CHAPTER 1

The Complex Abdomen

Tracy R. Bilski, Brian Rowlands and Adam Brooks

OVERVIEW

• Damage control is the staged operative care of the patient to prevent or interrupt the lethal triad of hypothermia, coagulopathy and acidosis
• Initial damage control surgery focuses solely on the control of haemorrhage and contamination
• Temporary abdominal closure techniques are applied if fascial closure is not possible or inadvisable
• Abdominal compartment syndrome is raised intra-abdominal pressure that leads to impaired perfusion of the viscera and systemic sequelae
• The complex abdomen patient requires the coordination of multiple therapies, investigations and interventions over a protracted time

Introduction

The abdomen is a common source of complications in surgical patients (Box 1.1). Perioperative wound problems and issues with abdominal drains can occur as a result of patient disease as well as problems with postoperative care. Treatment of these patients requires meticulous wound and drain care as well as a high index of suspicion for complications. Recent changes to the approach of injured, seriously ill or septic surgical patients has led to an increasing number of patients initially managed with multiple staged procedures and open abdomens. These patients require great commitment from medical and nursing teams, which must span the duration of the hospitalization as well as re-integration and care in the community.

The open abdomen

Definitions

When the abdominal fascia is unable to be re-approximated following laparotomy the result is an open abdomen. Typically, this occurs following major trauma and a damage control procedure or with intra-abdominal catastrophes and frank abdominal sepsis. The open abdomen may also be a result of a decompressive laparotomy for abdominal compartment syndrome (ACS) (Figure 1.1).

Damage control is the staged operative care of the patient to prevent or interrupt the lethal triad of hypothermia, coagulopathy and acidosis. Damage control surgery for the abdomen refers to an abbreviated laparotomy for trauma or emergency surgery that focuses solely on the control of hemorrhage and contamination (Figure 1.2). There are three phases:

• Phase I. Control of hemorrhage and contamination – definitive reconstruction is delayed. Temporary abdominal dressing or skin closure performed.
• Phase II. Restoration of physiology in the intensive care unit (ICU).
• Phase III. Re-operation for removal of packing, definitive repair of injury and closure if possible. At this stage fascial closure may not be possible.

Reasons for leaving the abdomen open

• In trauma or emergency surgery, unstable physiology necessitating a truncated laparotomy with expedited move of the patient to the ICU for correction of physiological derangement.

Box 1.1 Case study

A 44-year-old male was involved in a motor vehicle crash sustaining injuries to the colon and a laceration to the spleen. At laparotomy he underwent resection and anastomosis of the colon and a splenectomy. On postoperative day 8 he spied a fever with a discharge from the lower aspect of his wound. Later that day the surgeon was urgently called as bowel was clearly protruding through the skin. The bowel was covered with saline-soaked gauze and the patient urgently taken to the operating room where a complete breakdown of the anastomosis with free pus and faecal spillage was discovered. He underwent an abdominal washout and diversion procedure (end colostomy) with a VAC dressing and the placement of two tube drains. His critical care course was very unstable and involved numerous abdominal procedures to control sepsis. Eventually a Vicryl™ mesh was placed over the bowel and allowed to granulate before the placement of a split thickness skin graft. He was finally discharged home 45 days after his initial injuries requiring continuing wound care to his skin-grafted abdomen and an abdominal binder to support his large abdominal hernia.
Typically occurs when intra-abdominal pressures >25 mmHg. Bladder pressure is the standard method for measuring intra-abdominal pressure.

Management of the open abdomen
In the immediate postoperative period or immediately after decompressive laparotomy, coverage of the exposed intra-abdominal contents must be achieved (see Temporary abdominal closure below).

In the later postoperative period, if it is impossible to close the wound then there are the following options:
1. Coverage of intestinal contents by approximating the skin edges. The ventral hernia is accepted and a planned repair at 6–18 months performed.
2. Allowing the exposed intestinal surface to form a bed of granulation tissue followed by split thickness skin grafting. A follow-up procedure for removal of the skin graft and repair of the hernia with abdominal wall component separation will be necessary.
3. Placement of vicryl (or other absorbable) mesh to the fascial edges, covering the exposed intestinal contents. A bed of granulation tissue is allowed to form followed by split thickness skin grafting. Hernia repair as above will be necessary.
4. Closure of the wound over time by secondary intention. Some patients may opt not to have further surgery and will accept the long-term issues of an incisional hernia.

‘There is little point in achieving a technically excellent wound closure if the patient dies of the sequelae’ Anon (2006).

Temporary abdominal closure
The open abdomen requires coverage of the exposed intra-abdominal contents and in the immediate postoperative period there must be adequate control of effluent. If fascial closure is not possible or inadvisable then there are many different ways to achieve this:

Skin closure
The skin may be closed over unapproximated fascia. This is the best option if possible, but it is important to avoid precipitating ACS by an overtight closure.

Oclusive dressings
Bogotá bag
First developed in Bogotá, Columbia in 1984, the Bogotá bag involves covering exposed bowel with a sterile silastic sheet (traditionally an opened out 3 L urological irrigation bag), which is then sutured to the surrounding skin (Figure 1.3). The most commonly used material in our centre are empty bags of 0.9% saline, divided at three edges and cut to shape.

‘Vacpack’ dressing/Opsite sandwich
Surgeons can construct a vacuum dressing that can be applied directly on to bowel (Figure 1.4):
1. Step 1. Select a sterile towel of comparable size to the wound you wish to cover.
2. Step 2. Wrap the towel in a sterile adhesive dressing, e.g. Ioban™.

In other surgical procedures where the patient develops similar unstable physiology (e.g. ruptured abdominal aorta, acute mesenteric ischaemia).
Oedematous bowel unable to be fully reduced into the abdomen without causing signs/symptoms of intra-abdominal hypertension or ACS.
In gross abdominal sepsis from bowel perforation or anastomotic breakdown.
Abdominal compartment syndrome.
Intra-abdominal hypertension refers to elevated intra-abdominal pressure (normal 5–7 mmHg).

Abdominal compartment syndrome
Clinical scenario whereby intra-abdominal hypertension results in impaired perfusion of the viscera and systemic sequelae.
Clinically manifested by elevated peak airway pressures, decreased cardiac output, oliguria, septic complications from gut bacterial translocation and elevated intracranial pressures.
• **Step 3.** Place the non-adhesive towel dressing in the wound, tucking the edges under the fascial edge. Jackson-Pratt (suction) drains are placed either side of the dressing at the fascial edge.
• **Step 4.** Cover the entire wound with a second large sterile adhesive sheet. Ensure that the drains are wrapped within a mesentery of the adhesive sheet to provide a good seal.
• **Step 5.** Finally, attach the proximal end of the drain to a suction source. This shrinks the dressing and wound overall and collects effluent.

**KCI Vac dressing**

Vacuum Assisted Closure device (V.A.C.® Therapy Kinetic Concepts Inc., San Antonio, Texas) is a non-adhesive proprietary dressing with a patented black sponge suction that acts to collect effluent fluid, shrink the wound and promote granulation tissue by inducing a uniform suction throughout the wound surface (Figure 1.5).

A piece of foam sponge with an open-cell structure is placed on to the abdominal wound and fashioned into shape. The entire area is then covered with a transparent adhesive membrane, which is

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**Figure 1.3** Bogotá bag in situ. Partial closure of abdominal wound at a second look laparotomy for severe liver trauma. The subcostal incision had been closed while a Bogotá bag was used for the midline wound until a further attempt was made to close the wound at a third laparotomy.

**Figure 1.4** (a, i–iii) Constructing an Opsite sandwich. (b) An Opsite sandwich in place.
The complex abdomen

Management of the patient with a complex abdomen (Figure 1.6) following an intra-abdominal ‘catastrophe’, trauma or abdominal sepsis requires the full attention and close cooperation of the multidisciplinary team. It is imperative that while in hospital a named consultant takes overall responsibility for directing care, surgical intervention and referral for opinions. A clear schematic drawing in the notes of the procedure(s) performed is vital for the rest of the team to provide information on lines, tubes, drains, stomas and options for feeding (Figure 1.7).

It is through attention to detail at all levels, and the coordination of surgery, imaging and radiological intervention (when indicated) and perseverance that the best results will be obtained.

The complex abdomen patient often requires the coordination of therapies over a protracted time for some or all of the following:

- Critical care (surgical airways, intravenous lines, ventilation);
- Wound infection;
• Open abdomen;
• Multiple abdominal drains;
• Multiple operations;
• Repeat imaging;
• Interventional radiology (drainage of collections);
• Management of abdominal fistulae;
• Stoma care; and
• Nutrition (enteral and parenteral).

These patients often have long hospital stays and we have found it valuable to produce a summary of events and interventions every 50 days of hospital stay.

Further reading
World Society of Abdominal Compartment Syndrome. www.wsacs.org