

***“Study on Relaparotomy in Coimbatore Medical College and Hospital”***

Dissertation submitted to  
Tamil Nadu M G R Medical University  
Chennai 600032, April 2014



In partial fulfillment of the  
Regulation of the award of  
M.S.DEGREE IN GENERAL SURGERY



Department of General Surgery  
Coimbatore Medical College and Hospital  
Coimbatore – 641018

## **CERTIFICATE**

This is to certify that the dissertation entitled “Study on Relaparotomy in Coimbatore Medical College and Hospital” submitted to the Tamil Nadu Dr M.G.R. Medical University, Chennai 600032. In partial fulfillment of the University regulation for award of M.S. Degree in General Surgery is bonafied work done by Dr.Sushanth.S post graduate student in General Surgery under my direct supervision and guidance, during the period November 2012 to October 2013.

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I hereby declare that the dissertation entitled “Study on Relaparotomy in Coimbatore Medical College and Hospital” was done by me at Coimbatore Medical College Hospital, Coimbatore 641018, during the period of my post graduate study for M.S. Degree Branch 1(General Surgery) from 2011 to 2014.

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## ACKNOWLEDGMENT

It would not have been possible to write this thesis without the help and support of the kind people around me, to only some of whom it is possible to give particular mention here.

I would like to express my deepest gratitude to my guide. **Prof. Dr. P Swaminathan M.S(G.S), D.O.** for his excellent guidance and support which helped me to complete this thesis. I am indeed blessed to have him as my teacher and guide in the art of surgery.

I also take this opportunity to thank **Prof. Dr. Elango. V** , Head, Department of Surgery for his moral support and guidance all through. I fall short of words to thank my assistant professors, **Dr. Vishwanathan G, Dr. A M Umashankar and Dr R Jayakumar** without whom this thesis would never have seen the light of the day. It is their constant guidance, support and constructive criticism that has always brought out the best in me.

My sincere thanks to Professors, **Dr. N Renganathan , Dr. S Natrajan , Dr R Ravindran, Dr.Sharada** for their advice and guidance. I want to place on record my gratitude to the Dean of my college, **Dr.Vimala.M.D**, for permitting to conduct my study in this institution.

I express thanks to all my friends who have helped me in preparation of this dissertation. Above all I would like to thank my parents, for their unequivocal love and support for whom mere words of gratitude will never suffice. I would be failing in my duty if I did not thank all my patients who consented to be a part of this study. My heartfelt thanks reach out to them.



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**STUDY ON RELAPAROTOMY IN COIMBATORE MEDICAL COLLEGE HOSPITAL**

BY SUSHANTH SHIVARAMIEGOWDA


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*"Study on Relaparotomy in Coimbatore Medical College and Hospital"*

Dissertation submitted to  
Tamil Nadu M G R Medical University  
Chennai 600032, April 2014



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M.S DEGREE IN GENERAL SURGERY



Department of General Surgery

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18:38 07/12/2013

“Study on Relaparotomy in Coimbatore Medical College and Hospital”



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## *“Study on Relaparotomy in Coimbatore Medical College and Hospital”*

### ABSTRACT

#### Purpose

To find out, common indications for performing Relaparotomy, outcomes of Relaparotomies, factors influencing the associated mortality rate in Coimbatore Medical College Hospital.

#### Methods

30 patients who underwent relaparotomy for complications arising due to initial laparotomy were included in the study. Demographic features and initial diagnoses of the patients, the reasons for their initial surgery and their postoperative complications and outcome of relaparotomy were analyzed.

#### Results

The average patient age was 52.2 years and the male:female ratio was 25:5.

Relaparotomy was performed for the following complications: leakage of an intestinal repair or anastomosis (n = 7, 23%); persistent intraabdominal infection (n = 7, 23%), burst abdomen (n = 6, 20%), enterocutaneous fistula (n = 3, 10%), persistent intraabdominal abscess (n = 2, 7%), stomal complications (n = 2, 7%),

post-operative hemorrhage (n = 2, 7%) and persistent intestinal gangrene (n = 1, 3%). A mortality rate of 20% (n = 6) was attributed mainly to infections (n = 22, 73%). The average interval between the first laparotomy and relaparotomy was 12.3 days, and the average hospital stay was 25.8 days.

#### Conclusions.

According to our study, the reasons for Relaparotomy (RL) are many. Anastomotic leak and persistent intra abdominal infection are major reason for relaparotomy, and these are associated with high mortality. The reduction of high RL rates, and subsequent high mortality rates, mainly depends on the success of the first operation

Key words; Relaparotomy. Anastomotic leak. Persistent intraabdominal infection. Burst abdomen.

## **INTRODUCTION**

## INTRODUCTION

The term RELAPAROTOMY (RL) refers to operations performed within 60 days in association with the initial surgery, for complications arising following primary surgery whereas the term “early RL” refers to laparotomy performed for the original disease within 21 days of the first operation. These urgent Relaparotomy are also called as final *choice operation*.

The purpose of RL is to

- 1) Manage complications of the previous surgery.
- 2) Maintain intestinal continuity.
- 3) Prevent fecal contamination of the abdomen.
- 4) Relieve intestinal obstruction.
- 5) Maintain homeostasis.
- 6) Prevent intra-abdominal infection or sepsis and
- 7) Carry out delayed curative surgery.

*Relaparotomy may be early or late; planned or unplanned; emergency or elective; radical or palliative.*

## COMMON CAUSES OF ABDOMINAL RELAPAROTOMY ARE ASFOLLOWS:

- 1) Leakage from intestinal repair site or anastomotic site.
- 2) Intra operative hemorrhage.
- 3) Enterocutaneous fistula.
- 4) Persistent peritonitis.
- 5) Persistent intra-abdominal abscess.
- 6) Burst abdomen.
- 7) Stomal complication.
- 8) Early post-operative intestinal obstruction.
- 9) Progressive intestinal necrosis.

The incidence of relaparotomy requiring complications depending on disease characteristics for which patient is admitted and the type of primary surgery they have received. These complications usually have high mortality rate.

Hence immediate diagnosis and planned reintervention is needed to save the patients. In spite of early diagnosis and appropriate intervention mortality rate following relaparotomy are still high.

Whenever complications occur following gastrointestinal surgery the surgeon will have to make one of the most difficult decisions in

medicine whether or not to attempt reoperation. In such cases a judgment must be made weighing the risk of reoperation against the potential advantages to be gained.

If the initial operation presented extreme technical challenges or the patient was in poor condition, the surgeon may question whether a second look will serve to improve the situation.

The need for reoperation can be averted by following certain surgical rules:

1. Complete preoperative study and correction of related deficits, bleeding tendency, respiratory problems, kidney insufficiency, and problems related to hypertension;
2. Good anaesthesia and postoperative care.
3. Large enough incision so *that* the operation can be done easily.
4. A complete laparotomy.
5. Meticulous operative techniques and care in ligating vessels and sewing.
6. Careful examination of both the abdominal cavity and the operative field at the end of the operation.
7. Appropriate drainage of what must be drained.
8. Asking for help when you have reached the limit of your ability.

## **OBJECTIVES OF THE STUDY**



## **OBJECTIVES OF THE STUDY**

TO FIND OUT

- 1) Common indications for performing Relaparotomy.
- 2) Outcomes of Relaparotomies.
- 3) Factors influencing the associated mortality rate.

## **REVIEW OF LITERATURE**

# ANATOMY OF THE PERITONEAL CAVITY

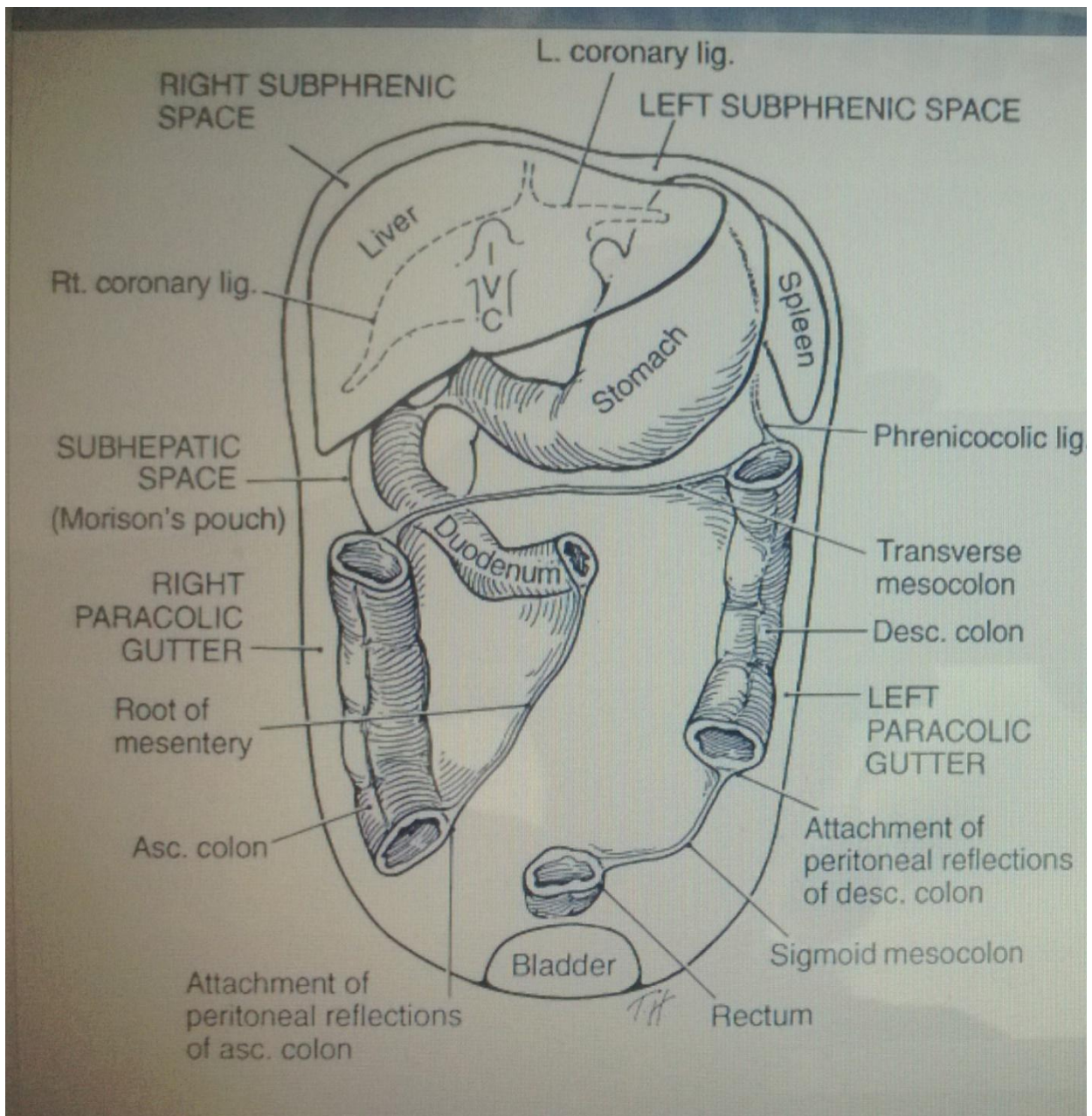


FIGURE 1

DIAGRAM SHOWING DIFFERENT INTRAPERITONEAL SPACES

The peritoneal cavity is divided into greater and lesser sacs, both these sacs communicate via foramen of Winslow. Within the greater sac, number of areas, (due to both anatomic and physiologic factors) are potential sites of fluid accumulation and therefore abscess formation.

These include the

- 1) Right subhepatic space.
- 2) Both right and left subphrenic spaces.
- 3) The paracolic gutters.
- 4) Lesser sac and
- 5) The pelvis.

## 1) RIGHT SUBHEPATIC SPACE

Boundaries of this space

Superiorly – by inferior surface of right lobe of liver

Inferiorly -- by the hepatic flexure and the transverse mesocolon.

Medially --second part of the duodenum and hepatoduodenal ligament,

Laterally -- by the body wall.

Posteriorly-- it opens into Morison's pouch,

In recumbence Morison's pouch is the most dependent part of peritoneal cavity, so it is prone to fluid accumulation and abscess formation.

## 2) RIGHT SUBPHRENIC SPACE

It lies between the right hemi diaphragm and superior surface of right lobe of the liver.

Medially bounded by falciform ligament.

Posteriorly bounded by right triangular ligament and coronary ligament of liver.

## 3) LEFT SUBPHRENIC SPACE

This is an huge space that extending from above the left lobe of liver, upto the spleen , posteriorly and to beneath the left lobe of the liver, anteroinferiorly.

It has got two components;

The subphrenic and the subhepatic component.

The subphrenic space extends laterally between the diaphragm and the spleen and inferiorly it passes between the spleen and kidney.

*Subhepatic component communicates freely with the subphrenic component around the lateral aspect of left hepatic lobe*

## 4) PARACOLIC GUTTERS

These potential spaces lay between ascending colon and the body wall on right side, descending colon and body wall on left side

On the left side phrenocolic ligament prevents communication between the gutter and the subphrenic space

Inferiorly sigmoid colon limits gutter communication with the pelvis.

*On the right side, paracolic gutter freely communicates with the right subphrenic, subhepatic spaces and pelvis.*

## 5) LESSER SAC

Lesser sac lies posterior to stomach and gastro hepatic ligament.

Superiorly--it extends behind the caudate lobe of liver

Inferiorly -- it extends upto transverse mesocolon.

Posterior border of the lesser sac is formed by anterior surface of the pancreas.

Though lesser and greater sacs communicates freely through foramen of Winslow. Spreading of infection from greater to lesser sac is uncommon. Usually infections of lesser sac originate from the surrounding organs for example stomach or pancreas.

## 6) PELVIC CAVITY

In upright and semirecumbent positions this is the most dependent area of the peritoneal cavity.

Anteriorly pelvic cavity is bounded by the urinary bladder and body wall.

Posteriorly by rectum and bony pelvic wall.

In females, the space is subdivided into anterior (utero-vesical pouch) and posterior (rectouterine pouch) by uterus. Pelvic abscess commonly localised to utero-vesical pouch.

## **PHYSIOLOGY OF THE PERITONEAL CAVITY**

It is a single layer of mesothelial cells, on the basement membrane supported by a highly vascularized connective tissue. The surface area of the peritoneum is large in the adult male it averages around  $1.8 \text{ m}^2$ . It has been estimated that a 1 mm increase in the thickness of the peritoneum by fluid accumulation can result in the sequestration of 18 L of fluid, a fact relevant to the massive fluid shifts associated with diffuse peritonitis.

The peritoneum covers interior surface of the diaphragmatic surface, abdominal wall, retroperitoneal and pelvic surfaces and intra-abdominal viscera. The peritoneum forms a closed sac in males, in females maintains continuity with the mucous membranes of fallopian tubes.

About  $1 \text{ m}^2$  of peritoneum, function as a passive, semi permeable membrane allowing diffusion of water, electrolytes, and some macromolecules.

Under normal conditions, peritoneal cavity contains  $<50 \text{ mL}$  of sterile fluid which resembles lymph fluid with low specific gravity, low protein content and  $<3000$  cells per cu mm. This fluid is secreted from the visceral peritoneal surfaces. This fluid is constantly circulated through the peritoneal cavity.

Primarily peritoneal fluid transmigrates towards the right subphrenic area and into the pelvis. It is believed that negative pressure in the subphrenic space created by diaphragmatic motion is responsible for this kind of cephalic movement.

Lymphatic of parietal peritoneal surfaces absorbs most of peritoneal fluid, remaining is absorbed through diaphragmatic lymphatics. Diaphragmatic lymphatics also clear particulate matter, cells and microorganisms present in peritoneal fluid, thus contributing to the peritoneal defence mechanism.

Similar to inflammation in other parts of body peritoneal inflammation is characterized by

Hyperemia.

Influx of fluid.

Recruitment of phagocytic cells and

Fibrin deposition.



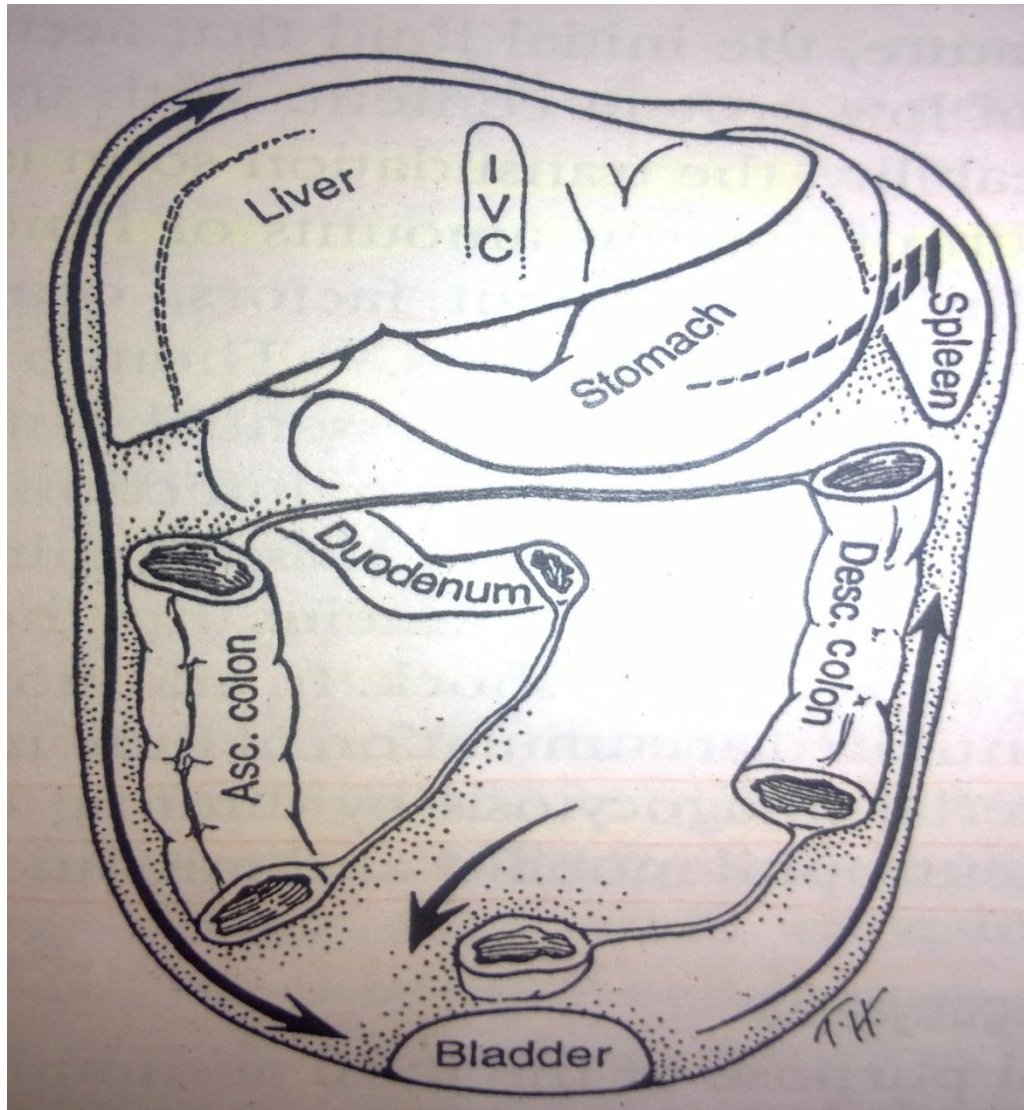


FIGURE 2

ARROW SHOWS THE MOVEMENT OF PERITONEAL FLUID IN PERITONEAL CAVITY

# GENERAL RULES FOR EXAMINATION OF A POSTOPERATIVE PATIENT

## Always know

- 1) *Abdominal pain* is not very useful diagnostic sign in post-operative period.
- 2) *Abdominal distention* can be decreased by ryles tube suctioning.
- 3) *Fever* is masked by antibiotics.

So it becomes very difficult to examine the patient and diagnose the complication. In these circumstances repeated evaluation of all postoperative signs and changes will help in making the appropriate diagnosis.

## EXAMINATION AT THE FOURTH DAY

A complete examination of the patient must be carried out on the fourth day. The fourth postoperative day as a rule marks the beginning of convalescence.

*The patient who has slept well, gets up and walks alone, and eats and goes to the toilet by himself is convalescing.* The surgeon should still examine the patient completely at this time.

## FEVER CURVE

The fever is commonly due to atelectasis. A spiking fever should be a worry. Each rise in degree may be a sign of an anastomotic leak, an abscess formation, or a hematoma which is being infected. Urine should be checked for cloudiness, which may be an indication of pyuria.

## AGITATION

Postoperative patients are usually calm if adequate analgesics are given. If they are agitated and thirsty we should look for other signs of complication. In these the patient avoids sedation.

## EXAMINATION OF ABDOMEN

The abdomen expected to be soft, flat, and free of pain by the fourth day. A detailed abdominal examination should not be delayed beyond 4th day. The complete examination on 4<sup>th</sup> day will be very useful. If any abnormality is detected immediate laboratory and radiological investigation should be carried out instead of applying wait and watch policy.

## **COMMON INDICATIONS OF RELAPAROTOMY ARE BRIEFLY EXPLAINED BELOW**

- 1) Leakage from intestinal repair site or anastomotic site.
- 2) Intra operative hemorrhage.
- 3) Enterocutaneous fistula.
- 4) Persistent peritonitis.
- 5) Persistent intra-abdominal abscess.
- 6) Burst abdomen.
- 7) Stomal complication.
- 8) Early post-operative intestinal obstruction.
- 9) Progressive intestinal necrosis.

## 1) ENTEROCUTANEOUS FISTULA



PHOTO 1

PHOTO SHOWING ENTEROCUTANEOUS FISTULA WITH  
IMPENDING WOUND DEHISCENCE FOLLOWING LOWER GI  
SURGERY

A fistula is an abnormal transmural communication between two epithelized surfaces. In the past most gastrointestinal-cutaneous fistulas were spontaneous in origin.

At present, instrumentation or operations are the common causes. Postoperative enterocutaneous fistulas usually occur when patient preparation poor, (emergency procedures), patient previously treated with radiation therapy.

High risk surgeries for fistula formation are generally of three types:

- 1) Cancer operations.
- 2) Operations for inflammatory bowel disease and
- 3) Adhesions release which are present as the result of previous surgery.

## CLASSIFICATION OF GASTROINTESTINAL FISTULAS.

### 1) Anatomic

Internal or External

Internal -- Fistula between internal organs. Example Colovesical fistula.

External -- Enterocutaneous fistula.

## 2) Physiologic

Depending on quantity of fistula Output (ml/day)

Low <200 ml/day

Moderate 200-500ml/day

High >500ml/day

## 3) Etiologic

Depending on underlying disease process.Malignant or non malignant.

## ETIOLOGY

Aetiology of fistula is very important for deciding management plan.

This is because few fistulas spontaneously close depending on site of origin.

### *A) Spontaneous fistulas*

15% to 25% enterocutaneous fistulas are Spontaneous in origin.

Few common causes include

- 1) Radiation.
- 2) IBD.
- 3) Diverticular disease.
- 4) Appendicitis.
- 5) Malignancies.
- 6) Perforation of duodenal ulcer.
- 7) Intestinal actinomycosis.

8) TB.

### *B) Iatrogenic*

75% to 85% of enterocutaneous fistulas are iatrogenic in origin.

High risk surgeries for fistula formation are generally of three types:

1) Cancer operations.

2) Operations for inflammatory bowel disease and

Adhesions release which are present as the result of previous surgery.

## GASTRIC FISTULAS

85% to 90% of cases are postoperative in origin. Anastomotic leakage or fistula formation after gastric resection for cancer is an ominous occurrence.

Gastric leak occurs in

6% to 8% cases under going gastric resection.

3% cases under going bariatric operation.

Rare following resection for ulcer disease.

Mortality is between 15% to 20%. And it increases to if output is >200ml/day, and reaches 60% when malnutrition is present.



## DUODENAL FISTULAS

50% to 80% are postoperative in origin. The mortality ranges from 7% to 67% with an average of 28%. Occur as the result of complications after gastric resections or, duodenum, pancreas, operations on the biliary tract, right colon, kidney and aorta.

Factors associated with increased mortality include

- 1) Uncontrolled sepsis.
- 2) Age >65.
- 3) Output >500 ml/24 hours.
- 4) Malnutrition.
- 5) Multiple operations.

Uncontrolled sepsis is the most important factor when it is present; mortality is between 70% to 100%.

## SMALL INTESTINAL FISTULAS

Most common type of GI fistulas encountered. 70% to 90% them occur after an operative procedure. The different complications leading to fistula formation include,

Leak in anastomosis (most common).

Unrecognized injury to the bowel at the time of lysis of adhesions.

Inadvertent suture of the bowel at the time of abdominal closure.

Postoperative complications particularly fistula formation can be decreased by well vascularized, tension-free anastomoses performed in nutritionally replete patients.

## COLONIC FISTULAS

These are primarily the result of diverticulitis, IBD, cancer, appendicitis, radiation therapy or secondarily from surgical treatment of these diseases. They are generally low output.

Adjuvant radiotherapy following surgery has improved long term survival of colonic malignancies, but it has led to a 5% to 15% development of radiation-induced gastrointestinal complications, particularly anastomosis breakdown.

Few techniques which help in decreasing postoperative leaks and fistula formation from irradiated pelvic anastomoses are,

- Anastomotic coverage.
- Filling-irradiated dead space with muscle flaps.
- Sigmoid exclusion.
- Anal pull-through procedures.

## PATHOPHYSIOLOGY

Fistulas lead to fluid loss, electrolyte imbalance, minerals and protein loss leading to malnutrition and sepsis.

Patients with the following nutritional characteristics have been shown to be at increased risk for anastomotic breakdown and subsequent fistula formation:

- Weight loss of 10% to 15% total body weight over a short period (3 to 4 months).
- Serum albumin <3 gm/dL.
- Serum transferrin <220 mg/dL.

## PREVENTION

- 1) Mechanical bowel preparation should be given to decrease these bacterial counts.
- 2) Intraluminal antibiotic and Systemic antibiotics with activity against enteric organisms should be administered preoperatively, and readministered throughout the procedure.
- 3) On-table luminal preparation.
- 4) Anastomoses should be done in healthy bowel with adequate blood supply, without tension.

- 5) Perfect haemostasis should be achieved to prevent unnecessary devascularisation.
- 6) The abdominal wall should be closed securely after an anastomosis to prevent exposure of a fresh suture line and to help seal any minor leaks.
- 7) Fresh anastomoses should not be allowed to come into direct contact with the abdominal closure suture line and should be covered by fat or omentum.
- 8) The inflammatory process of two adjacent healing suture lines may predispose to fistula formation.
- 9) At the end of an abdominal procedure, unless it has been removed, the greater omentum should be placed back in its anatomic position covering the intestines.
- 10) Dead space should be filled with live tissue or drained with closed suction.
- 11) Mid drains should be kept away from the anastomosis.
- 12) Finally, the patient should be fully hydrated to provide adequate circulatory support and to prevent hypotension that may predispose to fistula formation.

## TREATMENT

There is no correlation between the quantity of fistula output and spontaneous closure. Anatomic and etiologic factors are more important for predicting spontaneous closure. Initially conservative treatment should be employed followed by surgical management if needed. Few points which in deciding line of management are out lined below.

*The highest rate of spontaneous closure occurs in*

- Oropharyngeal
- Oesophageal
- Duodenal stump
- Pancreatobiliary,
- Jejunal fistulas.

*Resistant to spontaneous closure*

- Fistulas arising from the stomach
- Ligament of Treitz or ileum.

*Other factors responsible for non-healing of fistula*

- Large adjacent abscesses.
- Intestinal discontinuity.
- Distal obstruction.

- Poor adjacent bowel.
- Fistula tracts <2 cm in length.
- Enteral defect >1 cm<sup>2</sup>.
- Fistulas arising from radiation damaged intestine and recurrent carcinoma.

## MANAGEMENT PHASES FOR GASTROINTESTINAL FISTULA

### 1) PHASE ONE --- STABILIZATION (done within 24 to 48 hrs )

- Rehydration.
- Correction of anemia.
- Drainage of sepsis.
- Electrolyte repletion.
- Oncotic pressure restoration.
- Nutrition support institution.
- Control of fistula drainage.
- Local skin care.

### 2) PHASE TWO --- INVESTIGATION (7 to 10 days)

- Fistulogram to define anatomy and pathophysiology.
- CT to localize collections.
- OGD or colonoscopy as indicated.

### 3) PHASE THREE --- DECISION MAKING (10 days to 6weeks)

- Assess likelihood of spontaneous.
- Closure.
- Plan therapeutic closure.
- Decide surgical timing.

### 4) PHASE FOUR --- DEFINITIVE THERAPY (after 4 to 6weeks, when spontaneous closure is unlikely).

- Plan operative approach.
- Bowel resection with end to end anastomosis.
- Ensure secure abdominal closure.
- Gastrostomy and Jejunostomy as indicated.

### 5) PHASE FIVE --- HEALING

- Continue nutrition support
- Trial feedings.

## **2) POSTOPERATIVE INTRAPERITONEAL HEMORRHAGE**

Acute intraperitoneal bleeding is usually easy to recognize during convalescence.

Common signs are

- Tachycardia.
- Drop in BP and central venous pressure.
- Decreased urine output.
- Cold extremities.
- Thirst, air hunger and apprehension with fainting.

At this point immediately examination of the patient should be carried out, before deep shock develops.

On the other hand, the medical causes of collapse, such as coronary occlusion or pulmonary embolism, must be ruled out.

It will be very difficult to find out the etiology of severe haemorrhage in those patients who underwent uneventful.



We should always follow a routine under these circumstances:

- 1) Make sure that adequate replacement of blood and fluids has been made.
- 2) Review the history and physical examination.
- 3) Make sure no error in cross matching during transfusion.
- 4) Rule out postoperative pancreatitis.

If above problems are ruled out, likely cause of shock is internal hemorrhage and reoperation is needed.

*We should always remember Transfusions will correct the effect but not the cause.*

### **3) ILEUS AND EARLY POSTOPERATIVE BOWEL OBSTRUCTION**

Though both these conditions present with similar complaints differentiation between them is must because treatment plan is completely different. Obstruction occurring within 30 days after surgery is known as early postoperative bowel obstruction. It may be functional or mechanical.

#### **1) FUNCTIONAL (i.e., ileus)**

Functional obstruction is caused by inhibition of propulsive bowel activity. It is of two types.

##### *Primary or postoperative ileus*

This usually occurs immediately following surgery, without any identifiable precipitating factors and usually resolving within 2 to 4 days.

##### *Secondary, adynamic or paralytic ileus*

This usually occurs as a result of a precipitating factor and there will be delay in return of bowel activity.

Ileus is mainly due to alteration in the contractile activity of the bowel, which is governed by a complex interaction among the enteric

nervous system, central nervous system, hormones, and local molecular and cellular inflammatory factors

## PATHOPHYSIOLOGY

1) During Surgery manipulation of the bowel result in

- Sustained inhibitory sympathetic activity.
- Release of hormones and neurotransmitter.
- As well as activation of a local molecular inflammatory response.

All these results in suppression of the neuromuscular apparatus.

2) Restriction of oral intake and postoperative narcotic analgesia during immediate postoperative period also contribute to altered small bowel motility.

3) Use of Opiates and opioid peptides for pain relief also suppress neuronal excitability enteric nervous system.

4) After transection and reanastomosis of the small bowel, the distal part of the bowel does not react to the pacemaker (found in the duodenum), and the frequency of contractions decreases.

## 5) Other causes of adynamic ileus

- Pancreatitis.
- Intra-abdominal infection (peritonitis or abscess).
- Retroperitoneal hemorrhage and inflammation electrolyte abnormalities.
- Lengthy surgical procedure and prolonged exposure of abdominal contents.
- Medications (e.g., narcotics, psychotropic agents).
- Pneumonia.
- Inflamed viscera.

## 2) MECHANICAL BOWEL OBSTRUCTION

It is caused by mechanical barrier. Barrier may be luminal, mural, or extraintestinal.

Mechanical early postoperative small bowel obstruction caused by

- Adhesions (90%) most common cause.
- Phlegmon or Abscess.
- Internal hernia.
- Intestinal ischemia.
- Intussusception (rare).

Mechanical early postoperative small bowel obstruction may be

- Partial or complete,
- High or low,
- Closed or open end,
- Uncomplicated or complicated.

## PRESENTATION

In patients with early postoperative small bowel obstruction bowel activity won't be seen or there may be temporary return of bowel function.

In mechanical obstruction, the obstruction may be partial or complete, may occur in the proximal part of the small bowel (high obstruction) or in the distal part of the small bowel (low obstruction), and may be a closed loop or open-ended obstruction.

Usually there will be stasis and accumulation of gastric and intestinal secretions and gas. The bowel will lose its tone and dilate. All these factors results in abdominal distension, pain, nausea, vomiting, and obstipation.

The extent of the clinical features varies with the cause, degree, and level of obstruction. Patients with high mechanical small bowel

obstruction vomit early in the course and usually have minimal distension. The vomitus is generally bilious.

Patients with distal obstruction, vomit later in the course and have more abdominal distension. The vomitus may initially be bilious and then becomes feculent as the disease progresses.

Differentiation between adynamic ileus and mechanical obstruction can be difficult.

#### IN ADYNAMIC ILEUS

- The stomach, small bowel, and colon are affected.
- Patients have discomfort but no sharp colicky pain and a distended abdomen.
- Bowel sounds will be absent or sluggish.

#### WITH MECHANICAL OBSTRUCTION

- High-pitched, tinkling sounds may be detected.
- Fever, tachycardia, manifestations of hypovolemia, and sepsis may develop.

#### DIAGNOSIS

The diagnosis of bowel obstruction is usually based on clinical findings and plain radiographs of the abdomen. In the postoperative period, differentiation between adynamic ileus and mechanical

obstruction is important because the treatment for both is completely different.

A CT scan, abdominal radiographs, and small bowel follow-through are used to make diagnosis and to decide treatment plan.

*In adynamic ileus, abdominal radiographs reveal*

- Diffusely dilated bowel throughout the intestinal tract.
- With air in the colon and rectum.
- Air-fluid levels may be present.

*In mechanical bowel obstruction abdominal radiographs reveal*

- There is small bowel dilation with air fluid levels.
- Thickened valvulae conniventes in the bowel proximal to the point of obstruction.
- Little or no gas.



PHOTO 2

X RAY SHOWING DILATED BOWEL LOOPS WITH MULTIPLE  
AIR FLUID LEVEL



## ROLE OF CT SCAN

A CT scan is more accurate for differentiating functional from mechanical obstruction.

- It clearly identifies the transition point or cutoff point at the obstruction site in cases of mechanical obstruction.
- It also determines the level (high or low).
- Degree of obstruction (partial or complete).
- Differentiates between uncomplicated and complicated obstruction.
- Identifies specific types of obstruction.
- CT may identify other associated disease states.

## TREATMENT

Preventive measures must be started intra-operatively and continued in the immediate postoperative period.

Following should be followed during surgery

- 1) Aeffort must be made during any abdominal operation to minimize injury to the bowel and other peritoneal surfaces, which is a recognized source of adhesion formation.
- 2) During the operation, the surgeon must handle the tissues gently and limit peritoneal dissection to only what is essential.
- 3) The bowel must not be allowed to desiccate by prolonged exposure to air without protection.

- 4) Moist laparotomy pads must be used to cover the bowel and must be moistened frequently if contact with the bowel is prolonged.
- 5) Instrument injury to the bowel must be avoided.
- 6) Adjunctive measures, such as antiadhesion barriers, may be considered.

Few antiadhesion barriers are available, like an oxidized cellulose product and a product that is a combination of sodium hyaluronate and carboxymethyl cellulose.

These agents may inhibit adhesions wherever they are placed.

- 7) In the postoperative period, electrolyte levels are monitored and any imbalance corrected.
- 8) Alternative analgesia to narcotics, such as NSAIDs and placement of a thoracic epidural with local anaesthetic, may be used when possible.
- 9) Intubation of the stomach with an NG tube needs to be applied selectively.

The use of prokinetic agents does not alter the outcome.

Once early postoperative obstruction is suspected or diagnosed, a three-step approach is essential to guarantee a favourable outcome

- 1) Resuscitation,
- 2) Investigation,
- 3) Surgical intervention.

*Emergency relaparotomy is performed if there is a*

- Closed- loop obstruction.
- High-grade.
- Complicated small bowel obstruction.
- Intussusception.
- Peritonitis.

Adynamic ileus is treated by resolving some of the causes mentioned earlier and waiting expectantly for resolution, with surgery not usually being required.

Partial mechanical small bowel obstruction is also initially managed expectantly, if the patient is stable and there is clinical and radiologic improvement. Surgical intervention is performed if there are signs of deterioration or no improvement.

## **4) ABDOMINAL COMPARTMENT SYNDROME(ACS)**

In healthy individuals, IAP ranges from subatmospheric to 5 mm Hg and fluctuates with respiration, body mass index and activity

Abdominal compartment syndrome (ACS) describes increasing organ dysfunction or failure as a result of intra-abdominal hypertension (IAH).

### **INTRA-ABDOMINAL HYPERTENSION (IAH) –**

Defined as intra-abdominal pressure(IAP) consistently more than 12 mm Hg, determined by a minimum of three measurements conducted 4 to 6 hours apart, measured at the end of expiration in a relaxed patient.

ACS may be primary or secondary and develops when IAP is 20 mm Hg or higher, with or without abdominal perfusion pressure (APP) less than 50 mm Hg (at of one or more organ systems that was not present previously).

Primary ACS develops as a result of pathologic IAH caused by intra-abdominal pathology.

Secondary ACS develops in the absence of intra-abdominal primary pathology, injury, or intervention.

## PRIMARY ACS

It commonly occurs in patients of multiple trauma.

### Causes

- Ileus due to bowel edema and peritonitis.
- Capillary leak.
- Massive fluid resuscitation and blood transfusion.
- Continued bleeding, coagulopathy.
- Packing used to control bleeding.

In these circumstances closure of a noncompliant abdominal wall under tension is associated with IAH in most of cases.

In nontraumatic post-operative patients, IAH and possibly primary ACS may develop in patients after reduction of chronic hernias, after repair of ruptured abdominal aortic aneurysm or the patients with retro-peritoneal hemorrhage, ascites, and pancreatitis.

## SECONDARY ACS

It is usually iatrogenic and commonly seen in patients with shock who require aggressive fluid resuscitation with crystalloids.

## PATHOPHYSIOLOGY OF ACS

After uncomplicated abdominal surgery, IAP will measure between 3 to 15 mm Hg. IAP reflected by intra-abdominal volume and abdominal wall compliance. When there is increase in volume and decrease in compliance, IAP increases leading to IAH. The deleterious effects increase in IAP is observed in the intra- and extra-abdominal organs and abdominal wall.

- RESPIRATORY SYSTEM

Here the effects are due to upward displacement of the diaphragm resulting in decreased thoracic volume and compliance and increased intrapleural pressure. Further leading to ventilation-perfusion mismatch, hypoxia, hypercapnia and acidosis.

- CARDIAC SYSTEM

Here the cardiac output is decreased due to compression of the inferior vena cava and portal vein resulting in decreased venous return. Left ventricular compliance will also be decreased due to increased intrathoracic pressure.

- RENAL SYSTEM

Due to direct compression of the kidneys, venous outflow will be obstructed and prerenal vascular resistance increases resulting in decreased glomerular filtration rate, renal plasma flow and urine output.

- SPLANCHNIC CIRCULATION

There will be decrease in splanchnic perfusion due to compression of the mesenteric vasculature subsequently leading to decreased hepatic arterial flow.

- CENTRAL NERVOUS SYSTEM

Elevated central venous pressure interferes with venous cerebral outflow, with consequent cerebral pooling and increase in intracerebral pressure and decreased cerebral perfusion.

Abdominal wound complications are seen due decreased blood flow to the abdominal wall.

## MANAGEMENT

### DIAGNOSIS

Is mainly on clinical grounds. In suspected patients IAP can be measured and monitored by urinary bladder catheter or gastric catheter.

### PREVENTION

Primary ACS can be prevented by leaving the peritoneal cavity open in patients who are high risk for developing IAH after high-risk surgical procedures.

## TREATMENT

Conservative fluid resuscitation, administration of analgesia, Sedatives and pharmacologic paralysis, patient positioning, drainage of intra-abdominal fluid, decompression by surgical intervention.

*The decision to intervene surgically is not based on IAH alone but rather on the presence of organ dysfunction in association with IAH.*

## POST-SURGICAL DECOMPRESSION

In primary ACS, surgical decompression is done by reopening of the preexisting laparotomy incision and treating the cause for ACS.

But decompression leads to severe hypotension as a result of sudden decrease in systemic vascular resistance, and abrupt increase in the true tidal volume delivered to the patient, and washout of the by-products of anaerobic metabolism from below the diaphragm. This results in respiratory alkalosis, decrease in effective preload. Due to increase in serum potassium arrhythmia or asystolic arrest may be seen.

So, decompression should be performed after adequate preload replacement. Once patient's condition becomes stable, the patient may be returned to the operating room for definitive closure. If primary closure is not possible, closure may be affected with skin flaps only, bilateral medial advancement of rectus muscle and its fascia with lateral skin relaxation



incisions, composite mesh, bioprosthesis or tissue expanders and myocutaneous flaps.

## **5) STOMAL COMPLICATIONS**



**PHOTO 3**

**PHOTO SHOWING MINIMAL MARGINAL NECROSIS AND  
PROXIMAL LOOP RETRACTION OF COLOSTOMY.**



Construction of a stoma for any pathology beholds a major psychological and physical stress on a patient. This magnifies with the onset of any complications of a stoma such as:-

1. Stomal necrosis
2. Stomal obstruction
3. Stomal prolapse
4. Stomal retraction.

Any such complication requires re-creation of the stoma with a more meticulous operation. Re-entering the Pandora box in such conditions poses a major challenge to the surgical team and tests to the core the competence and surgical skill of the team.

The various problems that a surgeon may encounter in such early re-exploration include

1. Entering an area of fibrinous adhesions where it may be difficult to identify any structures
2. Mobilising the length of intestine to bring out a second stoma
3. Risk of obliterative peritonitis & secondary peritonitis
4. Difficult closure of the skin due to its friability.

After a second stoma creation the patient is prone to various complications such as

1. Injury to the adjacent bowel and creation of an iatrogenic fistula
2. Tension on the intestine leading to the ischemia of the stomal edge
3. Stomal herniation and parastomal herniation due to widening of the myo-aponeurotic aperture created for the stoma

Hence the following precautions need to be taken at the time of both the primary and secondary procedures

1. Perfect surgical technique
2. Adequate mobilization of the bowel
3. Proper anchorage to the skin and rectus
4. Proper post-operative stomal and skin care

In relaparotomy the following need to be ensured

1. Optimization of the patient to as near physiological condition as possible
2. Generous incision
3. Gentle handling with extreme caution
4. Limited usage of energy sources
5. Perfect hemostasis
6. Decision of exteriorization / laparostomy as the condition governs.

## 6) BURST ABDOMEN



PHOTO 4

PHOTO SHOWING BURST ABDOMEN WITH EVISCERATION

Acute wound failure (wound dehiscence or a burst abdomen) refers to postoperative separation of the abdominal musculoaponeurotic layers. Acute wound failure occurs in approximately 1 % to 3% of patients who undergo an abdominal operation.

Dehiscence most often develops 7 to 10 days postoperatively but may any time after surgery, from 1 to more than 20 days. Burst abdomen is of two types namely partial thickness burst and full thickness burst.

It is among the most dreaded complications faced by surgeons and is of great concern because of the risk of evisceration, the need for some form of intervention, and the possibility of repeat dehiscence, surgical wound infection, and incisional hernia formation.

## FACTORS ASSOCIATED WITH WOUND DEHISCENCE

- 1) Technical error in fascial closure (placing sutures too close to the edge, too far apart, or under too much tension in appropriate suture materials)
- 2) Emergency surgery
- 3) Intra-abdominal infection
- 4) Advanced age
- 5) Wound infection, hematoma, and seroma.
- 6) Elevated intra-abdominal pressure
- 7) Obesity

- 8) Chronic corticosteroid use
- 9) Previous wound dehiscence
- 10) Malnutrition, Systemic disease (uremia, diabetes mellitus)
- 11) Radiation therapy and chemotherapy.

## PRESENTATION

A sudden, dramatic drainage of a relatively large volume of a clear, salmon colour fluid precedes dehiscence in 25% of patients. More often, patients report a ripping sensation.

## PREVENTION

Prevention of acute wound failure is largely a function of careful attention to technical detail during fascial closure, such as

- 1) Proper spacing of the suture,
- 2) Adequate depth of bite of the fascia,
- 3) Relaxation of the patient during closure,
- 4) Achieving a tension free closure.
- 5) For very high-risk patients, interrupted closure is often the wisest choice.
- 6) Alternative methods of closure must be selected when primary closure is not possible without undue tension.



## TREATMENT

Treatment of dehiscence depends on the extent of fascial separation and the presence of evisceration and/or significant intra-abdominal pathology (e.g., intestinal leak, peritonitis).

A small dehiscence, especially in the proximal aspect of an upper midline incision 10 to 12 days postoperatively, can be managed conservatively with saline moistened gauze packing of the wound and use of an abdominal binder. In the event of evisceration, cover the eviscerated intestines with a sterile, saline moistened towel and preparations made to return to the operating room after resuscitation.

Similarly, if probing of the wound reveals a large segment of the wound that is open to the omentum and intestines, or there is peritonitis or suspicion of intestinal leak, complete relaparotomy should be made.

Once in the operating room, thorough exploration of the abdominal cavity is performed to rule out the presence of a septic focus or an anastomotic leak that may have predisposed to the dehiscence. Infection should be controlled before attempting to close.

Management of the incision is a function of the condition of the fascia. When technical mistakes are made and the fascia is strong and intact, primary closure is warranted. If the fascia is infected or necrotic,



debridement is performed. The incision can then be closed with retention sutures.

Closure with an absorbable mesh (polyglactin or polyglycolic acid) may be preferable because the mesh is well tolerated in septic wounds and allows bridging the gap between the edges of the fascia without tension, prevents evisceration, and allows the underlying cause of patient dehiscence to resolve.

The problems encountered in the treatment of burst abdomen include the common problems of bowel adhesions, friable tissues, difficulty in secondary closure of the abdomen. Moreover in partial thickness burst, the bowels may lie entirely in the subcutaneous plane and utmost care has to be taken during making of incisions to prevent an iatrogenic damage to the bowels.

Following precautions should be taken during a relaparotomy for a burst abdomen.

1. Carefully placed incision in partial thickness burst
2. Entry in a preferably in a virgin area of the abdomen
3. Gentle dissection and handling of the tissues
4. Exploring for possible abscess cavities and draining them all
5. Inspection of the viscera to rule out any injury

6. Obtain a secure closure with placement of tension sutures to amplify the closure.

Even with all the meticulous precautions taken, complications with their attendant morbidity and mortality are more common after second surgery especially for this condition.

In certain situations, a laparostomy can be considered a safer alternative to prevent the development of abdominal compartment syndrome. Any closure technique has to be accompanied by acceptance of a risk of possible future incisional hernia which may require surgical intervention. Hence it is best to prevent this condition at all costs by an appropriate closure for the first laparotomy and prevention of risk factors giving rise to a postoperative burst abdomen.

## **7) POST OPERATIVE PERITONITIS**



**PHOTO 5**

**PHOTO SHOWING DIFFUSE POST OPERATIVE PERITONITIS**

**WITH FRANK PUS.**

Source and nature of the microbial contamination divides Peritonitis into 3 types

*Primary peritonitis* defined as an infection (often monomicrobial), of the peritoneal fluid without visceral perforation. Source of the bacteria is an often extra *peritoneal*.

*Secondary peritonitis* is the most common form of peritonitis, refers to peritoneal infection arising from an *intra-abdominal* source, usually a perforation of a hollow viscus.

*Tertiary peritonitis* develops following the treatment of secondary peritonitis and represents either a failure of the host inflammatory response, or a super infection.

## SECONDARY PERITONITIS

Common cause of secondary peritonitis is hollow viscus perforation. Other cases are caused by complications of abdominal surgery, like anastomotic leak biliary leak.

Mortality rate varies according to disease pathology Perforated duodenal ulcer and perforated appendicitis -- 0% to 10%.

Ceacal perforation and diseases of the biliary tract -- 20% to 40%.

Leaking intestinal anastomosis -- 30%.

The presence of advanced age, renal, cardiac and hepatic, or pulmonary insufficiency, malignancy and diabetes all increase the mortality associated with bacterial peritonitis. It has noted that even 6hour delay prior to treatment can increase mortality from 10% to 20%.

The clinical presentation of peritonitis varies from acute abdominal pain to shock depending upon time of presentation since perforation.

Management includes plain chest x ray, erect abdominal x ray, and basic investigation including serum amylase to rule out pancreatitis USG and CT scan in required cases.

Once the clinical diagnosis of secondary peritonitis is made, both physiologic support and aggressive anti-infectivetherapy should be started immediately.

The primary objectives in the treatment are

- (1) Resuscitation,
- (2) Initiation of antibiotic therapy,
- (3) Emergency surgery,
- (4) Minimization of the source of bacterial contamination,
- (5) Reduction of the bacterial inoculum, and
- (6) Continued metabolic support.

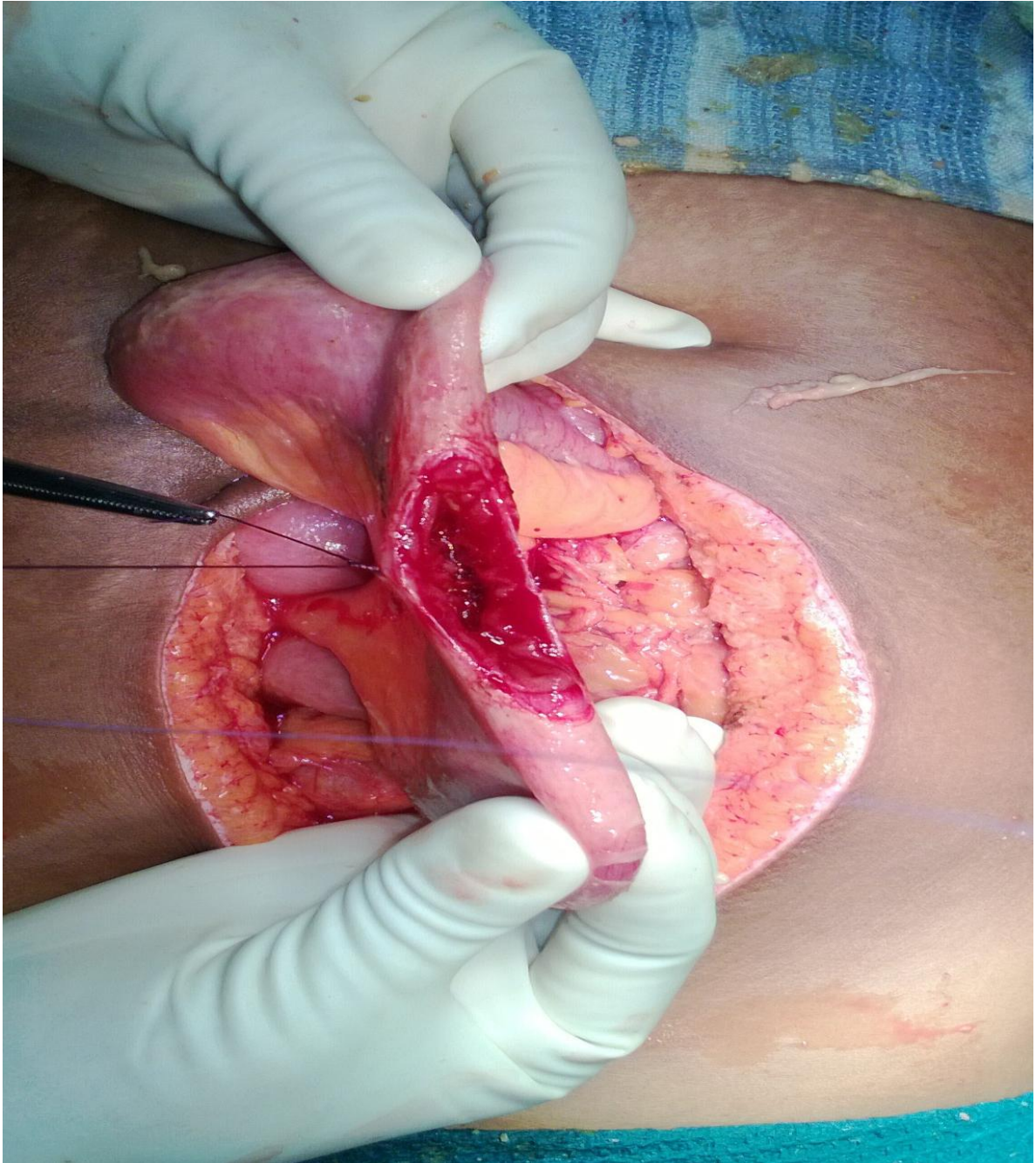


PHOTO 6

PHOTO SHOWING PERFORATION WITH TRIMMED EDGES  
WHICH IS SAFE FOR PRIMARY CLOSURE



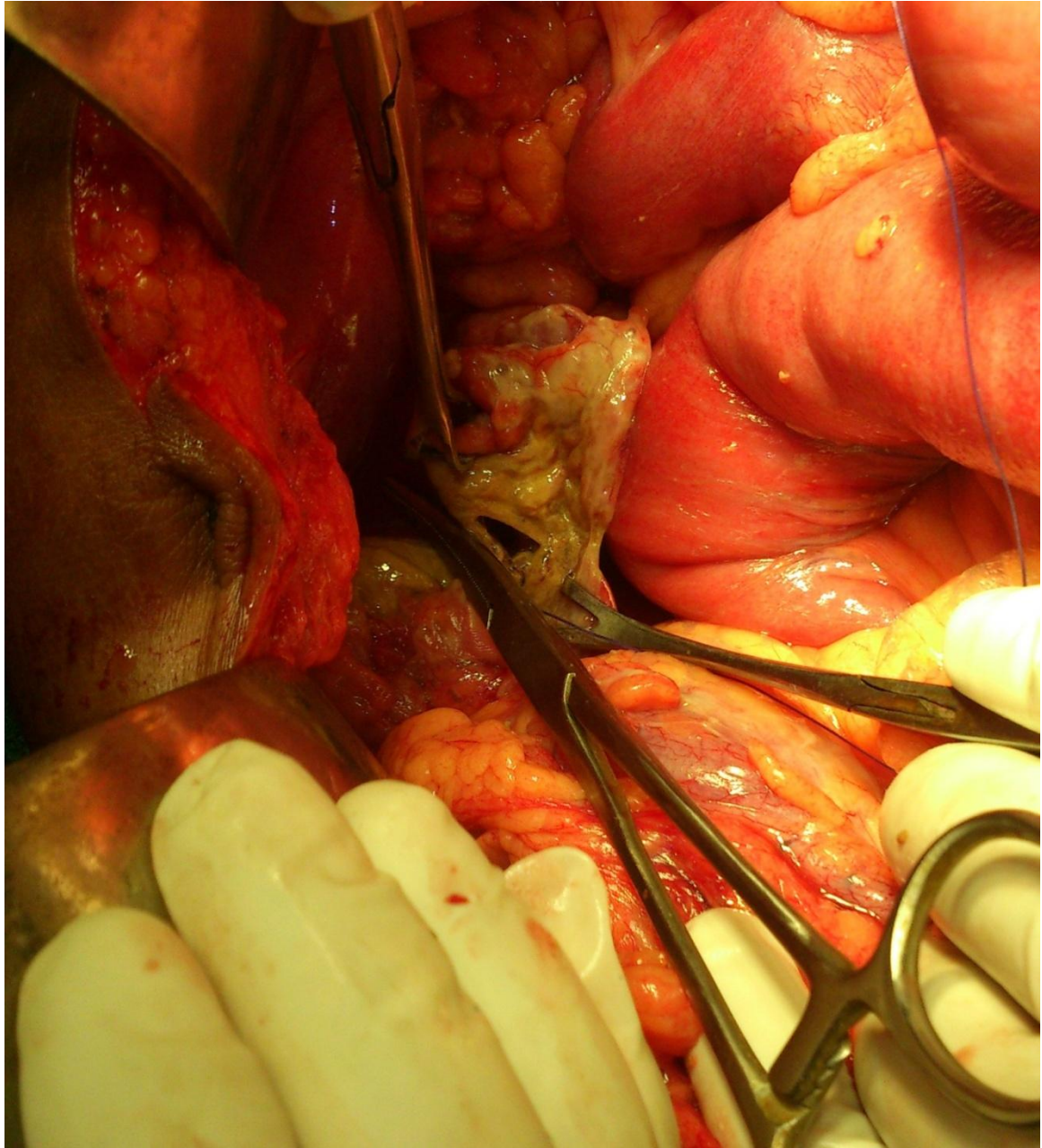


PHOTO 7

PHOTO OF DESCENDING COLON PERFORATION WITH UNHEALTHY  
EDGES WHERE PRIMARY CLOSURE IS NOT ADVISED

## TERTIARY PERITONITIS

Tertiary peritonitis refers to a persistent diffuse peritonitis usually following the initial treatment of secondary peritonitis. It is mainly because of both failure of *host responses and super infection*.

The clinical presentation includes low grade fever, leucocytosis, elevated cardiac output and low systemic vascular resistance. The general metabolism is elevated and these patients are in catabolic state. There will be dysfunction of one or more organ systems.

In spite of the indications of occult sepsis, in these cases both CT and laparotomy often fails to identify a focal source of infection. Instead, there will be diffuse peritoneal infection with a dispersion of fibrinous material over peritoneal surfaces. If superinfection is present, culture will yield two distinct categories of microorganisms.

(1) Infection with highly virulent gram-negative aerobic bacteria, such as *Pseudomonas* species, and *Serratia* species, with extensive antibiotic resistance characteristics (or)

(2) Infection with low-virulence organisms such as *Staphylococcus epidermidis*, enterococcus, and *Candida* species which are resistant to the initial antibiotic therapy.



Treatment in these circumstances depends upon culture and sensitivity along with relaparotomy and giving complete intra abdominal wash to reduce the bacterial load in required cases.

The presence of *Candida* in peritoneal fluid cultures should be treated with amphotericin B.

In the absence of a focal site of infection such as an intraperitoneal abscess, operative management has a remarkably minor role in the treatment of this entity.

Given the clinical presentation of this disease, the high failure rate of antibiotic therapy, and the failure of peritoneal defence mechanisms to localize infection, it is likely that tertiary peritonitis represents an abnormal host response.

Despite evidence of cytokine-mediated systemic symptoms, local defences are no longer competent. The development of multiorgan failure may be related to a loss of regulation of inflammatory mediators such as TNF and IL1.

## **8) INTRAPERITONEAL ABSCESSSES**

Intraperitoneal abscesses can occur in any location within the peritoneal cavity, even within abdominal viscera.

The most common mechanisms by which extravisceral abscesses formed are

- 1) As residual loculations following diffuse peritonitis,
- 2) Infection of an intraperitoneal fluid collection following laparotomy,
- 3) Leakage from a spontaneous visceral perforation or failed intestinal anastomosis.

Visceral abscesses commonly develop from the hematogenous or lymphatic seeding of solid organs, such as the liver, spleen or pancreas.

The various sites of extravisceral abscesses essentially reflect the potential spaces within the peritoneal cavity. The common sites of involvement are the subphrenic, subhepatic, lesser sac, paracolic gutters and pelvis.

The mortality of intraperitoneal abscesses treated without drainage is 100%. Currently, mortality associated with intraperitoneal abscess ranges from approximately 10% to 30%.

## CLINICAL PRESENTATION

Common clinical findings are high spiking fevers, mild localized abdominal pain, anorexia, and weight loss. However, the clinical findings vary considerably with the site of the abscess,

## DIAGNOSIS

It is very difficult to depend solely on physical examination of patient, especially in post operative patients.

Ultrasonography and CT have become mainstays in the diagnosis of intraperitoneal abscesses. CT is being the most accurate modality available at present.

## MANAGEMENT

Immediate attention should be given to the resuscitation and general support of the patient. The mainstay of treatment is drainage of the abscess, which can be accomplished by either percutaneous or surgical techniques.

Primary surgical drainage is indicated in any situation in which

- 1) The abscess is poorly defined or difficult to localize by imaging techniques(eg, interloop abscesses),
- 2) The abscess material is viscous or extensive necrotic debris is present(eg. pancreatic abscesses),

- 3) The approach for percutaneous drainage requires perforation of a hollow viscus (eg. lesser sac abscesses).

*Secondary surgical drainages* should be done if

- 1) Clinical signs of sepsis persist after percutaneous drainage or
- 2) Complete evacuation of the abscess cavity cannot be achieved.

***During operation,***

- The abscess wall should be identified,
- Cavity aspirated with a needle to confirm the nature of the abscess with the presence of pus.
- The abscess should then be widely opened and its contents evacuated.
- Necrotic tissue is debrided and copious irrigation of the cavity is performed. Drains are placed in dependent positions, and externalized via separate incisions, if necessary.

## SPECIFIC ABSCESS AND PREFERRED WAY OF DRAINAGE

### *Subphrenic and subhepatic abscess*

Percutaneous drainage of subphrenic and sub-hepatic abscesses is successful in up to 80% of cases. If surgical drainage of these abscesses is required, an extraperitoneal approach is preferred.

### Interloop abscess

Because of the ill-defined nature of these abscesses, and the difficulty in locating fluid collections, surgical drainage is the preferred approach.

Pelvic abscess - Percutaneous drainage is preferred.

## DIFFICULTIES DURING RELAPAROTOMY

Relaparotomy may be immediate unplanned or delayed planned. The difficulties encountered during immediate unplanned relaparotomy and delayed planned relaparotomy are quite similar with few differences.

Post operative adhesions being the most important one. To avoid these difficulties causing collateral damage relaparotomy should be done either within 6 days or after 6 weeks of primary surgery, which is not always possible.

Few difficulties encountered during relaparotomy are,

1. Poor general condition of patient with malnutrition.
2. Post operative intra abdominal adhesions.
3. Difficulty in closing abdominal wall during relaparotomy.

# 1) POOR GENERAL CONDITION OF PATIENT WITH MALNUTRITION.

Success or failure of relaparotomy depends on pre and post-operative nutritional status of patient. In almost all cases patient will be nutritionally deplete due to hyper catabolism resulting from previous surgery and the disease itself.

So whenever possible replacement of nutrition prior to relaparotomy should be done. Measurement of nitrogen balance is more reliable indicator of protein loss than change in body weight.

Good nutritional status will result in better anastomotic site healing, wound healing, and improve in immunological response and early post-operative recovery.

Options available for nutritional supplementation are

TPN—most important and most commonly used Others are,

Nasogastric feeding

Feeding gastrostomy

Feeding jejunostomy.

In general whenever GI tract is available it is the best, safest and cheapest means of providing nutrition.

## 2) POST OPERATIVE INTRA ABDOMINAL ADHESIONS.

Adhesions may be between bowel to bowel, bowel to peritoneal wall or at under surface of previous incisional site. They may be flimsy easily separable or thick inseparable which depends upon time interval between first and second surgery.

We should be very careful while opening the abdominal cavity because omentum or bowel is usually adherent to the under surface of the parietal peritoneum. The liver may be adhering to the uppermost part of an upper midline incision.

### FEW TIPS TO AVOID BOWEL INJURY

Preferably, the new incision should be extended a little proximal or distal to the old scar, and the peritoneum opened initially through this, it is hoped, unscarred area. If the area has been incised previously, the most delicate approach must be taken in incising the parietal peritoneum.

Finger exploration then will reveal the extent of the adhesions. Artery forceps are applied to the peritoneal edges while the assistant applies gentle traction. Under direct vision, the surgeon then must divide

the parietal adhesions with scissors or scalpel, keeping rigidly to the avascular line that can be defined where the adhesions attach to the parietal wall.

Any attempt to hurry this part of the operation will be met by annoying haemorrhage or, more seriously, by visceral damage. If bowel is densely adherent to the abdominal wall, it is wiser to take a sliver of parietal peritoneum or even subjacent muscle rather than risk opening the gut.

*It is better to have a little parietal wall on the intestine than to have intestinal mucosa on the parietal wall.*



### 3) DIFFICULTY IN CLOSING ABDOMINAL WALL DURING RELAPAROTOMY.

If primary closure is not possible, closure may be effected with

- 1) Skin flaps only,
- 2) Composite mesh,
- 3) Bioprosthesis,
- 4) Bilateral medial advancement of rectus muscle and its fascia with lateral skin relaxation incisions, or
- 5) Tissue expanders and myocutaneous flaps.

## **MATERIALS AND METHODS**

# **MATERIALS AND METHODS**

## **STUDY DESIGN:**

The study was performed as a prospective, non-randomized, observational study.

30 patients admitted in Coimbatore Medical College and Hospital who underwent relaparotomy were included in the study, after taking consent.

## **Inclusion criteria:**

- 1) Age above 12 years.
- 2) Patients undergoing Relaparotomy.

## **Exclusion criteria:**

- 1) Patients who received damage control surgery in primary surgery.
- 2) Patients who received minimally invasive surgery as percutaneous drainage in primary surgery.
- 3) Patients undergoing first laparotomy in other hospital.

## **STUDY PERIOD:**

November 1, 2012 to October 30, 2013 (Time frame of 12 months).

## **METHODOLOGY:**

Post-operative complications were determined mainly by careful clinical examination and close observation of altered general condition of patients or detection of presence of blood or inflammatory material or intestinal content causing treatment resistant peritonitis in the drain in postoperative period. This was supported by laboratory and radiological examination of patients.

The following parameters were considered as Relaparotomy decision criteria:

1. Existence of hemorrhage resistant to medical treatment.
2. Existence of progressive peritonitis.
3. Existence of abscess where percutaneous drainage is either impossible or ineffective.
4. Continuous contamination of abdominal cavity with fecal content.
5. Existence of progressive necrosis.
6. Existence of ileus resistant to decompression or medical treatment.
7. Worsening of patient's clinical condition despite medical treatment.

In the study following details were studied

- 1) Demographic features of the patients.
- 2) Initial diagnoses of the patients.
- 3) The reasons for their initial surgery.
- 4) Type of initial surgery (elective/emergency).
- 5) Their postoperative complications.
- 6) The average interval between the first laparotomy and relaparotomy.
- 7) The number of relaparotomies.
- 8) Associated co morbidity and its influence on outcome of relaparotomy.
- 9) Duration of hospital stay.
- 10) Outcome of relaparotomies was studied.
- 11) Factors associated with outcome of relaparotomy.

## **RESULTS**

## **RESULTS**

Out of 622 laparotomies done in our hospital from November 1, 2012 to October 30, 2013 (Timeframe of 12 months), 30 patients underwent relaparotomy for different indications, bringing the incidence of relaparotomy in Coimbatore Medical College Hospital to 4.8%.

### **1) COMMON INDICATIONS WERE**

- 1) Anastomotic leak (n=7, 23%).
- 2) Post-operative intra-abdominal infection (n=7, 23%).
- 3) Burst abdomen (n=6, 20%).
- 4) Enterocutaneous fistula (n=3, 10%).
- 5) Persisting intra-abdominal abscess (n=2, 7%).
- 6) Stomal complication (n=2, 7%).
- 7) Post-operative haemorrhage (n=2, 7%).
- 8) Persisting intestinal gangrene (n=1, 3%).

### **2) AGE AND SEX**

The average patient age was 52.2 years and male to female ratio was 25:5.

### **3) RELAPAROTOMY ACCORDING TO TYPE OF PRIMARY SURGERY**

Out of 30 relaparotomy 24 (80%) patients have underwent emergency primary surgery and 6 (20%) elective.

### **4) INTERVAL BETWEEN FIRST AND SECOND SURGERY**

The average interval between first laparotomy and relaparotomy was 12.3 days.

### **5) MORTALITY RATE**

Mortality rate of 20% (n = 6) was attributed mainly to infection and multi organ failure.

### **6) HOSPITAL STAY**

The average hospital stay was 25.8 days.

### **ANASTOMOTIC LEAK**

All anastomotic leak patients were initially resuscitated and observed closely. Development of peritonitis was considered as indication for surgery. When the signs of peritonitis developed even after giving adequate conservative treatment, these patients were taken up for surgery.



Intra operatively complete lavage was given and anastomotic repair was done either by trimming of edges or by complete re doing of resection anastomosis depending upon intra operative finding.

#### PERSISTING PERITONITIS AND PERSISTING ABSCESS

For persisting peritonitis and persisting abscess patients who did not responded to conservative treatment and who showed development of septicemia were taken up for surgery after resuscitation. Intra operatively complete lavage and evacuation of abscess cavity, post operative antibiotics according to culture sensitivity was given.

#### BURST ABDOMEN

For burst abdomen patients lavage was given to reduce the bacterial load and tension wire suturing was done for required cases after ruling out compartmental syndrome as a cause.

#### ENTEROCUTANEOUS FISTULA

Three fistula patients who did not respond to conservative treatment were taken up for elective relaparotomy. For these patients fistula tract excision, primary closure with or without resection of involved segment and proximal diversion was done.

## POST-OPERATIVE BLEEDING

Two patients had post-operative bleeding which was detected by presence of frank blood in drain. Out of these two patients one patient had severe hemorrhage which required immediate reopening and ligation of bleeding vessel.

Another patient was initially treated conservatively and later taken up for surgery when conservative treatment failed.

## STOMAL COMPLICATIONS

For two patients with stomal retraction complete re doing of loop colostomy was done, since adequate length of bowel could not be mobilized extarperitoneally.

Post operatively most of the patients were treated in surgical ICU and parenteral nutrition was administered along with general post-operative care.

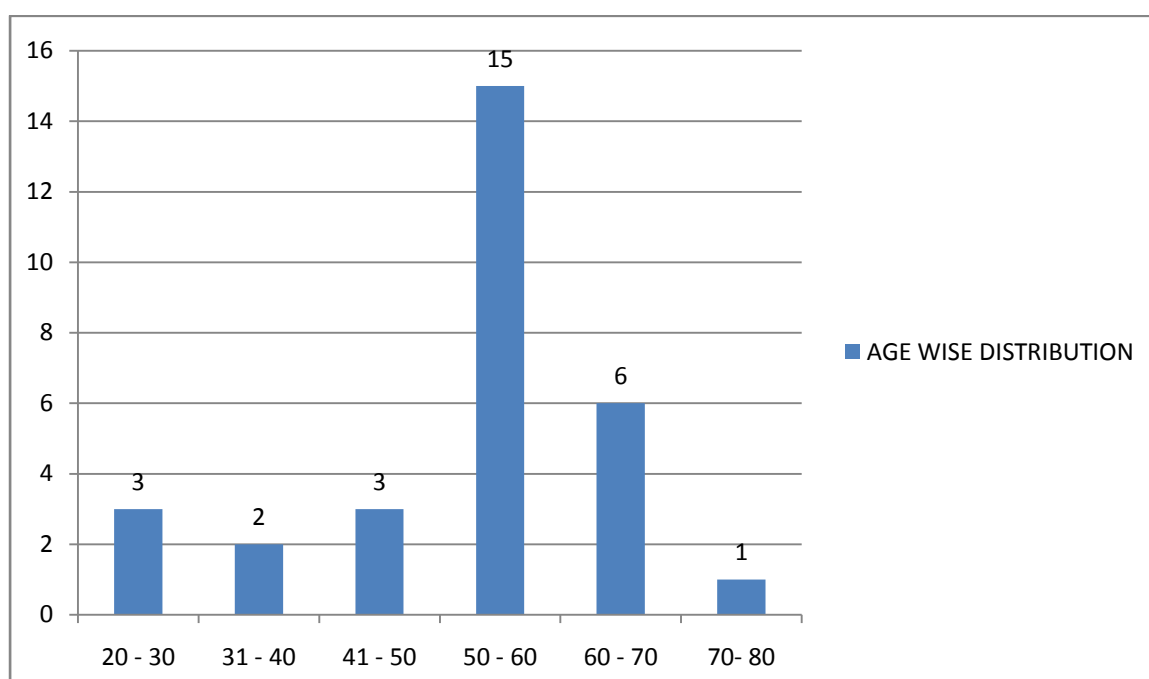
## INCIDENCE OF RELAPAROTOMY IN CMCH

<b>No of laparotomies</b>	<b>No of Relaparotomies</b>	<b>Incidence (%)</b>
622	30	4.8

Detail report is tabulated below

## AGE DISTRIBUTION OF PATIENTS

AGE GROUP (YEARS)	NO OF PATIENTS	PERCENTAGE
20- 30	3	10%
31 – 40	2	6.6%
41 – 50	3	10%
51 – 60	15	50%
61 – 70	6	20%
71 - 80	1	3.3%

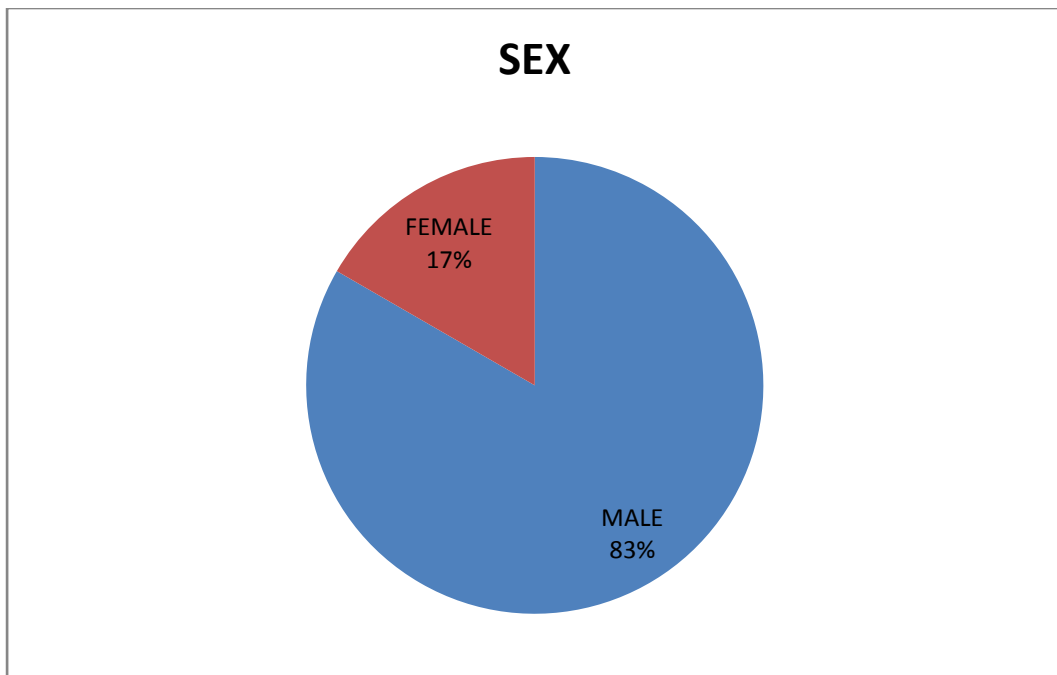


Majority of the patients in our study were found to be in 5<sup>th</sup> decade.

The mean age being 52.2 years.

## SEX WISE DITRIBUTION OF PATIENTS

<b>SEX</b>	<b>NO OF CASES</b>	<b>PERCENTAGE</b>
MALE	25	83%
FEMALE	5	17%



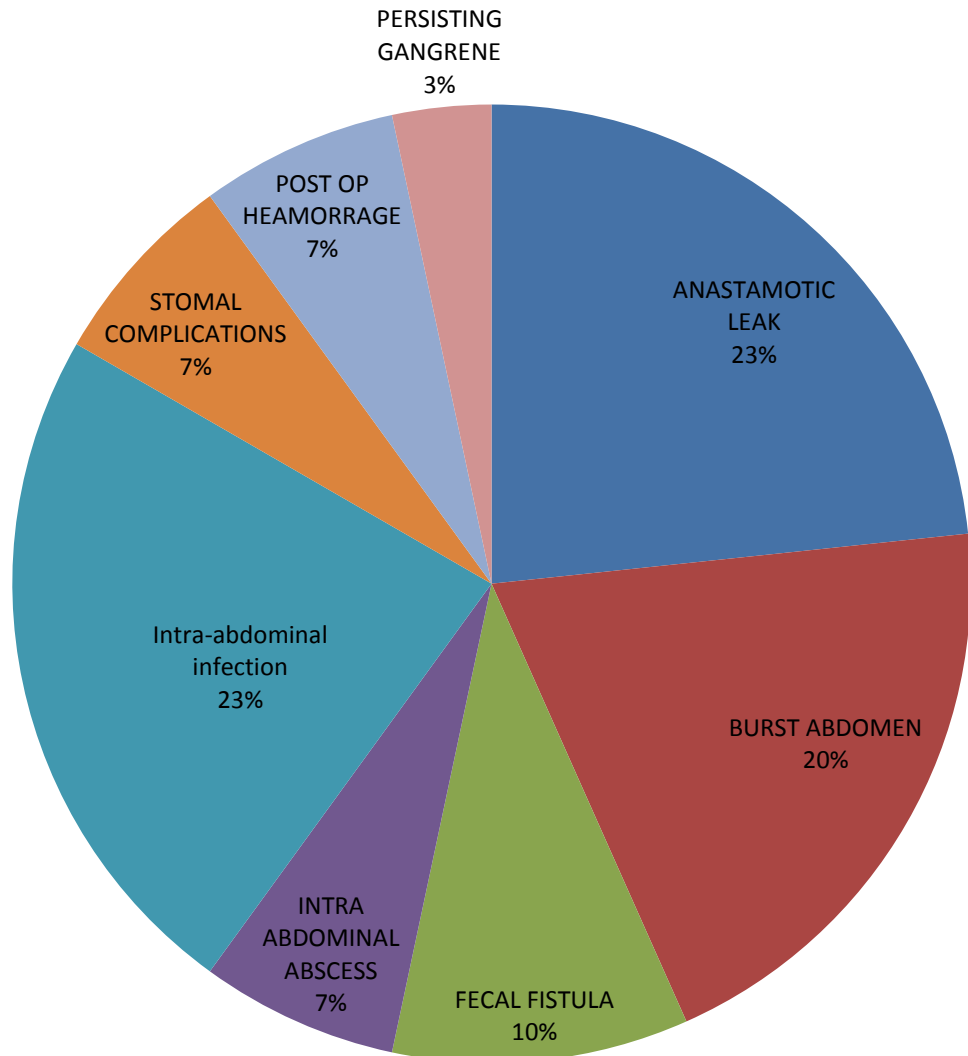
Most of the patients in the study were MALES, n = 25 (83%).

## COMMON INDICATIONS OF RELAPAROTOMY IN THE STUDY

INDICATIONS	NUMBER	PERCENTAGE
Anastomotic leak	7	23%
Persistent Intra-abdominal infection	7	23%
Burst abdomen	6	20%
Fecal fistula	3	10%
Persistent Intra-abdominal abscess	2	7%
Stomal complications	2	7%
Post-operative hemorrhage	2	7%
Persisting gangrene	1	3%

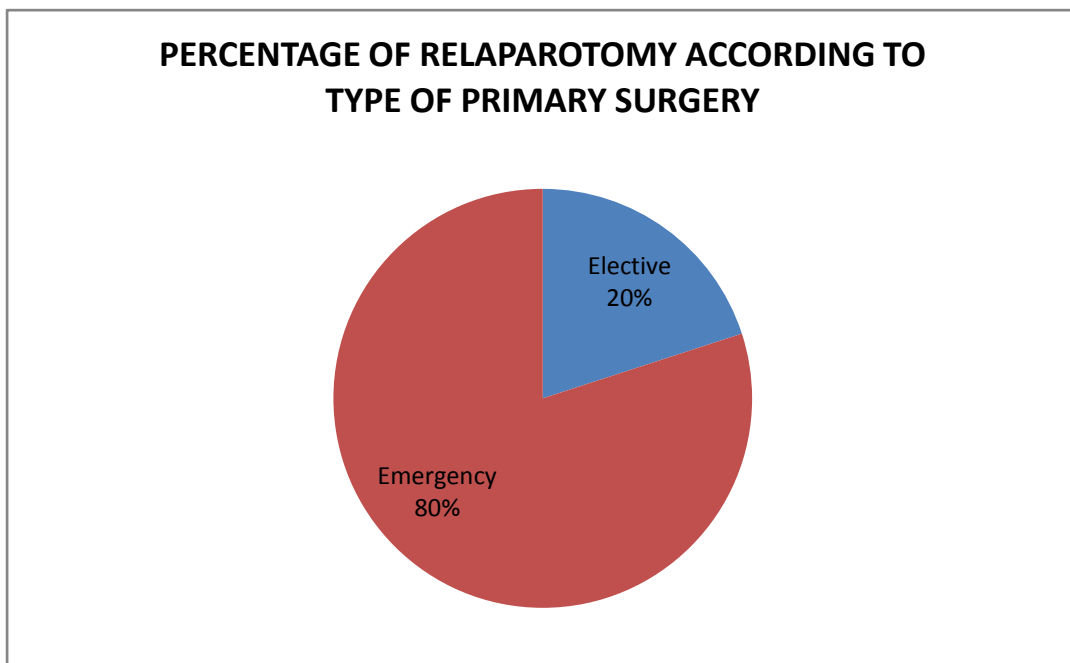
Most common indication of relaparotomy in our study is Anastomotic leak(23%) and intra-abdominal infection(23%), burst abdomen (20%) being second common indication followed by fecal fistula (10%), stomal complication (7), persisting abscess (7), Post-operative hemorrhage (7), persisting gangrene (3).

## COMMON INDICATIONS FOR RELAPAROTOMY IN THE STUDY



**PERCENTAGE OF RELAPAROTOMY ACCORDING TO TYPE OF  
PRIMARY SURGERY OUT OF 30 CASES**

<b>Type of primary surgery</b>	<b>No of relaparotomy(%)</b>
Elective	6 (20%)
Emergency	24 (80%)



Out of 30 cases of relaparotomy. 24(80%) patients had undergone emergency primary surgery and 6(20%) patients had elective primary surgery.

This indicates that risk of relaparotomy is more in patients undergoing emergency laparotomies.

## OUTCOME ACCORDING TO INTERVAL BETWEEN 1<sup>st</sup> SURGERY AND RELAPAROTOMY

In our study the average interval between first laparotomy and relaparotomy was 12.3 days.

Since our study included all common indications of relaparotomy. Significant correlation could not be derived according to the average interval between first laparotomy and relaparotomy and its outcome.

For example post-operative bleeding required emergency reopening and fistula required elective reopening after analyzing its response to conservative treatment.

## AVERAGE HOSPITAL STAY

The average hospital stay in our study group was 25.8 days.

This clearly indicates that patients requiring relaparotomy due to any reason will have a longer hospital stay.

For example generally patients with ileal perforation undergoing uncomplicated laparotomy will have an average 7 to 8 days of hospital stay.



## MORTALITY IN PATIENTS UNDER GOING RELAPAROTOMY IN THE STUDY

<b>TOTAL NO OF CASES</b>	<b>MORTALITY</b>	<b>PERCENTAGE</b>
30	6	20%

In the study mortality was noted in 6(20%) cases out of 30. This mortality result is comparable to previous published studies. Out of 6 patients 3 had anastomotic leak and 1 patient had persistent gangrene. These patients died due to diffuse peritonitis and multi organ failure.

In one patient though relaparotomy was done for post-operative bleeding he died due infection and metabolic complications. Another patient death was mainly due to shock because of post-operative bleeding from slipped ligature.

Out of 6 patients 5 had undergone emergency primary surgery and 1 had elective primary surgery.

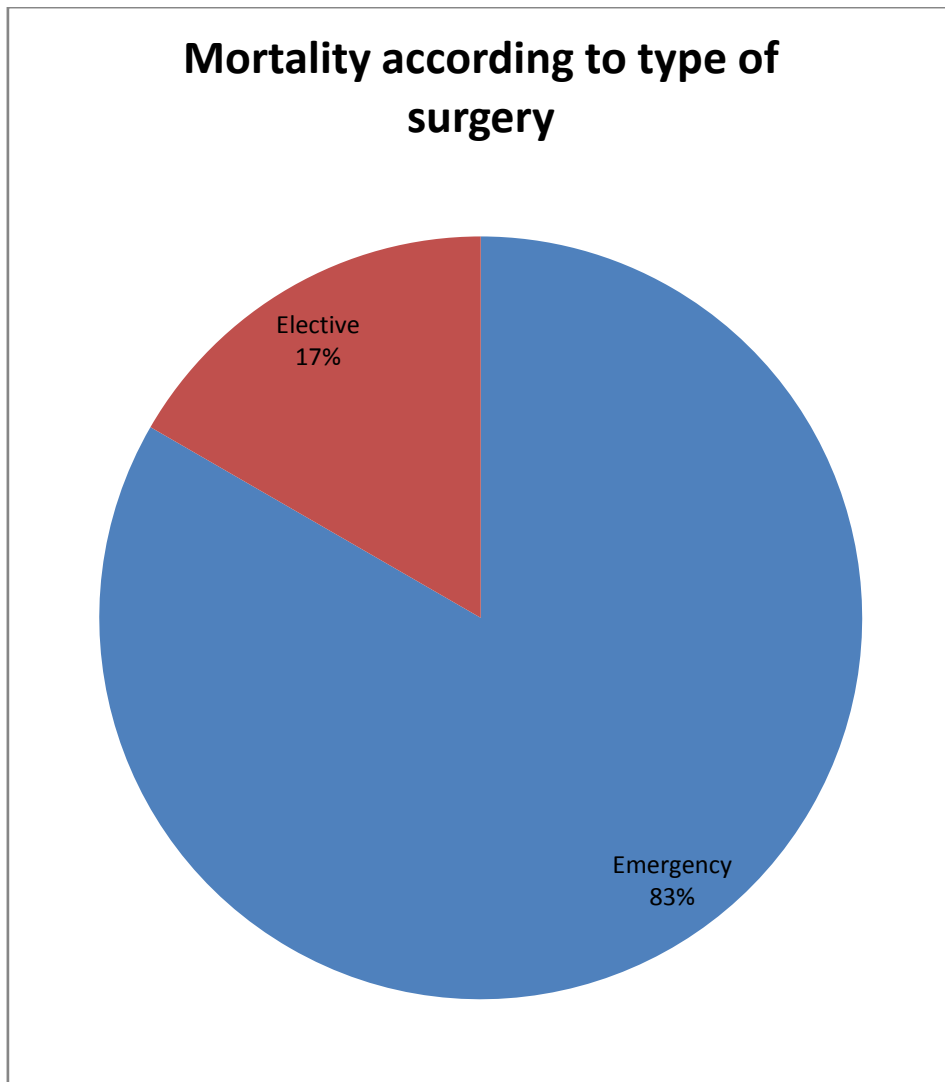
## INDICATIONS FOR RELAPAROTOMY AND ITS ASSOCIATED MORTALITY IN THE STUDY

REASON FOR RELAPAROTOMY	n(%)	MORTALITY (n)	CAUSE OF MORTALITY
Anastomotic leak	7(23%)	3	Sepsis with MOF*
Burst abdomen	6(20%)	0	--
Fecal fistula	3(10%)	0	--
Intra-abdominal abscess	2(7%)	0	--
Intra-abdominal infection	7(23%)	1	Sepsis and metabolic complication
Stomal complications	2(7%)	0	--
Post op hemorrhage	2(7%)	1	Shock
Persisting gangrene	1(3%)	1	Sepsis and metabolic complication

MOF\*-- Multiorgan failure

Out of 6 mortality in study 3 patients had anastomotic leak, anastomotic breakdown in distal bowel carries higher mortality due to rapid development and progression of fecal peritonitis.

## MORTALITY ACCORDING TO TYPE OF PRIMARY SURGERY



Out of 6 mortality in the study, 5 (83%) patients had undergone emergency primary surgery and 1 (17%) patients had elective primary surgery.

## FACTORS INFLUENCING THE OUTCOME OF RELAPAROTOMY AND ASSOCIATED MORTALITY.

In our study following factors were studied to find its association with outcome of Relaparotomy :

- 1) Elderly Age
- 2) Nutritional status
- 3) Presence of Co-morbidities
- 4) Diffuse peritonitis (intra operative finding) in relaparotomy.

### 1) ELDERLY AGE

The average patient age in the study was 52.2 years, ranging from 21 years to 80 years.

Out of 30 patients 22 patients were above 50 years of age. This indicates that patients above 50 years of age undergoing emergency laparotomy will carry a higher risk of treatment failure and requires subsequent other modes of intervention. And in all the 6 mortality in our study patient's age was more than 50 years indicating poor prognosis of relaparotomy in higher age group people.

## 2) NUTRITIONAL STATUS

In our study malnourished patients requiring relaparotomy had longer duration of hospital stay.

## 3) PRESENCE OF CO-MORBIDITIES ( 'p' value= 0.088)

Out of 30 patients who underwent relaparotomy 11 patients had associated co morbidities.

CO-MORBIDITIES	11
Diabetes mellitus	6
Malignancy	5
Renal failure	0
Liver failure	0

Out of 6 mortality in the study 1 patient died due post-operative hemorrhage and in remaining 5 patients 3 had diabetes mellitus as co morbidity and 1 had malignancy as co morbidity.

In our study though presence of DM appeared to increase the risk of infection and subsequent mortality and morbidity in patients undergoing relaparotomy, this significant finding could not be proved statistically by 'p' value.

4) DIFFUSE PERITONITIS (INTRA OPERATIVE FINDING) IN RELAPOROTOMY ( 'p' value= 0.5357)

<b>Total no cases</b>	<b>Presence of infection during relaparotomy</b>	<b>Total mortality in study</b>	<b>Presence of infection in mortality cases</b>
30	22	6	5

Out of 30 patients who underwent relaparotomy 22 patients had clear signs of intra peritoneal infection and 8 patients had no or minimal infection.

Out of 6 mortality in study 5 patients had diffuse intra peritoneal infection at the time of relaparotomy.

However mere presence of peritoneal infection does not influence the outcome of relaparotomy as an independent variable.

**PATIENT DEMOGRAPHICS AND FEATURES OF  
SURGICAL INTERVENTIONS**

		<b>Number</b>	<b>mortality</b>	<b>P value</b>
<b>Sex</b>	Male	25	6	0.2206
	Female	5	0	
<b>Surgery</b>	Emergency	24	5	0.819
	Elective	6	1	
<b>Infection in first operation</b>	Yes	22	5	0.5357
	No	8	1	
<b>Accompanying disease</b>	Yes	11	4	0.088
	No	19	2	

## **DISCUSSION**



## DISCUSSION

Relaparotomy rates after surgery involving the abdominal cavity and organs have been reported to range from 1.1% to 5.4%; <sup>4-8</sup>in our study, Out of 622 laparotomies done in Coimbatore Medical College Hospital from November 2012 to October 2013.

30 patients underwent relaparotomy for different indications, bringing the incidence of relaparotomy to 4.8%.

Relaparotomy is indicated for complications such as anastomotic leak, postoperative peritonitis caused by suture failure, early postoperative intestinal adhesive obstruction, wound dehiscence, post-operative abscess (refractory to conservative treatment), post-operative haemorrhage into the intestinal lumen or abdominal cavity after the first operation.

The rate of complications requiring RL after gastrointestinal surgery in our study was not higher when compared to previously <sup>1-2</sup>.

In our study, RL was required for iatrogenic colonic injury during appendectomy in one patient, and for iatrogenic transverse colonic perforation during pancreatic pseudocyst surgery in another patient. These events were not recognized peroperatively.

Similarly, relaparotomy was also done for wound leak following unsuccessful primary closure in two ileal perforative peritonitis patients. And one patient also needed relaparotomy for postoperative

haemorrhage due to slippage of ligature.

This suggest that at least few RLs are performed for preventable complications. Desiaterik et al. reported that 62.7% of relaparotomyare performed for improper surgical techniques and incorrect decision making<sup>11</sup>.

It has been reported that in 32.6%–42.5% of patients who suffered postoperative peritonitis or abscess, RLs were ultimately performed for intestinal suture failure or technical mistakes during the firstoperation<sup>1, 2, and 5,9,12</sup>

In our study, the most common (23%) indication for RL was leakage from an intestinal repair or anastomosis. Other common indication included complications such as persistent intraabdominal infection(23%), burst abdomen(20%), enterocutaneous fistula (10%).

Persistent intraabdominalabscess (7%), andstomalcomplication (7%), post-operative haemorrhage (7%)and persistent intestinal gangrene (3%) were uncommon indications for relaparotomy.

In our study, the rate of RL for preventable complications such as iatrogenic events, suture failure,stomal complication and inadequate haemostasis was20%.

Since most relaparotomies are performed for life threatening complications, the mortality rate is high.

The mortality rate in different studies vary between 20.5% and 61.5% according to different reports<sup>3,6,8-10,13-16</sup>.The differences in mortality rates among these reports are due to nonstandardized demographics of patient populations in different hospitals, and indications for RL. And also, differences in treatment approaches, for the same type of surgery.

In our study, the mortality rate associated with RL was 20%.*Mortality rates in relaparotomy depend upon the original disease for which primary surgery was done.*

In our study the mortality risk of RL was reported to be highest following anastomotic failure, moderate following haemorrhage and infection; lowest for wound dehiscence.

Timing of relaparotomy is another factor affecting mortality in patients undergoing RL. When indicated, performing RL as early as possible is more important than the average time it is performed, since few studies have shown a reduced mortality rate from 46% to 20.5%<sup>5,10,13</sup>by performing early RL to remove the focus of infection.

The average interval between the first operation and RL was reported to be 5 to 8 days<sup>7, 15</sup>.In our study it was 12.3 days. This difference was because in our study complications requiring early RL, such as haemorrhage were less seen, as compared to the high rate of later

complications such as leakage of an intestinal repair and anastomosis, or infection.

In our study mortality rate of 20% (n = 6) was attributed mainly to infection and multi organ failure. Mortality was found to be higher when relaparotomy is done for complications arising from lower gastro intestinal tract. The main reason for this high mortality rate is the immediate development of intra-abdominal infections following faecal contamination caused by perforations and anastomotic leakages.

The average patient age was 52.2 years and male to female ratio was 25:5. The average interval between first laparotomy and relaparotomy was 12.3 days and the average hospital stay was 25.8 days.

In our study out of 30 patients 25 patients were male, 24 patients had undergone emergency primary surgery, 22 had peritoneal infection at the time of first surgery and 11 patients had co morbidity (DM, n=6 and malignancy, n= 5) but significant 'p' value for these variables could not be derived from our study.

**CONCLUSION**

**CONCLUSION**

According to our study, the reasons for Relaparotomy (RL) are many. Anastomotic leak and persistent intra abdominal infection are major reason for relaparotomy, and these are associated with high mortality. The reduction of high RL rates, and subsequent high mortality rates, mainly depends on the success of the first operation.

To decrease the incidence of relaparotomy the following guidelines should be applied for the first surgery;

1. Patients should be fit for surgery.
2. Perfect haemostasis must be obtained intraoperatively.
3. Care must be taken to prevent intraperitoneal contamination from intestinal content during gastrointestinal surgeries.
4. In unfavourable conditions primary repair should be avoided and resection anastomosis should be performed, if required diversion should be made, to safe guard the anastomosis.
5. Care must be taken to avoid inadvertent iatrogenic injury.
6. Surgery must be performed under strict aseptic conditions
7. Complications must be diagnosed early and treated immediately, before serious infections and their systemic effects develop.

The surgeon should always plan “*to whom, when, under what condition, why and how the second surgery should be conducted*” when relaparotomy is required.

## **APPENDIX 1**

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## **APPENDIX 2**

### **PATIENT'S PARTICULARS**

Name

Age

Sex

IP No

Address

DOA

D O primary surgery

D O relaparotomy

DOD

### **HISTORY**

Chief complaints

History of present illness

History of Chronic Diseases / co morbidity

Details of primary surgery

Details of post-operative complications

### **GENERAL PHYSICAL EXAMINATION**

Nutritional status

Pulse

Blood Pressure

Temperature

Hydration

GCS

## EXAMINATION OF ABDOMEN

Inspection

Palpation

Percussion

Auscultation

PR examination

## SYSTEMIC EXAMINATION

Respiratory System

Cardiovascular System

Central Nervous System

## INVESTIGATIONS

Basis blood investigation

Chest X-Ray

Erect X-Ray Abdomen

USG Abdomen

CT scan

## DETAILED OPERATIVE NOTES

Diagnosis

Procedure

Intra operative findings

## DETAILS OF POST-OPERATIVE COMPLICATIONS

Bleeding

Anastomotic leak

Wound Dehiscence

Enterocutaneous fistula

Intra Abdominal infection

Intra Abdominal Abscess

Stomal complications

## CONDITION AT DISCHARGE

**APPENDIX 3**  
MASTER CHART

Sl. No.	Name	Age	Sex	IP No.	DOA	Diagnosis	DO 1st Surgery	Presence of infection	Complication seen	DO complication	DO 2nd Surgery	Days B/W 1st & 2nd Surgery	Co-Morbidity	Mortality	DOD	Elective/emergency	No of day in hospital
1	Ganesh	23	M	64207	21-10-12	Pseudocyst of pancreas	09-11-12	No	Fecal fistula	10th POD	04-01-13	55	No	No	15-01-13	<b>Elective</b>	66
2	Nagendran	53	M	212	02-01-13	Appendicular perforation	02-01-13	Yes	Pelvic abscess	5th POD	11-01-12	9	No	No	25-01-12	Emergency	23
3	Shivaraj	20	M	32481	06-06-12	Adhesive intestinal obstruction	10-06-12	No	Fecal fistula	11th POD	24-07-12	45	No	No	10-08-12	<b>Elective</b>	65
4	Dhanaraj	60	M	4214	04-01-13	Large bowel obstruction	04-01-13	No	Colostomy retraction	3rd POD	07-01-13	3	Yes (Ca)	No	15-01-13	Emergency	11
5	Kamaladas	52	M	51406	25-08-13	Trauma- jejunal perforation	25-08-13	Yes	Persistent Intra-abdominal infection	4th POD	31-08-13	6	No	No	13-09-13	Emergency	19
6	Rangasamy	80	M	40164	17-06-13	Gall bladder perforation	17-06-13	Yes	Post op bleeding	0 POD	19-06-13	2	Yes (Dm)	<b>Yes</b>	<b>DEATH</b>	Emergency	
7	Velusamy	72	M	20424	08-04-13	Duodenal ulcer perforation	08-04-13	Yes	Burst abdomen	9th POD	17-04-13	9	Yes (Dm)	No	25-04-13	Emergency	17
8	Ponnusamy	62	M	61899	12-08-12	Ruptured liver abscess	12-08-13	Yes	Persisting abscess	7th POD	22-08-13	10	No	No	01-09-12	Emergency	20
9	Rabhadulla	55	M	67434	23-09-12	Large bowel gangrene	23-09-12	Yes	Persisting gangrene	4th POD	27-09-12	4	Yes (Dm)	<b>Yes</b>	<b>DEATH</b>	Emergency	
10	Malik	21	M	24386	01-05-12	Trauma- jejunal perforation	01-05-12	Yes	Burst abdomen	7th POD	08-05-12	7	No	No	01-06-12	Emergency	31
11	Nataraj	65	M	18002	31-03-12	Gastric perforation	31-03-12	Yes	Persistent Intra-abdominal infection	7th POD	11-04-12	10	No	No	21-04-12	Emergency	20
12	Murugesan	39	M	43415	27-07-12	Ileal perforation	27-07-12	Yes	Persistent Intra-abdominal infection	6th POD	06-08-12	10	No	No	17-08-12	Emergency	21
13	Tangavel	51	M	36909	26-06-13	Trauma- jejunal perforation	26-06-13	Yes	Burst abdomen	12th POD	08-07-13	12	No	No	15-07-13	Emergency	19
14	Subramani	67	M	58342	27-09-13	Duodenal ulcer perforation	27-09-13	Yes	Burst abdomen	12th POD	09-10-13	12	Yes (Dm)	No	15-10-13	Emergency	17
15	Marutachalam	51	M	24957	29-04-13	Duodenal ulcer perforation	29-04-13	Yes	Burst abdomen	14th POD	13-05-13	14	No	No	20-05-13	Emergency	21
16	Gopalkrishnan	43	M	50901	20-07-13	Rectal prolapse	27-07-13	No	Burst abdomen	7th POD	27-07-13	7	No	No	05-08-13	<b>Elective</b>	16
17	Somasundaram	55	M	60969	08-06-13	Gastric perforation	08-06-13	Yes	Persistent Intra-abdominal infection	11th POD	22-06-13	14	No	No	28-06-13	Emergency	20
18	Palanisamy	52	M	51230	24-08-13	Gastric perforation	24-08-13	Yes	Persistent Intra-abdominal infection	6th POD	30-08-13	6	No	No	08-09-13	Emergency	15

Sl. No.	Name	Age	Sex	IP No.	DOA	Diagnosis	DO 1st Surgery	Presence of infection	Complication seen	DO complication	DO 2nd Surgery	Days B/W 1st & 2nd Surgery	Co-Morbidity	Mortality	DOD	Elective/emergency	No of day in hospital
19	ponnusamy	67	M	51105	02-09-13	Gastric Outlet Obstruction	12-09-13	No	Post op bleeding	0 POD	12-09-13	0	Yes (Ca)	Yes	<b>DEATH</b>	<b>Elective</b>	
20	chinnammal	65	F	44974	26-07-13	Appendicitis	01-08-13	No	Fecal fistula	5th POD	22-08-13	5	No	No	04-09-13	<b>Elective</b>	38
21	Devraj	55	M	61805	01-10-13	Ileal perforation	01-10-13	Yes	Anastomotic leak	7th POD	15-10-13	14	No	<b>Yes</b>	<b>DEATH</b>	Emergency	
22	Palanisamy	56	M	53396	03-09-13	Ileal perforation	03-09-13	Yes	Anastomotic leak	6th POD	13-09-13	10	No	<b>Yes</b>	<b>DEATH</b>	Emergency	
23	Rani	55	F	60713	06-10-13	Gastric perforation	06-10-13	Yes	Persistent Intra-abdominal infection	5th POD	12-10-13	6	No	No	29-10-13	Emergency	24
24	Palanisamy	46	M	44530	25-07-13	Large bowel obstruction	25-08-13	No	Colostomy retraction	4th POD	01-08-13	4	Yes (Ca)	No	29-08-13	Emergency	35
25	Rangammal	58	F	61012	12-06-13	Large bowel obstruction	12-08-13	Yes	Anastomotic leak	10th POD	23-06-13	11	Yes (Ca)	No	05-07-13	Emergency	23
26	Rayammal	52	F	59070	15-11-12	Ileal perforation	15-11-12	Yes	Persisting peritonitis	8th POD	25-11-12	10	No	No	03-12-13	Emergency	18
27	Parvathammal	58	F	23914	19-04-13	Large bowel obstruction	26-04-13	No	Anastomotic leak	8th POD	06-05-13	8	Yes (Ca)	No	17-05-13	<b>Elective</b>	28
28	Narayanan	50	M	64874	24-11-12	Small bowel gangrene	24-11-12	Yes	Anastomotic leak	12th POD	05-01-13	41	Yes (Dm)	No	18-01-13	Emergency	55
29	Murugan	36	M	53862	23-11-12	Large bowel obstruction (volvulus)	23-11-12	Yes	Anastomotic leak	10th POD	15-12-12	12	No	No	29-12-12	Emergency	36
30	Perumeshwara	56	M	56577	20-10-13	Sigmoid perforation	20-10-13	Yes	Anastomotic leak	8th POD	26-11-13	10	Yes (Dm)	<b>Yes</b>	<b>DEATH</b>	Emergency	



## **LEGENDS**

- 1) RL – RELAPAROTOMY
- 2) ACS — ABDOMINAL COMPARTMENT SYNDROME
- 3) IAH — I NTRA ABDOMINAL HYPERTENTION
- 4) APP -- ABDOMINAL PERFUSION PRESSURE
- 5) IAP—INTRA ABDOMINAL PRESSURE
- 6) DOA — DATE OF ADMISSION
- 7) DAS — DATE OF SURGERY
- 8) DOD — DATE OF DISCHARGE
- 9) MOF — MULTIORGAN FAILURE