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A Comparative Study Between Cystic Duct Clipping and Ligation in Laparoscopic Cholecystectomy

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Abstract

Background: Laparoscopic cholecystectomy (LC) nowadays is the standard treatment for gallstone disease. In LC cystic duct and artery are usually secured by titanium clips and there are other methods for securing the cystic duct and artery like intracorporeal ligation or harmonic scalpel. the application of clips is shown to have some complications.

Objective: To compare the suture ligation versus clipping for securing cystic duct and artery in LC in terms of efficacy and safety and operation time.

Patients and methods: A Prospective study included (60) patients who were admitted to El-Sayed Galal Hospital to undergo elective LC for symptomatic gall bladder stones. Patients were divided into groups (A, B).

Results: Mean operative time in group A was 50.87 min and in group B was 55.73 min There was a mean difference in operation time of about 5 min increased in group B with a *P* value (0.141) that was statistically insignificant.

Conclusion: Suture ligation of cystic duct and artery by vicryl 2/0 is a safe, effective and cost-effective alternative to clips, especially in developing countries and non-functioning of clip applicators and has an advantage in case of the wide cystic duct.

Keywords: Cholecystectomy, Cystic duct, Laparoscopy

1. Introduction

Surgical removal of the gall bladder is called a cholecystectomy. It is the most common operation done for symptomatic gallstone diseases and other gall bladder-related pathologies.¹

Laparoscopic cholecystectomy (LC) nowadays is the standard treatment for gallstone disease.²

In LC, the cystic duct and artery are usually secured with titanium clips and there are other ways to secure the cystic duct and artery such as intracorporeal ligation, extracorporeal ligation or a symmetrical scalpel Fig. 1.³

Cystic duct ligation appears to be more cost-effective and has an advantage in cases of dilated cystic ducts. On the other hand, the application of clips seems to have some disadvantages such as displacement of the body and leakage of bile. Cases have been reported after long-term follow-up

showing translocation resulting in the formation of gallstones or bile duct stenosis.⁴

Intracorporeal ligation takes longer than clip application, requires good training, and in some series, they found that ligation of the cystic duct and artery separately does not increase surgery time if the surgeon has experience with intracorporeal ligation.

This work aims to study the difference between clipping and ligation to secure the cystic duct and artery in LC in terms of effectiveness, safety and difference in operating times in both methods.

2. Patient and methods

A prospective study included (60) patients admitted to Al-Sayed Galal Hospital to undergo LC for symptoms of gallstones.

Gallstones were diagnosed clinically and confirmed by ultrasound of the abdominal cavity.

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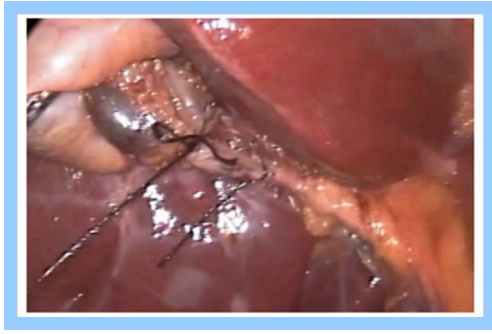


Fig. 1. Ligation of cystic duct and artery.

Consents were obtained from all study participants for both methods and were randomly divided into two groups.

Group A: includes 30 patients who underwent cystic duct and artery clipping during LC.

Group B: includes 30 patients who underwent cystic duct and artery ligation with Vicryl 2/0 during LC.

Inclusion criteria: Cases underwent LC for symptoms of gallstones.

Exclusion criteria: Cases who were diagnosed with mirrizi syndrome, Cases who were converted to open surgery and cases who were presented with Concomitant common bile duct stones.

2.1. Preoperative data

Demographic data (age, gender, and residence), medical history, medication intake, pancreatitis, previous endoscopic retrograde cholangiopancreatography (ERCP) and previous abdominal operations.

General assessment: includes height, body weight and BMI.

2.2. Operative data

The complications during the operation and the time of the operation in both groups were documented, where the times of operations are estimated from the first skin incision until the closure of the skin wounds.

2.3. Postoperative data

Follow-up during the hospital stay and on an outpatient basis for bile leakage, clip dislocation, or other complications.

2.4. Statistical analysis

Statistical package for social science (spss) program version 28 used for analysis.

Statistical significance depends on the *P* value equal to or less than 0.05.

3. Results

The study included 60 patients with symptomatic gallstone disease admitted to El-Sayed Galal for LC.

The patients were randomly divided into two groups, each including 30 patients.

3.1. Age distribution

The mean age in group A was 41.40 years range (20–59) and the mean age in group B was 38.73 years range. (19–53).

3.2. Gender distribution

In group (A) the ratio of males to females was 1: 2.75 and in a group (B) the ratio was 1: 3.2 [Table 1](#).

3.3. BMI

In both groups, BMI was predominantly between 25 and 30 and was classified as overweight and there was no statistically significant difference at the time of operation with respect to the BMI scale [Table 2](#).

3.4. Presentation

Of 60 patients who underwent LC, the main presentation in group A was chronic cholecystitis 21 patients then acute cholecystitis 9 patients, while group B included 22 patients who presented with chronic cholecystitis and 8 patients with acute cholecystitis.

There was an increase in the operation time in acute cases, but it was statistically insignificant in both groups [Table 3](#).

3.5. Previous ERCP

Three patients had a previous history of ERCP, two patients in group A and one patient in group B and there was no significant difference in the times

Table 1. Distributions of Gender in both groups.

CD_CA Securing	Frequency	Percent
Group A (Clipping)		
Female	22	73.3
Male	8	26.7
Total	30	100.0
Group B (Ligation)		
Female	23	76.7
Male	7	23.3
Total	30	100.0

Table 2. Relation between times of operation regarding BMI.

CD_CA securing	BMI	N	Mean time of operation (min.)	Std. deviation	P Value
Group A (Clipping)	Obese	5	55.20	5.586	0.228
	Overweight	17	50.41	4.032	
	Normal	8	49.13	4.673	
Group B (Ligation)	Obese	6	59.67	2.338	0.363
	Overweight	18	55.83	3.382	
	Normal	6	51.50	3.564	

of the operation in comparison with those who had no history of ERCP [Table 4](#).

3.6. Previous abdominal surgery

There were 8 patients who had previous abdominal surgery in group A, while in group B there were 5 patients who had previous abdominal surgery.

There was no statistically significant difference between the operation time in both groups regarding previous abdominal surgery [Table 5](#).

3.7. Operative data

3.7.1. Gallbladder perforation

During operations, there were GB perforations in 11 cases (18.3%) in both groups and there was no significant difference between operation times with regard to GB perforation.

3.7.2. Operation time

Operation time in both groups was calculated from skin incisions to wounds closure. The mean operation time estimated in group A was 50.87 min and in group B 55.73 min.

There was an increase in operation time of about 5 min in group B but it was not statistically significant in [Table 6](#).

3.8. Post-operative data

All patients were Discharged from the hospital after 1 day stay post-operative and the drain was

Table 3. Relation between times of operation regarding presentation.

CD_CA securing	Presentation	N	Mean time of operation (min.)	Std. deviation	P Value
Group A (Clipping)	Chronic	21	50.24	5.029	0.648
	Acute	9	52.33	3.969	
Group B (Ligation)	Chronic	22	54.59	3.737	0.072
	Acute	8	58.88	3.482	

Table 4. Relation between times of the operation regarding ERCP.

CD_CA securing	Previous ERCP	N	Mean time of operation (min.)	Std. deviation	P Value
Group A (Clipping)	Yes	2	48.00	8.485	0.144
	No	28	51.07	4.594	
Group B (Ligation)	Yes	1	58.00	.	0.945
	No	29	55.66	4.143	

removed 24 h after surgery as was no bile leak and less than 100 ml in the drain after 24 h and followed up in the outpatient clinic.

3.8.1. Bile leakage due to ligation slippage

There were two cases of clip slippage, one was discovered intra-operative and removed and another clip was applied, while the other case was discovered during follow-up and was having bile leakage and underwent ERCP [Table 7](#).

4. Discussion

Several methods have been studied for use as techniques for securing CD-CA rather than the application of clips, to predict long-term morbidity. In a study conducted in Japan, they found in their literature review that almost all cases of migratory clips included metal clips, so they used an absorbable clip due to the advantages of decomposition within 6 months.⁵

CD-CA clipping is a safe and effective method, but it has some disadvantages such as the wide diameter of the cystic duct, so intracorporeal ligation has an advantage in this situation and should be the standard in LC, especially with a good training.^{6,7}

In this study, the mean age of patients was 40 years with a female predominance compared to males, similar observations were made by Shabar Hussain whose study announced that among the 95 study participants, 89 (93.7%) were female and 6 (6.3%) were males with no statistically significant differences.⁸

In both groups with respect to BMI, most patients were overweight and there was no significant

Table 5. Relation between times of the operation regarding previous abdominal surgery.

CD_CA securing	Previous abdominal surgery	N	Mean time of operation (min.)	Std. deviation	P Value
Group A (Clipping)	Yes	8	51.00	5.831	0.372
	No	22	50.82	4.479	
Group B (Ligation)	Yes	5	56.20	3.899	0.338
	No	25	55.64	4.202	

Table 6. Association between times of operation (min.) and CD-CA securing.

CD_CA securing	N	Mean time of operation (min.)	Std. deviation	P Value
Group A (Clipping)	30	50.87	4.769	0.141
Group B (Ligation)	30	55.73	4.093	

difference between operations times with respect to BMI, as well as operations times in both groups which was similar to a study by Ismail, DA.⁹

Operation time in both groups was calculated from skin incision to skin closure. The mean operational time was calculated in both groups and found non-statistically significant results, in our study the mean operating time in the clipping group was 50.8 min and in the suturing ligation group it was 55.7 min with a *P* value of 0.141. Similar observations were made by Ismail, Da. Where it was found that there are no statistically significant differences in the operation times between the two groups with (*P* value: 0.08).

Another study declared that the operation time was 46.6 min in the clipping group and 70.7 min in the ligation group. The authors noted that the operation time was longer when using the intercorporeal ligation than when applying the clip, but the difference was statistically insignificant (*P* = 0.493).⁷

In our study two patients in group A had complications, one patient had Clip dislodgment discovered intra-operative and another patient was having post-operative bile leak due to clip slippage, which was managed by ERCP. There was no post-operative complication in the suture ligation group.

In another study, there were bile leakage in two patients (0.82%) patients after surgery. In one case, the clip was found to have slipped out of the cystic duct.¹⁰

In our study, the cost of Vicryl 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 15–25 EGP (0.82–1.3 \$), whereas for the titanium clips used for clipping it was far higher, reaching 100 EGP (5–6 \$).

This suggests that the use of sutures for ligation is a very cost-effective and economic option for ligation. The suture is readily available everywhere, but the availability of clips can be sometimes questioned even in terms of appropriate size and the suture is easy to apply in the dilated or short cystic duct.

5. Conclusion

Suture ligation of cystic duct and artery using absorbable suture is safe, reliable and low cost, especially in developing countries.

Intracorporeal ligation has an advantage in the case of the wide cystic duct diameter, as it decreases the complications resulting from clip slippage.

Conflict of interest

None declared.

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Table 7. Association between Bile leakage due to ligation slippage and CD-CA securing.

CD_CA securing	Bile leakage due to ligation slippage	Frequency	Percent	P Value
Group A (Clipping)	Yes	2	6.7	0.150
	No	28	93.3	
	Total	30	100.0	
Group B (Ligation)	No	30	100.0	