



TO STUDY THE EFFICACY AND FEASIBILITY OF 3 PORT AND 4 PORT LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

AIM: The aim of the study is to compare the efficacy and feasibility of 3 port LC and 4 port LC in Indian setup.

Method: Prospective analysis of 160 patients operated during 2015-2017 at M.L.B. Medical College, Jhansi. Outcome parameters includes operating time, days of hospital stay, days taken to return to work, cosmetic satisfaction, post operative pain and quantitative requirement of analgesia after surgery.

Results: 80 patients underwent 3 port LC and 80 patients underwent 4 port LC. In both 3 port and 4 port LC, the operating time was more or less equal [3 port LC-12.5 ± 7.4 to 4 port LC 13.78 ± 8.5]. no vascular injuries in both 3 port and 4 port LC. 3 patients developed ductal injury in 3 port and 2 patients in 4 port LC. Post operatively seroma developed in 4 patients in 3 port group and 6 patients in 4 port group. 2 patients in each group developed biliary peritonitis. 3 port group has lesser hospital stay, less use of analgesics and better cosmesis.

Conclusions: pre-operatively there is no significant difference between 3 port and 4 port LC. Post operatively 3 port is better than 4 port LC in terms of cosmesis, shorter hospital stay and low analgesic use.

KEYWORDS :

INTRODUCTION

Gall stones are among the most common causes of gastrointestinal illness requiring hospitalization. Indeed operations on biliary tract are among the most common abdominal procedure performed in the United States, with more than 6,00,000 cholecystectomies performed annually. Treatment of gall stones have evolved markedly since open cholecystectomy was first described by Langenbuch in 1881. Management has progressed through eras of nonsurgical management, laparotomy, minilaparotomy and now laparoscopic cholecystectomy which is the gold standard for the treatment of gall stone disease today.

Laparoscopy:

The Term laparoscopy was coined by Hans Christian – Jacobacus of Sweden in 1911.

Laparoscopic examination of abdominal cavity was introduced in 1901 by G. Kelling using a cystoscope inserted under local anesthesia.

The first laparoscopic cholecystectomy (LC) was performed in 1987 by Phillip Mouret and later established by Dubois and Perissat in 1990. Since then, it has met with widespread acceptance as a standard procedure. Standard laparoscopic cholecystectomy is done by using 4 trocars. The fourth (lateral) trocar is used to grasp the fundus of the gallbladder so as to expose Calot's triangle. It has been argued that the fourth trocar may not be necessary, and laparoscopic cholecystectomy can be performed safely without using it. Cooperative manipulation of the surgical instruments is very important for this procedure, for exposing Calot's triangle and dissecting the gallbladder from the gallbladder bed when using the 3 port techniques. Several studies have reported that 3 port laparoscopic cholecystectomy is technically possible. Further, in the era of laparoscopic surgery, less postoperative pain and early recovery are major goals to achieve better patient care and cost effectiveness.

We sought to, by a prospective study, investigate the technical feasibility, safety, and benefit of 3port laparoscopic

cholecystectomy versus standard 4 port laparoscopic cholecystectomy in our setup. Technical feasibility was defined as performance of the LC without much difficulty by using the 3port technique. The need of a fourth port was considered a failure of the 3port technique and the reason behind this is discussed herein.

Benefits were measured by various parameters like operative time, days of hospital stay, postoperative recovery time after discharge, days taken to return to work, cosmetic satisfaction, quantitative requirement of analgesia after surgery, and assessment of postoperative pain score using a 10cm visual analogue score (VAS).

Ergonomics in Laparoscopic Surgery:

Basic problem is the non-neutral position of surgeon during lap surgery which can result in range of discomfort from carpal tunnel syndrome to cervical spondylosis.

Incidence = 73% to 86% of lap surgeons report some type of discomfort.

5 factors affecting the stress placed on surgeon-

1. Table height
2. Monitor position
3. Use of foot pedal
4. Static body posture
5. Instrument design

AIMS AND OBJECTIVES:

To study the efficacy and feasibility of 3 port and 4 port lap cholecystectomy.

1. To compare the intraoperative and post operative complications of 3 port and 4 port lap cholecystectomy in Indian set up.
 - a. Operative time,
 - b. Days of hospital stay.
 - c. Days taken to return to work.
 - d. Cosmetic satisfaction.

- e. Assessment of postoperative pain score using a 10cm uncalculated visual analogue score (VAS).
- f. Quantitative requirement of analgesia after surgery.

MATERIALS AND METHODS:

The study included all patients presenting with gall bladder stone diseases both acute and chronic presenting to surgical OPD of MLBMC between 1 September 2015 and 30 APRIL 2017. The patients were matched for age and sex and then randomly selected for 3 PORT and 4 PORT cholecystectomy. Informed consent was taken in all patients. A single consultant surgeon carried out the surgical procedures with a sufficient experience in laparoscopy.

Pre Preoperative work up include:

1. A complete history and physical examination,
2. Standard laboratory tests including liver function tests
3. Radiological examinations including abdominal ultrasound and CECT where indicated.
4. Ultrasonography confirmed the presence of gall bladder stones in all patients.
5. Patients with CBD stones are excluded.

CC.Comparison of 3 port and 4 port lap chole was to be done with regards to –

1. Operation time
2. Conversion rate
3. Need of drain
4. Intra operative complications
5. Postoperative complications
6. Return to work time
7. Cosmesis

PATIENTS SELECTION:

The inclusion criteria were:

1. Age of patient between 10 and 85 years
2. Diagnosis of chronic/acute cholecystitis, symptomatic cholelithiasis, recurrent mild biliary pancreatitis, Gall Bladder (GB) polyp, GB Sludge, empyema, mucocele.

The exclusion criteria were:

1. Choledocholithiasis
2. Severe Acute Calculus Pancreatitis
3. Severe co-morbid conditions (uncontrolled diabetes, hypertension, severe direct hyper bilirubinemia)
4. ASA Grade-4

Randomization:

Random allocation of patients presenting with symptoms suggestive of gallbladder disease with confirmatory USG study was done to the two groups after matching for age and sex, using the sealed envelope technique which was opened just before the skin incision. The two groups were as follows

Group1: 3 PORT LAPAROSCOPIC SURGERY

Group2: 4 PORT LAPAROSCOPIC SURGERY

Data Collection:

Patient data were kept in computer data files and also a hand written proforma has been filled by residents of dept.

The details were recorded in a proforma (Annexure) and analyzed by Unpaired t test.

Operative technique:

The technique of laparoscopic cholecystectomy SLC was performed using a three-trocar approach in routine cases, 4 port cholecystectomy has been performed using technique as described below

TECHNIQUES:

The laparoscopic cholecystectomy would be carried out according to the standard technique described.

The difference in 3 port procedure was of the omission of the 4th 5 mm mid axillary port.

Operating surgeon will hold the dissecting instruments with his right hand through the 10 mm trocar while holding the gall bladder at Hartman's pouch by left hand instrument through 5 mm port the subcostal port.

In 4 port lap cholecystectomy the first 3 ports are identical to 3 port lap cholecystectomy but an additional 4th port is put in the anterior axillary line and would be placed in transumbilical plane just superior to it. The completion of procedure would be identical using clips/cautery for cystic artery and only clips for duct and closure of 10 mm ports with vicryl 1-0 and ethilon 2-0 and 5mm port will have skin closure with ethilon 2-0.

The three-port technique involves inserting a 10 mm trocar just below the umbilicus through which the 30 degree viewing videoscope will be introduced. Another 10 mm trocar will be inserted 3 cm below the xiphisternum to the right of the midline; and finally a 5 mm trocar at the right hypochondrium in midclavicular line 3 cm below the costal margin. The operating surgeon will conduct the procedure from the left side of the patient together with the assistant holding the camera while the TV monitor will be located on the upper right side of the patient and the nurse on the lower left side of the patient. The surgeon holds the infundibulum with a grasper through the 5 mm trocar, moving the infundibulum right and left or back and forth to display Calot's triangle, blunt dissection was used for adequate display of the cystic duct and cystic artery. The cystic duct will be clipped and will be divided followed by the cystic artery. The gall bladder will then be dissected from its bed and will be extracted from either the umbilical or the subxiphisternal ports. IOC will be performed through the 5 mm sub-xiphisternal trocar.

The **FOUR-PORT LC** was performed using the North American 'flip over' technique

PATIENT POSITIONING. After successful pneumoperitoneum creation, primary 10mm trocar is inserted in the midline towards the pelvis, obliquely through the umbilical incision. The pyramidal trocar is held in such a manner that index finger tip acts as a guard to avoid sudden entry. The trocar is inserted with screwing motion and its safe entry is confirmed by 'hiss of escaping gas'. After inserting telescope, a quick inspection of the peritoneal cavity is performed. After creating pneumoperitoneum, needle is replaced by 10 mm port and telescope inserted through it and peritoneal cavity inspected. Umbilical trocar is now inserted under vision and then telescope shifted to umbilical port. After insertion of trocar, table is tilted in reverse trendelenberg: 20° & right side of table is tilted up. A 10 mm second trocar (the working port) is inserted just below the xiphisternum to the right of the midline, obliquely entering the abdomen to the right of falciform ligament. This port will be used as for surgeon. All operating instruments like Maryland dissector, scissors, hook dissector, suction cannula clip applicator & alligator grasper will be introduced through this port. A 5 mm third trocar is inserted 2-3 cm below the right sub-costal margin in mid-clavicular line. This port will be used for inserting a atraumatic grasper which holds Hartman's pouch. 5 mm fourth trocar if required inserted. In the right anterior axillary line at the level of umbilicus. The fundus grasper will be introduced through this port. The trocars are inserted obliquely through the abdominal wall and directed towards the gall bladder. Abdominal wall is trans illuminated using tip of the telescope so that blood vessels in the wall can be avoided especially the superior epigastric vessels.

Cystic artery is then either cauterized by unipolar or bipolar cautery.

Cystic duct is then clipped using LT400 titanium clips. The cystic duct is then cut and gall bladder dissected off the GB fossa.

Gall Bladder is then extracted by GB extractor through the epigastric port. The ports are then closed by vicryl 1-0 and secured tightly and dressing done.

OBSERVATIONS AND RESULTS:

The study was done on 160 patients. Out of which 80 were included in group I (3 PORT) and 80 patients were included in Group II Standard Lap Cholecystectomy (4 PORT).

In case of the 3 PORT 37.5% patients were of 11-30 yrs and 44.50% patients were 31-50 yrs and 17.50% were > 51 yrs of age.

In case of 4 PORT 35.00% patients were of 11- 30 yrs of age and 50.00% patients were of 31- 50 yrs of age and 15.00% were > 51 yrs of age. That is in both groups number of the patients were significantly more of middle age group. [Table 1 & Graph 1]

In case of the 3 PORT 77.50% patients were female and 22.50% patients were male. In case of 4 PORT 73.75% patients were female and 26.25% patients were male. That is in both groups number of the female patients are significantly more than male patients. [Table 2 & Graph 2]

Peroperative Complications:

In study group 3 PORT (group I) 2 patients out of 80 developed type B Strasberg's ductal injury* and 1 patients developed biliary leakage due to CBD injury (Type D), which all were managed by intracorporeal suture repair with monocryl 3-0 or vicryl 3-0 and placing drain in morrison pouch. In study group 4 PORT (group II) 2 patients out of 80 developed bile duct injury, 1 patient had Type B Strasberg ductal injury and 1 patients developed Biliary leakage due to Type D ductal injury out of which 1 patient was converted to open cholecystectomy and primary repair was done with t-tube drain and rest 1 patient was managed by suture repair with monocryl 3-0 or vicryl 3-0 and then by placing drain in Morrison pouch. In both groups there was no vascular injury. [Table 5 & Graph 5]

Postoperative complication:

In study group 3 PORT (group I) 4 patients out of 80 developed seroma formation, 2 at umbilical port site and 2 at epigastric, which were managed conservatively and 2 patients out of 80 developed biliary peritonitis on postoperative day 3 due to possible ductal injury, and were managed by drain in Morrison pouch. In study group 4 PORT (group II) 6 patients out of 80 developed seroma, 4 at umbilical and 2 at epigastric port site which were managed conservatively and 2 patients out of 80 developed biliary peritonitis due to possible ductal injury, and were managed by Morrison pouch drain. [Table 6 & Graph 6]

All the patients who manifested with biliary peritonitis in post operative period whether in 4 PORT or 3 PORT were managed as per the protocol as::

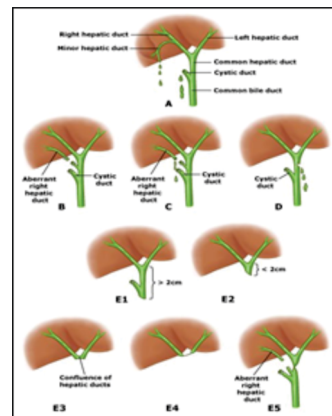
1. Diagnostic paracentesis to confirm biliary peritonitis
2. USG Scan for follow up
- A) State of CBD with regards to dilatation or abrupt cut or missed CBD stone.
- B) Amount and site of biliary collection.
- C) USG guided drain insertion in morrison pouch
3. If indicated (Biliary leakage persists >72 hrs as shown by persistent drain output) ERCP to be done with CBD stenting.

None of our patients had ERCP Requirement.

We used Strasberg's classification for bile duct injury in our study.

*** Strasberg's classification**

- A—Cystic duct leak or leak from small ducts in the liver bed
- B—Aberrant right hepatic duct with occlusion
- C—Aberrant right hepatic duct with open drainage
- D—Lateral injuries to the extrahepatic duct with open drainage
- E—Circumferential injuries of CBD at various levels
- E1—Transection >2 cm from the confluence
- E2—Transection <2 cm from the confluence
- E3—Transection at the confluence
- E4—Separation of major ducts in the confluence
- E5—Complete occlusion of all bile ducts.



In case of the 3 PORT the mean hospital stay was 2.70 days. In case of 4 PORT the mean hospital stay was 2.86 days. That is in both groups there was no significant difference in hospital stay. [Table 7 & Graph 7]

Using Subjective satisfaction score, in case of the 3 PORT cosmesis score on day 8 was 7.94. In case of 4 PORT the mean cosmesis score on day 8 was 7.34. That is the cosmesis was significantly better in 3 PORT than 4 PORT.

Variable	3 PORT	4 PORT	P value	
Relationship between patient with operative time in the 3 PORT and 4 PORT	Time Up to Removal of GB (in min.)	12.57±7.4	13.78±8.5	Not significant
Comparison of the mean of pain score of 1 st and 2 nd day in the 3 PORT & 4 PORT based on visual analogue scale	1 st day pain score	2.63±0.51	4.22±0.75	<0.0001
	2 nd day pain score	1.56±0.49	1.89±0.59	<0.0001
Comparison of the per operative complications	Vascular injury	0 (0.00%)	0 (0.00%)	<0.0001
Comparison of the post operative complication	Ductal injury	3 (3.75%)	2 (2.50)	<0.0001
	Seroma formation	4 (5.00%)	6 (7.5%)	<0.0001
	Biliary peritonitis	2 (2.5%)	2(2.5%)	<0.0001
Comparison of the hospital stay 3 PORT & 4 PORT	Mean Hospital Stay	2.40±1.01	2.74+1.23	<0.3470
Comparison of the Cosmesis in 3 PORT & 4 PORT based on subjective satisfaction score	Mean cosmesis	7.94±0.74	7.34+0.80	<0.0241

Comparison of symptoms distribution in 3 PORT and 4 PORT	Right upper quadrant pain	16	14
	Epigastric discomfort	9	8
Comparison of incidence of single/multiple stone in 3 PORT and 4 PORT	Single	8	10
	Multiple	68	65

DISCUSSION:

In our study the most common age group was 31-50 years in three port group and 31-50 years in four port group ($p > 0.05$), which is almost similar to Manoj Kumar et al who found the mean age to be 38.7 ± 13.7 in 3port and 39.13 ± 14.1 in 4 port group. Similar results were reported by Dhafir Al-Azawi et al, HS Harsha et al in 2013 and PK sharma et al who all found the most common age group to be 31- 50 yrs in both the groups.

Female to male ratio in our study was 3.75:1 in 3 port and 3:1 in 4 port groups, which is almost similar to Dhafir Al-Azawi et al who reported the female male sex ratio to be 4:1 in both the groups whereas M Kumar et al found the sex ratio to be 5:1 in 3 port group and 4:1 in 4 port group.

Routine laboratory investigations were done in all the cases. However no statistically significant difference was found between the two groups (p value > 0.05)

Additional port was required in 1 patients in three port group. However there was no need of additional port in any patient in four port group ($p=0.495$).

Subhepatic drain was placed in 3(3.75) patients in three port group and 2(2.5) patients in four port group because of difficult dissection in view of adhesions and gallbladder perforation during surgery leading to spillage of bile and stones. ($p=1$).

1 patients was converted to open in three port group and no patient in four port group. Total 8 patients, 4 from each group had difficulty in dissection of gall bladder bed, resulting in bleeding from liver bed, the bleeding was controlled by using diathermy and pressure gauge and post-operative period was uneventful. Nafeh A I et al and Slim K et al also reported similar results in their studies.

None of the patient in our study group has jaundice, port site bleeding, port site hematoma, port site hernia.

The mean operative time in three port 12.47 ± 7.53 minutes and in four port group 13.78 ± 8.92 minutes ($p > 0.05$). Similar results were reported by Nafeh A I et al.

In our study there is no significant difference in hospital stay in 3 PORT as compared to 4 PORT (3 PORT 2.40 ± 1.01 vs 4 PORT 2.74 ± 1.23 , $p=0.3470$). Laparoscopic cholecystectomy is a day care surgery and the patient can be discharged in a day. But in our study the time was beyond 48 hrs as the patient population catered was from a rural background so the discharge was postponed for their satisfaction. In study by M Kumar et al, mean postoperative stay in the hospital was 1.19 vs 1.44 ($P=0.39$) in the 3- and 4-port groups.

The mean visual analogue score for pain on postoperative days was 2.63 ± 0.51 on day one, 1.56 ± 0.49 on day two in the three port group and 4.22 ± 0.75 on day 1, 1.89 ± 0.59 on day 2 in four port group ($P < 0.05$). Manoj Kumar et al reported that the VAS score was significantly low in three port group. The average analgesia required was 0.73 doses in three port group and 1.36 doses in four port group (one dose = 75mg of diclofenac sodium given i/m), the difference was statistically significant ($P < 0.05$). These results were comparable with the results reported by Dion Y M et al.

Cosmesis was assessed by the subjective satisfaction score

based on size of the surgical scars and the number of scars. Patients in both the groups were operated laparoscopically, however in three port group there was one less scar than four port group. Average(range) scar size was 4 mm scar (3.5–5.5 mm) at 5 mm port and 11 mm scar (9–11 mm) at the epigastric port area, the umbilical scar was not seen. The three-port technique is as safe as the standard four-port laparoscopic cholecystectomy in experienced hands.

CONCLUSION:

We concluded that the use of three ports in LC did not significantly affect the

- Procedure's safety,
- Conversion rate,
- Operating time when used in AC and CC.

The introduction of the three-port technique, which is still in routine practice in our institute, has the following advantages

- Need of fewer painkillers
- Shorter hospital stays
- Fewer scars
- Cost effective

So 3 port lap cholecystectomy can be advocated to be better than the 4 port technique but especially in experienced hands.

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