A DISSERTATION ON

A STUDY ON THE EFFECT OF CARBONDIOXIDE AS PNEUMOPERITONEUM ON LIVER FUNCTIONS IN LAPROSCOPIC CHOLECYSTECTOMY

Dissertation submitted to

THE TAMIL NADU Dr.M.G.R.MEDICAL UNIVERISTY

CHENNAI

with partial fulfilment of the regulations

for the Award of the degree

M.S. [General Surgery]

Branch – I

DEPARTMENT OF GENERAL SURGERY,

STANLEY MEDICAL COLLEGE,

CHENNAI.

APRIL-2016

CERTIFICATE

This is to certify that the dissertation entitle **"A STUDY ON THE EFFECT OF CARBONDIOXIDE AS PNEUMOPERITONEUM ON LIVER FUNCTIONS IN LAPROSCOPIC CHOLECYSTECTOMY"** is a bonafide original work of, **Dr.K.CHANDRASEKARAN**, in partial fulfilment of the requirements for M.S.Branch–I (General Surgery) Examination of the Tamil Nadu Dr. M.G.R. Medical University to be held in APRIL 2016 under my guidance and supervision in 2014-15.

Prof.Dr.A.K.RAJENDRAN, M.S
Professor of General Surgery,
Guide and supervisor,
Department of General Surgery,
Stanley Medical College and hospital
Chennai – 600001

Prof.Dr.VISWANATHAN. M.S
Professor and HOD
Department of General Surgery,
Stanley Medical College and hospital,
Chennai – 6000001.

Dr. ISSAC CHRISTIAN MOSES, M.D,
Dean
Stanley Medical College and Hospital,
Chennai-600001

DECLARATION

I, **Dr. K CHANDRASEKARAN** solemnly declare that dissertation titled, **"A STUDY ON THE EFFECT OF CARBONDIOXIDE AS PNEUMOPERITONEUM ON LIVER FUNCTIONS IN LAPROSCOPIC CHOLECYSTECTOMY"** is a bonafide work done by me at Govt. Stanley Medical College & Hospital during 2013-2016 under the guidance and supervision of my Unit Chief **Prof. Dr. A.K. RAJENDRAN, M.S.,** Professor of Surgery. The dissertation is submitted to Tamilnadu Dr. M.G.R. Medical University, towards partial fulfillment of requirement for the award of **M.S. Degree (Branch – I) in General Surgery.**

Place : Chennai.

Date : **(Dr. K CHANDRASEKARAN)**

ACKNOWLEDGEMENT

I express my heartful gratitude to the Dean, **Dr. ISSAC CHRISTIAN MOSES, M.D,** Dean, Stanley Medical College and Hospital, Chennai-1 for permitting me to do this study.

I am deeply indebted to **Prof.Dr.Dr.A.K.RAJENDRAN, M.S,** Professor of General Surgery, Guide and supervisor**,** Department of General Surgery, Stanley Medical College and Hospital, Chennai – 600001 for his support and guidance.

I am very grateful to **Prof.Dr.VISWANATHAN. M.S,** HOD and Professor, Department of General Surgery, Stanley Medical College and Hospital**,** Chennai – 600001.

And my Assistant **Professor Dr.M.MANIMEKALAI, M.S., Dr.C.ARUN BABU, M.S.,** Stanley Medical College and hospital who guided and trimmed my work throughout the period of my study.

I am extremely thankful to all the Members of the INSTITUTIONAL ETHICAL COMMITTEE for giving approval for my study. I also thank all the patients who were part of the study and my Professional colleagues for their support and criticisms.

ABSTRACT AND KEY WORDS

A STUDY ON THE EFFECT OF CARBONDIOXIDE AS PNEUMOPERITONEUM ON LIVER FUNCTIONS IN LAPROSCOPIC CHOLECYSTECTOMY

AIM OF THE STUDY

1. To study the incidence of alterations in liver function following laparoscopic cholecystectomy in the Indian population
2. To study the significance of these alterations in patients and the safety of the procedure

MATERIALS AND METHODS

This is a prospective study conducted in the department of General surgery, Stanley medical college, Chennai, from July 2014 to June 2015.

This chapter presents an overview of the study design of LC performed under variable intraperitoneal pressure (12-14mmHg) in patients with cholecystectomy.

SOURCE OF DATA:

The patients admitted in our hospital wards with symptomatic cholelithiasis from July 2014 to June 2015 will be taken up for the study.

METHOD OF COLLECTION OF DATA

The study will be conducted on 50 patients undergoing LC under variable intraperitoneal pressure (12-14mmHg) at Stanley medical college, chennai. The study will be designed to evaluate the complications of LC especially the changes in liver enzymes.

All patients undergoing laparoscopic cholecystectomy will be invited to participate in the study and written informed consent will be taken. All patients will undergo a standard clinical and laboratory evaluation that includes briefly information about age, sex, address and routine investigation including ultra sound abdomen, which are done pre operatively.

Pre-operative investigations include liver function tests (SGOT, SGPT, alkaline phosphatase, gamma glutamyl transferase, bilirubin (direct), and bilirubin(total)).

The subject satisfying inclusion and exclusion criteria will be enrolled in the study.

The liver function tests will be further done 24 hrs later and in some patients liver function test will be repeated to monitor liver function. Adverse events will be noted in all the patients. Finally the duration of hospital stay will be noted. The patients who develops intra-abdominal complications will be excluded from the study.

CONCLUSION:

This prospective observational type of study was conducted in department of General Surgery, Stanley Medical College and Hospital, Chennai, from 1 July 2014 to 30 June 2015.

It can be concluded from the findings of the study that usage of co2 as pneumoperitoneum in laproscopic cholecystectomy has no significant effect on post operative liver enzymes.

It can be concluded that variation in insuffulation pressure has no effect on enzyme rise significantly.

It can be observed that duration of surgery with co2 pneumoperitoneum has no effect on postoperative LFT level.

Thus co2 in safe pneumoperitoneum can be safely used in laproscopic surgeries.

Key words: Laproscopic cholecystectomy, Co2 pneumoperitoneum, liver function test.

CONTENTS

LIST OF ABBREVATIONS

GB - Gall Bladder

CBD - Common Bile Duct

USG - Ultrasonogram

T.B - TOTAL BILIRUBIN

D.B - direct bilirubin

SGOT - serum glutamate oxaloacetate

SGPT - serum glutamate pyruvate transferase

ALP - alkaline phosphatase

LC - laproscopic cholecystectomy

ELEC - elective

EMER - emergency

TIME OF SURGERY

GROUP - 1<30 min

GROUP 2:30-90 min

GROUP3:90-135 min

GROUP4:135min

LFT:liver function test

LIST OF TABLES

LIST OF FIGURE

1. INTRODUCTION

1.1 OBJECTIVES :

AIM OF THE STUDY

1. To study the incidence of alterations in liver function following laparoscopic cholecystectomy in the Indian population

2. To study the significance of these alterations in patients and the safety of the procedure

2. REVIEW OF LITERATURE

In this modern era Laparoscopic surgery has evoked marked changes in approach to surgical diseases. The “Minimally invasive surgery “(MIS) , now turned into “Minimal Access Surgery” (MAS) has prompted us to scrutinize nearly all operations for possible conversion to Laparoscopic technique.

HISTORICAL ASPECTS

In the history of surgery few procedures have so rapidly changed the surgeon’s way of thinking and acting as has Laparoscopic cholecystectomy . It has been the true detonator of the laparoscopic revolution in digestive surgery.

First Laparoscopic cholecystectomy was done by **Mahe**in 1985. **Mouret**a general surgeon performed a Laparoscopic cholecystectomy and few months later showed video tape of his technique in Paris 1987.

In 1988 in Paris, **Dubois** and Co-workers – tried the laparoscopic method. During the same year, technique of internal lithotripsy for removing gallstones with a laparoscopic access was developed.

For the first time in the United States, a videotape of laparoscopic cholecystectomy using intra corporeal lithotripsy technique Endoscopic Surgeons in Louisville, Kentucky in April 1989.

As early as 1992, laparoscopic cholecystectomy had become the procedure of choice to remove gallbladder with calculi for two main reasons,

1. Constant improvement of results.

2. Simplification of technique.

The explosive success of laparoscopic cholecystectomy initiated revolution within us. At present nearly all abdominal surgeries can be performed laparoscopically.

In our hospital we are doing the following laparoscopic procedures.

1. Laparoscopic Appendicectomy
2. Laparoscopic Cholecystectomy
3. Diagnostic Laparoscopy
4. Laparoscopic Ovariectomy

2.1 OVERVIEW OF SURGICAL ANATOMY

Gallbladder is a pear shaped organ of size 7.5 – 12 cm , with a normal capacity of about 5 ml. It is located in the gallbladder fossa of inferior surface of right lobe of liver and covered by layer of peritoneum. It is anatomically divided into

- Fundus
- Body
- Neck (or) infundibulum through which bile drains into cystic duct which joins the common bile duct. Cystic artery, a branch of Right hepatic artery is usually given off behind the common hepatic duct supplies the gall bladder. There are various anomalies of GB, cystic duct and cystic artery course that must be recognized to avoid inadverdent injury during Laparoscopic cholecystectomy. Anatomy of calots triangle is very important either during open or Laparoscopic cholecystectomy. This is bounded above by the cystic artery, below by the cystic duct and medially by the common hepatic duct.

2.2 PHYSIOLOGY

Gallstones are the most common biliary pathology. More than 85% of patients are asymptomatic who needs expectant line of management.

They are classified into

1. Cholesterol stones – Most common
2. Pigment stones which again divided into
    a) Brown pigment stones.
    b) Black pigment stones

FACTORS IN GALLSTONE FORMATION

a. Supersaturated bile – Most important.
b. Impaired gall bladder function
c. Cholesterol nucleating factors
d. Absorption and enterohepatic circulation of bile acids.

2.3. PATHOLOGY

Lipids and fat soluable vitamins A,D,E,K absorption helped by bile.Cholesterol as well ws bilirubin excretion takes place with help of bile.Lipid dissolves in bile salt and get easily absorbed . Phospholipids

are synthesized in the liver in conjucation with bile salt. Cholesterol is not soluable in water and bile and is highly non polar.The normal volume of bile secreted by the liver is 50 to 100ml/day.

Solubility of bile salt,cheodeoxycholic acid,cholic acid is lost leading to gall stone formation. The primary event is formation of “biliary sludge”.Composition is, calcium bilirubinate granules, cholesterol crystals and a mucin. Contributing factors are prolonged fasting states or total parenteral nutrition.

CHOLESTEROL GALLSTONES :

The multifactorial step is

- supersaturation
- nucleation
- growth

Failure of motor function leads to gallstone formation. Cholesterol is maintained in soluable form by micelles.combination of , a bile salt – phospholipid – cholesterol complex and cholesterol – phospholipid vesicles. Cholesterol solubility depends on the relative concentration of cholesterol, bile salts and phospholipid.

Cholesterol supersaturation is present in many normal humans without gallstones. Thus, cholesterol supersaturation results in metastable state in which cholesterol precipitation may or may not take place and additional factors in bile must be present to either enhance or inhibit nucleation of cholesterol leading to next stage in gallstone formation.

Nucleation refers to the process in which solid cholesterol monohydrate crystals form and conglomerate. Vessicles get transferred to miscelles with the help of phosphplipid and cholesterol. Efficient transfer of phopholipid occur than cholesterol. As aresult enrichement of cholesterol with remaining vesicles occurs.Cholesterol rich vesicles get converted to large monohydrate.Accelerating factors include immunoglobulin,mucinand glycoprotein.

Clinical symptom occur as a result of biliary tree obstruction or injury of gall bladder. Growth of stones may occur in two ways.

- Insoluble precipitate deposition at the bile – stone interface.
- Leading to large conglomerate.

Decrease in motility of gallbladder leads to stone formation.

Additive factor includes gallbladder stasis, as starvation, parenteral nutrition, after vagotomy and in patients with tumours producing somatostatin or in those receiving somatostatin therapy.

PIGMENT GALLSTONES

Anions,bilirubin,palmitate,phosphates get precipitated with calcium leading to stone formation. Furthermore, bilirubinate, and palmitate also forms major components of pigment gallstones.

Pigment stones are classified into brown or black stones. Cause for black pigment stones are hemolytic anaemia or cirrhosis. In hemolytic anaemia total bilirubin and concentration of indirect bilirubin increases.

Brown pigment stones are seen most commonly in asian population.Constitution is cholesterol and calcium palmitate.Contributing factors include disorders of biliary motility and infection.

2.4.COMPLICATIONS OF GALLSTONES

a) In the Gall Bladder

1. Chronic Cholecystitis

2. Acute Cholecystitis

3. Gangrene

4. Perforation

5. Empyema

6. Mucocele

7. Carcinoma

b) In the Bile Ducts

1.Obstructive Jaundice

2.Cholangitis

3.Acute Pancreatitis

c) In the Intestine

1.Acute intestinal Obstruction

(Gallstone ileus)

Silent stones are incidentally found stone during examination for other pathology or in routine check up, which do not produce symptoms. Proplylactic cholecystectomy is not indicated in all these patients except in the following high risk groups.

- Diabetic patients
- Patients on immunosuppressive therapy
- Candidates for renal transplant
- Large gall stone more than 2 cm

- Multiple small stones

- Patients living in high risk areas where there is increased incidence of GB carcinoma.

- Porcelain GB, Cholesterosis GB

- Patient undergoing for abdominal surgery with incidental finding of gall stones, if general condition of the patient permits – incidental cholecystectomy may be done.

In our study the following groups of patients were taken.

- Cholelithiasis
- Chronic calculous cholecystitis
- Patients with biliary colic

GB: Assess

- Size of GB
- Walls of GB
- Intraluminal Calculi

CBD : Any calculi and diameter

Liver : Any solid (or) cystic lesions

Intrahepatic biliary radicle dilatation

Pancreas : Any mass in the pancreas

Diameter of pancreatic duct

2.5. INVESTIGATIONS

1. Complete hemogram – Hb%, TC, DC, ESR

2. Urine for routine examination

3. Blood for sugar, urea , creatinine and electrolytes

4. Bleeding time, clothing time and PTT

5. Liver function test

    i. Sr. Bilirubin – Total / Direct

    ii. SGOT

    iii. SGPT

    iv. Alkaline Phosphatase

    v. Proteins

6. Chest X-ray PA view

7. ECG

8. USG Abdomen

Reliable investigation for evaluation of biliary tract diseases.

2.6. LAPAROSCOPIC INSTRUMENTS

The surgeons knowledge of instrumentation and ability to "trouble shoot" certainly help to allay anxiety and contribute to optimal patient care.

OPERATING ROOM SETUP

The operating room setup includes equipment which properly positions the patient. Operative laparoscopic and video equipment and well coordinated assistant and nursing team are all required.

Anasthesiologist should be well versed with the potential problems and complications of laparoscopy.

ESSENTIAL EQUIPMENTS

a). Optic Equipments

- Laparoscope 5mm, 10mm – 100, 300
- Computed chip video camera
- Light source
- Video monitors and video recorder

b) Abdomen Access Equipments

- Veress needle
- Hasson cannula
- Gas cylinder (C02)
- Trocar and cannulas
- Insufflators

c). Laparoscopic Instruments

- Atraumatic grasping forceps
- Bipolar coagulation forceps
- Dissecting forceps – Maryland
- Scissors
- Clip applicators
- Staplers
- Endo pouches (or) Sacs
- Sutures and needles
- Needle holder
- Suction and irrigation system

LIGHT SOURCE

High intensity light source (Xenon) is necessary for adequate illumination of peritoneal cavity. The light source is connected to the laparoscope by either fibre optic cable (or) fluid filled cable. The fibre optic cables consist of an inner core of glass that has a high refractive index which absorbs much of the light input.

VIDEO CAMERA

Eye piece of laproscope is attached to video camera and has focus mechanism and zooming power.

The resolving power must be 400 lines of resolution per inch and has charge coupled device.

VIDEO MONITOR

The monitor resolution capability and video camera should match with each other and such monitor is selected. Three chip cameras require expensive monitors with 700 lines of resolution.

LAPAROSCOPES

Commonly used laparoscopes are rigid instruments that employ the Hopkins rod lens system of optics. It comes in sizes ranging between between 3mm to 10mm in diameter and variety of viewing angles. The 0 degree or end/ forward viewing is easy to use and results in least amount of image distortion. Angled scopes (30o, 45o) provide greater versatality by following the operator to looks around corners and solid organs but needs experience. Recently, flexible scopes have been developed.

INSUFFALATORS

Insuffalators used to create working space within the abdominal cavity by delivering C02 via an automatic high flow pressure – regulator system. C02 is currently the agent of choice because of low toxicity, low risk of gas embolism, rapid reabsorption, low cost and ease of use. Ideal insuffalator should be able to deliver 8 to 10L/min with a minimum acceptable flow rate of 6L/min. It regulates flow rate, monitors intra abdominal pressure and stops delivering C02 whenever the pressure exceeds predetermined level of 12 to 15mm Hg.

PUNCTURE INSTRUMENTS

To gain access to the peritoneal cavity 2 types of instruments used,

1. Veress needle

2. Laparoscopic trocar – sheath assemblies Veress needle achieve pneumoperitoneum in a “Closed” fashion.

It has outer sharp cutting needle and inner blunt spring loaded obturator. Once cutting needle enter peritoneal cavity blunt stylet springs forward thereby reducing injury.

Hasson cannula is used to create pneumoperitoneum in a "opened" fashion. By using this we may avoid inadverdent injury to the bowel and vessels which may occur occasionally.

The basic laparoscopic port consists of an outer hollow sheath or cannula that has a valve to prevent C02 escape, side port for insuffa-lation of gas and a portal for instrument access. The commonly used trocars are 5 mm and 10 mm in diameter.

SURGICAL INSTRUMENTS

They are modification of standard surgical instruments, shaft of these may be insulated with non-conductive material and the working tips are metal to allow use with electrocautery.

i. Dissecting forceps

Equipped with atraumatic tips that can be used to dissect and spread tissues bluntly. Forceps with gentle curve for dissecting around cornersalso available.

ii. Grasping forceps

It comes with either atraumatic or toothed jaws and has ratchet for locking onto the tissues being grasped.

iii. Scissors

Scissors with Metzenbaum – type configuration of tip useful for procedures like adhesiolysis.

iv. Clip appliers

They are the primary modality for ligating blood vessels and tubular structures. The clips are made of titanium and range from 7mm to 1mm.

v. The Push rod and suture loop

They are inserted via a hollow reducing sleeve. The suture then looped around the structure and the knot slide down and closed.

2.7. SURGICAL PROCEDURE

The two modalities used for coagulation and the hemostasis are the laser and electrocautery – monopolar or bipolar. The entire tip of the instrument must be well visualized to avoid contact with other structures there by avoiding thermal injuries

The laparoscopic cholecystectomy offers many advantages that include a markedly reduction in hospital stay and decreased cost. Patient preparation, induction of anesthesia, and sterile draping are

performed as for an open cholecystectomy. Although use of a urinary catheter depends on the clinical setting, an orogastric tube is standard to decompress the stomach and help with exposure of the upper abdomen. Access to the peritoneal cavity and creation of pneumoperitoneum can be performed by the open or closed technique according to the expertise and discretion of the surgeon. The open technique involves making a small incision at the umbilicus, cutting down through the fascia of the abdominal wall, incising the peritoneum directly, and inserting a blunt trocar, known as a Hasson cannula.

Alternatively in the closed technique, an incision is made and a needle inserted into the peritoneal cavity to insufflate the abdomen prior to the placement of any trocars. Following the establishment of a CO2 pneumoperitoneum, a brief exploration is performed and additional 5-mm ports are placed in the right anterior axillary line, right midclavicular line, and subxiphoid location). The lateral port at the anterior axillary line is used to elevate the fundus of the gallbladder toward the right shoulder. This retraction provides exposure to the infundibulum and porta hepatis. The midclavicular trocar is used to grasp thegallbladder infundibulum, retracting it inferolaterally to open the triangle of Calot. By distracting Hartmann's pouch laterally, the cystic duct no longer lies almost parallel to the common hepatic duct.

The dissection is then carried along the infundibulum on the anterior and posterior surfaces to expose the base of the gallbladder. This dissection will eventually clear all fibrofatty tissue from the triangle of Calot. Inferolateral traction of the infundibulum then allows documentation of two structures entering the gallbladder, the cystic duct and cystic artery. A useful landmark for the cystic artery is the overlying lymph node, known as Calot's node. The view of the liver bed through the space between cystic duct and cystic artery and above the cystic artery is known as the critical view of safety, and minimizes the risk of inadvertent iatrogenic bile duct injury . With sufficient dissection, clips are placed on the cystic artery and cystic duct. If a cholangiography is performed, the cystic duct is only clipped adjacent to the gallbladder and the cystic duct incised, although not transected. A cholangiographic catheter is then fed through the incised duct and fluoroscopic images obtained with injection of contrast into the cystic duct and biliary tree. On obtaining a normal cholangiogram or when cholangiography is not performed, the cystic duct is doubly clipped on the common duct side and transected. The previously clipped artery is also transected and the gallbladder dissected off the liver bed using electrocautery. Because the venous drainage of the gallbladder is directly into the liver bed through venules, excellent hemostasis must be achieved during this dissection.

The cystic duct and cystic artery clips are inspected just prior to completion of the dissection of the fundic attachments, because the superior traction of the fundus has provided exposure to the porta and triangle of Calot. The gallbladder is then brought out of the abdominal cavity through the umbilical port. In the setting of acute cholecystitis, or if during dissection the gallbladder was entered, a plastic bag should be used for retrieval.

THE PHYSIOLOGIC EFFECTS OF PNEUMOPERITONEUM

The pneumoperitoneum has many effects that are only partially known. There are effects resulting from the pressure within the abdomen and effects resulting from the composition of the gas used, generally carbon dioxide.

The pressure within the abdomen from pneumoperitoneum decreases venous return by collapsing the intra-abdominal veins, especially in volume-depleted patients. This decrease in venous return may lead to decreased cardiac output. To compensate, there is an elevation in the heart rate, which increases myocardial oxygen demand. High-risk cardiopulmonary patients cannot always meet the demand and may not tolerate a laparoscopic procedure. In volume-expanded healthy patients with full intra-abdominal capacitance vessels (veins), the

increased intra-abdominal pressure actually may serve as a pump that increases right atrial filling pressure.

Through a different mechanism associated with catecholamine release triggered by CO_2 pneumoperitoneum, heart rate rises along with systemic vascular resistance. This may lead to hypertension and impair visceral blood flow. It is not uncommon after the induction of pneumoperitoneum for the heart rate to rise along with the mean arterial pressure. However, in elderly, compromised patient, the strain on the heart can lead to hypotension, end-organ hypoperfusion, and ST-segment changes.

To minimize the cardiovascular effects of pneumoperitoneum, it is important that patients have adequate preoperative hydration. By insufflating the abdomen slowly, the vagal response to peritoneal stretching may be diminished and vagally mediated bradycardia avoided. Additionally, if cardiovascular effects are noted during insufflation or during the maintenance of pneumoperitoneum, the insufflation pressures should be lowered from the usual 15 to 12 mmHg, or pneumoperitoneum should be evacuated while the anesthesiologist sorts out the cardiovascular changes. Taking patients out of the steep

reverse Trendelenburg position can help to increase venous return. Sometimes these effects can last for hours after desufflation.

The elevated intra-abdominal pressures restrict movement of the diaphragm, which reduces diaphragmatic excursion. This is represented as a decrease in functional residual capacity and pulmonary compliance and an increase in inspiratory pressure. Overall, there is no significant change in the physiologic dead space or shunt in patients without cardiovascular compromise. After the induction of pneumoperitoneum, peak airway and plateau airway pressures increased by 50% and 81%, respectively. Bronchopulmonary compliance decreased by 47% during the period of increased intra-abdominal pressure. After desufflation, peak and plateau pressures remained elevated by 36% and 27%, respectively, for 2AND6 hours. Compliance remained at 86% of the preinsufflation value.

Urine output often is diminished during laparoscopic procedures and usually is the result of diminished renal blood flow owing to the cardiovascular effects of pneumoperitoneum and direct pressure on the renal veins. In addition to direct effects, elevated intra-abdominal pressure results in release of antidiuretic hormone (ADH) by the pituitary, resulting in oliguria that may last 60 minutes after the

pneumoperitoneum is released. Aggressive fluid hydration during pneumoperitoneum increases urine output. Positional changes can affect the collection of urine in the Foley catheter and must be taken into consideration if anuria is noted.

CARBON DIOXIDE RELATED EFFECTS

HYPERCAPNIA

Hypercapnia and acidosis are seen with pneumoperitoneum and are likely due to the absorption of carbon dioxide from the peritoneal cavity. In the ventilated patient, increasing respiratory rate or vital capacity must compensate for these changes. At extremes, increases in tidal volume may risk barotraumas, and increases in respiratory rates diminish time for gas mixing, increasing dead-space ventilation. A first steady state in $PaCO_2$ is reached around 30 minutes after introduction of the pneumoperitoneum. After this period, increases in $PaCO_2$ suggest that existing body buffers (>90% exist in bone) have been exhausted. Sudden increases may be related to port slippage and extraperitoneal or subcutaneous diffusion of carbon dioxide. This will resolve spontaneously once the port is repositioned.

Hypercapnia and acidosis that are difficult to control may follow, especially in elderly patients, those undergoing long operations, and patients with pulmonary insufficiency. Our response to this is to desufflate the abdomen for 10 to15 minutes. If reinsufflation results in recurrent hypercapnia, then we change insufflation gases or convert to an open operation. Acidosis can persist for hours after desufflation. Other complications of pneumoperitoneum that are less frequent but may be life threatening include CO_2 embolism and capnothorax.

CARBON DIOXIDE EMBOLUS

The incidence of clinically significant CO_2 embolism is very low, although recent reports using more sensitive tests suggest that tiny bubbles of gas are present commonly in the right side of the heart during laparoscopic procedures. Clinically important CO_2 embolism may be noted by unexplained hypotension and hypoxia during the operation. There is a characteristic millwheel murmur that can be detected with auscultation of the chest. This is produced by contraction of the right ventricle against the blood-gas interface. Usually the anesthesiologist notes an exponential decrease in the end-tidal CO_2, which is consistent with complete right ventricular outflow obstruction. The mainstays of treatment are immediate evacuation of the pneumoperitoneum and

placement of the patient in the left lateral decubitus, head down (Durant) position. This allows the CO_2 bubble to "float" to the apex of the right ventricle, where it is less likely to cause right ventricular outflow tract obstruction. It is important to administer 100% oxygen and hyperventilate the patient during this period. Additionally, aspiration of gas through a central venous line may be performed.

CAPNOTHORAX/PNEUMOTHORAX

Capnothorax can be caused by carbon dioxide escaping into the chest through a defect in the diaphragm or tracking through fascial planes during dissection of the esophageal hiatus. It also can be due to opening of pleuroperitoneal ducts most commonly seen on the right side. Pleural tears during fundoplication can lead to pneumothorax, and additionally, the usual causes of pneumothorax, such as ruptured bullae, may be the etiology. The effects of carbon dioxide gas in the chest usually are noted as decreased O_2 saturation (a result of shunting induced by lung collapse), increased airway pressure, decreased pulmonary compliance, and increases in carbon dioxide and end-tidal CO_2. The treatment is to desufflate the abdomen and stop carbon dioxide administration, correct the hypoxemia by adjusting the ventilator, apply positive end-expiratory pressure (PEEP), if possible, and decrease the

intra-abdominal pressure as much as possible. The recommendation is to avoid thoracentesis because this usually resolves with anesthetic management. We generally evacuate the capnothorax directly at the end of the procedure with a red rubber catheter placed across the diaphragm (through the pleural defect) and brought out a trocar site. The external end of the catheter is placed under water as the lung is inflated and then removed from the water when the bubbles stop. We do not obtain chest radiographs in the recovery room after these maneuvers if there is no evidence of hypoxia on 2 L/min of O_2 flow. Patients should be maintained on supplemental oxygen to help facilitate absorption of the carbon dioxide from the pleural space.

Although, various studies on laparoscopic cholecystectomy are available, the frequency and duration of postoperative pneumoperitoneum are not well established. Moreover, the observation of hemodynamic and metabolic impairment related to CO2 pneumoperitoneum and postoperative mesenteric ischemia reports following laparoscopic procedures have raised concern about local and systemic effects of increased intra abdominal pressure during laparoscopic procedures. This study aims to investigate the effect of carbon dioxide used as pneumoperitoneum over liver functions in lap

cholecystectomy under pressure [12-14mmHg] at Stanley medical college, Chennai

AIMS AND OBJECTIVES OF THE STUDY:

1. To study the incidence of alterations in liver function following laparoscopic cholecystectomy in the Indian population.

2. To study the significance of these alterations in patients and the safety of the procedure.

3. MATERIALS AND METHODS

This is a prospective study conducted in the department of General Surgery, Stanley Medical College, Chennai, from July 2014 to June 2015.

This chapter presents an overview of the study design of LC performed under constant intraperitoneal pressure (14mmHg) in patients with cholecystectomy.

SOURCE OF DATA:

The patients admitted in our hospital wards with symptomatic cholelithiasis from June 2013 to July2014 will be taken up for the study.

METHOD OF COLLECTION OF DATA (including sampling procedure, if any

The study will be conducted on 50 patients undergoing LC under variable intraperitoneal pressure (12-14mmHg) at Stanley medical college, Chennai. The study will be designed to evaluate the complications of LC especially the changes in liver enzymes.

All patients undergoing laparoscopic cholecystectomy will be invited to participate in the study and written informed consent will be taken. All patients will undergo a standard clinical and laboratory evaluation that includes briefly information about age, sex, address and routine investigation including ultra sound abdomen, which are done pre operatively.

Pre-operative investigations include liver function tests (SGOT, SGPT, alkaline phosphatase, gamma glutamyl transferase, bilirubin (direct), and bilirubin(total)).

The subject satisfying inclusion and exclusion criteria will be enrolled in the study.

The liver function tests will be further done 24 hrs later and in some patients liver function test will be repeated to monitor liver function. Adverse events will be noted in all the patients. Finally the duration of hospital stay will be noted. The patients who develops intra-abdominal complications will be excluded from the study.

3.1 Type of study : Prospective and Observational Study

3.2 Study approval : Prior to commencement of this study - Thesis & Ethical Committee of Stanley Medical College and Hospital, Chennai had approved the thesis protocol.

3.3 Place of study : Stanley Medical College and Hospital

3.4 Period of study : Duration starting from 01 July 2014 to 30 June 2015

3.5 Sample size :50 cases with comparative control group of 50 cases

3.6 Selection of patients:

a) Sampling method- Purposive**.**

b) Inclusion criteria- Patients with symptomatic or asymptomatic cholelithiasis or choledocholithiasis, age 20 to 80 yrs.

c) Exclusion criteria - - Any patient with pre-operative abnormality in liver enzymes.

- Suspected chronic liver diseases
- Common bile duct pathology
- Conversion to open cholecystectomy
- Hematological Disorders
- Intra – Operative Complication – CBD injury
- Incomplete data

3.7 STUDY PROCEDURE

Method of sampling was non-random, purposive. After admission short history was taken and physical examination was conducted on each patient admitted in surgery department with features suggestive of extrahepatic biliary lithiasis. Baseline investigations, as routinely required, were done, followed by imaging studies. Patients were then explained about their disease process and the possible line of management. All the necessary information regarding the study was explained to the patients or their valid guardian. Informed written consent was taken from the patients or their guardian willing to participate in the study. Detailed history was taken from the study group to establish proper diagnosis. Thorough physical examination was done in each case. Data collection sheets were filled in by the investigator

himself. All of the preoperative factors related to the patient were noted down in the data sheet. After proper evaluation and preparation, patients who required surgical management were taken up for surgery. Strict aseptic precautions were followed during the operation. Meticulous techniques were practiced as far as possible. The operation procedure and related preoperative factors were observed directly and recorded in the data collection sheet instantly.

After completing the collection of data it was compiled in a systematic way. **Operational definitions:**

Cholelithiasis :a condition marked by presence of calculi in the gallbladder.

Choledocholithiasis :a condition marked by presence of calculi in the common bile duct.

Jaundice : Those with **S**. bilirubin >1.2 mg/ dl were recorded as jaundiced.

Diabetes : Those known as diabetic from history and those with RBS more than 11 mmol/ l were included as diabetic.

ERCP: (endoscopic retrograde cholangiopancreatography) is a procedure used to diagnose and treat diseases of the gallbladder, biliary system, pancreas, and liver.

4. RESULTS

This prospective and observational study was carried out to determine the effect of co2 on liver function test was studied.

Fifty patients fulfilling the inclusion criteria from Surgery department of Stanley Medical College and Hospital during the period of 1 July 2014 to 30 June 2015.

All cases were evaluated clinically.

Only essential investigations necessary for diagnosis and preoperative assessment were carried out before operations.

All patients underwent post op LFT in addition.

The patients of both sexes and different ages were included in the study. The results obtained are as follows.

Types of operations: were recorded during each operation.

Table 1 : Age and Sex Distribution of patients with cholelithiasis

SEX	Frequency	Percent
MALE	10	20.0
FEMALE	40	80.0
Total	50	100.0

FIG 1:AGE DISTRIBUTION IN CHART

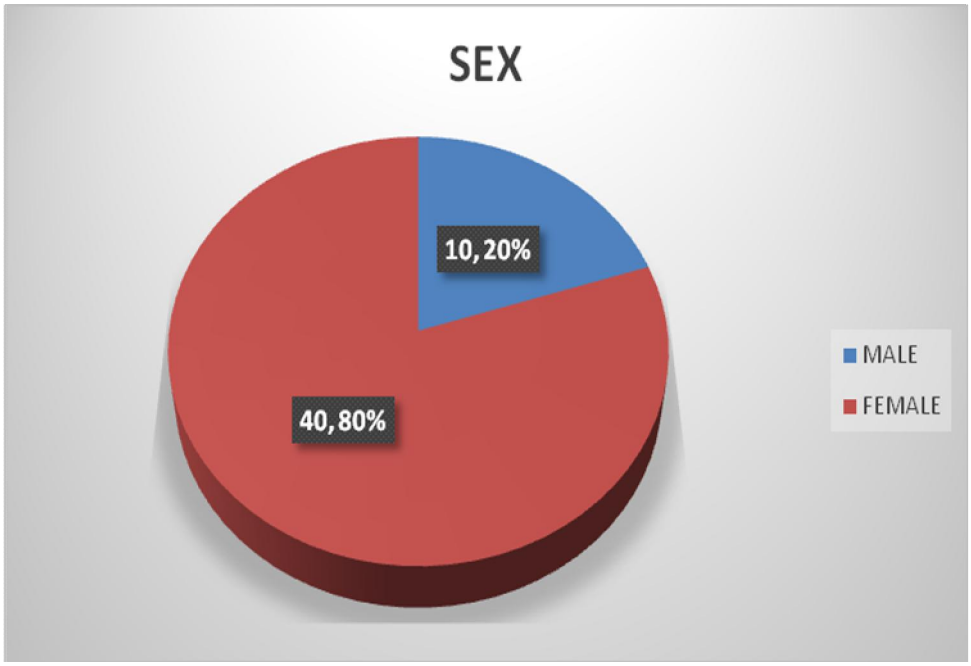
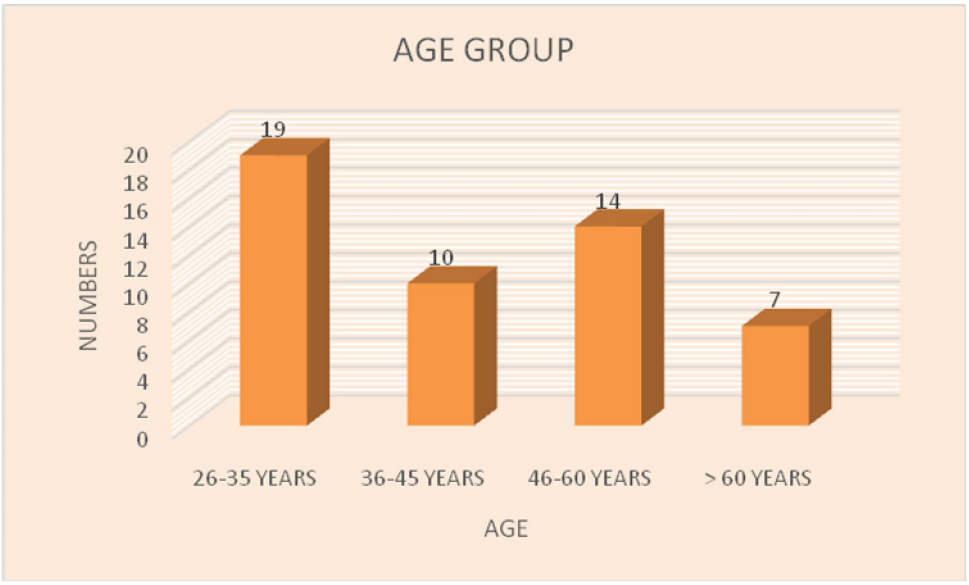


TABLE 2: PERCENTAGE OF SEX DISTRIBUTION

AGE GROUP	Frequency	Percent
26-35 YEARS	19	38.0
36-45 YEARS	10	20.0
46-60 YEARS	14	28.0
> 60 YEARS	7	14.0
Total	50	100.0

The mean age of patients was 44.75 with more than half of the patients (38%) belonging to the 26-35 age group. The male to female ratio was 1 : 4.

FIG 2:AGE WISE DISTRBUTION



Co2 pnuemoperitoneum was used as variable, group 1 as 12mm Hg pressure, group 2 as 13mm Hg pressure and group 3 as 15 mm Hg pressure. group 2 is used as standards. preoperative T.B. doent show significant rise {P>0.5}.

TABLE 3:COMPARISION FOR TOTAL BILIRUBIN PREOP AND POSTOP

Descriptive Statistics

	CO2 Pressure used	Mean	Std. Deviation	N
PRE_TB	GROUP 1	1.150	.4590	16
	GROUP 2	1.171	.5977	17
	GROUP 3	1.153	.4598	17
	Total	1.158	.5002	50
POST_TB	GROUP 1	1.006	.3678	16
	GROUP 2	1.106	.4175	17
	GROUP 3	1.082	.3909	17
	Total	1.066	.3874	50

Tests of Between-Subjects Effects

Measure: Total bilirubin

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	123.406	1	123.406	379.974	.000	.890
CO2 Pressure used	.061	2	.031	.094	.910	.004
Error	15.264	47	.325			

Effect of Co2 pnuemoperitoneum was studied and preop and post of direct bilirubin doesn't show significant rise[P is 0.2939].

TABLE 4:COMPARISION BETWEEN CO2 PRESSURE AND TOTAL BILIRUBIN

Descriptive Statistics

	CO2Pressure used	Mean	Std. Deviation	N
PRE_DB	GROUP 1	.325	.1693	16
	GROUP 2	.347	.2939	17
	GROUP 3	.418	.2186	17
	Total	.364	.2328	50
POST_DB	GROUP 1	.244	.1590	16
	GROUP 2	.213	.1100	17
	GROUP 3	.312	.1900	17
	Total	.256	.1589	50

variable co2 pneumoperitoneum pressure doesn't have any effect over the rise in serum direct bilirubin levels {P is 0.267}.

Tests of Within-Subjects Effects

Measure: diff_br

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
DB	Sphericity Assumed	.286	1	.286	12.498	.001	.210
	Greenhouse-Geisser	.286	1.000	.286	12.498	.001	.210
	Huynh-Feldt	.286	1.000	.286	12.498	.001	.210
	Lower-bound	.286	1.000	.286	12.498	.001	.210
DB * CO2PRESSUREUSED	Sphericity Assumed	.012	2	.006	.252	.778	.011
	Greenhouse-Geisser	.012	2.000	.006	.252	.778	.011
	Huynh-Feldt	.012	2.000	.006	.252	.778	.011
	Lower-bound	.012	2.000	.006	.252	.778	.011
Error(DB)	Sphericity Assumed	1.077	47	.023			
	Greenhouse-Geisser	1.077	47.000	.023			
	Huynh-Feldt	1.077	47.000	.023			
	Lower-bound	1.077	47.000	.023			

TABLE 5: Tests of Within-Subjects Contrasts for direct bilirubin

Measure: d.b.

Source	DB	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
DB	Linear	.286	1	.286	12.498	.001	.210
DB * CO2 Pressure used	Linear	.012	2	.006	.252	.778	.011
Error(DB)	Linear	1.077	47	.023			

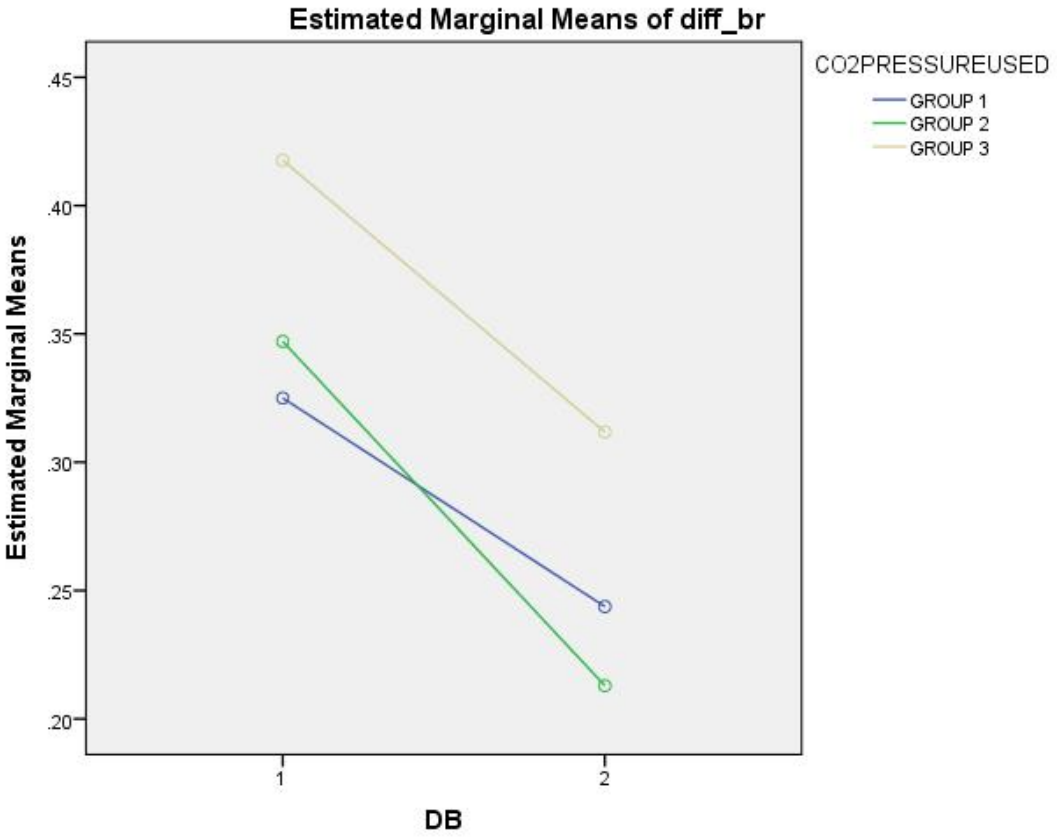
TABLE 6: Tests of Between-Subjects Effects direct bilirubin and CO2

Measure: d.b.

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	9.583	1	9.583	169.938	.000	.783
CO2 Pressure used	.153	2	.077	1.360	.267	.055
Error	2.650	47	.056			

FIG 3:GRAPHICAL REP OF SERUM BILIRUBIN



SGOT,SGPT and ALP dosent show any significant rise in the values postoperatively

TABLE 7: COMPARISON BETWEEN PREOP AND POST OP SGOT

Descriptive Statistics

	CO2 Pressure used	Mean	Std. Deviation	N
PRE_SGOT	GROUP 1	30.56	16.749	16
	GROUP 2	31.94	13.530	17
	GROUP 3	34.12	17.744	17
	Total	32.24	15.831	50
POST_SGOT	GROUP 1	34.56	15.327	16
	GROUP 2	32.88	15.419	17
	GROUP 3	32.06	16.338	17
	Total	33.14	15.421	50

TABLE 8:Tests of Within-Subjects Effects for SGOT

Measure: sgot

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
SGOT	Sphericity Assumed	23.059	1	23.059	.619	.435	.013
	Greenhouse-Geisser	23.059	1.000	23.059	.619	.435	.013
	Huynh-Feldt	23.059	1.000	23.059	.619	.435	.013
	Lower-bound	23.059	1.000	23.059	.619	.435	.013
SGOT * CO2Pressure used	Sphericity Assumed	151.309	2	75.654	2.032	.142	.080
	Greenhouse-Geisser	151.309	2.000	75.654	2.032	.142	.080
	Huynh-Feldt	151.309	2.000	75.654	2.032	.142	.080
	Lower-bound	151.309	2.000	75.654	2.032	.142	.080
Error(SGOT)	Sphericity Assumed	1749.941	47	37.233			
	Greenhouse-Geisser	1749.941	47.000	37.233			
	Huynh-Feldt	1749.941	47.000	37.233			
	Lower-bound	1749.941	47.000	37.233			

TABLE 9: Tests of Within-Subjects Contrasts for SGOT

Measure: sgot

Source	SGOT	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
SGOT	Linear	23.059	1	23.059	.619	.435	.013
SGOT * CO2 Pressure used	Linear	151.309	2	75.654	2.032	.142	.080
Error(SGOT)	Linear	1749.941	47	37.233			

TABLE 10:Tests of Between-Subjects Effects for sgot

Measure: sgot

Transformed Variable: Average

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	106760.043	1	106760.043	227.837	.000	.829
CO2 Pressureused	8.544	2	4.272	.009	.991	.000
Error	22023.346	47	468.582			

FIG 4:estimated marginal means of SGOT

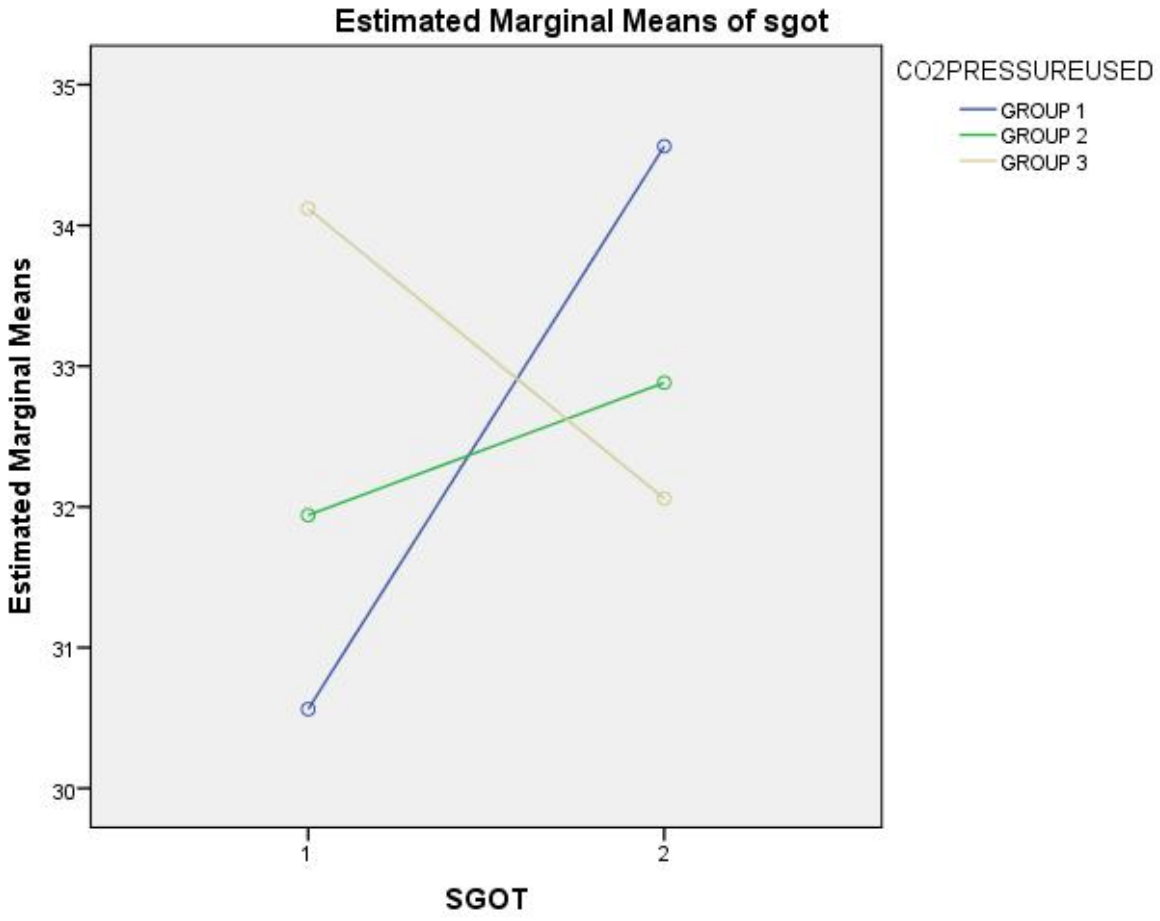


Table 11:Descriptive Statistics for SGPT

	CO2 Pressure used	Mean	Std. Deviation	N
PRE_SGPT	GROUP 1	30.31	8.670	16
	GROUP 2	27.47	10.235	17
	GROUP 3	33.59	16.447	17
	Total	30.46	12.331	50
POST_SGPT	GROUP 1	34.81	7.756	16
	GROUP 2	31.53	11.336	17
	GROUP 3	32.24	15.393	17
	Total	32.82	11.821	50

Tests of Within-Subjects Effects Measure: sgpt

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
SGPT	Sphericity Assumed	200.683	1	200.683	2.856	.098	.058
	Greenhouse-Geisser	200.683	1.000	200.683	2.856	.098	.058
	Huynh-Feldt	200.683	1.000	200.683	2.856	.098	.058
	Lower-bound	200.683	1.000	200.683	2.856	.098	.058
SGPT * Emer_Elect	Sphericity Assumed	120.677	1	120.677	1.717	.197	.036
	Greenhouse-Geisser	120.677	1.000	120.677	1.717	.197	.036
	Huynh-Feldt	120.677	1.000	120.677	1.717	.197	.036
	Lower-bound	120.677	1.000	120.677	1.717	.197	.036
SGPT * CO2 Pressureused	Sphericity Assumed	214.385	2	107.193	1.525	.228	.062
	Greenhouse-Geisser	214.385	2.000	107.193	1.525	.228	.062
	Huynh-Feldt	214.385	2.000	107.193	1.525	.228	.062
	Lower-bound	214.385	2.000	107.193	1.525	.228	.062
Error(SGPT)	Sphericity Assumed	3232.735	46	70.277			
	Greenhouse-Geisser	3232.735	46.000	70.277			
	Huynh-Feldt	3232.735	46.000	70.277			
	Lower-bound	3232.735	46.000	70.277			

Tests of Within-Subjects Contrasts

Measure: sgpt

Source	SGPT	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
SGPT	Linear	200.683	1	200.683	2.856	.098	.058
SGPT * Emer_Elect	Linear	120.677	1	120.677	1.717	.197	.036
SGPT * CO2 Pressure used	Linear	214.385	2	107.193	1.525	.228	.062
Error(SGPT)	Linear	3232.735	46	70.277			

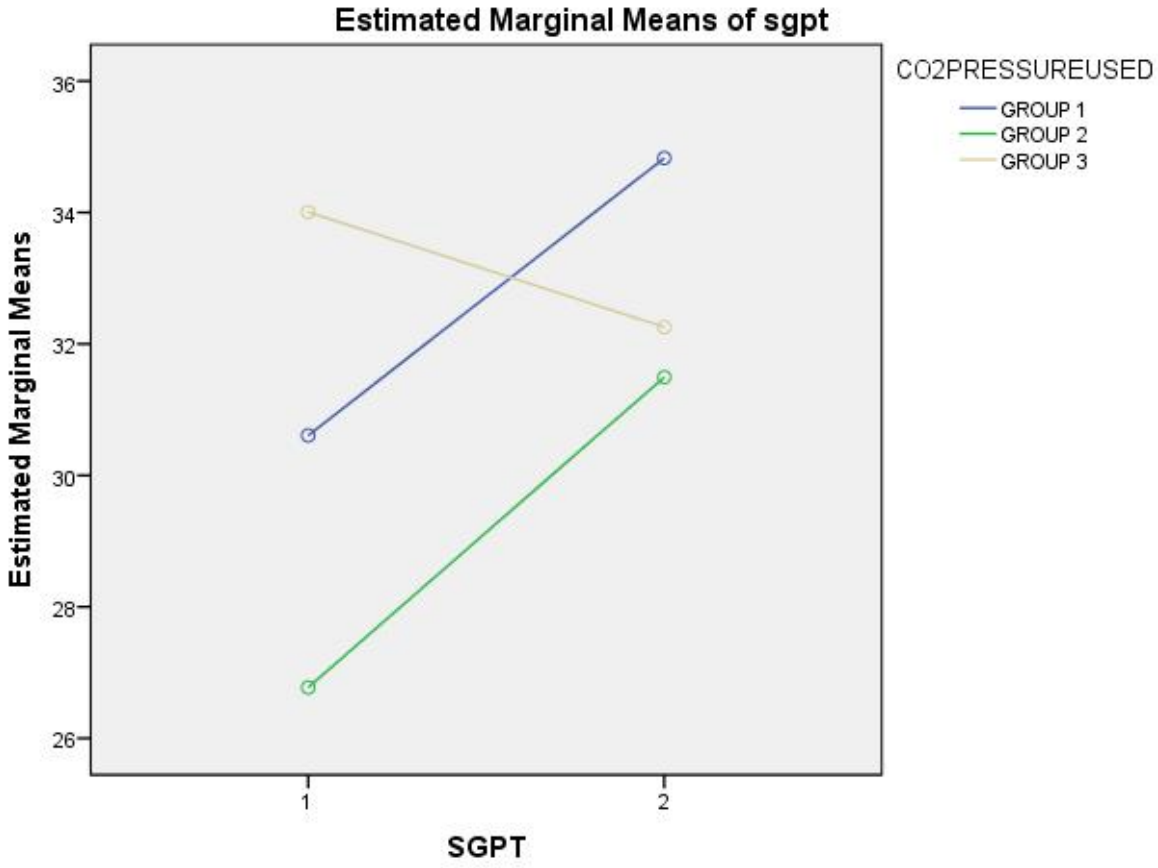
Tests of Between-Subjects Effects

Measure: sgpt

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	7494.873	1	7494.873	33.213	.000	.419
Emer_Elect	147.587	1	147.587	.654	.423	.014
CO2 Pressure used	311.557	2	155.778	.690	.507	.029
Error	10380.523	46	225.664			

FIG 5:estimated marginal means of SGPT



Covariates appearing in the model are evaluated at the following values: EMER_ELECT = 1.50

TABLE 12:Descriptive Statistics for ALP

	CO2Pressure used	Mean	Std. Deviation	N
PRE_ALP	GROUP 1	48.81	32.421	16
	GROUP 2	66.24	83.140	17
	GROUP 3	48.71	34.657	17
	Total	54.70	55.145	50
POST_ALP	GROUP 1	56.63	40.512	16
	GROUP 2	53.82	43.411	17
	GROUP 3	50.24	23.618	17
	Total	53.50	36.150	50

Tests of Within-Subjects Effects

Measure: alp

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
ALP	Sphericity Assumed	460.467	1	460.467	1.021	.318	.022
	Greenhouse-Geisser	460.467	1.000	460.467	1.021	.318	.022
	Huynh-Feldt	460.467	1.000	460.467	1.021	.318	.022
	Lower-bound	460.467	1.000	460.467	1.021	.318	.022
ALP * EMER_ELECT	Sphericity Assumed	436.933	1	436.933	.969	.330	.021
	Greenhouse-Geisser	436.933	1.000	436.933	.969	.330	.021
	Huynh-Feldt	436.933	1.000	436.933	.969	.330	.021
	Lower-bound	436.933	1.000	436.933	.969	.330	.021
ALP * CO2PRESSUREUSED	Sphericity Assumed	2069.697	2	1034.849	2.295	.112	.091
	Greenhouse-Geisser	2069.697	2.000	1034.849	2.295	.112	.091
	Huynh-Feldt	2069.697	2.000	1034.849	2.295	.112	.091
	Lower-bound	2069.697	2.000	1034.849	2.295	.112	.091
Error(ALP)	Sphericity Assumed	20740.463	46	450.880			
	Greenhouse-Geisser	20740.463	46.000	450.880			
	Huynh-Feldt	20740.463	46.000	450.880			
	Lower-bound	20740.463	46.000	450.880			

TABLE 13:Tests of Within-Subjects Contrasts for ALP

Measure: ALP

Source	ALP	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
ALP	Linear	460.467	1	460.467	1.021	.318	.022
ALP * Emer_Elect	Linear	436.933	1	436.933	.969	.330	.021
ALP * CO2 Pres-sure used	Linear	2069.697	2	1034.849	2.295	.112	.091
Error(ALP)	Linear	20740.463	46	450.880			

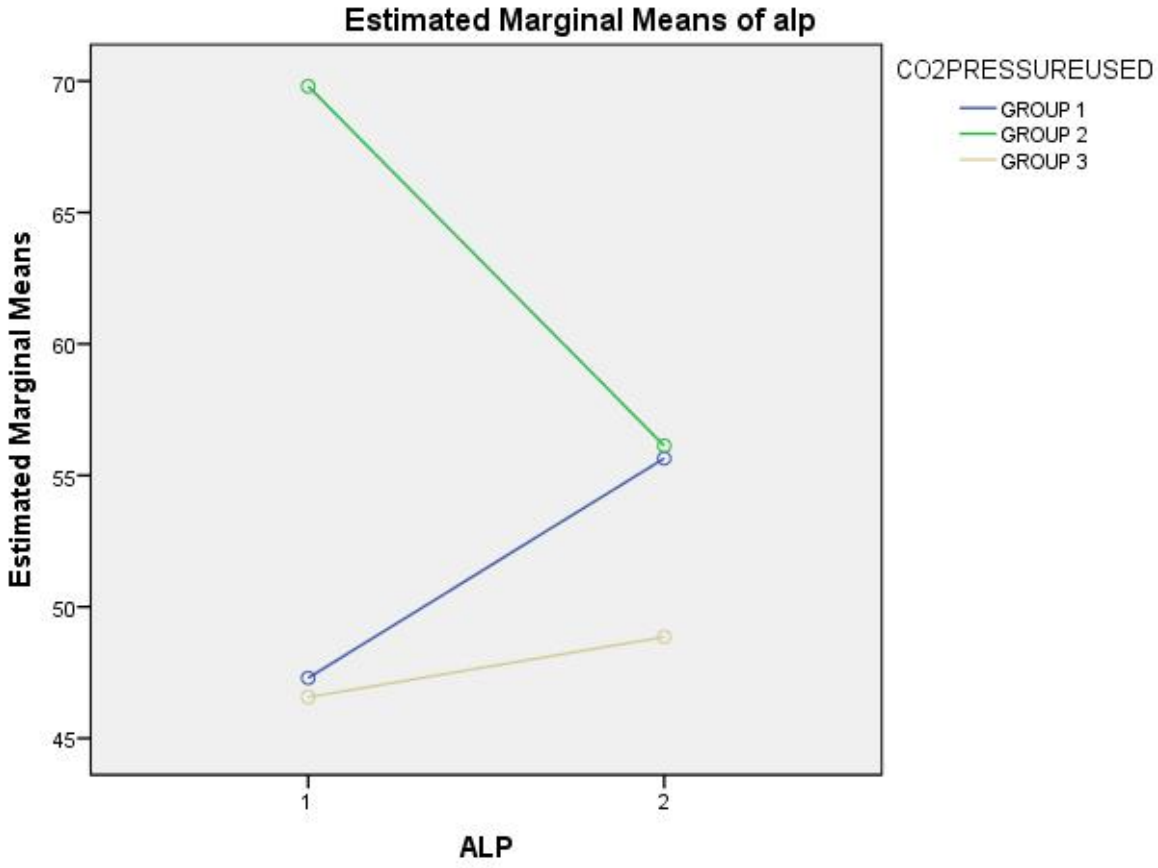
TABLE14:Tests of Between-Subjects Effects for ALP

Measure: ALP

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	67740.512	1	67740.512	17.447	.000	.275
Emer_Elect	9501.972	1	9501.972	2.447	.125	.051
CO2 Pressure used	4091.062	2	2045.531	.527	.594	.022
Error	178596.938	46	3882.542			

FIG 6:ESTIMATED MARGINAL MEANS OF ALP



Covariates appearing in the model are evaluated at the following values: EMER_ELECT = 1.50

5. DISCUSSION

This prospective, observational and comparative study was conducted among 50 purposively selected patients with evidence of cholelithiasis in department of General Surgery, Stanley Medical College and Hospital. The study was carried out with a view to determine the effect of co2 as pneumoperitoneum on liver functions during laproscopic cholecystectomy in view of determining its importance as it have no such role in raising the liver enzymes. Age of 50 patients ranged from 28-77 years. Most of the patients (19,38%) were in between 25-36 years; with mean age 30years and standard deviation 1.83 years. 20% of the patients were males while 80% of the patients were females. The male to female ratio was ~ 1 : 4.females are predominating the study.

The study is based on additive ANOVA model. The effect of Co2 on individual liver enzymes were studied. The surgery is classified based on emergency or elective. Based on duration of study classified as group 1<30 min, group 2,30-90 min, group 3,90-135 min, group 4, >135 min. Preoperative T.B. shows mean value of 1.171 and standard deviation of 0.5977 and post op T.B. mean value of 1.106 and SD of 0.4175. Preop D.B was mean 0.347 with SD 0.29.post op D.B. was

0.213 and SD of 0.11.with p value of 0.77. Pre operative SGOT with mean 31.94 and SD 13.53 and post operative SGOT with mean 32.88 and SD 15.4 with p value 0.197. Preoperative ALP was mean with SD is 66..24 and 83.14 and post operative value 53.82 and SD 43.411 and p value was 0.125.

5.2. LIMITATIONS OF THE STUDY

As this study has been carried out over a limited period of time with a limited number of patients and there was lack of financial and infrastructural support, it could not have been large enough to be of reasonable prescision. All the facts and figures mentioned here may considerably vary from those of large series covering wide range of time, but still then, as the cases of this study were collected from a tertiary level hospital in our country.

5.3. SUMMARY

5.4. CONCLUSION

This prospective observational type of study was conducted in department of General Surgery, Stanley Medical College and Hospital, Chennai, from 1 July 2014 to 30 June 2015. It can be concluded from the findings of the study that usage of co2 as pneumoperitoneum in

laproscopic cholecystectomy has no significant effect on post operative liver enzymes.

It can be concluded that variation in insuffulation pressure has no effect on enzyme rise significantly.

It can be observed that duration of surgery with co2 pneumoperitoneum has no effect on postoperative LFT level.

Thus co2 in safe pneumoperitoneum can be safely used in laproscopic surgeries.

5.5. RECOMMENDATIONS

On the basis of the findings of the study, the following recommendations can be made:

1. Co2 can be recommended in all laproscopic surgeries as insuffulator.

2. Further research is necessary in large scale for guidance regarding management.

INSTITUTIONAL ETHICAL COMMITTEE, STANLEY MEDICAL COLLEGE, CHENNAI-1

Title of the Work : Study on the effect of Carbondioxide as pneumoperitoneum on liver functions in laparoscopic Cholecystectomy

Principal Investigator : Dr. K Chandrasekaran

Designation : PG in MS (General Surgery)

Department : Department of General Surgery
Government Stanley Medical College,
Chennai-01

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 11.02.2015 at the Council Hall, Stanley Medical College, Chennai-1 at 2PM

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The Principal investigator and their team are directed to adhere to the guidelines given below:

1. You should inform the IEC in case of changes in study procedure, co investigator investigation or guide or any other changes
2. You should not deviate from the area of the work for which you applied for ethical clearance.
3. You should inform the IEC immediately, in case of any adverse events or serious adverse reaction.
4. You should abide to the rules and regulation of the institution(s)
5. You should complete the work within the specified period and if any extension of time is required, you should apply for permission again and do the work.
6. You should submit the summary of the work to the ethical committee on completion of the work.

K Chandra

MEMBER SECRETARY,

PROFORMA

Study on the effect of carbondioxide used as pneumoperitoneum on liver functions in laproscopic cholecystectomy.

Investigator: **Dr. K. CHANDRASEKARAN**, PG 3rd year – MS (General Surgery)

Guide: **Prof. Dr. RUKMANGADAN,PROF.DR.RAJENDRAN,**

Chief, Unit S5

- NAME : SL. NO:
- AGE /SEX:
- ADDRESS WITH CONTACT NUMBER:
- IP NO:
- DATE OF ADMISSION:
- DATE OF SURGERY:

: **HISTORY OF PRESENTING ILLNESS:**

PAST HISTORY:

WHETHER A KNOWN CASE OF DM/ HYPERTENSION/ ASTHMA / TB/EPILEPSY/ CARDIAC ILLNESS

H/O SIMILAR EPISODES IN THE PAST, IF ANY:

CLINICAL EXAMINATION:

GENERAL EXAMINATION: TEMP: P.R: B.P: R.R

SYSTEMIC EXAMINATION:

CVS

RS

PER ABDOMEN:

CLINICAL DIAGNOSIS:

DATE OF SURGERY

Investigations:

Preoperative and Postoperative investigation

LFT	
T.bil	
D.bil	
SGOT	
SGPT	
GGT	
ALP	

CHEST X RAY :

ABD X RAY:

USG ABD:

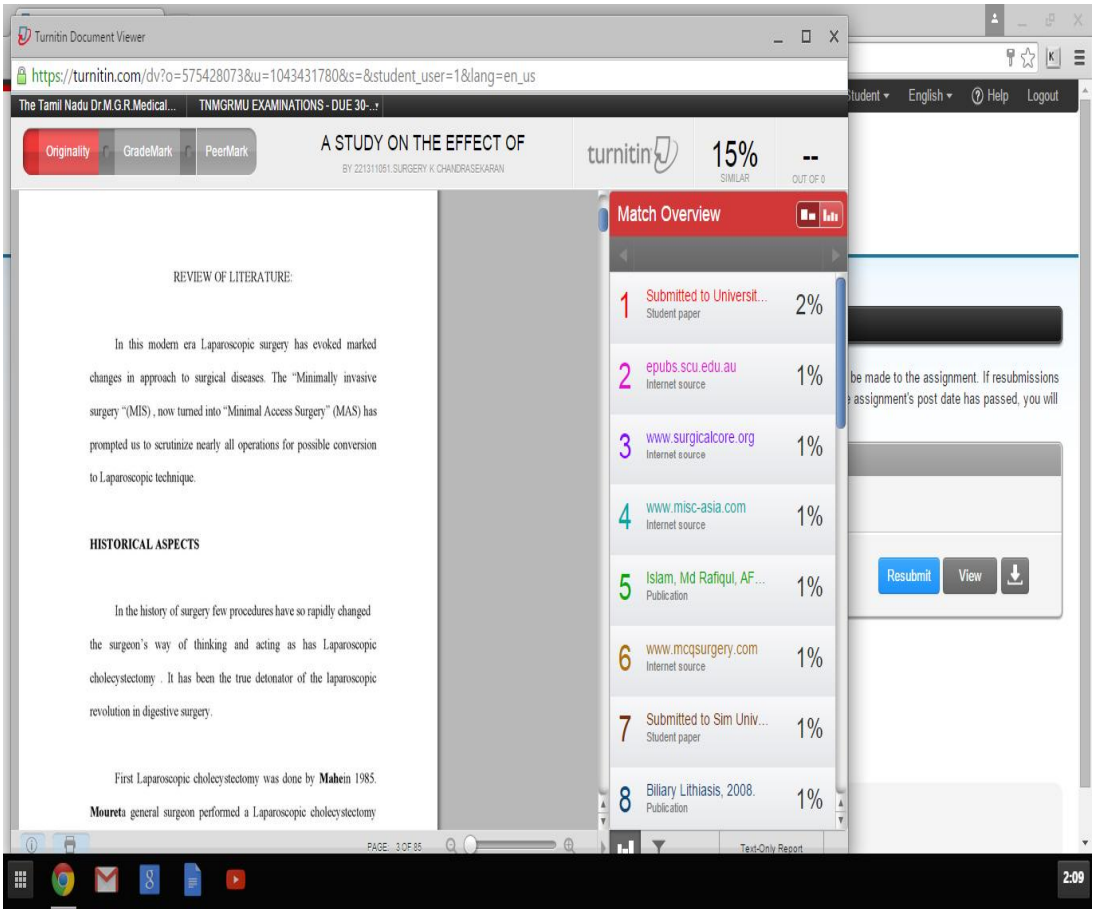
PATIENT CLINICAL COURSE:

OUTCOME OF TREATMENT: ***Study on the effect of carbondioxide used as pneumoperitoneum on liver functions in laproscopic cholecystectomy.***

Investigator: **Dr.K.CHANDRASEKARAN**, PG 2nd year – MS (General Surgery).

Guide: **Prof. Dr. RUKMANGATHAN, PROF DR.K.RAJENDRAN,** Chief, Unit S5.

PLAGIARISM


Turnitin Document Viewer
https://turnitin.com/dv?o=575428073&u=10434317808&s=&student_user=1&lang=en_us
The Tamil Nadu Dr.M.G.R.Medical...
TNMGRMU EXAMINATIONS - DUE 30-..
Originality
GradeMark
PeerMark
A STUDY ON THE EFFECT OF
BY 22131051.SURGERY K CHANDRASEKARAN
turnitin
15%
SIMILAR
--
OUT OF 0
REVIEW OF LITERATURE:
In this modern era Laparoscopic surgery has evoked marked changes in approach to surgical diseases. The "Minimally invasive surgery "(MIS) , now turned into "Minimal Access Surgery" (MAS) has prompted us to scrutinize nearly all operations for possible conversion to Laparoscopic technique.
HISTORICAL ASPECTS
In the history of surgery few procedures have so rapidly changed the surgeon's way of thinking and acting as has Laparoscopic cholecystectomy . It has been the true detonator of the laparoscopic revolution in digestive surgery.
First Laparoscopic cholecystectomy was done by Mahein 1985. Moureta general surgeon performed a Laparoscopic cholecystectomy
PAGE: 3 OF 85
Match Overview
1 Submitted to Universit... Student paper 2%
2 epubs.scu.edu.au Internet source 1%
3 www.surgicalcore.org Internet source 1%
4 www.misc-asia.com Internet source 1%
5 Islam, Md Rafiqul, AF... Publication 1%
6 www.mcqsurgery.com Internet source 1%
7 Submitted to Sim Univ... Student paper 1%
8 Biliary Lithiasis, 2008. Publication 1%
Text-Only Report
Student
English
Help
Logout
be made to the assignment. If resubmissions
assignment's post date has passed, you will
Resubmit
View
2:09

MASTER CHART

sS. no	Name	Ip No	Age	Sex	Mode of Surgery	Pre Operative Lft					Co2 Pressure used	Duration of Surgery	Postop Lft				
					Emer, elect	T.b	D.b	Sgot	Sgpt	Alp			T.b	D.b	Sgot	Sgpt	Alp
1	Jaya	1025752	54	f	emergency	1	0.6	54	36	158	12	1	1.2	0.5	50	37	190
2	eisia	2838211	40	f	emergency	1	0.2	38	20	30	12	2	1.1	0.1	40	40	60
3	shanthi	2889355	46	f	emergency	2	0.2	30	48	32	12	3	1.4	0.1	30	49	40
4	mumtaz	2679267	29	f	elective	2	0.1	40	28	59	13	2	1.7	0.2	50	50	40
5	amutha	2752825	45	f	elective	1	0.1	59	29	20	13	1	0.4	0.1	70	30	20
6	kuppu	2710142	46	m	elective	1	0.5	19	17	15	13	2	0.8	0.2	20	40	15
7	raji	2073893	67	f	emergency	1	0.1	40	20	14	14	3	0.7	0.2	50	10	10
8	meenakshi	3097799	57	f	emergency	1	0.3	41	26	23	14	2	1.5	0.2	20	50	46
9	kamtchi	3056144	67	f	elective	1	0.2	39	15	10	12	2	0.5	0.1	40	25	20
10	revathy	3045321	33	f	emergency	1	0.2	64	13	27	14	2	0.4	0.1	30	10	30
11	aminammal	2792486	47	f	elective	1	0.1	54	14	16	13	1	0.5	0.2	60	20	10
12	indiragandi	1332288	45	f	elective	2	0.6	79	24	31	12	1	0.5	0.1	80	40	20
13	gayathri	2735197	60	f	emergency	1	0.3	20	20	45	13	3	1.2	0.2	30	32	34
14	krishnan	2589174	70	m	emergency	2	0.6	79	24	31	14	3	1.5	0.8	80	60	40
15	krisnamoorthy	3092255	52	m	emergency	1	0.1	26	36	46	12	2	0.8	0.2	30	40	80
16	praveena	3695721	33	f	emergency	1	0.4	34	33	56	12	2	1.5	0.3	34	32	77
17	tamilselvi	3149567	30	f	elective	1	0.6	22	32	46	12	1	1	0.4	34	34	56
18	sivagami	3715098	56	f	elective	1	0.4	11	37	51	12	1	0.8	0.2	20	40	60
19	Kala	3722758	65	f	elective	1	0.4	11	37	51	12	1	1.2	0.6	15	40	43
20	chandrammal	3993521	77	f	elective	1	0.1	22	35	41	12	2	1.1	0.2	40	30	26
21	shankar	3418450	65	m	elective	2	0.6	23	22	34	13	2	1.5	0.2	25	24	45
22	jayakar	3843925	49	m	elective	1	0.4	14	39	58	13	2	0.9	0.1	20	35	59
23	puspa	4208912	40	f	elective	1	0.1	13	50	33	14	2	0.6	0.2	12	49	37
24	parvathy	4197420	44	f	elective	2	0.9	23	81	110	14	2	0.5	0.1	43	40	80
25	mahalakshmi	4138386	26	f	elective	1	0.6	38	46	40	14	2	1.5	0.1	30	26	40

S. no	Name	Ip No	Age	Sex	Mode of Surgery	Pre Operative Lft					Co2 Pressure used	Duration of Surgery	Postop Lft				
					Emer, elect	T.b	D.b	Sgot	Sgpt	Alp			T.b	D.b	Sgot	Sgpt	Alp
26	Murugan	1027142	48	m	elective	1.1	0.3	29	22	37	13	1	1.2	0.2	27	23	36
27	Kalaivani	1102632	33	f	emergency	2	0.4	22	26	33	12	2	1.8	0.3	20	25	34
28	Jeya	1102154	34	f	emergency	1	0.1	12	14	32	13	3	0.9	0.1	13	12	20
29	mangalakhshmi	1151876	58	f	emergency	0.8	0.2	11	11	20	14	3	0.7	0.2	15	15	22
30	Dili	1052367	28	f	emergency	0.9	0.3	20	20	32	12	2	0.9	0.2	20	18	35
31	sakuntala	2105042	60	f	emergency	1.5	0.2	24	22	35	13	1	1.6	0.1	22	27	32
32	Savithri	1575523	35	f	elective	0.6	0.2	32	30	61	13	2	0.5	0.1	33	31	60
33	Kursith	1301313	39	m	emergency	1.3	0.4	43	33	72	13	2	1.5	0.3	32	37	68
34	Revathy	1305645	32	f	elective	1.1	0.5	34	45	30	14	3	1	0.3	30	47	32
35	Komala	1037976	35	f	elective	0.9	0.2	30	34	50	12	3	0.8	0.4	30	37	52
36	Amutha	1986543	45	f	elective	0.8	0.1	20	19	72	13	2	0.9	0.2	15	15	84
37	Sarada	1255328	40	f	emergency	1.5	0.3	40	48	68	13	2	1.6	0.2	28	49	67
38	shanthadevi	1114325	33	f	emergency	1	0.5	28	35	50	14	2	1	0.4	30	40	50
39	Mallika	1411432	50	f	emergency	1.1	0.2	30	25	60	14	2	1.5	0.3	25	20	50
40	Pramila	1146823	32	f	emergency	1	0.5	28	35	50	14	1	1	0.4	30	30	80
41	jagadeeswari	1610323	32	f	emergency	1.5	0.6	20	38	55	14	1	1.5	0.4	20	19	44
42	Chitra	1617740	35	f	elective	1.3	0.4	30	36	65	14	1	1.4	0.3	30	30	64
43	Manikam	1391200	30	m	elective	1.1	0.3	24	26	46	14	3	1	0.2	20	22	49
44	ganapathy	1528932	28	m	elective	1.2	0.4	36	34	68	13	2	1	0.3	34	33	70
45	Sankar	4048912	45	m	elective	1.2	0.5	42	30	54	13	3	1.1	0.4	40	28	55
46	saraswathy	3351822	35	f	elective	1.2	0.5	23	24	24	14	1	1.2	0.6	30	30	80
47	Sasikala	2624534	32	f	emergency	1.3	0.6	54	36	150	14	1	1.4	0.5	50	50	100
48	Srimathi	2618955	39	f	emergency	3	1.3	36	46	380	13	4	1.5	0.5	40	50	200
49	Elizabeth	2661430	50	f	emergency	0.9	0.2	27	20	40	12	2	1	0.1	40	40	37
50	Umarani	2680055	63	f	emergency	0.6	0.3	24	32	74	12	1	0.5	0.1	30	30	76

BIBILIOGRAPHY

1 .Bailey and Love text book of surgery 25th edition

2. Cuschieri A., *Laparoscopic biliary surgery*, 2nd ed. Oxford: Blackwell Scientific Publications., 28.1992.

3. Sabiston textbook of surgery 19th edition

4. Maingots textbook of surgery

5. Ibraheim O.A et al, Lactate and acid base changes during laparoscopic cholecystectomy Middle East J Anesthesiol, 2006. 18(4): 757-68

6. Schwenk. W., O. Haase, and T. Junghans, Perspectives in sequential pneumatic compression of the lower extremities for laparoscopic surgery. Acta Chir Belg, 2002. 102(2):83-91.

7. Odeberg-Wernerman, S., Laparoscopic surgery--effects on circulatory and respiratory physiology: an overview. *Eur J Surg Suppl*, 2000(585):4-11.

8. Gutt, C.N., et al., Circulatory and respiratory complications of carbon dioxide insufflation. *Dig Surg*, 2004. 21(2):95-105.

9. Saber, A.A., et al., Changes in liver function tests after laparoscopic cholecystectomy: not so rare, not always ominous. *Am Surg*, 2000. 66(7):699-702.

10. Sakorafas, G., Anagnostopoulos G, Stafyla V, et al., Elevation of serum liver enzymes after laparoscopic cholecystectomy. *N Z Med J*, 2005. 118(1210):U1317.

11. Morino, M., G. Giraudo, and V. Festa, Alterations in hepatic function during laparoscopic surgery. An experimental clinical study. *Surg Endosc*, 1998. 12(7):968-969