(International Print/Online Journal)

SJIF IMPACT FACTOR: 5.565
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume3, Issue 5, Page No: 368-373
September-October 2020

A Study of Risk Factors Associated With Development of Incisional Hernia

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Type of Publication: Original Research Paper
Conflicts of Interest: Nil

ABSTRACT

Introduction: A laparotomy is one of the most commonly performed procedures in general surgery and in the associated sub specialities. Incisional herniation represents a significant and often underestimated complication of invasive abdominal surgery. A number of risk factors play a role in causation of incisional hernia. These may be biological, patient dependent or surgical.

Aim: To study the risk factors that may be involved in the formation of incisional hernia.

Material and Methods: The study was carried out in the department of surgery of a tertiary care centre. The study was conducted over a period of 18 months. All the patients admitted for incisional hernia were included in the study. Patients' personal particulars, co-morbidities, personal habits, indication for surgery, type of surgery were recorded. Statistical analysis was done using Chi square test.

Results: Female patients, underweight and obese patient were at high risk of developing incisional hernia. 26% patients were anaemic. 38% patients were hypertensive and 21.5% diabetic, 15% patients had malignancy. 13% patients had associated chronic obstructive pulmonary disease. 22.5% patients were smokers and 29% patients were alcoholic. 22.5% had chronic constipation. 10.75% male patients had benign prostatic hypertrophy (BPH). 18.28% patients were on immunosuppressive drugs and 77% had weak abdominal muscles with reduced tone. 51.6% were given midline incision and 44% patients had evidence of surgical site infection.

Conclusion: Comorbidities like anemia, diabetes and malignancy pose a higher risk.
A higher relative incidence in smokers and overweight underlines the importance of a healthy lifestyle with pre-op weight reduction being a good predictor of surgical outcome. Midline incisions intra operatively and post-operative surgical site infection (SSI) continue to be a major risk as well as predictive factor for development of incisional hernia.

Keywords: Laparotomy, Incisiional Hernia, Risk Factor

INTRODUCTION

A laparotomy is one of the most commonly performed procedure in general surgery and in the associated sub specialities. Millions of abdominal incisions are created each year worldwide. Incisional herniation represents a significant, and often underestimated complication of invasive abdominal surgery. Incisional hernia is any gap in the abdominal wall with or without a bulge in the area of a postoperative scar that can be seen or palpated on clinical examination or imaging [1,2]. Incisional hernias are iatrogenic hernia. They are one of the most common complications after abdominal surgery. The

true incidence is difficult to determine, as shown by the wide range of published figures in the literature. It occurs in 5-11% of patients subjected to abdominal operations [3,4]. Incisional hernia being a common surgical condition encountered in day to day practice, accounts for 15% to 20% of all abdominal wall hernias. It occurs as a result of excessive tension and inadequate healing of a previous incision, which is often associated with surgical site infection. A number of technical and patient-related factors have been linked to the occurrence of incisional hernias. Incisional hernias can occur early or late following the index surgery. There is evidence that the type of suture or technique of incision closure at the primary operation may contribute to hernia formation though none is confirmatory [5,6].

There is no definite profile of an individual most likely to develop an incisional hernia. Men, women, and children of all ages and ethnic backgrounds may develop an incisional hernia after abdominal surgery. Incisional hernia in most cases is diagnosed on a clinical basis. Ultrasonography is commonly used to confirm the clinical diagnosis. The sonographic image of a hernia is a fascial gap with protruding hernia contents. The hernia sac should increase in size or change location when the patient coughs.

If left unattended they can progress to massive sizes and cause discomfort to the patient. In some cases may even lead to strangulation of abdominal contents. Even worse may incarcerate, obstruct, perforate or can cause skin necrosis [3]. It is therefore recommended to treat the developing hernia. Primary repair of incisional hernias can be done when the defect is small (≤2 cm in diameter) and there is viable surrounding tissue. Larger defects (>2-3 cm in diameter) have a high recurrence rate (10- 50%) if subjected to primary closure, and requires repair with a prosthesis [6,7,8]. Incisional hernias can be the most difficult to treat and frustrating.

RISK FACTORS

Until recently, incisional hernias were thought to result mainly from a technical failure in the surgical closure of the abdominal wall. However, it is now known that a complex array of patient related, surgical, and postoperative variables influence the development of incisional hernia. These variables share a common denominator-they all influence normal wound healing [9].

Biological Risk Factors [10]

Any factor that compromises the normal sequence of wound healing of a surgical wound can contribute to the development of incisional hernia. In healthy skin, type I and type III collagens are found in a 4:1 ratio. In patients with incisional hernia, type III collagen may be increased in the skin and aponeurosis [11]. The ratio between type I (strong) and type III (weak) collagen is decreased, the quality of collagen is poorer. Certain drugs that have a general or specific immunesupressor effect, e.g. glucocorticoids and antiblastic drugs, delay healing by influencing the inflammatory phase.

Patient Dependent Factors: age (>65 years), sex (female), atherosclerosis, metabolic disorders (obesity, diabetes mellitus, renal insufficiency, protein deficiency, factor VIII coagulation deficiency), malnutrition, ascites, pregnancy, and conditions that increase intra-abdominal pressure are factors that predispose to the development of an incisional hernia.

Advanced age (>65 years) and atherosclerosis lead to reduced tissue perfusion and reduced collagen formation. Obesity leads to increased intra-abdominal pressure. Obesity related comorbidities, such as diabetes also increase risk of surgical site infection. Proteins and vitamins (especially Vitamin C) are important for collagen development; malnourishment and vitamin C deficiency lead to poor collagen formation and wound dehiscence. Immunosuppression alters the normal tissue regeneration.

Smoking alters the natural equilibrium between the formation and degradation of collagen. Another hypothesis concerns oxidative stress in smokers, which induces a greater inflammatory response due to increased chemotaxis. Also, the reduced oxygenation which follows the smoking-induced vasoconstriction of small blood vessels.

Diabetics have a five-fold higher risk for developing incisional hernia for two reasons: first, because the inflammatory phase is inadequate and second because of alterations in the microcirculation and granulation tissue [12,13.]

Local Risk Factors Wound infection is one of the main, if not the most important, risk factors. It is known that the infection resistance of a wound is

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proportional to its blood supply and, therefore, to the presence of oxygen. Though any laparotomy and any incision may develop incisional hernia; longitudinal laparotomy, midline and transverse incisions have highest chances of developing hernia [14]. Laparoscopic port sites may also develop hernia defects in the abdominal wall fascia. Suture-material used for closing the laparotomy incision can also be a factor [5]. Closure of abdominal fascia with a continuous non-absorbable suture had a significant lower rate of incisional hernia. Ideal suture is non-absorbable and the ideal technique is continuous suturing. Open suture repair for incisional hernia carries an unacceptably high recurrence rate [15,16].

With up to 20% of patients developing an incisional hernia at some stage postoperatively, the effects on those affected – poor cosmesis, social embarrassment, impaired quality of life even before the more obvious problems of pain, strangulation and skin erosion develop, the disease burden is significant**.** The present study is aimed to analyse the various etiological/risk factors responsible in development of incisional hernia.

AIMS AND OBJECTIVES

Present study was aimed to study the risk factors involved in the formation of incisional hernia.

MATERIALS AND METHODS

The study "**A study of risk factors associated with development of Incisional Hernias"** was carried out in the department of surgery of a tertiary care centre. An approval from ethical committee of the institution was taken. The study was conducted over a period of two years i.e. Oct 2013 to March 2015. All the patients admitted for incisional hernia were included in the study. Consent was taken from each patient. Patients' personal particulars like name, age, sex, address, profession and contact details were noted in a case record form for each patient. The duration of hernia, time elapsed from the preceding surgery, indications of the index surgery like malignancy, technique, if elective or emergency, were details taken from the patient as well as hospital records. Patient was also inquired for history of postoperative surgical site infection. Patients' past history in terms of comorbidities like Hypertension, Diabetes Mellitus, Tuberculosis, COPD, Chronic Bronchitis, or Collagen Vascular/Connective Tissue Disorders, was taken. History of smoking, alcohol intake, long term steroid intake, BPH, or chronic constipation was noted. Treatment history was recorded.

All patients were examined thoroughly. Their nutritional status in terms of BMI and presence or absence of pallor was noted. They were examined locally for the site and size of previous incision, size of the incisional hernia, the content, reducibility and the tone of the abdominal wall. Routine investigations of haemogram, urine analysis and X-ray chest over 30 years of age were tested for blood sugars, blood urea, liver function and renal function tests were done.in all patients. Any other test deemed necessary were performed.

STATISTICAL ANALYSIS

The data was subjected to univariate analysis using a t- test and Pearson chi square test for nominal data. A p value of less than 0.05 was considered statistically significant. Descriptive statistics and frequency table was used for profiling of patients. All statistical analysis was performed using the SPSS ver 16.0 (SPSS Inc, Chicago, IL, USA).

RESULTS The present study was done in the department of surgery of a tertiary care centre hospital from October 2013 to March 2015. A total of 93 patients were enrolled in the study.

The youngest patient was 18 years of age with the eldest being 89 years of age. However, majority of patients were in the age group of 40 -70 years (Table 1). Our study showed a female preponderance (58%). Out of 93 cases, 47 (50%) of the patients presented with the complaint of lump abdomen, 35 (37.6%) patients presented with pain and 11 (12%) came with signs and symptoms of obstruction. Patients had varied indications for laparotomy ranging from gynaecological to gunshot wound (Table 4).

A number of patients gave history of pre-existing comorbidities; 36 (38%) patients were hypertensive and 20 (21.5%) diabetic, 14 (15%) patients were being operated for some malignancy or had a coexisting one. 12 (13%) patients had associated chronic obstructive pulmonary disease. Three patients gave a history of associated connective tissue disorder namely rheumatoid arthritis (2 patients) and Ehlers-Danlos syndrome (1 patient). 41 (44% patients) out of 93 gave a positive history of surgical

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site infection though the extent and duration of the infection varied in each (Figure 1).

A number of patients gave a history of cofactors that can affect wound healing process. 21 (22.5%) patients were smokers and 27 (29%) patients were alcoholic. 21(22.5%) patients out of 93 gave a history of chronic constipation. 10 (10.75%) male patients had a history benign prostatic hypertrophy (BPH) whereas 17 (18.2%) patients were on immunosuppressive drugs (13 on chemotherapy and 4 on steroids) Table 2). Twelve (13%) patients were poorly built and nourished with a BMI of less than 18 kg/m^2 whereas 7 (7%) patients were overweight and 16 (17%) were obese with a BMI above 30 kg/m^2 (Table 3). Twenty-four (26%) patients had clinically appreciable pallor. 23% cases presenting with incisional hernia had a normal abdominal wall tone whereas in a majority i.e. 77% (72 patents) had weak abdominal muscles with reduced tone.

DISCUSSION

In our study 58% of the patients presenting with incisional hernia were females and 42% of patients were male with a male to female ratio of 1: 1.38. Higher incidence in females can be explained by the higher amount of abdominal wall laxity secondary to multiple pregnancies and more number of lower abdominal wall incisions which is associated with greater risk of developing incisional hernia. Similar results were found in the studies by Harding, Milbourn et al and Regnad [17,18,19.]

In our study the index surgery was performed for a varied number of conditions, emergencies like perforation peritonitis, acute appendicitis and acute intestinal obstruction to conditions like renal cell carcinoma and ovarian carcinomas. Gynaecological procedures accounted for 31% of all cases of incisional hernias (Table 4). These observations were similar to those in the study by Ponka (26%) and Millbourn et al (28.76%) [18,20]. 44 patients out of 93 i.e. 47.3% of cases had undergone an emergency procedure in their index surgery. Another Indian study by Tulaskar et al showed similar results [21].

Comorbidities

A number of patients gave a history of pre- existing comorbidities. 36 (38%) patients were hypertensive and 20 (21.5%) were diabetic. 14(15%) patients were being operated for a malignancy or had a coexisting one. 12 (13%) patients had associated chronic obstructive pulmonary disease (asthma or chronic bronchitis). 21 (22.6%) patients in our study were smokers. Smoking, because of free radical damage delays wound healing. Also COPD is directly associated with smoking and cough induced increased intra-abdominal pressure predisposes to wound gaping (Figure 1). Our results are comparable with results published by Cameron et al, in which chronic obstructive pulmonary disease (COPD) (23/110 – 20.90%) and stricture urethra (10/110 – 9.09%) was reported [22].

Twelve (13%) of patients were poorly built and nourished with a BMI of less than 18 and 23 (24.7%) patients had BMI more than normal. The finding is similar to that in the study by Nanjappa et al where 40% patients who developed incisional hernia were overweight and 13 % were obese. Obesity is perhaps an important factor, in the causation and recurrence of incisional hernias in this study. Obesity poses an increase in both wound complications and recurrences rates, even while using the laparoscopic approach [23,24]. Better outcomes can be expected if weight reduction is enforced prior to an operative intervention. Twenty-four (26%) patients had pallor signifying low haemoglobin. Anemia is one of the factors affecting wound healing and hence increased chance of developing an incisional hernia later in life.

Three patients gave a history of associated connective tissue disorder namely rheumatoid arthritis (2 patients) and Ehler Danlos syndrome (1 patient). Connective tissue disorders are associated with defective collagen and elastin synthesis specifically in Ehler-Danlos syndrome, leading to a weak scar and hence, there are higher chances of incisional hernia development.

Post Op Infections

A midline incision was more prone for development of incisional hernia (Table 5). 41 (44% patients) out of 93 gave a positive history of surgical site infection which led to a prolonged hospital stay requiring various levels of intervention (drainage, parenteral antibiotics) following the initial surgery. In other Indian studies, a similar incidence of post-operative infection was noted as in ours,[23,25] thus implying that surgical wound infection is a single most important factor contributing to poor wound healing, formation of an unhealthy scar and predisposing to a hernia at

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the incision site. Thus elimination of wound infection may lead to lowering of the incidence of incisional hernia.

Wall Tone The majority of the patients i.e. 72 (77%) had weak abdominal muscles with reduced tone while only 23% cases had a normal abdominal wall tone. This may be explained by the multiparous female preponderance in the study. Multiparity and also number of caesarean sections do contribute towards a lax lower abdominal wall. Also a large number of patients were in the elderly age group (60-70 years), leading to weak abdominal muscles and reduced tone.

PREVENTION

Incisional hernia being an iatrogenic condition following laparotomies, cannot be done away with completely. However, the incidence can be reduced by rectifying and or modifying the risk factors like smoking, obesity, and nutritional deficiencies, and optimising diabetic management even if this necessitate delaying the surgery. Further, the prevalence can be drastically minimised by careful patient management, before, during and after the surgery.

SUMMARY & CONCLUSION

The present study attempted to compare the various risk factors. The following points were observed

1. Incidence was higher in the elderly and more in females than males.
2. Comorbidities like anemia, diabetes and malignancy pose a higher risk.
3. A higher relative incidence in smokers and overweight emphasizes the importance of a healthy lifestyle with cessation of smoking and optimizing weight, thus ensuring higher probability of good surgical outcome.
4. Midline incisions and post-operative surgical site infection continues to be a major risk as well as predictive factor for development of incisional hernia.

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