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Tie versus clipping typed of cystic duct and artery ligation in laparoscopic cholecystectomy

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ABSTRACT

Background: In laparoscopic cholecystectomy (LC) cystic duct and cystic artery (CD-CA) are usually secured by using Titanium clips. Because of some complications may occur in application of clips; like dislodgement and migration of the clips, so other different techniques have been used, like intra or extracorporeal ligation, using of absorbable clips, harmonic scalpel or LigaSure. Intra-corporeal ligation takes more time than applying a clip, and it needs well training. In the other hand clipping have a challenge in cases with wide cystic duct. The objective of the study is to compare the efficacy and safety of suture ligation versus clipping, in securing CD-CA in LC, and also time difference of operations in both methods.

Methods: A Prospective study included 94 females, and 32 males underwent LC; in 51 patients CD-CA were secured by intra-corporeal ligation separately, and in 75 patients CD-CA were secured by Titanium clips. Postoperatively the patients followed up in the outpatient clinic at the end of the first and second postoperative weeks for any complication.

Results: There were no significant differences in the operation times between the two groups (p-value: 0.08), and also no significant difference found between the operation times and the different presentations, history of upper abdominal surgery, present of umbilical hernias, and different BMI. There was no per-operative bile duct injury and no postoperative bile leak, intraperitoneal collection, or jaundice, in both groups.

Conclusion: Suture ligation for CD-CA is safe and effective. Learning intra-corporeal knotting is important and plays an important role even in addition to the use of the clipping, and should be the recommended training in basic laparoscopic surgery.

Keywords: Laparoscopic cholecystectomy, bile duct injury, cystic duct ligation, intracorporeal knotting.
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INTRODUCTION

Laparoscopic cholecystectomy (LC) is a common surgical procedure and has improved surgical outcomes if compared with open cholecystectomy (OC), it has less postoperative pain, shorter hospital stay, quicker return to the normal activities and a more cosmetic outcome, but it needs higher infrastructure and expensive equipment. LC also associated with higher morbidity, such as bile duct injury (BDI), bile leakage, injury to the surrounding structures, uncontrolled hemorrhage, spillage of gall stone (GS), biliary strictures, and clip slippage.[1] Postoperative bile leak is a serious complication, occurs in about 0.3% of cases.[2] In LC, cystic duct and cystic artery (CD-CA) are usually secured by using Titanium clips. There are other different techniques for securing CD-CA, like intracorporeal ligation by separate and multiple ligatures for CD-CA by absorbable suture material, or extracorporeal ligation, using absorbable clips, harmonic scalpel or LigaSure.[3,4,5] The problem of using these advanced tools they are expensive for developing countries, as in a study done in India showed that suture ligation of CD appeared to be more cost effective.[6] On the other hand, the application of clips shown to have some drawbacks such as dislodgement and bile leak,[7,8,9] there are reported cases after long term follow up shown clip migration which resulted in biliary stone formation,[10,11,12] or bile duct stenosis.[13] In other studies, they found that clips ulcerated through the duodenum.[14] Although intra-corporeal ligation takes more time than applying a clip, and it needs well training, and in some series they found that ligation of CD-CA separately does not increase operative time if the surgeon has experience for intra-corporeal knotting.[15] And some others thought that it is feasible, cost-effective and safe alternative method to secure CD-CA in LC.[3] Although clipping and the use of Harmonic scalpel are an efficient and practical method for securing CD-CA in LC, they have a challenge in cases with wide CD (more than 5 mm).[7] The Aim of this study is to compare the two different methods; Tie versus clipping, for securing CD-CA in LC, in terms of efficacy and safety, and also the difference in the times of operations in both methods.

METHODS

A Prospective study was done between 23rd of February, and 22nd of May 2019, in Sulaimani Teaching Hospital and Baxshin private hospital in Sulaimani city. The study included patients with symptomatic GS who underwent LC; performed by two teams were using different methods. Consents were obtained from all participants included in the study for both methods. Demographic data (age, gender, and residency), body mass index (BMI), previous cholecystitis, pancreatitis, endoscopic retrograde cholangiopancreatography (ERCP) and previous abdominal surgery, all recorded before the operation. Postoperatively the patients followed up in the outpatient clinic at the end of the first and second postoperative weeks for any complication. Both groups had mixed cases of GS; acute and chronic Cholecystitis. The standard technique of LC was carried out with four ports and using a 30-degree laparoscope. Special attention was taken, like adequate insufflation of CO_2, good lightning, using of cauterization after holding the tissue under complete visualization. The intraoperative findings and complications recorded. The times of the operations estimated from the first skin incision until the closing of the skin wounds. Any case of conversion to OC was excluded.

Group A: include 51 patients had LC, done in Sulaimani Teaching hospital, ligations of CD-CA were done by tying them using 2/0 vicryle suture material by intra-corporeal knotting separately. Group B: include 75 patients had LC, done in Baxshin private hospitals, clipping of CD-CA were done by using Titanium clips. The data after collection were entered into an excel sheet then after data clearness transferred to Statistical Package for Social Sciences (SPSS) program version 21 for analysis. P-value equal to or less than 0.05 was regarded as statistically significant.

Table 1 Distributions of sex, presentation, ERCP, previous surgery, umbilical hernias and BMI

		Frequency	Percent
Sex	Male	32	25.4
	Female	94	74.6
Presentation	Biliary Colic	72	57.1
	Acute Cholecystitis	48	38.1
	Biliary Pancreatitis	6	4.8
ERCP	Yes	7	5.6
	No	119	94.4
Upper Abdominal Surgery	Yes	7	5.6
	No	119	94.4
Umbilical Hernia	Yes	6	4.8
	No	120	95.2
BMI	Low BMI	1	0.8
	Normal BMI	26	20.6
	Overweight	50	39.7
	Obese	49	38.9
Total		126	100.0

RESULTS

From 126 patients underwent LC; 94 (74.6%) were females, and 32 (25.4%) were males. The mean age and standard deviations were (41.857±13.5527) years. The main presentation was biliary colic (57.1%), then acute cholecystitis (38.1%) and (4.8%) had biliary pancreatitis. Seven patients had a history of ERCP, seven patients had upper abdominal scars for previous surgeries, and 6 patients had umbilical hernias. Most of the patients were overweight and obese (78.6%) (Table 1).

From those 126 patients, in 51 patients CD-CA were ligated by ties (2/0 Vicryle), while in 75 patients CD-CA were secured by clips. There were no significant differences in the times of the operations (Table 2).

There was no significant difference between the times of the operations and the presentations, and also there was no significant difference between the times of the operations in both groups (Table 3).

All patients who had a history of ERCP were operated in the group-A, and there was no significant difference in the times of the operations with comparison with those who had no history of ERCP (Table 4).

There was no significant difference between the times of the operations and history of upper abdominal surgery and between the times of the operations in both groups (Table 5).

There were no significant differences between the times of the operations and presence of umbilical hernias, and also between the times of the operations in both groups (Table 6).

There was no significant difference between the times of the operations regarding BMI, and also between the times of the operations in both groups (Table 7).

During the operations, there were perforations of the GB in 22 cases (17.5%), but there was no significant difference between the times of the operations in both groups (Table 8).

We have two conversions that were excluded from the study. We have no per-operative BDI and no postoperative complications in terms of bile leak, intra-peritoneal collection, or jaundice, in both groups.

Table 2 Association between times of operations (min.) and CD-CA ligations

CD-CA ligations	N	Meantime (Min.)	Std. Deviation	P-value
Tie	51	40.157	9.7373	
Clip	75	36.613	11.8537	0.08
Total	126	38.048	11.1426	

Table 3 Relation between times of operations regarding presentation and CD-CA ligations

CD-CA ligation	Presentation	Meantime of operation (Min.)	N	Std. Deviation	P-value
Tie	Biliary Colic	40.714	35	10.3996	
	Acute Cholecystitis	39.231	13	7.6937	
	Biliary Pancreatitis	37.667	3	12.5033	
	Total	40.157	51	9.7373	
Clip	Biliary Colic	34.865	37	11.6504	
	Acute Cholecystitis	38.286	35	12.1524	0.08
	Biliary Pancreatitis	38.667	3	11.5470	
	Total	36.613	75	11.8537	
Total	Biliary Colic	37.708	72	11.3701	
	Acute Cholecystitis	38.542	48	11.0511	
	Biliary Pancreatitis	38.167	6	10.7781	
	Total	38.048	126	11.1426	

Table 4 Relation between times of the operations regarding ERCP and CD-CA ligations

CD-CA ligation	ERCP	Meantime of operation (Min.)	N	Std. Deviation	P-value
Tie	Yes	43.286	7	9.7761	
	No	39.659	44	9.7502	
	Total	40.157	51	9.7373	0.08
Total	Yes	43.286	7	9.7761	
	No	37.739	119	11.1777	
	Total	38.048	126	11.1426	

Table 5 Relation between times of the operations regarding upper abdominal surgery and CD-CA ligations

CD-CA ligation	Upper abdominal surgery	Meantime of operation (Min.)	N	Std. Deviation	P-value
Tie	Yes	35.500	2	2.1213	
	No	40.347	49	9.8859	
	Total	40.157	51	9.7373	
Clip	Yes	31.200	5	7.2595	
	No	37.000	70	12.0566	0.08
	Total	36.613	75	11.8537	
Total	Yes	32.429	7	6.3471	
	No	38.378	119	11.2912	
	Total	38.048	126	11.1426	

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Table 6 Relation between times of operations regarding Umbilical Hernias and CD-CA ligations

CD-CA ligation	Umbilical Hernia	Meantime of operation (Min.)	N	Std. Deviation	P-value
Tie	Yes	50.000	1		
	No	39.960	50	9.7331	
	Total	40.157	51	9.7373	
Clip	Yes	39.600	5	6.1887	
	No	36.400	70	12.1565	0.08
	Total	36.613	75	11.8537	
Total	Yes	41.333	6	6.9761	
	No	37.883	120	11.3049	
	Total	38.048	126	11.1426	

Table 7 Relation between times of operation regarding BMI and CD-CA ligations

CD-CA ligation	BMI	Meantime of operation (Min.)	N	Std. Deviation	P-value
Tie	Low BMI	45.000	1		
	Normal BMI	41.300	10	10.3821	
	Obese	38.792	24	10.2065	
	Over Weight	41.188	16	9.2247	
	Total	40.157	51	9.7373	
Clip	Normal BMI	33.688	16	8.9048	
	Obese	41.920	25	15.2723	0.08
	Over Weight	34.088	34	8.7952	
	Total	36.613	75	11.8537	
Total	Low BMI	45.000	1		
	Normal BMI	36.615	26	10.0323	
	Obese	40.388	49	13.0013	
	Over Weight	36.360	50	9.4518	
	Total	38.048	126	11.1426	

Table 8 Relation between times of operations regarding perforation of the GB and CD-CA ligations

CD-CA ligation	Perforation	Meantime of operation (Min.)	N	Std. Deviation	P-value
Tie	Yes	38.000	10	8.4459	
	No	40.683	41	10.0510	
	Total	40.157	51	9.7373	
Clip	Yes	43.667	12	14.8283	
	No	35.270	63	10.8274	0.08
	Total	36.613	75	11.8537	
Total	Yes	41.091	22	12.4132	
	No	37.404	104	10.8104	
	Total	38.048	126	11.1426	

DISCUSSION

Many methods have been studied to be used as techniques for securing CD-CA rather than applying metal clips, for the expectation of long-term morbidity. In a study done in Japan, they found in their review of the literature that almost all cases of migrating clips involved metal clips, so they used a polymeric absorbable clip because of the advantageous in degrading within 6 months[16] and some believed that the CD ligation with absorbable thread should be a gold standard in LC[17] because it reduces the risk of postoperative morbidity.

Clipping of the CD-CA is a safe and efficient method, but it has some challenges like cystic duct diameter,[7] so intracorporeal ligation is solution and should be the gold standard in LC[1] especially after good training and also, as we came up with it, it is a safe and easily learned. Although longer time is expected for intracorporeal ligation of CD-CA, no significant differences found in our study in meantime of the operations; 40.157±9.7373 min. for Tie group, and 36.613±11.8537 min. for clip group, with P-value of (0.08), if compared to a study done in India where the meantime was 70.7 min. for ligature group and 46.6 min. for clip group,[1] they attributed that for less experience of surgeons to do intracorporeal ligation, and the meantime was 50 min. in study done by Pradu,[6] where CD ligation alone took 5 min. The meantime taken for the cystic duct ligation was 3.5 min. in a study that included 1000 LC by Golash V[18] and they regarded intracorporal ligation as simple, safe and economical. But in a study done by Seenu V and colleagues they were using polyglactin suture ligature and the time was slightly longer than that using Titanium clips,[19] but it required only extra 2-4 minutes more than clipping in the study done in Bangladesh.[3] In our study, the time of ligation of both CD and CA took 4-6 min. The Main presentation of GS in this study was biliary colic (57%), then AC (38%) and (4.8%) had pancreatitis. Female to male ratio was 3:1, while in a study done in Italy it was: AC (49%) and pancreatitis (4%).[20]

GB perforation occurred in 10 patients in group-A and 12 patients in group-B, (17.46%), nearly same in study done by Sharma D and colleagues,[1] but this didn't make significant difference in the time of the operations in our study (p-value 0.08). Seven patients (5.6%) in our study had a history of ERCP, and preoperative ERCP known to have more chances of having a difficult cholecystectomy[21] and all those patients were operated in Tie group and there was no significant difference in the times of the operations.

In a study done by Osman Riaz, there was 3.3% bile leakage in the clip group while no case in the tie group[22] and a study done in Tehran it was 4%,[23] in our study we have no BDI or bile leak, also no BDI found in the study used absorbable locking clips and showed a lesser incidence in bile leak postoperatively[6] and there was no significant difference in the postoperative outcome in either group in a study done by Seenu V and colleagues.[20] In our locality, the cost of clips, usually 4-5 clips are needed for a case of LC is 5 times more than the cost of an absorbable Vicryl suture used for the tie.

CONCLUSION

Ligation for cystic duct and artery is safe and effective. There were no significant differences found in meantime of the operations. Learning intracorporeal knotting is important in addition to the use of the clipping, especially in places where there are wide cystic duct and unsuitable size of the clip, and should be the recommended training in basic laparoscopic surgery.

ETHICAL CONSIDERATION

The study approved by the Ethical Committee of the College of Medicine of the University of Sulaimani.

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CONFLICT OF INTEREST

We declare that there were no conflicts of interest in this study.

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AUTHOR CONTRIBUTION

All of authors are equally contributed to the study from the study framework, data gathering, data analysis, until reporting the result of study.

REFERENCES

1. Sharma D, Sharma B, Solanki M. Laparoscopic Cholecystectomy: Cystic Duct Occlusion with Titanium Clip or Ligature. In J Sci Res. 2016; 11:1909-12.
2. Shea JA, Healey MJ, Berlin JA, Clarke JR, Malet PF, Staroscik RN, et al. Mortality and complications associated with laparoscopic cholecystectomy, A meta-analysis. Ann Surg. 1996;224:609-620.

3. Saha PK, Roy RR, Rahman M, Khan EH, Reza SM, Rabbani MG, Alom KS. Clipless Laparoscopic Cholecystectomy: An initial experience of 50 cases in Bangladesh. J Sci Foun. 2015; 13(1):11-4.
4. Kandil T, El Nakeeb A, El Hefnawy E. Comparative Study between Clipless Laparoscopic Cholecystectomy by Harmonic Scalpel Versus Conventional Method: A Prospective Randomized Study. J Gastrointest Surg. 2010; 14: 323-8.
5. Huscher CGS, Lirici MM, Di Paola M et al. Laparoscopic cholecystectomy by ultrasonic dissection without cystic duct and artery ligature. Surg Endosc. 2003; 17: 442-51.
6. Prabu KM, Balaji D, Pai VM. Is suture ligation of cystic duct in laparoscopic cholecystectomy a safe alternative to clipping? Our experience in a rural center. In Surg J. 2019 Sep 26;6(10):3715-8.
7. Abou-Sheishaa MS, ElHadidi A, Negm A, AbdElhalim M, Beshir M, Elbahy A, Comparing the efficacy and safety of methods for securing the cystic duct in laparoscopic cholecystectomy metallic clip versus harmonic scalpel versus suture ligation: (Prospective study). Al-azhar assiut medical journal. 2015;13(1): 96-101.
8. Photi ES, Partridge G, Rhodes M, Lewis MP. Surgical clip migration following laparoscopic cholecystectomy as a cause of cholangitis. J Surg case rep. 2014 Apr 1; 2014(4):rju026.
9. Raja W, Mathai SK, Sebastian B, Ahmad A, Khan SS, George M. Surgical Clip Migration Following Laparoscopic Cholecystectomy as a Cause of CBD Stone. In J Gastroenterol. 2017 Jul 10;1(1):9.
10. Chong VH, Yim HB, Lim CC. Clip-induced biliary stone. Singapore Med J. 2004; 45: 533.
11. Steffen M, Kronsbein H, Wesche L. Metal clip as a nidus for formation of common bile duct stone following laparoscopic cholecystectomy. Zeitschrift für Gastroenterologie. 2007 Apr; 45(04):317-9.
12. Ahn SI, Lee KY, Kim SJ, Cho EH, Choi SK, Hur YS, Cho YU, Hong KC, Shin SH, Kim KR, Woo ZH. Surgical clips found at the hepatic duct after laparoscopic cholecystectomy: a possible case of clip migration. Surg Laparosc Endosc Percutaneous Tech. 2005 Oct 1; 15(5):279-82.
13. Matsumoto H, Ikeda E, Mitsunaga S, Naitoh M, Furutani S, Nawa S. Choledochal stenosis and lithiasis caused by penetration and migration of surgical metal clips. J Hepato-Biliary-Panc Surg. 2000 Dec; 7(6):603-5.
14. Yao CC, Wong HH, Chen CC, Wang CC, Yang CC, Lin CS. Migration of endoclip into the duodenum. A rare complication after laparoscopic cholecystectomy. Surg Endosc. 2001 Feb;15(2):217-.
15. Wise US, Glick GL, Landeros M. Cystic duct leak after laparoscopic cholecystectomy: a multi-institutional study. Surg Endosc 1996; 10: 1189-93.
16. Yano H, Okada K, Kinuta M, Nakano Y, Tono T, Matsui S, Iwazawa T, Kanoh T, Monden T. Efficacy of absorbable clips compared with metal clips for cystic duct ligation in laparoscopic cholecystectomy. Surg Today. 2003 Jan 1;33(1):18-23.
17. Saha SK. Ligating the cystic duct in laparoscopic cholecystectomy. American J Surg. 2000 Jun 1; 179(6):494-6.
18. Golash V. An experience with 1000 consecutive cystic duct ligation in laparoscopic cholecystectomy. Surg Laparosc Endosc Percutaneous Tech. 2008 Apr 1; 18(2):155-6.
19. Seenu V, Shridhar D, Bal C, Parshad R, Kumar A. Laparoscopic cholecystectomy: cystic duct occlusion with titanium clips or ligature? A prospective randomized study. Trop Gastroenterol. 2004; 25(4):180-3.
20. HŘscher CG, Lirici MM, Di Paola M, Crafa F, Napolitano C, Mereu A, Recher A, Corradi A, Amini M. Laparoscopic cholecystectomy by ultrasonic dissection without cystic duct and artery ligature. Surg Endosc Inter Tech. 2003 Mar 1; 17(3):442-51.
21. Vivek MA, Augustine AJ, Rao R. A comprehensive predictive scoring method for difficult laparoscopic cholecystectomy. J Min Access Surg. 2014 Apr; 10(2):62.
22. Riaz O, Riaz MF, Rehan A. Metal Clips versus Intracorporeal Ligation for Cystic Duct Occlusion in Laparoscopic Cholecystectomy. Annals of Punjab Medical College (APMC). 2017 Jun 14; 11(2):165-8.
23. Talebpour M, Panahi M. New aspects in laparoscopic cholecystectomy. J Laparoendosc Adv Surg Tech. 2007 Jun 1; 17(3):290-5.