Section: General Surgery

Original Research Article

A COMPARATIVE STUDY OF INCIDENCE OF INCISIONAL HERNIA FOLLOWING EMERGENCY AND ELECTIVE SURGERIES

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ABSTRACT

Background: Aim: To compare the occurrence of incisional hernia in emergency and elective surgeries in Shadan Institute of Medical Sciences. **Objective:** 1) To compare the incidence of incisional hernia in emergency and elective surgeries. 2) To analyse the factors contributing for the development of Incisional hernia in the patients who have undergone elective and emergency surgeries in Shadan Institute of Medical sciences.
Materials and Methods: It was a case-control study conducted at Department of General Surgery, Shadan institute of medical sciences, Peerancheru, Hyderabad. Patients admitted in surgical wards of Shadan institute of Medical Sciences with incisional hernia with primary surgery done within 5 years and those who have undergone emergency and elective surgeries 5 years back.
Results: In the present study, incisional hernia is more common after emergency surgeries as compared to elective surgeries. The significance of age as a risk factor for Incisional Hernia cannot be determined in the present study. Further study with greater sample size of effected as well as controlled groups is required to establish a causal relation. Incisional hernia is more common in males as compared to females, but male sex is not a risk factor for development of incisional hernia. Post-operative wound infections, diabetes mellitus, smoking, BMI>25, COPD can be considered as risk factors in development of incisional hernia.
Conclusion: The present study concluded that Incidence of incisional hernia can be decreased by following proper suturing techniques, using appropriate suture material, observing sterile methods preoperatively and by achieving optimum glycaemic control.
Keywords: Incisional Hernia, BMI, COPD, Glycemic control, Smoking.

INTRODUCTION

Incisional hernia has followed abdominal surgery like a shadow for more than a century now. Incisional hernia is the one true iatrogenic hernia. Ian Arid defines incisional hernia as a diffuse extrusion of peritoneum and abdominal contents through a weak scar of an operation or accidental wound.
Incidence of incisional hernia is next only to inguinal hernia and may be higher than reported since most of these are asymptomatic. Abdominal incisions defer from most other incisions in that abdominal wall itself is subject to variable pressure from within. Hence physiological incisions should be preferred which produces less anatomical distortions. Among abdominal incisions highest incidences of incisional hernia occurs in the lower abdominal incisions. Through this incision only, most of the gynecological operations are being done. The posterior rectus sheath is deficient below the umbilicus and pressure in lower abdomen is more than upper abdomen and the stress and strain on the lower abdomen predispose for herniations. There are numerous etiological factors for the development of incisional hernia but wound infections and increased intra-abdominal pressure are the most important causes.
Incisional hernia is a common complication of abdominal surgery with an incidence of 3% to 20.6%.[1,2] Infection of the incision will increase the rate of hernia up to 23%.[3,4]

Prevalence varies depending on presence or absence of specific risk factors, the incision site, suture material and technique used for closure of surgical incisions.[5]

The rate of recurrence of incisional hernia varies, depending on the reparation method. It can be as high as 58% after suture repair, usage of prosthetic mesh and site of placement of mesh and methods of fixation of mesh. The on-lay technique of placement of mesh is followed by 20% rate of recurrence, the sub-lay technique of placement of mesh by 2-12% and the in-lay technique by 4% rate of recurrence and the laparoscopic approach of repair of incisional hernia has a low recurrence rate compared to open approach of repair.[6,7]

The risk factors of incisional hernia can be patient related and these include age >60 years, obesity body mass index >25 kg/m^2, comorbidities such as diabetes mellitus, chronic lung disease, obstructive jaundice, immune suppression in patients with organ transplantation, chemotherapy and steroid therapy. Surgery related risk factors are: emergency surgery, bowel surgery, abdominal aortic aneurism repair, formation of stoma and closure, surgeries for peritonitis, re-laparotomy, technique and suture material used for closure of abdominal incisions, wound infections, long time of operation, high blood loss and surgical experience. The biological factors that play a role in development of incisional hernia are smoking, collagen and metalloprotease synthesis and nutritional deficiencies.[8,9,10,11,12]

Aims and objectives

Aim

To compare the occurrence of incisional hernia in emergency and elective surgeries in Shadan Institute of Medical Sciences

Objective

1. To compare the incidence of incisional hernia in emergency and elective surgeries.
2. To analyse the factors contributing for the development of Incisional hernia in the patients who have undergone elective and emergency surgeries in Shadan Institute of Medical sciences.

MATERIALS AND METHODS

Study Design: Case-control study

Study Setting: Department of General Surgery, Shadan institute of medical sciences, Peerancheru, Hyderabad.

Study Population: Patients admitted in surgical wards of Shadan institute of Medical Sciences with incisional hernia with primary surgery done within 5 years and those who have undergone emergency and elective surgeries 5 years back.

Inclusion Criteria: All cases of incisional hernia admitted in Shadan Institute of Medical Sciences who underwent primary laparotomy within last 5 years and are willing to give written consent. Patients who underwent laparotomy within last 5 years in Shadan Institute of Medical Sciences and are available for follow up.

Exclusion Criteria: All patients who fit the inclusion criteria but not willing to give written consent.

Study Period: 2.5 years from the date of ethical committee clearance.

Sampling Technique: Census method. All patients admitted in surgical ward of Shadan Institute of Medical Sciences who were operated for incisional hernia with primary surgery done within 5 years and patients who underwent midline laparotomy 5 years back in Shadan Institute of Medical Sciences will be taken as sample.

Data Collection: Data will be collected from patients and bystanders using a semi structured questionnaire based on interview, clinical examination and operative notes ofprevious surgery obtained from Medical Records Department, Shadan Institute of Medical Sciences, Hyderabad.

Data Analysis: Data analysis will be entered in Microsoft Excel and will be analysed using appropriate statistical software.

Study Variables

- Age
- Sex
- Duration between surgery and appearance of hernia
- Smoking
- Diabetes mellitus
- Postoperative wound infections
- Body Mass Index

Statistical Test: Chi square test

Ethical Considerations: Institutional ethical committee clearance was taken, and study done after written informed consent signed by the participants. High level confidentiality maintained throughout the study.

RESULTS

General information of study subjects

Distribution of study subjects according to sex

Table 1: Study subjects according to sex

SEX	No. of cases	Percentage	Ratio
FEMALE	65	65%	1.85:1
MALE	35	35%	
TOTAL	100	100%	

DISTRIBUTION OF STUDY SUBJECTS ACCORDING TO AGE

Table 2: Study subjects according to age

AGE	No. of cases	Percentage	Ratio
<50 years	70	70%	2.33: 1
>50 years	30	30%	
TOTAL	100	100%	

STUDY SUBJECTS WITH POST OPERATIVE WOUND INFECTIONS

Table 3: Study subjects with post-operative wound infections

POST OPERATIVE WOUND INFECTIONS	No. of cases	Percentage
PRESENT	22	22%
ABSENT	88	88%
TOTAL	100	100%

STUDY SUBJECTS WITH DIABETES MELLITUS

Table 4: Study subjects with diabetes mellitus

DIABETES MILLETES	No. of cases	Percentage
PRESENT	45	45%
ABSENT	55	55%
TOTAL	100	100%

STUDY SUBJECTS ACCORDING TO INCIDENCE OF SMOKING

Table 5: Study subjects according to incidence of smoking

SMOKING	No. of Study subjects	Percentage
Present	18	18%
Absent	82	82%
Total	100%	100%

STUDY SUBJECTS ACCORDING TO BMI

Table 6: Study subjects according to BMI

BMI	No. of Study subjects	Percentage
Overweight	16	16%
Normal weight	84	84%
Total	100	100%

STUDY SUBJECTS WITH COPD

Table 7: Study subjects according to COPD

COPD	No. of study subjects	Percentage
Present	16	16%
Absent	84	84%
Total	100	100%

RESULTS AND INTERPRETATION

INCISIONAL HERNIA

Table 8: Incidence of incisional hernia

INCISIONAL HERNIA	Category				Total		X2	Df	p
	Emergency		Elective						
	N	%	N	%	N	%			
Present	11	22	6	12	17	100	1.772	1	0.183
Absent	39	78	44	88	83	100			
Total	50	100	50	100	100	100			

- Out of 100 patients, 17 patients developed incisional hernia.
- 11(22%) out of 50 of who underwent emergency laparotomy developed incisional hernia as compared to 6(12%) out of 50 patients who underwent elective laparotomy.

SEX DISTRIBUTION

Table 9: Sex distribution

SEX	INCISIONAL HERNIA				Total		X2	Df	p
	Present		Absent						
	N	%	N	%	N	%			
Female	10	15.3	55	84.7	65	100	0.343	1	0.557
Male	7	20	28	80	35	100			
Total	17	17	83	83	100	100			

- Out of 35 males who underwent previous laparotomy, 7(20%) patients developed Incisional hernia.
- Out of 65 females who underwent previous laparotomy,10(15.3%) patients developed incisional hernia.
- p value of gender distribution is 0.557, hence insignificant

AGE DISTRIBUTION

Table 10: Age Distribution

INCISIONAL HERNIA	Category				Total		X2	Df	p
	Present		Absent						
	N	%	N	%	N	%			
< 50	10	14.3	60	85.7	70	100	1.218	1	0.271
≥ 50	7	23.3	23	76.7	30	100			
Total	17	17	83	83	100	100			

- Out of 30 patients who were older than and equal to 50 years of age, 7(23.3%) developed had incisional hernia.
- Out of 70 patients who were younger than 50 years of age, 10 (14.2%) developed incisional hernia.
- p value of age ≥50 years is 0.271, hence insignificant.

POST-OPERATIVE WOUND INFECTION

Table 11: Post-Operative wound infections

POSTOP WOUND INFECTIONS	INCISIONAL HERNIA				Total		X2	Df	p	ODDS RATIO
	Present		Absent							
	N	%	N	%	N	%				
Present	9	40.9	13	59.1	22	100	11.43	1	<0.001	4.3
Absent	8	9.5	70	79.5	78	100				
Total	17	17	83	83	100	100				

- Out of 78 patients without post-op wound infection, 8 patients developed incisional hernia.
- Out of 22 patients with post-op wound infections, 9 patients developed incisional hernia.
- p value of post-op wound infection in incisional hernia is <0.001, hence significant.
- Odds ratio is found to be 4.3
- Patients with Post-operative wound infections have 4.3 times more risk of developing Incisional hernia.

DIABETES MELLITUS

Table 12: Diabetes Mellitus

DIABETES MELLITUS	INCISIONAL HERNIA				Total		X2	Df	p	Odds ratio	95%CI	Z Statistics
	Present		Absent									
	N	%	N	%	N	%						
Present	10	22.2	35	77.8	45	100						
											0.6790	
Absent	7	12.7	48	87.3	55	100	1.581	1	0.208	1.9592	to	1.244
											5.6527	
Total	17	17	83	83	100	100						

- Out of 55 patients without Diabetes Mellitus, 7 patients developed incisional hernia.
- Out of 45 patients with Diabetes Mellitus, 10 patients developed incisional hernia.
- p value for Diabetes in Incisional hernia is 0.208, hence insignificant.
- Odds ratio is 1.95
- Hence Diabetic patients are found to be 1.95 times more predisposed for incisional hernia than the non-diabetics.

SMOKING

Table 13: Smoking

SMOKING	INCISIONAL HERNIA				Total		X2	Df	p	Odds Ratio	95% CI	Z statistics
	Present		Absent									
	N	%	N	%	N	%						
Present	5	22.7	13	72.3	18	100						
											0.6761	
Absent	12	14.6	70	85.4	82	100	1.807	1	0.179	2.2436	to	1.320
											7.4454	
Total	17	17	83	83	100	100						

- Out of 82 patients without h/o smoking, 12 patients developed incisional hernia.
- Out of 18 patients with h/o smoking, 5 patients developed incisional hernia.
- p value of smoking in incisional hernia is 0.179, hence insignificant.
- Odds ratio is 2.2436.
- Hence Smokers are found to have 2.2 more risk than non-smokers for incisional hernia.

BODY MASS INDEX

Table 14: Body Mass Index

BMI	INCISIONAL HERNIA				Total		X2	Df	p
	Present		Absent						
	N	%	N	%	N	%			
Overweight	6	37.5	10	62.5	16	100	5.673	1	0.017
Normal	11	13.1	73	86.9	84	100			
Total	17	17	83	83	100	100			

- Out of 84 patients who were of normal weight, 11 patients developed incisional hernia.
- Out of 16 patients who were obese (BMI>24), 6 patients developed incisional hernia.
- p value of obesity in incisional hernia is 0.017, hence significant.

CHRONIC OBSTRUCTIVE PULMONARY DISEASE

Table 15: COPD

COPD	INCISIONAL HERNIA				Total		X2	Df	p
	Present		Absent						
	N	%	N	%	N	%			
Present	7	38.9%	11	61.1%	18	17%	7.454	1	0.006
Absent	10	12.2%	72	87.8%	82	83%			
Total	17	17%	83	83%	100	100%			

- Out of 82 patients without COPD, 10(12.2%) patients developed incisional hernia.
- Out of 18 patients with COPD, 7(38.9%) patients developed incisional hernia.
- p value of COPD in incisional hernia is 0.006
- Hence significant.

DISCUSSION

SEX DISTRIBUTION

In this study, out of 35 males who underwent previous laparotomy, 7(20%) patients developed Incisional hernia. Out of 65 females who underwent previous laparotomy,10(15.3%) patients developed incisional hernia. p value of gender distribution is 0.557, hence insignificant

In a systematic review and meta regression of factors affecting midline incisional hernia rates: Analysis of 14,618 patients published in 2015, male gender was showed to be a risk factor. In this study, out of 35 males who underwent previous surgery, 20% (7) patients developed incisional hernia. Out of 65 females who underwent previous surgery, 15.3% (10) patients developed incisional hernia. p value for gender distribution is 0.557, hence insignificant. Incisional hernia is more common in males as compared to females, but the difference is not significant enough for male gender to be considered as a risk factor.[13]

In a Cohort analysis "Factors affecting recurrence after incisional hernia repair" done at the University Hospital, SestreMilosrdnice, Zagreb, Croatia, of 297 patients who underwent Incisional hernia repair Retrospective analysis was done. 173 (58.2%) are females and 124 (41.8%) are males. p value of gender distribution is 0.243 (>0.04) which is insignificant. Hence sex cannot be considered as risk factor for incisional hernia according to this study.[14]

AGE DISTRIBUTION

In this study, out of 30 patients who were older than 50 years of age, 23.3% (7) had incisional hernia. Out of 70 patients who were younger than 50 years of age, 14.3%(10) had incisional hernia. p value of age >_ 50 years is 0.271 hence insignificant. Hence age cannot be considered as a risk factor for development of incisional hernia.

In a Cohort analysis "Factors affecting recurrence after incisional hernia repair" done at the University Hospital, SestreMilosrdnice, Zagreb, Croatia, of 297 patients who underwent Incisional hernia repair Retrospective analysis was done showing a p value of 0.103 (>0.04) Hence insignificant. The odds ratio is 1.01 showing no strength of association age and incisional hernia.[15]

In a retrospective study conducted at College of medicine, King Saud University, Riyad to report the five-year incidence of incisional hernia after vascular repair of abdominal aortic occlusive (AOD) and aneurysmal disease (AAA), 204 patients are considered in the study. Out of 154 patients with age less than 65 year 9.7% (15) developed incisional hernia and out of 50 patients with age >60 years 24% (12) developed incisional hernia. P value for age >60 years is 0.009 hence significant.

By the above studies it is evident that age can be considered as risk factor for incisional hernia provided that there is adequate sample size and there are adequate cases and controls in the group.

RISK FACTORS

POSTOPERATIVE WOUND INFECTIONS

In this study, out of 88 patients without post-op wound infection, 8 patients developed incisional hernia and out of 22 patients with post-op wound infections, 9 patients developed incisional hernia. p value of post-op wound infection in incisional hernia is <0.001, hence significant. Odds ratio is found to be 4.3. Patients with Post- operative wound infections have 4.3 times more risk of developing Incisional hernia.

In a study conducted on 2911 patients in 2015 in Sudan by Murray, reported an increase of incisional hernia by 1.9-fold after surgical site infection. In the current study incisional hernia occurrence increased to 4.3 folds after post-operative wound infection. Operation on previously infected or the relatively avascular scar tissue increases the risk of incisional hernia. In a retrospective published in Italian journal of Gastroenterology and hepatology, multivariateanalysis showed p value of postoperative wound infection in development of incisional hernia to be <0.00001. In this study out of 88 patients without postoperative wound infection, 9.5% (8) patients developed incisional hernia. Out of 22 patients with postoperative wound infection, 40.9% (9) developed incisional hernia. p value of postoperative wound infection in incisional hernia is <0.001 (<0.4), hence significant. Hence, postoperative wound infection is a risk factor for development of incisional hernia.

DIABETES MELLITUS

In this study, out of 55 patients without Diabetes Mellitus, 7 patients developed incisional hernia and Out of 45 patients with Diabetes Mellitus, 10 patients developedincisional hernia. p value for Diabetes in Incisional hernia is 0.208, hence insignificant. Odds ratio is 1.95. Hence Diabetic patients are found to be 1.95 times more predisposed for incisional hernia than the non-diabetics.

In a study done on “Incisional hernia: Risk factors, incidence, pathogenesis, prevention and complications” by Ismat M. Mutwali in Department of Surgery, Faculty of Medicine, Medical and Health Education Development Centre, AlzaeimAlazahari University, Khartoum, Bahri, Sudan, Diabetes mellitus was shown to be a risk factor. In this study, out of 55 patients without diabetes, 12.7% (7) patients developed incisional hernia. Out of 45 patients with diabetes, 22.2% (10) patients developed incisional hernia. p value for diabetes in incisional hernia is 0.208, insignificant.

In a study done on “Analysis of Risk Factors for Incisional Hernias and its Management” by Paudel SR, et al. at in Western Regional Hospital and Fewa City Hospital, Pokhara from 2013 to 2016. Diabetes was shown to be a risk factor for development of incisional hernia. A total of 100 patients were considered in the study out of which 5% of patients with diabetes millets developed incisional hernia in the follow-up period. p value for diabetes in incisional hernia is 0.032. Hence can be considered as significant.[16]

Incisional hernia in diabetic patients occurs due to altered regulation of collagen metabolism at the level of the fascial scar. When diabetes was optimally controlled, wound strength and extensibility were similar in diabetic and non-diabetics. So, the association between incisional hernia and diabetes might be explained by thesuboptimal glycemic control often found in elderly diabetic subjects and not by the disease per se.

SMOKING

In this study out of 100 patients, 18 patients have h/o smoking. Among them 5 patients developed incisional hernia and among 82 patients without h/o smoking 12 patients developed incisional hernia. p value of smoking in incisional hernia is 0.179, hence insignificant. Odds ratio is 2. 2436.Hence Smokers are found to have 2.2 more risk than non-smokers for incisional hernia.

In a study done on “Incisional hernia: Risk factors, incidence, pathogenesis, prevention and complications” by Ismat M. Mutwali in Department of Surgery, Faculty of Medicine, Medical and Health Education Development Centre, AlzaeimAlazahari University, Khartoum, Bahri, Sudan, chronic lung diseases were shown to be the risk factor for development of incisional hernia. In this study out of 82 patients without history of smoking, 14.6% (12) patients developed incisional hernia. Out of 18 patients with h/o smoking 22.7% (5) patients developed incisional hernia. p value of smoking in incisional hernia is 0.163, hence insignificant. Relative risk =1.9 odds ratio=2.24. The association of smoking for incisional hernia is showed with relative risk being 1.9 and with odds ratio=2.24. Hence, Smoking can be considered as risk factor for incisional hernia.[76] Also a study "Smoking a risk factor for incisional Hernia " conducted in Department of Surgery, Bispebjerg Hospital, University of Copenhagen, Copenhagen, Denmark showed smokers had a 4-fold higher risk of incisional hernia (odds ratio [OR], 3.93[95% confidence interval (CI), 1.82-8.49]) independent of other risk factors and confounders.[17]

BODY MASS INDEX

In this study, out of 84 patients who were of normal weight, 11 patients developed incisional hernia and Out of 16 patients who were obese (BMI>24), 6 patients developed incisional hernia. p value of obesity in incisional hernia is 0.017, hence significant. BMI (>24) can be considered as a risk factor for development of incisional hernia.

In a retrospective Study published by Italian journal of gastroenterology and hepatology, multivariate analysis p value of obesity to be <0.008. In this study, out of 84 patients with weight in normal range, 13.1% (11) had incisional hernia. Out of 16 patients who were overweight (BMI >=25), 37.5% (6) patients had incisional hernia. p value of BMI (>= 25) is 0.017 (<0.4), hence significant. The difference in occurrence of incisional hernia between patients who are in normal range of weight and overweight is significant enough for BMI >= 25 to be taken as a risk factor for development of incisional hernia.

Relative risk=2.86 odds ratio=3.98. Pre obese/ obese people are found to have 2.86- fold higher risk for incisional hernia compared with non-obese participants.[15]

In a study " Retrospective review of risk factors for surgical wound dehiscence and incisional hernia " data collection from medical records of all vascular procedures and laparotomies engaging the small

intestines, colon, and rectum performed in 2010. A total of 1,621 patients were included in the study. In this study out of 975patients with normal weight 320 (32.8%) developed incisional hernia and 645(39.7%) had BMI >25 out of which 131 (20.3%) developed incisional hernia with a p-value of <0.001. hence BMI can be considered as a significant risk factor for incisional hernia.[74]

A prospective study done by Colorectal Department, Colchester University foundation trust, UK on "The incidence of incisional hernias following ileostomy reversal in colorectal cancer patients treated with anterior resection" 121 patients were included in study. Individuals with incisional hernia were more likely to have higher BMI (Mean 29.1kg/m2; SD 5.03 vs 26kg/m2; SD 4.305, p = 0.0053).[18] A higher BMI has alsobeen shown be a risk factor for incisional hernia development following ileostomy reversal recently by Brook et al.

CHRONIC OBSTRUCTIVE PULOMONARY DISEASE

In this study Out of 82 patients without COPD, 10(12.2%) patients developed incisional hernia and out of 18 patients with COPD, 7(38.9%) patients developed incisional hernia.p value of COPD in incisional hernia is <0. 005.Hence significant.

In a multivariate prospective study "Development and Validation of a Risk Stratification Score for Ventral Incisional Hernia after Abdominal Surgery: Hernia Expectation Rates in Intra-Abdominal Surgery" published in journal of American college of surgeons, out of 625 patients, 93 (13.9%) patients developed incisional hernia. The study identified COPD as an independent risk factor for development ofincisional hernia with Hazard ratio of 2.35 and 95% confidence interval of 1.44 to 3.83.[19]

In a retrospective study to examine the true incidence of incisional hernia and its risk factors in patients undergoing surgery for colorectal cancer, two hundred ninety-five patients who underwent colorectal cancer surgery between 1993 and 2003 were included. The mean follow-up was 37.5 +/- 22 months. Forty-three patients developed incisional hernia, representing 14.5% of the total. The cumulative percentage of patients developing incisional hernia was 7% at 6 months, 16% at 1 year, 21% at 2 years and 33% at 5 and 10 years. The only significant independent risk factors were chronic obstructive pulmonary disease (COPD) (2-year cumulative incidence of incisional hernia of 53%, p = 0.04). Hence COPD can be considered as a risk factor for development of incisional hernia.[20]

CONCLUSION

Incidence of incisional hernia can be decreased by following proper suturing techniques, using appropriate suture material, observing sterile methods preoperatively and by achieving optimum glycaemic control.

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