CONVENTIONAL VERSUS TWO PORTS PLUS ONE PUNCTURE LAPAROSCOPIC CHOLECYSTECTOMY

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A protocol submitted in partial fulfillment of the requirement for the Degree of Dr.Med.Sc. (General Surgery) Defence Services Medical Academy, Yangon

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1. INTRODUCTION

1.1 Background Information

Gallstones are a major cause of morbidity in Western countries, with an estimated incidence of symptomatic gallstones of 2.2 per 1,000 individuals or an estimated 6.3 million men and 14.2 million women aged 20 to 74 years in the United States (US). Although the majority of gallstones remain asymptomatic, approximately one third eventually cause symptoms and complications. In the US, approximately 700,000 cholecystectomies are performed each year to treat symptomatic gallstones. Ninety-eight per cent of all gallbladder and biliary tract disorders are related to cholelithiasis and gallstone-related complications are responsible for 3,000 deaths per year (0.12% of all deaths). Medical expenses related to the symptoms and complications of gallstones currently exceed $6.5 billion USD per year. Cholelithiasis, with cholecystitis, is the most common principle gastrointestinal diagnosis for inpatients in the US. Furthermore, an association exists between the incidence of cholelithiasis and gallbladder cancer. The development of gallbladder cancer is believed to be linked with the chronic irritation of the gallbladder mucosa which can result from cholelithiasis, leading to malignant transformation or promotion of carcinogenic agents (American College of Surgeons, 2012).

Surgical treatment of symptomatic gallstones was initially conducted via open cholecystectomy, which was first undertaken in the 1880s and typically involved a single 10 to 18 cm incision. However, since the 1970s small incision open cholecystectomy has been used whereby the incision is typically less than 8 cm. Laparoscopic cholecystectomy (LC) was first undertaken by Philippe Mouret in France in 1987 and is now the standard procedure for gallbladder removal and the most commonly performed laparoscopic surgical procedure in the world (American College of Surgeons, 2012).

Since the first LC in 1987, LC raised concern about the risk of bile duct injury despite its advantages over open cholecystectomy with respect to cosmesis, postoperative pain, length of postoperative hospital stay, and return to normal activity. Not until 1992, a consensus development conference entitled “Gallstones and Laparoscopic Cholecystectomy” organized by the National Institutes of Health

approved LC as a safe and effective treatment for patients with symptomatic cholelithiasis. Subsequently, large-scale studies reaffirmed LC as the new gold standard for benign gallbladder diseases. Thereafter, LC has been a cornerstone for the treatment of benign gallbladder diseases. Conventional laparoscopic cholecystectomy (CLC) typically uses four small incisions to allow the insertion of operating ports through which a camera and instruments gain entry (Sang et al, 2014).

CLC has been the standard of treatment for symptomatic cholelithiasis, since the verification of its safety and feasibility in 1992. Though three ports LC was introduced thereafter, it could not replace CLC completely due to limited evidence. In CLC, the critical view of safety is best ensured by three instruments, which enable both attainment of sufficient operative vision and bimanual manipulation. However, as the number of incisions for ports increases, the potential risks of port-related complications also can increase. Furthermore, as patients have growing awareness of the quality of life, there has been an increase in demand for cosmesis (Sang et al, 2014).

Since the introduction of laparoscopic cholecystectomy in 1987, continuous trials for less invasive approaches by reducing the number and size of the ports have been attempted by many researchers. Reduced port laparoscopic surgery (RPLS) is a recent concept that indicates a laparoscopic surgery aiming at both reducing the number of ports and reducing the diameter of the port. Reducing the number of ports means not only reducing the number of ports inserted to the abdominal cavity, but reducing the number of skin incision by collecting a couple of ports to one incision (Toshiyuki et al, 2014).

In this context single incision laparoscopic cholecystectomy (SILC) was introduced by Navarra et al. in 1997. However, this technique had spread slowly until 2008 due to technical problems and the requirement for highly developed surgical skill. Although this technique has become more attractive with an improvement in skills and the development of new devices in recent years, it still has some problems such as repeated conflict between operating instruments; a lack of proprioception induced by the crossing of instruments, and consequently reduced visualization of key components of a cholecystectomy. These problems can increase the risk of bile duct injuries during SILC (Tae-Seok et al, 2016). It can be attributed to the difficulties in securing “critical view of safety”, a clear view of the structures including cystic duct, common bile duct, and liver during dissection in SILC; parallel instrumental

alignment and loss of triangular retraction hinder the critical view of safety in the single-port LC. Therefore, single-port LC is considered to be appropriate not for all patients with benign gallbladder diseases, but for selected patients without significant inflammation (Sang et al, 2014).

Bile duct injury is a serious complication which threatens the patient's safety. To minimize it, complete exposure and dissection of 'the critical view of safety' is strongly recommended before clipping or dividing the cystic structures. The critical view is best ensured by using 3 instruments, which enables both attainment of sufficient operative vision and bimanual manipulation. While dissecting during fewer port number and smaller size procedures, the ‘best practice’ approaches recommended for multiport cholecystectomy, including dynamic traction of the fundus of the gallbladder, dynamic lateral retraction of the gallbladder infundibulum, and identification and maintenance of the ‘critical view’ of the cystic duct and artery to avoid inadvertent injury to the common bile duct or hepatic arteries, should be followed (Ayman et al, 2013). Many researchers reported two ports LC can provide the critical view of safety conveniently, can maintain the principles of laparoscopic triangulation, and can preserve the fundamentals of laparoscopy such as operating ergonomics, surgical dexterity, and visualization of the surgical field (Adrian et al, 2013). According to the systematic review two ports LC; the two most common methods of two ports LC involve the insertion of two ports at umbilical and epigastric region and gallbladder anchorage with one or two percutaneous sutures, or gallbladder suspension with a needle grasper (Sreenivas et al, 2016).

Sutures are introduced in the abdominal cavity from a different site and the tissue is pierced, and then the sutures are retrieved through the abdominal wall. By pulling the thread outside, the tissue is retracted. Although some surgeons advocate this technique, it is cumbersome and sometimes causes bile spillage in laparoscopic cholecystectomy. Gadgets that measure 1.6-3 mm in caliber, including pre-tied loop, wire snare, and a needle grasper can be independently inserted elsewhere as in standard laparoscopic operations and used for tissue retraction (Toshiyuki et al, 2014).

There have been a number of modifications in the technique of laparoscopic cholecystectomy. Among them, a new technique utilizing a needle grasper held in the surgeon’s left hand is developed. Two ports LC assisted needle grasper technique successfully reduce port numbers compared to conventional laparoscopic cholecystectomy while maintaining equivalent surgical outcomes in terms of

operative time, open conversion rate, incidence of complications, requirement of total analgesics, and length of postoperative hospital stay. This technique overcame the challenging and technical difficulty of SILC alone. Two ports LC assisted needle grasper satisfies both safety and feasibility while improving cosmetic effect and become as an alternative to conventional laparoscopic cholecystectomy in benign gallbladder diseases (Sang et al, 2014).

1.2 Problem Statement

Laparoscopic cholecystectomy (LC) is the gold standard of treatment compared to the open procedure offering reduced hospital stay, rapid mobilization, excellent cosmetic effect, rare wound complications and rapid return to normal lifestyle. Laparoscopic cholecystectomy was the first surgical procedure to gain wide acceptance among patients and doctors, for reasons quite different from improvement in morbidity and mortality. Laparoscopic cholecystectomy is the procedure of choice for the vast majority of candidates. However, in 2-5% of them, the laparoscopic procedure is converted to laparotomy. Conversion may be due to intraoperative bleeding or other iatrogenic complication (intestinal, common bile duct injury) or elective when the surgeon encounters an unacceptable risk in proceeding with dissection at the Calot's triangle due to inflammatory tissue changes. The causes of conversion in other studies included dense adhesions obscuring critical view of Calot's triangle, biliary injury and instrument factors. The overall intra operative complication rate was 4.76% including bile duct injury. Regarding the mortality rate, there was no mortality after laparoscopic cholecystectomy. No other international and Myanmar studies regarding laparoscopic cholecystectomy mentioned any mortality in their series (Nyi Nyi Swe, 2014).

With the technical improvement and development of new instruments, single incision laparoscopic cholecystectomy (SILC) has been commonly performed for benign gallbladder disease such as gallbladder stone. SILC has the advantage of less invasiveness in comparison with CLC, which requires 4 incisions. However, this procedure is technically more difficult in comparison with CLC due to the limited motion of the working instruments, limited triangulation, and repeated confliction between working instruments. These problems lead to inadequate traction of the gallbladder during dissection of Calot's triangle and obtaining "critical view of safety" (CVS). For these reasons, concerns about biliary complication continue to be active subjects of debate, and previous studies that reported on the safety and feasibility of SILC were mostly confined to selective patients with exclusion criteria such as acute cholecystitis, obese patients, history of previous abdominal surgery, and so on (Cheon et al, 2015).

To prevent the bile duct injuries, "critical view of safety" (CVS) technique was first introduced in 1995 by Strasberg et al. and this technique has been adopted

widely by surgeons around the world for performance of laparoscopic cholecystectomy. To attain CVS, the triangle of Calot must be dissected free of fat and fibrous tissue, and the base of the gallbladder be separated from the cystic plate. Consequently, two, and only 2, structures should be entering the gallbladder, and these can be seen circumferentially (Strasberg et al, 2010).

Laparoscopic cholecystectomy is now the procedure of choice in all the gall bladder diseases and there is increase in the skills of surgeons with newer equipment. Two ports laparoscopic cholecystectomy is rarely performed as it demands greater expertise and skills. Also this technique is less expensive and less scar formation than conventional laparoscopic cholecystectomy (Nasir et al, 2018). Various techniques such as clipping, suture traction and grasper traction have been introduced by many groups to solve the problems of some new techniques of laparoscopic cholecystectomy, through the adequate traction of the gallbladder, and to attain CVS more safely. For the same reasons, alligator graspers (Minilap Grasper) have been used in many studies. Most of studies reported that alligator grasper assisted two ports laparoscopic cholecystectomy has the safety and feasibility for the treatment of patients with benign gallbladder disease through a comparison with experiences of conventional laparoscopic cholecystectomy (CLC). This technique could maintain the critical view of safety throughout the procedure. It also enables the operator to perform cholecystectomy using bimanual manipulation with stable inter-instrumental angle (Sang et al, 2014).

Single port laparoscopic cholecystectomy offers more cosmetic benefits, but clashes of forceps during operation & extraction of specimen is difficult. Two port techniques can overcome the difficulties in extraction of larger stones & specimen. Then consideration of advantages like small incision, less pain, faster return to activity, shorter hospital stay, decreased total cost and low morbidity laparoscopic cholecystectomy can be safely performed by two ports technique (Nasir et al, 2018). The phenomenon of reduced pain due to reduced number and sizes of the ports has been established by researchers such as Cheah et al. and Bisgaard et al. There were no reported complications at the needle puncture sites in the abdominal wall in any of the patients undergoing needle grasper assisted two ports laparoscopic cholecystectomy (Ranendra et al, 2016). Two ports laparoscopic cholecystectomy is equally effective and safer as compared to conventional laparoscopic cholecystectomy and post-

operative analgesia requirement was also less in two ports technique (Kumar et al, 2017).

Two ports LC has gained increased attention owing to its potential to improve the benefits of laparoscopic surgery, such as decreased postoperative pain, a more rapid return to normal activity, and an improved cosmetic outcome. Also two ports LC become much easier due to restoration of triangulation, learning curve becomes shorter, cause minimal violation of anterior abdomen leading to lesser postoperative pain and cosmesis is comparable. Since the first report describing two ports laparoscopic cholecystectomy in 1995, many new techniques and types of instrumentation have been reported. With the new techniques, the need for more sophisticated instruments escalates the cost of surgery and limits the use of these invasive techniques. A new technique utilizing a 2.3 mm alligator grasper held in the surgeon's left hand was developed and alligator grasper assisted two ports LC scores over conventional techniques as it requires minimal new instruments and can be performed at all laparoscopic centres without any new cost inputs, and simultaneously achieve the goal of minimal access surgery (Sreenivas et al, 2016).

Among the different types of laparoscopic cholecystectomy, two ports laparoscopic cholecystectomy using two conventional ports in unbilical and epigastric region assisted by 2.3 mm alligator grasper is also useful and popular. This novel technique is also called two ports plus one puncture laparoscopic cholecystectomy (TPPOP LC) (Vivek et al, 2014). Therefore this study is designed to observe the postoperative outcomes of two ports plus one puncture laparoscopic cholecystectomy.

1.3 Justification

Cholecystectomy is one of the most common elective operations in No.(1) Military Hospital (700 bedded) Pyin Oo Lwin. In 2018, 145 cholecystectomies were done (1/700 MH OT-Registry, 2018). Almost all cholecystectomies were done by conventional laparoscopic technique. Laparoscopic cholecystectomy has rapidly replaced open cholecystectomy as a standard treatment of symptomatic gall stones.

Conventional laparoscopic cholecystectomy is still gold standard procedure, but it still has chance of complications like wound infection, pain, bleeding and injury to nearby structures such as bile duct, bowel or liver. Among these injuries, bile duct injury is common and the percentage is 1% to 2%. The rate of open conversion from CLC is less than 1% (Sreenivas et al, 2016).

Two ports plus one puncture laparoscopic cholecystectomy is also acceptable procedure but it can carry longer operation. The percentage of bile duct injury is 1% to 3%. The conversion rate to conventional procedure is about 5.45% and to open procedure is about 0.18% (Sreenivas et al, 2016). Recent studies demonstrated two ports laparoscopic cholecystectomy using 2.3 mm alligator grasper has acceptable outcome. The main advantages of this two ports LC can be performed safely, principle as the previous conventional technique, reduce number of port, less painful, better for specimen delivery, higher cosmesis with shorter hospital stay (Nasir et al, 2018). Two ports laparoscopic cholecystectomy using conventional umbilical and epigastric ports assisted by 2.3mm alligator grasper may be the method of choice when considering laparoscopic cholecystectomy on a day-case basis due to early recovery.

Therefore, the key question about two ports plus one puncture laparoscopic cholecystectomy (TPPOP LC) is whether it provides a significant advantage over conventional laparoscopic cholecystectomy technique (CLC) now in use. There is no such comparative study in Military Hospitals and Myanmar yet.

So this study will compare the outcomes between conventional laparoscopic cholecystectomy (CLC) and two ports plus one puncture laparoscopic cholecystectomy (TPPOP LC). It may also help to find out safe and effective treatment options for symptomatic gallstones patients.

2. LITERATURE REVIEW

Gallstones are a major cause of morbidity in Western countries, with an estimated incidence of symptomatic gallstones of 2.2 per 1,000 individuals, or an estimated 6.3 million men and 14.2 million women aged 20 to 74 years, and approximately 700,000 cholecystectomies are performed each year to treat symptomatic gallstones in the United States. 98% of all gallbladder and biliary tract disorders are related to cholelithiasis, and gallstone-related complications are responsible for 3,000 deaths per year (0.12% of all deaths). Cholelithiasis is linked to gallbladder cancer, as chronic irritation of the gallbladder mucosa can lead to malignant transformation or the promotion of carcinogenic agents (American College of Surgeons, 2012).

Open cholecystectomy was the first surgical procedure used to treat symptomatic gallstones, and it was first performed in the 1880s. Since its introduction by Philippe Mouret in France in 1987, laparoscopic cholecystectomy has become the most common and frequently performed laparoscopic operation globally. Since 1987, many investigators have conducted ongoing study using fewer and smaller ports in an effort to use fewer invasive procedures. By combining many ports into a single incision, fewer ports will be used overall, which will also result in fewer skin incisions overall (American College of Surgeons, 2012).

Since the first LC in 1987, LC raised concern about the risk of bile duct injury despite its advantages over open cholecystectomy with respect to cosmesis, postoperative pain, length of postoperative hospital stay, and return to normal activity. Not until 1992, a consensus development conference entitled “Gallstones and Laparoscopic Cholecystectomy” organized by the National Institutes of Health approved LC as a safe and effective treatment for patients with symptomatic cholelithiasis. Subsequently, large-scale studies reaffirmed LC as the new gold standard for benign gallbladder diseases. Thereafter, LC has been a cornerstone for the treatment of benign gallbladder diseases. Conventional laparoscopic cholecystectomy (CLC) typically uses four small incisions to allow the insertion of operating ports through which a camera and instruments gain entry (Sang et al, 2014).

CLC has been the standard of treatment for symptomatic cholelithiasis, since the verification of its safety and feasibility in 1992. Though three ports LC was introduced thereafter, it could not replace CLC completely due to limited evidence. In

CLC, the critical view of safety is best ensured by three instruments, which enable both attainment of sufficient operative vision and bimanual manipulation. However, as the number of incisions for ports increases, the potential risks of port-related complications also can increase. Furthermore, as patients have growing awareness of the quality of life, there has been an increase in demand for cosmesis (Sang et al, 2014).

Since the introduction of single incision laparoscopic cholecystectomy (SILC) in 1997, there has been an increase in the risk of bile duct injury during this procedure due to the frequent conflict between laparoscopic instruments. Therefore, SILC is considered appropriate not for all patients with benign gallbladder diseases, but for selected patients without significant inflammation (Toshiyuki et al, 2014).

Bile duct injury is a serious complication which threatens the patient's safety. To minimize it, complete exposure and dissection of 'the critical view of safety' is strongly recommended before clipping or dividing the cystic structures. The critical view is best ensured by using 3 instruments, which enables both attainment of sufficient operative vision and bimanual manipulation. While dissecting during fewer port number and smaller size procedures, the ‘best practice’ approaches recommended for multiport cholecystectomy, including dynamic traction of the fundus of the gallbladder, dynamic lateral retraction of the gallbladder infundibulum, and identification and maintenance of the ‘critical view’ of the cystic duct and artery to avoid inadvertent injury to the common bile duct or hepatic arteries, should be followed (Ayman et al, 2013). Many researchers reported two ports LC can provide the critical view of safety conveniently, can maintain the principles of laparoscopic triangulation, and can preserve the fundamentals of laparoscopy such as operating ergonomics, surgical dexterity, and visualization of the surgical field (Adrian et al, 2013). According to the systematic review two ports LC; the two most common methods of two ports LC involve the insertion of two ports at umbilical and epigastric region and gallbladder anchorage with one or two percutaneous sutures, or gallbladder suspension with a needle grasper (Sreenivas et al, 2016).

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3. AIM AND OBJECTIVES

3.1 Aim

To compare clinical outcomes of conventional laparoscopic cholecystectomy (CLC) and two ports plus one puncture laparoscopic cholecystectomy (TPPOP LC).

3.2 Objectives

1. To compare the operation time between conventional laparoscopic cholecystectomy (CLC) and two ports plus one puncture laparoscopic cholecystectomy (TPPOP LC)
2. To compare the intraoperative complications of both study groups.
3. To compare the conversion rate of both study groups.
4. To compare the postoperative complications, postoperative pain, postoperative hospital stay of both study groups.

3.3 Hypothesis

Two ports plus one puncture laparoscopic cholecystectomy (TPPOP LC) is as safe and effective as conventional laparoscopic cholecystectomy (CLC).

4. RESEARCH METHODOLOGY

4.1 Study Design

Hospital based open labeled randomized control study

4.2 Study Population

All patients with symptomatic gall stones who will be treated by laparoscopic cholecystectomy

4.3 Study Area

Surgical ward of No.(1) Military Hospital (700 bedded), Pyin Oo Lwin

4.4 Study Period

This study will be carried out from December 2019 to December 2021.

4.5 Sample size determination

Target population of this study is patients with symptomatic gall stones requiring laparoscopic cholecystectomy and it will be carried out in surgical wards of No. (1) Military Hospital (700 bedded). The minimal required sample size can be calculated as follow;

$$n = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 (\sigma_1^2 + \sigma_2^2)}{(\mu_1 - \mu_2)^2}$$ (Lwanga S.K. & Lemeshow S., 1993)

n= minimum required sample size

For 95% confidence level, $Z_{1-\alpha/2}$ = 1.96 (for two sided)

For power 80%, $Z_{1-\beta}$ = 0.84

μ_1 = 2.85 (Analgesic need after CLC) (Sreenivas et al, 2016)

μ_2 = 2.31 (Analgesic need after TPPOP LC) (Sreenivas et al, 2016)

σ_1 = 0.79

σ_2 = 1.02

n = 44

After adding 10% drop out

n_1 = 49

The minimum required sample size will be 49 in each group, 98 in total.

By receiving the hospital statistics, patients who was treated by laparoscopic cholecystectomy were about 150 patients a year in No.(1) Military Hospital (700 bedded) Pyin Oo Lwin. So the require sample size can be met within the study period.

4.6 Sampling method and procedure

The patients will be selected according to the following criteria:

4.6.1 Inclusion Criteria

All patients with symptomatic gall stones who will be treated by laparoscopic cholecystectomy.

4.6.2 Exclusion Criteria

4.6.2.1 Patients with ASA III, IV & V

4.6.2.2 Previous upper abdominal surgery

4.6.2.3 Patients with common bile duct pathology

4.6.2.4 Patients with clinical or USG suspected gall bladder cancer

4.6.2.5 Patients with bleeding disorders

4.6.3 Randomization procedure

Randomization will be done by block design in this study. The patients will be enrolled into the study according to inclusion and exclusion criteria. Then they will be randomized by block randomization method. For sample size of 98 in total, there will be 10 blocks, each having 10 patients. In each block with 10 cases, two methods will be allocated in random order. Random block design will be generated by using Graphpad Prism Software. The first case will be allocated into one block by envelope method. Then following 9 cases will go into the same block in order. After completing one block, the same procedure will be done for another block for 10 patients. The blocks used for this randomization is shown below.

	1	2	3	4	5	6	7	8	9	10
Block1	A	A	B	B	B	A	A	B	A	B
Block2	A	B	B	A	B	B	A	B	A	A
Block3	A	A	B	B	A	B	B	A	A	B
Block4	B	A	A	B	B	A	A	B	B	A
Block5	B	A	B	A	A	A	B	B	A	B
Block6	B	B	A	B	B	A	A	A	B	A
Block7	A	A	B	A	A	B	A	B	B	B
Block8	A	B	A	B	B	B	A	B	A	A
Block9	B	A	B	A	A	B	B	A	A	B
Block10	B	B	A	A	B	A	B	A	B	A

Method A : Conventional laparoscopic cholecystectomy (CLC)

Method B : Two ports plus one puncture laparoscopic cholecystectomy (TPPOP LC)

4.7 Research procedure

4.7.1 Patient selection and data collection

The study population will include those patients with symptomatic gall stones who will be treated by laparoscopic cholecystectomy in No.(1) Military Hospital (700 bedded) and will not be met the exclusion criteria. Complete history will be taken including patient's identification, presenting symptoms, past medical and past surgical history. Thorough physical examination including general and abdominal examination will be performed. Investigations including liver function test, complete blood picture, urea, creatinine, viral serology for preoperative assessment will be done. Abdominal sonography will be carried out. The results will be recorded in the proforma.

After selection of the patients by inclusion and exclusion criteria, eligible patients will be counseled by the author about nature of disease, type of operation to be performed and possible complications. If the patient agrees to participate, a written informed consent will be obtained. The participants will be randomly allocated by block randomization method. Method A conventional laparoscopic cholecystectomy (CLC) will be done for control group and Method B two ports plus one puncture laparoscopic cholecystectomy (TPPOP LC) will be done for study group.

4.7.2 Preoperative preparation

The patients will be reviewed by anesthetist for preoperative assessment. General anesthesia will be required for both types of procedure. All patients will be entailed fasting for 6 hours. Prophylactic antibiotics will be given as intravenous ceftriaxone 1G at induction of anesthesia in both methods. If the patient has cephalosporin hypersensitivity, fluroquinolones group like levofloxacin 500mg will be given. A nasogastric tube will be inserted at induction of anaesthesia to decompress the stomach in both study groups. The patient will be asked to void urine immediately prior to surgery. The patient will be placed in supine position in both study groups **(Fig 10)**. The entire abdomen will be cleaned and draped in standard sterile fashion.

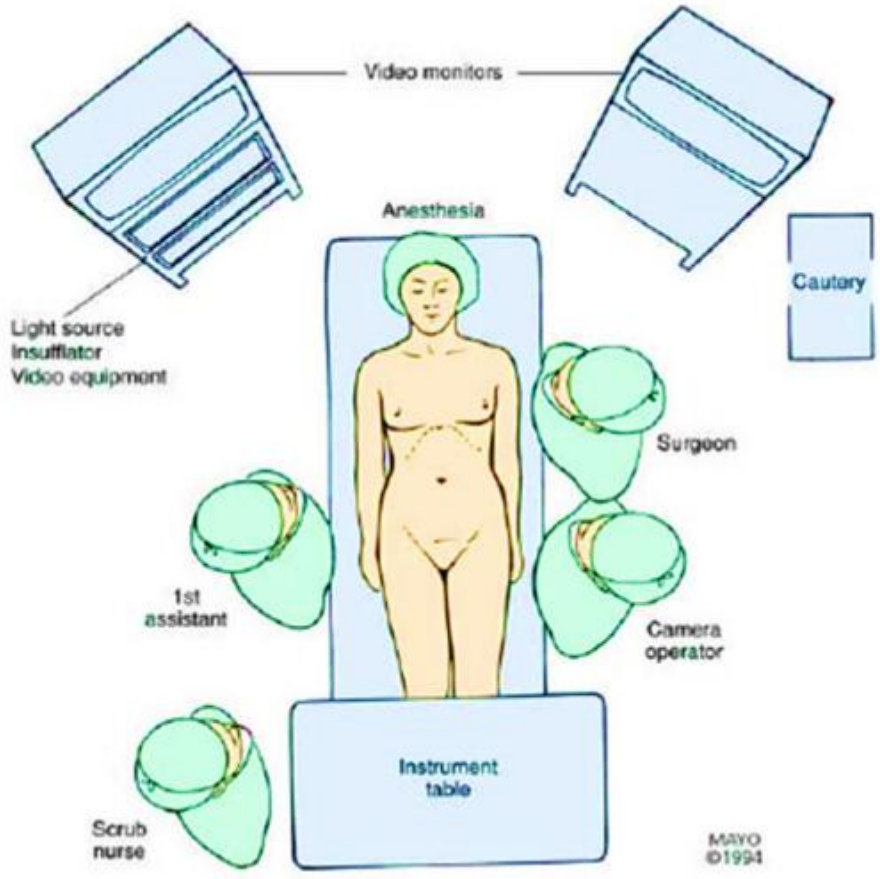

Figure 10. Operation table set up for laparoscopic cholecystectomy (Kumar et al, 2017)

4.7.3 Apparatus and instruments

These will include laparoscopic 30˚telescope, video camera, camera control unit, light source, HD monitor, rapid flow insufflator, electro surgical unit, suction irrigation device and trocars (two 10 mm trocars and two 5 mm trocars for CLC and one 10 mm trocar, one 5 mm trocar for TPPOP LC), laparoscopic instruments, 2.3 mm alligator grasper, 5mm clip applier and specimen retrieval bags **(Fig 11 & 12)**.

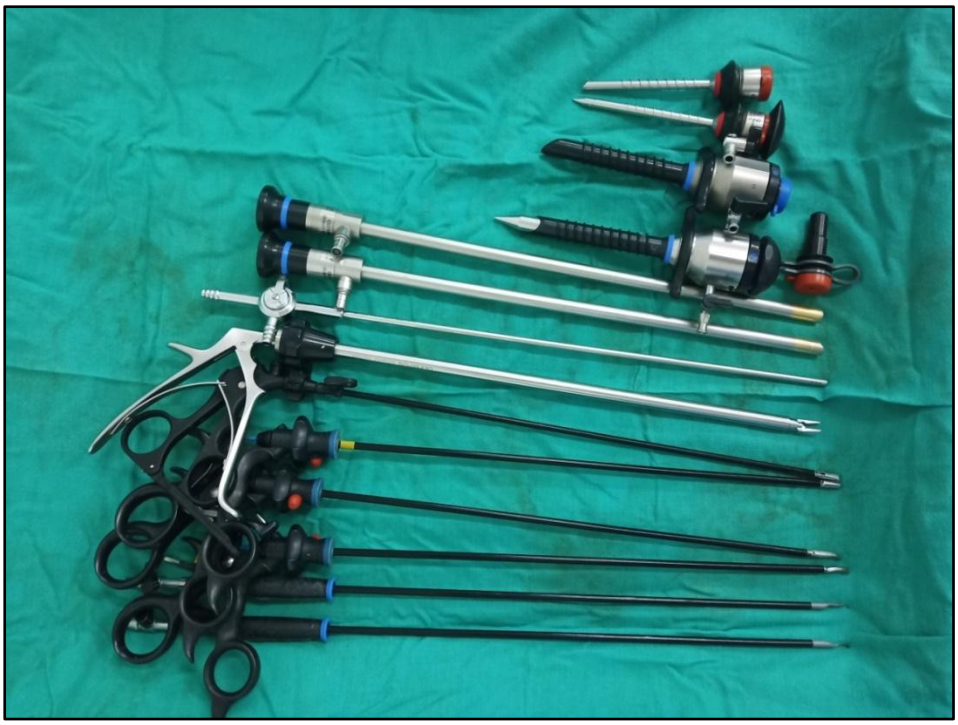

Figure 11. Laparoscopic instruments and apparatus for CLC

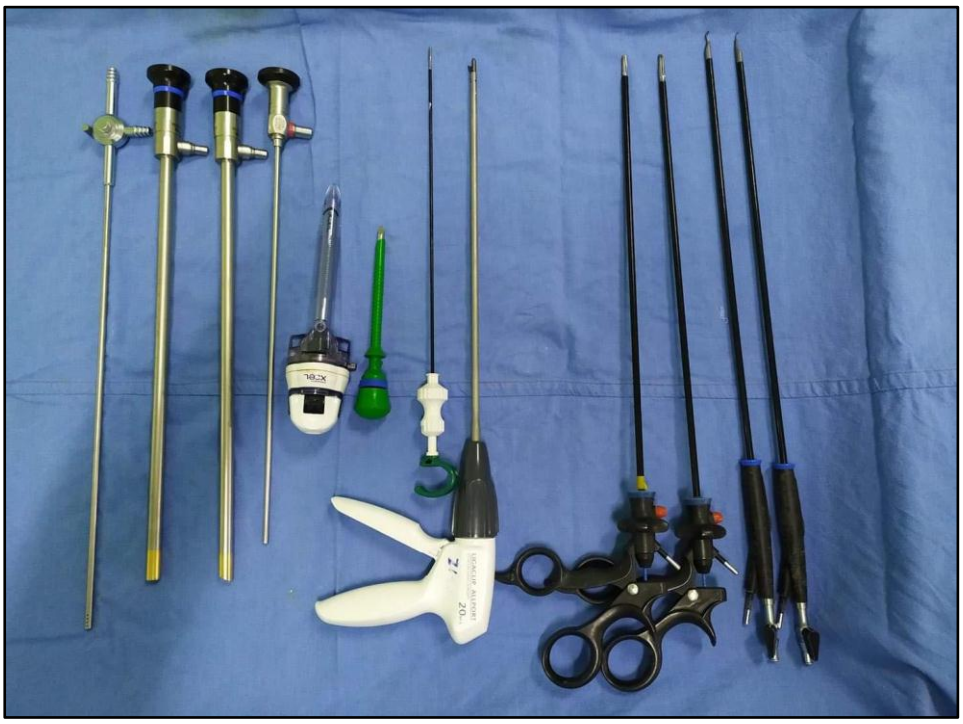

Figure 12. Laparoscopic instruments and apparatus for TPPOP LC

4.7.4 Procedures in conventional laparoscopic cholecystectomy

Step 1. A 10 mm subumbilical incision will be made and the first 10 mm trocar will be introduced by open Hasson technique **(Fig 13)**.

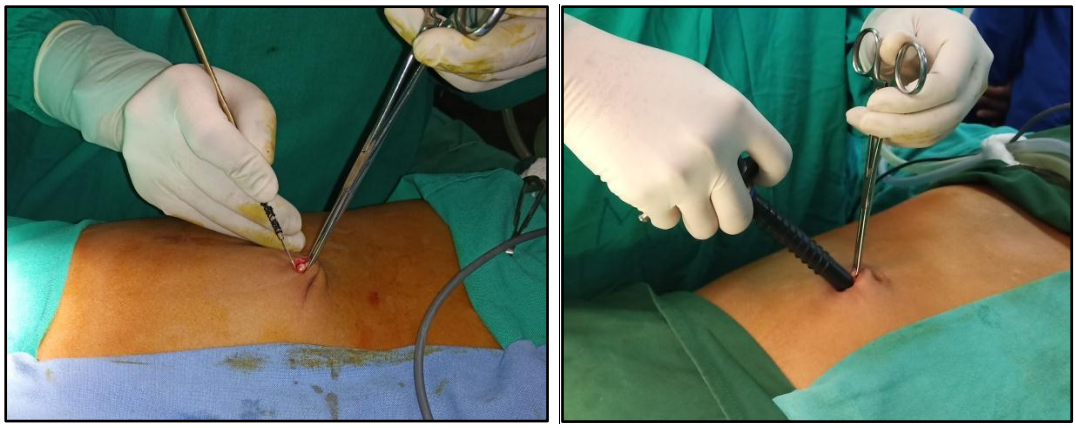

Figure 13. Insufflation with open Hasson technique

Step 2. Carbon dioxide pneumoperitoneum will be created and maintain at 12 mm Hg. Video telescope will be inserted from subumbilical port and will assess the pathological site and the visible portion of the whole intra-abdominal organs.

Step 3. The patient will be placed in reverse Trendelenburg position and the operation table will be tilted 15˚ left laterally. Three other working ports will be inserted under vision via video scope. Another 10 mm trocar will be placed in the subxiphoid epigastric region, a 5 mm trocar will be placed in the right subcostal midclavicular line, and another 5 mm trocar will be placed in the right subcostal anterior axillary line location **(Fig 14)**.

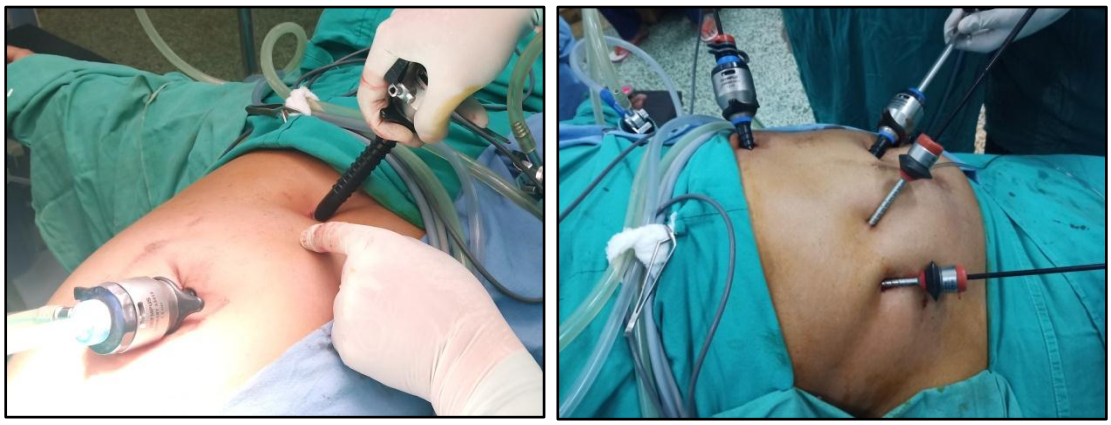

Figure 14. Trocars placement for conventional laparoscopic cholecystectomy

Step 4. The fundus of the gallbladder will be grasped with a non-traumatic forceps and pushed upwards and cranially to get good exposure. Calot's triangle will be displayed. Then cystic duct, cystic artery, common hepatic duct and common bile duct will be identified **(Fig 15)**.

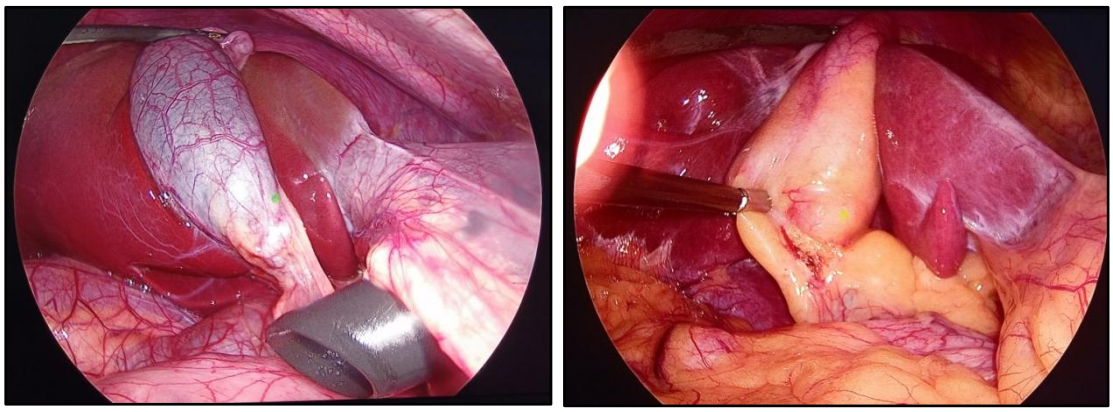

Figure 15. Grasping fundus and hartmann's pouch of gallbladder by conventional graspers

Step 5. A Maryland dissector will be used to clear the peritoneum over the infundibulum and cystic duct. The cystic duct will be clearly identified as it exits the infundibulum of the gallbladder and traverses toward the common bile duct. Once the peritoneum overlying the cystic duct is opened, the cystic duct will be cleared of its adventitial attachments circumferentially. Retracting the infundibulum toward the patient's left facilitates dissection of the lateral side of the cystic duct. The infundibulum will be again retracted to the patient's right and the triangle of Calot will be entered. An adequate segment of cystic duct will be cleared. Then cystic duct will be divided between haemoclips **(Fig 16)**.

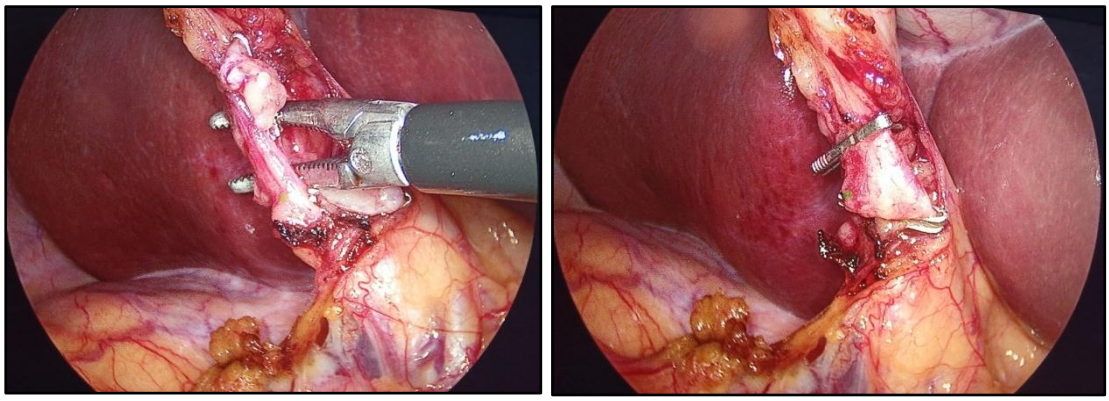

Figure 16. Dissection of cystic duct and cystic artery

Step 6. The cystic artery will be identified and cleared of surrounding attachments. When this has been verified, the cystic artery will be divided in continuity between clips.

Step 7. The infundibulum of the gallbladder will be retracted anteriorly allowing the gallbladder to be dissected from the liver bed using cautery and blunt or sharp dissection **(Fig 17)**.

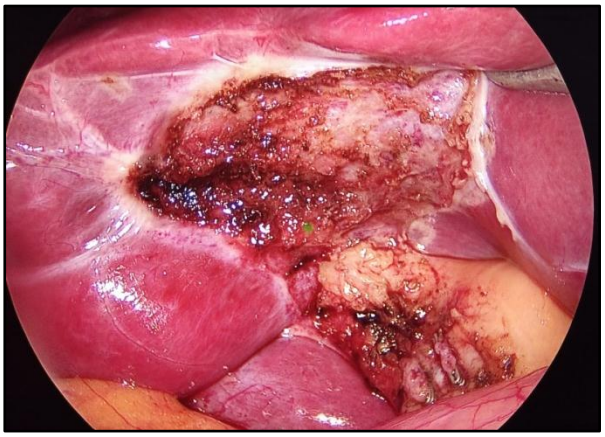

Figure 17. Liver bed after gallbladder dissection

Step 8. Then gallbladder will be placed into a specimen retrieval bag and removed through the subxiphoid port. If the gallbladder is exceedingly large, full of gallstones, or contains large stones, it may not be possible to safely remove the gallbladder. Options include crushing the stones inside the gallbladder with a clamp, removing many stones/stone fragments to help decompress the gallbladder, and/or enlarging the port incision **(Fig 18)**.

Figure 18. Gallbladder specimen with multiple gallstones

Step 9. Once the gallbladder is removed, the liver bed will be examined to be sure there is no bleeding or bile leakage.

Step 10. Two 10 mm incisions will be closed at the fascial level with non-absorbable sutures. All skin incisions will be closed with non-absorbable sutures.

4.7.5 Procedures in two ports plus one puncture laparoscopic cholecystectomy

Step 1. A 10 mm subumbilical incision will be made and the first 10 mm trocar will be introduced by open Hasson technique **(Fig 19)**.

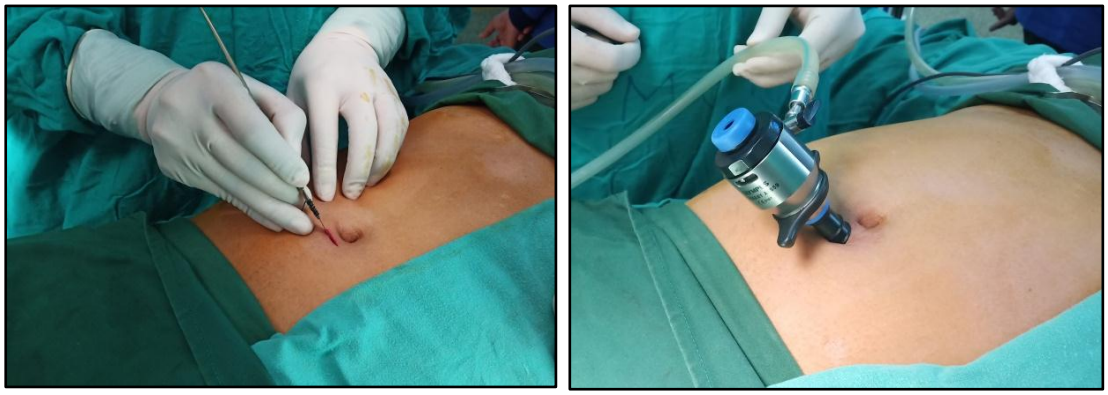

Figure 19. Insufflation with open Hasson technique

Step 2. Carbon dioxide pneumoperitoneum will be created and maintain at 12 mm Hg. Video telescope will be inserted from subumbilical port and will assess the pathological site and the visible portion of the whole intra-abdominal organs.

Step 3. The patient will be placed in reverse Trendelenburg position and the operation table will be tilted 15˚ left laterally. The working 5 mm port will be inserted under vision via video scope and will be placed in the subxiphoid epigastric region **(Fig 20)**.

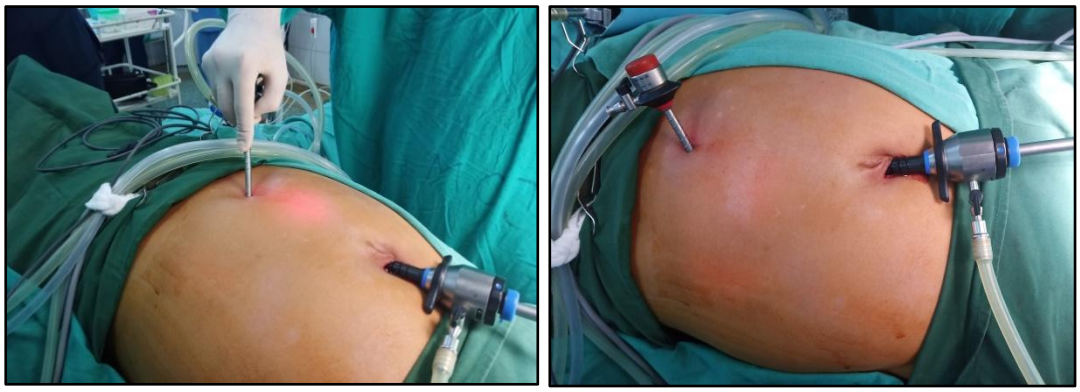

Figure 20. 5 mm trocar insertion at subxiphoid epigastric region

Step 4. A 2.3 mm alligator grasper will be punctured below the right costal margin under vision via video scope **(Fig 21)**.

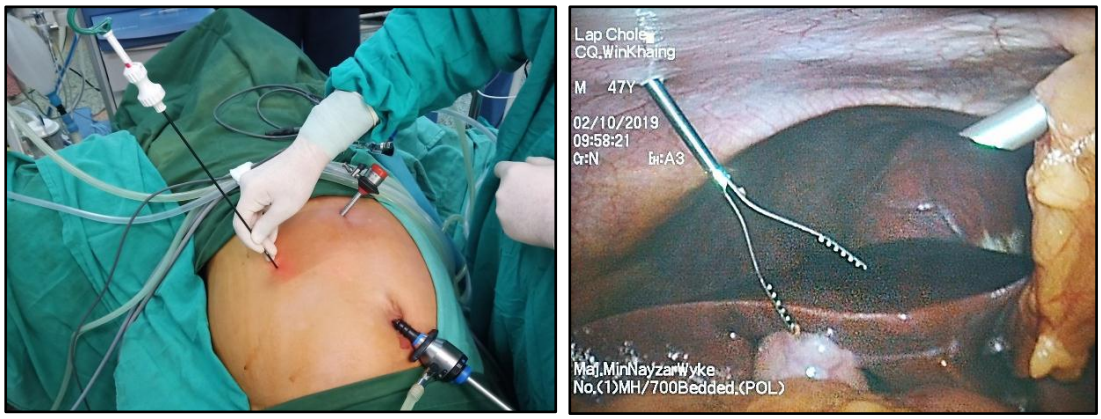

Figure 21. Alligator grasper (2.3 mm) puncture below right costal margin

Step 5. The hartmann's pouch of the gallbladder will be grasped with a 2.3 mm alligator grasper to get good exposure. Calot's triangle will be displayed. Then cystic duct, cystic artery, common hepatic duct and common bile duct will be identified **(Fig 22)**.

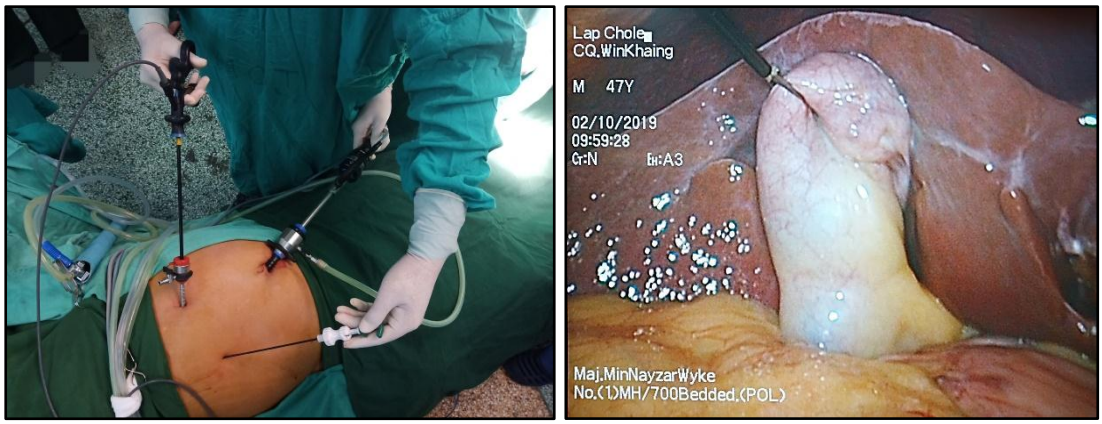

Figure 22. Positioning laparoscopic instruments and grasping gallbladder by 2.3 mm alligator grasper

Step 6. A Maryland dissector will be used to clear the peritoneum over the infundibulum and cystic duct. The cystic duct will be clearly identified. Once the peritoneum overlying the cystic duct is opened, the cystic duct will be cleared of its adventitial attachments circumferentially. Retracting the infundibulum toward the patient's left facilitates dissection of the lateral side of the cystic duct. The

infundibulum will be again retracted to the patient's right and the triangle of Calot will be entered. An adequate segment of cystic duct will be cleared. Haemoclips will be applied to cleared segment of cystic duct by 5 mm clip applier, and then cystic duct will be divided between haemoclips **(Fig 23)**.

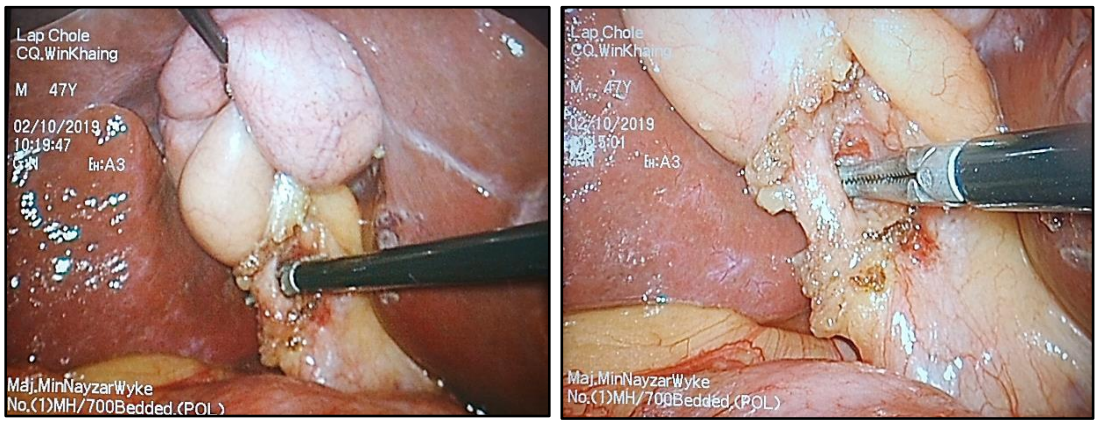

Figure 23. Dissection of cystic duct and cystic artery

Step 7. The cystic artery will be identified and cleared of surrounding attachments. When this has been verified, the cystic artery will be divided in continuity between clips after applying with 5 mm clip applier **(Fig 24)**.

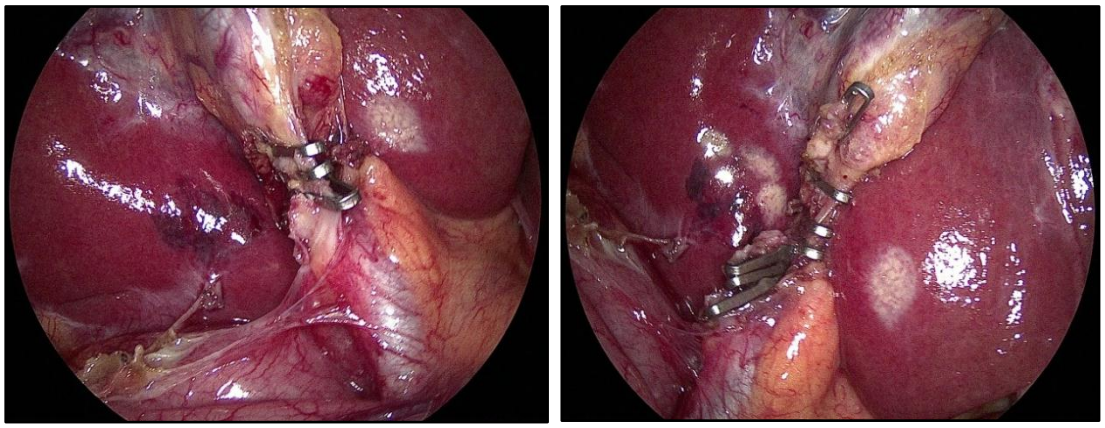

Figure 24. Metallic clips applied by 5mm clip applier

Step 8. The infundibulum of the gallbladder will be retracted anteriorly by 2.3 mm alligator grasper allowing the gallbladder to be dissected from the liver bed using cautery and blunt or sharp dissection **(Fig 25)**.

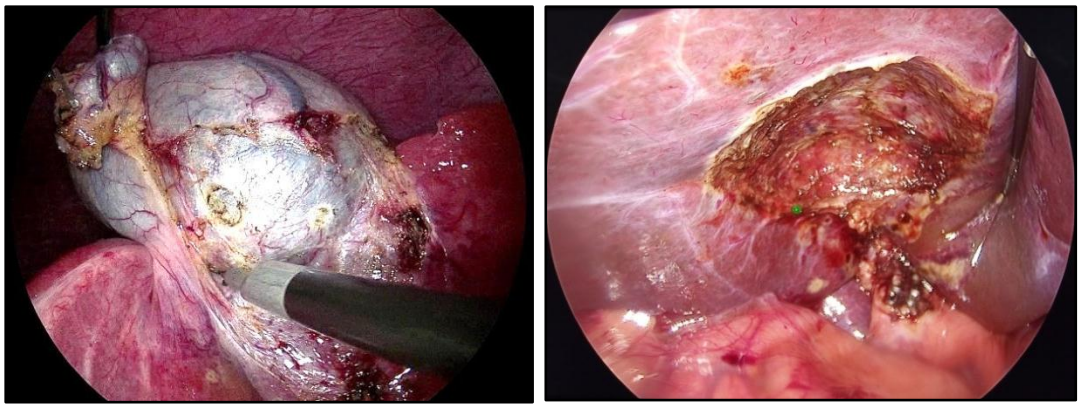

Figure 25. Liver bed after gallbladder dissection

Step 9. Then gallbladder will be placed into a specimen retrieval bag and removed through the 10 mm subumbilical port. This will be removed under vision via video telescope from 5 mm port. If the gallbladder is exceedingly large, full of gallstones, or contains large stones, it may not be possible to safely remove the gallbladder. Options include crushing the stones inside the gallbladder with a clamp, removing many stones/stone fragments to help decompress the gallbladder, and/or enlarging the port incision **(Fig 26 & 27)**.

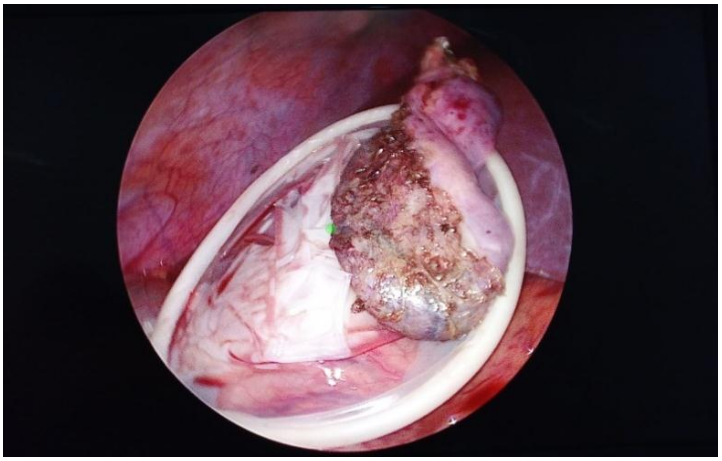

Figure 26. Gallbladder placement into a specimen retrieval bag

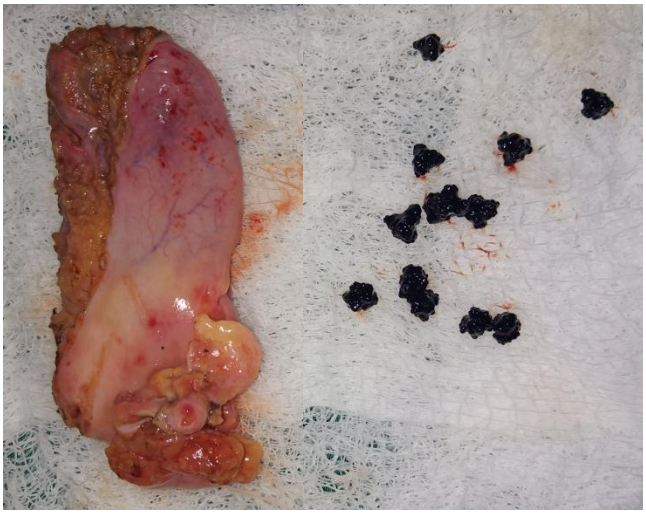

Figure 27. Gallbladder specimen with multiple gallstones

Step 10. Once the gallbladder is removed, the liver bed will be examined to be sure there is no bleeding or bile leakage.

Step 11. 2.3 mm alligator grasper will be removed and this punctured site will be covered with adhesive plaster only. 10mm subumbilical incision will be closed at the fascial level with non-absorbable sutures. All skin incisions will be closed with non-absorbable sutures.

4.7.6 Conversion to conventional laparoscopic cholecystectomy

Conversion to conventional laparoscopic procedure from TPPOP LC group will be performed where there are moderate adhesions and inflammation and difficulty to identify the important anatomy.

4.7.7 Conversion to open cholecystectomy

Conversion to open procedure from both study groups will be performed where there is difficulty to identify the important anatomy due to dense adhesions and inflammation, and complications such as bile duct injury, uncontrolled bleeding occurred.

4.7.8 Recording of parameters

The operation time will be recorded. Intraoperative complications including bile duct injury, bowel injury, vascular injury and injuries to nearby structures will be recorded. If conversion to other procedure from each group was present, it will be

recorded. Postoperative complications like prolonged ileus and wound infection will be recorded. Postoperative pain, rescue analgesic requirement and postoperative hospital stay will be recorded in the proforma.

4.7.9 Postoperative period

Nasogastric tube will be removed after operation. Antibiotics will be given single dose. If gallbladder perforation with bile spillage is present, antibiotics will be given total three doses.

For postoperative pain control, regular analgesic with paracetamol suppository (750 mg for <50 kg and 1 G for ≥50 kg body weight of the patient) will be given 6 hourly up to 72 hours. The patient will be assessed the pain score by using visual analogue scale (VAS) within 12 hour, 24 hour, 36 hour and 48 hour. Rescue analgesia will be added with injection of intravenous tramadol 1mg/kg if VAS was more than 4 and/or if the patient suffers breakthrough pain or if the patient complain of pain between the assessments. Total number and dose of rescue analgesia will be recorded in the proforma.

Patient will be discharged according to discharge criteria. The postoperative hospital stay will be calculated and recorded in proforma for each patient. During the hospital stay all cases will be observed daily by the researcher for early postoperative complications till the patients are discharged from the hospital. The complications which will be observed are wound infection, prolonged ileus, bile duct injury and bowel injury. Complications will be diagnosed clinically and confirmed by relevant investigations. These complications will be recorded in the proforma. All the complicated cases will be treated under the experienced consultant surgeon together with the researcher. After resuming oral intake, oral cefixime 200 mg twice a day will be given up to 5^{th} postoperative day. Patient will be ordered to take oral paracetamol 500 mg if they feel pain after discharge.

4.8 Working Definition

4.8.1 Operation time

The operation time is from the time of skin incision to the last stitch of skin closure.

4.8.2 Conversion to conventional laparoscopic cholecystectomy

Conversion to conventional laparoscopic procedure from study group will be performed where there are moderate adhesions and inflammation and difficulty to identify the important anatomy.

4.8.3 Conversion to open cholecystectomy

Conversion to open procedure from both study groups will be performed where there are difficulty to identify the important anatomy due to dense adhesions and inflammation, and complications such as bile duct injury, uncontrolled bleeding occurred.

4.8.4 Intraoperative complications

Intraoperative complications include bile duct injury, bowel injury, vascular injury and injury to nearby structures.

4.8.5 Bile duct injury

It means the injury to common bile duct with bile spillage during dissection of the Calot's triangle.

4.8.6 Bowel injury

It means the injury to gastrointestinal tract with spillage of bowel contents during procedure.

4.8.7 Vascular injury

It means the injury to cystic artery or hepatic artery with oozing or pumping blood during dissection of the Calot's triangle.

4.8.8 Injury to nearby structures

It means the injury to liver, diaphragm or omentum during procedure.

4.8.9 Postoperative complications

Postoperative complications include wound infection and prolonged ileus.

4.8.10 Postoperative outcomes

Postoperative outcomes include postoperative pain, postoperative complications and postoperative hospital stay.

4.8.11 Postoperative pain

Pain at the port insertion site, i.e., somatic pain at the abdominal wall.

4.8.12 Rescue analgesia

If VAS was more than 4 and/or if the patient suffers breakthrough pain or if the patient complains of pain between the postoperative assessment, rescue analgesia will be added with injection of intravenous tramadol 1mg/kg.

4.8.13 Wound infection

Wound infection will be described as minor if there is discharge without deep tissue destruction, and major if the discharge pus is associated with tissue breakdown, partial or total dehiscence of the deep facial layers of the wound, or if systemic illness is present.

4.8.14 Prolonged ileus

Prolonged ileus will be considered if there is no flatus passage until third postoperative day.

4.8.15 Postoperative hospital stay

Duration of hospital stay means duration from the date of operation to the date of discharge according to discharge criteria.

4.8.16 Discharge criteria

Patients will be discharged from the hospital when:

(a) have no fever,
(b) have no jaundice,
(c) well tolerate to oral intake,

(d) have recovery of bowel function,

(e) can walk without assistance,

(f) can manage postoperative pain with oral analgesic drugs and

(g) no immediate postoperative complication.

4.9 List of Variables

No.	Name of variable	Operational definition	Scale of measurement
1	Age	Age in complete years	Ordinal
2	Sex	Male, Female	Nominal
3	Weight	kg	Numerical
4	Height	meter	Numerical
5	BMI	kg/m^2	Categorical
6	Operation time	Minutes	Numerical
7	Bile duct injury	Yes, No	Nominal
8	Bowel injury	Yes, No	Nominal
9	Vascular injury	Yes, No	Nominal
10	Injury to nearby structures	Yes, No	Nominal
11	Conversion to CLC from TPPOP LC	Yes, No	Nominal
12	Conversion to open from both groups	Yes, No	Nominal
13	VAS pain score	Score 0 to 10	Categorical
14	Rescue analgesia	Milligrams	Numerical
14	Wound infection	Yes, No	Nominal
15	Prolong ileus	Yes, No	Nominal
16	Postoperative hospital stay	Days	Numerical

4.10 Data analysis

Data will be recorded by using a pre-structured proforma. Data will be collected as categorical as well as numerical variables. Record files will be constructed in Microsoft Excel. The base line data will be entered into data base file. The final data file in Microsoft Excel will be exported as data base file. The categorical data will be calculated by appropriate statistical method such as Chi-square. For continuous variables, the statistical significance of patients will be analyzed by two independent Student's t test. The level of significance will be set at $P<0.05$. After data analysis, the result will be presented in dummy tables and figures.

4.11 Ethical Consideration

This study will be considered to be ethical because the following conditions will be fulfilled for the research.

(i) The individual will be invited for the voluntary in the research.

(ii) The individual is free to refuse to participate and will be free to withdraw from the researcher at any time without penalty or loss of benefits to which he or she would otherwise be entitled.

(iii) The aim and procedure of research will be clearly explained and written informed consent will be taken before the initiation of the research work.

(iv) The potential patient will be explained the issue understanding about the following:

- (a) The expected duration of the individual's participation
- (b) The individual's participation is voluntary only, not for money or other forms of materials in return for the participation.
- (c) Both methods are the international accepted options for management of symptomatic gall stones.
- (d) Although accepted procedure, it still has chance of complications like wound infection, pain, bleeding and injury to nearby organs, etc.
- (e) To prevent the infection, potent broad spectrum antibiotics will be given before procedure intravenously after test dose.

(f) Pain can be present and will be treated according to pain treatment guideline in methodology.

(g) Complications of other will be treated accordingly.

(h) Researcher will take the responsibility for scientific correctness in conducting research according to protocol, not allowing scientific misconduct and confidentiality for all the information and results in this study.

(i) For the injuries or complications associated with research, the patient will be given immediate appropriate comprehensive treatment without patient's expense.

(j) There will be no compensation for participation in the research because participation in the research is completely voluntary.

(k) There will be no conflict of interest from any Instrument Company or Pharmaceutical Company.

(l) The protocol will be submitted to the Institutional Ethical Review Committee to approve or clear the protocol.

5. DUMMY TABLES

Table 1. Age distribution in both study groups

No.	Age (Years)	Group A CLC		Group B TPPOP LC	
		No.	%	No.	%
1	<30				
2	31-40				
3	41-50				
4	51-60				
5	>60				
	Total				

Table 2. Sex distribution in both study groups

No.	Sex	Group A CLC		Group B TPPOP LC	
		No.	%	No.	%
1	Male				
2	Female				
	Total				

Table 3. Comparison of operation time between both study groups

Operation time (minutes)	Group A CLC		Group B TPPOP LC		P value
	No.	%	No.	%	
30 – 60					
61 – 90					
91 – 120					
>120					
Total					
Mean ± SD					

Table 4. Comparison of intraoperative complications in both study groups

Intraoperative complications	Group A CLC		Group B TPPOP LC		P value
	No.	%	No.	%	
Bile duct injury					
Bowel injury					
Vascular injury					
Injury to nearby structures					
Others					
Total					

Table 5. Rate of conversion to open cholecystectomy in group A (CLC)

Conversion to other procedure	Group A CLC		P value
	No.	%	
Conversion to open procedure			
Total			

Table 6. Rate of conversion to other procedures in group B (TPPOP LC)

Conversion to other procedure	Group B TPPOP LC	
	No.	%
Conversion to CLC		
Conversion to open procedure		
Total		

Table 7. Comparison of rate of conversion to open procedure in both study groups

Conversion to open procedure	Group A CLC		Group B TPPOP LC		P value
	No.	%	No.	%	
Conversion to open					
Total					

Table 8. Postoperative pain assessment by VAS at 12 hour after operation

Severity of pain	Group A CLC		Group B TPPOP LC		P value
	No.	%	No.	%	
Mild					
Moderate					
Severe					
Total					

Table 9. Postoperative pain assessment by VAS at 24 hour after operation

Severity of pain	Group A CLC		Group B TPPOP LC		P value
	No.	%	No.	%	
Mild					
Moderate					
Severe					
Total					

Table 10. Postoperative pain assessment by VAS at 36 hour after operation

Severity of pain	Group A CLC		Group B TPPOP LC		P value
	No.	%	No.	%	
Mild					
Moderate					
Severe					
Total					

Table 11. Postoperative pain assessment by VAS at 48 hour after operation

Severity of pain	Group A CLC		Group B TPPOP LC		P value
	No.	%	No.	%	
Mild					
Moderate					
Severe					
Total					

Table 12. Rescue analgesic injection Tramadol requirement in both study groups

	Doses of Injection Tramadol requirement		P value
	Group A CLC	Group B TPPOP LC	
12 hour			
12 – 24 hour			
24 – 36 hour			
36 – 48 hour			
Total			
Mean ± SD			

Table 13. Comparison of postoperative complications in both study groups

Postoperative complications	Group A CLC		Group B TPPOP LC		P value
	No.	%	No.	%	
Wound infection					
Prolonged ileus					
Others					
Total					

Table 14. Comparison of duration of postoperative hospital stays in both study groups

Duration of postoperative hospital stay (days)	Group A CLC		Group B TPPOP LC		P value
	No.	%	No.	%	
≤3					
4- 7					
8-14					
>14					
Total					
Mean ± SD					

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7. APPENDICES

Appendix 1: Proforma

A. Identification

Case No. ( )

Registration No ----------

Name ----------

Age ----------

Sex Male ☐ Female ☐

Body weight ------ kg Height ---------- m^2 BMI (Kg / m^2) ------

Address ----------

Date of admission ----------

Date of discharge ----------

B. Operations

1. Date - ---------- Time start - ---------- Time end - ----------

2. Operative time - ( ) min

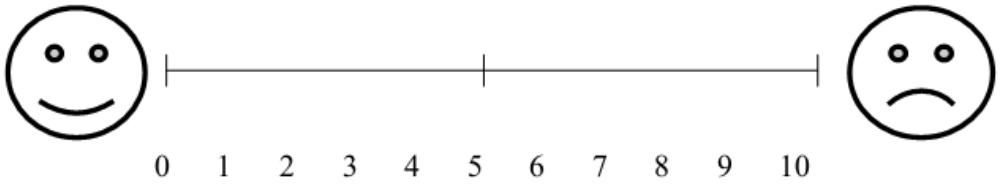
C. Intraoperative complications	Yes	No
1. Bile duct injury	☐	☐
2. Bowel injury	☐	☐
3. Vascular injury	☐	☐
4. Injury to nearby structures	☐	☐
5. Others	☐	☐

D. Conversion to other procedure (Group A)	Yes	No
Conversion to open	☐	☐

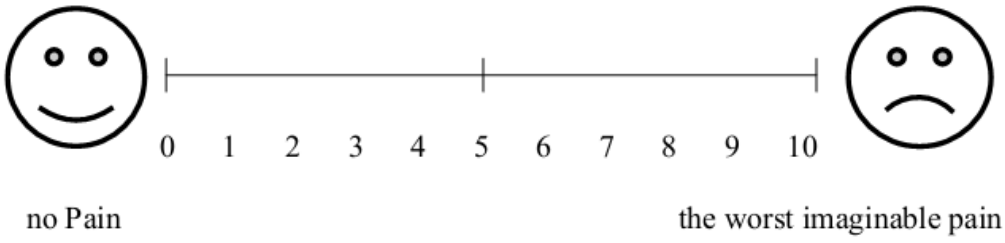
E. Conversion to other procedure (Group B)	Yes	No
1. Conversion to CLC	☐	☐
3. Conversion to open	☐	☐

F. Postoperative pain assessment by VAS (Mild pain is 1- 4, moderate pain is 5 – 7 and severe pain is 8- 10)

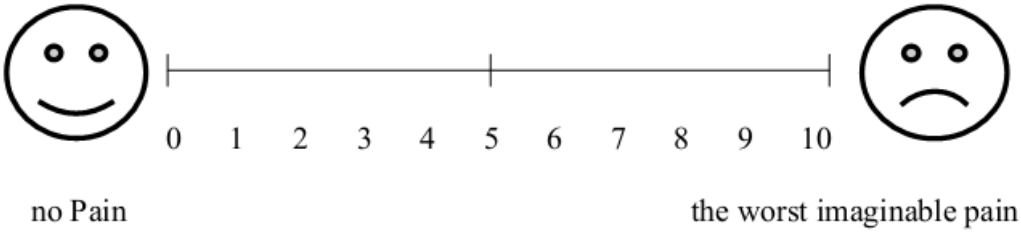
1. 12 hr postoperative time Mild ☐ Moderate ☐ severe ☐



2. 24 hr postoperative time Mild ☐ Moderate ☐ severe ☐



3. 36 hr postoperative time Mild ☐ Moderate ☐ severe ☐



4. 48 hr postoperative time Mild ☐ Moderate ☐ severe ☐

G. Rescue analgesic requirement (Injection Tramadol)

	1st Dose	2nd Dose	3rd Dose	4th Dose	5th Dose	6th Dose	7th Dose
Time							
Dose							

H. Postoperative complications **Yes** **No**

1. Wound infection ☐ ☐
2. Prolonged ileus ☐ ☐
3. Others ☐ ☐

I. Duration of hospital stay - ---------- days

Appendix 2: INFORMED CONSENT (ENGLISH)

Name of Principal Investigator	-	Dr. Min Nay Zar Wyke
Name of Organization	-	Department of Surgery Defence Services Medical Academy
Name of Sponsor	-	Nil
Title of Proposal	-	Comparative study of conventional laparoscopic cholecystectomy versus two ports plus one puncture laparoscopic cholecystectomy

PART I. Information Sheet

(1) Introduction

I am Dr. Min Nay Zar Wyke, and I am going to carry out this research for the Degree of Dr.Med.Sc (General Surgery) in laparoscopic cholecystectomy for symptomatic gall stones by means of conventional and two ports plus one puncture. I will explain you about the necessary information for this research. I also invite you to take part in this research. But, you have no need to decide for the participation in this research immediately. You can also consult with others and take advice from them. Concerning with the explanation for this research, you can ask me immediately about this if you do not understand it. You can also ask me later in any time about it.

(2) Purpose

The purpose of this study is to carry out a comparative study of conventional laparoscopic cholecystectomy and two ports plus one puncture laparoscopic cholecystectomy for symptomatic gall stones patients who admitted to No.(1) Military Hospital (700 bedded) Pyin Oo Lwin. By means of this research, we can study comparatively advantages and dis advantages of each treatment, and we can study which treatment is better than for patients. These research findings can help us how to choose the best way for the management of symptomatic gall stones in future.

(3) Type of Research Intervention

This research is comparative, prospective, hospital-based interventional, open-labelled, randomized controlled trial study by the procedure of conventional

laparoscopic cholecystectomy and two ports plus one puncture laparoscopic cholecystectomy for symptomatic gall stones patients.

(4) Participant selection

According to inclusion and exclusion criteria, all patients with symptomatic gall stones will be selected from the surgical wards of No.(1) Military Hospital (700 bedded) Pyin Oo Lwin.

(5) Voluntary participation

Your participation in this research is entirely voluntary. You have no disturbances for your personal freedom due to this research. If you choose not to participate, nothing will change in your treatment plan. You can also quite from the research any time if you do not want to participate in the research anymore, and it will change nothing in your treatment plan.

(6) Procedure

Symptomatic gall stones patients, who meet inclusion criteria will be recruited within two years period at No.(1) Military Hospital (700 bedded),Pyin Oo Lwin. They will be explained about the study procedure that they will be undergone either conventional laparoscopic cholecystectomy and two ports plus one puncture laparoscopic cholecystectomy.

In conventional laparoscopic cholecystectomy, the procedure will be done with four ports which will be placed 10 mm port in the subumbilical region, another 10 mm port in the subxiphoid epigastric region, 5 mm port in the right subcostal midclavicular line and another 5 mm port in the right subcostal anterior axillary line location.

In two ports plus one puncture laparoscopic cholecystectomy, the procedure will be done with two ports, which will be placed 10 mm port in the subumbilical region, 5 mm port in the subxiphoid epigastric region, and with 2.3 mm alligator grasper which will be punctured below the right costal margin.

All patients will be fully informed about the procedures of two methods and their complications in easily understandable terms. All patients, who give written informed consent, will be included in the study.

The selected patients will be randomly posted in groups of conventional laparoscopic cholecystectomy and two ports plus one puncture laparoscopic cholecystectomy. All the records from the study will be kept confidential. The reports on analysis of the data from the study may be published in the future; however, privacy of the participant will be strictly maintained. You are free to withdraw from the study anytime without affecting the medical care of you.

(7) Duration

This research will take at least 2 weeks for each participant. The mean operation time for conventional laparoscopic cholecystectomy will be about 40 minutes and for two ports plus one puncture laparoscopic cholecystectomy about 50 minutes.

(8) Risks

In this study, conventional laparoscopic cholecystectomy and two ports plus one puncture laparoscopic cholecystectomy will be compared.

Conventional laparoscopic cholecystectomy is still gold standard procedure up to now. Although accepted procedure, it still has chance of complications like wound infection, pain, bleeding and injury to nearby structures (bile duct, bowel, liver). Among these injuries, bile duct injury is common and the percentage may be 1% to 2%. Conversion to open procedure from conventional laparoscopic cholecystectomy will be performed where there is difficulty to identify the important anatomy due to dense adhesions and inflammation, and complications such as bile duct injury, uncontrolled bleeding occurred. The rate of open conversion from conventional laparoscopic cholecystectomy will be less than 1%.

Two ports plus one puncture laparoscopic cholecystectomy is also acceptable procedure but it can carry longer operation. It also has chance of complications like wound infection, pain, bleeding and injury to nearby structures (bile duct, bowel, liver) as conventional laparoscopic cholecystectomy. The percentage of bile duct injury may be 1% to 3%. If there is difficulty to identify the important anatomy due to dense adhesions and inflammation, and complications such as bile duct injury, uncontrolled bleeding occurred, treatment can be converted to conventional procedure (about 5.45%) or open procedure (about 0.18%).

Complications will be treated accordingly. Pain will be treated according to pain treatment guideline. All the information and the results from this study will be confidential. The study will not interfere the treatment planned according to hospital guideline.

(9) Discomforts

By participating in this research it is possible that you may experience some discomfort due to laparoscopic cholecystectomy.

(10) Benefits

By participating in this research, if you are in the group of conventional laparoscopic cholecystectomy, your disease will be removed immediately after surgery and its operation time is relatively less than contralateral technique.

On the other hand, if you are in the group of two ports plus one puncture laparoscopic cholecystectomy, you will not have inferior treatment outcomes. This technique can maintain the principle as the conventional technique and the advantages such as reduce number of port, reduce size of port, less painful and higher cosmesis can be obtained. No matter what, your participation is likely to help us in obtaining information for future treatment in symptomatic gall stones.

(11) Incentives

You will not get any incentives in cash by involving in this study.

(12) Confidentiality

All the records from the study will be kept confidential. It will be shared only between the responsible persons. The reports on analysis of the data from the study may be published in the future; however, privacy of the participants will be strictly maintained.

(13) Sharing the Results

The knowledge that we get from this research will be shared for future treatment of symptomatic gall stones. Confidential information will not be shared. There will be small meetings in the community and these will be announced. After

these meetings, we will publish the results in order that other interested people may learn from our research.

(14) Right to Refuse or Withdraw

You do not have to take part in this research if you do not wish to do so and refusing to participate will not affect your treatment at this clinic in any way. You will still have all the benefits that you would otherwise have at this clinic. You may stop participating in the research at any time that you wish without losing any of your rights as a patient here. Your treatment at this clinic will not be affected in any way.

(15) Alternatives to Participating

If you do not wish to take part in the research, you will be provided with the established standard treatment available at the hospital in accordance with your health problem.

(16) Who to Contact

If you have any questions you may ask me now or later; even after the research has started. If you wish to ask questions later, you may contact any of the followings:

Dr. Min Nay Zar Wyke
Department of Surgery,
Defence Services Medical Academy, Mingalardon
minnayzarwyke3681@gmail.com
Ph.095501867

If there are any complaints about this study or principal investigator, the participant can also contact to ethical review committee DSMA.

Prof. Lt.Col. Daw Mo Mo Than
Professor and Head
Department of Biochemistry
Defence Service Medical Academy, Mingalardon
momomoekyaw@gmail.com
Ph.095143107

Part II. Certificate of consent

(A) Purpose of the study

The purpose of this study is to study the comparison between conventional laparoscopic cholecystectomy and two ports plus one puncture laparoscopic cholecystectomy. These research findings can help in our national health project management. If you agree to participate in this study, you are requested to follow our instructions guideline according to our research protocol.

The information you provide is very confidential and it will not be disclosed to anyone. It will be removed from the questionnaires and use of your answer without identifying.

(B) Declaration of the volunteer

I have been invited to participate in comparative study of conventional laparoscopic cholecystectomy and two ports plus one puncture laparoscopic cholecystectomy. I am aware that there may be no incentive to me personally. I have been provided with the name of the researcher who can be contacted using the phone number and address. I have read the foregoing information or it has been read to me. I have had the opportunity to ask questions about it, and any questions that I have asked have been answered to my satisfaction. I consent voluntarily and also there is no threat and undue influence of the investigator or any other persons to participate as a subject in this study. I understand that I have the right to withdraw from the study at any time without affecting further medical care to me in any way.

Name of Participant _____

Signature of Participant _____

Date (Day/month/year) _____

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Name of Witness _____

Signature of Witness _____

Date (Day/month/year) _____

I have accurately read or witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Name of Researcher _____

Signature of Researcher _____

Date (Day/month/year) _____

If illiterate

A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb print as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Name of witness_____

Signature of witness _____

Date (Day/month/year) _____

Left Thumb print of participant

Name of Researcher_____

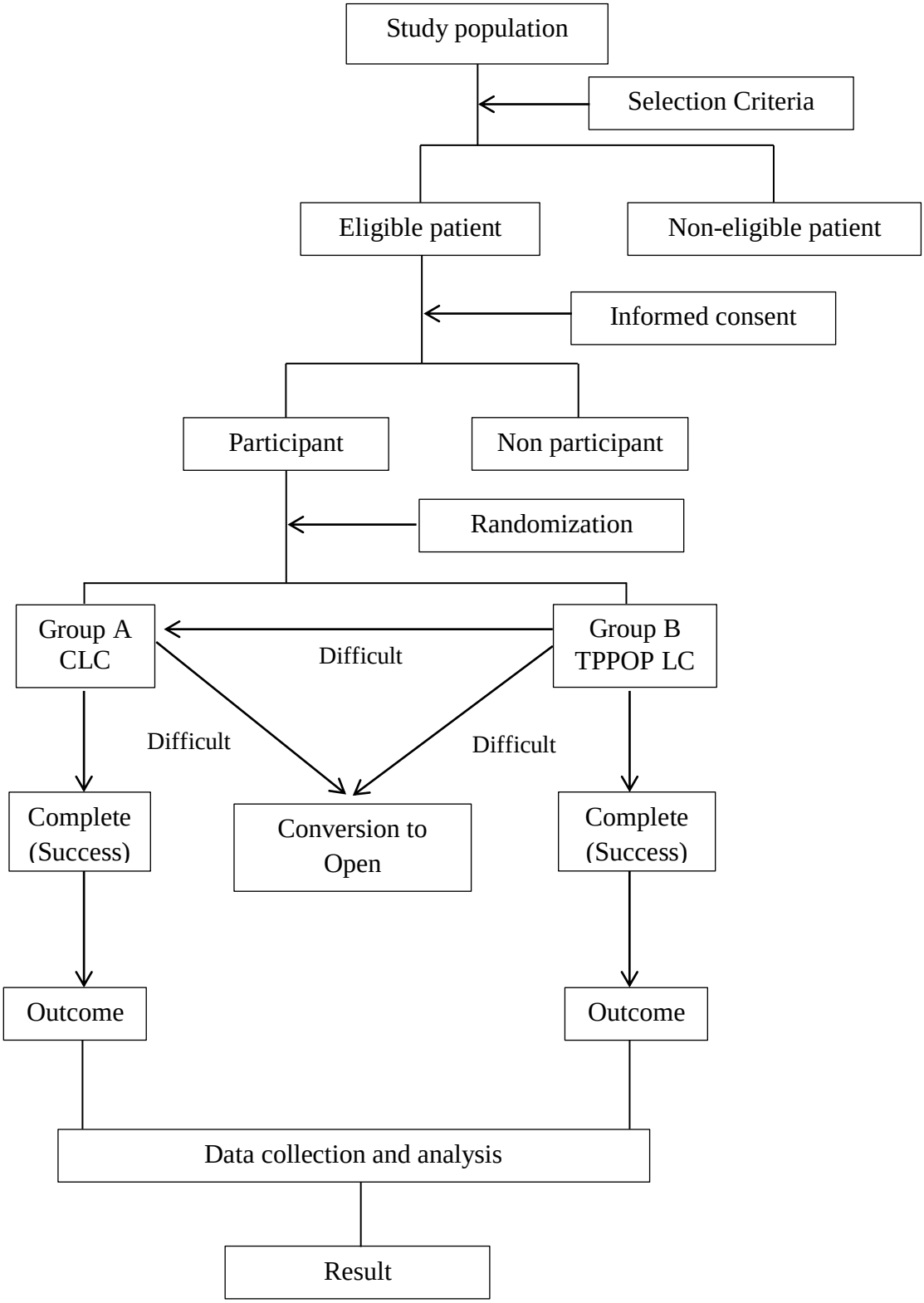
Signature of Researcher _____

Date (Day/month/year) _____

Note: A copy of this informed consent form is handed to the participant.

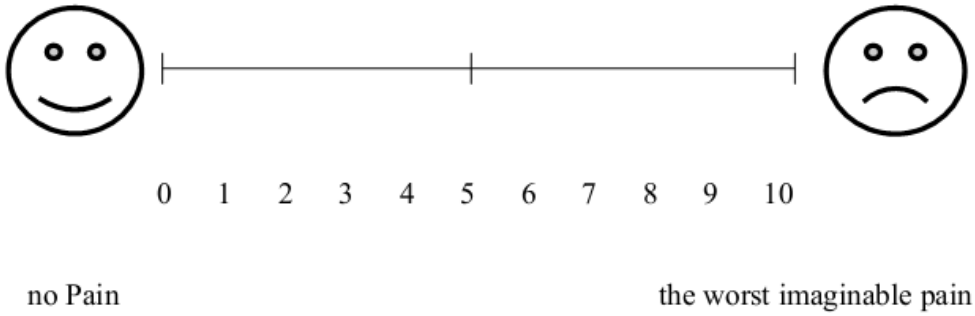
Appendix 3: Flow Chart

Flow chart of study design



Appendix 4: Visual Analogue Scale (VAS)

The postoperative pain will be evaluated according to the VAS (Visual Analog Scale). The VAS consists of a 10 cm line, one end marks with ‘no pain’ and the other ‘the worst imaginable pain’. The patient marks the point on the line to indicate the pain intensity, he or she suffers. The clinician then measures the line from 0 end & scored. Mild pain is 1- 4, moderate pain is 5 – 7 and severe pain is 8- 10 (Sodhi and Fernando 2002).



Appendix 5: Gantt Chart