

A Study to Observe the Cases of Abdominal Wound Dehiscence in Patients Undergoing Emergency Laparotomy with Midline Incision

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ABSTRACT

Aim: A study to observe the cases of abdominal wound dehiscence in patients undergoing emergency laparotomy with midline incision.

Objectives: To calculate the frequency of abdominal wound dehiscence in patients undergoing emergency laparotomies subjected to midline incision and to determine hypoproteinemia, anemia and surgical site infection as contributing factors for abdominal wound dehiscence in emergency laparotomies with midline incision.

Materials and Methods: Observational cohort study carried out in the department of General Surgery at Sri Guru Ram Das University of Health Sciences, Vallah, Sri Amritsar on 60 patients who underwent emergency laparotomy with midline incision.

Results: In our study, patients belonging to various kinds of age group and socio economic background were included in the study irrespective of the gender. Amongst the 60 patients included, abdominal wound dehiscence was seen in 36 patients corresponding to 60% of the sample size. This study was endeavoured to delineate the role of anemia, hypoalbuminaemia and SSI (surgical site infection) in the dehiscence seen in these patients and it was observed that majority of the patients undergoing abdominal wound dehiscence had hypoalbuminaemia thus, making it the most significant risk factor followed by anemia and surgical site infection.

Conclusion: In this study we concluded that Abdominal wound dehiscence is a serious sequel of impaired wound healing. Many factors can predispose to this grave complication of which anemia, hypoproteinaemia and surgical site infection carry enormous significance. Patients with these risk factors require more attention and special care to minimize the risk of occurrence. Postoperative abdominal wound dehiscence can be prevented by improving the nutritional status of the patient, strict aseptic precautions, optimization of patient's hemodynamic losses and by proper surgical technique. Early diagnosis of burst abdomen and aggressive treatment helps in reducing morbidity and mortality. Some of the major factors like the ones mentioned in this study must be vigilantly looked for and treated to prevent this catastrophic complication.

Keywords: Wound infection, wound dehiscence, burst abdomen, laparotomy

Introduction

An abdominal wound may occur due to disruption in the anterior abdominal wall caused by either trauma ^[1] or any surgical intervention in order to gain access to the underlying pathology ^[2]. This incision when made initiates a cascade of mechanisms at cellular level, which aims at achieving healing at incision site ^[3]. Whenever there is hindrance in the normal cascade of abdominal wound healing process, it results in the disruption of the abdominal wound that is also known as wound dehiscence ^[4].

Abdominal wound dehiscence (AWD) is a terminology that is commonly used to explain the separation of different layers of an abdominal wound before complete healing has taken place. Other terms used are acute laparotomy wound failure and burst abdomen. It usually occurs when a wound fails to achieve the required strength to withstand stresses placed upon it ^[5].

Abdominal wound dehiscence (burst abdomen, fascia dehiscence) is a severe postoperative complication, with high morbidity and mortality rates. The incidence, as described in the literature, ranges from 0.4% to 3.5%. Prolonged hospital stay, high incidence of incisional hernia, and subsequent reoperations underline the severity of this complication ^[6].

A burst abdomen is considered present, when intestine, omentum or other organs are seen in the abdominal wound following abdominal surgery. It occurs mostly between the sixth and eighth day after operation ^[7].

It is one of the most dreaded life-threatening complications owing to the associated rapid onset of often irreversible pathological sequel and is a major cause of postoperative morbidity and mortality. Different combinations of factors are identified as risk factors in several studies ^[8] and are mostly classified as local and general factors. So, early identification of these factors and doing simple routine laboratory investigations may help in reducing the occurrence of wound dehiscence. Nearly half the adverse events following postoperative complications are considered to be preventable by doing the appropriate surgical technique and wound care with sterile techniques ^[9] and also by improving the nutritional status of the patient and taking strict aseptic precautions.

This abdominal wall disruption may be partial or complete. Partial disruption is when one or more layers have separated but the underlying sheath and peritoneum is intact. Complete disruption is when all the layers have disrupted.

Hypoproteinaemia and anemia contributes to prolonged inflammatory phase and impairs fibroplasia, proliferation, proteoglycan and collagen synthesis, neoangiogenesis and wound remodelling ^[10]. Hypoalbuminaemia is associated with poor wound healing, decreases collagen synthesis in the surgical wound and anastomosis. Loss of protein from protein-calorie malnutrition leads to decreased wound tensile strength, decreased T-cell function, decreased phagocytic activity and decreased complement and antibody levels, ultimately diminishing body's ability to defend the wound healing against infection ^[11].

Continued presence of bacteria causes influx and activation of neutrophils and increases in levels of degradative matrix metalloproteinases (MMPs). In the absence of sufficient tissue inhibitors of MMPs, wound degradation will occur ^[12]. The release of endotoxins by bacteria leads to the production of collagenase, which degrades collagen fibers. Infection thereby causes a prolongation of the inflammatory phase and negatively affects deposition of collagen and fibroblast activity.

Aim

A study to observe the cases of abdominal wound dehiscence in patients undergoing emergency laparotomy with midline incision.

Objectives

1. To calculate the frequency of abdominal wound dehiscence in patients undergoing emergency laparotomies subjected to midline incision.

2. To determine hypoproteinemia, anemia and surgical site infection as contributing factors for abdominal wound dehiscence in emergency laparotomies with midline incision.

Materials and Methods

Observational cohort study carried out in the department of General Surgery at Sri Guru Ram Das University of Health Sciences, Vallah, Sri Amritsar from 1 March 2021 to July 2022 on 60 patients who underwent emergency laparotomy with midline incision.

Inclusion criteria: Patients of the age > 18 yrs and of either sex who underwent emergency laparotomy with midline incision.

Exclusion criteria

Patients with- Local Factors

1. Tissue tension due to a large defect or poor apposition
2. Hematoma at the site of incision
3. Reexploration surgeries
4. Post radiation surgeries

Systemic Factors

1. Obesity (as per BMI)
2. Malignancy
3. Jaundice
4. Diabetes mellitus
5. HIV and immunosuppressive diseases
6. Steroids and cytotoxic drugs
7. Neuropathies of different causes
8. Respiratory diseases causing postoperative cough

An elaborative study on 60 cases, with regard to date of admission, clinical history regarding the mode of presentation, significant risk factors and comorbidities, investigations, time and type of surgery and post-operative day of wound dehiscence was done. Postoperatively patient was observed for 12 days. Serum levels of haemoglobin, total protein, albumin, globulin and total leukocyte count were done on post-operative day 1, 5 and 10 regular antiseptic dressings were done following post-operative day 2 till post-operative day 12. The surgical wound was observed for any discharge or clinical signs of surgical site infection (edema/induration/local rise in temperature) and in the former case swab culture was sent to identify the causative organism and appropriate subsequent treatment at therapy was chosen.

Statistical Analysis

The data from the present study was systematically collected, compiled in Microsoft Excel and statistically analyzed with SPSS version 26 to draw relevant conclusions. The observations were tabulated in the form of frequency & percentage. To find the significance Chi square test for categorical data was applied. Level of significance was determined as its, $p < 0.050$ as significant and $p < 0.001^{**}$ as highly significant.

Results and Observations



Partial AWD.

Complete AWD

In our study, patients belonging to various kinds of age group and socio economic background were included in the study irrespective of the gender. Amongst the 60 patients included in this study from 1 March 2021 to July 2022, abdominal wound dehiscence was seen in 36 patients corresponding to 60% of the sample size. This study was endeavoured to delineate the role of anemia, hypoalbuminaemia and SSI (surgical site infection) in the dehiscence seen in these patients.

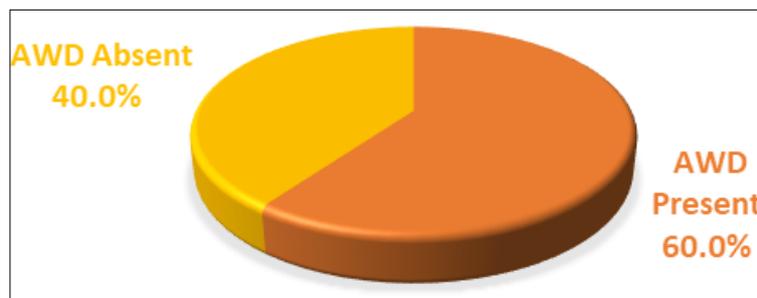


Fig 1: Frequency of abdominal wound dehiscence

Table 1: Distribution of patients with abdominal wound dehiscence in different age groups

Age Group	AWD Present		AWD Absent		Total	P value
	No.	Percent	No.	Percent		
≤20 years	3	8.30%	1	4.20%	4	0.583
21-30 years	5	13.90%	5	20.80%	12	
31-40 years	6	16.70%	8	33.30%	14	
41-50 years	6	16.70%	0		6	
51-60 years	9	25.00%	5	20.80%	12	
61-70 years	4	11.10%	4	16.70%	8	
>70 years	3	8.30%	1	4.20%	4	
Gender						
Female	16	44.40%	8	33.30%	24	0.432
Male	20	55.60%	16	66.70%	36	
Socioeconomic status						
Rural	34	94.4%	19	79.2%	53	0.071
Urban	2	5.6%	5	20.8%	7	

As per this study it was observed that the majority of the patients who underwent abdominal wound dehiscence belonged to the age group of 51-60yrs (25%). However, as per the statistical analysis of our study age is found to be a non significant contributing factor to AWD. (p=0.583). It was also observed that 20 of the 36 patients were males while 16 were females and it was therefore concluded that there was almost equal incidence of abdominal

wound dehiscence in both the sexes. Hence gender was a non-significant risk factor to AWD according to this analysis. (p=0.432)

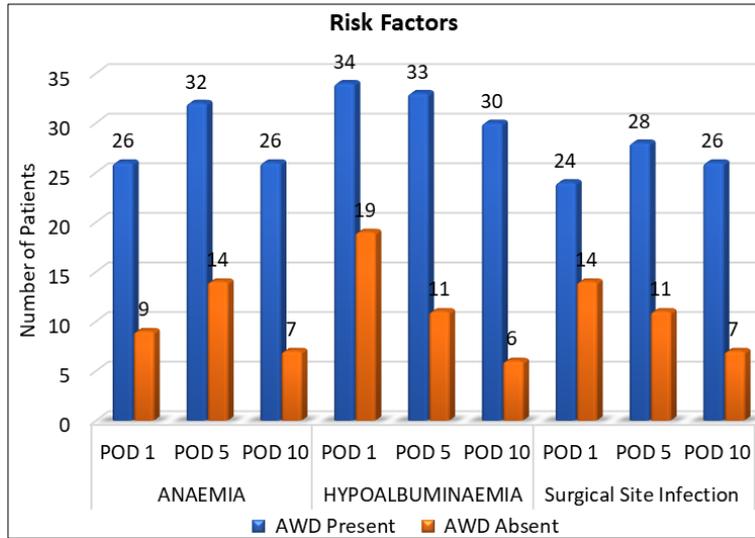


Fig 2: Presence of anemia, hypoalbuminaemia and surgical site infections amongst all the patients of abdominal wound dehiscence

Hence, with the data collected in this study it was observed that majority of the patients undergoing abdominal wound dehiscence had hypoalbuminaemia thus, making it the most significant risk factor followed by anemia and surgical site infection.

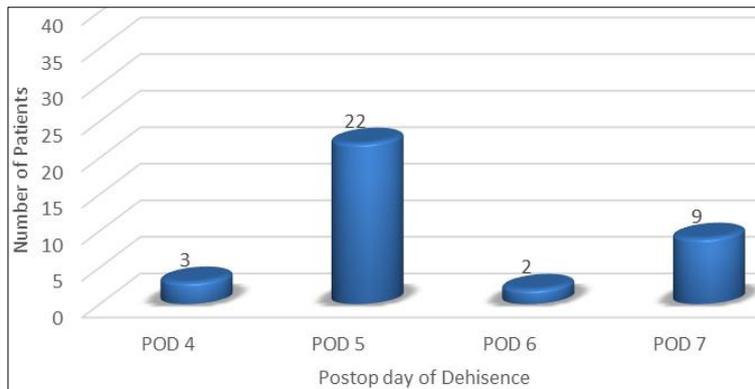


Fig 3: Presentation of abdominal wound dehiscence on different postoperative days

In our study majority of the patients had partial wound dehiscence i.e 69.4% as opposed to the 30.6% of the patients with complete wound dehiscence. As was observed in our study, most of the AWD presented on POD 5 i.e 61.1%, with partial wound dehiscence being more common than complete dehiscence of abdominal wound i.e 69.4%. So all the wounds were observed for any clinical findings at the surgical site by POD 5 and pus discharge was found to be the most common clinical presentation.

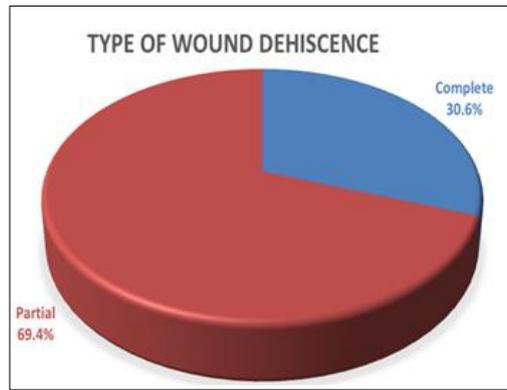


Fig 4: Types of AWD

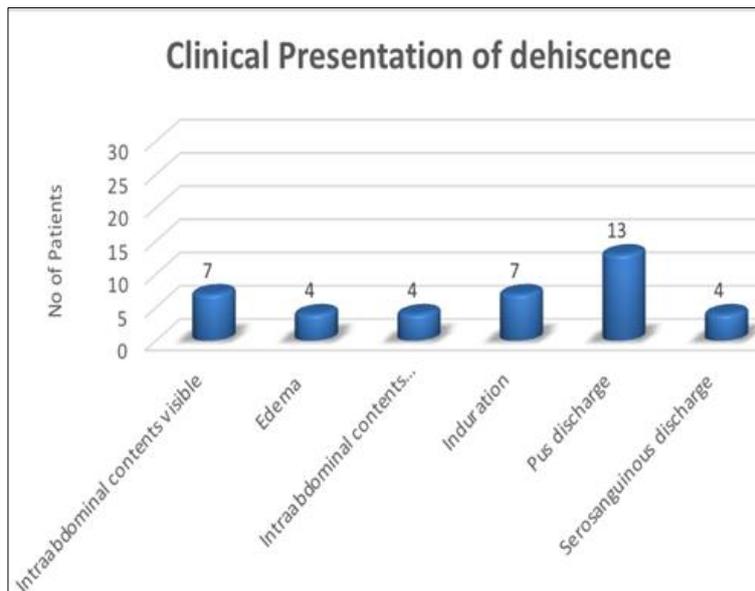


Fig 5: Clinical presentation of AWD

It was observed that majority (44.4%) of the cases of surgical wound dehiscence were managed by delayed secondary suturing. The second most common (25%) treatment modality opted was immediate resuturing with tension suturing done mostly in cases of burst abdomen.

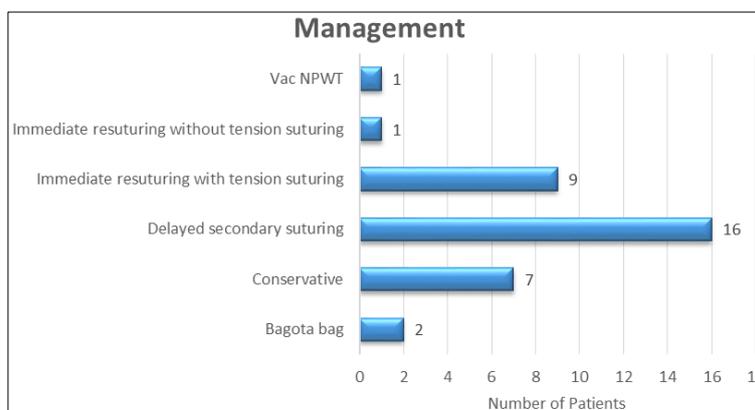


Fig 6: Management of abdominal wound dehiscence

Discussion

In a prospective study by Ramneesh G *et al.* [14] done on patients who developed wound

dehiscence (partial or complete) following laparotomy, pre-operative investigations, intra-operative findings and any post-operative complications were recorded in a specified performa. In that study anemia (in 13 patients) and low serum albumin (in 16 patients) were concluded to be the risk factors for abdominal wound dehiscence along with other factors.

Similarly in a study by Gupta S *et al.* [15], it was observed that amongst the main causes of surgical wound dehiscence were local infection, flaws in the surgical technique, excessive stress at the edges of the wound, and low perfusion in the area. In turn, local risk factors for the complication of surgical site constituted a traumatic process in the wound after surgeries, haematoma and radiotherapy. Among the systemic risk factors were age, malnutrition, obesity, smoking, immunological impairment, associated consumptive diseases and chronic use of steroidal drugs or immunotherapeutic drugs.

These findings were in concordance with our study where haemoglobin status, serum albumin levels and SSI were found to be significant risk factors for abdominal wound dehiscence as the remaining contributing local and systemic factors were excluded from the study beforehand so that the focus could be drawn on the above mentioned three factors only.

Summary and Conclusion

- Abdominal wound dehiscence is known to cause significant morbidity and mortality.
- Hypoalbuminaemia is one of the most important factor in predicting wound dehiscence.
- Patient factors like older age group, gender, obesity, peritonitis due to bowel perforation, intestinal obstruction or any other abdominal pathology may not always act as determinant for wound dehiscence
- Emergency procedures are prone for burst abdomen.
- Simple investigations like CBC, RBS, RFT, LFT, chest x-ray etc and clinical history may help to detect predisposing factors.
- Surgeon factors like para-median incisions, improper suture technique and improper aseptic precautions which may or may not lead to wound infection and then wound dehiscence.
- Hospital stay and health expenditure is usually protracted.
- Patients with significant risk factors like hypoalbuminaemia, anemia and surgical site infection require more attention and critical care to minimize the risk of occurrence.
- Postoperative abdominal wound dehiscence can be prevented by improving the nutritional status of the patient, strict aseptic precautions, avoiding para-median incisions, improving patients respiratory pathology and by proper surgical technique.
- Most common postoperative day of presentation of wound dehiscence was day five and majority of the cases of wound dehiscence who presented with pus discharge had staphylococcus aureus as the most commonly isolated organism.
- Partial wound dehiscence was managed by secondary suturing while complete wound dehiscence was managed by tension suturing. Partial wound dehiscence was more common than complete

In this study we concluded that Abdominal wound dehiscence is a serious sequel of impaired wound healing. Many factors can predispose to this grave complication of which anemia, hypoproteinaemia and surgical site infection carry enormous significance. Patients with these risk factors require more attention and special care to minimize the risk of occurrence. Postoperative abdominal wound dehiscence can be prevented by improving the nutritional status of the patient, strict aseptic precautions, optimization of patient's hemodynamic losses and by proper surgical technique. Early diagnosis of burst abdomen and aggressive treatment helps in reducing morbidity and mortality. Some of the major factors like the ones mentioned in this study must be vigilantly looked for and treated to prevent this catastrophic complication.

References

1. Hahler B. Surgical wound dehiscence. *Medsurg Nurs*. 2006;15(5):296.
2. Van Ramshorst GH, Nieuwenhuizen J, Hop WCJ, *et al*. Abdominal wound dehiscence in adults: development and validation of a risk model. *World Journal of Surgery*. 2010;34:20-27.
3. Zinner MJ, Schwartz SJ. In: Maingot's Abdominal Operations. 10th. Ellis H, editor. New York, NY, USA: McGraw-Hill Education; c2012. p. 416-22.
4. Ramneesh G, Sheerin S, Surinder S, Bir S. A prospective study of predictors for post laparotomy abdominal wound dehiscence. *J Clin Diagnost Res*. 2014;8(1):80.
5. Van Ramshorst GH, Nieuwenhuizen J, Hop WC, Arends P, Boom J, Jeekel J, *et al*. Abdominal wound dehiscence in adults: development and validation of a risk model. *World journal of surgery*. 2019;34(1):20-7.
6. Choudhury A, Deka RK, Gogoi B, Kumar NA. Clinical study of abdominal wound dehiscence including its causes and management Authors. *J Evolut Med Dent Sci*.2017;6(19):1519-24.
7. Begum B, Zaman R, Ahmed MU, Ali S. Burst abdomen-a preventable morbidity. *Mymensingh medical journal: MMJ*. 2008;17(1):63-6.
8. Qureshi IP, Modi V, Qureshi S, Gupta P, Gupta M. Study of early post-operative complications of major surgery in patients in tertiary care teaching hospital in Central India-a prospective observational study," *Asian Pacific Journal of Health Sciences*, 2018, 5(2).
9. Soressa U, Mamo A, Hiko D, Fentahun N. Prevalence, causes and management outcome of intestinal obstruction in Adama hospital, Ethiopia, *BMC Surgery*. 2018;16(38):121-28.
10. Menke NB, Ward KR, Witten TM, *et al*. Impaired wound healing. *Clin Dermatol*. 2007;25:19-25.
11. Bickler SW, Sanno-Duanda B. Epidemiology of paediatric surgical admissions to a government referral hospital in the Gambia. *Bulletin of the World Health Organization*. 2000;78(78):1330-36.
12. NagaMuneiah S, Roopesh Kumar NM, Sabitha P, Prakash GV. Abdominal wound dehiscence-a look into the risk factors. *IOSR J Den Med Sci*. 2015;14(10):47-54.
13. Aksamija G, Mulabdic A, Rasic I, Aksamija L. Evaluation of risk factors of surgical wound dehiscence in adults after laparotomy. *Medical Archives*. 2016;70(5):369-72.
14. Van Ramshorst GH, Nieuwenhuizen J, Hop WC, Arends P, Boom J, Jeekel J, *et al*. Abdominal wound dehiscence in adults: development and validation of a risk model. *World J Surg*. 2010 Jan;34(1):20-7.
15. Soares KC, Baltodano PA, Hicks CW, Cooney CM, Olorundare IO, Cornell P, *et al*. Novel wound management system reduction of surgical site morbidity after ventral hernia repairs: a critical analysis. *Am J Surg*. 2015 Feb;209(2):324-32.