Peri-operative Anesthetic Management for Patients with Perforation Peritonitis

An Essay

Submitted for partial fulfillment of Master Degree
in Anesthesia

By

Mohammed Mohammed EL metwally
M.B, B.ch- Ain Shams University

Under Supervision of

Prof. Dr. Hala Amin Hassan Ali
Professor of Anesthesia, ICU and Pain Management
Faculty of Medicine – Ain Shams University

Dr. Amal Hamed Rabie
Lecturer of Anesthesia, ICU and Pain Management
Faculty of Medicine – Ain Shams University

Dr. Amin Mohammed Al Ansarey
Lecturer in Anesthesia, ICU and Pain Management
Faculty of Medicine – Ain Shams University

Faculty of Medicine
Ain Shams University
2015


بسم الله الرحمن الرحيم
قَالُواْ سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا
عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ
صدق الله العظيم
سورة البقرة – آية٣٢

First of all, thanks to ***ALLAH*** *for giving me the strength to complete this work.*

This thesis would not have been possible without the help, support and patience of my supervisors. I would like to thank ***Prof. Dr. Hala Amin Hassan Ali,*** *Professor of Anesthesia, ICU and Pain Management, Faculty of Medicine – Ain Shams University for her outstanding supervision and guidance. I really have the honor to complete this work under her supervision.*

I would like to express my gratitude to ***Dr. Amal Hamed Rabie****, Lecturer of Anesthesia, ICU and Pain Management, Faculty of Medicine – Ain Shams University, for her remarkable efforts, considerable help and kind.*

I can't forget to thank ***Dr. Amin Mohammed Al Ansarey****, Lecturer in Anesthesia, ICU and Pain Management, Faculty of Medicine – Ain Shams University, for his great efforts, cooperation and time he has devoted to achieve this work.*

Last but not least, thanks to my ***Family*** *for pushing me forward in every step in my life.*

Mohammed Mohammed El-Metwally

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List of Abbreviations

Abb.	Full-term
ARDS	: Adult respiratory distress syndrome
CNS	: Central nervous system
CRRT	: Continuous renal replacement therapy
CVP	: Central venous pressure
FIO2	: Fractional inspired oxygen concentration
GIT	: Gastrointestinal tract
ICU	: Intensive care unit
IVF	: Intravenous fluids
MAC	: Minimum alveolar concentration
MAP	: Mean arterial pressure
NE	: Norepinephrine
NSAIDs	: Non steroidal anti-inflammatory drugs
PaO2	: Partial pressure of oxygen
PEEP	: Positive end-expiratory pressure
rhAPC	: Recombinant human activated protein C
SaO2	: Oxygen saturation
SD	: Standard deviation
SIRS	: systemic inflammatory response syndrome
SLED	: Sustained low efficiency dialysis
SVO2	: Venous oxygen saturation
SVR	: Systemic vascular resistance
TNF	: Tumor necrosis factor
TPN	: Total parenteral nutrition

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Introduction

The peritoneal membrane is a semi-permeable membrane that lines the abdominal wall (parietal peritoneum) and covers the abdominal organs (visceral peritoneum). The membrane is a closed sac in males. The fallopian tubes and ovaries open into the peritoneal cavity in females. The size of the membrane approximates the body surface area (1-2 m2). There are about 100 cc of transudate that is contained in the cavity in normal individuals ***(King, 2007).***

Peritonitis is the inflammation of the peritoneum. It is caused by a bacterial or fungal infection. There are two major types of peritonitis, Spontaneous bacterial peritonitis and Perforation peritonitis ***(Doron and Gorbach, 2006).***

Perforation peritonitis is a frequently encountered surgical emergency in tropical countries. A majority of patients present late, with septicemia, thus increasing the incidence of morbidity and mortality thereby complicating the task of anesthesiologist in the perioperative period. Despite advances in surgical techniques, antimicrobial therapy and intensive care support, management of peritonitis continues to be highly demanding, difficult and complex ***(Gupta and Kaushik, 2006).***

Despite the development of much ancillary diagnostic technology, the diagnosis of peritonitis is still dependent on clinical criteria ***(Schein, 2002).***

Treatment of intra-abdominal infections is without doubt one of the most common and important challenges for surgeons generally and for those who work in low-income countries, in particular ***(Schein, 2002).***

As operative management, which may require repeated laparotomies, may tax the skills of the most experienced surgeon. A multi-disciplinary approach to intensive care support of the critically ill patient may be as important to survival as surgery. Controlling the source of infection removing contamination by peritoneal lavage, antibiotics and physiologic support remain the chief modalities of treatment ***(Schein, 2002).***

Chapter (1)

Pathophysiology of Perforation Peritonitis

Epidemiology

The common age for its occurrence has been reported to be 45-60 years. Majority of the patient's are male, with a male: female preponderance of 3:1 ***(Jhobta et al., 2006)***.

perforation of the proximal part of the gastrointestinal tract (GIT) is more common, distal gut perforation is more common in the western population Overall, duodenum is the most common site of perforation ***(Melangoni and Inui, 2006).***

Etiology

Perforation of any portion of the gut within the abdominal cavity leads to peritonitis and intra-abdominal sepsis. Besides a perforated peptic ulcer, other important perforations include appendicular perforation, diverticular perforation, perforation of the small bowel in enteric fever and perforation of tuberculous ulcer. Corticosteroids, Non steroidal anti-inflammatory drugs (NSAIDs) can induce perforation in any portion of GIT ***(Johnson et al., 2003).***

Acute inflammatory disease within the pelvis initially causes pelvic peritonitis, which may progress to generalized peritonitis. In Indian females, septic abortion and puerperal

sepsis are important causes of peritonitis. Acalculous cholecystitis and acute pancreatitis can complicate the course of critical illness and are due to poor perfusion in critically ill patients ***(Holzhemer et al., 2005).***

Table (1): Common causes of perforation peritonitis ***(Sharma et al., 2013).***

Perforated gastric or duodenal ulcer
Perforation of hollow viscus or any portion of the gut
Enteric ulcer
Tubercular ulcer
Inflammatory bowel disease
Diverticulitis
Iatrogenic (corticosteroids and NSAID use)
Penetrating trauma to abdomen

Occasionally, perforation with localized or generalized peritonitis can occur in inflammatory bowel disease. Gangrene of the bowel from strangulation and obstruction or from mesenteric vascular ischemia or occlusion are important causes of peritonitis. Rupture of an empyema of the gall bladder or a gangrenous cholecystitis, also causes generalized peritonitis. Acute inflammatory disease within the pelvis initially causes pelvic peritonitis, which may progress to generalized peritonitis ***(Johnson et al., 2003).***

Peritonitis is traditionally classified as:

a) Primary peritonitis.

b) Secondary peritonitis.

c) Tertiary peritonitis ***(Martin and Rossi, 2000).***

Primary peritonitis results from spontaneous bacterial infection of the peritoneum, alone or in association with peritoneal dialysis. This type of peritonitis is rare less than 1% of all cases of peritonitis ***(Doron et al., 2006).***

The form most commonly encountered by surgeons is secondary peritonitis resulting from perforation of a hollow viscus or other abdominal pathology. Both cases of peritonitis are very serious and can be life threatening if not treated quickly ***(Doron et al., 2006).***

The main cause of secondary peritonitis is the escape of pus from an infected abdominal organ, including:-

(1) Perforated ulcer – a severe, untreated ulcer can sometimes burn through the wall of the stomach or duodenum allowing digestive juices and food to leak into the abdominal cavity.

(2) Perforated bowel – the intestines can be damaged and perforated by a range of conditions, including diverticulitis and inflammatory diseases such as Crohn's disease.

(3) Burst appendix – the appendix is a thin tail growing out of the large intestine. Food or faecal matter can sometimes lodge inside the appendix and become infected with bacteria.

(4) Perforated gall bladder – this small sac stores bile from the liver. A severe infection (cholecystitis) can cause the gall bladder to burst.

(5) Pancreatitis – an inflamed pancreas can directly cause inflammation in the abdomen, which may be very severe. The two major causes of pancreatitis are alcoholism and gallstones.

(6) Ectopic pregnancy – the fertilised egg lodges and grows inside the slim fallopian tube instead of the uterus. The tube ruptures in around one out of five cases.

(7) Salpingitis – inflammation of the fallopian tube. Sometimes, the tube becomes distended with pus until it bursts.

(8) Abdominal surgery – infection is a risk of any type of major surgery.

(9) Necrotising enterocolitis – a condition that affects newborn babies and sometimes prompts peritonitis.

(10) Blood infection – can be caused by a range of conditions, including cirrhosis of the liver, some forms of kidney disease and appendicitis.

(11) Dialysis – bacteria on peritoneal dialysis equipment can enter the abdominal cavity.

(12) Stab wound – bacteria from a knife or other sharp object enters the abdominal cavity ***(Martin and Rossi, 2000).***

Tertiary peritonitis is characterized by a class of very ill patients in whom secondary peritonitis fails to resolve despite what appear to be appropriate measures and is associated with multi-organ failure ***(Martin and Rossi, 2000).***

Intra-abdominal infections comprise a) infections of specific organ systems, eg. appendicitis and cholecystitis; b) peritonitis resulting from extension of infection into the general peritoneal cavity and c) intra-abdominal abscesses which result from the extension of inflammation beyond the viscus and from incompletely resolved peritonitis ***(Marshall, 2004).***

Primary peritonitis is usually caused by liver disease. Fluid builds up in the abdomen, creating an environment for bacteria to grow. Secondary peritonitis is caused by other conditions that allow bacteria or fungus to come into the peritoneum from a hole or tear in the abdominal wall. Tears can be caused by pancreatitis, a ruptured appendix, stomach ulcer, Crohn's disease, or diverticulitis ***(Doron et al., 2006).***

Peritoneal dialysis, which uses the blood vessels in the abdomen to filter waste from your blood when your kidneys can't, also may cause peritonitis ***(Doron et al., 2006).***

The following risk factors may increase the risk for primary peritonitis:

(a) Liver disease (cirrhosis).
(b) Fluid in the abdomen.

(c) Weakened immune system.
(d) Pelvic inflammatory disease ***(Doron et al., 2006).***

A wide variety of disease states give rise to intra-abdominal infection ***(Levinson, 2005).*** While varying according to age, gender and geography, the three most common causes of generalized peritonitis in low-income countries are probably appendicitis, perforated duodenal ulcer and typhoid perforations, in no particular order ***(Gupta et al., 2006).***

In a study of children 50% of patients had typhoid perforation ***(Adesunkanmi et al., 2003).*** In women, the complications of pelvic inflammatory disease predominate. Abdominal trauma resulting in intestinal injury is also a significant cause of peritonitis, particularly in low-income countries ***(Malangoni and Inui, 2006).***

In the West appendicitis remains the most common cause of peritonitis, followed by colonic perforation, usually as a result of diverticulitis ***(Malangoni and Inui, 2006).***

Iatrogenic causes, resulting from failure of intestinal anastomosis and inadvertent bowel injuries, need to kept in mind. Certain clinical conditions, primary peritonitis and appendicitis, are more common in children. Intra-abdominal infection has its own features in the elderly ***(Thompson et al., 2006).***

Spontaneous peritonitis and secondary peritonitis

Peritonitis may be classed as spontaneous peritonitis or secondary peritonitis. The symptoms of spontaneous peritonitis are often less dramatic than secondary peritonitis. Spontaneous peritonitis can occur in patients with severe liver disease, heart disease or kidney disease. Often these diseases cause the accumulation of fluid within the abdominal cavity. This is called ascites. The presence of ascites, together with the person's weakened defences against infection, often leads to bacterial infection ***(Gupta et al., 2006).***

Risk factors for secondary peritonitis include:

(a) Appendicitis (inflammation of the appendix)

(b) Stomach ulcers.

(c) Torn or twisted intestine.

(d) Pancreatitis.

(e) Inflammatory bowel disease, such as Crohn's disease or ulcerative colitis.

(f) Injury caused by an operation.

(g) Peritoneal dialysis.

(h) Trauma ***(Levinson, 2005).***

Symptoms of peritonitis:

- The symptoms of peritonitis include:

(a) Severe and constant abdominal pain.

(b) Fever.

(c) Inability to break wind or pass stools.

(d) Nausea and vomiting.

(e) Shock ***(Levinson, 2005).***