

A Clinical Study of Factors Affecting Healing of Incision Site after Laparotomy

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Abstract:

Background: Laparotomy is an incision made into the abdominal wall to visualise and explore the viscera inside of the abdominal cavity. Break in continuity of the skin with or without deeper tissues, following laparotomy, results in abdominal wound dehiscence. This study is done to evaluate the factors affecting healing of incision site of laparotomy.

Aims and Objectives: 1. To identify various factors affecting postoperative wound healing. 2. To study various wound complications occurring following laparotomy. 3. To observe the measures for preventing the wound complications.

Material and Methods: This study is a Prospective study conducted on 100 patients who undergoing laparotomy (both emergency and planned) between June 2020 to January 2022 in General Surgery Department of S.C.L Hospital Ahmedabad. A detailed history was taken from all the patients.

Result: In this study the various Factors affecting healing of incision site after laparotomy, which occurred in 100 patients who underwent laparotomy in the Department of General Surgery S.C.L. Hospital Ahmedabad were analysed. Patients above 15 years were included in this study. Patients aged > 60 years developed more wound complications as compared to patients < 60 years suggesting that increasing age acts as a risk factor. Development of wound complications were more in females compared with male. All patients who had hypoproteinemia, malnourishment (BMI <18.5) and were on steroid therapy developed more wound complications. 9 out of 11 patients developed complications who had BMI >30 (obese). 7 out of 13 anemic patients developed wound complications. Out of 100 patient, 55 patients had comorbidities (i.e. DM, HTN, IHD, COPD).

Conclusion: This study was conducted to study the factors affecting wound healing. Wound healing after laparotomy is influenced by a variety of factors like timing of laparotomy, age, comorbid conditions, malnutrition, obesity, anemia, hypoproteinemia, immunosuppressive states, indication of laparotomy, postoperative abdominal condition, length of hospitalisation. Optimisation of these factors as far as possible will reduce the incidence of wound complications.

Key words: Factors Affecting wound healing, Wound complication after laparotomy

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Introduction

Despite the advances made in asepsis, antimicrobial drugs, sterilisation and operative technique, post-operative wound problems continue to be a major problem.

Clean sound healing of laparotomy wound after any intra-abdominal procedure is a cardinal index of good surgical repair. Post-operative wound problems delays recovery and often increases stay and may produce lasting sequelae and require extra resources for investigations, management and nursing care, therefore its prevention is relevant to quality patient care. Considering wound problems are quite common in developing countries like INDIA the

present study was taken up to find out factors affecting healing of incision site after laparotomy.

Post-Laparotomy Wound Problems

1. Surgical site infections
2. Seroma or hematoma formation
3. Stitch abscess/ granuloma/ sinus
4. Burst abdomen
5. Incisional hernia
6. Hypertrophic scars

Factors Influencing Wound Healing

- Patient Factors

- Preoperative Factors
- Per-Operative Factors
- Post-Operative Factors
- Technical Factors

1. Patient Factors

* Age - Incidence of wound problems increases at extremes of age. Patients with age

>60 yrs or <1 yrs show decreased antibody production, decreased phagocytic activity

and amoeboid movement of leukocytes and impaired vascular reaction to wound, all

leading to increased chance for infection. [1]

* Obesity - Blood flow and blood volume per unit weight are decreased in adipose tissue.

Therefore the obese patient has relatively avascularity and therefore increased susceptibility to infection.

* Malnutrition - Adequate vitamins, trace elements, fatty acids and proteins are essential for wound healing.

* Hypoxia - Molecular oxygen is essential for collagen formation. Hypoxia prevents fibroblast proliferation and collagen synthesis; it also promotes bacterial invasion into the wound.

* Anemia - It leads to decreased white blood cell infiltration, angiogenesis, fibroblast production, and collagen production, all contributing to delayed wound healing. [2]

* Diabetes Mellitus - Diabetes mellitus impairs wound healing in several ways. Diabetes associated with large vessel occlusion (macroangiopathy) and end-organ microangiopathy each lead to tissue ischemia and infection. Diabetic sensory neuropathy leads to repeated trauma and unrelieved wound pressure.

* Steroid Therapy Increased steroid levels suppress the normal inflammatory response necessary for wound healing, it also reduces host immune power thus making it vulnerable to infection.

* Immunosuppression

* Jaundice

2. Pre-Operative Factors

* Duration of preoperative hospitalisation –Longer the period, the greater the problem.

* Hair removal from operative site - Timing and technique of hair removal affects the bacterial flora in the operative field.

* Preoperative scrub: Pre-operative scrub with hexachlorophene containing or other antiseptics on the evening before an operation is associated with a significantly decreased postoperative wound problems.

* Prophylactic antibiotic therapy - When proper prophylaxis is administered in indicated cases it helps to reduce the risk of infection considerably

3. Per-Operative Factors

* Surgeon's hand scrub

* Skin preparation

* Drapes

* Surgical Gloves

* Gown and Masks

* Surgical Technique

* Peritoneal cavity irrigation

* Duration of Operation

* Design of Operation Theatre

4. Post-Operative Factors

* Distension of Abdomen

* Postoperative Intraoperative collections

* Severe abdominal pain

* Ascites

* Vomiting

5. Technical Factors

* Type of Incision

* Type of Suture Material

* Type of Abdominal Closure

* Tissue Handling

Material & Methods:

The present study deals with 100 cases undergoing laparotomy (both emergency and planned) conducted in the Department of General Surgery at a tertiary

care teaching hospital. This Prospective study includes Laparotomies performed from June 2020 to Jan 2022. A Pre designed Proforma was used to collect the information for individual cases. All the patients were thoroughly examined during their pre operative and postoperative periods and records were maintained in details as per proforma. They were observed carefully till their discharge from the hospital and were followed for a period of 6 months after surgery.

Exclusion criteria:

- Age < 15 years
- Pregnant patients.

Results

AGE (in years)	No. of cases	No. of cases of wound complications	% of cases
<20	7	1	14.2%
21-40	30	3	10 %
41-60	37	17	45.9%
>60	26	16	61.5%
Total	100	37	
p - value	0.024 (significant)		

Patients aged > 60 years developed more wound complications(61%) as compared to patients suggesting that increasing age acts as a risk factor. Calculated p-value from the table is also significant ($p < 0.05$) which suggests that age is significant factor for wound healing. Incidence Rate in present study is more in males(63%) compared with females(37%). However, development of wound

complications were more in females(40%) compared with male(35%). As shown above, amongst 43 patients of peritonitis ; 15 had ileal perforation, followed by 11 patients with appendicular perforation, 9 had peptic perforation, 3 patients had jejunal perforation, 2 had cecal perforation, 2 had sigmoid perforation And 1 patient had transverse colon perforation.

Sr No.	Types of Wound complications	No. of cases
1	Wound infection	17 (45.9%)
2	Wound gap	7 (18.92%)
3	Burst Abdomen	6 (16.22%)
4	Incisional Hernia	3 (8.11%)
5	Hypertrophic scar	2 (5.41%)
6	Stitch granuloma	2 (5.41%)
	Total	37(100%)

Types of Wound Complications

Among 100 patients who underwent laparotomy 37 patients developed wound complications postoperatively. 17 patients developed wound infection, 7 developed wound gap, 6 developed burst abdomen, 3 developed incisional hernia, 2 patients developed hypertrophic scar and 2 patients developed stitch granuloma.

Systemic Factors Influencing Wound Complications

Sr No.	FACTORS	NO. of cases	No. of patients developed wound complications	% of cases
1	Anemia	13	7	53.8%
2	Hypoproteinemia	12	12	100%
3	Obesity	11	9	81.8%
4	Malnourishment	5	5	100%
5	Steroid Therapy	3	3	100%

Certain systemic factors affect wound healing. In our study, Anemia, Hypoproteinemia, Obesity important role in wound healing. All patients who had hypoproteinemia, malnourishment (BMI <18.5) and were on steroid therapy developed wound complications. 9 out of 11 patients (81.8%) 30 (obese). 7 out of 13 anemic patients developed wound complications.

Sr No.	PATIENTS	NO. of cases	No. of patients developed wound complications	% of cases
1	WITH COMORBIDITIES	55	31	56.3%
2	WITHOUT COMORBIDITIES	45	6	13.3%
	Total	100	37	
	P-value	0.0019 (significant)		

Out of 100 patient, 55 patients had comorbidities (i.e. DM Development of wound complications were high in patients with comorbidities (56.3%) compared with patients without comorbidities (13.3%). Calculated p-value is also significant ($p < 0.05$) which suggests presence of comorbid condition has a significant role to play in wound healing. Among the total 100 patients 72 patients underwent emergency laparotomy and 28 patients had elective laparotomy. Development of wound complications was high among those who underwent emergent laparotomy (43%) as compared with those who underwent elective laparotomy (21%). Total 36 patients had a hospital stay of less than a week. Among them only 1 patient developed postoperative wound complications. As the hospital stay increased to more than a week, wound complication rate also increased.

Discussion:

Among all patients with wound complications, maximum cases were > 40 years of age, which suggested that increasing age is a risk factor due to poor nutritional status, associated comorbid conditions, decreased body resistance and increased susceptibility to infections. Hanif et al [3] and Makela et al [4] found an increased age more than 50 as a risk factor for wound complications. In present study of 100 patients, 72 patients underwent emergency laparotomy

and 28 patients had elective laparotomy. Development of wound complications was high among those who underwent emergency laparotomy (43%) compared with those who had elective laparotomy (21%). Similar findings were present in Garg et al [5]. In our study, we found that the wound infection (46%) was the main wound complication as compared to other wound complications. Ching G et al [6] showed maximum number of wound complications were wound dehiscence (41%).

In this study preoperative anemia ($Hb < 10$ gm%) is found to be significantly associated with contribution to development of wound complications. Total 13 patients had anemia out of which 7 developed wound complications. Joergenson and Smith et al [7] also noticed a higher incidence of burst abdomen

in patients having anemia in their study. Hypoproteinemia (< 5.7 gm/dl) was noted in 12 patients. All 12 patients developed wound complications. Meena K et al [8] also mentioned hypoproteinemia (< 6 gm/dl) as a significant variable for wound dehiscence. Body mass index > 30 was included in factors for assessment and found that 9 of 11 patients with obesity developed wound complications. Ramneesh G et al [5] stated that BMI > 35 (obesity) is significant to influence wound dehiscence. According to Muneah NS [9] et al 2015, BMI > 25 had a higher rate of wound dehiscence. Malnutrition (BMI < 18.5) was found in 5 patients in our study. All 5 patients developed wound complications that signifies that malnutrition has an important role in wound healing. Cruse et al [10] suggested that malnutrition in preoperative patients is an independent risk factor for development of wound complications. Among all 100 patients, 3 patients were on steroid therapy. All 3 patients developed wound complications. Cruse et al [10] and Webster C et al [11] found that steroids interfere with normal wound healing and are a risk factor for development of wound complications.

Conclusion:

This is a study of 100 cases of laparotomy undergoing emergency or elective operations.

From the results of this study, we can conclude that a number of factors affect wound healing of the incision site after laparotomy. Systemic underlying disorders like anemia, diabetes, jaundice, hypertension etc. increase the rate of wound problems. Infection rate is higher for emergency operations than elective operations. Because emergency operations are more contaminated than elective operations, there is also no time to correct underlying comorbid conditions and other risk factors; higher rates of wound complications in emergency laparotomies are observed. Problem is more at the extreme of age, because at extreme ages the patient is unable to withstand marked alteration in the internal milieu which occurs in emergency or elective operations. Obesity has a definite role to play in wound healing. Various putative risk factors for wound healing are investigated. Important risk factors for wound healing identified in this study include hypoproteinemia,

anaemia malnourishment and steroid therapy. Increase in hospital stay leads to more chances of wound complications

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