



## A CLINICAL STUDY OF THE FACTORS AFFECTING POST LAPAROTOMY WOUND HEALING

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**ABSTRACT** **BACKGROUND:** Wound Healing is the summation of a number of processes that follow injury. Despite immense advances in the technique of wound creation and closure, there continues to be an important percentage of patients undergoing abdominal operations, suffering from delayed wound healing and partial wound failure. Apart from increasing patient morbidity and hospital stay, it also is a psychological blow to both the surgeon and patient alike.

The incidence of post-operative wound dehiscence was investigated in patients in several studies (e.g., 1.25 per 1,000 discharges at 0 to 17 years, 1.74 at 18 to 44 years, 2.65 at 45 to 65 years, and 3.77 at 65 or more years. Additionally, it was found that this complication resulted in an increased mean length of stay (by 21.1 days) and a tremendous increase in charges for affected patients, with 5.7 times higher odds of in-hospital mortality. Wound Infection rate varies from 6.8 percent to 21.4 percent depending on the procedure and other patient factors. The aim of this study is to assess the various factors influencing post laparotomy wound healing. To identify the pre-operative, operative and post operative risk factors in patients having poor wound healing.

**RESULTS** This prospective study was conducted in Government General Hospital, kurnool. A total of 100 patients undergoing laparotomies were studied. 40 patients were found to have delayed wound healing. The strongest association for delayed healing was found to be wound infection, followed by chronic cough, steroids and poorly controlled diabetes.

### CONCLUSIONS

The incidence of delayed healing was found to be higher in our study with increased incidence of wound infection. It was found that emergency laparotomies were associated with an increased incidence of wound infection and thereby delayed healing. Poor wound healing is also associated strongly with poor nutrition and uncontrolled diabetes. These factors should be taken into account and efforts have to be made to correct the risk factors pre or post-operatively.

### KEYWORDS :

#### INTRODUCTION

In humans, regeneration of tissues is limited. Only epithelium and the liver can actually regrow; most tissues heal by repair, which results in scarring. Most individuals expect that healing is an inevitable outcome; wound healing is taken for granted. However although healing is perceived as inevitable, it can in fact be fraught with problems and altered at many points. Normally, healing goes through the physiological phases of coagulation, inflammation, matrix synthesis and deposition. These are followed by angiogenesis, fibroplasias, epithelialization, contraction, remodeling and scar maturation.

Rio et al. and Makela et al.<sup>4</sup> reported in case control studies that patients with three to five factors such as age > 65, wound infection, pulmonary disease, hemodynamic instability, ostomy within the incision, hypoproteinemia, sepsis, obesity, uremia, hyperalimentation, malignancy, ascitis, steroid use and hypertension; were at a higher risk of poor wound healing than control patients. Low oxygen tension has a profoundly deleterious effect on all aspects of wound healing. Fibroplasia, although stimulated initially by the hypoxic wound environment, is significantly impaired by local hypoxia. Optimal collagen synthesis requires oxygen as a cofactor, particularly for the hydroxylation step.

Increasing the fraction of inspired oxygen (FiO<sub>2</sub>) of inspired air for brief periods during and immediately after surgery; results in enhanced collagen deposition and in decreased rates of wound infection after elective surgery.

Diabetes Mellitus is the best known of the metabolic disorders contributing to increased rates of wound infection and failure. Uncontrolled diabetes results in reduced inflammation, angiogenesis and collagen synthesis. Hyperglycemia can interfere with uptake of Vitamin C, a vital component for hydroxylation of proline in collagen synthesis. Wound infection is considered the major deterrent to wound healing. Surgery breaches the intact epithelium, allowing bacterial

access to the deeper tissues and bloodstream. The incidence of wound infections bears a direct relationship to the degree of contamination that occurs during the operation from the disease process itself. About three-fourths of the total wound infections are superficial or suprafascial and the remaining are deep, involving the fascia and abdominal cavity. Most intra-abdominal infections however, do not communicate with the wound. Surgical technique with regards to incision and closure of the abdomen, is closely related to the wound outcome. Mass closure has been shown to be superior to layered closure, with lower incidence of hernia and dehiscence.

Elevation of intra-abdominal pressure due to sudden forceful acts such as coughing, sneezing, ileus, urinary retention, ascitis, fecal impaction, U.G.I endoscopy, retching are all known to be associated with increased incidence of wound failure. The importance of nutrition in the recovery from surgical injury has been recognized by clinicians since the time of Hippocrates. The degree of nutritional impairment need not be long standing. Thus patients with brief pre-operative illnesses will demonstrate impaired fibroplasias.

#### AIMS AND OBJECTIVES

To assess the prevalence of the following risk factors in patients who have poor wound healing, post laparotomy.

#### Pre-operative:

1. Age > 65 yrs,
2. Sex,
3. Diabetes mellitus,
4. Steroid use.
5. Chronic cough (Asthma/COPD)

#### Operative:

1. Emergency/ elective laparotomy,
2. Type of incision.

#### Post-operative:

1. Wound infection.

**MATERIALS AND METHODS**

All adult male and female patients undergoing laparotomy for various indications were included in the study. This descriptive, non-interventional case study was conducted in the Departments of General Surgery in Government General Hospital attached to Kurnool Medical College from Oct 2019 to Sep 2021 (minimum of 100 cases)

**Inclusion Criteria**

Patients undergoing Abdominal Laparotomy (Emergency or Elective).  
1. Age > 18yrs

**Exclusion Criteria**

Patients  
1. Who are undergoing re-laparotomy  
2. Who are known to be suffering from collagen vascular diseases

**RESULTS**

A total number of 100 patients were entered in the study. All patients underwent abdominal laparotomy either under emergency or elective basis. 2 patients underwent re-laparotomy and were excluded from the final analysis.

**Age Distribution**

Out of 100 patients who underwent the study, 40 patients had delayed wound healing. Among the delayed wound healing cases average age was 64.5 years

**Table 1: Age distribution**

Age Groups	No. Of patients	Delayed wound healing	Percentage
18-30	9	1	11.12%
31-40	11	5	45.45%
41-50	22	7	31.82%
51-60	31	11	35.48%
61-70	23	14	60.86%
>70	4	2	50%

**Sex Distribution**

Out of the 40 patients with delayed wound healing, 30 were males and 10 were females.

**Table 2 : Sex Distribution**

Sex	No. With Delayed healing	Percentage
Male	31	75%
Female	9	25%

**Diabetes Mellitus**

Out of 100 patients in the study 30 had diabetes and out of which 16 patients had delayed wound healing

**Table 3: Diabetes Mellitus**

No. Of patients with diabetes	No. Of diabetics with delayed wound healing	Percentage
30	16	53.3%

**Steroid Usage**

Out of 100 patients in the study, 6 were using steroids and all of them had delayed wound healing

**Chronic Cough**

Out of 100 members, 26 were having chronic cough secondary to COPD, Asthma, among which 19 had delayed wound healing.

**Table 3: chronic cough**

No. Of patient with chronic cough	No. Of patients who had delayed wound healing	Percentage
26	19	73%

**Laparotomy**

Out of the 100 patients who were included in the study, 65 patients underwent emergency laparotomy, and 35 underwent elective laparotomy.

Out of the 65, undergoing emergency laparotomies, 33 had delayed wound healing.

Out of the 35, undergoing elective laparotomies, 7 had delayed wound healing.

**Table 4: Laparotomy**

Type of Laparotomy	No. of Cases	No. of pts with delayed healing
Emergency	65	33 (52%)
Elective	35	7 (20%)

**Type Of Incision**

Out of the 100 patient included in the study,  
 • 80 underwent laparotomy through vertical midline incision, in which wound healing was delayed in 32.  
 • 11 underwent laparotomy through right subcostal incision, in which wound healing was delayed in 3 and  
 • 9 underwent laparotomy through paramedian incisions, in which wound healing was delayed in 5 patients

**Wound Infection**

Out of the 40 patients who developed delayed wound healing, 39 developed wound infection.

**DISCUSSION**

In the present study, males were presenting with delayed wound healing almost three times as common as females (M: F 3:1). A study conducted in Manchester, by Gilliver SC, Ashworth JJ, Ashcroft GS<sup>96</sup> showed a similar ratio of males presenting two and a half times more common than females (M:F 2.5:1).

**Age Incidence**

In the present study, the average age of patients with delayed wound healing was found to be 64.5 yrs. A prospective audit Done by S. Guo and L.A. DiPietro<sup>97</sup> at the Center for Wound Healing and Tissue Regeneration, University of Illinois at Chicago showed a higher result, of the average age being 68.6 yrs.

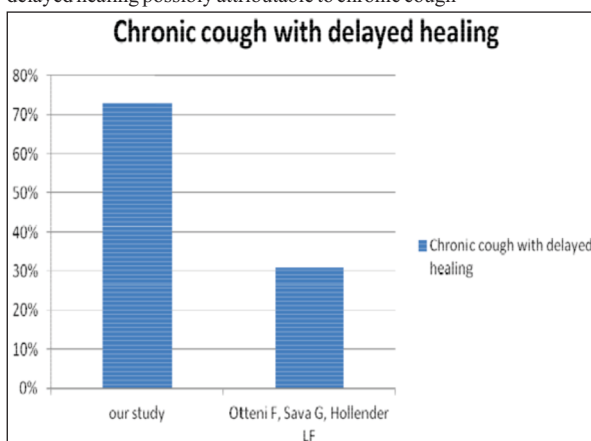
**Table 5: Comparison of average age of patients with delayed healing.**

	Our study	Woo, Ayello EA, Sibb ID RG et al
Diabetics with delayed healing	53%	23%

**Glucocorticoids**

In the present study, only two patients were taking glucocorticoids and both had delayed healing. This is a lot more than the results published by Wagner E, Huck G, Stiehl DP, Jelkmann W, Hellwig-Bürgel T<sup>101</sup>. et al. University of Luebeck, Germany. They found 42% of their patients on steroids suffered from delayed wound healing.

**Chronic Cough** In our study 70% of patients with chronic cough had delayed wound healing, which is much higher than the results reported by Otteni F, Sava G, H Hollender reported 31% of patients with delayed healing possibly attributable to chronic cough



**Type of Laparotomy**

In our study 50% of emergency laparotomies and 20% of elective laparotomies developed delayed wound healing. This is a higher than the results published by Rodríguez-Hermosa JI, Codina-Cazador A, Ruiz B, Roig J et al.<sup>105</sup> who found delayed healing in 20% of emergency surgeries and less than 5% in elective surgeries.

**Table 6: Type of Laparotomy**

Our study	Rodríguez-Hermosa JI, Codina-Cazador A, Ruiz B, Roig J et al

Emergency Laparotomy	50 %	20 %
Elective Laparotomy	20 %	5 %

### Wound Infection

In our study 99% of the patients had having delayed healing had wound infection. This is higher than the results published by Rodríguez-Hermosa JI, Codina- Cazador A, Ruiz B, Roig J who attribute wound infection to be associated with 70% of patients with delayed healing.

**Table 7: Wound infection**

	Our study	Radek KA, Matthies AM, Burns AL et al.
Wound infection with delayed healing	99%	70%

### CONCLUSION

- The incidence of delayed wound healing was found to be a lot higher in our study. The principal associated factor was found to be wound infection. The other factors may directly delay healing or may indirectly increase chances of wound infection. Factors that could not be altered like age above 65 and male sex, might alert the surgeon, that the patient has an increased risk of having delayed wound healing. Alterable factors such as low haemoglobin, Serum Albumin require corrective measures as far as possible. Chronic cough though frequently associated with smoking, requires serious attention.
- Diabetics require strict glycaemic control in order to, not retard the wound healing process. Emergency laparotomies are at a higher risk of delayed healing, probably due to increase in contamination and inadequate preparation for surgery. Among the type of incisions, delayed healing was associated mostly with paramedian incisions.
- The strongest associated factor with delayed healing was found to be wound infection.

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