

## Case Control Study

**Utility of routine blood tests after elective laparoscopic cholecystectomy for symptomatic gallstones**

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**Abstract****AIM**

To evaluate the value of blood testing after elective laparoscopic cholecystectomy and its association with procedure related complications.

**METHODS**

Charts of all patients undergoing elective laparoscopic cholecystectomy from January 2013 through December 2014 were reviewed retrospectively for demographics, indication for surgery, operative course and outcome. In our institution the decision to perform postoperative blood analysis is left for the discretion of the surgeon, therefore we had the possibility to compare the results of those who had blood analyses results to those who did not. Analysis was performed to identify variables associated with the decision to perform postoperative blood tests. Subsequently a univariate and multivariate analyses was performed comparing the two cohorts. Secondary subgroup analysis was performed to identify factors associated with procedure related complications.

**RESULTS**

Five hundred and thirty-two elective laparoscopic cholecystectomies for symptomatic gallstones were performed during the study period. Sixty-four percent of the patients ( $n = 340$ ) had blood tests taken post operatively. Patients that had laboratory tests taken were older ( $P = 0.006$ , OR = 1.01), had longer surgery ( $P < 0.001$ , OR = 3.22) had more drains placed ( $P < 0.001$ , OR = 3.2) and stayed longer in the hospital ( $P < 0.001$ , OR = 1.2). A subgroup analysis of the patients who experienced complications revealed longer stay in the hospital ( $P < 0.001$ ), higher body mass index (BMI) ( $P = 0.04$ , OR = 1.08),

increased rates of drain placement ( $P = 0.006$ , OR = 3.1) and higher conversion rates ( $P = 0.01$ , OR = 14.6). Postoperative blood tests withdrawals were not associated with complications ( $P = 0.44$ ). On Multivariate analysis BMI and drain placement were independently associated with complications.

### CONCLUSION

The current study indicate that routine postoperative blood tests after elective laparoscopic cholecystectomy for symptomatic gallstones does not predict complications and may have an added benefit in diagnosis and management of cases were the surgeon encountered true technical difficulty during surgery.

**Key words:** Cholecystectomy; Blood tests; Laparoscopy; Complications; Post-operative; Gallstones; symptomatic

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**Core tip:** Laparoscopic cholecystectomy is the procedure of choice for patients with symptomatic gallstones. Although some patients will need overnight observation many of the younger patients, with low body mass index (BMI), that did not have severe gallbladder infection may be performed under day surgery, in institutions that have the necessary setup. The current study show that postoperative blood analyses does not predict nor correlate with postoperative complications and has no impact on outcome. The only independent predictors of complications on multivariate analysis are BMI and drain placement that was used a surrogate for technical difficulty during surgery. Intuitively length of surgery is thought to be in correlation with technical difficulty. In centers were supervised residents perform high percentage of the operations, length of surgery does not correlate with difficulty or post operative complications and by itself does not seem to indicate need for post-operative blood analyses.

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## INTRODUCTION

Cholelithiasis is a common disease affecting millions of people around the world. Laparoscopic cholecystectomy (LC) is the procedure of choice for symptomatic gallstones and more than 500000 procedures are performed annually worldwide. The need for blood tests evaluation after LC is seldom discussed in the literature<sup>[1,2]</sup>. In our institution postoperative follow-up blood testing is left for the discretion of the attending surgeon in charge of the

case. Departmental protocols exist for the treatment of procedural related complications. Post LC liver function tests have been previously shown to be slightly and transiently elevated with no clinical significance<sup>[3-6]</sup>. We sought to evaluate whether routine blood tests after elective laparoscopic cholecystectomy have any impact on patient's outcome and whether they are predictive of postoperative complications.

## MATERIALS AND METHODS

Charts of all patients undergoing elective laparoscopic cholecystectomy from January 2013 through December 2014 were reviewed retrospectively for demographics, indication for surgery, operative course and operative outcome. Post-operative laboratory analyses order during the time frame of the study were left for the discretion of the attending surgeon in charge of the case. Data was compared between the two groups (lab vs no lab) to identify factors associated with the surgeon threshold to order blood work postoperatively. A second subgroup analysis was performed to evaluate the differences between patients who experienced complications and patients who did not. Variables that were significant by univariate analysis were subjected to a multivariate logistic regression model to evaluate variables that are independently associated with complications. Primary measure of outcome was surgical complications and secondary measure of outcome was the association of postoperative blood tests with factors such as age, body mass index (BMI), length of surgery and the positioning of a drain.

### Statistical analysis

Potential associations were assessed by Fisher's exact test for percentages, *t*-test for means, and Mann-Whitney *U* tests for medians. A series multivariable logistic regressions were applied to identify independent characteristics with a  $P < 0.10$  from univariate analysis; these were treated as candidate variables in the models<sup>[7]</sup>. Factors included in the final regression models were assessed for significance by the likelihood ratio test (LRT). Two-tailed  $P$  value  $< 0.05$  was considered statistically significant. Statistical analysis was performed with JMP version 12.1.0 (64 bit), SAS institute inc.

## RESULTS

During the study period 532 elective LC for symptomatic gallstones were performed. Mean age of the patients was 48 years; the majority of the patients (73%) were females. Most patients were overweight (71.7%,  $n = 302$ ) with a mean BMI of 28.6 (Table 1). Two patients (0.4%) were operated for gallstone and had incidental finding of adenocarcinoma of the gallbladder. Both were confined to the mucosa (T1) and were submitted for follow-up alone. Five patients (0.9%) required conversion to open approach. Sixty four percent of the patients ( $n =$

**Table 1** General data and demographics *n* (%)

	<i>n</i> = 532
Age (yr)	48.9 ± 17.3
Gender (female)	386 (72.56)
LOS (d) (median)	1.5 (1-7)
Time of Surgery (min) (median)	50 (14-178)
Drain	134 (25.2)
Laboratory analysis	340 (63.9)
BMI (kg/m <sup>2</sup> )	28.6 ± 5.6
> 25.1	302 (71.73)
> 30.1	138 (32.8)
> 35.1	52 (12.35)

LOS: Length of stay; BMI: Body mass index.

**Table 2** Detailed rate and type of complications *n* (%)

	<i>n</i> = 532
Overall complication rate	21 (3.9)
Biliary damage	5 (0.9)
Hemorrhage	10 (1.9)
Post-operative abscess	5 (0.9)
Urinary tract infection	1 (0.2)

340) had blood tests (complete blood count and routine chemistry including electrolytes, renal and liver function tests) withdrawn post operatively. Overall complications rate was 3.9%. Postoperative bleeding was the most common complication (1.9%, *n* = 10). Three patients were re-operated for this complication. Biliary duct injury and intra-abdominal infection were equally common (0.9%, *n* = 5) (Table 2).

Patients who had post-operative laboratory tests taken were older ( $P = 0.006$ , OR = 1.01), had longer surgery ( $P < 0.001$ , OR = 3.22) and stayed longer in the hospital ( $P < 0.001$ , OR = 1.2) (Table 3). Closed suction drain was placed in 25.2% (*n* = 134) of the patients. Post-operative blood tests were more commonly withdrawn in this subgroup of patients ( $P < 0.001$ , OR = 3.2) (Table 3).

The primary outcome of the study was complications and the ability of postoperative blood tests to predict them. A subgroup analysis of the patients who experienced complications compared to the ones who did not showed that complications were associated intuitively with longer stay in the hospital ( $P < 0.001$ ), but also with higher BMI ( $P = 0.04$ , OR = 1.08), higher rate of drain placement ( $P = 0.006$ , OR = 3.1) and higher conversion rate ( $P = 0.01$ , OR = 14.6). Interestingly postoperative blood tests were not associated with complications ( $P = 0.44$ ). On Multivariate analysis BMI (0.05) and drain placement (0.02) were both associated independently with complications (Table 4).

To evaluate the differences in pre and postoperative liver function tests we performed the Wilcoxon signed rank test. We found statistically significant increase in aspartate transaminase (AST) and a decrease in alkaline phosphatase (ALP), both with no clinical significance.

**Table 3** Comparison of patients with and without laboratory test post operatively *n* (%)

	Laboratory ( <i>n</i> = 340)	No laboratory ( <i>n</i> = 192)	<i>P</i> value
Age (yr)	50.4 ± 17.7	46.1 ± 16.4	0.006
Gender (female)	239 (70.3)	147 (76.6)	0.12
LOS (d)	1.9 ± 0.99	1.3 ± 0.56	< 0.001
Length of surgery	55 (15-178)	43 (14-100)	< 0.001
BMI (kg/m <sup>2</sup> )	28.9 ± 5.8	28.1 ± 5.2	0.17
Complications	18 (3.4)	4 (0.8)	0.07
Conversion	5 (0.3)	0	0.16
Drain	109 (20.5)	25 (4.7)	< 0.001

LOS: Length of stay; BMI: Body mass index.

## DISCUSSION

Laparoscopic cholecystectomy is the standard of care for patients with symptomatic gallstones. Preoperative evaluation and its importance are vastly discussed in the literature and are beyond the scope of this article. We sought to focus on the postoperative follow-up of patients and to evaluate the surgeons' threshold to order these tests.

In many institutions LC is performed in day surgery setup. Routine blood testing post-operatively may result in inconvenience to the patient and his family as well as increased overall costs. In the current study we evaluate the surgeons' threshold to order post-operative blood tests. Older age, prolonged surgery and the need for more than one day of hospitalization triggered the need for postoperative blood work. Drain placement is a good surrogate to the complexity encountered by the surgeon during the procedure especially if done electively. In fact patients who had drains placed had significantly more blood test taken. Subgroup analysis to identify factors associated with complications showed that postoperative blood tests were not independently associated with increased rate of complications. In fact the only factors independently associated with increased risk for complications were BMI and drain placement.

Length of surgery was associated with increased risk of complications on bivariate analysis but not on multivariate analysis correcting for BMI, drain placement, length of surgery and postoperative blood withdrawal. Our institution is a university center and residents perform high percentage of the procedures with the supervision of an attending surgeon. Length of surgery may be affected therefore by our teaching duties and not necessarily a true complexity of the cases.

We also evaluated the utility of the blood test taken and whether they have actually changed the management of the patients. In the complication group (*n* = 21), 12 patients were discharged on day one or two. Blood tests were taken to 75% (*n* = 9) of 21 patients in the complication group. All blood work returned normal and the patients were discharged. All these patients were readmitted for complications. This observation

**Table 4** Subgroup univariate and multivariate analysis comparing patients who experienced complications with those who did not *n* (%)

	Complications ( <i>n</i> = 22)	No complications ( <i>n</i> = 510)	<i>P</i> value (univariate)	<i>P</i> value (multivariate)
Age (yr)	53 ± 17	48.7 ± 17.4	0.26	
Gender (female)	15 (68.2)	371 (72.8)	0.63	
LOS (d)	2.45 ± 1.2	1.7 ± 0.9	< 0.001	
Length of surgery	57.3 ± 20.7	53.4 ± 23.3	0.44	0.08
BMI (kg/m <sup>2</sup> )	31.5 ± 8.1	28.5 ± 5.5	0.04	0.05
Postop labs	18 (81.8)	322 (63.1)	0.07	0.06
Conversion	2 (9.0)	3 (0.6)	0.01	
Drain	11 (50.0)	123 (24.1)	0.006	0.02

LOS: Length of stay; BMI: Body mass index.

suggests that the immediate postoperative blood work did not change the management and did not predict the complications.

In conclusion, the results of our study suggest that routine postoperative blood tests after elective laparoscopic cholecystectomy are unnecessary and should be carried out only in selected cases where the surgeon encountered true technical difficulty during surgery. Length of surgery by itself does not seem to indicate need for blood test postoperatively only when it is accompanied by high level of difficulty. Future prospective studies that address the matter are needed.

## COMMENTS

### Background

Laparoscopic cholecystectomy (LC) is the procedure of choice for patients with symptomatic gallstones and thousands of these procedures are performed every year worldwide.

### Research frontiers

The current study explore the need for routine post operative blood analysis.

### Innovations and breakthroughs

Although many places do not take blood samples after uneventful laparoscopic cholecystectomy, gives the evidence for such routine.

### Applications

Laparoscopic cholecystectomy may be performed safely under day surgery setup.

### Peer-review

This article is an interesting study and suitable for publication in this journal. Authors described utility of routine blood tests after LC.

## REFERENCES

- Halevy A**, Gold-Deutch R, Negri M, Lin G, Shlamkovich N, Evans S, Cotariu D, Scapa E, Bahar M, Sackier JM. Are elevated liver enzymes and bilirubin levels significant after laparoscopic cholecystectomy in the absence of bile duct injury? *Ann Surg* 1994; **219**: 362-364 [PMID: 8161261 DOI: 10.1097/0000658-199404000-00006]
- Kaldor A**, Akopian G, Recabaren J, Alexander M. Utility of liver function tests after laparoscopic cholecystectomy. *Am Surg* 2006; **72**: 1238-1240 [PMID: 17216828]
- Tan M**, Xu FF, Peng JS, Li DM, Chen LH, Lv BJ, Zhao ZX, Huang C, Zheng CX. Changes in the level of serum liver enzymes after laparoscopic surgery. *World J Gastroenterol* 2003; **9**: 364-367 [PMID: 12532468 DOI: 10.3748/wjg.v9.i2.364]
- Hasukić S**. Postoperative changes in liver function tests: randomized comparison of low- and high-pressure laparoscopic cholecystectomy. *Surg Endosc* 2005; **19**: 1451-1455 [PMID: 16206003 DOI: 10.1007/s00464-005-0061-5]
- Bickel A**, Weiar A, Eitan A. Evaluation of liver enzymes following elective laparoscopic cholecystectomy: are they really elevated? *J Gastrointest Surg* 2008; **12**: 1418-1421 [PMID: 18516716 DOI: 10.1007/s11605-008-0557-0]
- Inal MT**, Memis D, Sezer YA, Atalay M, Karakoc A, Sut N. Effects of intra-abdominal pressure on liver function assessed with the LiMON in critically ill patients. *Can J Surg* 2011; **54**: 161-166 [PMID: 21443832 DOI: 10.1503/cjs.042709]
- Hosmer DW**, Lemeshow S. *Applied Logistic Regression*. 2nd edition. New York: John Wiley & Sons, 2000: 143-202 [DOI: 10.1002/0471722146]

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