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TO COMPARE KNOT VS CLIP FOR LIGATION OF CYSTIC DUCT IN LAPAROSCOPIC CHOLECYSTECTOMY

Surgery

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ABSTRACT

This study aimed to compare intracorporeal knotting with clip ligation for securing the cystic duct in laparoscopic cholecystectomy. The comparison was based on feasibility, operative time (from incision to closure), and post-surgical factors such as pain, complications, and associated risks, including gallbladder perforation, bile leakage, liver injury, wound infection, clip migration, and clip slippage. **Methodology:** Patients were randomly divided into two groups: **Study group:** Underwent extracorporeal knotting for cystic duct closure. **Control group:** Had the cystic duct secured using clips. The study was conducted from August 2023 to March 2025 **Results:** Among 60 patients, 11 in the control group experienced intraoperative complications, whereas no complications were observed in the study group. The average operative time for the study group (intracorporeal knotting) was 67.33 minutes, compared to 61.89 minutes for the control group (clip ligation). **Conclusion:** Intracorporeal knotting in laparoscopic cholecystectomy offers advantages like reduced complications, with minimal increase in surgical time.

KEYWORDS

INTRODUCTION

Laparoscopic cholecystectomy (LC) has become the standard treatment for gallbladder disease, particularly symptomatic cholelithiasis [1]. The procedure has undergone significant advancements, with various techniques being developed to improve outcomes. One crucial aspect of LC is the ligation of the cystic duct and cystic artery, which can be achieved using clips or extracorporeal knotting [2-4].

Gallbladder disease is a common condition, with a significant incidence of gallstones and associated complications [5-7]. The diagnosis and treatment of gallbladder disease have evolved, with laparoscopic approaches becoming increasingly popular [8-10]. However, the choice of technique for cystic duct ligation remains a topic of debate among surgeons [11-13].

This study aims to address this debate by evaluating the outcomes of clip application and intrracorporeal knotting for cystic duct ligation during LC. We will examine the feasibility, operative time, postoperative pain, and associated morbidities of these two techniques.

The importance of proper cystic duct ligation cannot be overstated, as it is a critical step in preventing bile leaks and other complications [14].

AIMS AND OBJECTIVES

The study aimed to compare intracorporeal knotting and clip ligation for securing the cystic duct in laparoscopic cholecystectomy, focusing on:
Feasibility of both techniques.

Operative time (from incision to closure).

Postoperative outcomes, including pain, surgical costs, and complications such as bile leakage, liver injury, gallbladder perforation, wound infection, clip migration, and slippage.

METHODOLOGY

Study Design

This study was designed as a prospective, interventional, comparative study. It aimed to compare the outcomes of two different techniques for cystic duct ligation during laparoscopic cholecystectomy: clip application and intracorporeal knotting. The study utilized a parallel-group design, where participants were randomly assigned to one of the two treatment groups.

Study Setting

The study was conducted in the Department of Surgery at S.N. Medical College, Agra. This tertiary care hospital serves a large population and provides a diverse patient pool, enhancing the generalizability of the study findings. The study was approved by the institutional ethics committee before commencement.

Study Duration

The study spanned a period of 20 months, from August 2023 to March2025.

Study Sample Size

The sample size for this study was calculated based on a previous study by Kuldip Singh et al. (2017)(15) which reported the mean operating time for extracorporeal knotting and clip application during laparoscopic cholecystectomy. Based on their data, the anticipated mean difference in operating time between the two groups was 12.67 minutes, with a common standard deviation of 14.85 minutes. Using a power analysis with a desired statistical power of 80% and a significance level of 0.05, the calculated minimum sample size required was 30 patients per group. Formula used was as follows:

$$N = 2\left[\frac{\left(Z_{1-\alpha/2} + Z_{\beta}\right) * S}{d}\right]^2$$

—level of significance = 95%
$Z_{1-\beta}$—power of the study = 80%
d = clinically significant difference between two parameters
SD = common standard deviation

To account for potential dropouts or losses to follow-up, the sample size was increased to 35 patients per group, resulting in a total sample size of 70 patients.

Data Analysis

The collected data were analyzed using mean ± SD, percentages, and graphical representations. Differences between quantitative variables were assessed through unpaired t-tests or Wilcoxon signed-rank tests. Categorical data were compared using the Chi-square test or Fisher's exact test to determine statistical significance.

Data Collection Methodology

Patients undergoing cholecystectomy were enrolled in the study and were alternately assigned to either the study or control group. Each participant underwent a thorough clinical examination and comprehensive investigations before being included in the study. Baseline patient characteristics were documented for both groups.

All cases were carefully monitored and assessed during the preoperative, intraoperative, and postoperative phases, with a follow-up period of three months. During the postoperative assessment, parameters such as time taken for laparoscopic cholecystectomy, duration from incision to closure, presence of bile/stone spillage, and the cost of clips or sutures were recorded. Patients were continuously observed for any complications.

Inclusion Criteria

Patients diagnosed with cholecystitis, whether calculous or acalculous, and those with cholelithiasis were eligible for inclusion in the study.

Exclusion Criteria

Patients with pre-existing cardiac conditions, pregnant women, individuals deemed unsuitable for general anesthesia, and those with common bile duct (CBD) stones were excluded from the study

RESULTS

This study was conducted from August 2023 to March 2025, i.e., for a period of 20 months; 60 cases were subjected to laparoscopic cholecystectomy, and the following results were observed. In the study group, there were no intraoperative complications noted among the 30 patients. In the control group, 11 patients had intraoperative complications, six patients had clip slippage and stone spilling into the peritoneal cavity from the gallbladder, four patients had clip slippage and bile spillage into the peritoneal cavity from the gallbladder, and 1 patient had clip migration (Table 1). In the study group, mean time taken for the operation was 67.33minutes when compared to control group of 61.89 minutes. In the study group, maximum time taken was 106 minutes and the minimum time taken was 36 minutes. In the control group, maximum time taken was 78 minutes and the minimum time taken was 36 minutes .(Table 2)

Table 1: Distribution Of Subjects According To Intraoperative Complications

	Study Group		Control Group			
Intraoperative Complications	**N**	**%**	**N**	**%**	**Chi square test**	**Remark**
Bile leak	0	0	0	0	$\chi2 = 13.469$	p=0.0037
Clip migration	0	0	1	3.3		
Clip slippage,bile leak	0	0	4	13.33		
Clip slippage, Stone spillage	0	0	6	20.0		
Nil	30	100	19	63.3		
Total	30	100.0	30	100.0		

Table 2: Comparison Of Operation Time (minutes) Between Study And Control Groups

Operation Time (minutes)	Mean	±SD	Difference in mean (%)	Unpaired t test	P value	Remarks
Study	67.33	15.230	4.68 (6.94%)	t=1.636	p= 0.107	NS
Control	61.89	10.55				

Follow up

Patients were followed up till one month,no significant complications were observed.

DISCUSSION

For centuries, gallstones have affected humans, and cholecystectomy remains the best treatment for symptomatic gallstone disease. Among elective procedures, laparoscopic cholecystectomy is preferred due to its effectiveness and feasibility. Compared to open surgery, it offers benefits such as faster recovery, less pain, shorter hospital stays, and a quicker return to daily activities.

This study evaluated the use of intracorporeal knotting with Vicryl No. 1 sutures for cystic duct occlusion. The knot was tied in two locations—one near the common bile duct and the other close to the gallbladder. The gallbladder was then dissected and removed. In most cases, stones were extracted in an endo-bag, while a few patients required drain placement.

For patients with obstructive jaundice, additional ligation of the cystic duct was necessary before suturing, reducing the risk of bile duct injury. Literature suggests that using a suture with an absorptive property minimizes the risk of bile leakage.

The study found that most patients undergoing laparoscopic cholecystectomy were between 30 and 49 years old, similar to findings from previous research.

Regarding surgical time, intracorporeal knotting took an average of 67.33 minutes, compared to 61.89 minutes with clips. However, the difference was not statistically significant. While clips save intraoperative time, they carry risks such as slippage, which can lead to bile leakage. Knotting, on the other hand, is a more secure option in situations where clips may not be ideal.

One drawback of intracorporeal knotting is that it is not commonly used, requiring specific skills and practice. Nonetheless, experience has shown that with increased use, surgical time can be reduced.

CONCLUSION:

Intracorporeal knotting in laparoscopic cholecystectomy offers advantages like reduced complications, with minimal increase in surgical time.

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