

Comparing the Efficacy of Clipping versus Suture Ligation of the Cystic Duct in Laparoscopic Cholecystectomy: A Prospective Study

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Abstract

Introduction: Laparoscopic cholecystectomy (LC) has been performed for decades and is a fairly standardized procedure throughout the world. Ligation of the cystic duct (CD) is popularly done with the help of metal clips (MC). There are many other techniques described in the literature to deal with ligation of the CD. Suture ligation (SL) of the duct is one such way. The technique is simple, secure, and cost-effective.

Materials and Methods: This is a randomized prospective study conducted in Sri Ramachandra University Hospital from January 2012 to October 2015. All patients included consented for the study. Patients who underwent subtotal cholecystectomy were excluded from the study.

Results: A total number of 364 patients were included in the study. In 168 patients, the CD was clipped using MC and in 196 patients, the CD was suture ligated. 31 patients had to be excluded from the study belonged to the MC group. This was based on intra-operative findings such as frozen calot's triangle, wide CD, and Mirizi's. Of the 196 patients in the SL group, the CD in 40 of those patients had to be divided and closed in continuity for intra-operative findings as mentioned above. The mean operating time in the MC group was 51 min 32 s and 57 min 42 s in the SL group. In the MC group, three patients had post-operative bile leak from the CD stump and two had injury to the common bile duct.

Conclusion: SL of the CD is a very safe and secure alternative to the application of MC. It is also very cost-effective. This technique is recommended in all laparoscopic cholecystectomies, especially in difficult cases

Key words: Clipping, Cystic duct, Laparoscopic cholecystectomy, Suturing

INTRODUCTION

Laparoscopic cholecystectomy (LC) has been performed for decades and is a fairly standardized procedure throughout the world. Ligation of the cystic duct (CD) is popularly done with the help of metal clips (MC).¹⁻⁴ There are many other techniques described in the literature to deal with ligation of the CD. Suture ligation (SL) of the

duct is one such way. The technique is simple, secure, and cost-effective.⁵⁻⁷

In this study, we compare the results of two groups of patients, one in whom MC was used and the other in whom the CD was suture ligated, were studied and followed up for a period of 3-6 months.

MATERIALS AND METHODS

This is a randomized prospective study conducted in Sri Ramachandra University Hospital from January 2012 to October 2015. All patients included consented for the study. Patients who underwent subtotal cholecystectomy were excluded from the study. The same principle of Calot's

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triangle dissection was followed for all patients and at the time of CD ligation, it was revealed to the surgeon by closed envelope method whether to clip or suture ligate the duct. All patients underwent routine ultrasound, to look for pericystic duct collection on post-operative day (POD) 7. Patients were followed up in the immediate post-operative period for complications and subsequently for long-term follow-up.

RESULTS

A total number of 364 patients were included in the study. In 168 patients, the CD was clipped using MC and in 196 patients, the CD was suture ligated. 31 patients had to be excluded from the study belonged to the MC group. This was based on intra-operative findings such as frozen calot's triangle, wide CD, and Mirizi's. Of the 196 patients in the SL group, the CD in 40 of those patients had to be divided and closed in continuity for intra-operative findings as mentioned above. The mean operating time in the MC group was 51 min 32 s and 57 min 42 s in the SL group. In the MC group, three patients had post-operative bile leak from the CD stump and two had injury to the common bile duct (CBD). In this Group, one patient had post-operative bile leak and one patient had post-operative biliary stricture which was an incidental finding on follow-up. 42 patients in the MC group had subclinical pericystic duct collection on POD 7 ultrasound screening. Only four patients in the SL group had a collection. However, no intervention was required for the same, and it was managed conservatively. All patients were followed up for a period of 3-6 months. No significant long-term morbidity was noted in both groups.

DISCUSSION

LC has been the gold standard for over two decades (5). The complexity of gallbladder pathologies and its varied clinical presentation all has a bearing to what is in store for the operating surgeon. Be it a resident trainee or an expert surgeon, gallbladder surgeries always have a special reverence among all. Having been done extensively over the years, this surgery is one of the most standardized procedures today. The principle of gallbladder surgeries has been clearly defined and the techniques adapted today, all pave way for the safest possible outcome for the patient.^{8,9}

There is clearly no discrepancy regarding the various principle outlined, but however there are various clinical scenarios that might arise during surgery that may allow the operating surgeon to do something outside the routine. Like for example, following Calot's dissection, one finds the CD to be too wide for a safe ligation using MC. By principle, the duct has to be ligated and in open surgery, the

CD is securely ligated. However, in laparoscopy through a 10 mm epigastric port, a titanium metal clip is loaded onto a 10 mm applicator, and the CD is clipped twice and divided.

In this study, we put to use the older straightforward technique of SL of the CD and see how it compares with the ever so popular application of MC. LC has been included as a part of postgraduate training in our institution. Hence, as mentioned previously, they are performed across the entire hierarchy. Having said this, it is only obvious that the operating times noted in both groups may not throw light on the "true" time taken for SL of the CD and its subsequent effect on total time taken for surgery completion as senior surgeons are surely quicker than a trainee. Another fact to be considered is difficult gallbladder surgeries, which obviously is going to take longer. In our series, the longest time duration was at 3 h 52 min 23 s. In a series of 3126 patients reported by Subhas *et al.*,¹ retrospectively 70 patients were identified to have an operating time of more than 3 h, the operating time ranged between 3 h and 6 h 40 min for difficult surgeries.

The biggest advantage in the current usage of MC is its quick and easy application. A cochrane review showed a statistically significant operative time difference in the SL group (9). The time taken for SL was slightly longer when compared to the application of clips (3). However, it had no bearing in terms of time taken for the surgery per say in both groups, and there was no significant time delay in the SL group. In a series of 1000 cases done with SL of CD, the mean time taken is 3.5 s.¹⁰

The cost of one pack of medium clips (6 clips) is between 550 and 750 INR, depending on various companies. Recently, the use of absorbable clips with locking has come to vogue. It is, however, more expensive as compared to routine MC. Use of endo staplers is another method to close the CD and here again, the cost of stapler and the loading gun is quite steep. In our series, we used 3-0 polyglactin, which costs between 250 and 350 INR. This single suture material, the free end was used to ligate the CD, the cystic artery and for port closure, the needle end for skin closure.

Post-operative bile leak is a serious complication following LC. While majority of surgeons prefer the use of MC in routine LC, the disadvantage is that the clip limbs may not approximate correctly or the clips might slip off the stump.⁶ One cannot solely blame the clip, but the clip applicator might not give the adequate compression required for good approximation of the clips. Sometimes, these clips even fall off the applicator, common problem in an old applicator.⁷ There is documented evidence of clip migration into the CBD.⁸

Compared to MC, it is observed that the use of absorbable locking clips shows a lesser incidence in bile leak post-operatively.² In another study similar to ours reported a similar leak rate between both groups.³ However, in our series, the leak rate in the SL group was much less in comparison. On retrospective analysis, it was noted that the single case of bile leak was in a patient with a frozen Calot's triangle, and the duct had to be divided and sutured. There were no leaks in patients who had a straightforward ligation of the CD. In a series of 328 patients who underwent CD ligation with suture, only one patient had a reported bile leak.⁴

There is documented evidence that MC can induce inflammatory reaction around the CD stump.¹¹ To study this, we did an ultrasound screening for all patients in the study on POD and to find that, there was a radiologically significant fluid collection and fat stranding around the CD stump where MC was applied. However, this was not clinically significant as the patients had no specific symptoms.

In our cases, we used bipolar cautery for the cystic artery. Even though ElGeidie⁴ used monopoly cautery to tackle the cystic artery with no documents thermal injury to CBD, we prefer the use of the safer option of using the bipolar cautery for precise and safe cauterization of the cystic artery.

The use of simple ligature for CD occlusion is a very safe technique to prevent post-operative bile leak.¹² For beginners, it might be time-consuming to do an intra-corporeal knot but in the long run, it helps to harness knowing skills very early. Furthermore, intra-corporeal knowing and suturing are very important in the practice of advanced laparoscopic procedures. In conditions where the CD is dilated and wide, the clip may not occlude the entire lumen and thus the risk of leak is high. The same when suture ligated is safe and secure.

The specimen side also needs to be ligated so as to prevent bile and stone spillage into the peritoneal cavity during surgery.⁴

CONCLUSION

SL of the CD is a very safe and secure alternative to the application of MC. It is also very cost-effective. This technique is recommended in all laparoscopic cholecystectomies, especially in difficult cases.

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