

Abdominal Wound Dehiscence: A Review of Risk Factors, Prevention and Management in Obstetrics and Gynecology Practice

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Abstract

Abdominal wound dehiscence (AWD) is considered as a severe postoperative complication in which there is a partial or complete disruption of an abdominal wound closure with or without protrusion and evisceration. The incidence and mortality rate varies in different health centers. Risk factors are classified into three groups, which includes: pre-operative, intra-operative, and post-operative. The management of Burst Abdomen or Wound Dehiscence is diverse from conservative treatment to surgical treatment.

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Introduction

Abdominal wound dehiscence (AWD) or 'acute laparotomy wound failure' is described as a post-operative complication in which separation of abdominal wound layers occurs before completion wound healing process. ABD is further classified into: (1) partial AWD (Figure 1), in which only superficial layers or a part of post-operative wound reopens; and (2) complete AWD/burst abdomen (Figure 2), in which all layers or thickness of post-operative wound are separated with protrusion of underlying tissue and organs (evisceration).¹ Similiar condition often confused as a differential diagnosis of AWD is incisional hernia (Figure 3), which refers to abdominal wall hernia at the site of a

previous surgical incision, this condition is further assessed radiologically and will not be discussed further in this review.

The incidence of abdominal wound dehiscence varies between 0.4 – 3.5%, with mortality as high as 45% in different health facilities without specific global incidence recorded.² In Indonesia, a study in Hasan Sadikin General Hospital from 2011 – 2014 found approximately 252 cases of abdominal wound dehiscence with incidence varies between 0.4 – 1.13%.³ Based on the data mentioned, AWD is still considered as a long term problem, which consequently may prolong hospital stay and increase burden on health care resources. There are currently risk factors and risk predictors developed in order to plan proper prevention and management.^{2,3}



Figure 1: A case of 29 year old woman with partial abdominal wound dehiscence post-midline incised caesarean section (Photo taken from one of our cases found in Ende District General Hospital, East Nusa Tenggara, 2019, the patient has consented for usage in this clinical review).

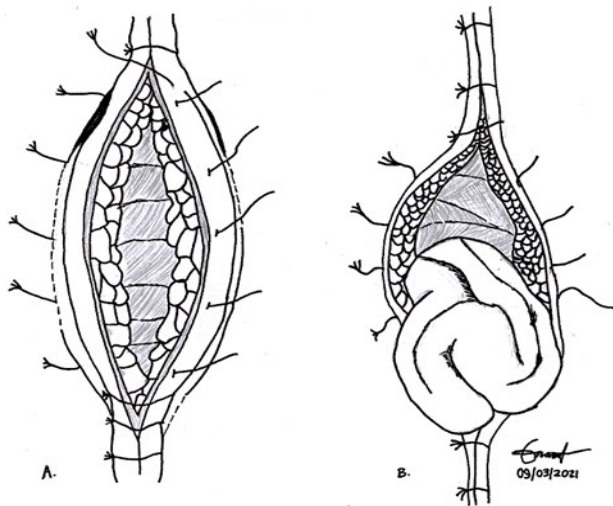


Figure 2: (A) Partial Abdominal Wound Dehiscence, (B) Complete Abdominal Wound Dehiscence



Figure 3: A case of 35 year old woman with incisional hernia post laparotomy (Photo taken from one of our cases found in Ende District General Hospital, East Nusa Tenggara, 2019, the patient has consented for usage in this clinical review).

Risk Factors

Risk factors for AWD can be classified into three main groups: (1) pre-operative risks, (2) intra-operative risks, and (3) post-operative risks. Pre-operative risks include old age (> 65 years old), male gender, smoking, obesity, diabetes, hypoalbuminemia/malnutrition, sepsis, anemia, uremia, malignancy, chemotherapy/radiotherapy, and long term corticosteroid usage.^{4,5} AWD occurs more in male compared to female; this correlated with the higher incidence of peptic ulcer and lower abdominal wall elasticity, which consequently results in higher intra-abdominal pressure and therefore increase risk of AWD.⁴ Anemia, malnutrition, diabetes and smoking may also increase the risk of AWD by impairing cellular oxygen perfusion during wound healing process, which includes hemostasis, inflammation, proliferation, and maturation phases.⁶ During hemostasis phase, platelet aggregation degranulate and activate the formation of blood clots followed by vasodilatation of capillaries and activation of complement cascades. Inflammation phase occurs as macrophage begins cellular lysis, accompanied by production of cytokines

and growth factors by neutrophils; the highly oxidative effect of these processes requires adequate oxygenation. Proper cellular oxygen perfusion also supports the proliferation phase in which granulation tissue formation in wound space due to migration of fibroblast responsible for collagen synthesis.⁶

Intra-operative risk factors include surgical procedure types (emergency vs elective surgical procedure), incision types, use of drainage, suturing techniques and suturing materials.⁷⁻⁸ Emergency surgical procedure increases the risk of AWD compared to elective surgical procedure due to lack of preparation to regulate the patient factors mentioned above. Recent cross sectional study by Saad AR (2019) reported significantly higher incidence of AWD in emergency surgical procedures: simple closure procedure/Grahams patch of perforated peptic ulcer (24.2% cases), Adhesolysis of intestinal obstruction (18.2% cases) and simple closure of perforated typhoid ulcer (10.6% cases).⁹ Incisional types are also reported to have some degree of correlation with AWD patients as the study of Saad AR (2019) established higher incidence of AWD in previous upper

to lower midline incision (48.5% cases), lower midline incisions (21.21% cases), and upper paramedian incision (12.12% cases) compared to other incision types; hence, these reported data supports previous studies by Bueger et. al. (2002) and Mokela et. al. (1995), which first summarized the same conclusion regarding procedure and incision types.^{9,10} The use of drainage in abdominal surgeries with massive bleeding minimize contact between suture wound with intestine as well as pooling of excessive blood which affects intra-abdominal pressure, therefore reduces the risk of AWD or incisional hernia.⁷⁻⁸ Surgical techniques are also play a role, in which less tissue bites (< 1 cm width), Improper layer by layer closure approach, less proper laid knots, and extensive tension in knots increase the risk of AWD. The use of slow absorbable material such as polydioxanone (PDS) gives enough time for wound to properly heal while providing sufficient strength in wound closure; this further explains the lower incidence of AWD in

elective surgical procedures compared to emergency surgical procedures, as a result of the later tends to use fast absorbable surgical material. Previous surgical history, which includes caesarean section procedure also increases the risk of AWD due to potential risk of post-surgical adhesion especially during trial of labor after casearean (TOLAC) within 2 years post sugery.¹¹

Post-operative risk factors include conditions which increase intra-abdominal pressure: the use of mechanical ventilation, excessive coughing and vomiting, post-operative ileus, urinary bladder distention, and ascites; and other post-operative conditions which further impair wound healing: infection and anti-neoplastic medication.¹² Risk factor determination in patients at risk of abdominal wound dehiscence is necessary to formulate necessary prevention and proper management.

<u>Risk Factors for Wound Dehiscence after Laparotomy</u>	
Preoperative/Patient's Factors:	<ul style="list-style-type: none"> • Age (> 65 years) • Male • Smoker • Obesity • Diabetes • Hypoalbuminemia/Malnutrition • Sepsis • Anemia • Uremia • Malignancy • Chemotherapy/Radiotherapy • Steroid Use
Operative Factors:	<ul style="list-style-type: none"> • Emergency Surgery • Re-Operation • Bowel (Dirty) Surgery • Suture Type and Technique
Post-Operative Factors:	<ul style="list-style-type: none"> • Mechanical Ventilation • Haemodynamic Instability • Increased Intraabdominal Pressure • Ascites • Wound Infection

Figure 4: Risk Factors Associated with Abdominal Wound Dehiscence (Abdominal Surgery: Abdominal Wound Dehiscence and Incisional Hernia, Elsevier, 2009)

Prevention and Management

The prevention of AWD is done effectively by identifying and addressing each potential risk factors mentioned before.¹³ A few pre-operative risk factors or patient related conditions are modifiable in non-emergency surgical cases; these risk factors include diabetes, hypoalbuminemia, sepsis, anemia and uremia which should be managed earlier before surgical procedure commences. The management of these conditions includes maintenance of blood glucose level within ideal range, appropriate use of prophylactic antibiotics, transfusion of blood products and fluid resuscitation necessary to ensure proper cellular perfusion. Other non-modifiable pre-operative risk factors (age, gender, smoking, malignancy, history of chemotherapy/radiotherapy and steroid usage) can be used to reconsider indications, objectives, and necessities of a surgical procedure; elective surgical procedures should only be conducted if the benefits far-outweigh the risks mentioned.¹³

Intra-operative risk factors should be addressed with proper choice of incision types, use of drainage if necessary, proper suturing techniques and materials. According to the studies mentioned before, there is a distinct higher incidence of AWD in vertical (midline and para-midline) incisions compared to transverse incisions; therefore, recent use of vertical incisions have decreased over the years. This is apparently seen in daily obstetrics and gynecology practice, in which *pfannensteil incision* also known as infraumbilical transverse incision is more preferable in daily caesarean section and a few elective laparotomy procedures; this incision type reduces the risk of deep epigastric vessel dissection and nerve injuries, hence allowing effective wound healing and less post-operative pain. Upper or lower midline incision is still preferred in most emergency or exploratory laparotomy procedures due to its easy access and wider surgical field of the whole abdomen.^{10,13}

Another study recommends the installation of abdominal and subcutaneous

drainage (e.g. Ryle's tube) in surgical procedures with risk of massive blood loss (e.g. exploratory laparotomy). The use of drainage in abdominal surgeries with massive bleeding minimize contact between suture wound with intestine as well as pooling of excessive blood which affects intraabdominal pressure, therefore it reduces the risk of AWD or incisional hernia.⁷⁻⁸

Proper suturing techniques also has a significant impact for intra-operative prevention of AWD.¹³ Good bites of tissue (> 1 cm) with minimal suture length to wound length ratio of 4:1, properly laid/tied knots, and avoidance of excessive suture tension are recommended by European Hernia Society Guideline; the abdominal anatomy should be restored to its normal state, suture closure is performed with layer by layer approach from innermost to outermost layers: intra-abdominal organs (uterus/intestines), peritoneum, extra-peritoneal fat, deep fascia, abdominal muscles, superficial fascia, subcutaneous tissue, and skin.^{13,14} In case of *Pfannensteil incision* used in obstetrics and gynecology procedures, an incision is performed below arcuate line located between umbilicus and inguinal ligament, where the fascia of all three abdominal muscles combined in front of the rectus muscle as a single fascia (anterior rectus fascia), hence closure of peritoneum is directly followed by rectus closure and subsequent anterior rectus fascia closure; these can be performed with continuous suture, however outer subcutaneous fat closure is performed with interrupted sutures, which is more recommended compared to continuous suture in providing necessary tension to prevent AWD.¹⁴ In case of midline incision similar suturing techniques can also be applied and closure is performed along linea alba due to its less vascularization, many surgeons combined the use midline incision from skin to fascia layers and proceed with transverse incision from rectus to lower uterine segment; this combination is performed to reduce risk of deep epigastric vessel dissection and nerve damage, which are benefits of transverse incision and yet still able to widened incision vertically for

better field of view and access of the abdomen in emergency situation. The use of slow absorbable material such as polydioxanone (PDS) is recommended to give enough time for the wound to properly heal while providing sufficient strength in wound closure.¹⁴

Post-operative risk factors can be prevented by alleviating additional patient symptoms which may increase intra-abdominal pressure (e.g. coughing and vomiting) and educating the patient to prevent coughing, vomiting, and reduce excessive abdominal pressure when urinating or defecating.^{13,14} Other conditions such as ileus, urinary bladder distention and ascites require immediate abdominal decompression with nasogastric tube and/or foley catheter to reduce excess intra-abdominal pressure. Pre-operative skin preparation which includes hair trimming especially in obstetrics and gynecology procedures which is mostly performed in pubic region, and aseptic followed with antiseptic application of chlorhexidine-alcohol and/or povidone iodine rub, can reduce microbial load and subsequent risk of post-operative surgical site infections.¹⁴

The management of AWD depends on the severity of dehiscence (partial or complete), which varies from conservative management to debridement and secondary re-closure. Conservative management is accomplished by wound packing with saline moistened sterile gauze, sometimes additional semi-occlusive dressing impregnated with petrolatum, silicone, topical crude honey, zinc chloride spray, or magnesium hydroxide ointment can be added to allow small amount of exudates to pass through; therefore moist environment necessary for cells migration, proliferation, and maturation can be maintained; the use of those additional adjunctives has also been shown to decrease wound size, healing time, and infection risk. This can be followed with secondary intention healing in which wet dressing is changed to dry dressing, allowing further periodic removal of inflammatory exudates, excess suture materials, infectious organisms and debris (physical debridement); while wound bed

granulates in. Even though it was less invasive, conservative management with secondary intention healing still has a relatively lengthy recovery period.¹⁴ This method of approach is only applicable in partial wound dehiscence cases, while, complete dehiscence, or 'burst abdomen', will require emergency re-closure.^{13,14}

The recent development of multidisciplinary AWD management strategies has shifted from the preference of conservative management with secondary intention towards debridement and secondary re-closure. Secondary re-closure employs surgical wound debridement and re-closure after approximately 4 days of granulation period. A prospective study by Dodson et al (1992) in a series of 33 obstetric and gynecology cases, found that patients who underwent secondary closure had a significant shorter mean healing time of approximately 10-17 days (n=15) compared to 30-60 days (n=18), additionally patient from secondary re-closure group has significantly fewer amount of follow up visits (1-2 times) compared to patients from secondary intention healing group (2-14 times). Similar result is also reported from the study of Walter et. al. (1990) with mean healing time of 0-3 days in secondary re-closure group compared to 60-70 days in secondary intention group. Recent development of immediate re-closure after debridement as an alternative is currently considered beneficial. A study of Falola et. al. (2018) observed patients who underwent immediate direct re-closure after debridement; demonstrated a median healing time of approximately 20 days, which is comparable to previous studies. Immediate re-closure of wound eliminates all the period of secondary intention healing, which may prolong disability period, increase postoperative follow-up visits, and increase the emotional toll on affected patients. Although this approach of management does carry risks associated with the use of anesthesia and surgical intervention, which may not be present in conservative management with secondary intention healing; it is demonstrated that the benefits far outweigh the surgical risks.^{13,14}

Conclusion

Abdominal wound dehiscence (AWD) is still considered as a long term problem, which is described as a post-operative complication in which separation of abdominal wound layers occurs before completion wound healing process. Risk factors for AWD can be classified into three main groups: pre-operative risks, intra-operative risks, and post-operative risks. Risk factor determination in patients at risk of abdominal wound dehiscence is

necessary to formulate necessary prevention and proper management. Management of AWD is dependent to the risk factors involved and severity of cases, which varies from conservative management to surgical debridement with delayed or immediate wound re-closure. Immediate re-closure of wound is currently considered beneficial since it eliminates all the period of secondary intention healing, which may prolong disability period, increase postoperative follow-up visits, and increase the emotional toll on affected patients.

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Signature,

A handwritten signature in blue ink, appearing to read 'Gnasaf', with a stylized flourish extending to the right.

Gezta Nasafir Hermawan