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Repair of large and giant incisional hernia with onlay mesh: Perspective of a tertiary care hospital of a developing country

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ABSTRACT

Purpose: Ventral incisional hernias, especially large and giant, carry significant post repair complications. This retrospective review is undertaken to determine the outcomes of large and giant incisional hernia repair as well as the risk factors of recurrence and surgical site infection at a tertiary care hospital in developing country.

Method: This case series included adult patients, operated between January 2001 and June 2009 for incisional hernia of size ≥ 10 cm (vertical or horizontal dimension) at our institute with follow up of at least one year. The charts of selected patients were reviewed by a general surgery fellow for hernia recurrence, complications, mortality and the predictive factors.

Results: Sixty out of 391 patients operated for incisional hernia were found eligible; of them 29 (48.3%) had large (defect of 10–15 cm) and 31 (51.7%) had giant hernia (defect size >15 cm). Mean age of patients was 43.8 ± 11.8 with female preponderance (male: female; 1:1.6). Fourteen (23.33%) patients developed complications and there was no mortality. Surgical Site Infection (SSI) was observed in 13 (21.67%) patients and significant predisposing factors for SSI (with or without mesh infection) were diabetes mellitus, emergency surgery, contaminated surgery and recurrent incisional hernia. With a mean follow up of 20.05 ± 8.8 months (range: 12–48months), four (6.67%) patients had recurrence of hernia.

Conclusions: Repair of large and giant incisional hernia using prosthetic non-absorbable mesh, mainly onlay, carry acceptable rates of complications.

1. Introduction

Ventral incisional hernias (VIH) develop in 10–20% of patients after abdominal surgery[1]; they are a major source of morbidity and upto 44% recurrence rate is reported within first five years after repair.[2–4] Incisional hernias typically develop within first 5 years of surgery; however, their development may be delayed. A number of factors contribute to evolution of a small incisional hernia into a large one over a period of time.[5,6] According to the size of defect, European Hernia Society classifies incisional hernias as: a) Small: <5 cm in width or length. b) Medium: 5–10 cm in width or length. c) Large: >10 cm in width or length.[7] There is no unanimous definition of what surgeons actually mean by giant incisional hernia (Fig. 1); however, the classification proposed by Chevrel based on the diameter of the wall defect, suggests the denotation of giant for those ≥15 cm in transverse dimension.[8] Small hernias with defect size upto 3 cm can be repaired by simple suturing alone; however, it is usually difficult to repair large hernias without using autologous tissue flap or prosthesis reinforcement.[9,10]

Surgical site infection (SSI), recurrence, mesh infection, wound dehiscence, seroma and enterocutaneous fistulae are common complications of incisional hernia repair reported in literature.[11] The incidence of SSI after open and laparoscopic VIH repair has been reported in up to 27.7% and 10.5%, respectively.[12] The extent to which the well-known risk factors of SSI i.e. co-morbidities, hernia characteristics (e.g., size or duration) and procedural characteristics (including operative technique, surgeon's experience, and medical center's results) play any role in the occurrence of SSI following VIH is still largely unknown.[13]

Overall recurrence rates up to 33% after first repair and 44% after second repair have been reported and mostly within 3 years of the repair.[3] With the use of prosthetic mesh, the rate of recurrence has been lowered to 8–24%, but it has not been eliminated.[14] A number

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of risk factors of recurrent VIH have been hypothesized i.e. Obesity (BMI>35), hernia size, wound infection, smoking, diabetes, chronic obstructive pulmonary disease, age, history of an abdominal aorto-iliac aneurysm repair, and steroids use.[15–19]

Currently, no technique or approach has gained wide acceptance as the gold standard for the repair of incisional hernia. The choice of a technique is more often determined by the surgeon's preference, surgical tradition, or even by the hospital's economic situation, than by the type of incisional hernia.[20] This is an even more complex issue when treating obese patients with a massive or multifascial hernia and loss of abdominal domain.[21] Although the introduction of synthetic mesh is generally reported to have decreased the recurrence rate,[17,22,23] few studies have focused on the long-term recurrence, pain, and quality of life after the repairing of giant ventral hernias.[24]

Since there is lack of consensus on definition and standard treatment for large incisional hernias,[25] dearth of data on the procedures and outcomes of giant incisional hernias especially from developing countries; we have conducted this retrospective review to determine the outcomes of large and giant incisional hernia repaired at a tertiary care hospital in developing country. Furthermore we have also attempted to determine the risk factors of recurrence and surgical site infection after repair of large and giant incisional hernia.

2. Material & methods

This case series included adult patients, who were operated between January 2001 and June 2009 for incisional hernia of size ≥ 10 cm (vertical or horizontal dimension) at Aga Khan University Hospital with follow up of at least one year. ICD code **553.21** for incisional hernia was run to retrieve the charts of patients. Operative notes and clinic follow ups were reviewed to select the patients fulfilling the inclusion criteria. Patients with missing records were excluded. Study was exempted from Ethical Review Committee as per institutional guidelines.

The charts of selected patients were reviewed by a general surgery fellow for hernia recurrence, complications (SSI, mesh infection and seroma formation) and mortality. The predictive factors compared consisted of age, sex, BMI, comorbidities, previous history of chemo/radiotherapy or incisional hernia repair and surgical details of VIH repair (Type, nature, duration, mesh application & fixation).

Data was entered on SPSS – 16. Descriptive analysis of baseline characteristics was done. Categorical variables i.e. sex, comorbids and outcomes were analyzed as proportions. Continuous variables i.e. age and duration of surgery were analyzed as means (±standard deviation). Predictive factors were compared between the groups by Chi squared or Fisher's exact test for categorical variables and Student's *t*–test for continuous variables. *P*-value <0.05 was considered significant.

3. Results

A total of 391 patients operated for incisional hernia were reviewed and 60 patients were found eligible to be included in this study; of them 29 (48.3%) were large (defect of 10–15 cm) and 31 (51.7%) were giant hernia (defect size >15 cm) (Fig. 1). Mean age of patients was 43.8 ± 11.8 with female preponderance (male: female; 1:1.6). Most of the patients were obese with 29 patients (48%) having BMI between 30 and 41 kg/m^2. Demographic (Age, sex, BMI) and perioperative data are reported in Table 1. In majority of patients, it was elective clean procedure with onlay placement of mesh fixed with prolene sutures. Component separation was required in only five patients for adequate repair and was done as a part of mesh repair.

Complications were observed in 14 (23.33%) patients, of which SSI was the most common complication found in 13 (21.67%) patients. This included two patients with mesh infection. Second most common complication after SSI was seroma formation (1.67%) seen in just a single patient. Significant predisposing factors for SSI (with or without mesh infection) were diabetes mellitus, emergency surgery, contaminated surgery and recurrent incisional hernia (Table 2). We did not find any significant association of SSI with gender, technique of mesh placement and fixation, defect size and history of chemotherapy. There was no mortality in this series.

With a mean follow up of 20.05 ± 8.8 months (range: 12–48months), four (6.67%) patients had recurrence of hernia, three of them in the onlay technique group and one in the inlay technique group. Significantly higher proportion of patients with Pfannenstiel incision and chemotherapy within 1 year prior to repair were found to have recurrence (Table 3).

4. Discussion

Surgery for giant incisional hernias has undergone major changes in the last two decades and patients can now be treated with high success rates .With the use of prosthetic mesh becoming the standard of care in the management of incisional hernias, the subsequent rate of recurrence has been lowered to 8–24% from 33 to 44%, but it has not been eliminated.[14,25] However the question of debate now is the positioning of mesh; on the rectus sheath or under rectus sheath.[15,18,26]

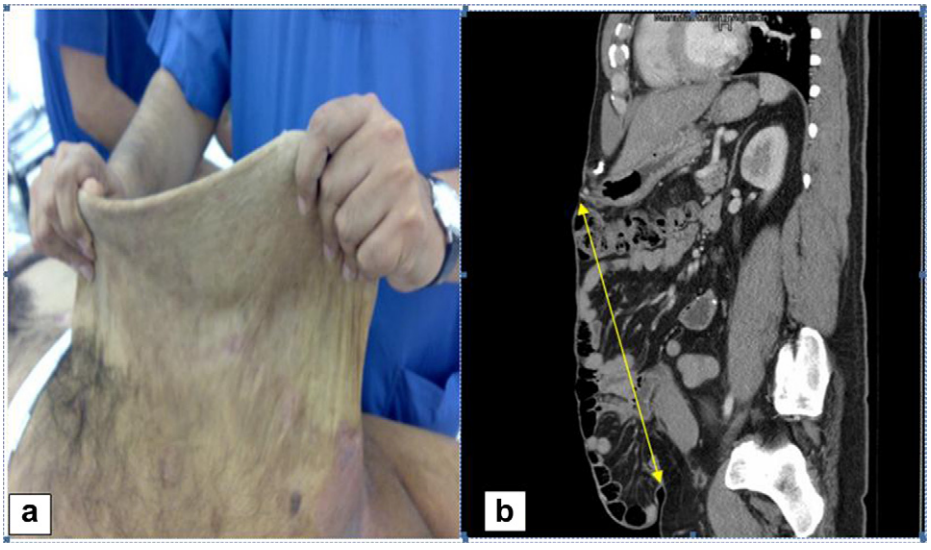

Fig. 1. Shows a giant incisional hernia with just a skin fold overlying it (a). The arrow in the adjacent CT scan picture (b) signifies defect size and the contents protruding through it.

Table 1
Showing baseline characteristics of all the patients operated for large and giant incisional hernia ($n = 60$).

Variable	Value
Age	43.8 ± 11.8
Sex	
Male	23 (38.3%)
Female	37 (61.7%)
BMI	29.45 ± 5
Follow up (Months)	20.05 ± 8.827 (range: 12–48)
Defect size	14.4 × 10.5 cm^2
Type of surgery	
Elective	55
Emergency	5
Placement of mesh	
Onlay	54
Inlay	4
Sublay	2
Component separation	5
Mesh fixation	
Suture	40
Staples	14
Combined	6
Degree of contamination	
Clean	52
Clean contaminated	8

The recurrence rate following repair of ventral incisional hernia in our study is 6.6% which is lower when compared with similar recent studies from around the world. This Low recurrence rate in our study can be attributed to a number of factors. Firstly, the mean duration of follow up (mean 29.45 ± 5 months) in our patients was shorter than similar studies from around the world. However, notice in Table 4 that Baradaran H et al although having a shorter follow up period than us had a recurrence rate similar to us (7%).Secondly, only 18.3% of our patients had already undergone any previous repair of Incisional hernia, whereas 28.3% and 100% of the patients had undergone one or more previous incisional hernia repairs in the studies conducted by de Vries Reilingh TS et al (recurrence rate: 28%) and Affifi et al (recurrence rate: 14.6%), respectively. This effect of increase in recurrence rate after subsequent incisional hernia repairs is well documented in literature.[3]

Another potential risk factor for this difference in recurrence rate could have been the technique of mesh placement. Majority (90%) of cases in our study underwent the onlay technique of hernia repair. Though a few patients had undergone sublay (4%) and inlay (6%), their numbers were not enough to draw any significant relationship between the rate of recurrence and technique used. However, the number of patients in our onlay group is large enough to compare it for recurrence with the onlay groups of similar studies.

Table 2
Analysis of analysis of risk factors for surgical site infection after large & giant incisional hernia repair.

Variable	Surgical site infection ($n = 13$)	*P*-value[a]
Diabetes mellitus		
Yes	7/14	0.003
No	6/46	
Type of surgery		
Elective	10/55	0.03
Emergency	3/5	
Degree of contamination		
Clean	9/52	0.037
Clean contaminated	4/8	
Pervious surgery for incisional hernia		
None	8/49	0.016
Once	3/4	
Twice	0/5	
>2 times	1/2	

[a] Chi-square test.

Table 3
Analysis of risk factors for recurrence after incisional hernia repair.

Variable	Recurrence ($n = 4$)	*P* value[a]
Type of incision leading to incisional hernia		
Pfannenstiel	3/18	0.042
Others	1/42	
History of Chemotherapy		
None	3/57	0.001
Within 1 year	1/1	
Within 1–5 years	0/2	

[a] Chi-square test.

The rate of recurrence in the onlay group in our study was 6.67% (mean follow up 20 months), which is significantly lower compared to average of 18.5% for onlay technique of repair reported in literature.[27] Venclaukas et al, Raafat et al and TS de Vries et al reported recurrence rates of 10.5%, 27.2% and 23% in their onlay groups with mean follow ups of 12, 30 and 30 months, respectively. This discrepancy can be because of patient factors and follow up time as mentioned before.

Raafat et al, L Venclaukas et al and TS de Vries et al in their studies concluded that underlay technique of repair, with recurrence rate of 0%–12%, seems to be a much better technique compared to onlay. However, in our study, we have a similar rate of recurrence (6.6%) with the onlay technique. This entails the need for a large multicenter RCT to decide the best treatment technique for incisional hernia repair. The Ventral Hernia Working Group also noted that underlay may be preferred because of the theoretical advantages of this technique. However, there is no reliable data supporting the use of one technique over another.[11]

Common complications following ventral hernia repair include infection, seroma, wound dehiscence, and the formation of enterocutaneous fistulae.[11] Each of these complications conveys morbidity and the risk for additional sequelae. Each also relates to the management of the wound and to risks associated with the use of repair materials. A wound dehiscence, for example, may lead to exposure of the repair material; in case of permanent synthetic mesh, it will most likely require removal because of continued risk for infection.[28]

The incidence of surgical site infection in our study was 21.67%, making it the most common complication following the repair of incisional hernia. This is consistent with literature, with wound infection as the most common complication following incisional hernia repair.[1,15,16,26] Diabetes mellitus, emergency surgery, contaminated surgery and recurrent incisional hernia were the only significant predisposing factors for SSI in our study. Surgical site Infection was followed by seroma formation (1.67%) as the second most common complication.

Infection is a common and significant postoperative occurrence that increases the risk of hernia recurrence.[19] Studies have reported rates of infection following ventral hernia repair ranging from 4% to

Table 4
Showing comparison of our study with other similar studies.

Study	Year	Sample size	Follow up (months)	Recurrence	SSI	Mesh infection
de Vries Reilingh et al	2004	53	24 (8–58)	28%	26%	3.3%
Afifi et al	2005	41	30 (median)	14.6%	4.8%	–
Bernard et al	2007	61	35 (8–88)	5%	21%	3%
Baradaran et al	2008	29	16 8–26	7%	3%	0%
Paajanen et al	2010	10	30 (7–72)	10%	30%	0%
Our study	2010	60	20 (12–48)	6.6%	21%	3.3%

16%, compared with only 2% following other clean surgical procedures.[4,6,12,13,18] Similar to the available studies we also found decreased rates of Surgical Site Infection in clean vs. contaminated surgery (17.3% vs. 50%, $p < 0.05$). In addition, the type of surgery (elective vs. emergency) was significantly associated with rate of SSI in our study. Since both of these factors are related to wound care, they warrant better intra operative and immediately post-operative services for decreased rate of infection. Furthermore antibiotic prophylaxis which has been demonstrated to lower the rate of infection following incisional hernia repair[13] should become a standard practice when repairing incisional hernias.

In our study Diabetes Mellitus was also found to be an independent risk factor for Surgical Site Infection. Diabetes mellitus is a risk factor for surgical site infection in all types of surgeries.[29] A five year prospective study of surgical wound infection complicating eight clean elective operations was carried out by Ehrenkranz et al in 9108 community hospital patients by detailed stratification of risk. Diabetes mellitus and/or operations lasting beyond 4 h characterized high risk patients in his study.[28] Screening for diabetes and hyperglycemia among patients having Giant incisional hernia repair may be warranted to prevent post-operative and long-term complications of this metabolic abnormality.

In addition the Medical center effect as described by Kaafarani et al is also considered to play a role in determining the rate of infection.[13] In his study Kaafarani argues that the quality of care provided to patients at various medical centers also play a key role in predicting rate of SSI, however the size of their effect is still largely unknown.

Another factor that has been reported by various other authors that seem to be significantly associated with wound infection was the technique of placement of mesh.[8,26] We did not find any significant association ($p > 0.05$) of SSI with technique of mesh placement, probably due to the small number of patients in inlay and sublay groups. Therefore, further analysis is needed to reach at a conclusion, since the technique of mesh placement has been reported to have significant association with both Surgical Site Infection and recurrence.

Mesh Infection is a devastating complication of Incisional hernia repair which may result in sepsis, requiring mesh extraction or fistula formation. In our study two patients developed this complication. Cobb et al. observed a rate of 10.2% of mesh infections in their retrospective study.[30] Since majority of the cases of mesh infection require mesh explantation, the authors concluded that mesh infection after incisional hernia surgery conveys significant morbidity and should be avoided.

In this era of minimally invasive surgery, laparoscopic hernia repair is gaining widespread acceptance due to improving learning curve and additive advantages of laparoscopic over open repair (early recovery, lower pain and complications). Laparoscopic ventral hernia repair (either with polypropylene or composite mesh) has been reported to have complications in up to 16% and recurrence in up to 2.5% of patients.[31–35] Parker et al. reported 0% recurrence after laparoscopic repair of large incisional hernias with follow up of 41 (3–74) months (34). These results are promising; however, one complication that is reported more in laparscopic than open ventral hernia repairs is bowel injury in up to 2% of patients, which might be serious enough to end up in mortality (32).

Our study has several limitations: it is retrospective, observational and has a relatively short follow up period. To avoid bias, the definition of outcomes i.e. SSI and mesh infection were kept uniform. A prospective, randomized clinical trial, comparing different techniques for large and giant incisional hernia repair should be conducted to validate these findings.

5. Conclusion

Repair of large and giant incisional hernia using prosthetic non-absorbable mesh has a reasonably good outcome with acceptable rates of recurrence. The Technique of mesh placement is still at surgeon's discretion; however, onlay mesh repair has shown promising results in our study. Surgical Site Infection is the most common complication following repair of large and giant incisional hernia. Diabetes Mellitus and contaminated surgery have consistently been shown to be the two most important risk factors for SSI. Further prospective research is required to elucidate the ideal method of repair for large and giant incisional hernias.

Ethical approval

Exempted from Ethical Review Committee.

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None.

Author contribution

Ayaz Ahmad Memon – Design, Data Collection, Manuscript review.

Hasnain Zafar – Review and Final approval of manuscript.

Aimal Khan – Manuscript writting.

Ghulam Murtaza – Analysis, Manuscript writing.

Masooma Zaidi – Design and data collection.

Conflict of interest

None.

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