Exploratory Laparotomy

6.0 Contact Hours

California Board of Registered Nursing CEP# 16140

American Medical Education Center

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Title: Exploratory Laparotomy
Self Study Module 3.0 CONTACT HOURS
Suggestion: Read through these questions before the module as they will be the SAME questions on the required online exam.

Choose the Single Best Answer for the Following Questions and Place Answers on Form:

1. What is true about an exploratory laparotomy?
   a. It can be done in the minor operating room theater
   b. It is done when the patient has colon cancer
   c. The surgeon does not know what he/she will do before opening the abdomen
   d. It is only done in patients with abdominal pain

2. Exploratory laparotomy is not done as much today because of:
   a. Patient refusal
   b. Availability of better imaging techniques
   c. Better medical knowledge
   d. Improved laboratory tests

3. Free air under the diaphragm leading to an exploratory laparotomy may be due to all of the following except?
   a. Perforated peptic ulcer
   b. Perforated appendix
   c. Perforated sigmoid diverticulum
   d. Perforated esophageal diverticulum

4. Which of the following is not a rare cause of bowel obstruction?
   a. Mesenteric hernia
   b. Femoral hernia
   c. Intussusception
   d. Colon cancer

5. A 65 year old undergoes CT guided aspiration of a fluid collection in the upper quadrant. The contents are analyzed and reveal presence of food and liquid fecal material. The next step is:
   a. Diagnostic peritoneal lavage
   b. Diagnostic Laparoscopy
   c. Antibiotics
   d. Exploratory laparotomy

6. All the following disorders can cause chronic abdominal pain leading to an exploratory laparotomy except?
   a. Endometriosis
   b. Tubo-ovarian abscess
   c. Tuberculosis
   d. Appendicitis

7. In the past, which cancer was often staged with an exploratory laparotomy?
   a. Colon cancer
   b. Multiple myeloma
   c. Stomach cancer
d. Hodgkin disease

8. After an exploratory laparotomy, the patient is always at risk for?
   a. Cancer
   b. Pain
   c. Incisional hernia
   d. Inguinal hernia

9. Decompression of what organ system is highly recommended in a patient undergoing an exploratory laparotomy?
   a. Stomach
   b. Rectum
   c. Gallbladder
   d. Cecum

10. In a patient with mild coagulopathy undergoing an urgent exploratory laparotomy, deep vein thrombosis prophylaxis can be undertaken by-
    a. Administration of 5 mg warfarin
    b. SCDs
    c. Starting heparin
    d. Keeping the legs elevated on the operating room table

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**Self Study Module 3.0 CONTACT HOURS**

**Objectives**

*At the completion of this program, the learners will:*

1. Describe how a patient is positioned for an exploratory laparotomy.
2. List the equipment required for an exploratory laparotomy.
3. Discuss indications and contraindications for an exploratory laparotomy.
4. Name the complications of exploratory laparotomy.
5. Review how an exploratory laparotomy is performed.

An exploratory laparotomy is a common general surgery procedure. By definition, an exploratory laparotomy procedure is done with the aim of finding out what is wrong with the patient, when clinical examination and imaging studies are not definitive. An exploratory laparotomy is often undertaken in patients who present to the emergency department 1) with unexplained or acute intense abdominal pain 2) patients who have continued abdominal pain following abdominal trauma and in 3) patients who need to be staged after diagnosis of a malignancy.

Once the surgeon finds the cause, the exploratory laparotomy can then be continued as a therapeutic procedure. This may mean removing the offending lesion or performing a
biopsy of an abdominal mass if the patient is inoperable. It is important to understand that in a routine laparotomy, the diagnosis is known beforehand and offers a specific treatment to the patient. In an exploratory laparotomy, the surgeon does not know what therapeutic measure he/she will undertake until the abdomen is opened and explored.

In the last decade, the role of exploratory laparotomy has declined because of the availability of sensitive imaging techniques. Both CT scan and MRI offer state of the imaging with excellent resolution. In many cases, the cause of the abdominal pathology can be revealed with these imaging studies.

Further rapid advances in laparoscopic surgery now provide a minimally invasive method of inspecting the abdominal cavity with minimal morbidity. Nevertheless, exploratory laparotomy still remains a cost effective and rapid means of assessing the abdomen, especially in people with blunt and penetrating trauma.

**Indications**

There are generally four major indications for an exploratory laparotomy that are as follows:

1. **Acute Pain**
   
a. The patient has acute onset of intense pain. The imaging studies are not clear on the pathology. However, it is suspected that the patient may have an acute disorder, which requires surgery (e.g. mesenteric ischemia). In such a scenario, the exploratory laparotomy is done for both diagnostic and therapeutic purposes. If the surgeon finds dead bowel from mesenteric ischemia, the bowel will be resected.

b. There are some patients who present to the ED with severe abdominal pain and have features of peritonitis. X-rays reveal free air under the diaphragm and a perforated viscus is suspected. However, it is not possible to tell if this perforation is from the stomach, appendix, cecum or the sigmoid colon. In such cases, an exploratory laparotomy is done to find out the cause of the free air (pneumoperitoneum). Once the cause is found, appropriate treatment is undertaken. In some of these cases of free air, the diagnosis is often found to be intestinal ischemia, which requires resection.

c. Some patients present to the ED with symptoms of nausea, vomiting, abdominal distension and obstipation. X-rays usually reveal dilated bowel loops with air-fluid levels. Even though a likely clinical diagnosis is bowel obstruction, the cause is often not known preoperatively. Rare causes of bowel obstruction include incarcerated hernia, mesenteric hernia, intussusception and femoral hernias.

d. There are some patients who have fever and abdominal pain because of fluid collection in the peritoneal cavity. These collections are often identified with a CT scan and most can be managed using CT guided drainage. However, if the aspiration reveals bowel contents, an exploratory laparotomy is required to find the source and repair it.
2. Abdominal Trauma With Hemodynamic Instability

Patients with abdominal trauma who are unstable often require exploratory laparotomy as a life saving measure. Often there is no time for imaging studies because of patient instability. These patients often have moderate to severe bleeding from injury to the liver or spleen. In such cases, the surgery is done for diagnosis and for therapeutic.³

3. Chronic Abdominal Pain

With the availability of CT scans and MRI, surgery for patients with vague abdominal pain is on the decline. However, there are some patients who present with intense pain and no diagnosis is available. In such cases, an exploratory laparotomy is needed. Such patients may include women with endometriosis⁴, Tuberculosis⁵, adhesions of bowel wall and pathology of the female reproductive organs (e.g. tubo-ovarian abscess).

4. Staging of Certain Cancers

Exploratory laparotomy was often used to stage certain malignancies (ovarian) and Hodgkin disease. However, with availability of more sophisticated CT scans, staging with an exploratory laparotomy has fallen out of favor. Surgery may be indicated in a few patients in whom the treatment is solely primary radiation.⁶

Contraindications

The chief contraindication for exploratory laparotomy is a patient who is not fit general anesthesia. Other disorders that may make the patient unsuitable for general anesthesia are those with a severe coagulopathy, lack of blood in case patient has a ruptured aneurysm, advanced malignancy and multiorgan failure with poor prognosis.

Technical Considerations

Exploratory laparotomy is not only a diagnostic procedure but often the surgeon will treat the problem. Therefore, whenever an exploration of the abdomen is done, the operating room must have the necessary equipment and facilities to deal with the type of disorder. If the patient has a ruptured aortic aneurysm, a cell saver and aortic prosthetic grafts must be available.

Exploratory laparotomy done only for diagnostic purposes is not benign. Postoperatively the patient may develop adhesions, bowel obstruction, and be prone to an incisional hernia. Thus, exploratory laparotomy should be done with good clinical judgment. Negative exploratory laparotomy only harms the patient more.

Therefore, every effort should be made to make a diagnosis prior to surgery. In some cases, diagnostic peritoneal lavage (DPL) may be used to determine the cause of the abdominal pathology. If the DPL is positive then an exploratory laparotomy is needed. If the results are negative, the patient still needs to be monitored very closely.⁷
Preprocedural Planning
In emergency cases, it is not always possible to fully prepare the patient, however, the better the patient is prepared, the more likelihood that the outcome will be good. This means optimizing the patient’s condition. Whenever possible, the patient’s volume status should be corrected. If the hemoglobin is low, blood should be transfused. Any electrolyte deficiency must be corrected. If the patient has any coagulopathy, appropriate blood products and FFP must be available.

Before the start of the surgery but after the patient has been put to sleep, the anesthesiologist will usually insert a nasogastric tube to decompress the stomach. The risk of such aspiration is high in these patients because of the emergency nature of the procedure and because of paralytic ileus. Some of these patients may not have been fasting for the recommended 8 hours prior to surgery. A foley catheter is highly recommended as it can help monitor urine output in these ill patients. The foley catheter also decompresses the bladder. When a midline abdominal incision is made, the inferior part of the incision can easily cut into the distended bladder.

Equipment
Exploratory laparotomy is always done in a dedicated general surgery operating room. The basic equipment needed includes:

- Artery forceps
- Abdomen retractor
- Army and navy retractor
- Bowel clamps (atraumatic clamps)
- Drapes, gowns, mask, gloves. High shoe covers are recommended because most of these cases are associated with bleeding and contamination of the peritoneal cavity.
Copious irrigation is often done and spillage on the floor is common.
- Electrocautery
- Foley catheter
- Kelly clamps
- Lap pads
- Needle holder
- Retention sutures
- Richardson retractor
- Saline for irrigation
- Scalpel with handle
- Sterile specimen containers
- Staplers for bowel resection
- Stoma appliance bag
- Suction with tubing
- Surgical blade
- Surgicel, fibrin glue
- Sutures- prolene, nylon, vicryl
- Tissue forceps
- Vascular set (should not be opened unless there is a vascular injury)

If there is any suspicion of a vascular injury or ischemia, than a vascular instrument tray should be available in the room. Similarly, if there is suspicion for rectal, urological or gynecological involvement, appropriate instruments trays have to be ready, but not opened. If the case involves abdominal trauma, a cell saver should be on stand by.

Patient Preparation

Patients who require exploratory laparotomy must be prepared for the worst-case scenario. This means having two large bore intravenous line in the arms, foley catheter (which is placed after the patient is asleep), and perhaps a central line. Adequate precautions should be undertaken to prevent deep vein thrombosis, if the patient has a coagulopathy, then SCD and compression stockings are adequate. The use of heparin or lovenox depends on surgeon preferences.

Anesthesia

Exploratory laparotomy is almost always done with the patient under general anesthesia. Because patients who are anesthetized under emergency situations to be at very high risk for aspiration, appropriate precautions are necessary. The stomach should be emptied with a nasogastric tube prior to intubation, and one needs to utilize the rapid sequence induction technique to reduce the risk of aspiration.

Positioning

For an exploratory laparotomy, the patient is usually placed supine. The arms may be tucked at the sides or they may be abducted on an arm board at right angles to the
body. If the patient is suspected of having a pelvic pathology, then a lithotomy position may be used. This allows the surgeon simultaneous access to the rectal and vaginal areas as well.

**Technique of Exploratory Laparotomy**

Once the patient is asleep, the entire abdomen from the nipples down to the mid thigh is prepped. The groin should also be thoroughly prepped. Exploratory laparotomy is best performed using a vertical midline incision. This incision allows for rapid entry in the peritoneal cavity, is safe and bloodless. The initial incision may be made just above and below the umbilicus and can be extended depending on the pathology found. It is important not to compromise exposure of the peritoneum with cosmesis by keeping the incision small. The midline skin incision is made with a surgical knife and deepened down to the subcutaneous tissues and fat. Following this, electrocautery can be used to obtain hemostasis. The linea alba is identified as the shiny layer deep to the subcutaneous tissues. This layer can be opened with a knife or heavy mayo scissors, which reveal the preperitoneal fat. The abdominal incision is completed and one can enter the peritoneal cavity. The peritoneum must be lifted to avoid injury to the underlying. The peritoneal is usually lifted with 2 straight artery forceps or Kelly and then palpated to make sure no bowel or omentum is caught in between the instruments.

In bowel reoperations, one has to be very careful because the underlying bowel is often attached to the parietal peritoneum. It is best to open the peritoneum in a virgin area, or if needed, the incision should be extended.

**Exploration of Abdominal Cavity**

When performing an exploratory laparotomy, the surgeon’s operative goals may be based on initial imaging suspicion. In any case, a systemic approach to the cavity should be undertaken and priority should be given to any life threatening condition.

If the patient has a massive hematoperitoneum, one may suspect bleeding. Secondly, when there is blood in the peritoneal cavity, it interferes with proper exploration. Therefore, the surgeon will generally lift the small bowel and its mesentery out of the abdominal cavity and place it at the side in a plastic bag or an enclosure made from moist towels. This helps evacuate all the blood from the abdominal cavity. The next step is to place laparotomy pads in the 4 quadrants of the peritoneum. This is followed by carefully removing each pad and inspecting the quadrant for bleeding.

It is always easier to identify bleeding in the absence of a large hematoperitoneum. Common causes of bleeding in the abdominal cavity include laceration of the liver, spleen, ruptured ectopic pregnancy, hollow visceral injuries, mesenteric tears, and aneurysms of the abdominal aorta, spleen or liver vessels. Once the source of bleeding is identified, appropriate measures can be undertaken.

If there is bowel perforation with spillage of enteric contents, all food and fecal material should be removed with suction. The entire bowel must be inspected starting with the
stomach down to the distal colon. Perforations are most common in the anterior part of the stomach and sigmoid colon. When inspecting bowel, each segment is inspected in a systemic fashion on both sides.

If no source of perforation is found, one should then look for the appendix and colon. If perforation in bowel is seen, atraumatic clamps should be placed on either side of the perforation and the abdomen cleaned. Methods to control the source of spillage include buttressed repair, direct repair, bowel resection and primary anastomosis or bowel resection and formation of a stoma. In the presence of fecal contamination of the abdominal cavity, most surgeons will resect the bowel and create a stoma. Performing an anastomosis under such circumstances can be very risky and prone to break down. The final choice of repair depends on patient age, morbidity and extent of disease.

In patients with bowel obstruction, one possible cause found during exploratory laparotomy may be just one single adhesive or fibrous band. Other causes may include volvulus or malignant omental deposits.

When staging a patient with a malignancy like ovarian cancer or Hodgkin disease, the surgeon should systematically check the abdomen for any foci of cancer. Biopsies may be obtained from the liver, spleen and any enlarged lymph nodes. If there is a suspicious ovarian lesion, the gynecologist should be consulted and asked to come to the operating room. If he/she is unavailable, images should be obtained. If there is a prior consent, an oophoropexy may be done.

Completion and Closure
Once the exploratory laparotomy is performed, the abdominal cavity is thoroughly irrigated with warm water. Complete hemostasis is obtained. The decision to place drains in the peritoneal cavity is a matter of debate. There are no good data to indicate that drains are of benefit. However, people with massive peritoneal contamination may benefit from a drain. The drain may be placed under the diaphragm to prevent subphrenic abscess, subhepatic space to prevent bile collection or in the pelvic cavity.

Once the count is correct, the abdominal wound is closed. It is important to have a double count of all instruments and lap pads. In cases where an exploratory laparotomy is done as an emergency, small instruments and gauze have a good chance of being lost. The surgeon should also make an effort to double check the peritoneal cavity for any gauze, pads or instruments and not just rely on the scrub nurse or the surgery technologist.

Closure of the abdomen is usually done with a non-absorbable continuous suture (e.g. polypropylene or nylon). Some surgeons may use an absorbable suture like PDS in an interrupted or a continuous fashion.

It is important to take good bites of the fascia about 1 cm from the edge of the linea alba. The subcutaneous layer may be approximated with a 3-0-vicryl suture. The skin may be closed with staples or with a subcuticular stitch.
There are times when the abdominal closure may be difficult due to edema or distended bowel loops. In such scenarios, closure of the abdomen can result in excess abdominal pressure, impaired ventilation, dehiscence and pain. There is also a concern for abdominal compartment syndrome. Thus, a delayed closure may be a better alternative. The surgeon may use a mesh to close the abdomen superficially, keep the patient intubated and paralyzed. The patient can then be brought back to the operating room in 24-48 hours. In the ICU, the patient is kept on the dry side to limit the edema.

Post Procedure

In general, patients who undergo exploratory laparotomy are ill and having undergone emergent surgery are best monitored in the ICU or a step down unit at least for the next 12-24 hours. Patients who are critically ill are monitored in the ICU until they are extubated.

Complications of Exploratory Laparotomy

In general, an exploratory laparotomy is associated with the same complications as any other laparotomy. The complications are divided into:

Early

- Ileus: this may last a few days and may initially be confused with a bowel obstruction. X rays usually reveal dilated bowel loops.
- Collection of abscess may occur in the pelvis, subhepatic space or subphrenic. The diagnosis can be made with a CT scan. Moreover, CT guided drainage and antibiotics are adequate treatment in most patients.
- Bleeding
- Sepsis may occur if the patient had bowel perforation with significant contamination of the peritoneal cavity.
- Coagulopathy can occur if the surgery was complicated, associated with bleeding and massive blood transfusions.
- Wound infection.
- Dehiscence of abdominal wound often requires return to the operating room for rinsing the peritoneal cavity and placement of retention sutures.
- Atelectasis
- Bowel anastomotic leak usually presents within the first 4 days and requires emergent return to the operating room.

Delayed

- Enterocutaneous fistula may present after a few weeks with intestinal contents draining through the skin.
- Short bowel syndrome may occur if a large segment of bowel was been resected.
- Bowel obstruction may occur from adhesive bands or recurrence of disease.
- Stomal stenosis and may require dilatation.
- Stomal prolapse can occur if the stoma was not properly passed through muscle layers or a large opening was made.
- Incisional hernia is always a concern after an exploratory laparotomy.

References


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