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Original Research Article

Study of multiple risk factors associated with development of incisional hernia

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Abstract

Background: Incisional hernia (IH) is a known complication of abdominal surgery. Its incidence remains high in spite of the great improvement in the techniques and suture materials used for closing the abdominal wall incisions. This study was undertaken to study the incidence and various risk factors leading to IH.
Methods: A total of 40 patients having IH admitted in a Tertiary Care Hospital at Hyderabad from 2007 to 2009 have been studied in various aspects like age, sex, clinical presentation and nature of previous operation, site of previous scar, precipitating factors like obesity, nutrition and wound infection.
Results: Incisional hernia was common in 4th, 5th and 6th decade with female predominance (Male: Female ratio = 1:9). IH was more common in patients with previous history of gynaecological operation. Most of the patients presented with IH in the infra-umbilical region. In this study, 65% of patients with IH found to be obese, among them, 76.9% had wound infection during previous surgery. The P value was extremely significant. It is showing strong association between obesity and wound infection to the occurrence of IH.
Conclusions: The highest incidence of incisional hernia observed in elderly patients with female preponderance. Operations on the female pelvic organs were the most common procedure preceding the development of IH. Obesity and post operative wound infection are important predisposing factors. All these factors are inter-related. Presence of more than one risk factor in a patient shows increased predisposition to the incidence of IH.
Keywords: Incisional hernia, Incidence, Risk factors, Obesity, Infection, Infra-umbilical, Pelvic.

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1. Introduction

"Hernia" is defined as a protrusion of a viscus or part of viscus through an abnormal opening in the wall of its containing cavity. Hernias are among the oldest known afflictions of human kind and surgical repair of hernia is the most common general surgery procedure performed today. A Post operative ventral or incisional hernia is the result of failure of the lines of closure of the abdominal wall following laparotomy. The approximated tissues separate and abdominal organs mainly bowel loops bulges through the gap, which is covered from inside outwards with peritoneum, scar tissue and skin.

Incisional hernia is a serious post-operative complication of laparotomy. Its incidence following abdominal surgery ranges from 2 to 11%. [1]

A number of predisposing factors have been identified that may be related to specific patient characteristics and underlying pathological process or iatrogenic factors. Many factors singly or in various combinations may cause failure of wound to heal satisfactorily and may lead to the development of post-operative incisional hernia. The incidence rate rises to 26% in those who develop wound infection. [2] Predisposing factors can be conveniently discussed as shown below[3-6].

Predisposing factors	
Systemic factors	**Local factors**
Age	Infection
Obesity	Incision
Nutrition	Indication for surgery
Jaundice	Surgery on pancreas
Severe anaemia	Surgery in malignancy
Haematollogic derangements	Chronic strain
Diabetes	Technique of suturing
Drugs	Inappropriate suture material
Ionizing radiation	Suture length to wound length ratio
Smoking	Tension

The occurrence of incisional hernia has also been attributed to the disturbance of collagen metabolism at the microscopic level. [7] Hence, tension free repairs are recommended. This entails the use of mesh, either open or laparoscopic. [3,8] With mesh repairs, the recurrence rate of incisional hernia has decreased to 10 to 20 %.[9] The aim of present study was to determine the association of incisional hernia in isolation, or in various combinations of specific risk factors such as sex, obesity, history of previous wound infection, the type of incision used and the number of previous operations.

2. Materials and Methods

This was a prospective study done in Tertiary Care Hospital in Hyderabad from February 2007 to May 2009. Total 40 patients of either sex, having age greater than 18 years with incisional hernia were randomly selected for the study. An incisional hernia was diagnosed by either clinical examination or radiological imaging (computed tomography scan or ultrasound). The patients with age less than 18 years were excluded from the study. A detailed history with specific reference to previous surgery/surgeries and the post-operative period was elicited from the patient and verified with the previous records which were available with the patient.

The various risk factors such as age, sex, obesity-(Body mass index above 25 was taken as obesity in this study), wound infection (History of any purulent discharge from the wound was considered as wound infection), second surgery through same incision were studied. Also, associations of incisional hernia with these riskfactors both independently and in combination were studied.

3. Observations and Results

Total 40 cases of incisional hernia were studied in this series, and it found that IH was common in 4th, 5th and 6th decade. Also IH was more common in female (90%) than males (10%) with male to female ratio of 1:9 showing a clear predilection towards female sex, (Table 1).

Table 1: Age and Sex Distribution

Age group (in years)	Sex		Total no. of cases	Percentage
	Male	Female		
< 20	1	0	1	2.5
20 – 30	1	3	4	10
31 – 40	0	6	6	15
41 – 50	0	8	8	20
51 – 60	1	10	11	27.5
> 60	1	9	10	25

62.5% of all hernias followed operations on female pelvic organs. 10% followed after incisional hernia repair and 20% cases followed after acute abdominal procedures. 2.5% followed after elective abdominal surgery, (Table 2).

Table 2: Initial Operative Procedure

Procedure	No of cases	Percentage
Hysterectomy	14	35
LSCS	9	22.5
Tubectomy	2	5
Incisional hernia repair	4	10
Acute abdomen	8	20
Malignancy	2	5
Other	1	2.5

Wound infection was present in 22 cases amounting to 55% of incisional hernias. 75% of incisional hernia recurred in sub-umbilical midline incisions (Lower midline), (Table 3). Incisional hernia recurred in 52.5% of cases following a second surgery as shown in table 3.

Table 3: Site of Previous Incision and No. Of Previous Surgeries

Type of Incision	No. of cases	Percentage
Lower midline	30	75
Mc Burney's	3	7.5
Mid midline	4	10
Upper midline	3	7.5
No. of Surgeries	**No. of Cases**	**Percentage**
One	19	47.5
Two	14	35
> Two	7	17.5

The correlation between incisional hernia and various factors was established using Fisher's exact test. Among the obese people, 96.2% were females. There was association between obesity and female sex, (Table 4), but it needs study involving large population to strengthen the association. However, among the obese people, 76.9% had wound infection during previous surgery and the P value was extremely significant. It is showing strong association between obesity and wound infection to the occurrence of incisional hernia. Obese people with SUML incision constitute 92.3 % and non-obese with SUML incision were 64.28%. P value was < 0.05 showing a very strong correlation between obesity and sub-umbilical midline incision to result in incisional hernia as depicted in table 4.

Table 4: Correlation of Obesity with Sex, Wound Infection and Subumbilical Midline Incision

Obesity	Female	Male	Total	Incidence	P value
Obese	25	1	26	96.2%	p>0.05 (0.1145)
Non-Obese	11	3	14	78.5%	
Total	36	4	40	-	
Obesity	**Wound Infection**	**No wound infection**	**Total**	**Incidence**	**P value**
Obese	20	6	26	76.9%	P<0.05 (0.0002)
Non-obese	2	12	14	14.28%	
Total	22	18	40	-	
Obesity	**SUML Incision**	**Other Incisions**	**Total**	**Incidence**	**P value**
Obese	24	2	26	92.3%	P<0.05 (0.0393)
Non-Obese	9	5	14	64.28%	
Total	33	7	40	-	

Lower midline incision when compared to other incisions with repeated surgeries through the same scar, the incidence of incisional hernia is 60.6% and 14.28% respectively. This study shows a very strong association (P<0.05; 0.0395) between repeat surgery through lower midline incision to the occurrence of incisional hernia, (Table 5).

Table 5: Subumbilical Midline Incision and More Than One Surgery

Incision	More Than One Surgery	One Surgery	Total	Incidence
SUML Incision	20	13	33	60.6%
Other Incision	1	6	7	14.28%
Total	21	19	40	-

4. Discussion

Forty patients participated in this study during a time span of 28 months from Feb 2007 to May 2009. Incisional hernia usually occurs from the third decade of life onwards, the peak incidence was after the age of 50 years. Ellis *et al* [10] in their study noticed a mean age of 49.4 years. The current study found more incidence of incisional hernia in the female population as reported by previous studies.[10,11] High incidence of incisional hernia was seen in middle aged and elderly females, whereas there was no increased incidence in males. This can be explained by multiparity and repeated surgeries on female pelvic organs. In present study, 62.5% of the incisional hernias occurred following operations on female pelvic organs which are correlated with the other studies. [12-14]

In present study, 75% of incisional hernias appeared in the subumbilical midline incisions. Shukla *et al* [15] reported 53% of the incisional hernia in midline infra-umbilical incisions. Ponka [16] reported 36% of incisional hernia through the midline infra Umbilical incision and Agbakwuru *et al* [17] also found that 81.9% incisional hernias occur through the midline infraumbilical incision. In current study, 65 percent of patients with incisional hernia found to be obese. The repeated surgery through same incision resulted in an incisional hernia in 52.5 percent of cases. Lamont and Ellis [18] found the incidence of incisional hernia was 6 percent after freshly made incision and on the other hand the incidence increased after both re-incision (12%) and incisional hernia (44%) respectively.

Occurrence of incisional hernia appears to be multifactorial and these factors are inter-related. Association of one or more factors increases the predisposition to the occurrence of incisional hernia. An attempt is made to study the inter-relationship of these factors to the incidence of incisional hernia using “Fisher’s exact test”. Obese females have a specific predilection towards occurrence of incisional hernia. Our study sample is relatively small. We feel a larger study is needed to emphasize this association more strongly. In Sharma *et al* [19] study obesity as a causative factor was prominent in 12 (23%) female patients. Obesity is prone for wound infection, as 76.9 percent of obese people had a history of wound infection following previous surgery, as against 14.28 percent of non-obese patients.

Obesity and wound infection shows a strong association with incisional hernia with P< 0.05.Obese patients with lower midline incision constitute 92.3 percent and non-obese with lower midline incision constitute 64.28 percent. There appears a strong association between lower midline incision in an obese person and the occurrence of incisional hernia (P< 0.05).

Repeat surgery done through a lower midline incision resulted in incisional hernia in 60.6 percent of patients in current study whereas repeat surgery done through other than lower midline incision resulted in 14.28 percent of cases. There was a very strong association between these two factors as P< 0.05.

5. Conclusions

The highest incidence of incisional hernia observed in elderly patients (age between 51-60 years) with female preponderance. Operations on the female pelvic organs were the most common procedure preceding the development of incisional hernia. Etiology is multifactorial. Obesity and post-operative wound infection are important predisposing factors. Also, lower midline incision appears to have a special predilection towards incisional hernia formation. Repeated surgery through the same incision has a role in the occurrence of incisional hernia. All these factors are inter-related. Presence of more than one risk factor in a patient shows increased predisposition to the incidence of incisional hernia.

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