

Outcome assessment between elective or urgent laparoscopic cholecystectomy

Avaliação dos resultados entre a colecistectomia laparoscópica eletiva ou de urgência

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ABSTRACT: *Background:* Laparoscopic cholecystectomy is gold standard treatment for cholelithiasis. It is classified as elective or urgent and there is a small amount of publications comparing these two moments of attendance. *Aim:* To analyse the results of elective and urgent laparoscopic cholecystectomy regarding the time between hospitalization and surgery, the length of hospitalization, complications, use of antimicrobials and drains, mortality and cost. *Methods:* Retrospective analysis of 368 patients who underwent laparoscopic cholecystectomy. Data were collected from the medical records and from the hospital account of the patients. *Results:* Of 368 patients, 277 (75,3%) underwent elective cholecystectomy and 91 (24,7%) under emergency cholecystectomy. Of those submitted to the elective, 194 (70,04%) were women. The average age was 45,66±14,87 years. The average hospital stay was 26,60±16,85 hours. Two (0,72%) patients used antimicrobial therapy and 16 (5,78%) patients used drain. There were complications in 6 (2,17%) cases. The average cost was 3,157,76±1.882,22 reais. In emergency cholecystectomies, 61(67,03%) patients were women. The average age was 51,36±19,08 years. The average hospital stay was 108,27±96,11 hours. Antimicrobials were used by 33 (36,26%) patients and drain by 21(23,08%) patients. Complications occurred in 13 (14,29%) patients. Two (2,20%) patients died. The average cost was 9,357,00±7.224,14 reais. Analysing the variables, the average cost of emergency cholecystectomies was three times the cost of electives. *Conclusion:* Urgent laparoscopic cholecystectomies have a considerably higher cost due to longer time between hospitalizations and surgeries, longer hospitalization time, higher complication rate, more use of drains and greater need for antimicrobial therapy when compared to elective procedures.

Headings: Cholecystectomy, Laparoscopic. Elective Surgical Procedures. Intraoperative Complications

RESUMO: *Introdução:* Colecistectomia laparoscópica é tratamento padrão-ouro para colelitíase. É classificada em eletiva ou de urgência e existe uma quantidade pequena de publicações que comparam esses dois momentos de atendimento. *Objetivo:* Analisar os resultados de colecistectomias laparoscópicas eletivas ou de urgência quanto ao tempo entre internação e cirurgia, tempo de hospitalização, complicações, uso de antimicrobianos e de drenos, mortalidade e custo. *Métodos:* Análise retrospectiva de 368 pacientes submetidos à colecistectomia laparoscópica. Dados foram coletados do prontuário e da conta hospitalar dos pacientes. *Resultados:* Dos 368 pacientes, 277 (75,3%) foram submetidos à colecistectomia laparoscópica eletiva e 91 (24,7%) à de urgência. Dos submetidos à eletiva, 194 (70,04%), eram mulheres. A idade média foi de 45,66±14,87 anos. A permanência hospitalar média foi de 26,60±16,85 horas. Utilizaram terapia antimicrobiana 2 (0,72%) pacientes e dreno 16 (5,78%) pacientes. Houve complicações em 6 (2,17%) casos. O custo médio foi 3.157,76±1.882,22 reais. Nas de urgência, 61 (67,03%) eram mulheres. A idade média foi 51,36±19,08 anos. A permanência hospitalar média foi de 108,27±96,11 horas. Usaram antimicrobiano 33 (36,26%) pacientes e dreno 21 (23,08%) pacientes. Complicações ocorreram em 13 (14,29%) pacientes. Dois (2,20%) pacientes foram a óbito. O custo médio foi de 9.357,00±7.224,14 reais. Analisando as variáveis, o custo médio das colecistectomias de urgência foi o triplo do das eletivas. *Conclusão:* Colecistectomias laparoscópicas de caráter urgente apresentam um custo consideravelmente mais elevado devido ao maior tempo entre internação e cirurgia, maior tempo de hospitalização, maior índice de complicações, mais uso de drenos e maior necessidade de terapia antimicrobiana, quando comparadas a procedimentos eletivos.

Descritores: Colecistectomia Laparoscópica. Procedimentos Cirúrgicos Eletivos. Complicações Intraoperatórias

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INTRODUCTION

Laparoscopic cholecystectomy (LC) is the gold standard treatment for cholelithiasis. This technique has replaced the laparotomic cholecystectomy as the first treatment choice for gallstones and cholecystitis¹.

The cholecystectomies can be classified as elective or urgent, considering electives those ones that it is possible to choose the most appropriated date to execute the procedure, having no urgency or emergency features. This ones, mostly, are executed after several exams that aim to obtain the patient's best health condition and reduce as much the risk of complications. On the other hand, the urgent cholecystectomies are executed when the patient presents a severe condition, for example, an acute cholecystitis, which needs an immediate medical intervention².

A study carried out in the United Kingdom³ compared these two types of surgery and showed that elective surgeries required shorter average operative time, less incidence of complications, such as cardiovascular and biliary fistulas and less risk factors for conversion to laparotomy than those of urgency. The same study showed that the length of hospital stay for patients operated on urgently is practically double.

Analysis made with data from cholecystectomies from the Michigan Surgical Quality Collaborative (USA)⁴, throughout the state of Michigan (USA), showed a significantly increased length of hospital stay in patients undergoing urgent cholecystectomy. Morbidity and mortality rates were also higher in urgent cholecystectomies compared to elective ones.

The placement of a drain in laparoscopic cholecystectomy has the function of preventing collections of bile and blood, which in the future may require open procedures. An analysis of the Cochrane Database of Systematic Reviews, concluded that there is no evidence to support the use of drains in elective surgeries. On the other hand, it was observed that in the surgical management of acute cholecystitis, the use of a drain was reported by most surgeons. Emergency surgery for acute cholecystitis was the main reason for drainage, followed by shedding of intraoperative bile⁵.

In addition, an important comparison factor is the cost of these interventions. The total cost of hospitalization is the sum of several factors, such as those related to diagnostic and therapy services - including complementary exams and surgical procedures - that are different depending on whether the surgery was elective or urgent. This can cause variations in costs for the same surgical procedure⁶. In 2016, in the city of Fortaleza, Ceará (Brazil), R\$ 2.682.666,88 was allocated for the treatment of cholelithiasis and cholecystitis, representing 8.35% of the hospitalization costs with benign diseases of the

digestive system in the city during this period. Among the hospitalizations for cholelithiasis, 73.68% went to elective hospitalization.

"Elective or urgent, the fact is that there is a small amount of publications that compare these two moments of service"⁸.

The aim of this study was to comparatively analyze the results of elective and urgent cholecystectomies in the context of the time between hospitalization and surgery, length of hospital stay, complications, use of antimicrobials, use of drain, mortality and overall cost in a private hospital.

METHODS

This retrospective study was carried out by consulting the electronic medical record and hospital bill of 368 patients who underwent surgery at *Hospital Santa Catarina*, in the city of Blumenau - SC, Brazil, from November 2016 to October 2017.

The patients were separated between those who underwent elective LC and those who underwent urgente LC. Elective cholecystectomies were defined as those in which it was possible to choose the most appropriate date for the procedure to be performed, with no urgency or emergency. And by emergency cholecystectomy, those performed when the patient entered the hospital at the emergency room and had an acute condition, such as acute cholecystitis or biliary colic. Patients who underwent a procedure other than cholecystectomy during surgery were excluded.

Gender, age group, time between hospitalization and surgery, length of hospital stay, use of antimicrobials, use of drains, complications, outcome (hospital discharge or death) were then analyzed in the electronic medical records.

The overall cost of the procedure was analyzed in the hospital bill (from admission to hospital until discharge).

The LC were performed by a surgical team composed of 11 surgeons, who have 5 to 11 years of experience in laparoscopic surgeries.

Written and informed consent was obtained from all patients included in the study before LC. The study protocol was approved by the local ethics committee.

Data analysis and testing was performed using statistical software. Mean and standard deviation were used to describe quantitative data and frequency for qualitative data. The Kolmogorov-Smirnov test was applied to analyze which variables have parametric distribution. The means were compared using the Student's "t" test for parametric variables or Mann-Whitney U test for nonparametric variables. The frequencies were compared using the chi-square test. The $p < 0.05$ value was considered statistically significant.

RESULTS

In the elective group, the population was 277 (75.30%) patients. Of these, 194 (70.04%) were female and 83 (29.6%) male. The average age was 45,66±14,87 years old.

The mean hospital stay in this group was 26.60±16.85 hours. And the average time between hospitalization and surgery was 1.66±0.18 hours.

Antimicrobial prophylaxis was used by 100% of the patients, following the hospital protocol. In only 2 (0.72%) patients, the association of Ciprofloxacin (200 mg intravenously every 8 hours) and Metronidazole (500 mg intravenously every 8 hours) was used. In the great major, the prophylaxis used was 2g of Cefazolin during anesthetic induction.

Drain was used in 16 (5.78%) patients, of which, 14 used a tubular drain, one used a Kehr drain associated with tubular drain and one used suction drain.

Six (2.17%) cases of procedures with adversities or complications were identified, as shown in Table 1. In 3 of these cases there was bleeding in the liver bed, one of which was resolved with raffia of the liver injury and the other two required a new surgical procedure for raffia of the injury. In one case, the patient had diffuse and severe abdominal pain, with no improvement with morphine and hypotension (blood pressure of 82x60mmHg), and was admitted to the ICU. One patient had a hypertensive crisis during anesthetic induction and another presented dyspnea on small efforts, saturating 86% in room air, being reversed after nebulization with bronchodilator. No patient died.

Table 1. Adversities or complications of elective LC

Adversities or Complications	n
Bleeding in the liver bed.	3
Diffuse and severe abdominal pain, without improvement with morphine and hypotension (blood pressure of 82x60mmHg), being admitted to the ICU.	1
Hypertensive crisis in anesthetic induction.	1
Pain, bloating and fever.	1
Intraoperative hypertension.	1
Dyspnea on small efforts, saturating 86% in room air, being reversed after nebulization with bronchodilator.	1

The average cost of the procedure was R\$ 3,157.76±1.882,22.

In the group that urgent surgery had to be performed, the total population was 91 (24.70%) patients. Of these, 61(67.03%) were female and 30 (32.97%) were male. The average age was 51,36±19,08 years old.

The average hospital stay was 108.27±96,11 hours, and the average time between hospitalization and surgery was 44.29±35,35 hours.

As in the elective group, 100% of the patients used antimicrobial prophylaxis with intravenous 2g cefazolin during anesthetic induction. Therapeutic use occurred in 33 (36.26%) patients, being the combination of ciprofloxacin (200 mg intravenous every 8 hours) and metronidazole (500 mg intravenous every 8 hours) the most used for this purpose.

Drain use occurred in 21 (23.08%) patients, 19 of whom used a tubular drain, 1 used a Blake drain and 1 a Penrose drain N° 1.

Complications occurred in 13 (14.29%) patients, 2 of whom had urinary retention, the others, each presented a different complication, which are specified in Table 2. Two (2.20%) patients died.

Table 2. Adversities or complications of urgent LC

Adversities or Complications	n
Urinary retention.	2
Bronchospasm after extubation.	1
Hemodynamic instability, acute renal failure, central cyanosis and extremity necrosis.	1
Pain, bloating and fever.	1
Intraoperative hypertension.	1
Lowering of the level of consciousness in the postoperative period, pleural effusion requiring thoracentesis. Pericardial effusion and cardiorespiratory arrest.	1
Drop of saturation in the operating room (75% in room air) with cyanosis of the extremities, having to postpone the surgery. After LC, the patient had a septic event, acute renal failure, anemia and anasarca.	1
Leukocytosis, impaired renal function, pleural effusion, anemia, acute respiratory failure after red blood cells transfusion and bacteremia.	1
Hypertensive peak.	1
Pulmonary thromboembolism.	1
Placement of long nasogastric tube during the procedure.	1
Biliary fistula, decreased level of consciousness, bronchospasm requiring intubation, septic shock and infection by e. coli in abdominal fluid.	1

The average cost of the procedure was R\$ 9,357.00±7.224,14.

Comparatively analyzing the results, in relation to age (p=0,02444), time between hospitalization and surgery (p <0.00001) and total in-hospital time (p <0.00001), a statistically significant difference was observed in the comparisons between elective and urgency LC. Therefore, it is clear that the emergency surgeries had older patients, a longer time from admission to surgery and a longer duration of hospitalization. It can be seen by observing Table 3 that the average of these variables in emergency surgeries were significantly higher.

Table 3. Analysis of the quantitative variables in relation to urgent or elective LC

Variable	Electives (n=277)		Urgency (n=91)		p
	Mean	SD	Mean	SD	
Age (years)	45,66	14,87	51,36	19,08	0, 02444
Time between hospitalization and surgery (hours)	1,66	0,18	44,29	35,35	< 0.00001
Total hospitalization time (hours)	26,60	16,85	108,27	96,11	< 0.00001
Cost (reais)	3.157,76	1.882,22	9.357,00	7.224,14	<0.00001

It is also observed that the average cost of emergency LC was practically the triple of the elective ones ($p < 0.00001$).

Analyzing the qualitative variables, the occurrence

of complications ($p < 0.00001$), use of a drain ($p < 0.00001$) and antimicrobial therapy ($p < 0.00001$), were more recurrent in urgent LC compared to electives ones (Table 4).

Table 4. Analysis of the qualitative variables in relation to urgent or elective LC

Variável	Electives		Urgency		p
	n	%	n	%	
Complications	6	2,70	13	14,29	< 0.00001
Antimicrobials use	2	1,25	33	51,56	< 0.00001
Drain use	16	5,78	21	23,08	< 0.00001
Deaths	0	0	2	2,20	a

a. No statistics were calculated.

DISCUSSION

This study analyzed the results of elective and urgent cholecystectomies, seeking to compare their differences regarding the time between hospitalization and surgery, the length of hospitalization, complications, use of antimicrobials, use of drains, outcomes and the overall cost of the procedure. The analysis of the variables aimed to investigate their relationship with the procedures, elective or urgent.

When analyzing the gender of the patients, a prevalence of 70.04% was found for females and 29.96% for males in elective surgeries. Regarding urgent surgeries, the prevalence was 67.03% for women and 32.97% for men. A higher prevalence of women is compatible with that found in the medical literature.

The average age found was 45.66 and 51.36 years for elective and urgent surgeries, respectively. A higher average age is observed in urgent surgeries because the incidence of acute cholecystitis and other exacerbations is significantly higher in patients with older age than in young patients. In addition, elderly patients are more likely to have a prolonged history of vesicular diseases and to experience exacerbations⁹.

The average time between admission to the hospital and surgery was greater in emergency surgeries, 44.29 hours, as a result of the time needed to confirm the diagnosis and stabilize the patient for the surgical procedure. In elective surgeries, due to the fact that patients already had previous consultations and previous diagnosis, the average

was 1.66 hours.

The total length of hospitalization was also greater for urgent surgeries, due to the longer hospital stay until surgery and the postoperative period. These patients were hospitalized on average 108.26 hours, while for elective patients the average was 26.6 hours. Acute cholecystitis and other exacerbations are related to a longer stay in the hospital after a LC because they have higher conversion rates for open surgery and other complications during and after surgery¹⁰.

Considering adversities, random events, not desirable, but possible to happen, which have a short resolution and with a low risk of compromising postoperative recovery, and complications, events of defined cause, which have an elongated resolution and that endanger the postoperative evolution. It was observed that not only the percentage but also the severity of the elective surgery events were lower. Among the elective patients, 2.17% had some type of adversity, of these, only 1 (0.36%) was a complication, the patient had hypotension (blood pressure of 82x60mmHg) and was admitted to the ICU. In urgency patients, there were 14.29% adversities or complications, with 4 (4.40%) very serious complications: pulmonary thromboembolism, septic shock, cardiorespiratory arrest and hemodynamic instability with acute renal failure.

Complications are more frequent in urgent patients, as most of them present with acute cholecystitis and have increased values of inflammatory markers. In addition, if the patient's ultrasound shows empyema or an increase in the thickness of the vesicular wall above three millimeters,

there is an even greater risk of complications¹¹.

All elective patients used antimicrobial prophylaxis, most of which was administered cephalazine. In two patients (0.72%), antimicrobial therapy was required, combining ciprofloxacin with metronidazole. A survey conducted by Uludag et al.¹² compared a group for which antimicrobial prophylaxis was administered to another for which a placebo was administered. Both groups consisted of patients who would undergo elective surgery. It was concluded that antimicrobial prophylaxis did not influence the incidence of surgical site infections and, for this reason, it is not necessary for elective laparoscopic cholecystectomies in low-risk patients. Souza et al.¹³ concluded the same in his study in which 199 elective patients were analyzed. However, according to Uchiyama et al.¹⁴, the complications associated with postoperative infections were reduced with the use of antimicrobial prophylaxis administered one hour before laparoscopic cholecystectomy.

As patients who underwent elective surgery, antimicrobial prophylaxis was administered to all urgent patients. Antimicrobial therapy was used in 33 patients (36.26%), the association of ciprofloxacin with metronidazole being the most used. The Tokio Guideline¹⁵ published in 2018 recommends the administration of antimicrobials up to 24 hours after surgery in patients with mild acute cholecystitis and for four to seven days in moderate or severe cases, once the focus of the infection is controlled. Reducing the misuse of antimicrobials is of great importance in order to reduce the complications caused by these drugs (such as allergies and gastrointestinal symptoms), costs and bacterial resistance^{16,17}.

Use of a drain was necessary in 5.78% of the elective patients, that is, in 16 patients out of a total of 277. The main drain was the tubular drain, placed in 14 individuals. It is observed that in patients who underwent urgent surgery, the

use of drains is more frequent, 23.08%, the equivalent of 21 patients out of 91 analyzed. Of these, 19 used a tubular drain, and the other two used Blake and Penrose N° 1 drains.

Hospital discharge was the outcome for all elective patients and, for 97.8% of patients undergoing urgent cholecystectomy. The mortality rate found in this study, 2.20% of urgent patients, is similar to that published by Harboe and Bardram¹⁸. Another important point to be considered is the age of these patients who died, with an average of 88.5 years. Advanced age, associated comorbidities common in this group of patients and the urgency of surgery as a result of an acute condition are factors that increase the surgical risk, complications and, consequently, the mortality rate^{9,19,20}. However, we have to consider that the total mortality rate, considering both elective and urgent patients, was 0.54%, in line with the literature, which says that the cholecystectomy mortality rate is 0.5% in patients with more than 50 years².

The average cost of urgent surgery was approximately three times higher than that of elective surgery, as a result of factors such as the prolonged time between hospitalization and surgery, the total length of hospital stay, the need to manage complications, use of drains and antimicrobials. Treating patients who do not yet have an acute inflammatory condition, by means of elective surgery, minimizes the total cost of treatment^{21,22}.

CONCLUSION

Urgent laparoscopic cholecystectomies have a considerably higher cost due to longer time between hospitalizations and surgeries, longer hospitalization time, higher complication rate, more use of drains and greater need for antimicrobial therapy when compared to elective procedures.

Authors' Participation: *Lescowicz WRA*: Literature review, data collect, data analysis, writing the article, preparation of tables and final review. *Okuhara MKS*: Literature review, data collect, data analysis, writing the article, preparation of tables and final review. *Pinto RD*: Project orientation and final review.

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