Research Article

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A comparative study to evaluate the outcome of routine use of drain verses no drain after laparoscopic cholecystectomy: a tertiary care teaching centre experience

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ABSTRACT

Background: Laparoscopic cholecystectomy (LC) is the currently the gold standard method of cholecystectomy for symptomatic cholelithiasis. The role of routine drainage after LC to decrease postoperative morbidity is still an issue of considerable debate. This study aims to assess the benefits and harms of routine abdominal drainage and to compare the outcome of sub hepatic drainage with no drainage after uncomplicated LC.

Methods: This retrospective study was conducted in two phases, as open, randomized controlled trial (RCT), conducted in general surgery department of Civil Hospital - Sola, Ahmedabad, from April 2013 to March2014 for phase I and From April 2014 to December 2014 for phase II. In this study, in phase I, total 160 patients with chronic calculus cholecystitis underwent LC. Patients were divided into two groups, sub hepatic drainage (group A: 78 patients) or no drainage (group B: 78 patients). The rest 4 patients were excluded either due to conversion or elective sub hepatic drainage. In phase II, 110 consecutive patients were enrolled, who underwent LC with No sub hepatic drainage.

Results: Duration of operation, character and amount of drain fluid (if placed), postoperative ultrasound for sub hepatic collection, postoperative pain, postoperative nausea/vomiting, duration of hospital stay, and preoperative or postoperative complications were noted and analysed. Duration of operation and hospital stay was slightly longer in group A patients (P values 0.002 and 0.029, respectively); postoperative pain perception, nausea/vomiting, and postoperative complications were nearly same in both groups (P value 0.064, 0.078, 0.003, respectively). Sub hepatic fluid collection was more in group A (P=0.002). Phase II results were nearly similar to group B patients in phase I. **Conclusions:** Routine sub hepatic drainage after LC is not necessary in uncomplicated cases.

Keywords: Laparoscopic cholecystectomy, Sub hepatic drainage - Drains versus no drains Pnumoperitoneum, Postoperative pain

INTRODUCTION

Laparoscopic cholecystectomy (LC) is the current preferred method of cholecystectomy. The role of routine drainage after LC to decrease postoperative morbidity is still an issue of considerable debate. The main reason to use drains in laparoscopic cholecystectomy is to avoid bile and blood collection requiring subsequent open procedures and to reduce post operative Pain. Drainage of

body cavities has been practiced in medicine for a long time.¹ Historical reports of drainage of chest empyema and ascites go back to the Hippocratic era.² However, abdominal drainage has always been a subject of controversy, practiced in confusion and subjected to local dogmas.³ A hundred years have passed during which operative surgery and supportive care techniques have progressed astonishingly; but what about drainage? Is the practice of drainage any less controversial, more rational

and less confusing today.4 Cholecystectomy without sub hepatic drainage was first de-scribed in 1913, and since then surgeons were divided whether to use it as a routine drainage or not in uncomplicated cases.⁵ Most surgeons continue to use routine sub hepatic drain for the fear of bile leak and bleeding.^{6,8} Such complications invariably occurred in spite of sub hepatic drainage.⁷ Easier convalescence, decreased rate of complications, and shortened hospital stay were the advantages of no drainage. Laparoscopic cholecystectomy (LC), after its advent in 1987, rapidly established itself as the gold standard treatment of gallstones Arguments of drainage from open era continues into the laparoscopic era, with another factor, that is, pneumoperitoneum being questioned. Pneumoperitoneum is considered the causative factor for postoperative nausea/vomiting, and postoperative pain, especially shoulder tip pain, following LC. This study, therefore, aims to determine the role of routine sub hepatic drainage, after uncomplicated LC, and its effect on postoperative nausea/vomiting, pain, and wound complications.

METHODS

This Retrospective study was conducted in two phases. Phase I was conducted at surgical department of civil hospital, Sola, Ahmedabad from April 2013 to March 2014 (tertiary care teaching institution) and phase II was conducted at same institute but from April 2014 to December 2014. Phase I study was retrospective, analytical, comparative study using randomized controlled trial (RCT). Blocked randomization was used for allocation of patients to two groups (groups A and B). The patients are divided in blocks of two, and within each block the first patient was allocated in group A and the second in group B. The whole process of generation, allocation and implementation of randomization, as well as assessment were done by different groups of junior doctors who were posted in surgery department for rotation. The study was open as patients, junior doctors (assessors), and surgeons cannot be blinded. A total of 160 patients were enrolled in Group A, 78 patients, underwent LC with sub hepatic drain-age. Group B, 78 patients, underwent LC without sub hepatic drainage. Phase II was a retrospective, descriptive case series, 110 consecutive patients (Group C) were enrolled, who underwent LC with no sub hepatic drain placement. All the patients with chronic calculus cholecystitis were included in the study. The exclusion criteria were as follows: acute cholecystitis, choledocholithiasis, acute pancreatitis, previous upper abdominal surgery, patients who require conversion and elective sub hepatic drainage, cases within complete patients' data, and patients who were lost to follow-up. An informed written consent was taken and patients were counselled about the merits and demerits of sub hepatic drain-age or no drainage. A thorough record of patients' data was maintained, including the history and clinical examination. Investigations included blood complete picture (CP), fasting blood sugar (FBS), liver function tests (LFTs),

hepatitis B surface antigen (HBsAg), anti-hepatitis C virus (anti-HCV), X-ray chest, and ultrasound abdomen. The preoperative ultrasound findings recorded were as follows: thickness of gallbladder wall, number of stones present, any pericholecystic fluid or adhesions, CBD diameter, and liver parenchyma. Endoscopic retrograde cholangio pancreatography (ERCP) was performed in cases with choledocholithiasis and acute pancreatitis. All the patients were operated under general anaesthesia. Antibiotic prophylaxis was done, using 1.5 g of intravenous cefuroxime at the time of induction of anaesthesia; the dose was repeated once after 12 h postoperatively. Operative details recorded included operating time (from first port incision to last port closure), operative findings (i.e. gall-bladder size, adhesions, number of stones), complication, conversion, and sub hepatic drainage. Complete haemostasis was achieved in each case. In cases of gallbladder perforation and stone spillage, attempt was made to retrieve stone as far as possible and sub hepatic area was irrigated and sucked out completely. At this stage, sealed envelope was opened to randomize the patients into group A or B. Drains (if placed) were brought out through one of the 5mm ports; they were removed when the discharge was less than 20-ml in last 24 h. Postoperative ultrasound for the detection of subhepatic fluid collection was done at the following times: first scan 24 h after removal of drains (group A) or 24 h postoperatively (group B), and second scan 96 h after the first scan. Severity of pain was defined using verbal rating scale. All patients received diclofenac suppository 50 mg at the induction of anaesthesia, and bupivacaine (0.2%) was infiltrated into the gallbladder bed and 10-mm ports to decrease postoperative pain; diclofenac 75 mg intramuscular injection was given 12 hourly for 24 h, followed by diclofenac oral 50 mg 8 hourly for the next 24 h. Patients were discharged on 2^{nd} , 5^{th} and 7^{th} postoperative day in this study invariably. Skin sutures were removed between 8th & 10th postoperative days. The follow-up schedule included initial weekly follow-up in the 1st month, and then monthly follow-up for 3 months, and a quarterly follow-up for one year; the patients were then advised to come in case of any problem/complication related to the operation. The hypothesis tested in this study was that the omission of routine subhepatic drainage would be better than drainage in terms of postoperative nausea/vomiting, postoperative pain, and wound complications. The primary outcome measure was the presence of subhepatic fluid collection at abdominal ultrasonography, performed 24 h & 72 h after surgery. Secondary outcome measures were postoperative abdominal and shoulder tip pain, use of analgesics, nausea, vomiting, and morbidity. Statistical analysis was done using SPSS 16. The inferential statistics were calculated using Pearson's chi-square and Student's t tests. A P value of <0.05 was considered significant.

RESULTS

The patients were enrolled from April 2013 to March 2014 for phase I and from April 2014 to December 2014 for phase II, with strict one year follow-up period. There were no significant demographic differences between the three groups. The mean age of the patients in group A, B and C were 41.35, 41.07 and 39.5 years, respectively. The sex distributions were as follows: 68 females and 10 males in group A, 66 females and 12 males in group B and 96 females and 14 males in group C. But the sub hepatic fluid collection on the first ultrasound at 24 h was significantly higher in group A patients than in group B and C patients (Table 1). The difference was insignificant on subsequent ultrasound at 72 h (Table 1). Statistically significant difference was observed in post-operative complications between the three groups (Table 2). Preoperative complications were comparable between the three groups (P value=0.952); gallbladder perforation (with or without stone spillage) occurred in 8 group A, 8 group B and 9 group C patients, whereas bleeding from gall bladder bed or cystic artery occurred in 3 group A, 3 group B and 4 group C patients.

Table 1: Comparative analysis of primary and secondary outcome variables.

Study group	Variable	No.	Mean ±	P value*	95% CI
Group A (Phase I)	Drain volume in 24 hr (ml)	78	3.99± 5.28	0.000	2.75
	Subhepatic fliud, st USG (cm3)	78	3.13± 3.63	0.000	2.268
	Subhepatic fluid,2 nd USG (cm3)	78	0.26± 1.18	0.116	- 0.054
Group B (Phase I)	Drain volume in 24 hr (ml)	0			
	Subhepatic fliud,1 st USG (cm3)	78	2.85± 3.64	0.000	1.97
	Subhepatic fluid,2 nd USG (cm3)	78	0.05± 0.45	0.960	- 0.102
Group C (Phase II)	Drain volume in 24 hr (ml)	0			
	Subhepatic fliud,1 st USG (cm3)	110	2.01± 3.05	0.000	1.548
	Subhepatic fluid,2 nd USG (cm3)	110	0.01± 0.14	0.000	- 0.059

^{* =} Student's t test

Table 2: Comparative analysis of postoperative complications.

Complications	Group A (phase I) No.(%)	Group B (phase I) No.(%)	Group C (phase II) No.(%)
Shoulder tip pain	7 (8.97)	6 (7.69)	4 (3.63)
Vomiting	3 (3.84)	3 (3.84)	0
Nausea	5(6.41)	4 (5.12)	3 (2.72)
Port site pain (wound infection)	1 (1.28)	2 (2.56)	1 (0.90)
Ileus	2 (2.56)	0	1 (0.90)
Fever and cough (chest infection)	3 (3.84)	1 (1.28)	1 (0.90)
Complication rate	21 (26.92)	16 (21.5)	10 (9.09)
Total	78 (100)	78 (100)	110 (100)
P value*	0.017		

^{* =} Pearson chi-square

DISCUSSION

Sub hepatic drainage after cholecystectomy, open or laparoscopic, is still an unsolved debate. Lewis et al in analysis of 1920 open cholecystectomies showed no significant difference in the complication rate between the drained and non-drained group. 10 In this study, the complication rate is comparable between the drain group (26.92%) and the non-drain group in phase I, that is, initial study period (21.05%), but decreases markedly in non-drain group in phase II (9.09%). Routine sub hepatic drainage is not recommended after cholecystectomy if the gallbladder bed remains dry and there is no leakage from the biliary system, as found in study.^{1,11} An example can be taken from appendicectomy for appendicitis where drainage is of no help and, in many cases, increases the chance of complications, especially wound infection and dehiscence. 11 But many surgeons still continue drainage for reasons based on traditional teaching and anecdotal complications and not on reliable facts and figures. 11 The major reason for drainage is the fear of bile leakage that may lead to bile peritonitis; this is usually due to an aberrant bile duct and not slippage of the cystic duct ligature.⁷ Fear of blood collection requiring intervention is another reason for routine drainage after LC.13 Drainage also allows CO2 insufflations during laparoscopy to escape via the drain site, thereby decreasing the shoulder pain.^{1,14} Prevention of intraabdominal collections after LC is the main reason of drainage. The peritoneal cavity usually absorbs serous fluids rapidly, but blood and bile are absorbed more slowly. 12 Post cholecystectomy collections in the sub hepatic space are on the whole small, rapidly reabsorbed, and essentially similar in size and number whether a drain is used or not.⁵ Fraser et al found that the amount of fluid drained was on average twice as large as the volume

SD = Standard deviation

^{95%} CI = 95% confidence Interval of the difference

of sub hepatic fluid measured.⁶ They also suggest that drain provokes leakage & from superficial biliary ductules damaged by dissection and contend that without drainage it would rapidly wall off.⁵ Thiebe and Eggert reported that the total number of abdominal collections was higher in the drain group (44%) compared with the no drain group (4.1%). They performed routine ultrasound on the fourth postoperative day, as compared with first and fourth day in this study. 18 The sub hepatic fluid collection on first ultrasound at 24 h was significantly higher in drained group than in non-drained groups (Table 1). Further, the difference became insignificant on subsequent ultra-sound at 72 h (Table 1). Intra peritoneal collection of blood may cause postoperative pyrexia, prolong the hospital stay, and increase the incidence of wound infection, while the presence of bile in the peritoneal cavity produces peritoneal irritation. 12 However, only some clinically significant abdominal collections may need intervention, while other abdominal collections may not be clinically significant. 19,20 The only patient requiring intervention in the two trials mentioning treatment of the abdominal collections was in the drain group. ^{21,22} The drain may also give false sense of security as it may get blocked and the patient continue to bleed internally and later presenting with signs of shock, as reported in one study. ¹² Another study reported laparotomy for post cholecystectomy bile peritonitis in patients who had drains placed, suggesting that drain placement does not guarantee prevention of this complication.²³ It is assumed that the use of a drain might be helpful for early detection of postoperative bleeding. However, significant bleeding can also be easily detected by clinical and ultrasonographic signs of intra-abdominal hemorrhage in the event that there is no drain.²³ If there is doubt as to the significance of the collection, the ultrasonographic study can be repeated in a few days. An enlarging collection associated with persistent fever or worsening pain will suggest an abscess.²⁰ However, one cannot eliminate the possibility that the drain, acting as a foreign body, stimulates the formation of this fluid. Whatever the mechanism, the result is a fluid accumulation, most probably serous, adjacent to a drain.²⁰ The drain may prove dangerous after simple cholecystectomy as infection introduced along a drain may render an otherwise harmless collection of bile a cause of peritonitis. 5,7,20 Also drain may rapidly become walled off, and then merely provokes an exudate in response to its own presence.⁵ Even if complications do occur in non-drain cases, minimally invasive interventions such as percutanenous and/or endoscopic techniques can be applied to solve the problem according to minimally invasive principles.²³ It would be reasonable, however, to leave a drain if there is a worry about an unsolved or potential bile leak, that is, imperfect closure of the cystic duct or bile staining in the lavage fluid or gallbladder bed, suggesting the possibility that an accessory duct has been missed. In these cases, a drain can be selectively used, bearing in mind that drain placement, although sometimes providing a false sense of security, guarantees neither prevention nor treatment of

postoperative bile or blood collections.²³ The advantages of not inserting a drain are reduction of hospital stay, patient comfort, and lower incidence of post-operative complications. 12,13,18,22,24 On the other hand, drainage results in higher wound infection rate and longer hospital stay. 18,24 Gurusamy et al reported lower wound infection rate in the no drain group than in the drain group, maybe because of the presence of a foreign body. 19 Johansson et al safely performed day-case LC with low rates of readmissions.²⁵ However, the insertion of drain can delay the discharge and, thus, decrease any saving in costs of day-case LC. 18 Further, drain-related pain may negate one of the most important advantages of the laparoscopic approach i.e. less pain.²³ Postoperative pain and postoperative nausea/vomiting are important problems after a procedure that is designed for minimal discomfort. In fact, these are the most common cause of delayed discharge after laparoscopic procedures.9 Carbonic acid that results from CO₂ insufflations and gas that separates the liver dome the diaphragm causing the stretch of the attachments of the liver result in the postoperative pain, especially shoulder tip pain. 16 Nursal et al found subdiaphragmatic drain effective in reducing the incidence and the amount of subdiaphragmatic gas bubble. 15 Another study in which residual gas was removed by active aspiration through the trocars rather than drains documented a decrease in opioid use, but not in VAS scores.¹⁷ Another study used irrigation with relatively large amounts of saline, which presumably replaced the subdiaphragmatic gas and finally absorbed, and this proved effective in reducing pain. ²⁶ In this study, subdiaphragmatic gas volume was significantly lower in group A patients than B. Both active aspiration of CO₂ through the trocar as well as saline lavage and suction had been used more efficiently, resulting in lesser sub diaphragmatic gas volume. This greatly reduces postoperative nausea/vomiting and shoulder tip pain from 19.22% (group A) and 16.65% (group B) to 6.35% in (group C). Gurusamy et al in a meta-analysis reported decreased early postoperative shoulder pain in the drain group that was not significant and reversed in the later postoperative period. This would not suggest that drainage of residual CO2 or peritoneal fluid is of value in reducing the pain of LC.¹⁹ They also noted lower nausea rate in the drain group compared with the no drain group. 19 Gurusamy et al noted that drain use after open or LC increases the wound infection, but chest complications occurred only in open cholecystectomy.¹⁹ One study of open cholecystectomy reported wound infection at 1.6% for non-drained cases and 8.4% for drained cases, with chest infection in 31% of cases and the great majority of these were in the group that had been drained (21 of the 22 cases). 11 Similarly in this study, wound infection was comparable in both groups occurring in 1.27% cases in drained group and 1.36% in non-drained groups, but chest infection occurred in 3.80% in drained group and 1.02% in non-drained groups. It would seem that the presence of the drain and the extra pain resulting cause a splintage of the lower right chest and predispose to atelectasis and chest infection. ¹¹ They also reported reoperation for collections more common after drainage, as well as the drain fever on removing or manipulating a drain that has been in situ for more than 48 h. ¹¹ Finally, the timing of randomization is important in evaluation of these studies. If the randomization was performed toward the end of the surgery (after the gallbladder dissection and hemostasis is complete, the dropouts and crossovers can be kept to a minimum. For example, a surgeon may obtain meticulous hemostasis if he knew that the patient was randomized to the 'no drain' group. ¹⁹ In this study, the randomization was done at the end of surgery, thus reducing the bias introduced by the surgeon.

CONCLUSION

Routine sub hepatic drainage after LC is not necessary in uncomplicated cases.

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REFERENCES

- 1. Petrowsky H, Demartines N, Rousson V, Clavien PA. Evidence-based value of prophylactic drainage in gastrointestinal surgery: a systematic review and meta-analyses. Ann Surg. 2004;240:1074-84.
- 2. Robinson JO. Surgical drainage: a historical perspective. Br J Surg. 1986;73:422-6.
- 3. Moshe Schein. To Drain or not to Drain? The Role of Drainage in the Contaminated and Infected Abdomen: An International and Personal Perspective. World J Surg. 2008;32:312-21.
- Henrik P, Nicolas D, Valentin, Pierre-Alain C. Evidence-based Value of Prophylactic Drainage in Gastrointestinal Surgery. Ann Surg. 2004;240:1074-85.
- 5. Mellor SG, Thomas MH, Donnellan BS. Cholecystectomy: safe or not safe to drain? J R Soc Med. 1988;81:566-8.
- 6. Fraser I, Everson NW, Nash JR. A randomised prospective trial of two drainage methods after cholecystectomy. Ann R Coll Surg Engl. 1982;64:183-5.
- 7. Diez JA, Pujato MR, Ferreres AR. The need of drainage after cholecystectomy. HPB Surg. 1990;3:5-10.
- 8. McCormack TT, Abel PD, Collins CD. Abdominal drainage following cholecystectomy: high, low, or no suction? Ann R CollSurg Engl. 1983;65:326-328.
- 9. Nursal TZ, Yildirim S, Tarim A, Noyan T, Poyraz P, Tuna N, et al. Effect of drainage on postoperative nausea, vomiting, and pain after laparoscopic

- cholecystectomy. Langen-becks Arch Surg. 2003;388:95-100.
- Lewis RT, Goodall RG, Marien B, Park M, Lloyd-Smith W, Wiegand FM. Simple elective cholecystectomy: to drain or not. Am J Surg. 1990;159(2):241-245.
- 11. Chilton CP, Mann CV. Drainage after cholecystectomy. AnnR Coll Surg Engl. 1980;62:60-5.
- 12. Salam IM, Mcmullin JP, O'higgins NJ. A comparison of two types of vacuum drainage atter cholecystectomy. Ann R Coll Surg Engl. 1984;66:190-1.
- 13. Hawasli A, Brown E. The effect of drains in laparoscopic cholecystectomy. J Laparoendosc Surg. 1994;4(6):393-8.
- Jorgensen JO, Gillies RB, Hunt DR, Caplehom JR, Lumley T. A simple and effective way to reduce postoperative pain after laparoscopic cholecystectomy. Aust N Z J Surg. 1995;65(7):466-9.
- 15. Abbott J, Hawe J, Srivatsava P, Hunter D, Garry R. Intra-peritoneal gas drain to reduce pain after laparoscopy: randomized masked trial. Obstet Gynecol. 2000;98(1):97-100.
- 16. Alexander JI, Hull MG. Abdominal pain after laparoscopy: the value of a gas drain. British J Obstet Gynaecol. 1987;94(3):267-9.
- 17. Fredman B, Jedeikin R, Olsfanger D, Flor P, Gruzman A. Residual pneumoperitoneum: a cause of postoperative pain after laparoscopic cholecystectomy. Anesth Analg. 1994;79(1):152-4.
- 18. Thiebe U, Eggert A. Drainage after laparoscopic cholecystectomy. Minimal Invasive Chirurgie. 1994;3:90-92.
- 19. Gurusamy KS, Samraj K, Mullerat P, Davidson BR. Routine abdominal drainage for uncomplicated laparoscopic cholecystectomy (Review). Cochrane review, published in The CochraneLibrary by JohnWiley & Sons, Ltd. 2009;1:1-11.
- Elboim CM, Goldman L, Harm L, Palestrant AM, Silen TW. Significance of post-cholecystectomy subhepatic fluid collections. Ann Surg. 1983;198(2):137-141.
- Capitanich P, Segundo UL, Malizia P, Herrera J, Iovaldi ML. Usefulness of prophylactic drainage in laparoscopic cholecystectomy. Randomized prospective report. Prensa Medica Argentina. 2005;92(9):623-7.
- 22. Mrozowicz A, Rucinski P, Polkowski WP. Routine drainage of the subhepatic area after laparoscopic cholecystectomy. Pro-spective, controlled study with random patient selection. Polski Przeglad Chirurgiczny. 2006;78(5):597-609.
- Tzovaras G, Liakou P, Fafoulakis F, Baloyiannis I, Zacharoulis D, Hatzitheofllou C. Is there a role for drain use in elective laparoscopic cholecystectomy? A controlled randomized trial. Am J Surgery. 2009;197:759-63.

- 24. Nomdedeu J, Escrig J, Salvador JL. Systematic placement of drains in laparoscopic cholecystectomy. A prospective study. Revista de la Sociedad Valenciana de Patologia Digestiva. 1996;15(4):299-300.
- 25. Johansson M, Thune A, Nelvin L, Lundell L. Randomized clinical trial of day-care versus overnight-stay laparoscopic cholecystectomy. Brit J Surgery. 2006;93(1):40-5.
- 26. Tsimoyiannis EC, Siakas P, Tassis A, Lekkas ET, Tzourou H, Kambili M. Intraperitoneal normal

saline infusion for post-operative pain after laparoscopic cholecystectomy. World J Surg. 1998;22:824-8.

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