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
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 of 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.

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., 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.4
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 ElGeidie\(^4\) 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.\(^5\)

**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.

**REFERENCES**


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