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Original Research Paper

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COMPARATIVE STUDY ON SUTURE LIGATION VS CLIP LIGATION OF CYSTIC DUCT IN LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT Laparoscopic cholecystectomy (LC) has become the gold standard for the management of symptomatic gallstones disease. In the last decades, the number of cholecystectomies has increased worldwide. Cholelithiasis and its consequences are the main cause of surgical entry into the peritoneal cavity. In laparoscopic cholecystectomy (LC), cystic duct and cystic artery are normally secured with Titanium clips. Intra corporeal ligation, extracorporeal knotting and Harmonic scalpel application are other options. We studied the efficacy and safety of suturing with silk as compared to clip application for cystic duct and artery ligation separately. We observed that both techniques were safe and less time consuming, but silk ligation has been proven to be more secure than clip application.

KEYWORDS : Laparoscopic Cholecystectomy, Cystic duct, Titanium clips, Silk thread

AIM OF STUDY

The aim of our study is to compare the outcome of Suture Ligation vs Clip Ligation of cystic Duct in Laparoscopic Cholecystectomy.

INTRODUCTION

Laparoscopic cholecystectomy (LC) has become the gold standard for the management of symptomatic gallstones disease. Cholelithiasis and its consequences are the main cause of surgical entry into the peritoneal cavity. In laparoscopic cholecystectomy (LC), cystic duct and cystic artery are normally secured with Titanium clips. However, application of clips is associated with some problems. These include dislodgement of the clip or bile duct necrosis resulting in postoperative cystic duct leak. Another clip-related problem was reported at long term follow up, which is late postcholecystectomy clip migration. This was reported to result in the biliary stone formation, duodenal ulcer and even clip embolism. Alternative techniques have included the use of locking absorbable clips, and the Harmonic Scalpel. These are, however, more expensive, not readily available and used infrequently. Most studies describe separate and multiple ligations of cystic duct and cystic artery, which are viewed as technically demanding and time consuming. Similarly, the harmonic scalpel and ligasure are prohibitory expensive for resource limitations. After several modifications, the success of Intracorporeal Ligation of cystic duct with silk 2/0 was observed. The time taken for tying varied from two to seven minutes, and no bile leak or other complication were noted. Silk is easy to handle and freely accessible anywhere, which is particularly important when working in rural centres. But for clipping, clip applicator and Liga clips are required. Also, special care is needed to handle and clean the instrument.

MATERIALS AND METHODS

The study was conducted as a clinical trial with approval from the Ethical committee at the Department of Minimal Access Surgery, Madras Medical College, Chennai-03, during the period between September 2016 to July 2018.

SAMPLE SELECTION

The patients diagnosed to have benign Gall bladder disease (such as Symptomatic Cholelithiasis, Gall Bladder Polyps and Acute or Chronic inflammation of Gall bladder and admitted in the Department of Minimal Access Surgery for Laparoscopic Cholecystectomy were selected for the study.

The diagnosis was based on history, clinical examination, laboratory and radiological investigations.

INCLUSION CRITERIA

All consenting patients with Benign Gall bladder diseases such as

- Symptomatic Gall stone disease
- Gall Bladder Polyps >10mm
- Acute and Chronic Cholecystitis.

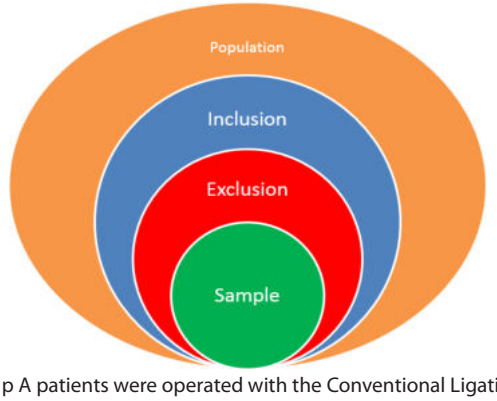
EXCLUSION CRITERIA

The patients with following attributes and associated conditions were excluded from the study to avoid bias.

- Age less than 16 years and more than 70 years
- Choledocholithiasis
- Previous Upper Abdominal surgeries
- Comorbidities like Cirrhosis, Ascites & Coagulopathy
- Anesthetic fitness with ASA grading of 3 and above.

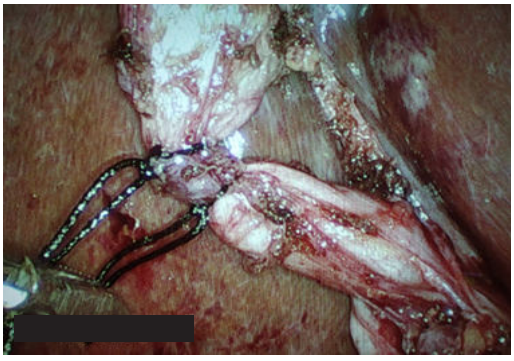
SAMPLING METHOD

88 patients with Benign Gall bladder diseases planned for Laparoscopic Cholecystectomy were enrolled in the study. Random numbers were generated and used to allocate patients to each group with equal distribution with 44 patients in each group. Group A patients were subjected to Laparoscopic Cholecystectomy with conventional Clip Ligation of Cystic Duct. Group B patients were subjected to Laparoscopic Cholecystectomy with Suturing of the Cystic duct .



Group A patients were operated with the Conventional Ligation of Clip during the Laparoscopic cholecystectomy by a trained Laparoscopic surgeon and were followed up post-operatively for 2 days. The Conventional Clip Ligation Technique involves the ligation of the cystic Duct using the 300 or 400 LT Titanium clips . The Clips were applied to the Cystic Duct after achieving the critical view of safety.

Similarly the Group B patients were operated with Suturing of the Cystic Duct during the Laparoscopic Cholecystectomy by a trained Laparoscopic Surgeon and were followed up post-operatively for 2 days. The Suturing technique involves suturing of the Cystic Duct using Silk as the suturing material. The sutures were always applied after achieving the critical view of safety .



Standard Laparoscopic instruments, operating tables, energy devices (Monopolar and Bipolar) and Ergonomics were followed in both groups. The details of surgery such as ability to achieve critical angle of Strasberg, Suturing time & Time required for Clipping of Cystic Duct were calculated, total duration of procedure(time taken from the incision for the first port till the retrieval of specimen Gall Bladder), conversions from Clip application technique to suturing technique , Post-operative pain scores

(using Visual Analogue Scores) and Perioperative complications if any during the procedure were also documented. The total time duration required for both the procedures were calculated. Subsequently the data obtained from the both groups were analysed and formulated in various tables and charts for comparison in parallel.

RESULTS

STUDY DEMOGRAPHY

The study involved 88 patients diagnosed with benign Gall bladder diseases and underwent Laparoscopic Cholecystectomy. There were no drop outs from the study. Each Group had equal number of patients i.e 44 patients each.

AGE DISTRIBUTION

Age distribution of the sample population ranged from 12 years to 66 years with the mean age of 39 years.

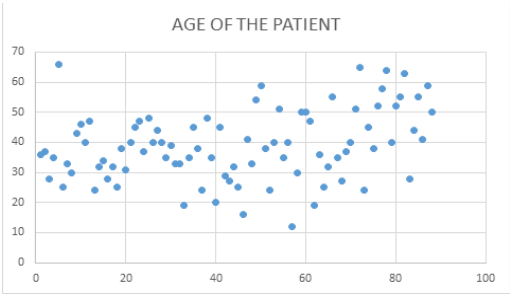


Figure 5.1 AGE DISTRIBUTION OF THE SAMPLE

GENDER RATIO

Female patients outnumbered the male patients with the ratio of 5:1in the study. A total of 73 females and 15 males were included in the study.

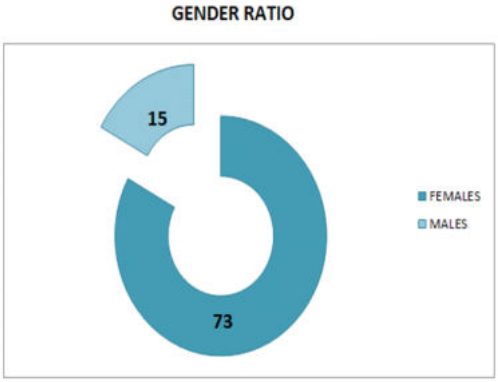


Figure 5.2 GENDER RATIO

The Benign pathologies of the selected patients included mainly symptomatic Cholelithiasis, followed by Chronic Calculous cholecystitis and Gall Bladder polyps. The post- operative histopathology reports of all patients were verified to confirm the diagnosis and rule out incidental malignancies.

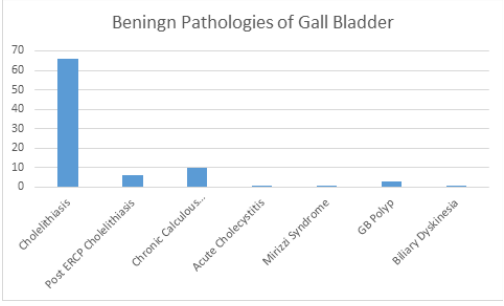


Figure 5.3 BENIGN GALL BLADDER PATHOLOGIES IN THE STUDY SAMPLE OVERALL OPERATING TIME

All the patients included in the study were operated and procedure was completed laparoscopically .The operating time was recorded for all the procedures and the average operating time was 54 minutes. The shortest operating time was 25 minutes and longest was 150 min.

GROUP- A(Clip Ligation)

OPERATING TIME

Being a familiar technique, the average operating time was around 52 minutes, slightly lower than the overall operating time.

CONVERSIONS AND COMPLICATIONS

Per se conversion is not a complication, not only by definition but also in Laparoscopy. Out of 44 cases operated, all cases were completed using Clip ligation of cystic duct by laparoscopic method. There were nil Perioperative complications documented in group A patients.

GROUP- B (Suture Ligation)

OPERATING TIME

The average operating time was around 57 minutes slightly higher than the overall average. The range was between 25 minutes (shortest) to 150 minutes (longest).

CONVERSIONS AND COMPLICATIONS

Per se conversion is not a complication, not only by definition but also in Laparoscopy. Out of 44 cases operated, all cases were completed by Suture ligation of cystic duct by laparoscopic method. There were nil Perioperative complications documented in group B patients.

ADDITIONAL PORTS

Additional ports were needed in 8 cases. In 3 cases it was for the need of access into the abdomen with pneumoperitoneum due to suspected adhesions and in another 5 cases it was needed for initial cases for handling of the suture material and for the retraction of the hartmann's pouch .

DISCUSSION

Laparoscopic cholecystectomy is being increasingly performed as a day care surgery procedure. Evidence showed that there was no significant difference in morbidity between day surgery procedure and overnight stay, and both approaches had similar prolonged hospitalization and readmission rate. In addition, there was no significant difference in the visual analogue scale score, postoperative nausea and vomiting scale, time to return to activity and work between the two groups. Laparoscopic cholecystectomy can be performed safely in selected patients as a day surgery procedure. The cystic duct and artery are normally closed with titanium clips. No bile leakage or other problems were reported with intracorporeal ligation of the cystic duct/artery by silk 2/0. The time required for tie varied from two to seven minutes. Intracorporeal ligation is normally superior to extra corporeal knotting. Simple ligation of artery and duct is safe and economical. Gurusamy KS found that it was necessary to close the cystic duct completely during LC to avoid leak from stump. There was a statistically significant longer operating time (mean difference 12.00 minutes) in the ligature group than in the non-absorbable clips group. Another study performed the 'C' technique for closure of the cystic duct in 1000 consecutive patients subjected to LC as intracorporeal knotting. Neither bile leakage nor any other procedure-related complication was seen. The mean time taken for cystic duct ligation was 3.5 minutes. The method of total intracorporeal cystic duct and artery ligation in LC is simple, technically easy, secure, and economical. There was no postoperative bile leakage. Another study reported that the time from skin incision to closure of wound was 46.6 minutes in the clip group and 70.7 minutes in the ligature group. The authors observed that the operative time was longer when using intracorporeal knotting as compared with clip application, but the difference was not statistically significant (P=0.493). We also share their observations, as surgeons are not used to intracorporeal knotting, but we observed that ligation of the cystic duct or artery is more secure when silk was used as compared with clips. If you start using intracorporeal knotting routinely, the procedure becomes less time consuming with the increasing number of cases done. A study found that the average operative time was 61.29 minutes (25-160). Ghavidel A et al found that post-cholecystectomy clip migration was rare, but could lead to complications such as clip-related biliary stones. Most of such incidents have been reported as case reports in the literature. It can occur at any time but mostly after a median period of two years post-cholecystectomy. In our group, there was no such complication neither any leakage from the bile duct was observed in the postoperative period. Other authors observed more benefits of the simple ligation of cystic duct. It is easy and practical. This is a simple technique that could be performed without any difficulty. Beyond doubt, simple ties are always available and very economic. Another study revealed that intracorporeal knotting and endoloop closure were safe, successful and feasible methods for appendicectomy. The authors observed that silk was a better alternative option to ligate the base of the appendix as compared to harmonic-like device. Hence, in rural locations, or in settings where instruments are not affordable to the surgeon, or in financially compromised patients, silk can be used without any complication. Mehmedovic Z et al declared that LC was associated with a higher risk of intraoperative lesions and primarily lesions of biliary ducts. In a small percentage of cases, biliary fistulas occur, most commonly after leakage from cystic duct stump or accessory bile ducts. Our study observed that with the tight secure of silk to the cystic duct, the colour of the duct changed to white. We have not come across any kind of injury in any group. Cystic duct leakage with metal clips persists after laparoscopic cholecystectomy. Use of locking clips on leaks from the cystic duct stump after LC is an alternative to metal clips. A study noted the migration of two clips into the common bile duct (CBD) along with retained stones as rare complications of LC, and highlighted that it should be kept in mind as differential diagnosis of recurrent cholangitis in post-cholecystectomy cases. An author described an intraductal migration of surgical clips into the CBD after 10 years of LC, which was unusual and could result in gallstone formation- clip cholelithiasis. Photi ES et al have done the ligation of the cystic duct with surgical clips, and reported a case of cholangitis secondary to clip migration into the CBD. Another case was reported as postoperative Mirizzi syndrome caused by the migration of four polymer laparoscopic clips, which could confuse the diagnostic and therapeutic field for treatment. A study reported a case of bile leak caused by an injury to the ducts of Luschka after LC; the leak was treated with ES using 5-F NBT, and the resolution of the leak was confirmed without repeated endoscopy. In our study, no such complication was encountered. We applied the clips with keeping the distance from the cystic duct- CBD junction, which may be the reason of non-migration of clips into the CBD. Though it was our observation, large series of studies are required to give a concrete evidence. We believe that, if LC is performed safely and meticulously, then complications may be decreased. One more observation in our study was that silk ligation was a safer option than clip application to avoid the CBD stricture formation or migration. During the study it was noted that repeated insertion of the clip applicator was required for clipping but in case of silk ligation, only one time the thread was inserted and kept near the calots triangle or dissected area. The cystic duct or artery vice versa could be ligated separately with a piece of thread, though there were no major differences in the form of timing. In our study, the cost of silk suture was much cheaper than that of titanium clips used for the cystic duct and artery. For the suture material used during the study, the price was only 40–60 Rupees whereas for the titanium clips used for clipping it was far higher, reaching 790–1000 Rupees. This suggests that the use of suture for ligation is a very cost-effective and economic option for ligation. In the present study, surgery was performed by a single surgeon to avoid complications, as operating time would vary among surgeons. With the use of silk, epigastric port size can be reduced from 10 mm to 5 mm. Therefore, the advantages of the present study include: 1) suture ligation needs skills and experience, which can be improved by training; 2) when the colour of the cystic duct becomes white, it means that silk tied to the cystic duct is secure enough; 3) suture is readily available everywhere, but the availability of clips can be sometimes questioned even in terms of appropriate size; 4) the cost of clips is much higher than that of silk; 5) silk is easy to apply in dilated or short cystic duct.

SUMMARY

On summarizing the findings of our study, we have found many advantages in the suture ligation technique of the cystic duct. It is very much feasible and practical as it required only simple intra corporeal suturing techniques.This is a simple maneuver that could be learnt easily. Moreover, we found that intracorporeal knotting technique should be mastered by surgeons willing to perform more advanced and complex laparoscopic procedures. Additionally, this technique avoids the intrinsic disadvantages of the use of clips. Beyond doubt simple ties are always available and very economic. We did not record bile duct injuries due to spread of monopolar diathermy current while dividing the cystic artery. We think that absence of this complication in our study patients is due to cauterizing the artery on the wall of the gallbladder far away from hilar structures after adequate arterial dissection. It is to be noted that some prerequisites should be fulfilled to obtain the best outcome when adopting this technique; 1) the cystic artery should be controlled prior to cystic duct ligation to avoid the possibility of torn artery during maneuvers needed for duct ligation 2) the cystic artery should be dissected up to the gallbladder wall sufficiently away from the hilar structures to minimize the risk of diathermy current spread and 3) the distal end of cystic duct should be ligated also to avoid spillage of gallbladder contents that may add to infective complications, and also to allow the use of the left hand instrument for dissection of gallbladder from liver.

Hence the proposed modification of LC with suture ligation of cystic duct is feasible, practical, safe and more economic as well.

CONCLUSION

Suturing technique can be used in the ligation of cystic duct during the procedure of Laparoscopic Cholecystectomy .This technique can be used as safe and effective alternative for the Conventional clip technique in Laparoscopic Cholecystectomy. Suturing technique can be used by experienced hands and in cases where cystic duct is large and cannot be occluded by the use of clips for ensuring safety .

Thus Suturing technique would be an effective technique in laparoscopic cholecystectomy for ligation of cystic duct in primitive setup and in cases of instruments failure and in peripheral set up without increasing morbidity to the patients.

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