given 3 days with analgesics Early mobilization was encouraged, as cultural attitudes towards surgery in our setting are prohibitory to early ambulation for several days in postoperative period. Antiemetic was given for 24 hours. Patients were examined in follow-up after discharge at 1 week, 4th week and 12th week for wound complications like sinus, neuralgia and recurrence of hernia etc. Observations in both the groups were recorded in the performa attached. The result of these two groups were compared and analysed. Conclusion was drawn on the basis of analysis of observation. Transversus abdominis muscle release technique. (Above) The posterior rectus sheath is incised just medial to the linea alba to expose the rectus muscle. (Below) The retro rectus plane is then developed laterally to the linea semilunaris, with care taken to preserve the epigastric vessels.

RESULTS

In the present study, 57.5% were females with the sex ratio of males to females being 1:1.4. There were 82.5% of incisional hernias following emergency surgery and 17.5% were after elective surgery in the present study. Associated risk factors in the present study for incisional hernia included low haemoglobin which was less than 9gm/dl in 7 (17.5%) & less than 11 gm/dl in 26 (65%) patients. It was also noted in this study that in onlay mesh repair group, 10 (50%) had hypoproteinaemia & hypoalbuminemia and in underlay mesh repair group, 7(35%) had hypoproteinaemia & 8(40%) had hypoalbuminemia. It was found that multiple factors were present in the same patient and contribute to poor wound healing leading to wound infection & seroma formation. The mean total time taken for operation was more in underlay group i.e. 139.5±24.38 minutes compared with 127.5±23.59 minutes in onlay group in this study which was not statistically significant. (p>0.05) According to Ibrahim AH et al, the mean total time taken for surgery in the onlay group was 75-90 (83.41±10.24) minutes compared with 80-100 (89.52±7.25) minutes in the underlay group comparable to our study. The difference of time can be accounted due to more dissection needed for creating preperitoneal space. Onlay meshplasty has mean duration of surgery of 90 minutes, because it requires less tissue dissection. This is further affected by large hernias and multiple adhesion where it takes more time for tissue separation. Patient operated by underlay meshplasty having mean operative time 120 minutes. 3 patients in group B operated by underlay meshplasty having duration of surgery up to 150 minutes.

The difference of time can be due to more dissection time needed for adhesiolysis of intestinal loops creating space between rectus muscle & rectus sheath and securing haemostasis. Ease of operation is largely subjective (surgeon factor being constant) and depends on surgeon's experience, exposure and planning, quality of assistance, conductive facilities like light, cautery, instruments quality and sutures etc.

Type of Operation	LSCS	%	Hysterectomy	%	Exploratory Laparotomy	%
Goel TC, Dubey PC[10] N= 146	42	28.7	14	9.5	18	12.33
Jat MA et al[11] N=200	43	21.5	-	-	37	18.5
Present Study N=40	10	25	3	7.5	23	57.3

Table 1. Comparison of Types of Previous Operation Responsible for Incisional Hernia in The Present Study with Previous Studies

Various Studies	Group A (Onlay) (minutes)	Mean ± SD	Group B (Underlay) (minutes)	Mean ± SD
at MA et al[11] N=200	30-90	-	40-100	-
Ibrahim AH et al N=40	75-90	83.41±10.24	80-100	89.52±7.25
Present Study N=40	90-150	127.5±23.59	90-150	139.5±24.38

Table 2. Comparison of Mean Operative Time of Present Study with Previous Studies

Study	Year	Total Number of Patients	Group A (Onlay)		Group B (Underlay)	
			Recurrence (%)	Wound Infection (%)	Recurrence (%)	Wound Infection (%)
deVries Reilingh et al[18]	2004	53	23	69	12	12
Rafeto et al[19]	2005	41	27.3	4.5	0	5.3
Forte et al	2011	246	33.3	33.3	0	0
Hamy et al[20]	2003	350	10	25	3.1	4
Manohar et al	2010	50	-	-	2	2
Leber et al[21]	1998	-	-	-	17	4
Present study	2016	40	0	25	0	0

Table 3. Showing Comparison of Complications of Present Study with Other Studies[22]

Mean Hospital Stay in Days (%)	Group A (Onlay)	Group B (Underlay)
de Vries Reilingh et al.	8.2	6.1
Gleysteen[24]	7.9	5.9
Ibrahim AH et al[25]	4.63	2.62
Jat MA et al[11]	4	3
Present Study	11.05	7.14

Table 4. Comparison of Mean Hospital Stay in Present Study with Previous Studies

The drain was removed in 90% of patients treated with onlay mesh repair (Group A) between 5-10 days, which is slightly longer than reported by previous studies, in which the period of drainage ranged from 2 to 7 days. However, patients who were treated with retro muscular mesh repair (Group B), 65% patients didn't have drain inserted and rest of the patients (35%) had their drain removed within 5 days, which was comparable to previous studies, in which the period of drainage ranged from 2 to 5 days. There was no significant difference in the incidence of seroma formation

or surgical wound infection between the individuals who underwent placement of continuous suction drains in the subcutaneous tissue and those treated with the progressive tension suture technique. This complication was managed with seroma drainage. Onlay technique had more of seroma formation, due to the fact that onlay techniques require significant subcutaneous dissection to place the mesh, which can lead to devitalized tissue with seroma formation or infection. The superficial location of the mesh also puts it in danger of becoming infected if there is a superficial wound infection. These patients were treated with appropriate antibiotics and regular dressing. No patient required removal of mesh because the infection was superficial and responded well to antibiotics. In underlay 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.[12,13,14] Stoppa reported an infection rate of 12% while White et al reported an incidence of 6% in onlay mesh repair.[15] Liakakos et al, found that the recurrence rate with mesh repair was only 8% after 90 months of follow-up.[16] Similarly, in a larger comparative study of 272 hernias, Schumpelick et al, found a recurrence rate of 7% for mesh repair after a mean follow-up period of 64 months.[17] Significantly more patients, reported pain on day one, two, four and seven postoperatively in Group B as compared to patients in Group A. Visual Analogue Scale (VAS)[23] is an instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured. The amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain. Duration of hospital stay indirectly indicate the degree of morbidity in terms of postoperative complication. The mean duration in the present study in underlay group was 7.14 days compared to 11.05 days in onlay group. As per Ibrahim AH et al study, mean duration of hospital stay in the onlay group ranged from 3 to 9 (4.63±0.35) days, whereas it was 1-4 (2.62±0.74) days in the underlay group.

DISCUSSION

Ventral hernia is a protrusion of an abdominal viscous or part of a viscus through the anterior abdominal wall occurring at any site other than the groin. It includes incisional hernias, para umbilical hernias, umbilical hernia, epigastric hernias, and spigelian hernias, respectively.[26] The method chosen depends on the size of the hernial defect. The size of hernia can be assessed with the patient standing and coughing. The size of the defect and its behaviour can be examined with the patient supine. The surgeon's hand with fingers straightened is inserted into the defect, and the patient is requested to raise his head and shoulders forward without the aid of his hands. If necessary, he is asked to raise his straightened legs at the same time. Ventral hernias in the anterior abdominal wall include both spontaneous and most commonly, incisional hernias after an abdominal operation. It is estimated that 2-10% of all abdominal operations result in an incisional hernia. Small hernias <2½ cm in diameter are often successfully closed with primary tissue repairs. However, larger ones have a recurrence rate of up to 30-40% when a tissue repair alone is performed.[27] 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 the risk of infection with the 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, nowadays; tension free mesh repair is ideal hernia repair technique.[28]

In the present study, the mean age of the patient presented with incisional hernia was 47.6 yrs. The youngest patient was 19 yrs. old and the oldest being 82 yrs. The mean age group of patients who had hernioplasty in Group A was 48.4 years and in Group B was 46.8 years. In the present study, most of the cases of incisional hernia had reported in fourth, fifth and sixth decade. This may be because of the frequency with which certain operations were performed at this time of life. Carlson et al, found that many patients with incisional hernia were between 25 and 90 years with mean age of 60.3 yrs.[29] Incisional hernia occurred at an early age in this study, as compared to westerners probably because of early marriage and multiple pregnancies in Indian women, which leave the abdominal wall weak.

Summary

1. 50% of patients were in the age group of 41-60 years and 30% were between age 21-40 years. There was no statistically significant difference in the age of patients in Group A and Group B. ($p > 0.05$)
2. Incidence of incisional hernia was 82.5% following emergency surgery and 17.5% after elective surgery.
3. Site of incisional hernia was infraumbilical in 60% and supraumbilical in 40% of patient in Group A as compared to 40% infraumbilical and 60% supraumbilical in Group B.
4. Size of defect in all cases was more than 4 cms.
5. Operative time was less than 90 minutes in 15% patients, between 91-150 minutes in 80% and more than 151 minutes in 5% of patients in Group A whereas 80% of patients got operated between 91-150 minutes and 20% took more than 151 minutes in Group B. The mean operative time was lesser for Group A (127.5 minutes) in comparison to Group B (139.5 minutes) which was not statistically significant. ($p > 0.05$)
6. Subcutaneous suction drain was inserted in all (100%) cases of Group A as compared to 25% in Group B. It was not used in 75% of patients in Group B.
7. Various complications observed in Group A were retention of urine, seroma and chest infection in 20% of cases each. Chest infection was observed in 15% of patients in Group B.
8. 95% of the patients in Group B were discharged on or before 10th post-operative day as compared to 55% patients in Group A.

9. Wound infection was observed in 5 (25%) patients. Causative organisms were staphylococcus aureus and pseudomonas aeruginosa in 3 and 1 case each. None of the cases in Group B had post-operative wound infection.
10. Mean post-operative hospital stay was longer (11.05 days) in Group A as compared to 7.15 days in Group B. (p>0.01)
11. All the patients in group A and B complained of pain at one-week post-operatively. In addition, one patient of group A had wound infection which was treated conservatively.
12. None of the patients in either group complained of pain or recurrence of hernia at 12-weeks follow-up.

CONCLUSIONS

Underlay mesh repair for incisional hernia was better than onlay mesh repair procedure because of shorter post-operative hospital stay, lesser complications and cost effectiveness. Underlay mesh repair required experienced surgeon, careful and gentle dissection. In patients presenting with ventral hernia, it is important to recognize the associated risk factors such as diabetes, obesity, parity, previous surgeries to carefully plan the type of repair either pre-peritoneal or onlay repair to prevent the complications such as seroma formation, wound infection, chronic pain, and the recurrence. Seroma formation, infection, and chronic pain are found to be more commonly associated with onlay mesh repair compared to pre-peritoneal mesh repair. Recurrence is higher in cases of ventral hernia operated by onlay mesh repair. Recurrence is higher in cases with co-morbidities such as obesity, diabetes, and multiparity. Although time taken for surgery in onlay mesh repair is significantly less compared to pre-peritoneal mesh repair, complications associated with it limits its wider usage. Considering the burden of surgeries especially in third world countries with a limited number of surgeons, it could provide valuable alternative over the pre-peritoneal repair. The advantage of onlay mesh repair is its ease but associated complications limit its use.

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