

OPEN ABDOMEN, WHAT IS NEW IN ITS SURGICAL MANAGEMENT?

Ghassan AA Nasir

MB,ChB, FRCS, FICS Prof. and Senior Consultant Surgeon, Faculty of Medicine, UiTM, Shah Alam, Malaysia

Abstract

Open abdomen is a concept that the abdomen is left open after laparotomy especially when it was done as emergency for traumatic abdomen or reopens the abdomen when signs of increase intra-abdominal pressure (IAP) causing abdominal compartment syndrome (ACS).

This open abdomen must be covered temporarily till the signs of abdominal compartment syndrome (ACS) disappears and intra-abdominal pressure (IAP) returns normal, then reclose the abdomen by one of definitive procedure.

It was found that Vacuum-assisted wound closure (VAWC) is the best temporary procedure to close the abdomen to get early or late fascial closure as the best definitive closure of open abdomen.

Also It was found that the classification of open abdomen is so helpful in choosing the procedure for temporary and definitive closure, this classification is new thing and dependable.

Introduction

The concept of leaving the abdomen opens intentionally after laparotomy has surgical heresy to an accepted method of management in certain circumstances¹. These circumstances are increase in intra-abdominal pressure (IAP) and ensuing abdominal compartment syndrome (ACS) which emphasized in patients with severe abdominal trauma, peritonitis, necrotizing pancreatitis and occasionally paralytic ileus or massive ascitis².

The intra-abdominal pressure (IAP) is a little more than atmospheric pressure (2-10 mm Hg). The value above 15 mmHg is consider intra-abdominal hypertension and the value above 25 mmHg is consider as indicator of abdominal compartment syndrome (ACS)³.

Abdominal compartment syndrome (ACS) is a serious condition and leads to a serious changes which are

1. Fall in cardiac output.
2. Decrease in renal perfusion and decrease in renal output.
3. Increase in airway pressure, decrease in lung compliance and upward displacement of the diaphragm and compression of the lungs⁴.

To prevent this serious condition (ACS) is by keeping the abdomen open and to manage it effectively is by decompressing the abdomen with reopening the abdominal incision^{2,4}.

The management of open abdomen

Is to cover the open abdomen or to close it temporarily till patient condition allows definitive closure^{2,4-10}.

The ideal cover

The characters of the ideal cover to the abdominal contents after leaving the abdomen open

- i. Should protect the viscera and avoid fistulas

- ii. Easy to apply, remove and allow nursing care
- iii. Available and inexpensive
- iv. Maintain the abdominal domain
- v. Preservation of the accessibility to the abdominal cavity
- vi. Preservation of feasibility of abdominal walls closure¹⁰.

Methods to cover the open abdomen

Many methods are used to cover or to close the open abdomen temporarily and these

1-Towel clip closure of the skin⁴: Depending on the length of the incision, up to 25-30 standard towel clips may be necessary to complete closure of laparotomy wound during 2-min period, drain is put lateral to the incision and large plastic adherent drape is placed over the towel clips and the drain.

2-Plastic Silo (Bogota bag)^{2,4,8}: Is inexpensive and readily available, is by using a plastic intravenous fluid bag (usually 3-L bag used for irrigation) which is cut into a flat sheet, sterilized and then fitted to the edge of the fascia with sutures after making a numerous small holes in the sheet for the fluid to escape. Suction catheter should be placed over the sheet and under the towel dressing.

3-To use a large sheet of absorbable woven mesh such as polyglactin (Vicryl) or polyglycolic acid (Dexon), also sewn to the fascia, over which is placed two section drains. This is usually covered with a wet towel and the entire wound can then be isolated with a large sheet of adherent plastic materials^{2,4,10}.

It is important not to use polypropylene mesh or Marlex (not absorbable) because of potential damage caused by the mesh to the bowel even if we cover the bowel with omentum especially when there is sepsis².

4- To use a sheet of mesh with zipper in its center, this type of temporary closure is used when the abdominal cavity is required to open many times post-operatively for cleaning such as in sever necrotizing pancreatitis or sever peritonitis^{4,9}.

5-Vacuum-assisted wound closure (VAWC)^{1,2,4-7,10} introduced in 1995 and becomes a routine technique in managing the open abdomen especially in acute abdominal wall defects. It has become clear that the application of the dressing that covers the exposed abdominal contents but also has negative pressure applied which allow gradual approximation of the fascial edges of the wound and simplified the definitive later closure of open abdomen.

(VAWC) is formed by a- large silastic sheet with numerous small holes for aspiration of intra-abdominal fluid and prevent adhesion to the bowel; it must be put under the fascial edges and fixed to it by sutures

b- Section catheter is put above the silastic sheet

c- Polyurethane foam applied over the silastic sheet to full the defect till the skin and fixed to it

When the (ACS) has been treated and the intestinal edema and distention have subside, we remove the temporarily covers and look to and classified the open abdomen

Photo of (VAWC) device—

Classification of open abdomen (OA)(11)

Grade 1 A—clean OA without adherence between the bowel and abdominal wall or fixity of the abdominal wall.

Grade 1 B—contaminated OA without adherence/ fixity

Grade 2 A— clean OA developing adherence/ fixity

Grade 2 B— contaminated OA developing adherence/ fixity

Grade 3--- OA complicated by bowel fistula formation

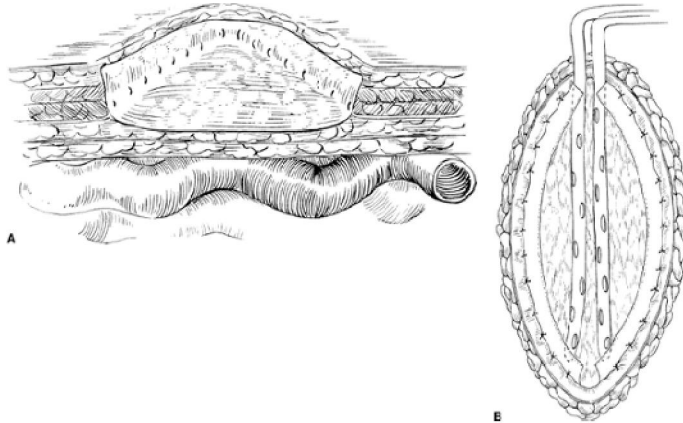
Grade 4--- frozen OA with adherent/ fixed bowel¹¹.

This classification allows a. description of the patient's clinical course
b. standardized clinical guideline for improving OA management

Definitive closure of open abdomen^{1,2,4,10,12-14}

There are many methods to close the open abdomen when the (ACS) has been treated, the intestinal edema and distention have subsided, and the open abdomen had been classified, these are

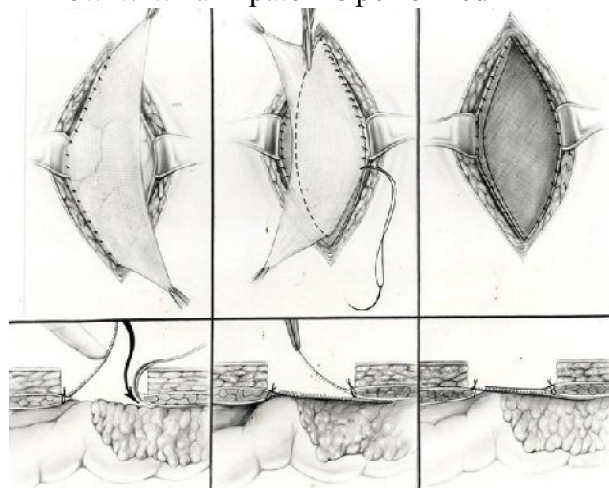
(1) Primary fascial repair^{1,4,11} ---if be possible, can be applied to grade 1A of OA.



(2) Fascial repair with mesh prosthesis^{2,4,10}—in certain conditions, must be no infection and enough skin to cover the prosthesis, can be applied to grade 2A of OA.

(3) Closure with Wittmann patch^{4,13-14}—sheet of Wittmann patch is sutured to each fascial edge and these 2 sheets are trimmed and overlap and sutures one to the other closing the defect of open abdomen, can be applied to grade 2A of OA. This procedure can be used for temporary closure also.

How Wittmann patch is performed



(4) Planned hernia^{2,4,11}—a planned hernia approach aims at skin coverage with subsequent delay abdominal wall reconstruction. Skin closure is achieved with split thickness skin graft over the bowel or over the granulation tissue that

develops when we remove the temporary covers, can be applied to grade 2A & B of OA.

(5) Reconstructive surgery of the abdominal wall^{2,4,11} with or without flaps, can be applied to grade 2A, B & 4 of OA.

Discussion

Leaving the abdomen open become usual thing after exploratory laparotomy for major abdominal trauma¹ Along with this transition have come several methods of managing the open abdomen that afford protection to the viscera and also allow for simple return to the abdominal cavity if reoperation is required¹

Our goal in all these methods is to close the abdominal fascia later when safe (Primary fascial repair) which is the ideal closure, this proves difficult to impossible after 7-10 days¹. But using the VAWC as temporary cover to open abdomen help a lot later for primary fascial closure because it is not cover the open abdomen only but also creates a negative pressure which pull the fascia edge of the laparotomy wound, reducing the congestion and edema, and prevent adhesion¹. Also we can keep this VAWC for longer period than 7-10 days till several weeks which allow easier delay primary fascial repair (Barker, Garner), it allows 88% of primary fascial closure substantially reduce the need for creation of controlled ventral hernia^{1,2,4-7}.

Otherwise if we fail in primary fascial repair, so we perform a planned hernia approach^{2,4,8} with split thickness skin

graft primeraly or over absorbable mesh which had been put already, and after 9-12 months we perform delay repair of the ventral hernia and reconstructive surgery of the abdominal wall^{2,4,10}.

The classification of open abdomen (OA) will help a lot in the choice of the method of management¹¹.

Grade 1A of OA----- Primary fascial repair

Grade 2A of OA----- Fascial repair with mesh prosthesis

Or closure with Wittmann patch

Grade 2B & 4 of O A--- Planned hernia approach

In conclusion

The classification of open abdomen (OA) will help a lot in the management of it, and must depend on this classification, secondly to chose the VAWC as temporary cover to open abdomen because this method help a lot later for primary fascial closure of open abdomen which is not cover the open abdomen only but also creates a negative pressure which pull the fascia edge of the laparotomy wound, reducing the congestion and edema of the wound and bowel, and prevent adhesion between them.

References

- 1- Miller P.R.MD, et al. Prospective Evaluation of Vacuum Assisted Fascial closure after an open abdomen; Ann surgery.2004 May; 239(5): 608– 616.
- 2- Baker RJ. Abdominal wall incision & repair. Fisher JE, Bland KI. Mastery of Surgery. Lippincott William & Wilkins, 2007; Part 1: Chapter 10.
- 3- Kovac N. Sirarovic M. M-Sunko B. Clinical Significance of IAP in patients with ACS. SIEGNA VITAE 2007; 2(2):14-17.
- 4- David V F. Ernest E M. Kenneth L M. Trauma Damage Control. TRAUMA.McGraw-Hill.2005; 5th edition: 877-896
- 5- Brock WB, Barker DE, Burn RP. Temporary closure of open abdominal wound: the vacuum pack. Am Surgery.1995; 61:30-35.
- 6- Garner GB, et al. Vacuum-assisted wound closure provided early fascial reapproximation in trauma patients with open abdomen. Am J.Surgery 2001; 182:630-638.
- 7- Barker DE, Kaufman HJ, Smith Ia. Vacuum pack technique temporary abdominal closure. J Trauma.2001; 48:201.
- 8- Fernandez L, Norwood S, Roettger R, et al. Temporary intravenous bag silo closure in severe abdominal trauma. J Trauma.1996; 40:258.
- 9- Cuesta MA, Doblaz M, Casteneda L, et al. Sequential abdominal re-exploration with zipper technique. World J Surgery.1991; 15:74-80.
- 10- Ari Leppaniemi. Surgical management of abdominal compartment syndrome; indications and techniques: Scand J Trauma Resusc Emerg Med. 2009 Apr 14;17(1):17.
- 11- Bjork M, et al. Classification-important step to improve management of patients with open abdomen. World J Surgery.2009 Jun;33(6):1154-7.
- 12- Vertrees A, et al. Modern management of complex open abdominal wounds of war: 5 years experience. J Am Coll. Surgery. 2008 Dec; 208(6):801-9.
- 13- Tieu BH, et al. The use of the Wittmann patch facilitates a high rate of fascial closure in severely injured trauma patients and critically ill emergency surgery patients. J Trauma .2008(Oct); 65(4): 865-70.
- 14- Weinberg JA, et al. closing the open abdomen: Improved success with Wittmann patch staged abdominal closure. J Trauma .2008(Aug); 65(2): 345-8.