



A TERTIARY CARE CENTER STUDY OF RISK FACTORS FOR WOUND DEHISCENCE

General Surgery

**Dr Pradeep
Kumar J***

Associate professor, Department of surgery, PESIMSR, Kuppam, Chittoor, Andhra Pradesh *Corresponding Author

Dr Pramod D

Plastic Surgeon, Assistant professor, Department of surgery, PESIMSR, Kuppam, Chittoor, Andhra Pradesh

ABSTRACT

This prospective study included consecutive 100 cases of wound dehiscence following abdomino-pelvic surgeries satisfying inclusion criteria in single institute. Several factors influence the wound healing process and good understanding of risk factors is essential for prevention. Older age group, male sex, anaemia, pulmonary disease, diabetes, malnutrition and obesity were patient factors contributing the development of post operative abdominal wound dehiscence. Intra-peritoneal infection is the most important factor in predicting wound dehiscence. Emergency procedures and vertical incisions were prone for burst abdomen. Specific preoperative physiologic and physical pre surgical rehabilitation programs can be used to target and to ameliorate specific co-morbidities to decrease the risk of dehiscence at the incision site. More attention and special care to patients with these risk factors will certainly reduce mortality and morbidity.

KEYWORDS

wound dehiscence, midline incision, surgical wound, emergency surgery

INTRODUCTION

Wound complications are important causes of early and late postoperative morbidity following surgery. Wound dehiscence also known as “wound separation” is an unpleasant event in the process of wound healing. Wound dehiscence is estimated to occur in 0.5%–3.4% of abdomino-pelvic surgeries and results in mortality in approximately 40% of cases¹. Wound dehiscence is parting of the layers of a surgical wound. Depending on the extent of separation wound dehiscence can be partial or complete. In superficial dehiscence the skin wound alone fails to heal with the rectus sheath remaining intact whereas in full thickness dehiscence often termed as “burst abdomen”, the rectus sheath fails to heal and bursts, leading protrusion of abdominal content outside.

Wound dehiscence is a clinical diagnosis and can occur without warning². A wound is at the greatest risk of dehiscence in the first two weeks after surgery when the wound is still fresh and very fragile³. Wound dehiscence may occur even after 30 days post surgery⁴. Superficial dehiscence usually simple wound care and heal by secondary intention and that this can take several weeks. In case of small dehiscence debridement and primary closure can be considered once wound is devoid of infection. Deep dehiscence of the underlying fascia is a surgical emergency and might required to be closed in the operating room, as this can lead to evisceration.

The complex process of wound healing in a closed surgical incision (known as healing by primary intention) can be divided into four distinct, necessary, but overlapping, phases: haemostasis, inflammation, proliferation and remodelling⁵. Disruption of the healing of a closed surgical incision can occur for a multitude of reasons and may occur during any phase of healing. Risk factors for wound dehiscence can be divided into patient, intra-operative and post-operative factors. The patient factors contributing wound dehiscence are male gender, increasing age, anemia, hypoalbuminemia, malnutrition, malignancy, jaundice, obesity and diabetes. Surgical experience, operative time exceeding 2.5 hours, type of incision, suture material, drain and medical illness also affect wound dehiscence.

Wound dehiscence has significant impact on health care cost, both for patients and hospitals. Although several systemic factors are associated with increased risk, their clinical importance is over stated⁶. The large number of risk factors associated with wound dehiscence provides multiple opportunities before, during and after surgery to implement interventions that aim to reduce risk. Hence good knowledge of risk factors is mandatory for prophylaxis. In this study we aimed to elucidate some factors contributing to disruption of incision.

Subjects and Methods:

A total of 100 cases which developed wound dehiscence after

emergency and elective abdomenopelvic operations were included in the study.

Inclusion criteria:

- Patients of age > 18 years and of either sex.
- Patients who have developed abdominal evisceration
- Patients who give consent for investigation and treatment.

Exclusion criteria:

- Wound dehiscence after second or third surgery
- Wound dehiscence after any gynaecological procedures or after incisional hernia.

Informed consent from each patient was obtained for the use of their clinical data and patients were monitored from the time of admission, up till the time of discharge from the hospital. We preferred continuous mass closure and use of resorbable suture with delayed degradation, such as polydioxanone for abdomen closure. We do not routinely close the subcutaneous layer of the wound. On some occasions, in obese patients, we will employ series of simple, interrupted, absorbable polyglactic acid (vicryl) sutures to re-approximate the subcutaneous layer. These stitches are inverted to bury the knots within the wound. Data was collected using a pretested pro-forma comprising clinical history, physical examination, details of surgery and results of certain investigations. Significant risk factors like anaemia, malnutrition, obesity, chronic cough, smoking, alcoholism were noted. Surgical details included indication of surgery, elective or emergency procedure, type of incision taken and intra-operative findings.

Wound dehiscence was defined as separation of the fascial layers of abdominal wall with or without associated protrusion of a viscus. Surgical wounds were classified as clean, clean contaminated, contaminated and dirty wounds accordingly. Postoperatively day of diagnosis of wound dehiscence was noted. Excel software programs were used for statistical analysis.

Results:

In our study, in detail we have analyzed various risk factors for wound dehiscence in 100 patients. The youngest patient was 18 year old and oldest patient was 80 years. Most of the patients belonged to the fourth decades of life i.e. 23 out of 100 cases, followed by sixth decade of life and seventh decade of life. 78 patients were males and 22 were females.

Table 1: Incidence of abdominal wound dehiscence in different age group

Age	No. of cases (N=100)	Percentage
11 – 20	6	6
21 – 30	11	11
31 – 40	23	23
41 – 50	17	17

51 – 60	22	22
51 – 70	19	19
> 70	2	2
	100	100

Mean day of presentation of wound dehiscence was 10.5 days postoperatively. Wound dehiscence was noted in 87 cases (87%) which were operated as emergency surgery and 13 cases (13%) as elective surgery. 63 cases (i.e. 63%) were operated with midline incision and 35 cases (35%) were operated using paramedian incision.

42 patients were diagnosed to have peritonitis secondary to hollow viscus perforation and the procedure performed was peritoneal lavage with perforation closure. 24 patients had appendicular pathology and underwent appendicectomy with peritoneal toilet. 20 patients presented with intestinal obstruction, 16 patients underwent resection and anastomosis and 4 patients underwent adhesiolysis. 8 patients were having malignancy in whom resection and anastomosis was done in 6 cases and colostomy was done in 2 cases.

Table 2: Frequency of abdominal wound dehiscence in relation to type of incision

Type of incision	No. of cases	Total (n=100)
Upper midline	23	63
Midline (M)	36	
Lower midline	4	
Right-upper paramedian (RCP)	11	35
Right lower paramedian (PLP)	24	
Loin	1	1
Mc Burney's	1	1

Table 3: Distribution of abdominal wound dehiscence according to underlying intra abdominal pathology

Diagnosis	No. of cases (n=100)
Hollow viscus perforation	42
a.Duodenal ulcer perforation	26
b.Others (GP, IP, JP, MDP)	16
Appendicular pathology	24
Intestinal obstruction	20
Malignancy	8
Others (Meckel's diverticulitis, intussusception, mesenteric cyst)	6

Wound dehiscence developed in 71 cases of surgical wounds classified as contaminated, 22 cases classified as dirty and 7 cases classified as clean contaminated. There was no incidence of wound dehiscence in clean surgical wounds.

Out of 100 cases studies, 72 patients were having their BMI above 22 and 28 patients were having their BMI 22 and below. 56 patients were having Hb% < 10 gm% and 44 patients were having 10gm% and more than 10gm%. 42 patients had hypoalbuminemia and 12 patients had hyperbilirubinemia. All the co morbid conditions noted were tabulated.

Table 4: Co morbid condition at the time of admission

Co-morbid condition	Number of cases (N=100)	Percentage
Diabetes	34	34%
Hypertension	38	38%
Pulmonary disease	24	24%
Malnutrition	28	28%
Obesity	22	22%
Anemia	56	56%
Malignancy	8	8%
Hypoproteinemia	42	42%
Hyperbilirubinemia	12	12%
Steroids/drug history	4	4%

In our study average duration of stay was 22 days. 2 patients (i.e. 2%) died in our study, one was due to mesenteric vascular ischemia and

other was due to carcinoma sigmoid colon.

DISCUSSION:

In our study, the age of patients ranged from 18 to 80 yrs. The peak incidence was in 31 to 40 yrs age groups as the incidence of appendicular perforation and duodenal ulcer perforation was more common in this age group. Taking sex incidence, there was a male preponderance with the male: female ratio in this study being 3.5:1. This male predominance is explained by the fact that men build up higher abdominal wall tension than females⁷ and higher incidence of peptic ulcer perforation and intestinal obstruction in male sex (78%).

Surgical wounds are classified based on the presumed magnitude of bacterial load at the time of surgery. Operations with higher wound classification are associated with high degree of contamination and extensive introduction of bacteria into a normally sterile area. A prospective study that analyzed surgical wound dehiscence rates following laparotomy by surgical wound class (i.e. clean, clean-contaminated, contaminated, or dirty or infected) reported that dehiscence was more common in the contaminated or dirty categories⁸. Our study showed that incidence was more common in patients with peritonitis due to duodenal and appendicular perforation and in which wounds were classified as contaminated.

The likelihood of contamination of the surgical field is higher in emergency surgeries and patients present in poor general and nutritional condition. 87% of patients who underwent emergency surgery developed abdominal wound dehiscence ($p < 0.001$). Certain types of operations like laparotomy for localised or generalised peritonitis have a tendency to be followed by dehiscence. The cause of the wound failure is not in the operation itself but in the presence of many of the factors which affect stages of wound healing.

The tension of the suture line is lower in transverse or oblique incision than in the midline incisions. In clinical studies wound dehiscence has indeed been reported to be very low in muscle splitting incision but they provide a limited access to the abdominal cavity. In our study out of 100 patients 63 patients underwent surgery with midline incisions and 35 patients with right paramedian incisions, i.e. 98% of patients with vertical incisions ($p < 0.007$) had wound dehiscence. Grantcharov TP study supports the similar incidence stating the incidence of abdominal wound dehiscence and burst abdomen is more common in patients with vertical incision than in those with transverse incision⁹.

Patients developed wound dehiscence on an average 10.5 days post-operatively. A sudden increase in pain or discharge of serosanguineous fluid from the incision may herald wound dehiscence¹⁰. The mean hospital stay was 22 days which is similar to a study by Mazilu et al¹¹. Mortality following abdominal wound dehiscence can be 3%–35%¹² and results in almost 10 days of extra hospitalization. There was no mortality due to wound dehiscence in our study. Reported mortality of 2% was due to mesenteric ischemia and malignancy.

About 56% of patients showed haemoglobin < 10gm%. Anemia affects the immune system of the wound healing process as there is reduced blood oxygenation and increased perioperative stress. Healing is affected mainly due to the micro-angiopathy in diabetes mellitus. Postoperative coughing and straining are established factors in causing wound dehiscence. Coughing results in mechanical stress causing breakage of the sutures or rupture of the healing incision after suture or clip removal/reabsorption. Malnutrition, weight loss up to 20%, and hypoalbuminemia affect the extension of the inflammatory phase of wound healing process with a disorder of collagen synthesis.

Excessive fat in the omentum and the subcutaneous tissue results in increase strain on the wound with all body movements in the early postoperative period. Associated poor muscle tone and lack of muscle mass also are causative factors in the development of wound dehiscence. A study at Department of Surgery Sundsvall County Hospital, Sweden concluded overweight (BMI > 25) as a risk factor for wound infection but these effects may be eliminated if patients are sutured with a suture length to wound length ratio of 4 – 4.9¹³. In our study 21 patients were overweight, (BMI > 25) and 28 patients were having their BMI 22 and below ($p < 0.001$, S).

An etiologic factor cannot be identified in every patient with wound dehiscence. The role of ascorbic acid, zinc and manganese in extra cellular fluid has not been established definitively, although they are

thought to influence the maintenance of connective tissue integrity. Anticoagulants such as warfarin sodium have adverse effect on fibrinogenesis and they increase postoperative wound haematoma, modestly increasing the risk of incisional hernia. Hence studies are needed to evaluate all other possible factors which contribute to wound dehiscence.

CONCLUSION

Wound dehiscence increases the morbidity, causes severe impact on a patient's psychosocial wellbeing and carries considerable costs for healthcare systems. Patient's health status and surgical procedure are the two important risk factors for wound dehiscence. The risk increases with emergency nature of surgery, vertical incisions and with surgical wounds classified as contaminated and dirty. Male gender, older age group, anemia, diabetes, pulmonary diseases, obesity, hypoproteinemia, hyperbilirubinemia, malnutrition are important factors contribute to wound dehiscence.

Some factors identified as important causative for abdominal wound dehiscence may not be possible to correct preoperatively, such as patient age or over weight which could not be influenced in an emergency laparotomy for a grossly contaminated abdomen. However postoperative abdominal wound dehiscence can be prevented by improving the nutritional status of the patient, strict aseptic precautions, avoiding midline incisions, improving patients respiratory pathology to avoid postoperative cough, proper surgical technique and strict post-operative care with stress on prevention of wound infection.

REFERENCES:

1. Pavlidis T, Galatianos I, Papaziogas B, et al. Complete dehiscence of the abdominal wound and incriminating factors. *Eur J Surg*. 2001; 167(5):351–354.
2. Hahler B. Surgical wound dehiscence. *Medsurg Nurs* 2006; 15(5): 296–300.
3. Sandy-Hodgetts, K, Ousey K, Howse E. Ten top tips: management of surgical wound dehiscence. *Wounds International* 2017; 8(1): 11–14.
4. Mir MA, Manzoor F, Singh B, et al. Development of a risk model for abdominal wound dehiscence. *Surgical Sci* 2016; 7: 466–74.
5. Reinke JM, Sorg H. Wound repair and regeneration. *Eur Surg Res* 2012; 49: 35–43.
6. Poole GV. Mechanical factors in abdominal wound closure: the prevention of fascial dehiscence. *Surg* 1985 Jun; 97(6):631–40.
7. Gürleyik G; Factors affecting disruption of surgical abdominal incisions in early postoperative period. *Ulus Travma Derg*. 2001 Apr; 7(2): 96-9.
8. Ramneesh G, Sheerin S, Surinder S, Bir S. A prospective study of predictors for post laparotomy abdominal wound dehiscence. *J Clin Diagn Res* 2014; 8(1): 80–83.
9. Grantcharov TP, Rosenberg J. Vertical compared with transverse incision in abdominal surgery. *Eur J Surg* 2001 Apr; 167(4):260–7.
10. Black J, Black S. Surgical reconstruction of wounds. In: Baranoski S, Ayello EA. *Wound care essentials*, 3rd edition. Wolters Kluwer/Lippincott Williams & Wilkins; 2012: 460–76.
11. Mazilo O, Grigoras D, Cnejevici S, et al. postoperative complete abdominal dehiscence: risk factors and clinical correlations. *Chirurgia (Bucur)*. 2009 Jul; 104(4): 419-23.
12. Van Ramshorst GH, Eker HH, van der Voet JA, et al. Long-term outcome study in patients with abdominal wound dehiscence: a comparative study on quality of life, body image, and incisional hernia. *J Gastrointest Surg* 2013; 17: 1477–1484.
13. Israelsson LA, Jonsson T. Overweight and healing of midline incisions. *Eur J Surg* 1997 Mar; 163(3):175-80.