ROLE OF DIAGNOSTIC LAPAROSCOPY IN DIAGNOSING CHRONIC ABDOMINAL PAIN

DISSERTATION SUBMITTED TO
THE TAMIL NADU DR.M.G.R.MEDICAL UNIVERSITY

IN PARTIAL FULFILLMENT OF THE REGULATIONS
FOR THE AWARD OF THE DEGREE OF

M.S (GENERAL SURGERY) BRANCH-1
GOVT.RAJAJI MEDICAL COLLEGE & HOSPITAL
MADURAI

THE TAMIL NADU DR.M.G.R MEDICAL UNIVERSITY
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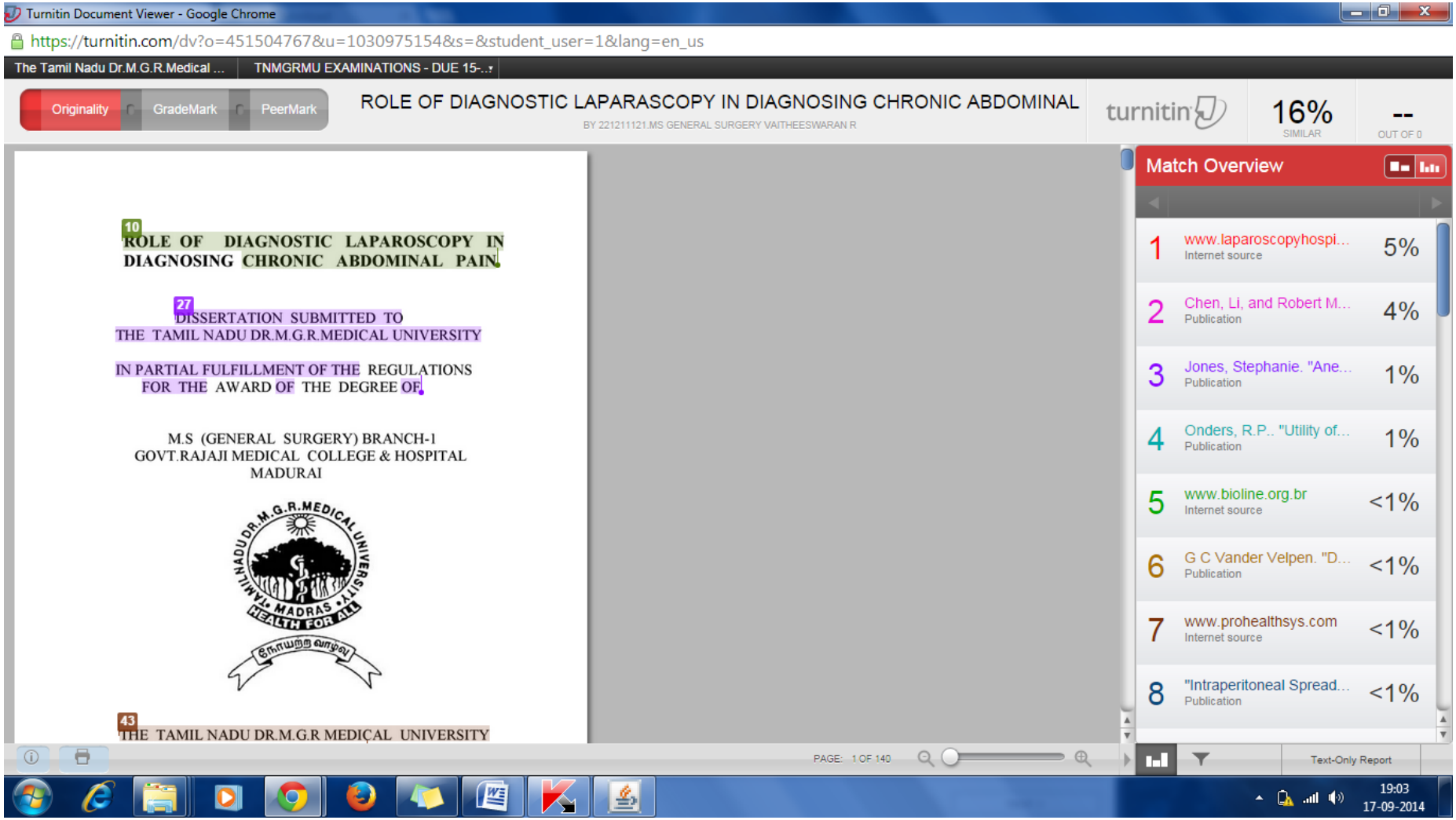
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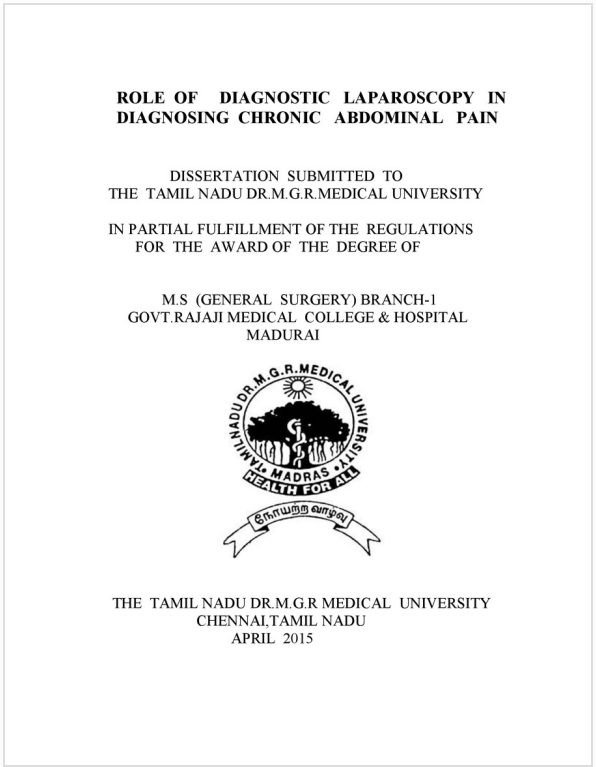

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APRIL 2015

DECLARATION

I ,solemnly declare that the dissertation titled "ROLE OF DIAGNOSTIC LAPAROSCOPY IN DIAGNOSING CHRONIC ABDOMINAL PAIN" was done by me at Govt.Rajaji Medical College and Hospital during 2013-2014 under the guidance and supervision of DR.A.M.Syed Ibrahim M.S , Professor of Surgery

This dissertation is submitted to the Tamil Nadu Dr.M.G.R Medical University towards the partial fulfillment of requirements for the award of M.S DEGREE(BRANCH- I) in General Surgery.

Place: Madurai Dr.Vaitheeswaran

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I whole heartedly thank all the patients who willingly co-operated and rendered themselves for the study without whom this study could not have been a reality

LIST OF ABBREVIATIONS USED

(in alphabetical order)

CO2	Carbon dioxide
CT	Computed Tomography
D-Lap	Diagnostic laparascopy
5- HT	5 Hydroxy Tryptamine – Serotonin
HPE	Histo Pathological Examination
IBD	Inflammatory Bowel Diseases
NSAID	Non Steroidal Anti Inflammatory Drug
T	Thoracic Segment of spinal cord
UGI	Upper Gastro Intestinal endoscopy
USG	Ultra Sonography

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INTRODUCTION

Patients with chronic abdominal pain are amongst the most difficult to manage. Potentially it can be unrewarding for both the patient and the treating physician.[1] It can affect a patient both physically and mentally. Chronic abdominal pain is associated with poor quality of life.[2]

Most patients in this group would have already undergone many diagnostic procedures. No results can be reached in > 40% patients even after complete evaluation with imaging studies · These searches for pathology often include such procedures as upper and lower gastrointestinal endoscopies, computerized tomography and screening for undetected carcinoma.

When the limits of reasonable noninvasive testing are reached in an individual patient's illness, which is likely to occur without the extensive testing practiced today, the surgeon is often consulted. A high chance of a non therapeutic abdominal exploration naturally results. Clearly diagnostic laparoscopy is an important intermediate option between refusing to explore a patient's abdomen and performing laparotomy.[7]

Diagnostic laparoscopy can be done under direct vision with simple equipment as it does not require a video camera or the electronic gadgetry associated with laparoscopic surgery. With advances in optics, laparoscopy allows perfect visual examination of the peritoneal cavity and further makes possible, histological diagnosis of target biopsy under vision. Laparoscopy is as much a surgical procedure as an exploratory laparotomy, often just as informative, and to the trained surgeon affords a better view of the entire peritoneal cavity than the usual exploratory laparotomy. To achieve a high rate of positive diagnosis from laparoscopy requires much more than correct technique, it requires thorough background of surgery, sound clinical acumen as also knowledge and awareness of abdominal pathology

In many cases it prevents unnecessary negative laparotomy. The early recovery and return to daily activities are a source of gratification for the operating surgeon

AIMS OF THE STUDY

To study the efficacy of diagnostic laparoscopy in identifying the etiology of undiagnosed chronic abdominal pain.

OBJECTIVES OF THE STUDY

1) To establish that laparascopy can also be offered as effective therapeutic option for patients with chronic abdominal pain

2) To evaluate causes for chronic abdominal pain using laparascopy in order of increasing frequency

REVIEW OF LITERATURE

History of Laparoscopy

We are witnessing the dawn of a new era, in which closed body cavity procedures are more and more often being performed through minimal access by endoscopic visualization.[10] Through the effort of many individuals, increasingly more procedures once thought to be impossible through endoscopic access are now widely performed. The wide spread acceptance of this technique has been largely propelled by public awareness that minimally invasive surgery is associated with less pain ,quicker return to normal activity and better cosmetic results

Ever since the dawn of civilization, advances in technology and advances in surgery have been inseparably linked. A glance at ancient textbooks of surgery reveals examples of the ingenuity of surgeons who devised instruments and operations to deal with deformity and disease.[11] To begin with, their application was limited by the problems of pain, shock and infection. The turn of the nineteenth century saw a revolution in the way surgery was practiced which was brought on by advances in anaesthesia, asepsis and anti-septics and the role of blood transfusion

At the turn of the twenty first century we are at the brink of another revolution, based on the imaging in surgical techniques. With the advent of fibre

optics, three chip cameras and 3 dimensional and high definition displays, the quality of imaging has improved leaps and bounds.

Greek and Roman physicians made the earliest attempts to view the interior of body cavities.[11] Records from 400BC show the physicians of Hippocrates' school using rectal and vaginal speculae. Similar instruments have been described from Pompeii (destroyed in AD70) and from Babylon (AD500)11. It is assumed that the earliest endoscopes used daylight or a naked flame as illumination.

By the end of eighteenth century Phillip Bozzini came with idea of Lichtleitr ,an instrument that employs mirrors,speculum and candle to visualize proctum,bladder and also has a role as colposcopy

Antonin Desormeaux in 1853 invented an universal endoscope that used alcohol as source of light and an array of system of lens that intensified visual field illumination . It was further enhanced by Bruck ,a Polish dentist to a internal speculum with platinum tip mounted light. It had disadvantages of flare and thermal injury that prompted changing of angle of the lens from source of light that impaired visualization to a great extent

Maximilian Nietze and Reinecke by 1879 came u;p with an idea of three lens system that led to the development of first endoscopes and cystoscopes .Leiterr and Newman made significant contributions to this development.

Nietze ' s design incorporated many operating ports and crystalline lens that allowed for excellent viewing that paved way for natural orifice/open laparascopy.

Diagnostic Laparoscopy And Thoracoscopy[12]

Laparoscopy (extracted from Greecian term (lapro -flank, and skopein- examine) was initially done by George Kelleng of Germany in 1901 in a dog by Nietze '. He described the use of a cystoscope to examine the effects of increased intra-abdominal pressure on the small bowel.[13]

Hans Christinian Jacobeus of Sweden, performed the first laparoscopy and thoracoscopy ever in human beings, describing the abdominal TB, malignancy and malignancy through the diagnosis of endoscopy.

Bertram Berneheim from U.S.A first did laparoscopy at Johns Hopkins University with a proctoscope measuring about half an inch through the periumbilical region without creating pneumoperitoneum.

Roger Korbesch , a German was the first to publish a comprehensive txt book on laparascopy and thoracoscopy .Additional indications are covered in this book

Heinze Kalik , a German hepatologist came forward with an upgraded version of oblique forward-viewing scope(45 degree), that increased operator orientation favourably and reduced blind spot of operator to nearly 10 degrees.

Richard Zollikoefer ,a Swiss surgeon invented the idea of inert Co2 for creation of pneumoperitoneum

Janeos Veress, a Hungarian by 1938 was the first to use Veress needle for insuffulation

Therapeutic Laparoscopy And Thoracoscopy[12]

By early 1900s role of endoscope in thoracic surgery was grasped and employed with success. To create artificial pneumothorax in patients with pleural adhesions ,thorascope is employed for adhesiolysis

.

Kalk ,an American endoscopist was the first to proclaim the technique

of dual trocar for liver biopsy. Carl Ferevers ,a German surgeon first performed adhesiolysis for interloop adhesions causing acute intestinal obstruction. Han Frangenheim, a German surgeon described first, the CO2 insuffulator

By late nineties , two vital developments were brought essential for proclaimed use of laparoscopy.

- The first was the introduction by Harold Hopkins from England,a rod lens system that raises the transmission of light by former scopes by 80-times.

- The second was fibreoptic cables with cold light transmission described by Hirschoweitz , a gastro surgeon from Michigan

German Gynaecologist Karl Semm first described automatic insuffulator . He also introduced many devices and techniques, like endo-loop with pretied suture, the laparoscopic clip applier, the saline irrigator and many laparascopic instruments.The credit of World‘s first laparascopic appendectomy belongs to him

Laparoscopy in General Surgery[12]

The development of silicon chip ,a charge coupled device with solid state image sensor and mini camera linked main stream surgery with laparascopy .It allows visualization for all operating members simultaneously in comparison to single eye piece of past

The first reported laparoscopic cholecystectomy in man is performed by the surgeon Philip Mouret of France.

Karl Miller,[14] in 1996, reported that laparoscopy provided diagnosis in 89.8% of patients.

Klingensmith et al,[15] in 1996, suggested that laparoscopy can also be used as a diagnostic device and has resulted in favourable outcomes in several noted cases

Salky BA, Edye MB,[16] in 1998, concluded laparoscopy as a means of diagnosis for abdominal conditions presenting with chronic and acute pain

Lavonius M et al,[17] in 1999, suggested that laparoscopy is a indispensable technique for identifying and treating abdominal conditions presenting with chronic pain .

Raymond P,[18] in 2003, concluded that laparoscopy has a vital role as a therapeutic and investigating tool for patients with long standing abdominal pain.

DJ Swank et al,[19] in 2003, established role of laparascopic lysis of adhesions in patients whom they are constant source of pain .

Arya PK and Gaur KJBS,[20] in 2004, concluded D-Lap as a high reliable diagnostic tool for cases of unrevealed abdominal pain by other modalities

Paajanen,[4] in 2005, concluded that by careful selection, for patients with chronic abdominal pain laparoscopy alleviates the symptoms in more than 70% of patients and it should be considered if other diagnostic tests are negative.

Krishnan P et al,[21] in 2008, concluded laparascopy can offer histological diagnosis in pts with evidence of GI Tuberculosis with low level of complication rate (8%)

Nafeh MA et al,[22] in 1992, performed laparoscopy in 200 patients with undiagnosed ascites and concluded that laparoscopy was an effective tool in diagnosing tuberculous peritonitis.

S Rai et al[23] recorded a 92 % diagnostic rate in their study to diagnose patients with abdominal tuberculosis.

Embryology And Anatomy of Abdominal Organs[24]

The endodermal gut tube created by body folding during the 4th week consists of a blind ended cranial foregut, a blind-ended caudal hindgut, and a midgut open to the yolk sac through the vitelline duct.

By the fifth week, the abdominal portion of the foregut is visibly divided into the esophagus, stomach, and proximal duodenum. The stomach is initially fusiform, and differential growth of its dorsal and ventral walls produces the greater and lesser curvatures. Meanwhile, hepatic, cystic, and dorsal and ventral pancreatic diverticula bud from the proximal duodenum into the mesogastrium and give rise, respectively, to the liver, gallbladder, cystic duct, and pancreas. In addition, the spleen condenses from mesenchyme in the dorsal mesogastrium.

During the sixth and seventh weeks , the stomach rotates around longitudinal and dorsoventral axes so that the greater curvature is finally directed to the left and slightly caudally. This rotation shifts the liver to the right in the abdominal cavity and brings the duodenum and pancreas into contact with the posterior body wall, where they become fixed (i.e., secondarily retroperitoneal.) This event converts the space dorsal to the rotated stomach and dorsal mesogastrium into a recess called the lesser sac of the peritoneum. The pouch of dorsal mesogastrium forming the left lateral boundary of the lesser sac subsequently undergoes voluminous expansion, giving rise to the curtain- like greater omentum that drapes over the inferior abdominal viscera.

The midgut differentiates into the distal duodenum, jejunum, ileum, cecum, ascending colon, and proximal two thirds of the transverse colon. The future ileum elongates more rapidly than can be accommodated by the early peritoneal cavity, so that by the fifth week the midgut is thrown into an anteroposterior hairpin fold, the primary intestinal loop, which herniates into the umbilicus during the sixth week. As the primary intestinal loop herniates, it rotates around its long axis by 90 degrees counterclockwise (as viewed from the ventral side) so that the future ileum lies in the right abdomen and the future large intestine lies in the left abdomen. Meanwhile, the cecum and appendix differentiate, and the jejunum and ileum continue to elongate. During the 10th through 12th weeks, the intestinal loop is retracted into the abdominal cavity and rotates through an additional 180 degrees counterclockwise to produce the definitive configuration of the small and large intestines.

The hindgut gives rise to the distal one third of the transverse colon ,rectum , the sigmoid and descending colon, . Just superior to the cloacal membrane, the primitive gut tube forms an expansion called the cloaca. During the 4th to 6^{th} weeks, a coronal urorectal septum partitions the cloaca into the urogenital sinus, which will give rise to urogenital structures and a dorsal anorectal canal. The distal one third of the anorectal canal forms from an ectodermal invagination called the

anal pit. Between the 6th and 8th weeks, the lumen of the gut tube becomes solidly filled by epithelium, and then is gradually recanalized. During recanalization, mesodermal extensions project into the lumen and together with the overlying epithelium form the villi of the intestines. Cytodifferentiation of the gut epithelium depends on interactions with the underlying mesoderm and is regionally specified based on the cranial – caudal axis and radial axis (lumen to outer tunic) of the gut. Migrating neural crest cells form the enteric nervous system.

Abdominal Planes And Regions [25]

For descriptive purposes, the abdomen can be divided by a number of imaginary horizontal and vertical lines drawn using the skeletal landmarks of the thorax and abdomen . Projection of these lines into the sagittal or transverse planes can then be used to define certain abdominal 'planes'. Apart from dividing the abdomen into different

regions for descriptive purposes, these planes are also of value in defining approximate vertebral levels and the positions of some relatively fixed intra-abdominal structures.

Vertical Planes[25]

In addition to the midline, which passes through the xiphisternal process and the pubic symphysis, there are two paramedian planes which are projected from the midclavicular line (also sometimes called the lateral or the mammary line). This line passes through the midpoint of the clavicle, crosses the costal margin just lateral to the tip of the ninth costal cartilage, and passes through a point mid way between the pubic symphysis and ASIS. It approximates to, but does not exactly correspond to, the lateral border of rectus abdominis.

Horizontal Planes[25]

Several horizontal planes have been defined, but only the subcostal, transpyloric and transtubercular planes are in common clinical use.

The transpyloric plane lies midway between the Xiphisternum and the umbilicus. It usually lies at the level of the body of L1 near its lower border and meets the costal margins at the tips of the ninth costal cartilages, where a distinct 'step' maybe felt at the costal margin. The linea semilunaris crosses the costal margin on the transpyloric plane. The hilum of both kidneys, the origin of the superior mesenteric artery, the termination of the spinal cord, the neck, adjacent body and head of the pancreas, and the confluence of the superior mesenteric and splenic veins as they form the portal vein may all lie in this plane. The pylorus may be found in the transpyloric plane, but is not a constant feature.

The transtubercular plane joins the tubercles of the iliac crests and usually lies at the level of the body of the L5 near its upper border. It indicates, or is just above, the confluence of the common iliac veins and marks the origin of the inferior vena cava.

Abdominal Regions[25]

The abdomen can be divided into nine arbitrary regions by the transpyloric and transtubercular planes and the two midclavicular planes projected onto the surface of the body. These regions are used in practice for descriptive localization of the position of a mass or the localization of a patient's pain. They may also be used in the description of the location of the abdominal viscera. The nine regions thus formed are: epigastrium (2); right and left hypochondrium (1 ,3); central or umbilical (5); right and left lumbar (4, 6); hypogastrium or suprapubic (8); right and left iliac fossa (7, 9). The general visceral cavity of body is formed by abdominal and pelvic cavity ,continuous with each other . They confer protection to urinary ,digestive and reproductive systems and support through the fascial and ligamentary attachments. Neuro vascular structure supplying viscera also pass along the abdominal wall.

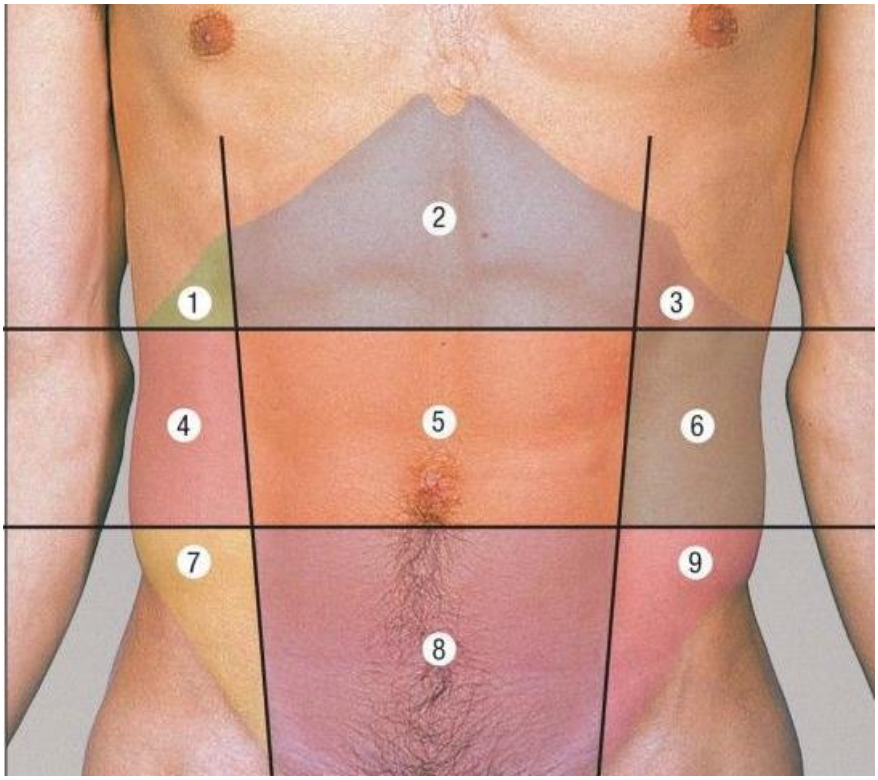

Fig 1 :Regions of the abdomen

Orientatation of viscera on entering abdominal cavity –Liver is located along the right side beneath the ribs ,stretching along the midline till the point inferior to Xiphoid process . Stomach lies to the left of liver ,the greater omentum arises from the greater curve of stomach . , The coils of the small intestine are generally seen beneath it, while the cecum and the left colon lies in the RIF and LIF respectively and are p exposed partly. The appendix is attached to the caecum along with its mesentery. It may be placed pre ileal, post ileal,

sub caecal, retro caecal, para caecal or sub hepatic in position. The appendix can be identified by tracing the taenia coli. The base of the appendix lies where the three taenia coli meet. It is attached to the caecum about 2cm below the ileo caecal valve. The rectum is confined to the sacral concavity being overshadowed by coils of intestine ,the bladder lies in the anterior pelvis but projects above pubic symphysis on distension.Sigmoid colon lies between bladder and rectum [18]

Stomach continues as duodenum, the pyloric sphincter marks point of continuity and it appears like a thick ring .

The duodenum lies beneath the inferior surface of the liver and disappears from the view . Retracting the omentum from the view will reveal passage of duodenum across the left and it's transformation into jejunum and then ileum . The length is about 6 metres , and if the ileum is traced it will be seen entering into the caecum in the RIF . From the cecum the large intestine takes an arched course, passing at first upward on the right side, then across the midline and downward on the left side and forming respectively the ascending, transverse and descending parts of the colon. In the pelvis it assumes the form of a loop, the sigmoid colon, and ends in the rectum

By retraction of the stomach towards the right ,the spleen is revealed in the (Lt)Hypochondrium beneath the stomach .[26]

A small sac like outpouching is seen on the undersurface of the right lobe of the liver- the gall bladder. It might overhang and project as far below to the right iliac fossa too when grossly distended. The pancreas is usually not visualized easily since it is a retroperitoneal structure. If the lesser sac is entered, it is seen extending from the "c loop" of the duodenum obliquely to the left crossing the midline towards the splenic hilum.

The kidneys too being retroperitoneal are not visualized unless specifically looked for. They lie in the lumbar region with their concavities facing the midline. The Peritoneum covering the inner surface of abdomen wall and viscera gives it a shining appearance.[26]

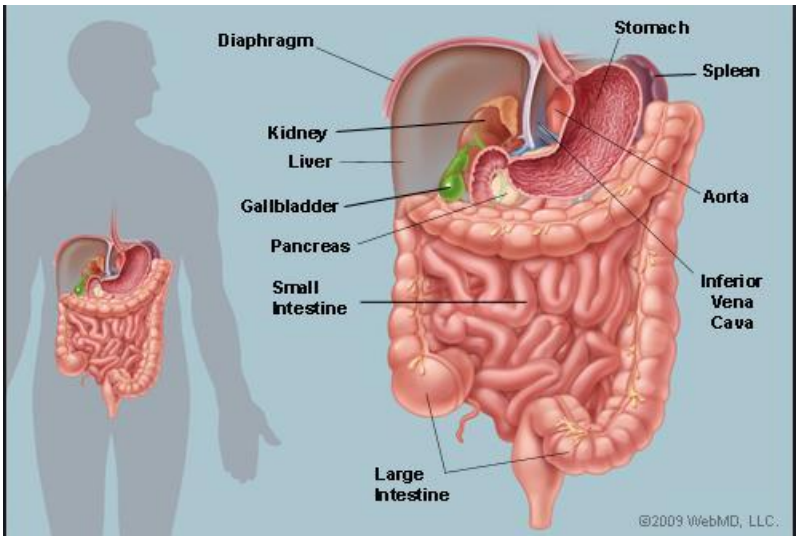

Fig 2 :Arrangement of normal intra abdominal viscera

General Arrangement of the Peritoneal Cavity[25]

The peritoneum forms the largest serous membrane of the body, and its arrangements are complex. In males it forms a closed sac, but in females it is open at the lateral ends of the uterine tubes. It consists of a single layer of flat mesothelial cells lying on a layer of loose connective tissue . The peritoneal cavity is a large continuous space lying between the parietal peritoneum covering the inner surface of abdominal wall and the visceral peritoneum enveloping the viscera. The main region of peritoneal cavity is the the greater sac, which is equivalent to the main abdominal cavity surrounding the majority of the abdominal and pelvic viscera . The lesser sac, or omental bursa, is a small diverticulum lined with peritoneum, which is situated behind the stomach and lesser omentum and in front of the pancreas and retroperitoneum. These lesser and greater sac communicates via the Winslow's epiploic foramen.

For clinical purposes, the peritoneal cavity can be divided into several spaces because pathological processes are often contained within these spaces and their anatomy may influence diagnosis and treatment . Functionally the peritoneal cavity is divided into into two main compartments , supramesocolic and inframesocolic, which are partially divided by the transverse colon and Gastrocolic omentum.

Supramesocolic Compartment

The supramesocolic space lies above the transverse mesocolon between the diaphragm and the transverse colon. It can be functionally divided into Rt and Lt supramesocolic spaces. These regions can be further subdivided into a number of subspaces, which communicates with each other under normal conditions, but are frequently subdivided by inflammatory adhesions in disease. The right supramesocolic space can be divided into three subspaces; the Rt subphrenic space, the right subhepatic space, and the lesser sac. The left supramesocolic space can be divided into two subspaces; the left subphrenic space and the left perihepatic space.

Lesser sac (omental bursa)

The lesser sac is a cavity lined with peritoneum and connected to the larger general peritoneal cavity (greater sac) by the epiploic foramen. It is considered part of the right supramesocolic space because embryologically the liver grows into the right peritoneal space and stretches the dorsal mesentery to form the lesser sac behind the stomach . The sac varies in size according to the size of the viscera making up its walls

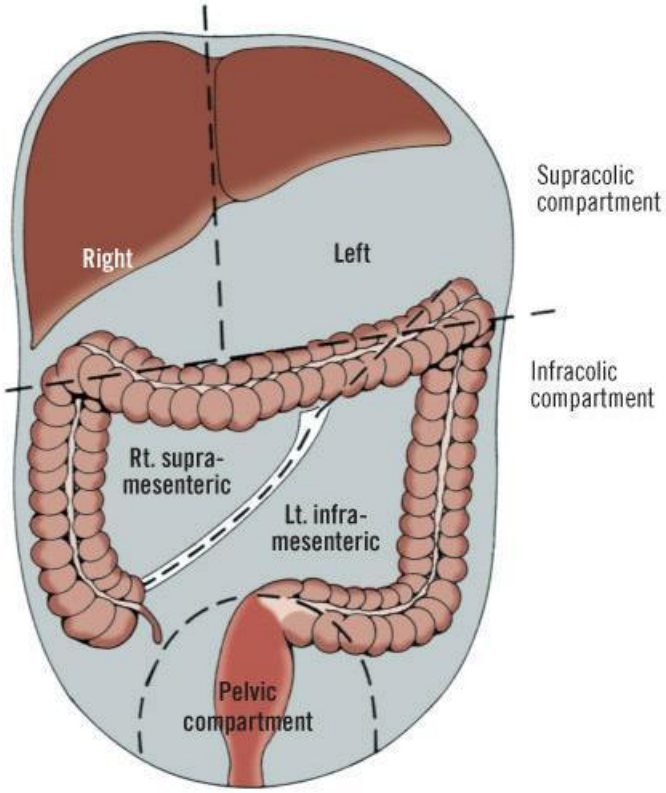

Fig 3 : Recesses of the Peritoneal Cavity

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The posterior peritoneal layer of the lesser omentum, the peritoneum over the posterior wall of the stomach and first part of the duodenum, and the uppermost part of the anterior layer of the greater omentum forms the anterior wall of the omental bursa

The posterior wall is formed mainly by the peritoneum covering the posterior abdominal wall in this area. The superior border of the lesser sac is narrow and lies between the right side of the oesophagus and the upper end of the fissure for embryological remnant ligamentum venosum. Here peritoneum of the

posterior wall of the lesser sac is reflected anteriorly from the diaphragm to join the posterior layer of the lesser omentum.

The inferior border of the lesser sac runs along the line of the fusion between the layers of the greater omentum. This runs from the gastrosplenic ligament to the peritoneal fold behind the first part of the duodenum. In cases where the layers are not completely adherent to each other , the lesser sac may extend as far as the bottom of the two lamina of the greater omentum. The right border of the lesser sac is formed by the reflection of the peritoneum from the pancreatic neck and head onto the inferior aspect of the first part of the duodenum . Above the epiploic foramen the right border is formed by the reflection of peritoneum from the diaphragm to the right margin of the caudate lobe of the liver and along the left side of the inferior vena cava, enclosing the hepatic recess.

The left border of the lesser sac runs from the left end of the root of the transverse mesocolon and is mostly formed by the inner layer of peritoneum of the splenorenal and gastrosplenic ligaments. The part of the lesser sac lying between the splenorenal and gastrosplenic ligaments is referred to as the splenic recess. Above the level of the spleen, the two ligaments are merged as the short gastrophrenic ligament, which passes forwards from the diaphragm to the posterior aspect of the fundus of the stomach and forms part of the upper left border of the

lesser sac. The two layers of the gastrophrenic ligament diverge near the abdominal oesophagus, leaving part of the posterior gastric surface devoid of peritoneum. The left gastric artery runs forwards here into the lesser omentum.

Epiploic foramen (of Winslow)

The epiploic foramen (foramen of Winslow, aditus to the lesser sac), is a short , vertical slit , usually 3 cm in height in adults , in the upper part of the right border of the lesser sac . It leads into the greater sac. The anterior border contains the common bile duct (on the right), portal vein (posteriorly) and hepatic artery (on the left) between its two layers. Superiorly the peritoneum of the posterior layer of the hepatoduodenal ligament runs over the caudate lobe of the liver which forms the roof of the foramen Winslow . To the right, the rim of the foramen is continuous with the peritoneum of the greater sac. The roof is continuous with the peritoneum on the inferior surface of the right hepatic lobe. The anterior and posterior walls of the foramen are normally apposed.

Inframesocolic Compartment

The inframesocolic compartment lies below the transverse mesocolon and transverse colon are far as the true pelvis. It is divided by the root of the mesentery of the small intestine into two unequal domains. It contains the right paracolic

gutter and left paracolic gutters lying lateral to the ascending and descending colon. As a consequence of the mobility of the transverse mesocolon and mesentery of the small intestine, disease processes are rarely well contained within these spaces, and fluid within the infracolic space tends to descend into the pelvis or the paracolic gutters.

Lateral to the descending and ascending colon lies a shallow recess – Rt and Lt paracolic gutter . The right (lateral) paracolic gutter communicates from the right subhepatic space , down to the space in and around the caecum. It descends over the pelvic brim into the pelvis. Superiorly, it is continuous with the the lesser sac through the epiploic foramen,. Thus Bile, pus or blood released from viscera may run along the gutter and collect in locations quite far from the suspected organ of origin. Any collections from the RIF may collect in the lesser sac by coursing along rt paracolic gutter communicating with foramen of Winslow. In cases of perforation of stomach in erect posture the gastric content may track to the RIF mimicking appendicitis . The right subhepatic collections are more common than left because of wider space offered by the right paracolic

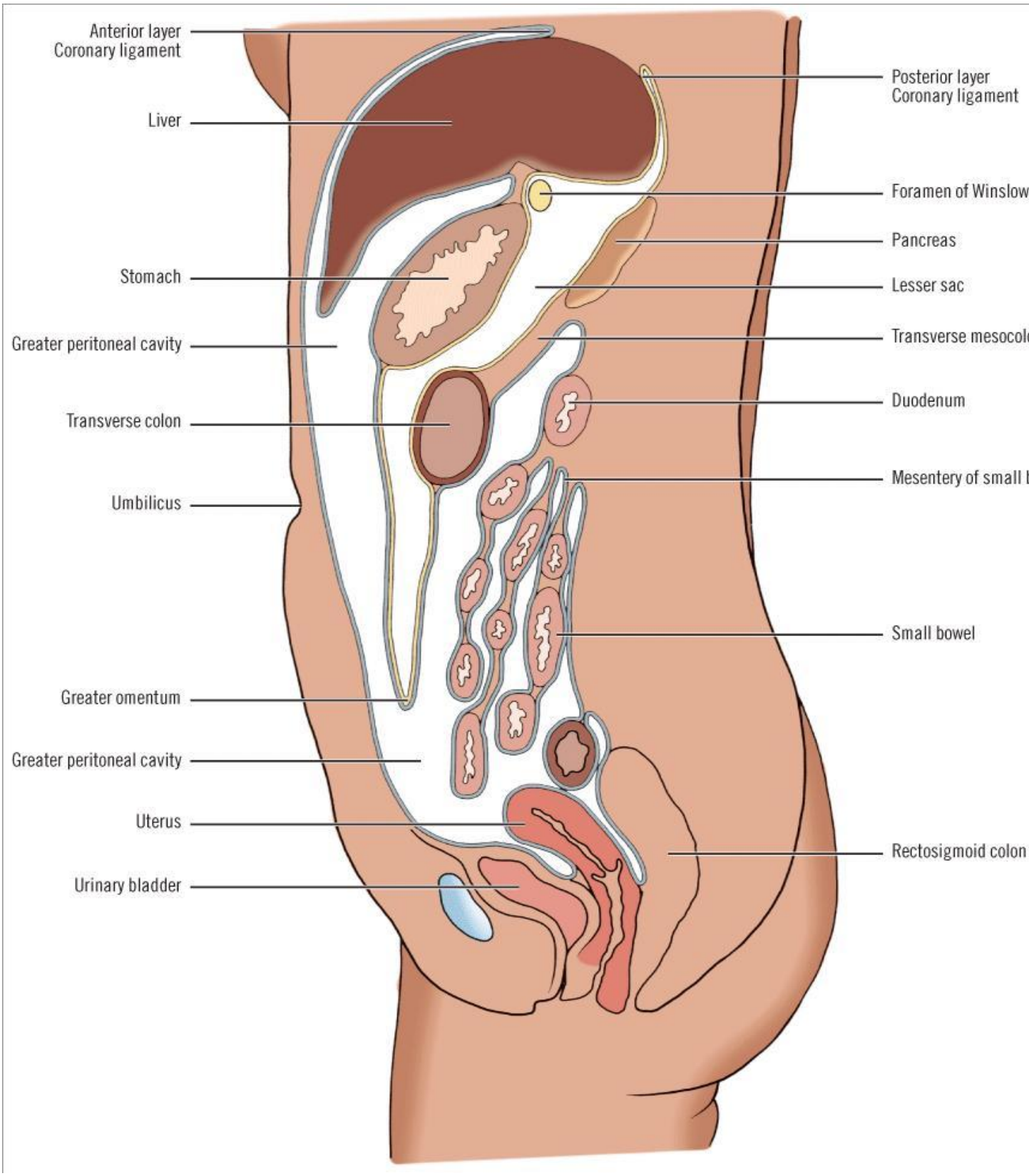


Fig 4 : Sagittal section showing peritoneal attachments and reflections

Pathophysiology of chronic abdominal pain [27]

One of the most common reasons an individual seeks the advice of a physician is because he or she is in pain. Pain was called by Sherrington, "the physical adjunct of an imperative protective reflex." Painful stimuli generally initiate potent withdrawal and avoidance responses . It turns out to be immensely complex because when pain is prolonged and tissue is damaged, central nociceptor pathways are sensitized and reorganized.

A 2009 report in "*Scientific American"* indicated that 10–20% of the US and European populations experienced chronic pain ;59% of these individuals were women. Nearly 20% of adults with chronic pain indicated that they have visited an alternative medicine therapist.

Classification of Pain

Definition of pain by the International Association for the Study of Pain (IASP) is as, "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage."

Pain is frequently classified as physiologic or acute pain and pathologic or chronic pain, which includes inflammatory pain and neuropathic pain. Acute pain

typically has a sudden onset and recedes during the healing process. Acute pain can be considered as "good pain" as it has role in protective mechanism. The withdrawal reflex can be considered as an example in this aspect.

Chronic pain can be considered "bad pain" because it persists long after recovery from an injury and is often refractory to common analgesic agents, including nonsteroidal anti-inflammatory drugs (NSAIDs) and opiates. Chronic pain can result from nerve injury (neuropathic pain) including diabetic neuropathy, toxin-induced nerve damage, and ischemia.

Pain and temperature sensations arise from unmyelinated dendrites of sensory neurons located around hair follicles throughout the glabrous and hairy skin as well as deep tissue. Impulses from nociceptors (pain) are transmitted via two fiber types. One system has thin fibred myelinated A δ fibers (2–5 μm in diameter) with property of rapid conduction. The other one is non myelinated C fibers(0.4–1.2μm in diameter) which has low velocity of conduction.[28]

Visceral Pain [28]

Viscera has mostly pain receptors in majority than other . Also, visceral pain differs from surface pain in several important aspects. The main contrasting feature of visceral pain is it 's dull nature in contrast to the parietal pain which

is sharp in nature . Conversely, diffuse stimulation of pain nerve endings throughout a viscus as caused by termination of the blood supply to a wide area of gut activates several diffuse pain fibers at the same time and can result in unbearable pain.

Morever, pain originating from viscera are poorly localized,with nausea, and frequently accompanied with autonomic disturbances like sweating and changes in blood pressure. In addition to that of being poorly localized, radiation of visceral pain is common and is referred to remote areas. The Autonomic system , similar to the somatic has afferent components, higher integrating stations and effector pathways.

Causes Of True Visceral Pain[:28]

Any stimulus that stimulates wider range of receptors in large areas of the viscera results in visceral pain. Such stimuli include ischemia from occlusion of vessels, chemical damage to the viscera, spasm from repeated contraction of the smooth muscle of a hollow viscus due to obstruction or distension and excess strain on the connective tissue surrounding or lying within the viscus. It s through the small Type C fibres visceral pain are transmitted

Ischemia:

Bradykinin , lactate and other acidic end products of anaerobic metabolism resulting from ischaemia of viscera can excite the pain receptors and cause visceral pain

Chemical Stimuli:

Following perforation of the gastrointestinal tract damaging substances like proteolytic acidic gastric juice gets seeped into peritoneal cavity that causes wide spread digestion of visceral peritoneum stimulating wider areas of nerve stimulation resulting in severe excruciating pain.

Spasm Of A Hollow Viscus:

Following Spasm of a part of the hollow viscus like the gut, the, bile duct, a ureter and the gall bladder can result in pain, by mechanical excitation of the free nerve endings and pain receptors or the spasm might be severe enough to cause decreased blood to the musculature along the wall of hollow viscus, compounded with the increased requirement for nutrients causing severe pain. Usually pain originating from a spastic viscus is in the form of cramps, with the increasing severity of pain reaching peak and then subsiding. This process occurs transiently at serial intervals, once every few minutes. The transient

cycles occur due to intervals of contraction of smooth muscle. For example, every time a peristaltic wave passes along an stmulated spastic gut, a cramp results. This cramping type of pain commonly occurs in appendicitis, gastroenteritis, menstrual bleeding, at the time of delivery, gallbladder disease and ureteral obstruction.

Overdistention Of A Hollow Viscus :

Extreme loading of a hollow viscus also can cause pain, probably due to overstretching of the tissues themselves. Overdistention can result in compression of the blood vessels along the wall of hollow viscus , thus accentuating ischemic pain.

Insensitive Viscera:

A few visceral surfaces are almost nonresponsive to any type of noxious stimuli. Few instances are the liver parenchyma and the pulmonary alveoli. Even then the capsule of liver is extremely stimulatory to reflexes from direct injury and stretch, and the bile ducts are also increasingly sensitive to noxious stimuli . Apart from the alveoli that are nonsensitive in lungs ,the bronchi as well as the parietal pleura are extremely sensitive to noxious stimuli.

“Parietal Pain” Caused By Visceral Disease

When a disease affects a viscus, the disease process often spreads to the parietal peritoneum, pleura, or pericardium. These parietal surfaces, like the skin, are supplied with extensive pain innervations from the peripheral spinal nerves. Therefore, pain from the parietal wall overlying a viscus is frequently sharp.

Localization Of Visceral Pain— “Visceral” And The “Parietal” Pain Transmission Pathways

Pain arising from viscera cannot be localized, due to variety of reasons. First, the patient’s brain is not aware of the existence of variety of internal organs ; hence any pain that arises internally will be localized externally in a superficial fashion . Second, sensory impulses from the abdominal viscera are conducted via two pathways to the central nervous system—the original visceral and referred parietal pathway. Real visceral pain is conducted by noxious sensory fibers within the nerve bundles of autonomic system and also are referred to superficial surface of the body often remote from the excited organ. In contrast , parietal impulses are transmitted directly through segmental

spinal nerves from th e parietal peritoneum, pleura, or pericardium, and these pain impulses are generally felt directly over the inciting area.

Referred Pain[27]

Following irritation of an intra abdominal organ it usually produces pain felt remote from the site in a somatic structure that may be far away. Such type of pain referred to the parietal structure is referred pain .

Localization Of Referred Pain Transmitted Via Visceral Pathways[28]

When visceral pain is referred to the body surface, the person usually regionalises it to the dermatome that gave rise to visceral organ in the embryo, not strictly the site the viscera now lies. For example , the neck and upper thorax are the sites of origin of heart, so in a way the cardiac visceral fibers for pain runs superiorly along the sympathetic nerves for sensation and terminate in the segments C-3 and T-5 of spinal cord. Hence, cardiac pain is referred along lateral neck, left side of shoulder, adjoining pectoral muscles, down the arm to the tip of finger and into the upper part of the chest. These are the sites of the parietal region that gives their own somatic sensory nerve fibers into the C-3 to T-5 cord segments. The origin of stomach is roughly from the T7 to T9 segments of the embryo. Hence , gastric pain is referred to the upper epigastrium superior to the umbilicus, corresponding to the body surface

innervated by T7 to T9 segments.

The basis for referred pain may be convergence of both somatic and visceral pain fibers on the identical II order neurons in the dorsal horn that project to the thalamus and then to the somatosensory cortex. This is called the convergence– projection theory. Somatic and visceral neurons converge in the ipsilateral dorsal horn. The somatic nociceptive fibers normally do not excite the II order neurons, but following prolongation of the visceral stimulus, facilitation of the somatic fiber endings occurs. They now stimulate the second-order neurons, and of course the brain cannot decide if the stimulus arose from the viscera or from the area of referral.

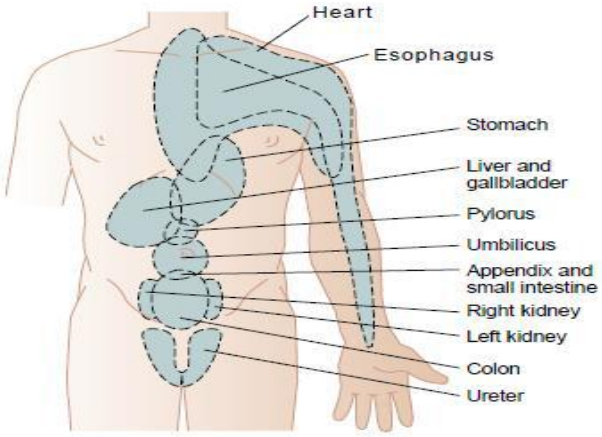
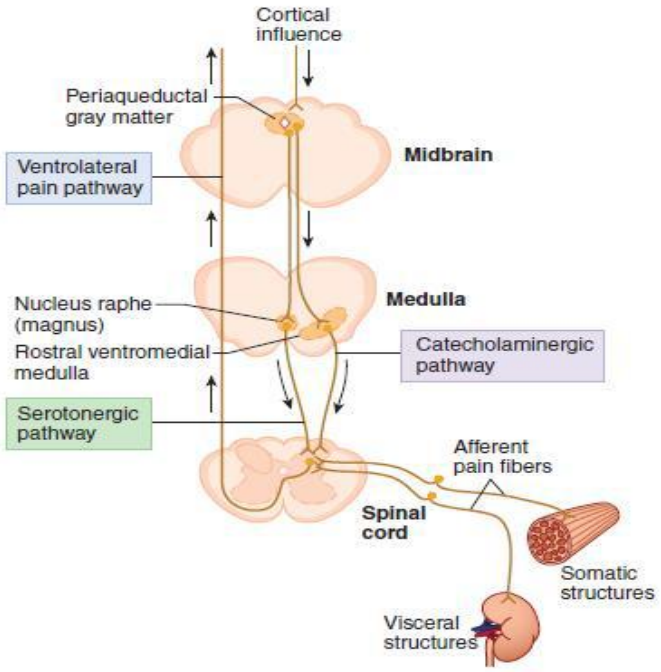


Fig 5: Areas of referred pain

Fig 6: Pain transmission pathway



Parietal Pathway For Transmission Of Abdominal And Thoracic Pain.

Pain arising in the viscera is usually localized to two areas of the body surface concomitantly due to the dual pathway of pain transmission one via the referred visceral pathway and other via direct parietal pathway. The figure below shows dual pathway of pain transmission due to appendicitis .Impulses initially pass from the appendix via visceral pain fibers situated inside sympathetic nerve bundles, and then terminate in the spinal cord at the level of T-10 or T-11 segments ; It is referred to peri umbilical region . And also pain impulses originating from the parietal peritoneum following contact of abdominal wall with the inflamed appendix is transmitted directly over the lower quadrant of the abdomen on the right side as a sharp pain

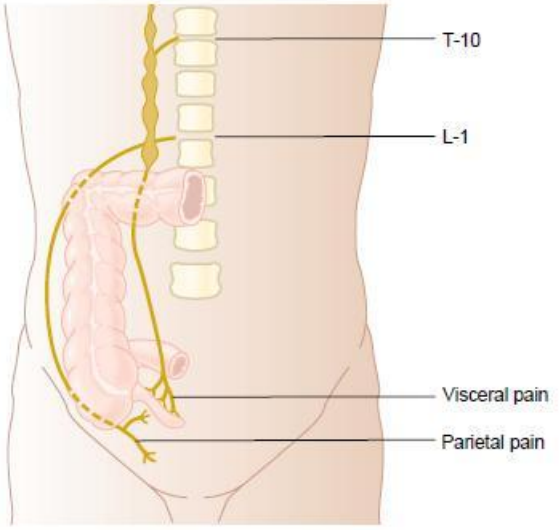


Fig 7: Parietal Pathway Of Pain In Appendicitis

Biochemical Mechanisms [27]

Serotonin is mainly secreted from the GIT . 5-HT mediates numerous functions such as bowel contraction or relaxation, intestinal secretion and the sensation of pain and nausea. Depending on its subtype and location 5-HT is actively released from enterochromaffin cells as a result of mechanical or chemical stimuli and increases peristalsis, bowel wall tone and sensory perception. At the spinal level, repeatedly stimulated afferent fibers increase second order neuronal responsiveness, possibly through the release of stimulatory neuropeptides (eg. Substance P, neurokinin and calcitonin gene related peptide among others) and excitatory amino acids (eg. Glutamate). These substances increases membrane excitability and activate post synaptic receptors (primarily N-methyl D- aspartate, also substance P and calcitonin gene related peptide) which leads to increased

release and influx of intracellular Ca which in turn activates phospholipase C, protein kinase C, nitric oxide and other second messengers which increase neuronal excitability and pre-synaptic transmitter release thereby permitting more Ca influx and creating a positive feedback loop. These substances may also increase the expression of proto-oncogenes such as c-Fos that act as third messengers in the transcriptional control of genes that encode neuropeptides such as dynorphin. Increased dynorphin gene expression can enhance neuronal excitability for days to weeks.

Chronic pain is often refractory to most conventional therapies such as NSAIDs and even opioids . In new efforts to treat chronic pain, some therapies focus on synaptic transmission in nociceptive pathways and peripheral sensory transduction. TRPV1, a capsaicin receptor, is activated by noxious stimuli such as heat, protons and products of inflammation. Capsaicin transdermal patches or creams reduce pain by exhausting the supply of substance P in nerves. Nav1.8 (a tetrodotoxin-resistant voltage-gated sodium channel) is uniquely associated with nociceptive neurons in dorsal root ganglia. Drugs like Lidocaine and mexiletine relieves chronic pain by this channel blockade. Ziconotide, a voltage-gated N-type Ca 2+ channel blocker, has been approved for intrathecal analgesia in patients with refractory chronic pain.

Physical Examination

As is done with any other patient, general physical examination starts with a primary general survey of the patient before proceeding to a more specific and detailed systemic examination.

The overall appearance of the patient is noted along with a simultaneous assessment of his built and nourishment status. Starting from head downwards the following are looked for

Pallor

Icterus

Signs of vitamin deficiency

Cyanosis

Clubbing

Koilonychia

Peripheral limb edema

Generalized lymphadenopathy with special attention to Virchows and Irish node.

Systemic examination begins with examination of the system in question, abdomen, in cases of chronic pain abdomen. It begins with proper exposure of the parts in question. Abdominal examination by palpation is done after inspection for any obvious masses or dilated veins or previous scars which might give a valuable clue in the final assessment of the patient. Palpation begins with a customary

superficial palpation of all abdominal regions after noting for any local rise in temperature and tenderness. A more detailed deep palpation is then carried out in all regions of the abdomen to look for the possible cause of abdominal pain. The knowledge of anatomy is vital to arrive at a proper anatomical source of diagnosis. Renal angles and hernia orifices including the external genitalia also form a very important part of the examination and should not be missed. The rest of the systems should also be examined in detail.

During the physical examination, patients with functional abdominal pain syndrome, may not exhibit autonomic arousal. In fact, the presence of tachycardia, diaphoresis, and blood pressure changes suggests a more acute peripheral source of pain.

The "closed eyes sign" may be noted. When the abdomen is palpated, patients with functional abdominal pain syndrome may wince with eyes closed, whereas those with abdominal pain from organic causes keep their eyes open in anticipation of fear from the examination. "Stethoscope Sign", that is, gentle pressure at the painful site of the abdomen with the diaphragm of the stethoscope, elicits no or only a minimal response and thereby affords a more accurate appraisal of the complaint.

The need to review the prior investigations cannot be over emphasized here. It provides a valuable clue to the pattern of pain and helps in deducing the probable etiology and source of pain abdomen in these patients.

Causes of Chronic Abdominal Pain[29]

Peptic ulcer disease

Gall stones

Chronic pancreatitis

Recurrent /chronic appendicitis

Abdominal neoplasms

Inflammatory bowel diseases

Mesenteric ischemia

Intestinal adhesions

Intestinal obstruction

Intestinal tuberculosis

Tuberculous peritonitis

Abdominal neoplasms:

Gastrointestinal lymphomas

Gastrointestinal stromal tumours (GIST)

Gastrointestinal carcinoid tumour and the carcinoid syndrome

Endocrine tumours of the pancreas and the gastrointestinal tract

Tumours of the stomach

Pancreatic cancer, cystic pancreatic neoplasms and other non- endocrine pancreatic tumours

Tumours of the gall bladder, bile duct and ampulla

Hepatic tumours and cysts

Small intestinal neoplasms

Malignant neoplasms of the large intestine

Investigations

The following are a battery of investigations that are carried out in patients presenting with chronic pain abdomen. Needless to say, not all investigations are done for all patients. The choice of investigations are the sole discretion of the treating surgeon and the clinical picture that the patients presents with.

Hematological: Hemoglobin%, Total Leucocyte Count, Differential Count, Erythrocyte Sedimentation Rate, Pro Thrombin time- International Normalised Ratio(PT-INR)

Biochemical: Blood urea, Serum creatinine, Random Blood Sugar, Liver Function

Test, Serological markers

Urine: albumin, sugar, microscopy

Stool: for occult blood

Ultra Sonography of the abdomen

X-Ray: chest, erect abdomen

Upper GI endoscopy for APD and Gastrointestinal tumors

Colonoscopy for IBD and large intestinal tumors

Sigmoidoscopy for IBD and large intestinal tumors

Barium studies

USG / CT guided FNAC

Diagnostic Laparoscopy as an Investigative Tool

Diagnostic laparoscopy is rapidly becoming a popular procedure among the general surgeons in increasing numbers and is used in patients where other routine investigative modalities have not thrown any light on the possible cause for chronic pain abdomen. The indications include abdominal pain (acute and chronic), focal liver diseases, ascites , pre operative evaluation of malignant diseases etc. the overall diagnostic rate is 99% for abdominal conditions with acute pain, 70% for abdominal conditions with chronic pain , 95% for focal hepatic disorders, 95% for abdominal masses, 95% for ascites and 80% for retro peritoneal diseases. Diagnostic laparoscopy should be used with increasing

frequency when a tissue diagnosis is needed.

Indications For Diagnostic Laparoscopy[3]

Elective	Emergency
Detailed evaluation of chronic pain syndrome	Assessing cause for acute abdominal pain and peritonitis
Detailed study of focal hepatic disease	Blunt and penetrating trauma
Assessing the cause for ascites	Evaluation of ICU patients
Staging laparascopy for malignancy	
Workup for fever of unknown origin	
As a second-look procedure	
Evaluation of small insignificant inguinal or ventral hernia	

Contraindications To Diagnostic Laparoscopy:[7]

Severe and unstable cardiopulmonary disorder

Uncorrected coagulopathy

Infections of the parietal wall

The role of laparoscopy for the staging of malignancy is wellknown . D – Lap is routinely performed for inspecting the surface of the liver.

Laparoscopic guided needle biopsy is far superior to blind biopsy via percutaneous route in the diagnosis of cirrhosis and is usually performed under LA . Chances of blind biopsy causing injury to the liver and missing small inconspicuous lesions such as small metastases are higher. Laparoscopy is indicated for assessing the cause for ascites following failure of imaging modalities to reveal the cause . Diagnostic laparoscopy will also help in ruling out a nonoperable cause for abdominal pain . By laparoscopy the rate of negative laparotomy can be greatly minimised .Especially laparoscopy is fruitful in young women experiencing gynecological problems to rule out appendicitis. In younger individuals with ill-defined abdominal pain of diagnostic difficulty D-Lap can be used to reveal diagnosis wher other imaging modalities are of little help. In the intensive care unit (ICU), laparoscopy plays a major role in preventing non therapeutic celiotomy in patients with a suspected abdominal catastrophe.

It can be done under local or general anaesthesia in a standard operating room set-up, with proper port placement and normal laparoscopic equipment. GA allows handling of inflamed tissues without pain, biopsy of peritoneal and omental lesions and safe conversion to an open procedure. The following laparascopic devices may be required for aiding in D-Lap and should be available:

- Angled laparoscope (30-degree)
- Scissors
- Grasping devices
- Liver retractor
- Blunt probe
- Babcock clamp
- Hook cautery
- Cupped forceps
- Biopsy forceps
- Uterine retractor
- Hollow suction/ irrigation probe

Pre-Operative Evaluation And Patient Preparation

A well taken history and meticulous physical examination are the deciding factors of patient selection for surgery. Any comorbid conditions that expose patients to both anaesthetic and surgical complications should be recognised. Any severe cardiac or lung disorder should be searched for based on symptoms and ruled , even though it has not been previously diagnosed. Similar to other surgical procedures, patient preparation starts with informed and written consent.

The patient must be aware of the potential advantages ,proposed risks and other alternatives to the planned laparoscopic procedure and must know about the possibility of requirement for conversion to an open procedure . Preoperative antibiotics is administered before skin incision is performed in any procedure where bacterial infection of the wound is possible (i.e., clean contaminated cases). Also, antibiotics need to be administered following placement of prosthetic mesh during the surgery. For immune deficient patients antibiotics to counteract skin flora should also be given. From the probable risk of DVT following laparoscopic surgeries , several surgeons recommend administering a single dose of subcutaneous heparin several hours before surgery. Mechanical bowel preparation is not absolutely required prior to procedure

Equipments Used In Laparoscopy[10]

Equipment falls into two broad categories: those major pieces of equipment that enable the surgeon to perform laparoscopy and those instruments related to the performance of specific tasks or procedures .

I. Imaging System

Imaging system includes the Source of light, Light cable, Monitor screen and Camera.

A. Laparoscopes

Laparoscopes can be of rigid or fibre optics variety . Frequently employed ones are rigid scopes, like 0°, 30°, 3mm, 5mm and 10mm. The 30° angled scopes are amenable for rotation and used to look down , see up the anterior abdominal wall and can be viewed side ways.

B. Light Source

The new light source such as 250 watt halogen lamp has been provided with a cooloing condenser system, but Xenon lamp (cold light source)can be too used that gives better visual clarity. The intensity of light can be adjusted dither manually or automatically. Xenon lamp with superior intensity gives far better visual and photographic clarity.

C. Light Cable

Light carrier can be a fluid or either a glass fibre light cable .The plasic sheath surmounting the light cable should be devoid of cracks and bends . The cables come in several diameters and lengths. The diameter of the fibre bundle should be chosen in such a way it is mildly larger than the contained lens system and should not be too long.

D. Cameras

Currently small and low weight cameras are present, which is handy providing optimally sharp pictures of increased resolution and brilliant colour reproduction .The resolution of one chip camera is of point 450- 600;While that of 3 chip cameras with greater than 750 horizontal lines give brilliant visual clarity. However one chip camera is suffice for routine laparoscopic surgeries but if the need for recording surgery into a larger film or video production arises, three chip camera is preferred . Currently an enhanced version of 3 digital chip cameras integrating image processing modules are available .

E.Monitors

Following the S-VHS connection an ideal video monitor must produce images with higher resolution. Video screen of 20 inches and above and without flickering is preferred.

II. Gas For Pneumoperitoneum

Initially pneumoperitoneum was created using air , but it was abandoned following the risk of air embolism.

The ideal insufflating agent should have following features:

- It should have lack of color, physiologically inert at room temp

and should not explode in the presence of electrocautery or laser coagulation.

- It should have high blood solubility .
- The insufflating gas should be easily available, of low cost and nontoxic.

1.Carbon Dioxide

Carbon dioxide is an odorless, colorless gas. It is a easily obtained, stable at room temp, naturally produced in the tissues and subsequently removed from body in the lungs. Due to these features, Carbon dioxide is the most frequently used gas for insufflations during any laparoscopic procedure.

Advantages

- It has very low risk of venous gas embolism
- It is non combustible

Disadvantages

- Hypercarbia and acidosis
- The direct effects of carbon dioxide and acidosis can lead to depressed cardiac contractility, pulmonary hypertension and systemic vasodilation with fall in pressure

2. Nitrous Oxide

Nitrogen is non reactive , colorless, gaseous element stable at room conditions and easily available . Nitrous oxide has been advocated for the techniques performed under local anaesthesia, or for patients undergoing procedures for longer duration with poor pulmonary reserve .

Advantages

- Negligible changes in acid-base balance.
- Significantly reduced pain

Disadvantages

- Aids combustion in the along with hydrogen or methane gas.

3. Helium (He)

Helium is a gas with no color, no odour, without taste and it is obtained from natural source. It is inert gas and neither is combustible , nor aids combustion. Helium is comparatively less soluble in water than carbon dioxide and hence more chance of air embolism

Advantage

- The main benefit is the negligible effect on acid- base balance.

Disadvantages

- Owing to it s poorly solublity in water , it is associated with increased risk of subcutaneous emphysema .
- Raised risk of venous gas embolism as it is relatively less soluble in

water compared to carbon dioxide.

- It is readily diffusible due of its reduced density.

4. Argon

Argon gas has no color, no odour, is non combustible and chemically inert.

Advantage

- The stable acid base status of the gas is it' s main advantage.

Disadvantage

- The most worrisome disadvantage of the gas is it s propensity to cause cardiac depression.

III. Laproflattor

The electronic carbondioxide Laproflattor is an all purpose insufflations unit used routinely in theatres . Insufflations of the peritoneal cavity under controlled pressure achieves the essential working space for surgery by causing distension of the peritoneal cavity and collapsing the hollow organs. Automatic insufflators enables the surgeon to predetermine the pressure and provides gas till the required level is reached. Further fall in insuffulation pressure due to leakage of gas from ports is checked by automatic activation of the insuffulator . It is possible to alter Insufflation pressure from 0 to 30 mm Hg as and when needed ; total gas flow volumes can be set to any value in the range 0-9.9 liters/mm. The vital indicators for insufflators are preset pressure, current

pressure, flow rate and amount of gas used.

IV. Suction Irrigation Machine

Suction And Irrigation Hand Apparatus

Irrigation and suction are most vital at the time of laparoscopic surgeries specially to sustain clear visual field and confirm established hemostasis. It ‘ s available in 5mm and 10mm sizes and can be reused. The suction tip is helpful for occasional suction and can be also used as a blunt instrument for dissection like a finger in conventional surgeries. The suction irrigation apparatus is most commonly during surgery to maintain a clear field . Normal saline or ringer lactate is used for irrigation purposes. Sometimes, heparinized saline is employed to dissolute clots to enhance proper suction from increased bleeding.

V. Operative Hand Instruments

Both reusable and one use instruments are widely available. One use instruments offer superior performance and increased safety on single use. Reusable instruments are cost effective for the long run, however, they require adequate cleaning and proper maintenance.

A. Insuffalation Cannulas

1. Veress Needle

Veress needle was introduced by a thoracic physician for aspirating fluid in pleural effusion hoping that its spring mechanism and blunt tip will not cause injury to lung tissues. Veress needle has an bevelled edged outer cannula for cutting through tissues .Within the cannula lies an inner stylet, that is loaded with a spring which springs in forward direction in response to the rapid fall in pressure upon moving beyond the abdominal wall and reaching the peritoneal cavity. The hole on the lateral aspect of the stylet allows for CO2 gas to be delivered intra-abdominally. In the beginning Veress needle based creation of pneumoperitoneum is practiced so the trocar can enter abdominal wall safely without injuring the abdominal viscera

Veress needle technique is the commonly practiced way for creation of initial pneumoperitoneum . It is mandatory to verify Veress needle every single time before employing it, for its proper functioning . The size of Veress needle can be 80mm, 100mm, 120mm. In thick abdomen walled patients 120mm is required and in very frail patients with thin abdomen 80mm Veress needle is the needle of choice . Veress needle must be used and held like a dart during insertion.

2. Hassan Cannula

It is not commonly used like that of a Veress needle . There is less chance of risk of injury to vascular structures and hollow visceral . It is the preferred instrument to access the abdomen, needful to say in patient who has underwent intra-abdominal procedures in the past . It is made of three pieces: a blunt tipped obturator ,a conical sleeve, a metal or plastic sheath with either a trumpet or flap valve. Over the sheath are 2 struts for binding 2 fascial sutures. These sutures are then tightly rolled around the struts, effectively seating the conical sleeve into the laparoscopic port. This generates an efficient seal for maintaining pneumoperitoneum.

B. Trocars

Though the term "trocar" refers to the entire assembly but actually it is a stylet that is passed through the cannula. Various trocars are there with various tip types . The cutting tips may be in the appearance of a 3 edged pyramid or a flat 2 edged blade. Conical tipped trocars are believed to be atraumatic to the body tissues. It can penetrate via abdominal wall without damage to the tissues and a reduced risk of herniation or bleeding is reported. Cannulas are made from either plastic or metal. Plastic devices though they can be transparent or opaque, should be designed in so as to minimize the glare from reflection of light from scope . The tip of single use trocars is a 2 edged

blade. These are highly efficient in penetrating the parietal wall by dividing the tissue as they pass through. Many of the single use plastic trocar has associated-spring mechanism that sharply withdraws the pointed tip immediately once it Passes through the parietal wall to lower the risk of injury to viscera. Trocar and cannula are of several sizes and diameter varying upon the device for which it is designed . The diameter of outer cannula varies from 3 mm to 30 mm; the most common size being 5mm and 10 mm . Some recent single use trocar incorporate special design features as direct serial incision of the tissue guided under visual control [Excel trocar]. Each and every cannulas come with a valve mechanism at the upper part . Always ensure that in trocar all the valves move freely and the insufflation valve remain closed (to avoid escape of air from created pneumoperitoneum).The valves within cannula offer internal air seals, that enable devices to move within cannula without loss of created pneumoperitoneum. They can be either oblique, transverse, or in piston arrangement. The valves are designed in such way they can be manually or automatically retracted during passage of device .It is imperative to remember that sharp trocars are far way better than blunt ones, as they require less amount of force to be introduced into the abdominal cavity obviating risk of injury to viscera . The cannula ‘ s end can be either straight or oblique. An cannula with oblique tip is ensures the smooth passage of the trocar through the parietal wall.

C. Reducing Sleeve

It is employed to minimize the port size from 10mm to 5mm or 5mm to 3 mm, in such a way the pneumoperitoneum will be maintained even when surgeon opts for a instrument from larger diameter to smaller diameter .

D. Needle Holder

Laparoscopic needle holder comes with either a straight or curved tip. It requires 2 needle holders for performing a swift endo-suturing, although it is possible for satisfactory endo- suturing with a single needle holder and a grasper.

E. Port Closure Instrument

These are excellent hand instruments for closure of the laparoscopic ports, especially 10mm or larger ports.

VI. Other Hand Instruments

Disposable or Reusable Instruments

Reusable instruments are expensive during initial buy but they are cost effective on a long term usage . In developing nations, single use instruments are less frequently used owing to low labor cost . However in Europe and USA, the scenario is to avoid using reusable instrument to cut labour charges .

Insulation of single use instrument are amenable to damages easily that can lead to electrosurgical injuries. Usually the lap instruments differ in diameter from 1.8 to 12mm though greater part of instruments were made to pass through 5 to 10mm of cannula. They also vary differently in length based on the manufacturer but they are easier to work with if they uniformly are os same length of about 36 cm in adult and 28 cm in younger age group. For pediatric surgery instruments varying in size from 18 to 25 cm are convenient . However they can also be used in adults where the operating space is narrow . 45 centimeter devices are used in obese individuals .Suited for better handling half of the instruments should lie within the abdomen and half should lie outside. This makes the instrument to act like class I lever thus stabilizing the port nicely and making surgery more convenient.

F. Instruments For Sharp Dissection

- Scissors
- Electro surgery hook
- HF Electro surgery spatula (Berci)
- HF Electro surgery knife
- Knife

Scissors

It uses two blades which when glided with one another causes fine cutting tissues

Types of Laparoscopic Scissors

(1) Straight Scissors

(2) Curved Scissors

(3) Serrated Scissors

(4) Hook Scissors

(5) Micro-tip Scissors

Spatula, Hook And Harmonic Scalpel

Spatula with flat tip is ideal for dissecting the gall bladder from the gall bladder fossa . It is extremely safer when compared to hook. Hook has a L shaped tip. Frequently it is used to dissect out the gallbladder from the Gall bladder fossa . Some surgeons also use this device for enterotomy. In modern era of laparoscopic surgery ultrasonic scalpel (Harmonic scalpel) is used for advanced procedures.

Clip Applicator

They come in both single use and reusable forms . Reusables forms occur in 3 sizes - large, medium and small. They are employed to occlude both cystic

artery & duct according to their size. Disposable clip applicator is available with preloaded 20 clips per unit similar to the Protack that comes with 30 clips per unit.

Electrocautery / LASER

Electrocautery or LASER energy is used to dissect tissue. Either energy modality will also adequately achieve hemostasis of small blood vessels. Electrocautery uses microwave wavelength energy to produce heat that can dissect and coagulate tissue. This device is familiar to most general surgeons. A power setting of 20-30 watts is usually sufficient. Although coagulation current is used primarily, a mixed blend of cutting and coagulation may be valuable. A number of different laparoscopic instruments have recently been adapted to incorporate monopolar electrocautery.

Fig 8: Laparoscopes

Fig 9: Light Cable

Fig 10: Camera

Fig 11: Suction Irrigation Hand Apparatus

Fig 12: Veress Needle

Fig 13 : Hasson's Cannula

Fig 14 : Tips And Trocars

Fig 15 : Needle Holder

Fig 16 : Port Closure Needle

Fig 17 : Scissors

Fig 18 : Working Instruments

Fig 19 : Spatula , Hook and Hormonic Scalpel

Fig 20: Clip Applicator

Operating Room Layout:

The position of the surgeon, assistants, video monitors, anesthesia equipment and other necessary machines (laser, irrigators etc) must all be carefully planned, placement will vary, depending on the area of focus inside the abdomen.

Specialized laparoscopic carts allow for compact storage of instruments. Otherwise the numerous electrical cords, gas lines, light cords etc obstruct the flow of traffic in the operating room and may even cause an accident involving the patient, operating room personnel or equipment.

Anaesthetic Issues[12]

The anaesthetic management of laparoscopic surgery has several important goals. The complications of laparoscopic procedures has increased, operative times has lengthened , but duration of hospital stay has minimised . Hence, the anesthesiologist should balance required intraoperative amnesia, both postop and intraop analgesia and muscle relaxant with the need for quick postoperative recovery and low side effects.

Preoperative investigations should be ordered to assess general condition of the patient. The need to review past medications and blood investigation reports cannot be over emphasized.

The requirement for needed laboratory studies, an ECG, or chest X ray depends mainly on the general condition of the patient, based on the history and physical examination as the main guiding tool:

Hb	Surgical blood loss expected, suspected pallor
Electrolytes, BUN, Serum Creatinine	Diabetes, Hepatic diseases, chronic kidney disease, diuretic Use
LFT	Liver disease
PT, aPTT	H/o abnormal bleeding, liver disease
Chest X ray	Recent respiratory tract infection, unstable COPD, Unstable cardiac disease

Whenever possible, NPO (Nil Per Orally) should be observed for at least 6 hours following intake of solid food and 2 hours for clear liquids intake.

Preoperative intake of H2-antagonist (cimetidine, famotidine, or ranitidine) and metoclopramide to lower gastric acid production ,to increase gastric pH and to promote gastric emptying. These medications should be administered either intravenously less than 1 hour before or orally 2 hours before induction of anaesthesia for maximal benefit

. Anaesthetic Techniques

Although there is report of success with local, regional, and general anaesthesia for laparoscopic surgery, the wide range of procedures are being done under general anaesthesia. Local anaesthesia has been used mainly for either diagnostic or short therapeutic methods , such as liver biopsies. Every port site should be anasthetised with local anaesthetic.

About 5 mL of 0.5% or 1% lidocaine or 0.5% bupivacaine is infiltrated at every site, with 1 :200,000 epinephrine included to raise the anaesthetic duration and to reduce systemic absorption. The intra-abdominal viscera could also be sprinkled with local anaesthetic before they are handled, retaining the thought that the highest recommended doses of local anaesthetic (5 mg/kg for lidocaine, 2.5 mg/kg for bupivacaine). The role of either a epidural or spinal anaesthesia for laparoscopr has been reviewed , most commonly for ligating fallopian tubes and inguinal hernia repair. A T4 level blockade is needed for adequate peritoneal pain relief and relaxation of abdominal musculature. Even with the increased level of anaesthesia , shoulder pain from irritation of diaphragm by carbonic acid formed from the carbon dioxide can occur.

Neuraxial anaesthesia produces a sympathetic block with resulting significant hypotension, which gets more pronounced if combined with the reverse Trendelenburg position. Dyspnea is commonly occurred in patients having regional anaesthesia for laparoscopy, due to paralysis of the accessory respiratory muscles. Inspite of these drawbacks, regional anaesthesia is a preferred option if the patient is responsive and the procedure being of short duration with a lesser amount of manipulation. Local and regional techniques also offer the added benefits of reduced postoperative pain and vomiting and room for a speedy recovery.

General anaesthesia with intubation is the preferred and widely practiced mode of anaesthesia for laparoscopy. General anaesthesia gives total intraoperative analgesia and anaesthesia and maximal muscle relaxation which offers facilitated insufflation, permitting more working space for procedure with less amount of insuffulation.

Total intravenous anaesthesia (TIVA) using propofol and narcotics of short duration or use of the rapid acting inhalational agents desflurane and sevoflurane with shorter duration improves short-term recovery.

Surgical Technique

Creation of Pneumoperitoneum:

Before creation of pneumoperitoneum, it is essential to ensure that the patient is placed in the Trendlenburg's position so that the bowel loops fall away and thus avoiding inadvertent injury to the small bowel. A curvilinear incision is made in the midline of either the upper or lower margin of the umbilicus. With the dominant hand, grasp the shaft of the Veress needle gently like a dart and pass slowly the needle into the incision – either at a 45-degree caudal angle to the abdominal

wall (in the asthenic or minimally obese patient) or perpendicular to the abdominal wall in the markedly obese patient. There will be a feeling of initial toughness succeeded by a "give away" at two points. The first point is due to the needle

piercing the fascia and the second as it pierces the peritoneum. When the needle reaches the peritoneal cavity, an prominent click can be heard or felt as the blunt-tipped part of the Veress needle springs advancedly into the peritoneal cavity. Connect a 10-ml syringe containing 5 ml of saline to the Veress needle. There are five tests that should be performed in sequence to confirm proper placement of the needle.

- Hiss Test:- From the sound of air flowing through the Veress needle into the peritoneum by negative pressure which is accentuated by raising of abdominal wall, when the tip of the needle is properly positioned.

- Aspiration Test:- A full syringe filled with saline is connected to the Veress needle . Fluid injected into peritoneal cavity will move away normally and cannot be aspirated however if the fluid is aspirated ,an improper needle tip placement is more likely. Morever, if bowel content or blood is aspirated, then false placement of needle is confirmed.

- Negative Pressure Test:- The insufflation tubing of the insufflator must be connected to the Veress needle. Continuous monitoring for intraperitoneal pressure will reveal a slight negative pressure accentuated by parietal wall rise

- Early Insufflation Pressures:- Another hint for correct positioning is recording of the insufflations pressure which must not exceed 8mm Hg with flow at 11 litres/min. The static pressure should not be more than 3mm Hg. Pressures if greater than 15mm Hg indicates incorrect needle tip position.

- Volume Test: Normally for an individual it takes about 2.5 litres of gas to distend the peritoneal cavity to 8 – 10 mm hg .However if this pressure is attained with about less than one litres of gas as indicated by insuffulator then it should arise doubt about the position of needle

Open Technique:

In order to decrease the incidence of injuries associated with blind insertion of Veress needle and initial trocar, Hasson proposed a blunt mini laparotomy access called Hasson's open technique. Here an infra umbilical incision is made

and the sub cutaneous tissue is bluntly dissected and retracted. Two clamps are used to lift the linea alba. A horizontal or vertical defect of 1.5cms is made. Peritoneal fat is dissected bluntly till the peritoneum is identified. The peritoneum is held with a hemostat and incised. Two absorbable sutures are placed on either side of the fascial defect. Hasson's cannula with its blunt obturator is advanced into the peritoneal cavity until the olive abuts the fascia. The obturator is removed and the sutures are firmly attached to create a seal with the fascia. The laparoscope is then introduced for the procedure.

Similar to an open procedure, a thorough and meticulous laparoscopic exploration should be done to assess the abdominal cavity and pelvis. Usually a 5 mm Scope inserted via a periumbilical port is adequate for diagnostic purposes ;ideally a 10 mm Scope is ideal for therapeutic intervention. If required a second trocar may be inserted through the flank to facilitate adhesiolysis for an effective exploration. Also a third port may be required if an another working instrument is required to retract, palpate, or do a biopsy. Meticulous palpation with a blunt instrument can be indispensable during exploration.

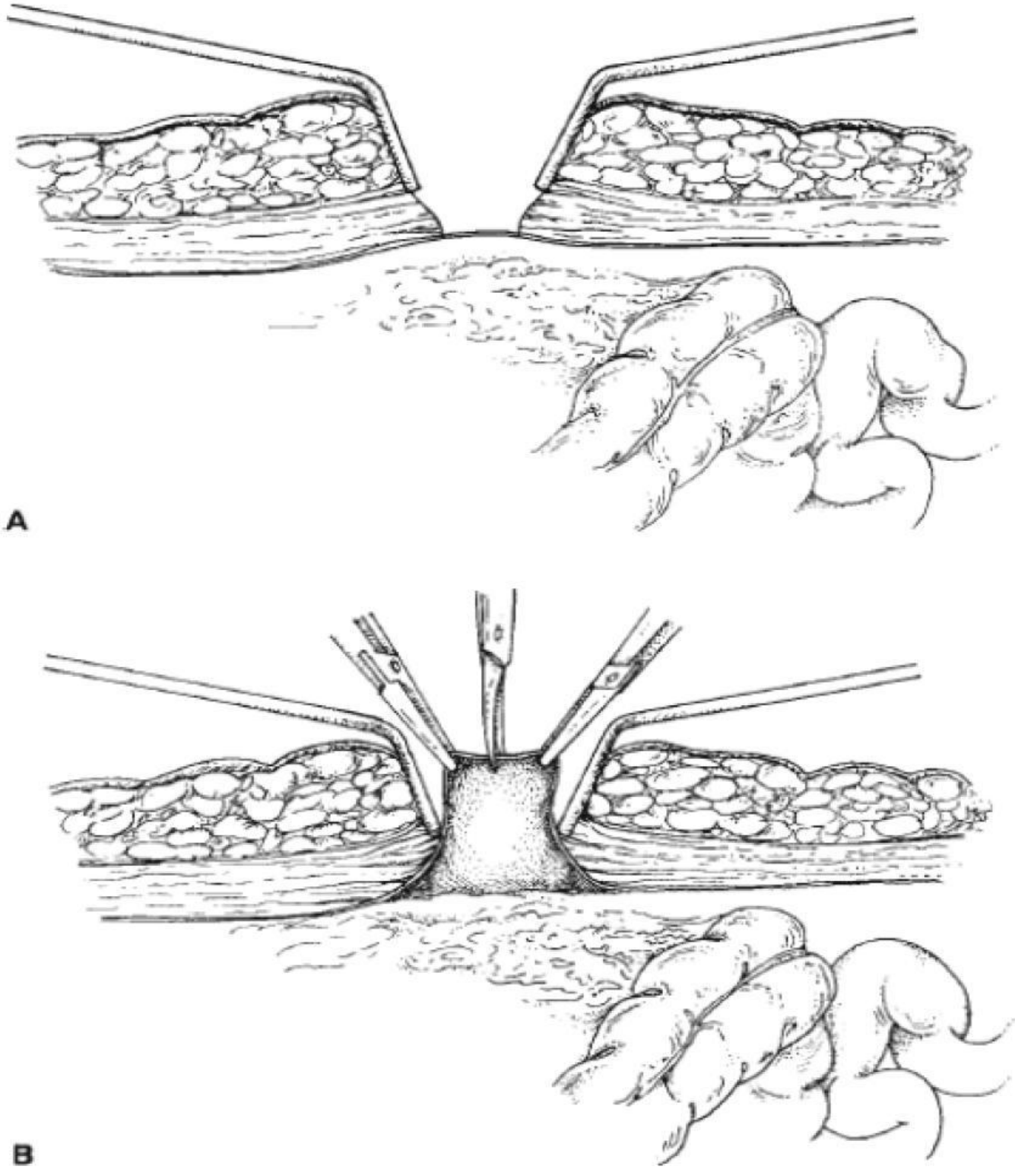


Fig 21 : Open Technique For Pneumoperitoneum Creation

Decompression of the stomach by means of a naso gastric tube insertion and that of the urinary bladder by means of a Foleys catheter insertion goes a long way in avoiding accidental injuries during creation of pneumoperitoneum and trocar insertion.

A. Pelvis

The pelvic viscera must be visualised first. A Trendelenburg position of 30 or 40 degrees may help in identification of pelvic structures. In women, the tubo – ovarian structures and uterus are inspected. A uterine manipulator should be used to lift the uterus and visualise the adnexa, cul-de-sac and bladder. Normal ovaries are pearly white, shaped like an almond ,and the size is 2 x 3 x 3 cm. Ovaries must be looked for any signs of torsion. Ovarian cysts should also be identified .Decompression of a large cyst with a needle is ideal prior to excision. If an ovarian malignancy is doubted, peritoneal washings should be done for cytology and the opposite ovary should be thoroughly analysed . Salpingitis and early ectopic pregnancy will produce inflammation and erythema of the fallopian tubes. Uterine leiomyomas will appear as a firm grayish masses that can be either microscopic or large enough to fill the whole abdominal cavity. An indirect hernia may project as a defect in peritoneum lying lateral to the

inferior epigastric vessels, whereas a defect in direct hernia lies medial to the inferior epigastric vessels. The bladder must be inspected for disorders and the sigmoid colon assessed for diverticulitis, pericolic abscess and tumor. Diverticuli appear as outpouchings of colonic mucosa between the mesenteric and anti mesenteric taeniae.

B. Midabdomen

With the patient in neutral position, intestine, omentum, and stomach are carefully examined. The appendix is identified by tracing the taenia of cecum where they merge at the base of appendix . During early appendicitis, the appendix will be erythematous with dilated vessels with a coat of fibrinopurulent exudate . A greenish black discolouration of necrosis reveals a gangrenous appendix and risk of impending perforation. Identification of Meckel's diverticulum neccesitates an thorough inspection of greater length of the terminal ileum along it ‘s anti mesenteric border . Crohn's disease appears in demarcated segments of bowel with areas of skip lesions with adjoining normal areas and may produce mesenteric fat stranding. The duodenum should be looked upon for early growth or perforation. Sometimes a perforated duodenal ulcer will be covered by omentum and maybe missed. Ischaemia of intestine produces a blue, dusky appearance of the bowel. An lesion causing obstruction of the small

or large bowel will act as a leading point forming prominent dilation of bowel above the lesion and collapsed bowel lying below the lesion.

A well delineated transition will not be marked if the lesion is following only partially obstructing of the bowel .Any defects in the mesentery of small bowel must be carefully inspected for a hernia.

C. Right Upper Quadrant

To evaluate the right upper quadrant the patient is positioned in 30 – 40 degrees of reverse Trendelenburg position with slant of the table to the side of patient's left. By this maneuver the colon and duodenum is allowed to move away from the side of the liver. Normal liver gives appearance of reddish-brown with a smooth surface. Both the two lobes of the liver must be carefully inspected and the falciform ligament looked for any pathology. Adhesions over the anterior surface of liver can cause inflammation from Fitze-Hugh-Curties syndrome. Fatty degeneration gives yellowish appearance to the liver, whereby nodularity gives notion for cirrhosis. The idea about size and pattern of reforming nodules will help to decide the prognosis. Primary carcinoma of the liver may be viewed upon like single or a number of small nodules and may be seen with diffuse metastases in peritoneum. Metastatic lesions usually appears like yellow, gray or white solid nodules. Sometimes lesions within the

liver parenchyma deep to the surface can be felt by blunt instrument palpation . Biopsy must be performed using a cutting needle, cupped forceps or scissors with a cautery or a needle aspiration should be performed for a solid lesion to ascertain histology and cytology. Hemangiomas shall appear like a bluish cystic lesions ; a biopsy is generally avoided because of severe bleeding that may follow . Hepatic, pancreatic and other lesions can be evaluated in detail by the use of laparoscopic ultrasound probe . The gallbladder is situated on the under surface of the liver seen projecting beyond the liver margin ; However , lifting of the liver and adhesiolysis of the fibrous band may be required if gall bladder is not seen. In acute inflammation of the gallbladder, it will be tense, edematous ,with pericystic fluid collections and it 's wall is covered by fibrino suppurative exudates .In chronic cholcystitis there are characteristics of presence of adhesions with thick ,tough and gray white gall bladder . Distended gallbladder may be seen in distal extra hepatic obstruction. A pale GB is seen either in malignancy or chronic inflammation . If indicated lap cholecystectomy is performed

D. Left Upper Quadrant

The spleen normally cannot be seen and if visible, sit indicates the presence of splenomegaly . Visualisation can be improved with the patient in reverse Trendelenburg and the slant of the table slightly to the right. Splenic

biopsy is complicated by risk of severe torrential hemorrhage and requires extreme exercise of caution . The left hemi diaphragm can be evaluated for small hiatal hernia and esophageal varices. Inward curving of the diaphragm shall be a que to pneumothorax.

Tissue Sampling

Tissue sampling is an inseparable part of diagnostic laparoscopy. For solid tumors of the liver , a Tru-cut biopsy generally provides adequate tissue samples for diagnosis. Bleeding occurring post biopsy can be controlled by direct pressure. Biopsy instruments are passed percutaneously or via an accessory port under the visual guidance of scopy. Protuberant small lesions are sampled with help of punch biopsy forceps, a device with an inferior cup- shaped blade that will sample a small tissue sample without causing damage to adjacent structures. Incisional biopsy will be required for tumours requiring large tissue samples. Hemostatic agents, electrocautery, and sometimes running sutures will be needed to achieve hemostasis. Aspiration of cysts with a needle can be done , but at the risk of torrential bleeding provided the lesion is a hemangioma or other vascular tumour

Doubtful peritoneal deposits and enlarged lymph nodes can be biopsied and sent for histopatholgical examination to confirm the diagnosis. Therapeutic interventions like appendectomy and adhesiolysis can also be

performed thus avoiding another hospitalization and procedure for the patient.

Postoperative Care

Postoperative care is needed according to the type of procedure done. For procedures without any complications the patient are usually monitored overnight or maybe discharged on the day of surgery . Commonly encountered problems in the immediate postoperative session are acute urinary retention and nausea.

Antiemetics and analgesics should be utilized liberally. Patients are supplemented with clear liquid based diet in the immediate postoperative session and asked to continue regular diet the next morning. Patients should not be restrained physically and should be asked to resume their day today activity in less than one week.

Complications Of Diagnostic Laparoscopy

A. Immediate

1) Anaesthesia

a. Complications of general anaesthesia/ sedation

b. Vaso vagal attack under local / regional anaesthesia

2) Insertion of pneumoperitoneum needle

Position of needle	Consequence	Remedy
Pre Peritoneum	Emphysema	Removal and reinsertion at another site
Hollow Viscous	Perforation / Distension	Removal, reinsertion and repair
Localized Adhesion	Localized Pneumoperitoneum	Removal and reinsertion
Omentum	Omental Emphysema	Removal and reinsertion
Blood Vessel	Bleeding / Air Embolism	Direct compression by trocar/ suture ligature/ Foley's catheter tamponade

3) Pneumoperitoneum

a. Cardio respiratory embarrassment due to elevation of diaphragm, compression of inferior vena cava , hypercarbia if CO2 is used

b. Air embolism if needle is in blood vessel or retroperitoneal vessels are torn due to trauma

4) Main trocar insertion

a. Hollow viscous perforation (stomach, bowel, bladder)

b. Solid organ injury (liver/ spleen when grossly enlarged)

c. Blood vessel injury (in abdominal wall- varix, epigastric vessels, in peritoneal cavity- mesenteric vessels, retroperitoneal- aorta, venacava, iliac

vessels). If central or retroperitoneal expanding hematoma occurs, the surgery should be immediately converted to open surgery. Mesenteric hematoma may be left as such

. 5) Examination

a. Injury with telescope

b. Flash burns during photography

6) Second puncture

a. Abdominal wall blood vessel injury is unlikely as it is done under vision.

7) Transperitoneoscopic procedures

a. Bleeding after biopsy

b. Biliary leak

c. Perforation after biopsy

d. Bleeding/ perforation while severing adhesions

e. Explosion with diathermy

8) Release of pneumoperitoneum

a. Pain if a large volume of gas is left behind

9) Exit

a. Ascites leak

b. Omental prolapsed

B. Delayed

10) Post peritoneoscopy

a. Infection, ascites leak, incisional hernia

Laudier TD and Moses[31] reported 2 year old sympyoms in a tri athlete with chronic recurrent abdominal pain where multiple diagnostic imaging studies failed to diagnose the etiology. Diagnostic laparoscopy however demonstrated the adhesions inbetween the ascending colon and the anterior parietal wall. Lap adhesiolysis was then employed with success and the athlete resumed his rigorous training few weeks post adhesiolysis without marked symptoms.

A prospective audit of advantages and post treatment benefit of laparoscopy was done in 220 cases by **G C Vandier Velpaen et al**.[32] Procedure was done in elective setup in hundred and eighty patients and in emergency setup forty members . The indications and need for surgery in

elective group were doubtful liver disease, staging laprascopy for intra abdominal tumours and abdominal conditions with chronic pain . Emergency laparoscopy was done in patients with abdominal conditions presenting with acute pain. Diagnostic positive results looked upon for the procedures -hepatic disorders 71%,staging of malignant growth 87%, inconclusive diagnosis 74%, acute abdominal pain conditions 100% and chronic abdomen pain conditions 41%. Plan of treatment notedly improved by D- Lap in 15 of 21 patients (71%) with hepatic disease, 10 of 30 patients (33%) with intra abdominal tumours, 5 of 19 (26%) with inconclusive diagnosis, 32 of 40 (80%) with acute abdominal pain conditions and 15 of 110 (23%) with chronic abdominal pain conditions . A fault in evaluation of disease nature or it 's stage was done by laparoscopy in 3 of 220 (1%) cases. There was nil morbidity and mortality reported during laparoscopy in the study.

A study was done by **Keltze et al**[33] to evaluate retrospectively the prevalence of adhesions from colon to pelvic side wall accompanied by intractable pelvic pain or pelvic endometriosis in 50 females who undergone laparoscopy for pelvic pain. 47 (84%) actually did have adhesions either from right or left sided colon to pelvic side walls or parietal wall. Right sided paracolic adhesions were found to be more common than the left sided adhesions (87.7% vs 46.7%) and were found to be more frequently extensive than minimal (46.7% vs 6.7 %).

In a study by **Reymond P and et al**[18] patients presenting with chronic abdominal pain can be subjected to various diagnostic tests with minimal or no favourable alteration in their pain. A sum total of 70 patients (61 women and 9 men) with an mean age of 42 years, undergone D-Lap for sole purpose of the assessment and treatment of chronic abdominal pain. The mean duration of pain happened to be 74 weeks (12-260 weeks) and the mean studies conducted before the surgical referral was 3.3.In 53 (76%) patients the procedures were performed in outpatient basis , with the rest of patient admitted for just monitoring. The mean length of time for surgery happened to be 70 min, none of the cases wanted conversion to morbid open procedure and hence none of expected complications happened . Findings were adhesions in 39, an insignificant hernia in 13, adhesions proceeding from the appendix to nearby structures in 6, prompt appendiceal pathology in 5,pelvic endometriosis in 3 and GB pathology in 2. 10 patients had no demonstrable pathology. During their initial post operative visit, in 90% of patients pain were to reported to be gone or improved. After an mean follow up for 129 weeks, 71.4% had pain relief on long term basis.

Jonathan M. Sackier et al[34]**-** Laparoscopy evolved as a science by the turn of this century, and several man of science assisted in the development of this technique. But, it was several years till the multiple trocar system came into

invention that allowed visualization of internal organs and biopsies to be obtained. Prompt preparation and attention to device handling ensures the safety of the operation.

Elective D-Lap is complimentary to other diagnostic modalities , for instance, the evaluation of abdominal pain, abdominal swellings, PUO and occult gastro intestinal bleeding. In several other circumstances, such as the investigation of oncology cases, this method is far superior to conventional imaging system as it enables biopsy specimens to be obtained. Following the correctness of the procedure, the diagnostic yield is superior with low the morbidity and mortality .

J.H.N. Wolfen and et al[35-] Study revealed 11 patients with TB peritonitis who were treated at a London hospital between years 1971 and 1978. Every patients were immigrants with a average age of 30 years. They had very short history of abdominal symptoms and were at times difficult to rule out from that of Crohn's disease or malignancy. The diagnosis was established through laparoscopy and targeted peritoneal biopsy of 8 in most suspicious areas from these patients. Laparoscopy is relatively safe and efficient method for arriving at an relatively early diagnosis in patients with doubt of tuberculous peritonitis.

Udawadia A E and et al[36]- performed analysis over a period of 18 years, D-Lap were done on adults using LA with no report of mortality, with a complication rate of 0.09%, 84% successful diagnostic rate and 74% underwent tissue biopsies to cover a wide spectrum of pathology. With the presence of battery of non -invasive diagnostic aids like USG, CT and MRI that are used alongside target biopsy, the role of D-Lap has changed. D-Lap is used for the assessment of hepatic and peritoneal pathology, abdominal TB and malignancy. D-Lap proceeds to play a vital role in the definitive investigation of patients with abdominal disease . When supplemented along with lap USG, it is truly efficient for staging abdominal and pelvic neoplasm and is far superior to conventional USG and CT.

Salky B A and et al[16]- study shows 387 patients ,of which 265 of who underwent diagnostic laparoscopy for chronic abdominal pain, the cause was found in 201 (76%) cases. A planned therapeutic laparoscopic interventions was carried out in 128 (48%) patients. Nearly in 64 (24%) of patients no abnormal findings turned out .However there happened one false negative laparoscopy the consequence of which it required conversion to laparotomy one month later.

Miller K and et al[14]- was done to decide the effectiveness of D-lap on patients with a chronic history of abdominal pain lasting for longer than 3 months the cause could not be evaluated . All 66 planned lap surgeries were done successfully as planned requiring no conversion to laparatomy and no post operative complication were reported . 5 out of 59 (8.5%) patients had no significant improvement in pain post operatively and 6 out of 56 (10.7%) continued to suffer from pain even at the time of follow up.

Nagy AG and et al[37-] study demonstrated the efficiency of D lap as a tool for diagnosis to general surgeons. 77 consecutive patients who undergone this treatment are reported. Of 11 patients, D lap gave a accurate diagnosis in 9 (82%) and hence celiotomy was not done in 7 (64%). In 21 patients with abdominal and pelvic tumours , 14 (67%) were perfectly evaluated, and in 8 (38%) hence the need for formal celiotomy was avoided . 3 patients with unknown causes of ascites and jaundice were properly evaluated obviating the need for celiotomy.

Kleingensmith FE and et al[15]- detailed study to assess the use of D Lap in patients presenting with abdominal conditions with chronic pain . A retrospective analysis was done in 34 patients who had D Lap for chronic

abdominal pain. Mean age of patient was 39 yrs. Vast majority included women. Many had some form of abdominal surgery in the past years.

All procedures were done via D Lap. Nearly in 65% of patients had some underlying disesae. And 56% of patients were subjected to Lap adhesiolysis, also 26% required nil operative surgery except for exploration. It s noteworthy that , 73% of patients showed lower pain threshold post operatively, irrespective of a positive or negative finding at D Lap.

In a analysis by **Al-Akeely MH**, [38] among the 35 patients admitted with chronic abdominal pain to Riyadh Medical Complex and planned for elective D-Lap,they were studied in depth for the impact created by this technique for consequetive treatment plans. D Lap established diagnosis in patients with place of doubt for neoplastic growth. In patients with symptoms revealing doubtful place for abdominal tuberculosis, the lap diagnosis and tissue diagnosis revealed TB(16 patients), Hepatic cirrhosis (2 patients), IBD (1 patient) and secondary deposits in terminal part of ileum (1 patient). In two patients, diagnosis was not grasped . In abdominal tuberculosis the accuracy of D Lap acumen was 71%.

Arya Prafull K and et al[20]- analysis showed patients with abdominal pain confined to lower abdominal quadrant in whom classical investigations were repeatedly negative that imposed a huge challenge to the treating doctors . In this prospective analysis , patients complaining of lower abdominal pain of > 6 months duration, in whom definitive diagnosis could not be achieved with usual methods. D Lap was done in 49 patients. D - Lap revealed positive findings with identification of underlying pathology in 44 (90%) of these patients. Abdominal TB, chronic inflammation of appendix and tuboovarian and uterine disorders contributed to majority of findings..

METHODOLOGY

Materials And Methods

This study was conducted in the surgical wards of Govt .Rajaji medical college hospital, Madurai

The study group consisted of 50 patients admitted to the surgical wards of Madurai medical college hospital with pain abdomen for 3 months duration or more between June 2013-July 2014 . A detailed history was taken from each of the patient as per the proforma designed before the commencement of the study. The clinical examination findings were also recorded in the proforma The results were then tabulated.

The recorded data included particulars of the patient, duration of illness, site of abdominal pain, other associated symptoms such as vomiting or fever or white discharge per vagina, past history of surgical explorations, co morbid conditions, investigations. Subsequently the intra operative findings, therapeutic/ diagnostic intervention done, correlation of the intra operative findings with the histopathology report, complications during the intra and post operative period and the relief from the pain were recorded and analysed.

As a part of the work up of a patient the following investigations were done routinely:

Hemoglobin estimation

Bleeding time

Clotting time

Random blood sugar

Total leucocyte count and differential count

Serum electrolytes

Blood urea

Serum creatinine

Urine for albumin, sugar and microscopic examination

Electrocardiogram

Ultrasonogram abdomen and

Chest X Ray.

The other investigations listed below were done as and when indicated

Blood :

Erythrocyte Sedimentation Rate

Fasting blood sugar and post prandial blood sugar

Imaging:

Erect X Ray abdomen

Barium studies

Esophago gastro duodenoscopy

Colonoscopy

Computerised tomograph of the abdomen

Written informed consent was taken prior to all the procedures.

Inclusion Criteria

- All cases of undiagnosed (by conventional methods and investigations such as detailed history, clinical examination, blood counts, urine examination, USG abdomen, Plain x ray abdomen) chronic abdominal pain >3 months duration of both sex.
- All cases of undiagnosed chronic abdominal pain in patients >14 years of age.
- Cases of clinically diagnosed chronic abdominal pain of >3 months duration not responding to the treatment given.

Exclusion Criteria

- All cases of undiagnosed chronic abdominal pain <3months duration of both sex.
- All cases of undiagnosed chronic abdominal pain in patients <14years of age.

All surgeries were carried out under general anaesthesia. All patients had a Ryle's tube inserted and bladder catheterized prior to anaesthesia.

Pneumoperitoneum was created using Hasson's technique. A 10mm umbilical camera port was inserted and two lateral 5mm ports depending on the organ of interest and the suspected pathology.

The sites of port insertion varied depending on the presence or absence of previous abdominal surgery scars. Diagnostic laparoscopy of the abdomen was carried out carefully inspecting the entire visceral contents of the abdomen for any pathology. Starting from the liver, the gall bladder, anterior surface of the stomach, large intestine, entire length of small intestine with particular emphasis on appendix and terminal ileum, anterior surfaces of the retroperitoneal organs, uterus, fallopian tubes and ovaries and peritoneal surface. Adhesions between the bowel loops or to the anterior abdominal wall was also looked for

The surgical procedure was carried out depending on the intra operative findings and as per indications which ranged from biopsy from suspicious lesions to adhesiolysis to appendectomy.

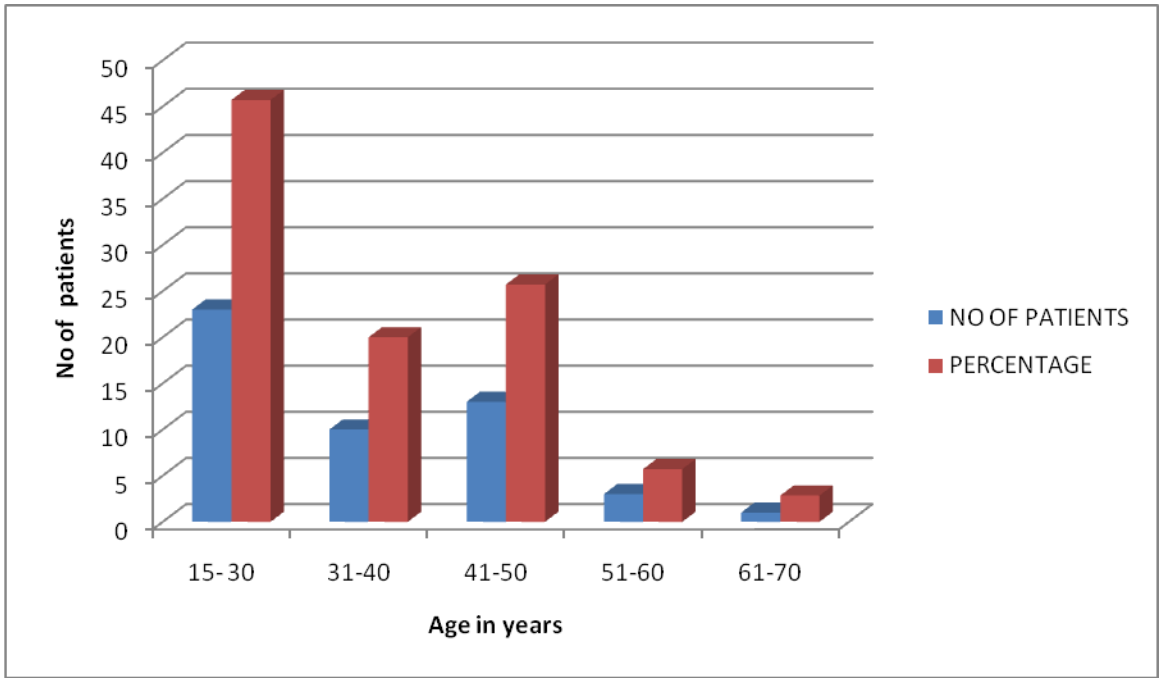
All the ports were closed using absorbable suture materials at the end of the procedure.

OBSERVATION

Age Distribution:

Table 1: Age distribution of patients presenting with chronic pain abdomen

Age (in Years)	No. of Patients	Percentage (%)
15-30	23	45.71
31-40	10	20
41-50	13	25.71
51-60	3	5.71
61-70	1	2.85
Total	50	100

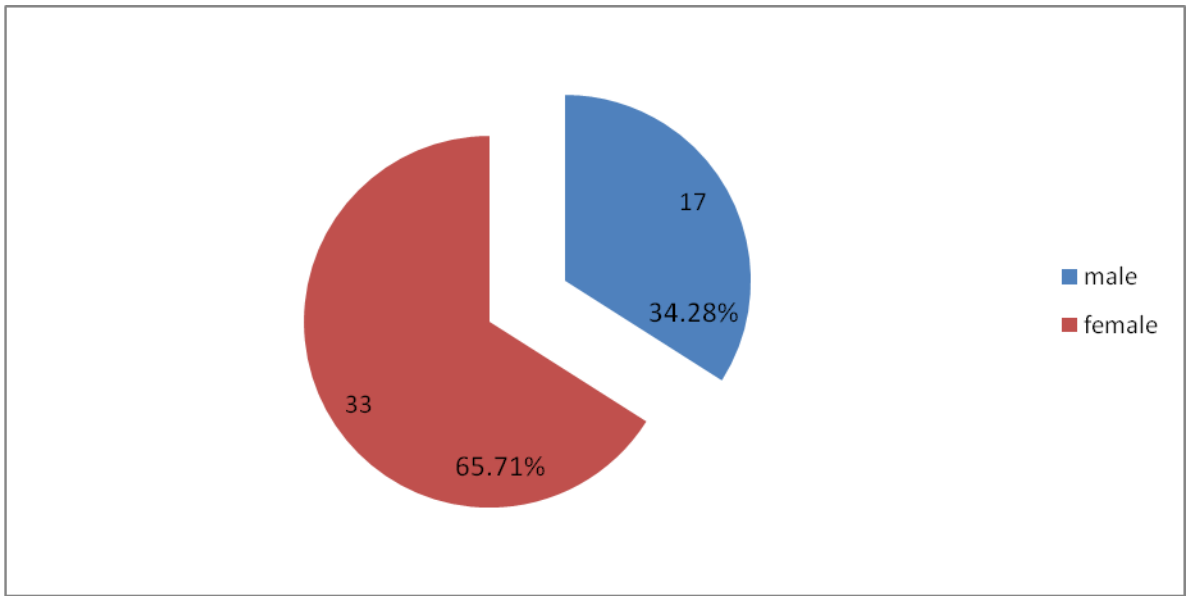


Our study of 50 patients with chronic pain abdomen showed a peak incidence of chronic pain abdomen in the third decade. The youngest patient in our study was 15 years and the oldest patient being 69years. The mean age of presentation was 35 years.

Sex Distribution:

Table 2: Sex Distribution of Patients with Chronic Abdomen Pain

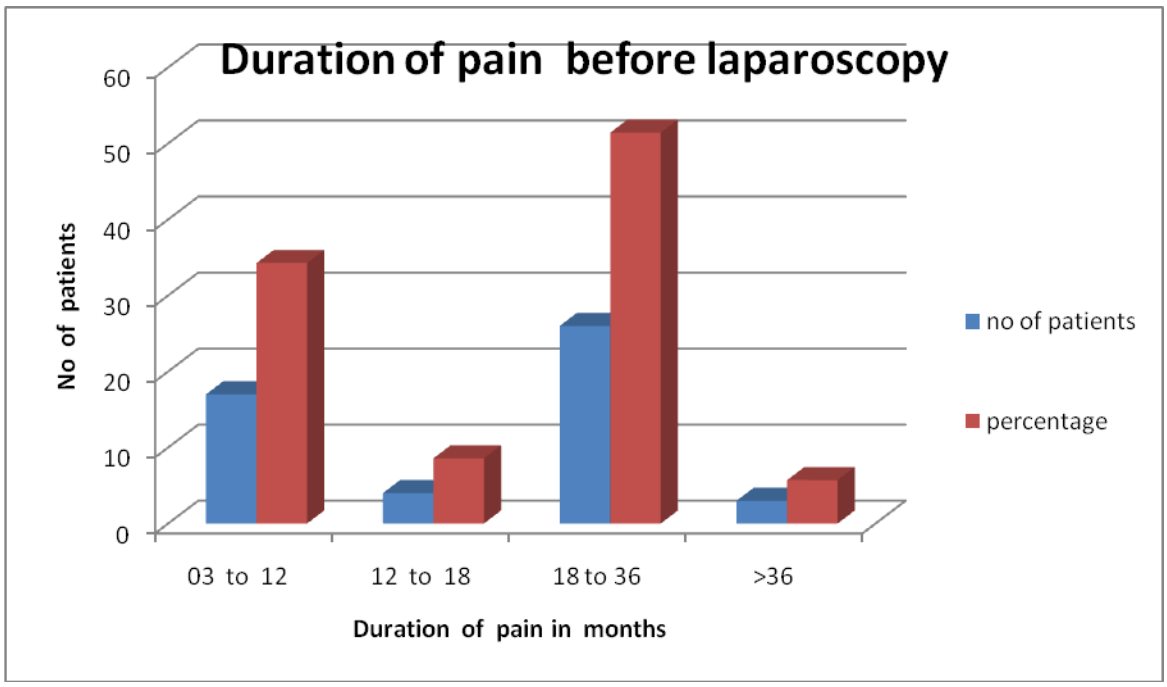
Sex	No. of Cases	Percentage
Male	17	34.28
Female	33	65.71



Our study of 50 patients showed female preponderance (66%) with chronic abdominal pain

Table no 3: Duration of pain before laparoscopy

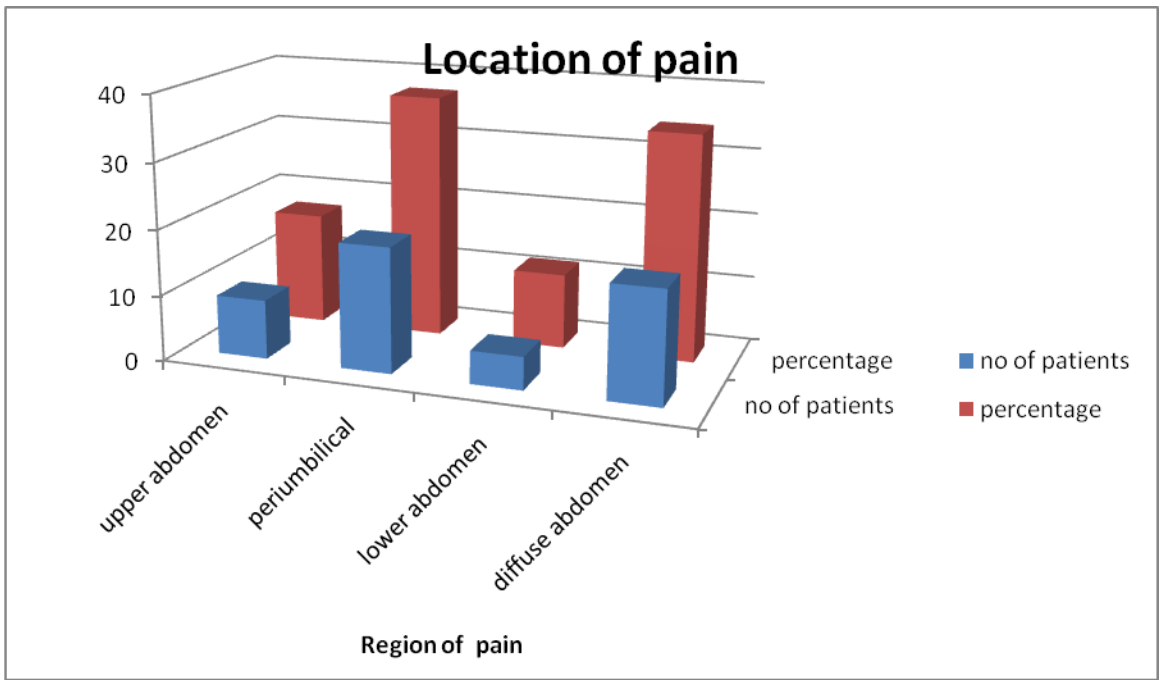
Duration of pain(months)	No of Patients	Percentage
3-12	17	34.28
12-18	04	8.57
18-36	26	51.42
>36	03	5.71



51% of patients in our study gave history of pain abdomen of duration between 18 to 36 months.

Table no 4: Location of pain

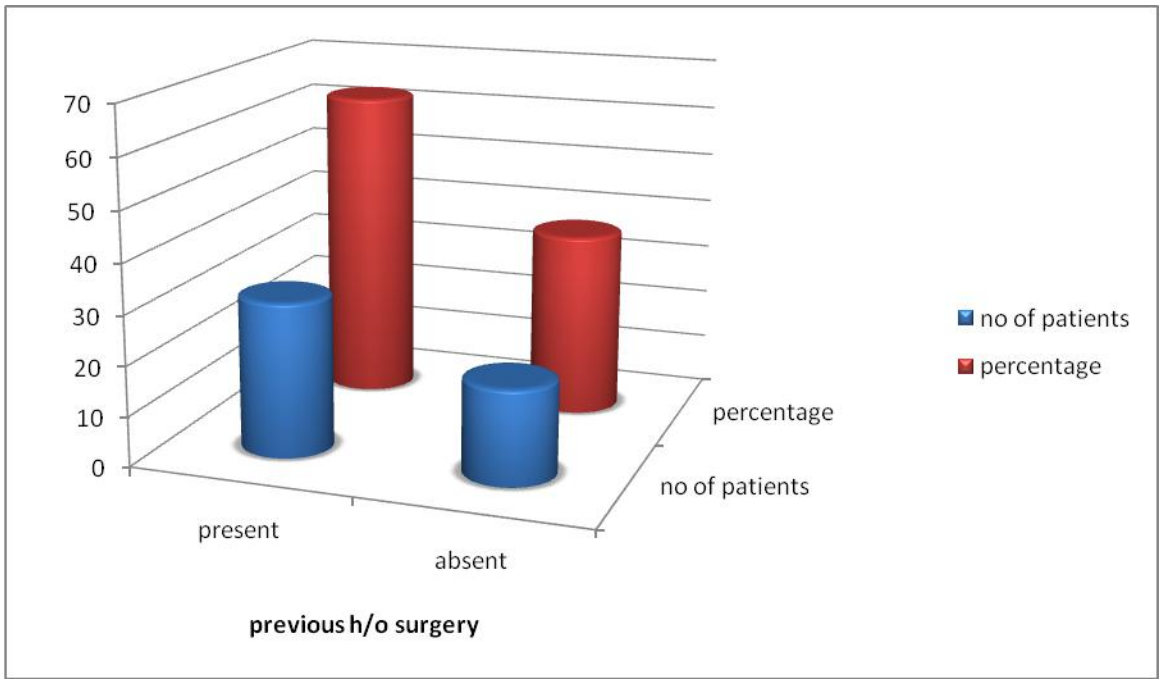
Region of pain	No of Patients	Percentage
Upper abdomen	09	17.14
Peri umbilical	19	37.14
Lower abdomen	05	11.42
Diffuse abdomen	17	34.28



About 37.14 % of the patients presented with pain in the periumbilical region followed by diffuse pain abdomen reported in 34.8 % of patiens.

Table no 5:History of Previous abdominal surgeries

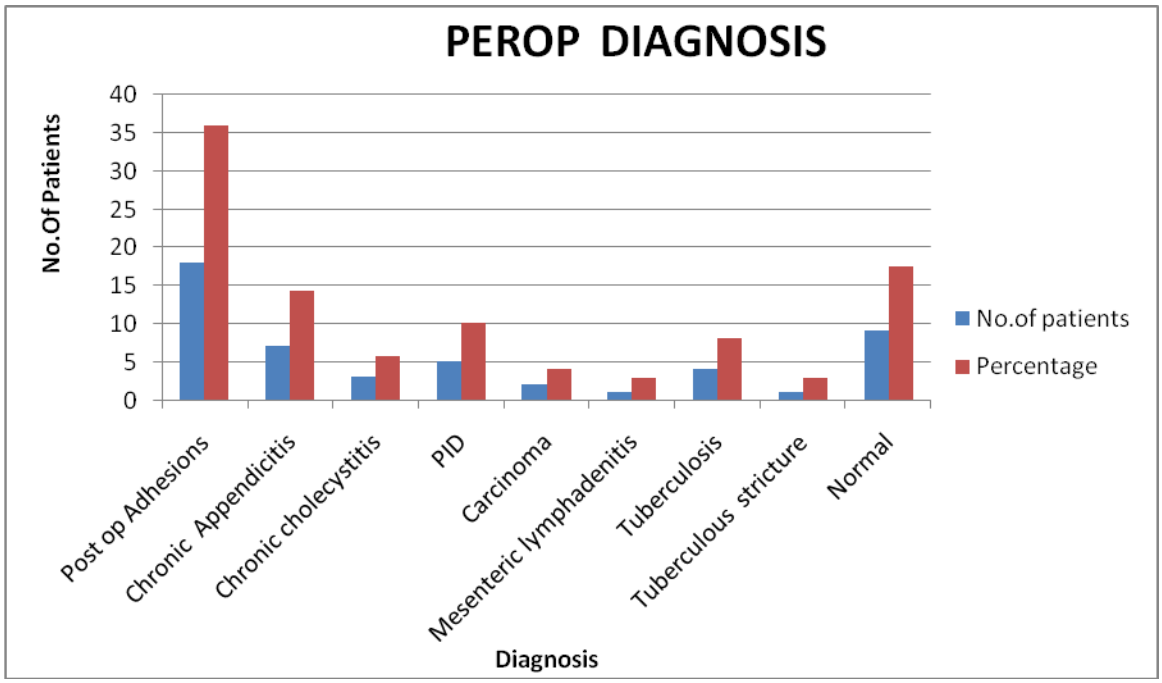
H/o surgery	No of cases	Percentage
Present	31	62.85
Absent	19	37.14
.		



Around 31 patients(62.85%) in our study had undergone a previous surgery compared to 19(37.14%) of them without any history of abdominal surgeries. Most of the patients had previous history of tubectomy with subsequent adhesions.

Table no 6: Findings at laparoscopy and interventions done

Diagnosis	Procedure	No of Patients	Percentage
Post operative adhesions	Adhesiolysis	18	36.00
Recurrent Appendicitis	Appendectomy	07	14.28
Chronic Cholecystitis	Cholecystectomy	03	5.71
Carcinoma	Biopsy	02	4.00
Mesenteric lymphadenopathy	Biopsy	01	2.85
Tuberculosis (peritoneum,omentum)	Biopsy + Cat 1 ATT	04	8.00
Tuberculosis(strictures)	Resection &Anastomoses with Cat 1 ATT	01	2.85
PID	No intervention	05	10.00
Normal study	No intervention	09	17.41



In our study of 50 patients, the most common finding was post operative adhesions, in 36% of patients. Most of the patients in this group were females and had a past history of abdominal surgery, tubectomy in most cases. Adhesiolysis was done in all these patients.

The next most common finding at laparoscopy in our st udy was a normal study (17.14%). These patients were just observed and followed up.

Recurrent appendicitis was our per operative diagnosis in 14.28% of our patients. The appendices felt firm to palpate per operatively. Appendectomy was done in such patients. Subsequent histopathological examination confirmed our diagnosis in most of these cases. One of the patient in this group had adhesions between the appendix and the lateral abdominal wall. Adhesiolysis and appendectomy was done. HPE turned out to be chronic imflammation in the appendix and hence included in this group for statistical analysis. We did laparoscopic cholecystectomy for 3 of our patients. HPE confirmed our findings in this group of patients.2 patients were diagnosed with carcinoma per operatively. One of them being carcinoma pancreas and the other had peritoneal deposits whose biopsy turned out to be Adenocarcinoma..Mesenteric lymph node biopsy was done in 1 patient.

Diagnosis of tubercular strictures was made in 1 patient. This patient underwent resection and anastomosis of the long segment stricture and stricturoplasty for another short segment stricture by open method. Post operatively, he was started on anti tubercular drugs and the patient followed up. Histopathological examination confirmed tuberculosis. In 4(8.01%) of the patients peritoneal and omental nodules(< 5mm) were found which revealed to be tuberculous nodules on histopathology.

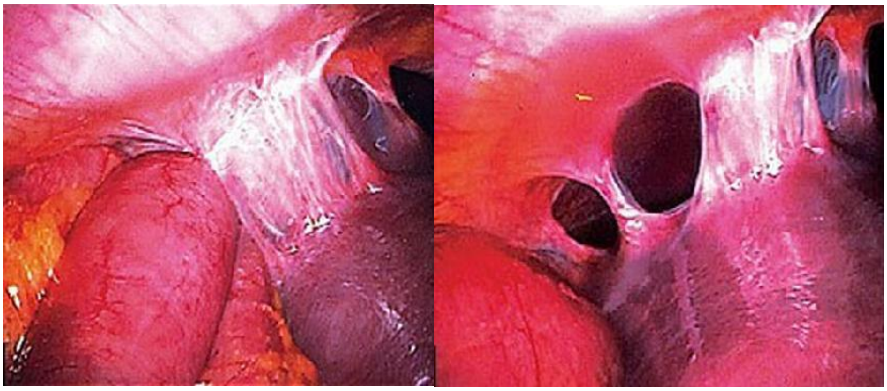


Fig 22 : Per operative Finding : Adhesions

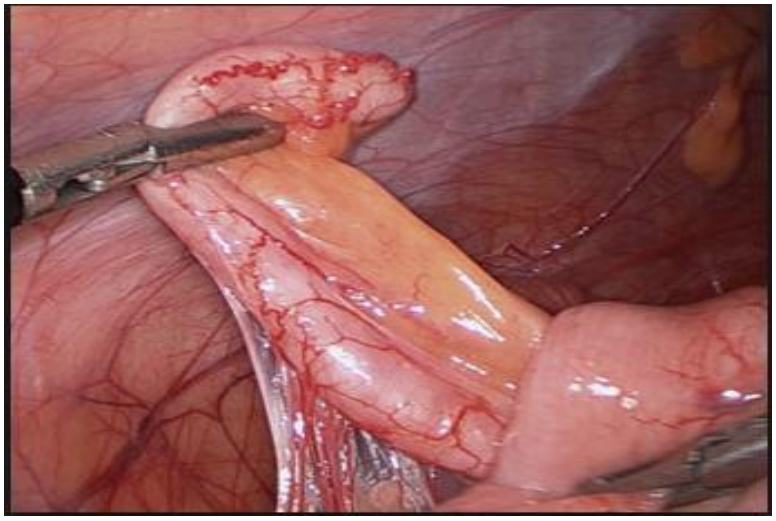


Fig 23 : Per operative Finding : Strictures

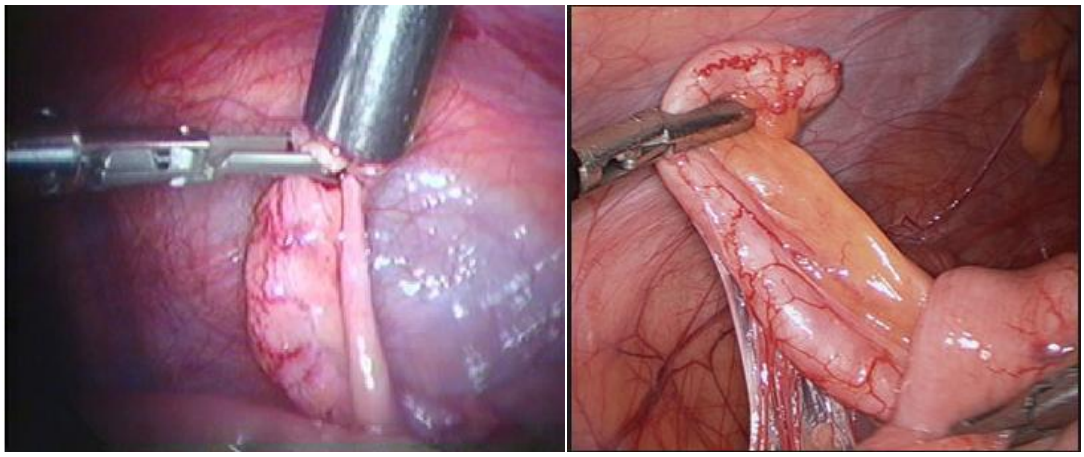


Fig 24: Recurrent appendicitis **Fig 25: Recurrent appendicitis with adhesions**

Morbidity:

In most of our cases there was no post operative complications except in three patients who developed surgical site infection which was managed conservatively by appropriate antibiotic cover and alternate day wound dressing. No mortality was encountered in our study group.

Duration of hospital stay:

Post operative hospital stay ranged from 4 to 11 days with a meanduration of stay of 5.5 days.

Duration of procedure:

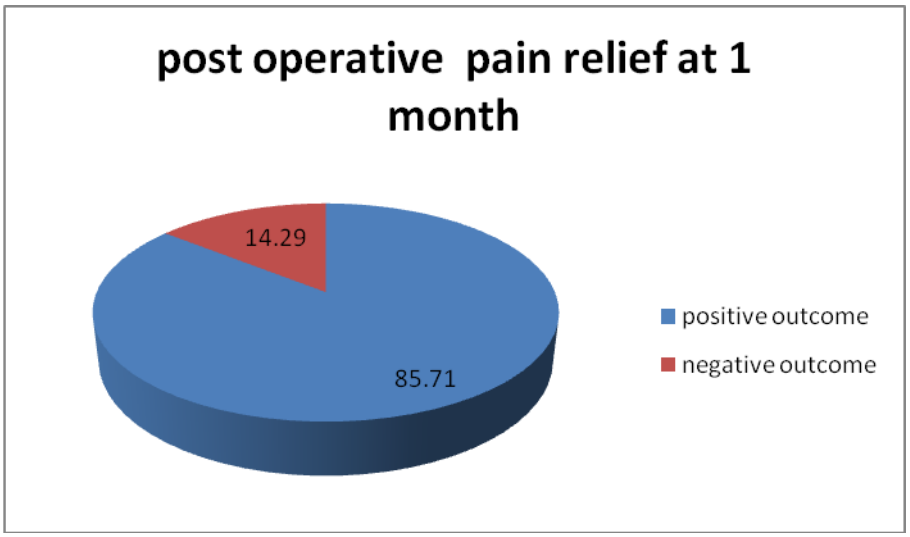
The average length of the operative time was 67.14 minutes and one patients required conversion to an open procedure. Both the cases were converted due to technical difficulties

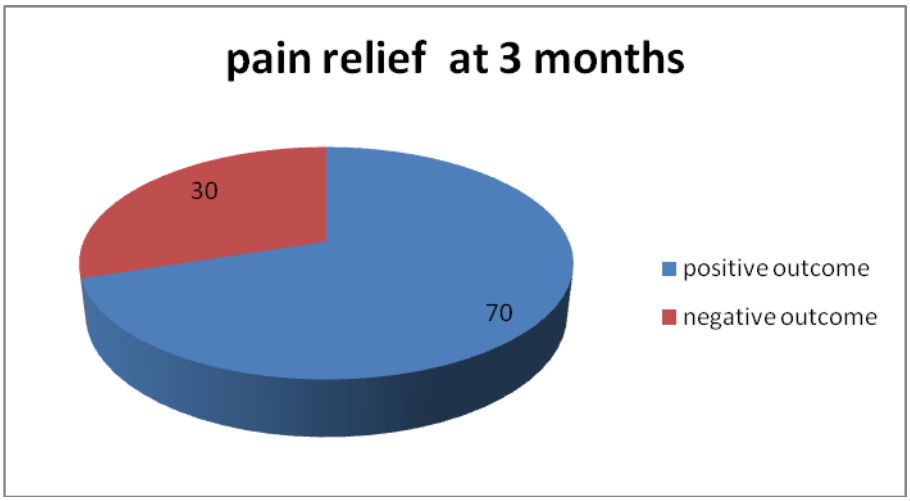
. Follow up:

During the follow up period, all patients were re-evaluated for pain. The patients were reviewed at one month and three months post operatively. Subjective assessment of pain was done during the follow up and positive outcome (less pain or disappearance of pain) was noted and negative outcome (persistence of pain or worsening pain) was also noted. 5 patients were lost to follow up at the three month time frame.

Table no 7: Post Operative pain relief

Duration	Positive outcome(%)	Negative outcome(%)
At 1 month	85.71	14.29
At 3 months	70	30


post operative pain relief at 1 month
14.29
85.71
positive outcome
negative outcome


pain relief at 3 months
30
70
positive outcome
negative outcome

DISCUSSION

The aim of our study is to study the efficacy of diagnostic laparoscopy as an investigative and therapeutic modality in the diagnosis and management of patients with chronic pain abdomen In this prospective study 50 patients were considered who were admitted in the surgical wards of Govt Rajaji Hospital, attached to Madurai Medical College and between June 2013 and June 2014. All patients had pain abdomen lasting for more than a period of three months.

Age and Sex Incidence

There were 17 males and 33 female patients in the study. The age group of patients in this study ranged from 15 to 69 years with the mean age being 35years. Male : Female ratio was 1 :1.9

Table No 8: Comparison of average age incidence

Study	Average age in years
Klingensmith et al[15]	39
Thanaponsathron et al [39]	27.5
Raymond et al[18]	42
Gouda M El- Labban and Emad N Hokkam [40]	36
Present study	35

In a study involving 34 patients by Klingensmith et al[15] the majority were women (85%). The average age in their study was 39 years (Range 21-75years).

In a study by Thanaponsathron et al[39] ,of 30 patients with chronic right lower quadrant pain, the average age was 27.5 years.

In a study by Raymond et al[18] for utility of laparoscopy in chronic abdominal pain involving 70 patients, the average age was 42 years.

In a study by Gouda M El- Labban and Emad N Hokkam[40] involving 30 patients, the average age of presentation was 36 years.

All the above studies show that the female sex was more commonly

afflicted by chronic pain abdomen and the average age at presentation in our study is comparable with the aforementioned studies.

Pain Duration:

In our study, the duration of pain ranged between 3 months to 3 years. In a study by Raymond et al[8] of 70 patients, the duration of pain ranged from 3 months to 5 years. In a study by Gouda M El- Labban and Emad N Hokkam[40] involving 30 patients, the duration of pain ranged from 3 to 15 months.

Prior Surgery:

Table No 9: Comparison Of Past History Of Abdominal Surgeries

Study	No of Patients with prior surgery(%)
Gouda M El Labban & E mad N Hokkam [40]	56.6
Kinnaresh Ashwin Kumar Baria [41]	22
Present study	62.8

In our study of 50 patients, 31 patients had previous history of abdominal surgery.

In a study by Klingensmith et al[15] involving 34 patients, most of the patients had previous history of abdominal surgery.

In a study by Gouda M El- Labban and Emad N Hokkam[40] involving 30

patients, 17 had a previous history of abdominal surgery.

In a study by Kinnaresh Ashwin Kumar Baria [41] involving 50 patients, 11 of them had a past history of abdominal surgery.

Laparoscopic Diagnosis:

In our study comprising 50 patients, laparoscopy identified pathology in 41 patients (82.85%). No abnormality was found in the remaining 09 patients (17.14%) who were just observed without any intervention.

Post operative adhesions:

Table no 10 : Comparison of Patients with adhesions

Study	No of patients with adhesions (%)
Lavonius M et al [15]	63
Klingensmith M et al [17]	56
Present study	36

36% of the patients in our series were found to have intestinal adhesions secondary to a prior abdominal surgery, mostly tubectomy (in 8 patients). Some patients had a past history of appendectomy (in 10), cholecystectomy (in 3), ovarian cystectomy (in 4), hysterectomy (in 5) and one patient had a prior history of laparotomy for hollow viscous perforation. Adhesiolysis was done as a therapeutic procedure.

Lavonius M et al[17] in their study of laparoscopy for chronic abdominal pain

in 46 patients reported post operative adhesions in 63% of cases.

In a study by Klingensmith et al[15] involving 34 patients, 56% of them underwent adhesiolysis.

In a study by Vafa Shayani et al [42] involving 18 cases, laparoscopic adhesiolysis resulted in a 77.8% cure rate from chronic abdominal pain.

In a study by Dunker S et al [43] laparoscopic adhesiolysis resulted in a positive outcome in more than 50% of patients.

Normal Study

Table no 11: Comparison of patients with normal study at laparoscopy

Study	Normal study (%)
Salky B et al [16]	24
Kinnaresh Ashwin Kumar Baria [41]	10
Vander Van et al [32]	23
Klingensmith et al [15]	26
Onders RP and Mittendorf EA [18]	14.2
Present study	17.14

17.14% of patients in our study did not have any pathology detected per operatively. In a study by Salky B A et al[16]involving 265 patients, normal laparoscopic findings were recorded in 24%.

In a study by Kinnaresh Ashwin Kumar Baria[41] involving 50 patients, 10% of them had no identifiable cause detected after laparoscopic examination.

In a study by Vander Velpen et al[32] a 23% of patients with uncertain diagnosis at the end of the procedure was reported.

In a study by Klingensmith et al[15] involving 34 patients, 26% of patients needed no operative intervention other than laparoscopic exploration.

In a study by Onders RP and Mittendorf EA[18] involving 70 patients, no abnormality was detected in 14.2 % of cases.

Chronic Appendicitis:

07 (14.28%) of patients in our study were diagnosed to have recurrent appendicitis. Histopathological examination confirmed the diagnosis in 6 of them. One of the specimens was reported normal. This is still justifiable because it makes the diagnosis of appendicitis less likely if the patient complains of similar pain in the future.

Laparoscopy is a useful technique for the diagnosis and treatment of abdominal pain even if the appendix is normal on inspection.[44]

In a study by Onders RP and Mittendorf EA[18] involving 70 patients, appendiceal pathology was detected in 7.14% of cases.

Diagnostic efficacy of laparoscopy:

Table no 12 : Diagnostic efficacy of laparoscopy

Study	No of patients	Percentage (%)
Raymond P et al[18]	70	85.7
Karl Miller et al [14]	59	89.8
Klingensmith et el [15]	34	65
Schrenk P et al [45]	92	87
Kinnaresh Ashwin Kumar Baria[41]	50	90
Andeallo B et al[46]	168	86.3
Salky B et al[16]	265	76
Gouda M El Labban & EMad N [40]	30	83.3
Present study	50	82.85

The present study findings correlate well with other published studies

Therapeutic efficacy of Diagnostic laparoscopy:

Table no 13: Therapeutic efficacy of diagnostic laparoscopy

Study	**No of patients**	**Efficacy(%)**
Klingensmith et al [15]	34	73
Vafa Shayani et al [42]	18	77.8
Miller K et al [14]	59	89.3
Kinnaresh Ashwin Kumar Baria [41]	50	94
Chao K et al [47]	41	78
Onders P et al[18]	70	70
Paajnen et al[4]	35	>70
Present study	50	70

Therapeutic efficacy here denotes the percentage of patients who reported a positive outcome (no pain or fall in pain) at the time of follow up The efficacy of diagnostic laparoscopy of the present study compares well with other previous studies.

CONCLUSION

Laparoscopy has an effective diagnostic accuracy and therapeutic efficacy in the management of patients who presented to us with chronic abdominal pain, especially in whom conventional methods of investigations have failed to elicit a cause for the pain.

Laparoscopy is safe, quick and effective modality of investigation for chronic abdominal pain. Diagnostic laparoscopy has a high diagnostic and therapeutic efficacy. Ability to pin point a cause for the abdominal pain or exclude a more major cause for pain not only avoids further investigations but also plays a significant role in alleviating the fears in the minds of the patients.

Not only does laparoscopy point to a diagnosis, it has the added advantage that therapeutic intervention can be done at the same sitting in most cases thus avoiding another hospitalization or another exploration of the abdomen. Laparoscopy prevents unnecessary laparotomy in a significant number of cases.

Diagnostic laparoscopy has a definitive role in the management of patients with chronic pain abdomen and should be an important investigative tool in the armamentarium of all practicing surgeons

SUMMARY

This study involving 50 patients was conducted in the surgical wards of Govt.Rajaji Hospital, attached to Madurai Medical College from June 2013 to June 2014.

This study was undertaken to evaluate the efficacy of diagnostic laparoscopy as an investigative modality in patients presenting with abdominal pain of duration more than 3 months.

All 50 patients underwent Diagnostic Laparoscopy under General anaesthesia after all the conventional investigations did not yield any diagnosis.

50 patients in the age group of 15 – 69 years were involved in the study with the average age of presentation being 35 years. 66% of the study population were females. 51% of the patients had duration of pain between 18 -36 months and 37% of them being in the periumbilical region. 63% of the patients had a previous history of abdominal surgeries.

The most common finding at laparoscopy in our study was post operative adhesions (36%). It was followed by patients who had a normal abdominal finding at laparoscopy (17.14 %) and recurrent appendicitis in 14.28 %.

1 case required conversion to laparotomy on technical grounds. Average duration of surgery in our study was 67.14 minutes.

The average duration of hospital stay being 5.5 days. There was no mortality in our study. Laparoscopy established the diagnosis in 82.85% of our patients.

Therapeutic intervention done at the time of diagnosis relieved 70% of patients of their pain at the end of three months.

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PROFORMA

Name

Age

Sex

Occupation

Address

In Patient Number

Religion

Date OfAdmission

Date Of Surgery

Date Of Discharge

Complaints:

Pain: Time/Date of onset

- Mode
- Site
- Character
- Shifting/ Migration/ Referred
- Aggravating factors

- Relieving factors
- White Discharge Per Vagina/ Vaginal bleed

Vomiting :

- Relation to pain
- Frequency
- Amount
- Colour
- Contents
- Character projectile/ non projectile

Bowels:

- Last evacuation
- Constipation/ Normal
- Diarrhoea/ Dysentry
- Worms

Distention:

- Duration
- Location
- Relation to pain
- Borborygmi

Fever:

- Duration
- Relation to pain
- Character
- Chills/ rigors

Past h/o:Diabetes Mellitus/ Hypertension/Tuberculosis/ Ischemic Heart Disease/

Previous Surgeries/ Previous Jaundice

Previous h/o hematemesis

- Color
- Frequency
- Amount
- Treatment for peptic ulcer

Drug h/o : Steroid, Aspirin, NSAID, Purgative

Personal H/o: DM/HTN

Diet, Smoke, Alcohol

Menstrual h/o: Cycles and number of days of flow

h/o passing clots/ pain

Family h/o: peptic ulcer/ TB/DM /HTN/Asthma

General Physical Examination:

- General Condition:

  Good

  Fair

  Poor

- Appearance
- Built/ nourishment
- Lymphadenopathy
- Pedal edema
- Level of consciousness
- Temperature
- Rashes
- Tongue
- Pallor
- Cyanosis
- Clubbing
- Icterus

Pulse Rate

BP

Respiratory rate and rhythm

Systemic Examination:

P/A:

Inspection:

- Distention
- Flanks
- Contour
- Movement with respiration
- Visible peristalsis
- Skin
- Umbilicus
- Scar
- Hernial orifices

Palpation:

- Temperature : increased/ Normal / Decreased
- Tenderness: Localised/ Generalised/ Quadrant/ Rebound
- Mass: +/ -

Percussion:

- Free fluid,Liver dullness

Auscultation: Bowel sounds: present (increased/ sluggish) / Absent

Per Rectal / Per Vaginal Examination:

CVS:

RS:

CNS:

Investigation:

X ray

- Calcification / Calculus
- Paralytic ileus

Chest X Ray:

- Evidence of TB/ Metastases
- Others

Blood:

- Hb%
- Blood Urea
- RBS/ FBS/ PPBS
- TC
- DC
- ESR
- Serum creatinine

- Serum electrolytes

Urine routine

Urine Pregnancy Test

Diagnostic peritoneal tap

Transudate/ exudate/ fecal/ hemorrhagic

USG Abdomen and pelvis

Diagnosis by laparoscopy:

- Recurrent appendicitis
- Post operative adhesions
- TB
- Secondaries
- Retro Peritoneal mass
- Chronic cholecystitis
- Normal

Laparoscopic procedure done:

- Appendectomy
- Adhesiolysis
- Cholecystectomy
- Biopsy

- Others/ converted to open

Operative Notes

Duration of the operation

Post operative management:

- Intravenous fluids
- Anti biotics
- Blood transfusion
- Ryles tube aspirate
- Drain removal

Complications:

- General:
- Pulmonary
- Cardiac
- Thrombo-embolic
- Renal
- Toxemia

Local:

- Stitch abscess
- Intestinal obstruction

- Paralytic ileus
- Fecal fistula
- Wound abscess
- Pelvic abscess
- Sub diaphragmatic abscess
- Biliary fistula

  Treatment of complications:

  - Cured
  - Improved
  - Worse

  Mortality

  Pain relief after one and three months

serial Number	Name	Age	sex	Duration of pain (MONTHS)	Location of pain	H/o Prev Surgery	Blood & urine inv	X ray Abdomen	USG Abdomen	OGD	Colonoscopy	Per op Diagnosis	Conv to Laparatomy	Procedure done	HPE	Hosp.stay (DAYS)	Pain relief at 3 months
1	Chellammal	30	F	13	PU	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	5	YES
2	Kumar	27	M	20	DA	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	8	No
3	Venkatesh	33	M	5	PU	YES	N	N	N	N	N	c lymphadenpathy	NO	BIOPSY	CI	5	YES
4	Gnanavel	23	M	22	LA	YES	N	N	N	N	N	Appendicitis	NO	Appendicectomy	CI	5	YES
5	Vadavi	21	M	4	PU	NO	N	N	N	N	N	TB Nodules	NO	BIOPSY + ATT I	TB	5	NO
6	Pandi	21	M	4	PU	YES	N	N	N	N	N	Appendicitis	NO	Appendicectomy	CI	4	YES
7	Rathnam	32	F	16	DA	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	6	NO
8	Ilakiya	24	F	7	UA	NO	N	N	N	N	N	Cholecystitis	NO	Cholecystectomy	CI	5	YES
9	Mookammal	56	F	39	UA	NO	N	N	N	GERD	N	Carcinoma	NO	BIOPSY	Ade.Ca	4	NO
10	Alamelu	51	F	8	DA	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	6	YES
11	Saraswathi	42	F	24	LA	YES	N	N	N	N	N	PID	NO	NIL	NO	5	YES
12	Vijayalakshmi	46	F	15	DA	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	6	YES
13	Meena	28	F	7	PU	NO	N	N	N	N	N	Appendicitis	NO	Appendicectomy	CI	5	YES
14	Fathima	39	F	19	UA	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	5	YES
15	Chandra	43	F	9	DA	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	8	NO
16	Muthumani	45	F	20	DA	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	5	YES
17	Nagarajan	46	M	21	PU	YES	N	N	N	N	N	Normal	NO	NIL	NO	6	NO
18	Nasreen Banu	49	F	10	DA	NO	N	N	N	N	N	PID	NO	NIL	NO	6	YES
19	Thulasi	39	F	29	PU	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	5	YES
20	Esther	19	F	4	LA	NO	N	N	N	N	N	Appendicitis	NO	Appendicectomy	CI	5	YES
21	Nagarathinam	27	F	26	PU	NO	N	N	N	N	N	Normal	NO	NIL	NO	5	NO
22	Kuruvammal	42	F	24	DA	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	5	YES
23	Nagarani	47	F	19	PU	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	4	NO
24	Palaniammal	34	F	20	UA	YES	N	N	N	GERD	N	Adhesions	NO	Adhesiolysis	NO	6	YES
25	Shobana	50	F	7	DA	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	6	NO
26	Kalaiselvi	27	F	5	LA	NO	N	N	N	N	N	Normal	NO	NIL	NO	4	YES
27	Neelammal	30	F	21	UA	YES	N	N	N	N	N	Cholecystitis	NO	Cholecystectomy	CI	5	YES
28	Dhanalakshmi	25	F	22	DA	NO	N	N	N	N	N	Appendicitis	NO	Appendicectomy	CI	10	YES
29	Backiaraj	35	M	25	PU	YES	N	N	N	N	N	Normal	NO	NIL	NO	4	YES
30	Pradeep	22	M	20	UA	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	5	YES
31	Murugaesan	33	M	24	PU	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	8	YES
32	Kasinathan	30	M	8	DA	NO	N	N	N	N	N	TB Stricture	YES	Laparatomy	TB	12	NO
33	Shankaralingan	28	M	26	LA	NO	N	N	N	N	N	TB Nodules	NO	BIOPSY + ATT I	TB	4	YES
34	Suseela	15	F	23	PU	NO	N	N	N	N	N	Normal	NO	NIL	NO	4	YES
35	Ahmed sheikh	69	M	37	DA	NO	N	N	N	N	N	Carcinoma	NO	BIOPSY	Ade.Ca	40	NO
36	Rajan	23	M	10	DA	NO	N	N	N	N	N	Appendicitis	NO	Appendicectomy	Normal	4	YES
37	Balachandran	26	M	19	DA	NO	N	N	N	N	N	TB Nodules	NO	BIOPSY + ATT I	TB	7	YES
38	Muniyandi	36	M	14	PU	YES	N	N	N	N	N	Normal	NO	NIL	NO	5	YES
39	Karuppasamy	44	M	11	UA	NO	N	N	N	GERD	N	Cholecystitis	NO	Cholecystectomy	CI	6	YES
40	Ammavasai	39	M	20	PU	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	4	YES
41	Selvi	24	F	10	UA	NO	N	N	N	N	N	PID	NO	NIL	NO	4	NO
42	Kalyani	46	F	9	PU	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	5	YES
43	Muniyammal	55	F	24	DA	YES	N	N	N	N	N	Normal	NO	NIL	NO	6	NO
44	Jothi	29	F	20	PU	NO	N	N	N	N	N	Appendicitis	NO	Appendicectomy	CI	5	YES
45	Vellathai	45	F	6	DA	YES	N	N	N	N	N	Normal	NO	NIL	NO	7	YES
46	Suganthi	18	F	20	UA	NO	N	N	N	GERD	N	TB Nodules	NO	BIOPSY + ATT I	TB	4	YES
47	Premalatha	28	F	28	PU	YES	N	N	N	N	N	PID	NO	NIL	NO	4	No
48	Parameswari	40	F	14	DA	YES	N	N	N	N	N	Normal	NO	NIL	NO	6	YES
49	Rani	26	F	30	PU	YES	N	N	N	N	N	Adhesions	NO	Adhesiolysis	NO	7	YES
50	Karupayee	39	F	37	DA	YES	N	N	N	N	N	PID	NO	NIL	NO	5	NO

KEY TO MASTER CHART

Ad. Ca	Adeno Carcinoma
CI	Chronic Inflammation
M	Male
F	Female
GERD	Gastro Esophageal Reflux Disease
HPE	Histo Pathological Examination
LGI	Lower Gastro Intestinal
UGI	Upper Gastro Intestinal
N	Normal
TB	Tuberculosis
LA	Lower Abdominal
UA	Upper Abdominal
PU	Peri Umbilical
DA	Diffuse Abdominal
USG	Ultra Sonography
ATT	Anti Tuberculous Therapy
PID	Pelvic Inflammatory disease