COMPARATIVE STUDY OF MERITS AND DEMERITS OF LAPAROSCOPIC CHOLECYSTECTOMY VERSUS OPEN CHOLECYSTECTOMY

A Prospective Study

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TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY

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CERTIFICATE

This is to certify that the dissertation titled ***"Comparative study of Merits and Demerits of Laparoscopic Cholecystectomy Versus Open cholecystectomy"*** is the original work done by ***Dr. N. Senthil Kumar*** post graduate in M.S., General Surgery at the Department of General Surgery, Madras Medical College, Chennai-600 003 to be submitted to the Tamil Nadu Dr. M.G.R. Medical University, Chennai- 600 032, towards the partial fulfillment of the requirement for the award of M.S., Degree in General Surgery, March 2008.

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CONTENTS

INTRODUCTION

Cholecystitis, a common condition resulting from complication of cholelithiasis, occurs in two forms - acute or chronic. Acute cholecystitis requires urgent intervention, typically with antibiotics followed by cholecystectomy. In the setting of acute cholecystitis, cholecystectomy is optimally performed early after the diagnosis is made. If urgent cholecystectomy is not feasible, operation can be delayed until after the acute episode has resolved and then performed electively, provided that the acute process can be controlled and the symptoms resolve. Chronic cholecystitis is the manifestation of ongoing, intermittent inflammation from recurrent biliary colic. These patients benefit symptomatically from elective cholecystectomy. A less common version of cholecystitis is acute acalculous cholecystitis, which occurs most often in critically ill patients with acute acalculous cholecystitis often reveal biliary sludge.

Open cholecystectomy increasingly is performed only in the few cases in which laparoscopic techniques do not allow a safe procedure. These cases may be recognized preoperatively or during laparoscopy. In these cases, attempts at performing a laparascopic operation might obscure the anatomy by producing hemorrhage or result in an iatrogenic injury.

Although meeting early skepticism from the academic surgical community, laparoscopic cholecystectomy was adopted rapidly around the world and subsequently has been recognised as the new "gold standard" for the treatment of gallstone disease".

There has been an increase in the rate of cholecystectomies since the introduction of laparoscopic cholecystectomy accompanied by evidence of lower clinical threshold for operative therapy of gallstones. Laparoscopic cholecystectomy as a now mature mode of therapy has introduced the general surgical world to the revolutionary advantages and unique perspectives and concerns of minimal access surgery.

AIM OF THE STUDY

Aim of this clinical study is to do comprehensive comparative analysis of the merits and demerits of Laparoscopic Cholecystectomy with reference to conventional open Cholecystectomy taking the following factors in to consideration.

- Duration of Surgery
- Return of Bowel Activity
- Post operative pain
- Length of hospital stay
- Time taken to resume normal day to day activity
- Complications
- Cosmesis
- Cost factor
- Conversion Rate

REVIEW OF LITERATURE

HISTORICAL REVIEW

1882 - Langenbuch - First performed open Cholecystectomy

1901 - Kelling in Dresden Germany - first performed Laparoscopy using room air

1911 - Jacobeue in Stockholm, Sweden - reprorted first clinical application of Laparoscopy and thoracoscopy

1924 - Zollikofer Switzerland - First used CO_2 for pneumoperitoneum

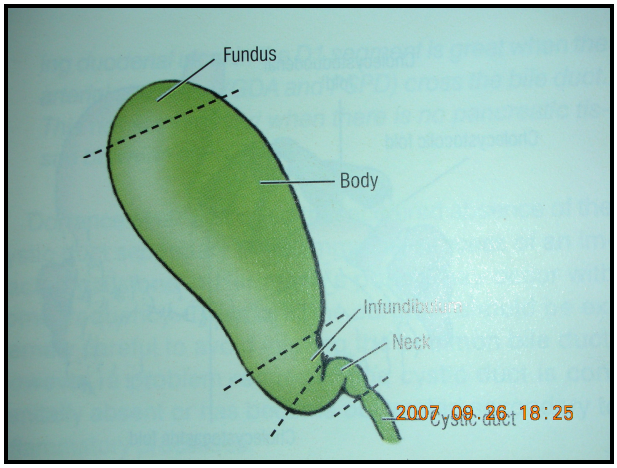
1938 - Veress in Hungary - Veress needle

1967 - Sem - German Gynecologist - New aspect of fibrooptics and automatic gas insufflation

1983 - Luckichey - First described Laparoscopic Cholecystectomy for treatment for acute Cholecystitis

1985 - Muche in Boblingen in Germany - First Laparoscopically assisted Cholecystectomy

1987 - Phillip Mouret a French surgeon in Lyon - First video laparoscopic Cholecystectomy.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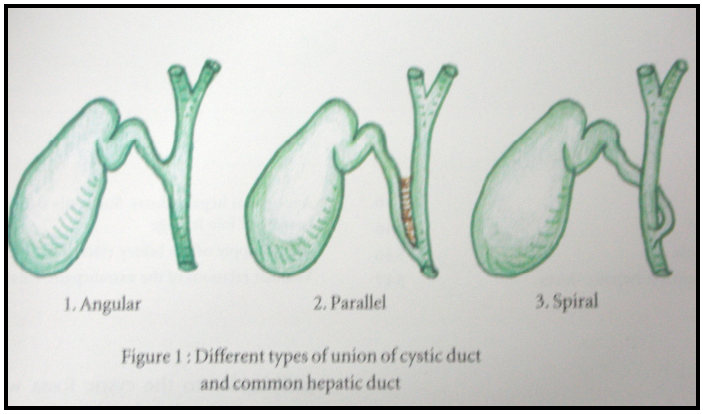


Figure 1 : Different types of union of cystic duct and common hepatic duct

- 17-23 % Parallels the hepatic duct for longer / shorter distance

- 8-13 % - may pass inferior / superior to common hepatic duct to enter left side.

- <1% GB is sessile

CYSTIC ARTERY

Cystic artery usually arises from the right hepatic artery. Reaching the gallbladder behind the common hepatic duct, the cystic artery usually branches into an anterior superficial branch and a posterior deep branch.

ORIGIN OF CYSTIC ARTERY

Origin	***Anson (676)***	***Michels (200)***	***Moosman (482)***
Right hepatic artery			
Normal	61.4	76	72
(Aberrant accessory)	10.2	13.5	15
(Aberrant replacing)	3.1	-	-
Left hepatic artery	5.9	4	3
Common hepatic artery	14.9	3	5
Gastroduodenal artery	2.5	4	2
Other	1.0	rare	3

VENUS DRAINAGE

- Hepatic surface is drained by numerous small veins to liver

- Do not from single cystic vein
- Veins from free surface open directly or follow hepatic ducts in to the liver

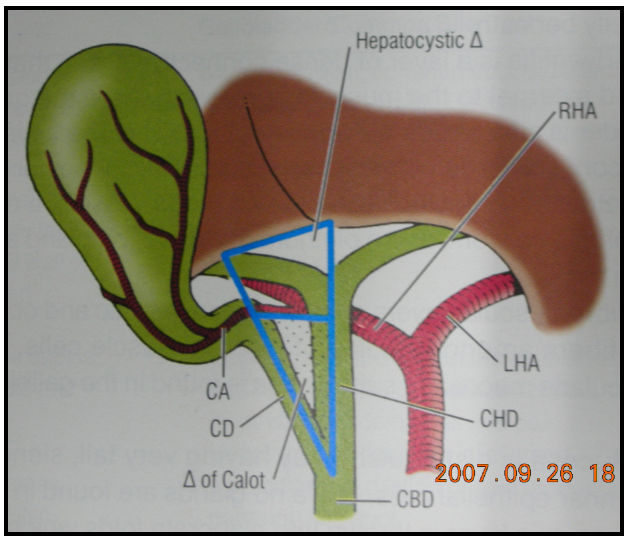
LYMPHATIC DRAINAGE

- Right Lateral wall drains directly to hiatal node.
- Left lateral wall GB drain to cystic node of Lund and then to node of hiatus

INNERVATION

Parasympathetic vagal and general visceral sensory fibers from the hepatic division of the anterior vagal trunk and the celiac division of the posterior vagal trunk follow the hepatic artery and its branches to the extrahepatic bile ducts and the gallbladder. Preganglionic sympathetics and visceral afferent fibers for pain reach the celiac plexus by way of the greater thoracic splanchnic nerves. The autonomic fibers synapse in the celiac ganglia, and postganglionic and sensory fibers pass into the hepatic plexus to reach the liver.

Fibers from the right phrenic nerve travel by way of the phrenic, celiac and hepatic plexuses to reach the gallbladder. Many of these fibers are afferent and may account for the pain referred to


Hepatocystic Δ
RHA
LHA
CA
CD
CHD
Δ of Calot
CBD
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- Adventitia
- Fibromuscular layers
- Mucosa

No muscularis mucosa or submucosa is found in the gallbladder. Mucosa is distinguished by having very tall, slender columnar epithelial cells. No glands are found in the mucosa, this layer is thrown into elaborate folds which form deep diverticula called “Rokitansky - Aschoff sinuses”

PHYSIOLOGY

The gallbladder concentrates bile by absorbing sodium, chloride and bicarbonate ions and water such the bile salts can be concentrated 5 to 25 times.

The hormone cholecystokinin causes contraction of the gallbladder muscle, forcing bile out. Stimulation from the vagus nerve also causes the gallbladder to contract.

INDICATION

The indications for laparoscopic Cholecystectomy are the same as that of indications for open Cholecystectomy.

Symptomatic Cholelithiasis

- Biliary colic
- Acute cholecystitis

Asymptomatic cholelithiasis

- Sickle cell disease
- Total parenteral nutrition
- Chronic immunosuppression
- No immediate access to health care facilities
- Incidental Cholecystectomy for patient undergoing laparoscopic procedure for other indication.

Acalculous cholecystitis (biliary dyskinesia)

Gallstone pancreatitis

Gallbladder polyps >1 cm in diameter

Porcelain gallbladder

CONTRA INDICATION FOR LAPAROSCOPIC CHOLECYSTECTOMY

Absolute

- Unable to tolerate general anesthesia
- Refractory coagulopathy
- Suspicion of carcinoma

Relative

- Previous upper abdominal surgery
- Cholangitis
- Diffuse peritonitis
- Cirrhosis or portal hypertension
- Chronic obstructive pulmonary disease
- Cholecystoenteric fistula
- Morbid obesity
- Pregnancy

ADVANTAGES AND DISADVANTAGES OF LAPAROSCOPIC CHOLECYSTECTOMY COMPARED WITH OPEN CHOLECYSTECTOMY

Advantages	***Disadvantages***
❖ Less Pain ❖ Early return of bowel activity ❖ Smaller incision ❖ Better Cosmesis ❖ Shorter hospitalization ❖ Earlier return to full activity ❖ Decreased total costs	❖ Leak of depth perception ❖ View controlled by camera operator ❖ More difficult to control hemorrhage ❖ Decreased tactile discrimination ❖ Potential carbon dioxide insufflation complications ❖ Adhesions and inflammation limit use Slight increase in bile duct injuries

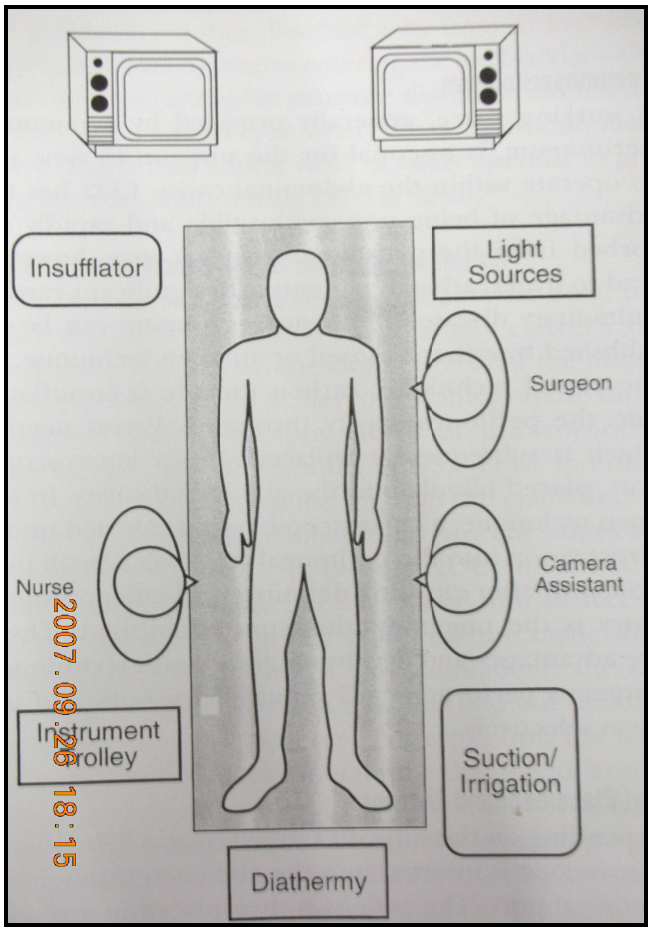
INSTRUMENTATION

Basic Laparoscopy

- Laparoscope - 0 degree / oblique 30 degree (ideal for viewing corners)
- Fiberoptic cable
- Insufflators
- Veress needles
- Two video monitor
- Instruments for Laparoscopic Cholecystectomy
  - ❖ Toothed grasping forceps, Fine tipped dissecting forceps, straight / curved scissors, Irrigation and aspiration cannula, Spatula tipped / hooked electrocautery device, Clip applicator, equipments for intraop cholangiogram.
- Laparotomy Instruments

OPERATIVE ROOM SETUP

American Technique- Surgeon stands to Left of the patient, Camera operator Left of Surgeon, 1st Assistant stands to the patients Right



French Technique - Patients legs are abducted and the surgeon stand between the legs

PATIENT PREPARATION

Patients are fasted approximately 8 hrs before surgery administrated a single preoperative dose of IV antibiotics. Sequential compression stocking to avoid pooling of blood in reverse trendelenburg position. After induction of General anesthesia orogastric tube is used to decompress stomach. Abdomen is shaved and prepared in standard patients.

OPERATIVE TECHNIQUE

Pneumoperitoneum

A working space, generally provided by a pneumoperitoneum, is essential for the surgeon to view and to operate within the abdominal cavity. Carbon dioxide has the advantage of being noncombustible and rapidly absorbed from the peritoneal cavity. It may lead to hypercarbia, however, in patients with significant cardiopulmonary disease. Pneumoperitoneum can be established by either a closed or an open technique. In the closed technique, carbon dioxide is insufflated into the peritoneal cavity through a Veress needle, which subsequently is replaced with a laparoscopic port, placed blindly into the abdominal cavity. In the open technique, a laparoscopic port is inserted under direct vision into the peritoneal cavity via a small incision; only after ensuring definitive and safe peritoneal entry is the pneumoperitoneum established.

For the closed technique, the surgeon should perform various tests to ensure the safety of the needle insertion before insufflation. A syringe containing 5 mL of normal saline solution is attached to the end of the needle to aspirate and show the absence of blood, urine, or enteric contents. If no fluid is aspirated, an assessment is made of the ease with which saline solution flows by gravity into the

zero pressure abdominal cavity-the "drop test." This test is done either by instilling a few drops of saline solution into the hub of the needle or by removing the barrel of the syringe.

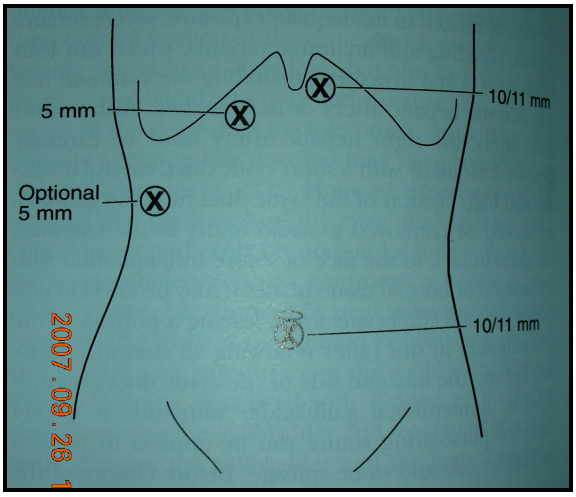
Insufflator tubing is connected to the Veress needle, and carbon dioxide is insufflated at a low flow rate of approximately 1 L/min. The initial pressure of the abdomen is usually 2 to 6 mm Hg and should not increase appreciably during the early phase of insufflation. Asymmetric distention, a rapid increase in pressure with low insufflated volume, or an initial pressure greater than 10 mm Hg suggests that the needle is not in the proper position. The abdomen should be serially percussed to confirm symmetric tympany associated with insufflation. The abdomen is fully insufflated with the upper pressure limit set at 12 to 15 mm Hg; this usually requires 3 to 6 L of carbon dioxide, depending on the size of the abdominal cavity and degree of muscle relaxation. If intra-abdominal pressure exceed 20 mm Hg, central venous pressures and blood pressure decrease because of decreased venous return and diminished cardiac output.

During the initial period of insufflation, the patient must be monitored closely for signs of gas embolism (hypotension, decreased oxygen saturation, decreased end-tidal carbon dioxide, "mill-wheel" heart murmur), vagal reaction (hypotension or bradycardia or both),

ventricular arrhythmias, and hypercarbia with acidosis. Most of these complications require immediate treatment by desufflating the carbon dioxide followed by gradual re-establishment of the pneumoperitoneum after the patient's condition has stabilized.

After the pneumoperitoneum is established, the Veress needle is replaced with a trocar/port through a periumbilical incision into which the laparoscope may be inserted.

Port Placement and Exposure

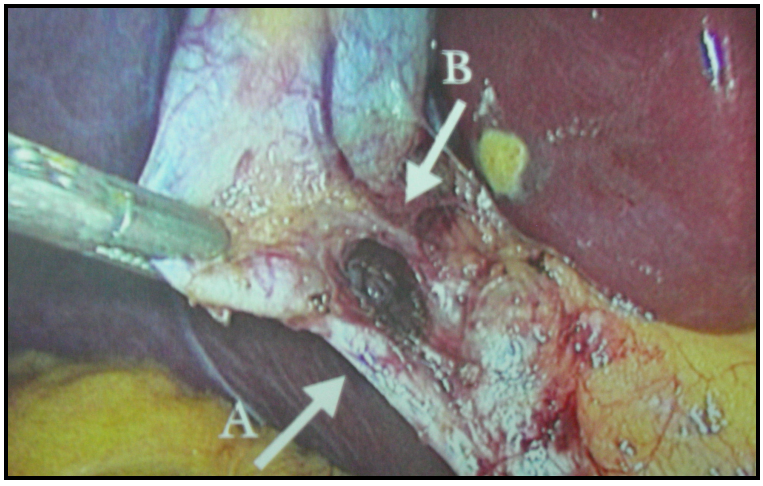


10-mm laparoscope is inserted into the abdomen through the umbilical port. The area immediately posterior to the umbilicus is viewed initially to ensure that there is no injury as a result of trocar insertion. Thorough intra - abdominal visual exploration is performed. The patient is placed in a reverse Trendelenburg position of 30 degrees while rotating the table to the left by 15 degrees. This

maneuver allows the colon and duodenum to fall away the liver. Falciform ligament and both lobes of liver are examined carefully for abnormalities. The gallbladder usually can be seen protruding beyond the edge of the liver.

Two small accessory subcostal ports are placed under direct vision. The fist 5 mm trocar is placed along the right anterior axillary line between the 12th rib and the iliac crest. A second 5 -mm port is inserted in the right subcostal area in the midclavicular line. Grasping forceps are placed through these two ports to secure the gallbladder. The assitant manipulates the lateral grasping forceps, which are used to elevate the liver and to expose the fundus of the gallbladder. The surgeon uses dissecting forceps to raise a serosal "fold" of the most dependent portion of the fundus. The assistant's heavy grasping forceps are locked onto this fold using either a spring or a ratchet device. With these axillary grasping forceps, the fundus of the gallbladder is pushed in a lateral and cephalad direction, rolling the entire right lobe of the liver cranially. This maneuver is complicated in patients with a fixed, cirrhotic liver or a heavy, friable liver resulting from fatty infiltration.

A final operating trocar/port is placed through an incision in the midline of the epigastrium. This trocar usually is inserted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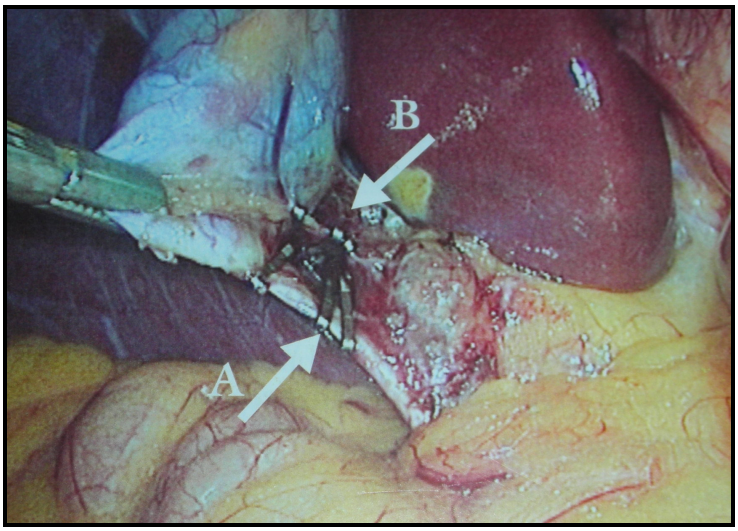
overlying fibroareolar structures from the infundibulum of the gallbladder. This is done with a blunt stripping action, always starting on the gallbladder and stripping the tissue toward the porta hepatis. The dissection should begin on a "known" structure (e.g., the gallbladder), rather than in an unknown area, to avoid damage to the underlying structures, such as the bile duct or the hepatic artery.

It is important to identify clearly the structures forming the sides of Calot's triangle (i.e., cystic duct, cystic artery and common hepatic duct)-the standard ventral aspect and its reverse (dorsal) aspect. Distinction is made here with the hepatocystic triangle proper, which is the ventral aspect of the area bounded by the gallbladder wall and cystic duct, the liver edge, and the common hepatic duct; the cystic artery and Calot's triangle lies within this space. The hepatocystic triangle is maximally opened and converted into a trapezoid shape by retracting the infundibulum of the gallbladder inferiorly and laterally, while maintaining the fundus under traction in a superior and medial direction. A lymph node usually lies adjacent to the cystic artery, and occasionally it is necessary to use a brief application of electrosurgical coagulation to obtain hemostasis as the lymph node is bluntly- swept away. To expose the reverse of Calot's triangle, the infundibulum of the

gallbladder is pulled in a superior and medial direction after clearing the structures, from the apex of the triangle, the junction between the infundibulum and the origin of the proximal cystic duct can be identified clearly. The strands of peritoneal, lymphatic, and neurovascular tissue are stripped away from the cystic duct to clear a segment from the surrounding tissue. Curved dissecting forceps are helpful in creating a "window" around the posterior aspect of the cystic duct to skeletonize the duct itself. Alternatively, the tip of the hook cautery can be used to encircle and expose the duct. It is generally unnecessary and potentially harmful to dissect the cystic duct down to its junction with the CBD. The cystic artery is separated from the surrounding tissue by similar blunt dissection at this time. If the cystic artery crosses anterior to the duct, the artery may require dissection and division before approaching the cystic duct. The neck of the gallbladder is dissected away from its liver bed, leaving only two structures entering the gallbladder-the cystic duct and artery. No structure should be divided until the cystic duct and cystic artery are unequivocally identified. This is the "critical view" of safety essential to prevent bile duct injury during laparoscopic Cholecystectomy .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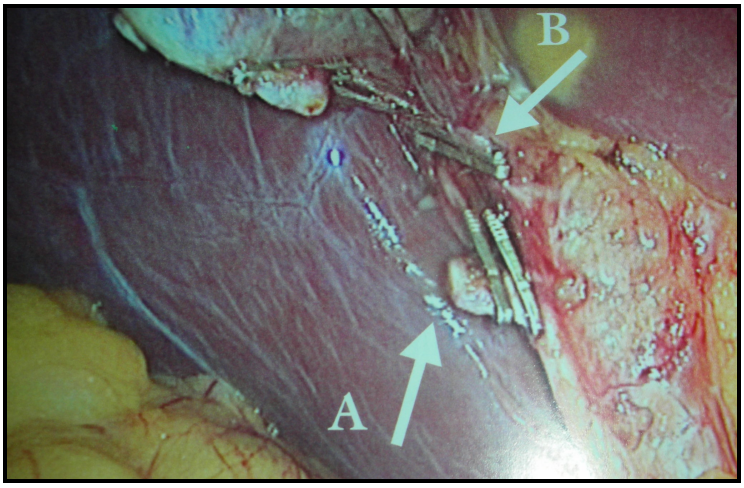
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to prevent stones migrating down the duct. To perform IOC, the anterolateral wall of the cystic duct is incised, and dissecting forceps are used to compress the cystic duct gently and systematically back toward the gallbladder, “milking” stones away from the CBD and out the ductotomy. A 4-Fr to 5-Fr catheter is inserted into the duct through a hollow, 5-mm metal tube that has an appropriate gasket to prevent carbon dioxide leakage around the catheter itself. The cholangiography catheter is inserted into the cystic duct, and a clip is applied loosely to secure the catheter in place. If the introducer has grasping jaws, it can be used to secure the catheter into the duct. Alternatively, catheters equipped with balloons proximal to the tip may be used for fixation. Cholangiography can be performed by either real-time fluoroscopy (dynamic IOC) or by obtaining two standard radiographs (static IOC) after injecting 5 mL and 10 mL of water-soluble contrast medium. The films should be inspected for the following: 1) the length of cystic duct and location of its junction with the CBD, 2) the size of the CBD, 3) the presence of intraluminal filling defects, 4) free flow of contrast material into the duodenum, and 5) anatomy of the extrahepatic and intrahepatic biliary tree. After the cholangiocatheter is removed, the cystic duct is doubly clipped below the ductotomy, with care to avoid the wall of the CBD,

and divided. The posterior jaw of the clip applier must be visualized before applying each clip to avoid injuries to the surrounding structures. Great care should be taken so that the CBD is not "tented up" into the clip.

Evaluation of the CBD by laparoscopic Ultra Sound is an alternative to cholangiography.

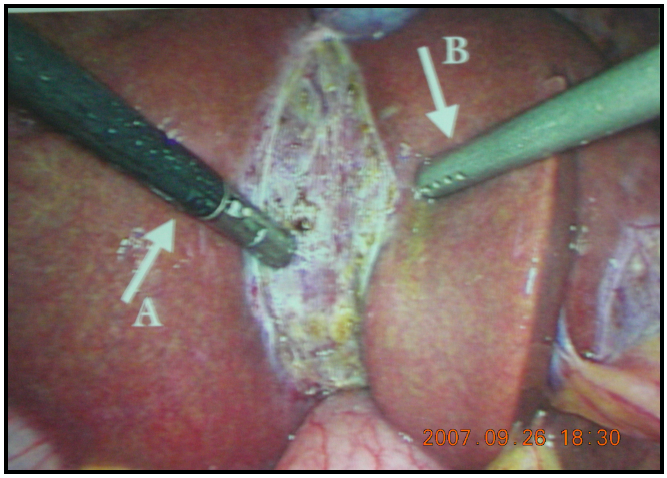
Completion of Cholecystectomy

After clip ligation and division of the cystic duct, the cystic artery is dissected from the surrounding tissue for an adequate distance to permit placement of three clips. The surgeon must ascertain that the structure is the cystic artery and not the right hepatic artery looping up onto the neck of the gallbladder or an accessory or replaced right hepatic artery. After an appropriate length of cystic artery has been dissected free, it is clipped proximally and distally before its transection. Electrocautery should not be used for this division because the current may be transmitted to the proximal clips leading to subsequent necrosis and hemorrhage. A common error is to dissect and divide the anterior branch of the cystic artery, mistaking it for the main cystic artery, this may result in hemorrhage from the posterior branch during dissection of the gallbladder fossa.

The ligated stumps of the cystic duct and the artery are examined to ensure that there is no leakage of either bile or blood, and that the clips are placed securely and compress the entire lumen of the structures without impinging on adjacent tissues. A suction-irrigation catheter is used to remove any debris or blood that has accumulated during the dissection. Separation of the gallbladder away from its hepatic bed is initiated using an electrosurgical probe to coagulate small vessels and lymphatics.

While maintaining cephalad traction on the fundus of the gallbladder with the axillary forceps, the midclavicular forceps pulls the neck of the gallbladder anterosuperiorly and then alternatively medially and laterally to expose and place the tissue connecting the gallbladder to the fossa under tension. An electrocautery spatula or hook is used in a gentle sweeping motion with low power (25-30 W) to coagulate and divide the tissue. Intermittent blunt dissection facilitates exposure of the proper plane.

Dissection of the gallbladder fossa continues from the infundibulum to the fundus, progressively moving the midclavicular grasping forceps cephalad to allow maximal countertraction. The dissection proceeds until the gallbladder is attached by only a thin bridge of tissue. At this point, before completely detaching the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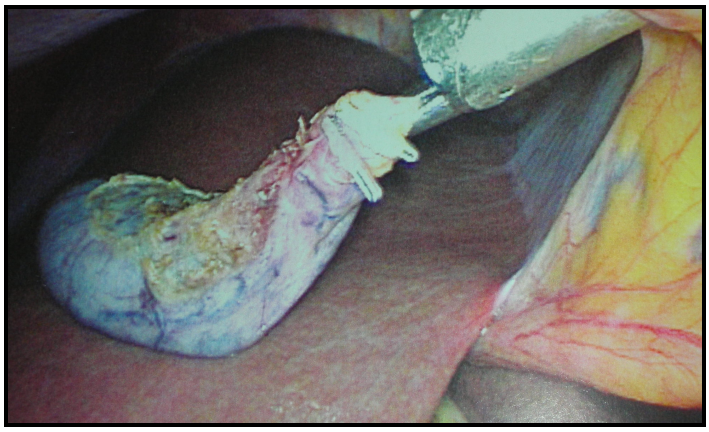


Usually, the gallbladder is most easily removed at the umbilical port site, where there are no muscle layers anterior to the fascial plane. Also, if the fascial opening needs to be enlarged because of large or numerous stones, extension of the umbilical incision causes less postoperative pain and has better cosmesis than does-enlarging the subxiphoid incision. The laparoscope is removed from the umbilical port and placed through the epigastric port. Large "claw" grasping forceps are introduced through the umbilical port to grasp the infundibulum of the gallbladder. The forceps, trocar, and gallbladder neck are retracted as a unit through the umbilical incision. The neck of the gallbladder is exteriorized through the anterior abdominal wail with the fundus remaining within the abdominal cavity.

If the gallbladder is not distended with bile or stones, it can be withdrawn with gentle traction. In most cases, a suction catheter introduced through an incision in the gallbladder neck is used to aspirate bile and small stones. Stone forceps also can be placed into the gallbladder to extract or crush calculi if necessary occasionally, the fascial incision must be extended to extract larger stones or thick-walled gallbladders. After the gallbladder is extracted, the operator's finger is used to occlude the port entry site. If any question concerning hemostasis or contamination of the right upper quadrant

remains, the umbilical port can be replaced under direct vision, and the upper part of the abdomen can be copiously irrigated and aspirated again. If not, all laparoscopic ports are now removed after allowing escape of the carbon dioxide.

Each incision is infiltrated with bupivacaine for postoperative analgesia. The fascia of the umbilical incision is closed with one or two large absorbable sutures. Closure of the subxiphoid fascia is optional because visceral herniation is unlikely to occur owing to the oblique entry angle of the trocar into the abdominal cavity and its location anterior to the falciform ligament. The skin of the subxiphoid and umbilical incisions is closed with subcuticular absorbable sutures. The skin incisions at both 5-mm port sites can be closed with adhesive strips or skin closure adhesives. The orogastric tube is removed in the operating room, and the patient is transferred to the postanesthesia care unit.

POSTOPERATIVE CARE

Observed in the hospital overnight or be discharged latter the same day. The patients is allowed clear liquids in the immediate postoperative period and is advanced to a regular diet as tolerated.

Postoperative referred shoulder and neck pain may occur transiently as a result of diaphragmatic irritation.

Patient may return to works as soon as the abdominal discomfort is tolerable, often within the first week.

Nevertheless, not all patients are candidates for outpatient laparoscopic cholecystectomy. Complications, including life - threatening complications, were not apparent by 8 hours postoperatively and clinically detected only 39% of the time at 24 hours after the procedure. Patients who may benefit from an overnight stay include elderly patients, patients with significant comorbid illnesses, patients requiring substantial analgesia postoperatively, and patients with complications.

SPECIAL CONSIDERATION

Conversion to Open Operation

Surgeons performing laparoscopic cholecystectomy should not think of conversion to open operation as a complication, but rather mature judgement.

When to convert from Lap to open cholecystectomy

- Injury to major blood vessels, viscus, or bile duct

- Anatomy unclear
- Failure to progress in a timely fashion
- Pathology not amenable to minimal access surgical techniques
- Choledocholithiasis untreatable by minimal access surgical techniques or postoperative endoscopic techniques, Billroth II, Previous failed ERCP, Minimal endoscopic experience.
- Fistula between the biliary system and bowel.
- Resectable gallbladder carcinoma

ACUTE CHOLECYSTITIS

There is a higher rate of conversion in the setting of acute cholecystitis, in particular after 72 hours, the rate of conversion increases significantly.

Intervention during the early phase reveals an inflamed, thick - walled, tensely distended organ. to gain adequate traction on the gallbladder with the grasping forceps, it may be necessary to decompress the gallbladder by aspiration. The normally thin, minimally adherent tissue that invests the cystic duct and artery is

markedly thickened and edematous and may not separate readily form these structures with the usual blunt dissection techniques. The duct wall also by edematous, making its external diameter similar to the gallbladder neck and CBD. Pericholecystic tissue planes may be obliterated by thick, "Woody" tissue that is difficult to dissect bluntly.

Intraoperative Gallbladder Perforation

Occur secondary to traction applied by the grasping forceps or electrosurgical thermal injury during removal of the gallbladder from its bed. Only difference between patients with and without bile leakage was that the operating time of patients with gallbladder perforation was approximately 10 minutes longer, presumably owing to the time spent cleaning up the operative field.

ANATOMIC VARIATION

One of the most frequent anomalies is a right hepatic artery that loops up onto the infundibulum of the gallbladder.

A short cystic duct is seen frequently and may be draining into the right hepatic duct or a low - entry right sectoral hepatic duct (2%) or common hepatic duct (1%) or connect the infundibulum with the CBD by the duct of only a few millimeters in length in 5% to 6% of cases. The most dangerous varient is when the cystic duct joins a low

- lying aberrant right sectoral duct. These injuries are underreported because occlusion of an aberrant duct may be asymptomatic and even unrecognized. One may have accessory duct draining into the cystic duct or from the liver directly into the gallbladder (ducts of Luschka). Since the widespread use of laparascopic cholecystectomy, there has been an increased occurrence of bile leaks from so called ducts of Luschka.

COMPLICATIONS OF LAPAROSCOPIC CHOLECYSTECTOMY

- Hemorrhage
- Bile duct injury - Most series quote major bile duct injury rates of 0.30% or less during open cholecystectomy, whereas the incidence of bile duct injuries during laparoscopic cholecystectomy is 0.40% or higher.
- Bile leak
- Retained stones
- Wound infection
- Incisional hernia
- Pneumoperitonium related
    - Carbon dioxide embolism
    - Vasovagal reflex
    - Cardiac arrhythmias
    - Hypercarbic acidosis
- Trocar related
    - Abdominal wall bleeding, hematoma
    - Visceral injury
    - Vascular injury

MATERIALS AND METHODS

The comparative study consists of patients who have undergone cholecystectomy for acute and chronic cholecystitis in Govt. General Hospital, Chennai - 3 in the last three years.

Out of the 115 patients, 55 patients underwent laparoscopic cholecystectomy and other 60 patients underwent open cholecystectomy by right subcostal / midline incision.

Cases were selected on randomized manner during the study in order to eliminate bias and allow for comparability by matching the laparoscopic and open procedures. Every patient got equal chance of being allotted into either group.

Patient who were taken up for surgery were diagnosed as acute or chronic cholecystitis clinically and complimented by USG abdomen. Patients with atypical symptoms more extensive workup including UGI scopy was done to rule out significant non biliary pain.

Patients with previous upper abdominal surgery, CBD stones, associated other pathology either preoperatively / preoperatively either in open or laparoscopic methods were excluded from the study.

High frequency USG abdomen of CBD. LFT including alkaline phosphates were done to rule out CBD stones.

In laparascopic procedure for ligating cystic artery and duct clips were used. Inj. Bupivacaine was infiltrated for both Lap and open groups around the incision site after surgery.

Patient in whom Lap cholecystectomy was converted to open cholecystectomy was not considered as complications and when were excluded from comparison. Conversion rate was calculated separately.

In the post operative period, the patients in both the groups were thoroughly followed up for the factors in the aim of our study and investigated in required conditions and all the findings were documented and results were consolidated.

CRITERIAS

The criterias followed in evaluation of the factors in the study during the post operative period are the following.

DURATION OF SURGERY

It was recorded as time taken form the starting of surgery to end of the surgery.

POSTOPERATIVE PAIN

VAS Score - Visual analogue score recorded at 1st hour of postoperative period. Scale comprises 0-10. O - No pain, 10 - worstpain experienced.

Analgesic Requirement - It was recorded as number of days injection analgesic required for alleviation of pain.

RETURN OF BOWL ACTIVITY

Hourly bowel sounds were monitored and recorded.

LENGTH OF THE HOSPITAL STAY

It was recorded as number of days the patients stayed in hospital from the day of the surgery to discharge.

NORMAL ACTIVITY

It was recorded as usual or routine domestic and social life at the discretion of the patient.

COSMESIS

It was recorded from the length of the scar.

COST FACTORS

It was recorded in two aspects. One for the institution and other for the patients.

COMPLICATION

Both intraoperative / postoperative complications were recorded.

CONVERSION RATE

Number of converted cases and reasons for conversion were recorded

PROFORMA

Name	:	Age / Sex	:
I/P.No	:	Date of Admission	:
Weight	:	Date of Surgery	:
Occupation	:	Date of Discharge	:

COMPLICATION OF HISTORY

Abdominal pain & Site

Vomiting

Fever

Jaundice, Pruritis

Bowel, bladder disturbances

H/o. Diabetes, Hypertension, Other systemic cardiovascular o and respiratory disorders.

H/o. Previous surgery

EXAMINATION

General

Build & Nutrition

Anemia / Jaundice / Cyanosis / clubbing / Pedal oedema

Lymphadenopathy

Hydration status

Pulse, BP,

ABDOMEN

Other systems:

Investigation

Hemogram - Hb %, PVC, TC, DC, ESR

Renal parameters - Urea, Sugar, Creatinine, Electrolytes

LFT - Total bilirubin, SGOT, SGPT, SAP, S. Proteins, S. albumin.

USG abdomen & Pelvis - Size, Number of Stones, Thickness of GB wall, Presence / absence of pericholecystic fluid diameter of CBD with high frequency probe.

Chest X Ray - PA view, abdomen X Ray erect, ECG

Pre OP diagnosis - Acute / Chronic cholecystitis

Pre OP. antibiotics : Inj. Cefotaxime 1gm iv+ Inj. Metronidazole 500 mg.

Surgery - Lap cholecystectomy / Open cholecystectomy

Duration of surgery

Postoperative antibiotics

Post operative follow up :

Pain - VAS Score, Analgesic requirement,

Bowel activity,

Length of stay

Return to work

Complications : Intra OP & Post OP

Conversion Rate

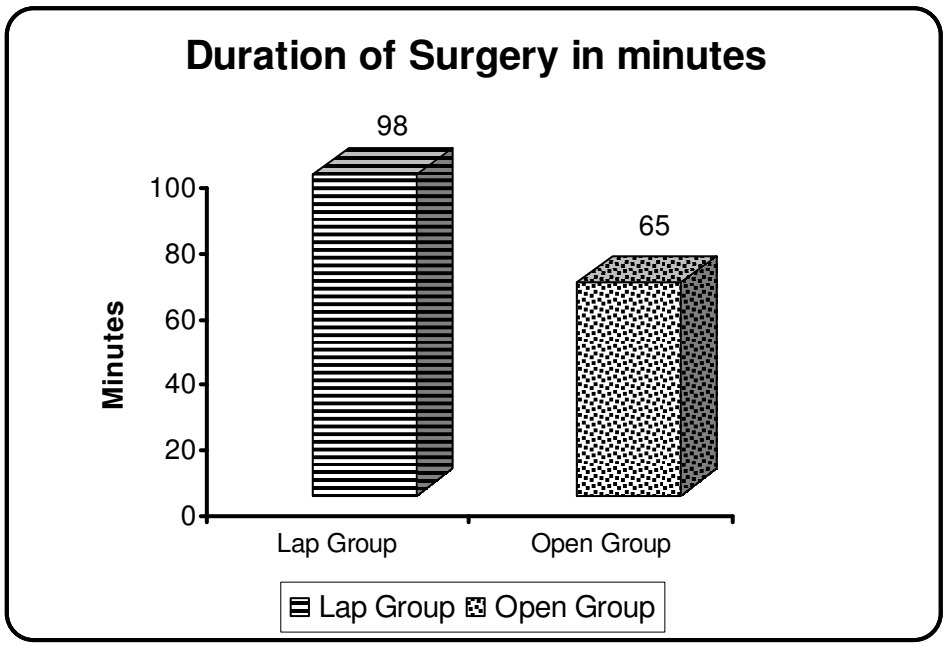
RESULTS

DURATION OF SURGERY

In Lap group the duration of surgery was 60-125 minutes with average 98 minutes.

In open group the duration of surgery was 50-90 minutes with average 65 minutes.

The above results shows that duration of surgery of lap group 1.5 times more than that of open.

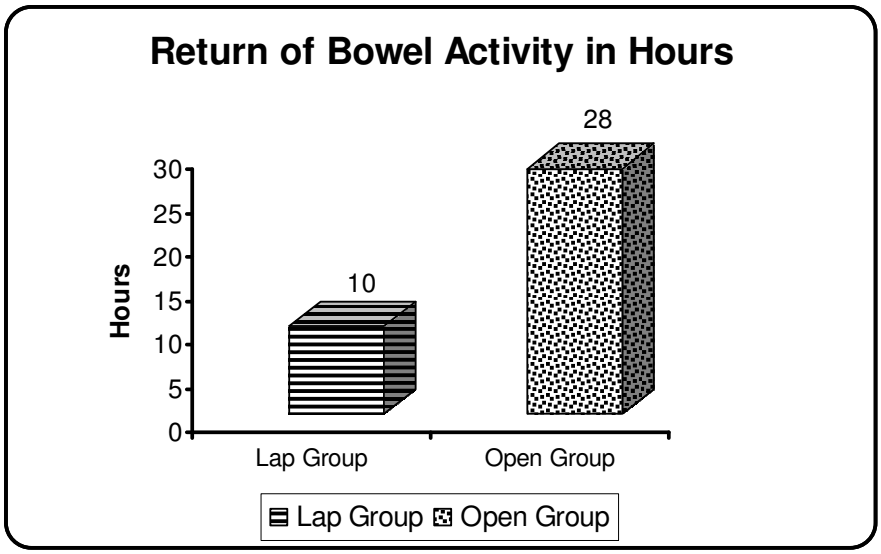


RETURN OF BOWEL ACTIVITY

In lap group bowel sounds were heard 4-12 hours. with average 10 hours.

In open group bowel sounds were heard 16-48 hours with average 28 hours.

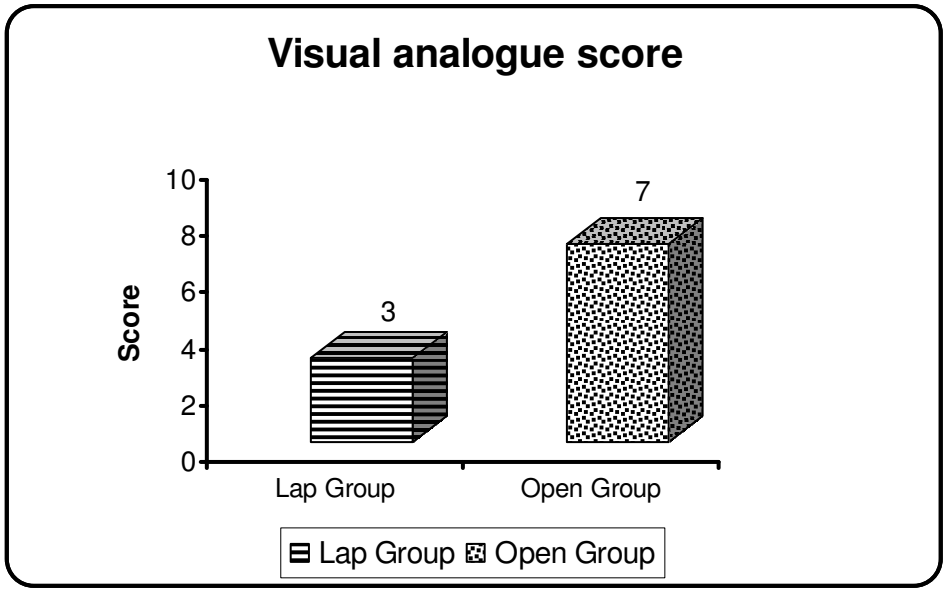
Bowel activity returned faster in lap group than that of open.



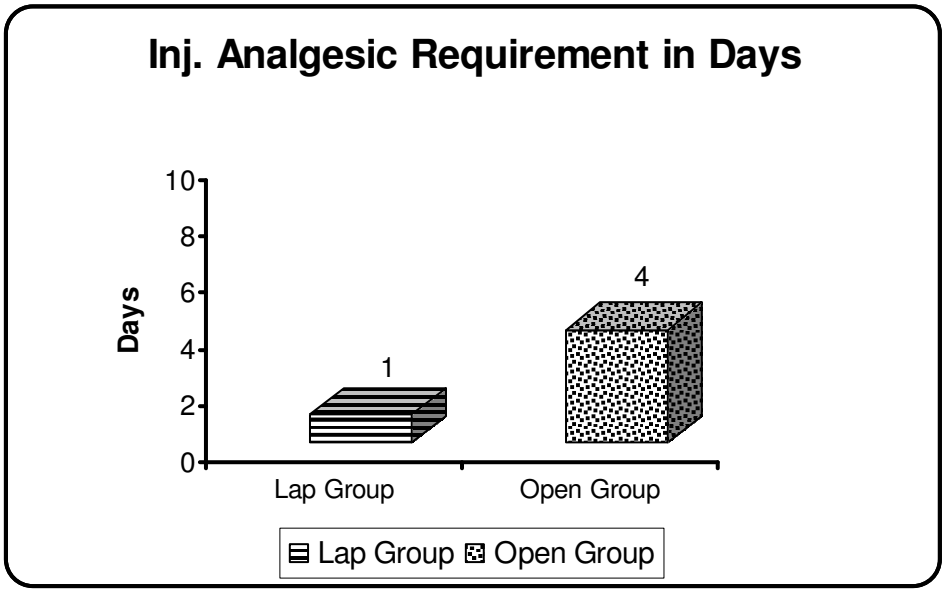
PAIN SCORE

	Lap Group	***Open Group***
VAS	3.8 (2-7)	7.1 (4-9)
Injection Analgesic requirement in days	1.7 (1-2)	3.9 (2-5)

Postoperative pain Lap group by VAS is 3.8, Open Group 7.1 which is 1.8 times lesser.

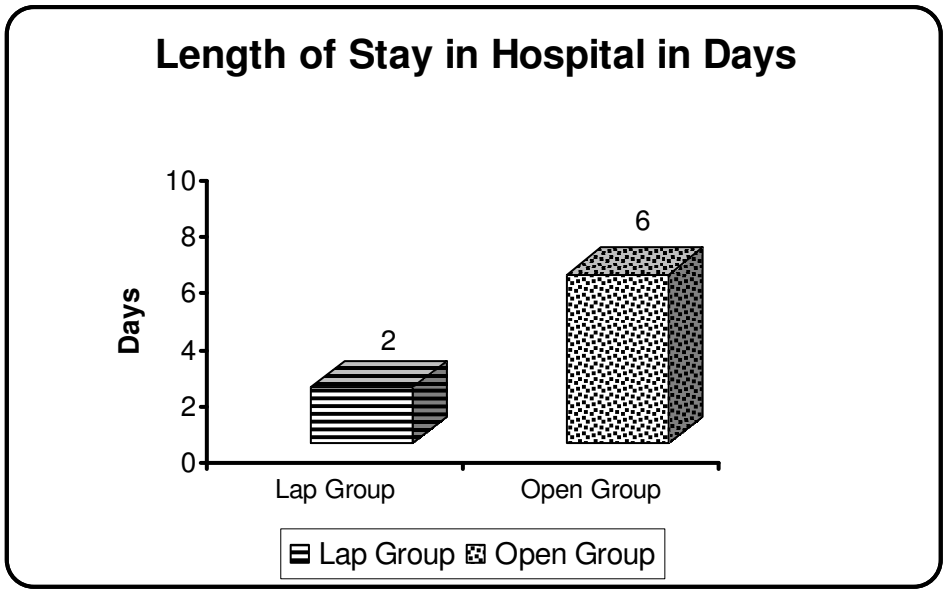


Inj.Analgesic requirement in Lap group 1.7 days, Open Group 3.9 days which is 2.2 times lesser.



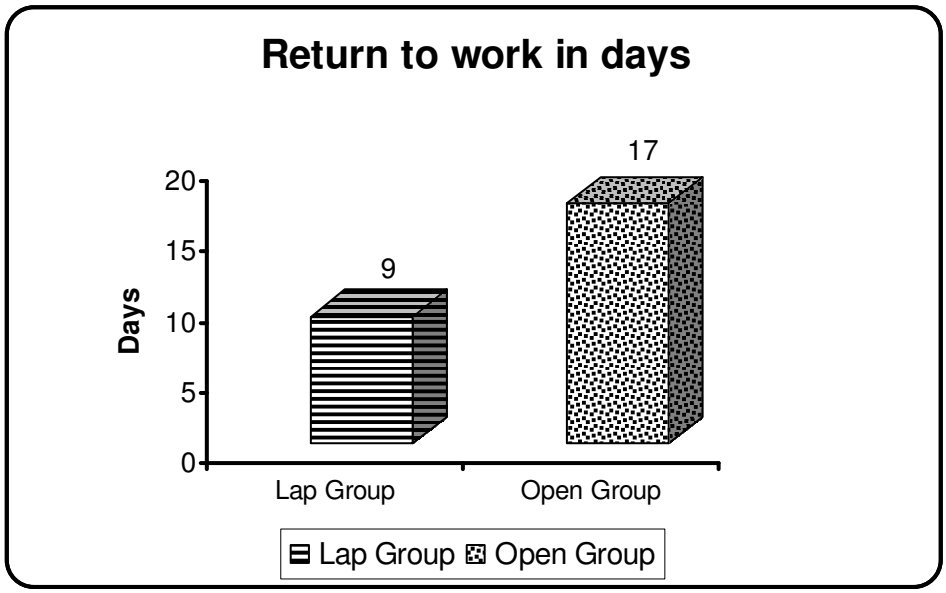
LENGTH OF STAY

Length of stay in Lap group was 2.4 days compared with Open Groups 6.2 days which was 3 times lesser.



RETURN TO NORMAL WORK

Patient in Lap group returned to work in 8.9 (6-30) days compared with Open Group 1.7 (12-48) days which was 2 times earlier.

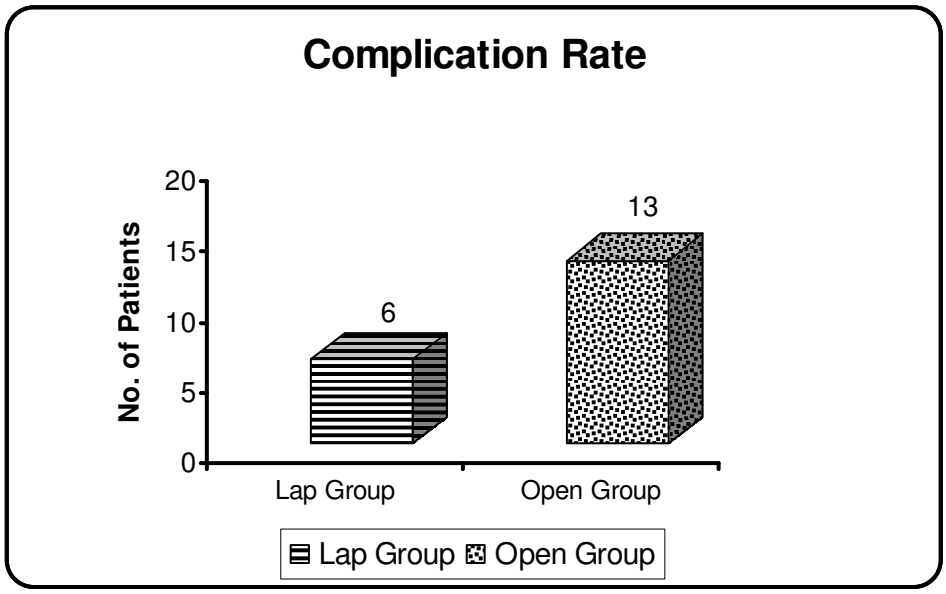


COSMESIS

The length of scar in Lap Group was 4 cm (3-5) compared with Open Group 11 cm (7-16) which was 3 times smaller.

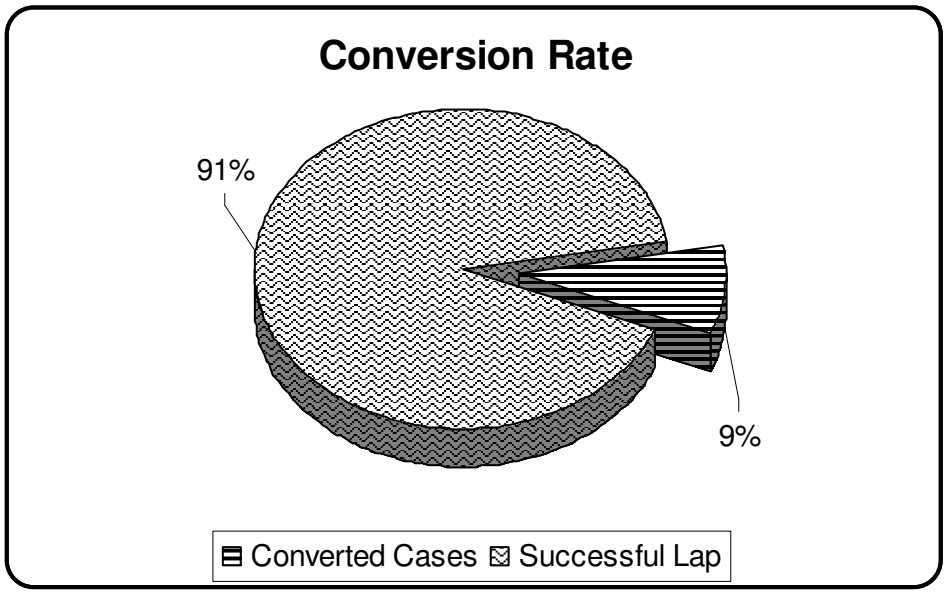
COMPLICATIONS

Complication rate in Lap Group was 6% compared with open group 13% which was 2 times lesser.



CONVERSION RATE

Conversion rate in our series was 9.09% (5 Cases).



DISCUSSION

There are many trials and studies have been conducted all over the world for the past one and half decades. Our study results are very well comparable with most of the trails and studies and are very much in keeping with the other studies.

Stud6y	*Number of Patients*	*Operating Room Time (min)*	*Complication (%)*	*Length of Stay (days)*	*Return to Work (days)*
Barkun et al., (1992)					
OC	25	73	8%	4	20
LC	37	86	2.7%	3	12
Trondsen et al., (1993)					
OC	35	50	20%	4	34
LC	35	100	17%	3	11
Berggren et al., (1994)					
OC	12	69	-	3	24
LC	15	87		2	12
McMahon et al., (1994)					
OC	148	57	20%	4	-
LC	151	71	17%	2	
Majeed et al., (1996)					
OC	100	40	Not	3	35
LC	100	65	reported	3	28
Kiviluoto et al., (1998)					
OC	31	–	23%	6	–
LC	32		3%	4	
OUR RESULTS					
OC	60	65	13%	6	16
LC	55	98	6%	2	9

DURATION OF SURGERY

Duration of surgery was 1.5 times greater in Lap group than open group. The reason for increased time in Lap group were

1. Time taken for creating pneumoperitoneum placement of trocar, tilting of table.
2. View controlled by camera operator.
3. Lack of depth perception.
4. Decreased tactile discrimation which makes surgery slower.
5. At last experience of surgeon.

POST OPERATIVE PAIN:

Post operative pain in Lap group by VAS score was two times lesser than Open group.

Inj. Analgesic requirement in Lap group was 2 times lesser than Open group.

The reasons for this observation in Lap group was due to

1. Smaller incision.
2. Less cytokine release due to Minimal tissue handling

BOWEL ACTIVITY

Earlier return of bowel activity in Lap group was due to

1. Minimal tissue handling
2. Less post operative pain and earlier mobilization of the patient.
3. Less amount of Opioid use.

DURATION OF STAY AND RETURN TO WORK:

Duration of stay in hospital was 3 times lesser in Lap group compared with Open group.

Earlier turn to work was observed 2 times more in Lap group due to following reason.

1. Smaller incision
2. Less pain
3. Earlier oral intake
4. Earlier mobilization from bed
5. Less wound infection.

COSMESIS:

- Length of scan in Lap Group was 3 times smaller than open.
- Cosmetic Superiority is due to
    1. Small incisions and smaller size of scars
    2. Better quality of scar
    3. Lower wound infection

COMPLICATIONS

Laparoscopic Cholecystectomy

- Complication rate in Lap group was 2 times lesser than open.
- In our study 2 cases of chronic port site sinus was observed. Culture and sensitivity including AFB (Atpical Mycobacterium chelonae) was taken which was negative for growth. Broad spectrum antibiotics and excision of sinus was done.
- Bile Leak observed in two patients one managed conservatively, other on investigation showed right

hepatic duct injury due to anomalous drainage of cystic duct in to Right hepatic duct.

OPEN CHOLECYSTECTOMY

- Wound infection was observed in 10% of cases (6 cases)
- CBD injury was observed in one patient. Which was treated by hepaticojejunostomy.
- One patient retained stones were observed postoperatively which was treated by ERCP, sphincterotomy with stone retrival.

COST FACTORS

Our study is done in Govt. Institution, a tertiary free health care provider to the public. Our study results shows that laparoscopic cholecystectomy was cost effective for the following reasons.

1. Because laparoscope is an one time investment in a institutional set up to varied diagnostic and therapeutic procedures, no additional expenditure is incurred by the Institute.
2. Gains out the laparoscopic cholecystectomy

a. To the Institute by the means of

   i. Reduced bed occupancy

   ii. Reduced wound infection

   iii. Reduced postop morbidity

b. To the patients by the means of

   i. Lesser pain experienced

   ii. Reduced wound infection& morbidity

   iii. Early return to normal work thereby gaining manpower days and income

CONVERSION RATE

Conversion rate from lap to open most series ranges from 1.8 - 7.8 %. In our series conversion rate - 9% (5 Cases) - 3 in acute cholecystitis, 1 due to bleeding, 1 due to short cystic duct. Acute cholecystitis higher rate of conversion due to edematous thick walled Gallbladder, densely adherent tissues making the dissection difficult.

SUMMARY

The results of our study which is comparable well with most trials and studies.

Factors	***Laparoscopic Cholecystectomy Group***	***Open Group***
Duration of Surgery in minutes	98	65
Return of Bowel Activity in Hours	10	28
Post Operative Pain		
Visual analogue score	3	7
Inj. Analgesic Requirement in Days	1	4
Length of Stay in Hospital in Days	2	6
Return to work in days	9	17
Cosmesis (Scar in CM)	4	11
Complication Rate	6	13
CONVERSION RATE 9%		

CONCLUSION

In my study I conclude that Laparascopic cholecystectomy is advantage over open cholecystectomy for following reasons associated with Laparoscopic group.

a) Earlier return of Bowel activity

b) Lesser postoperative pain and Analgesic requirement

c) Shorter hospital stay

d) Earlier return to work

e) Cosmetic superiority

f) Cost effectiveness

g) Lesser complication rate

With relative increase in Operative time was observed in Laparoscopic group due to learning curve of junior residence. Conversion rate in our study is similar to other studies.

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LAPAROSCOPIC CHOLECYSTECTOMY

ACC : Acute Cholecystitis

CCC : Chronic Cholecystitis

Sl. No.	D.O.S	Name	Age /Sex	IP. No.	Diagnosis	Operating Time min)	Intra OP Complication	Return of Bowel activity in Hrs.	Post OP Pain		Length of Stay in Days	Return to work in Days	Cosmesis Scar in cm	Post OP Complication
									VAS	Inj. Analgesic Requirement in Days				
1.	10.10.05	Indrani	40/F	756664	ACC	120	-	12	5	1	2	7	4	-
2.	19.10.05	Elumalai	32/M	759211	ACC	110	-	8	3	1	2	8	4	-
3.	27.10.05	Jesuselvi	29/F	760681	CCC	105	-	4	6	2	2	7	5	-
4.	14.11.05	Saleemabe	48/F	764242	CCC	115	-	16	4	1	2	10	4.5	Port Site Sinus
5.	28.11.05	Sukumar	55/M	76628	CCC	109	-	4	5	2	2	7	4	-
6.	5.12.05	Rambai	54/M	768126	CCC	100	-	8	4	1	3	9	4	-
7.	7.12.05	Prakasam	52/M	769921	CCC	98	-	20	2	1	2	6	4	-
8.	5.1.06	Renuga	34/F	773708	ACC	90	-	24	5	1	2	8	4.5	-
9.	8.3.06	Shankar	49/M	790482	ACC	76	-	8	5	1	2	11	4	-
10.	5.11.07	Beula	35/F	797443	ACC	85	-	12	2	1	1	7	4	-

11.	7.04.06	Ravikumar	30/M	798637	CCC	60	-	8	2	1	1	6	4	-
12.	17.4.06	Kalyanasundar	50/M	800494	CCC	96	-	10	2	1	12	30	3.5	Right Hepatic Duct Injury
13.	17.05.06	Saroja	55/F	802237	CCC	75	-	14	5	2	2	11	4	-
14.	01.07.06	Shankar	25/M	818601	CCC	79	-	12	5	2	2	9	4	-
15.	28.08.06	Ramaachand	53/M	831326	CCC	61	-	16	4	1	2	8	4.5	-
16.	01.09.06	Lakshmi	55/F	832435	CCC	63	-	12	3	1	2	10	4	-
17.	20.09.06	Sivakumar	38/M	83826	CCC	99	-	6	4	2	2	9	4	-
18.	27.09.06	Samsathbegum	43/F	839166	ACC	108	-	4	4	2	2	9	4	-
19.	04.10.06	Selvi	38/F	841739	ACC	110	-	8	3	1	2	9	4	-
20.	09.10.06	Perumal	70/F	840569	CCC	76	-	4	4	1	2	8	4	Port Site Sinus
21.	11.10.06	Shakunthala	54/F	842564	CCC	125	-	6	6	2	2	7	4	-
22.	16.10.06	Uma	36/F	846316	ACC	89	-	10	5	2	2	6	4	-
23.	18.10.06	Santhanamery	25/F	851046	ACC	67	-	4	2	1	2	7	4	-
24.	23.10.06	Venkataraoammal	26/F	854668	CCC	96	-	6	3	1	2	8	4	-
25.	25.10.06	Duraisamy	48/M	861237	CCC	78	-	8	4	1	2	10	4	-
26.	30.10.06	Viiayan	32/F	03818	CCC	109	-	9	5	1	2	11	4	-
27.	26.02.07	Raji	62/F	064292	CCC	80	-	12	2	1	2	10	3.5	-

28.	26.02.07	Sivamani	55/M	10774	CCC	60	-	6	4	2	2	12	4	-
29.	28.02.07	Kuppubai	26/M	12421	CCC	62	-	8	5	2	2	9	4.5	-
30.	23.03.07	Kanchana	40/F	18155	CCC	68	-	24	6	2	2	7	4	-
31.	18.04.07	Muthukumar	20/M	23367	CCC	60	-	12	4	1	2	7	4.5	-
32.	14.05.07	Ranganath	42/M	030782	ACC	70	-	18	3	1	2	8	5	-
33.	30.05.07	Bharathy	39/F	34585	ACC	72	-	10	4	1	2	9	3.5	-
34.	04.01.07	Meenakshi	37/F	43088	CCC	90	-	14	3	1	2	7	4.5	-
35.	04.07.07	Slteriv	40/F	44040	CCC	96	-	16	4	1	2	9	3.5	-
36.	09.07.07	Faiyas	45/M	43075	ACC	100	-	8	2	1	2	8	4	-
37.	11.07.07	Sekar	35/M	44192	ACC	82	-	6	4	1	2	7	4	-
38.	23.07.07	Sumathy	50/F	48876	CCC	99	-	12	3	1	4	14	4	Bile leak
39.	25.07.07	Baskar	40/M	47732	CCC	107	-	6	7	2	2	8	3.5	-
40.	13.08.07	Dhanidevi	45/F	52307	CCC	116	-	10	4	1	4	12	4	-
41.	20.08.07	Kairunisha	62/F	52258	CCC	120	-	12	4	1	5	14	4.5	-
42.	13.03.07	Pramila Bai	50/F	013862	CCC	109	-	14	3	1	2	7	3	-
43.	24.04.07	Jayanithi	31/F	25356	ACC	112	-	6	2	2	3	10	4	-
44.	12.05.07	Ambika	43/F	28694	CCC	118	-	8	3	2	3	7	4	-
45.	05.06.07	Narasimman	45/M	35784	ACC	122	-	12	4	1	2	7	4.5	-
46.	07.07.07	Velltahi	50/F	39343	ACC	110	-	6	2	1	3	6	4	-

47.	16.08.07	Ramados	25/M	39350	ACC	104	-	10	4	2	3	7	4	-
48.	28.08.07	Arthi Sinha	30/F	58272	ACC	109	-	6	3	2	3	6	4	-
49.	11.09.07	Lakshmi	32/F	61711	ACC	121	-	20	6	2	2	7	4.5	-
50.	18.09.07	Nandhakumar	55/M	63233	ACC	112	-	22	5	2	2	9	4	-
Lap converted open Cholecystectomy														
51.	29.06.07	Thiravarul	60/M	041335	Acute cholecystitis									
52.	11.07.07	Padmanaban	54/M	45238	Acute cholecystitis									
53.	23.08.06	Joseph Begam	55/F	831149	Bleeding									
54.	10.4.06	Padmavathy	54/F	798656	Short Cystic Duct									
55.	28.08.06	Ramachandran	53/M	831320	Adhesion									

OPEN CHOLECYSTECTOMY

Sl. No.	D.O.S	Nam	Age /Sex	IP. No.	Diagnosis	Operating Time min	Intra OP Complication	Return of Bowel activity in Hrs.	Post OP Pain		Length of Stay in days	Return to work in days	Cosmesis Scar in cm	Post OP Complication
									VAS	Inj. Analgesic Requirement in Days				
1.	21.09.05	Sheela	30/F	753130	ACC	62	-	48	7	4	6	15	10	-
2.	17.10.05	Thirupathy	45/M	757328	CCC	70	-	24	6	2	5	20	12	-
3.	23.11.05	Dhanalakshmi	38/F	766215	ACC	63	-	32	8	3	6	16	12	-
4.	15.02.05	Sampath	33/M	770825	CCC	74	-	48	9	4	20	40	15	Common Bile duct Injury
5.	12.01.06	Barathi	38/F	775982	ACC	70	-	28	7	3	8	21	9	-
6.	18.01.06	Chandra	50/F	779094	CCC	50	-	40	6	3	8	20	10	-
7.	25.01.06	Matheena beevi	48/F	779997	CCC	62	-	24	7	3	5	16	8	-
8.	27.01.06	Sivaraj	65/M	779914	CCC	65	-	28	6	3	6	14	7	-
9.	06.02.06	Ramadoss	56/M	779837	CCC	60	-	36	9	4	6	18	9	-
10.	15.02.06	Thayagaraj	47/M	785248	CCC	73	-	28	9	4	7	14	10	-
11.	27.02.06	Chinnammal	60/F	787163	CCC	55	-	24	7	3	6	17	11	-
12.	13.03.06	Jayakumar	55/M	790440	GB Polyp	52	-	32	7	4	5	18	10	-
13.	13.03.06	Kasinath	60/M	792131	ACC	56	-	44	6	4	6	14	9	-

14.	05.06.06	Zainaha	50/F	812456	CCC	69	-	24	8	3	5	16	9	-
15.	19.08.06	Vijaya	60/F	828145	CCC	55	-	20	6	4	5	19	11	Retained Stone
16.	21.08.06	Valli	27/F	831724	ACC	74	-	48	9	4	7	20	7	-
17.	13.09.06	Savithri	30/F	836452	CCC	54	-	28	8	4	6	20	12	-
18.	13.11.06	Prema	56/F	851214	CCC	53	-	20	9	5	5	16	9	-
19.	22.11.06	Lakshmi	22/F	851432	ACC	60	-	24	6	3	10	25	10	Infection
20.	21.03.07	Pramila	29/F	851634	ACC	64	-	20	5	4	5	14	11	-
21.	2.05.07	Vasantha	57/F	27329	CCC	77	-	22	9	4	6	15	8	-
22.	7.05.07	Krishanveni	50/F	27368	ACC	61	-	26	5	2	5	16	7	-
23.	14.05.06	Ranganath	42/M	030782	CCC	55	-	22	9	4	9	20	7	Wound Infection
24.	16.07.07	Premavathi	55/F	029024	CCC	57	-	30	7	3	5	14	9	-
25.	18.06.07	Manonmani	50/F	37865	CCC	68	-	22	8	5	6	16	11	-
26.	10.08.07	Kaveri	45/F	53881	CCC	62	-	26	7	4	4	17	12	-
27.	18.08.07	Narasimman	30/F	829197	CCC	54	-	22	8	5	5	14	10	-
28.	4.09.07	Sarasu	44/F	834199	CCC	59	-	20	9	4	6	16	8	-
29.	08.09.07	Krishnaveni	40/F	835867	ACC	71	-	16	7	5	7	14	9	-
30.	02.09.07	Banumathy	38/F	835870	ACC	87	-	18	8	4	5	17	10	-
31.	29.09.07	Kalavathy	40/F	837756	CCC	71	-	22	7	3	5	15	12	-

32.	09.10.06	Balasubramanian	35/M	841558	CCC	62	-	20	6	3	6	17	11	-
33.	3.11.06	Lakshmi	44/F	847360	ACC	72	-	24	4	2	4	14	13	-
34.	10.11.06	Vasuki	42/F	847467	ACC	54	-	28	8	3	6	18	14	-
35.	13.11.06	Martin	61/M	848863	CCC	52	-	26	9	4	8	24	15	-
36.	09.12.06	Balaraman	55/M	857294	ACC	59	-	29	7	4	5	14	12	-
37.	12.01.07	Raghuvaran	36/M	263570	CCC	62	-	30	6	3	10	28	10	Wound Infection
38.	16.02.07	Ammanji	42/F	006755	CCC	61	-	24	5	3	5	12	13	-
39.	18.05.07	Kanniammal	38/F	02882	CCC	65	-	21	5	3	5	16	15	-
40.	25.05.07	Janaki	52/F	32882	CCC	69	-	24	6	3	5	14	14	-
41.	18.06.07	Pushpalatha	35/F	037340	CCC	66	-	26	7	2	6	17	12	-
42.	13.07.07	Victor	67/F	639475	ACC	61	-	24	6	2	5	14	11	-
43.	10.08.07	Kumar	49/M	050028	CCC	59	-	22	6	3	5	14	10	-
44.	17.08.07	Shankar	28/M	045377	ACC	54	-	22	9	4	7	13	14	-
45.	20.08.07	Kanniammal	40/F	053266	CCC	56	-	24	6	3	9	25	16	Wound Infection
46.	14.11.06	Alamelu	45/F	849121	CCC	60	-	26	8	4	5	18	13	-
47.	02.12.06	Vasantha	45/F	852510	CCC	63	-	30	8	3	4	14	10	-
48.	13.01.07	Vijaya	31/F	000799	CCC	65	-	34	9	4	6	17	14	-
49.	20.01.07	Muniammal	70/F	235500	CCC	70	-	36	6	2	6	13	16	-

50.	15.02.07	Latha	36/F	008645	ACC	79	-	20	5	2	11	26	13	Wound Infection
51.	05.04.07	Sarasu	42/F	186412	ACC	69	-	24	8	4	5	12	14	-
52.	26.04.07	Justinselvam	33/M	25351	ACC	89	-	26	5	2	6	16	12	-
53.	05.05.07	Murugesan	47/M	21932	CCC	64	-	24	8	4	7	18	16	-
54.	17.05.07	Pramila	36/F	30421	CCC	70	-	40	7	3	12	28	14	Wound Infection
55.	22.05.07	Loganathan	40/M	32274	CCC	86	-	36	9	4	6	12	12	-
56.	05.06.07	Arumugam	60/M	35774	CCC	90	-	38	8	3	5	14	15	-
57.	14.07.07	Pachiammal	60/F	42779	CCC	83	-	39	6	2	5	13	11	-
58.	24.07.07	Baskaran	25/M	46602	CCC	67	-	40	4	2	5	16	14	-
59.	31.07.07	Chnaponnu	48/F	48345	ACC	72	-	42	9	3	4	20	15	-
60.	13.11.06	Prema	56/F	851214	ACC	79	-	32	8	3	4	18	16	-