

# AMBULATORY LAPAROSCOPIC CHOLECYSTECTOMY IS SAFE AND COST-EFFECTIVE: a Brazilian single center experience

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Received 22/11/2015  
Accepted 24/12/2015

**ABSTRACT - Background** - Laparoscopic cholecystectomy is the treatment of choice for gallstone disease, and has been performed as an outpatient surgery in many Institutions over the last few years. **Objective** - This is a retrospective study of a single center in Brazil, that aims to analyze the outcomes of 200 cases of ambulatory laparoscopic cholecystectomy performed by the same Hepato-Pancreato-Biliary team, evaluating the safety and cost-effectiveness of the method. **Methods** - Two hundred consecutive patients who underwent elective laparoscopic cholecystectomy were retrospectively analyzed; some of them underwent additional procedures, as liver biopsies and abdominal hernias repair. **Results** - From a total of 200 cases, the outpatient surgery protocol could not be carried out in 22 (11%). Twenty one (95.5%) patients remained hospitalized for 1 day and 1 (4.5%) patient remained hospitalized for 2 days. From the 178 patients who underwent ambulatory laparoscopic cholecystectomy, 3 (1.7 %) patients returned to the emergency room before the review appointment. Hospital cost was on average 35% lower for the ambulatory group. **Conclusion** - With appropriate selection criteria, ambulatory laparoscopic cholecystectomy is feasible, safe and effective; readmission rate is low, as well as complications related to the method. Cost savings and patient satisfaction support its adoption. Other studies are necessary to recommend this procedure as standard practice in Brazil.

**HEADINGS** - Laparoscopic cholecystectomy. Ambulatory surgical procedures. Cholelithiasis.

## INTRODUCTION

Cholelithiasis is one of the most common medical conditions in western countries, affecting 10% to 15% of the adult population<sup>(5,21)</sup>. Between 1% and 4% become symptomatic each year<sup>(4,21)</sup> and will require treatment. Laparoscopic cholecystectomy (LC) is currently accepted as the gold standard for management of symptomatic gallstone disease<sup>(37)</sup>.

LC remains one of the most frequent surgical procedures performed worldwide. Annually, around 1.5 million patients undergo LC in the United States<sup>(13)</sup>; it is estimated that this number reaches 200,000 patients/year in the Brazilian public healthcare System<sup>(11)</sup>. After Mühe performed the first LC in 1985<sup>(29)</sup>, advances in surgical technique, anesthesia and perioperative care have enabled better results and faster recovery,

leading to a progressive decrease in the length of hospital stay<sup>(9,24)</sup>.

Reddick and Olsen reported the first outpatient laparoscopic cholecystectomy in 1990<sup>(35)</sup>. Twenty-five years later, debates on the feasibility and safety of the procedure still persist. A number of studies have shown that, with proper selection and discharge criteria, ambulatory laparoscopic cholecystectomy (ALC) can be safely and effectively performed<sup>(1,19,44)</sup>.

Benefits of ALC include patients, hospitals and administrators. Patients experience high levels of satisfaction after surgery and an early return to normal activity<sup>(14)</sup>; the cost-effectiveness allows a greater flow of surgeries and availability of hospital beds, what contributes to the sustainability of the healthcare system and a better management of resources<sup>(14,15,16)</sup>.

Declared conflict of interest of all authors: none

Disclosure of funding: no funding received

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The purpose of this study was to analyze the outcomes of 200 cases of ALC performed by the same Hepato-Pancreato-Biliary (HPB) team, evaluating the safety and cost-effectiveness of the method.

### METHODS

Two hundred (200) consecutive patients who underwent elective laparoscopic cholecystectomy were retrospectively analyzed. All subjects were operated by the same HPB team from January 1st, 2013 to June 30th, 2015 at Santa Casa Hospital Complex, in the city of Porto Alegre, Brazil. LC is performed as an outpatient procedure by our group since 2010, thenceforth being the proposed method to all patients elected for this surgery.

Subjects with symptomatic cholelithiasis and gallbladder polyps associated to gallstones were included in this study. Patients undergoing concomitant procedures, such as umbilical or epigastric hernia repair and liver biopsy were analyzed together.

All subjects were evaluated by the HBP surgical team prior to surgery and tested for cholestasis - Gamma-Glutamyl Transpeptidase (GGT), Alkaline Phosphatase (ALP), Bilirubin levels (BILI), Alanine Aminotransferase (AST), Alaine Transaminase (ALT). Diagnosis was made through abdominal ultrasonography. An 8-hour fasting period was required before surgery and patients reported to the hospital 90 minutes before the procedure.

A 2g single dose of intravenous Cefazolin was administrated 1 hour before surgery for antimicrobial surgical prophylaxis - 400mg of Ciprofloxacin was used in patients allergic to the first choice. Surgery was performed by two surgeons and a scrub nurse. Four surgical ports were positioned according to the American technique after anesthetic infiltration with Ropivacaine 7.5%. At the end of the procedure, pneumoperitoneum was reduced and remade after 3 minutes, and abdominal cavity was evaluated again for bleeding of the liver bed and surgical ports. Additional procedures (hernia repair and liver biopsy), when necessary, were performed subsequently to the cholecystectomy. No cholangiogram was performed in these patients. Drains were placed in a case-by-case basis according to the surgeon's judgment, especially when there was significant inflammation of the hepatic pedicle or bleeding risk in anticoagulated patients.

After surgery, patients were referred to the recovery room with intravenous analgesia and antiemetic medications. They remained in observation for at least 5 hours (7 hours on average) and were later reassessed by the surgeon to define hospital discharge or admission.

Criteria for hospital discharge included stable vital signs, proper level of consciousness, capability to walk, no to low abdominal pain, no drains, good acceptance of oral diet and spontaneous diuresis. Patients who qualified for discharge received prescriptions for analgesic and anti-inflammatory drugs (dipyrone, acetaminophen and ketoprofen) and instructions to return to the emergency room if necessary. An appointment for review was scheduled after 15 days of surgery.

### RESULTS

Characteristics of the sample are presented in Table 1. Fifty six (28%) patients were male and 144 (72%) patients were female. Mean age was 43.8 years (16-88 years). One hundred ninety (95%) patients had cholelithiasis and 10 (5%) patients had gallbladder polyps associated to gallstones. Ten (5%) patients underwent LC + umbilical hernia repair, 31 (15.5%) patients underwent LC + liver biopsy; 4 (2%) patients underwent LC + liver biopsy + umbilical hernia repair; 1 (0.5%) patient underwent LC + umbilical hernia repair + epigastric hernia repair. There was no conversion to open surgery.

From a total of 200 cases, the outpatient surgery protocol could not be carried out in 22 (11%). Twenty one (95.5%) patients remained hospitalized for 1 day and 1 (4.5%) patient remained hospitalized for 2 days. Characteristics of these patients and reasons for hospitalization are displayed in Table 2.

TABLE 1. Characteristics of the sample

Age (average / in years)	43.8 (16-88)
Gender	
Male	56 (28%)
Female	144 (72%)
Diagnosis	
Cholelithiasis	200 (100%)
Gallstones + Polyps	10 (5%)
Liver abnormalities*	35 (17.5%)
Umbilical hernia	15 (7.5%)
Epigastric hernia	1 (0.5%)

\* Elevation of hepatic and/or bile duct enzymes, fatty liver disease or hepatitis.

TABLE 2. Characteristics of patients who did not complete the outpatient protocol

Age (average/in years)	43.6 (27-88)
Gender	
Male	5 (22.7%)
Female	17 (77.3%)
Diagnosis	
Cholelithiasis	22 (100%)
Gallstones + Polyps	2 (9.1%)
Liver abnormalities*	3 (13.6%)
Umbilical hernia	2 (9.1%)
Length of Hospital Stay	
1 day	21 (95.5%)
2 days	1 (4.5%)
Period of the day	
Until 14 pm	7 (31.8%)
After 14 pm	15 (68.2%)
Subhepatic drain	
Yes	9 (40.9%)
No	13 (59.1%)
Postoperative complications	
No	20 (91%)
Nausea / Vomit	1 (4.5%)
Need for ventilatory support	1 (4.5%)

\* Elevation of hepatic and/or bile duct enzymes, fatty liver disease or hepatitis.

From the 178 patients who underwent ALC, 3 (1.7 %) patients returned to the emergency room before the review appointment. The first one returned after 7 days complaining of abdominal pain and vomiting. Laboratory tests evidenced 18600 leukocytes, total BILI 1.1; direct BILI 0.6; AST 96; ALT 196; ALP 144; amylase 66; 128 lipase; GGT 281. Abdominal CT revealed a fluid collection without contrast enhancement in the gallbladder bed, measuring 5.0 x 6.3 cm. MRCP was normal. The patient was admitted for symptomatic treatment (analgesia and antiemetics) and discharged in three days, after clinical and laboratory improvement.

The second patient returned after 3 days, referring abdominal pain and fever. Laboratory tests, abdominal ultrasonography and abdominal CT were normal. The patient was medicated and monitored as an outpatient in the emergency room and discharged after recovery.

The third patient returned after 1 day, reporting headache and vomiting. He was evaluated by the emergency room staff, medicated and shortly discharged. He returned again in 3 days, referring epigastric pain after eating. Abdominal CT and laboratory tests were normal. He was revalued by the surgical team after 15 days, with no complaints.

Finally, comparing 10 patients undergoing outpatient laparoscopic cholecystectomy to 10 patients who remained hospitalized for 1 day, considering the same health insurance and surgical supplies, total hospital cost was on average 35% lower for the ambulatory group.

## DISCUSSION

LC is the treatment of choice for gallstone disease<sup>(37)</sup>. Over the last few years, advancements in surgical technique, anesthesia and perioperative care allowed its execution as an outpatient surgery<sup>(9,38)</sup>. A number of studies indicate that ALC is feasible, safe and effective<sup>(1,19,39,44)</sup>; cost savings<sup>(36)</sup> and patient satisfaction<sup>(14)</sup> are factors in support of its adoption. Standard practice in the United States and Canada, this routine has yet to gain acceptance in other countries. Insecurity among surgeons and patients, along with the lack of defined protocols are the main elements responsible for this controversy.

Selection criteria are considered to be crucial factors in outpatient LC protocols; well-defined and strict parameters have been associated to higher success rates<sup>(45)</sup>. LC is routinely performed as an outpatient procedure by our group, being the proposed method to all patients elected for this surgery. In this analysis, 22 (11%) patients did not complete the ambulatory protocol and 3 (1.7%) patients returned to the emergency room before the review appointment in 15 days, results that overlap the admission (1.6%-31%) and readmission (12%-10%) rates described before<sup>(3,7,8,26,27)</sup>. This outcome is in accordance with recent studies, which did not find an increase in hospitalizations and readmissions following the adoption of broader criteria<sup>(7,41)</sup>.

Operations performed after 2:00 p.m. and the insertion of surgical drains were the most frequent reasons for hospitalization in our study. Scheduling the procedures in the morning or early afternoon would enable an extended recovery time and a lower chance of admission. Akoh. et al.<sup>(3)</sup> suggested the application of a topical thrombotic agent during surgery in cases of oozing from the hepatic bed and the execution of exhaustive lavage in order to avoid to the maximum the use of drains. The performance of additional procedures was not detrimental, finding consistent with the report of Psaila et al.<sup>(32)</sup>. Nausea and vomiting are frequent obstacles in the outpatient approach to LC, being accounted for up to 20% of unplanned admissions<sup>(7,15,18,41,44)</sup>. In the present report, only one (4,5%) patient was admitted due to this cause; administration of prophylactic anti-emetic medication justify this finding<sup>(42)</sup>. The use of Propofol for anesthesia induction<sup>(17)</sup>, avoidance of nitrous oxide<sup>(33)</sup>, use of corticosteroids and cautious use of opioids are other parallel measures. The presence of this complaint in two (66%) of the three patients who returned to the emergency room suggests the need to include anti-emetic medication in the discharge prescriptions.

Postoperative pain is also a common limiting factor of ALC protocols, motivating up to 8% of unexpected hospitalizations<sup>(7,34,42)</sup>. Adequate pain control allows early mobilization, as well as contributes to satisfaction with the procedure. Preoperative wound infiltration with local anaesthetics and the administration of prophylactic analgesics in the recovery room are the main responsible factors to achieve this goal<sup>(2,30)</sup>; some authors suggest intraperitoneal local anaesthetic instillation<sup>(6,20-25,43)</sup>. In our series, three patients returned to the hospital before the review appointment for poorly controlled pain, indicating a need for optimization of pain medication prescriptions at discharge.

The morbidity of LC is low<sup>(12,40)</sup>. Among the main complications, hemorrhage (0.25%) is detected during operation or in the immediate postoperative period and bile duct injury (0.06%), if not identified during the procedure, becomes symptomatic in 48 hours<sup>(12,40)</sup>. Therefore, a 24-hour observation period offers no advantage in recognizing such conditions, being sufficient 4 to 12 hours<sup>(10)</sup>. In this study, no patients presented major complications. Three patients returned to the emergency room before the review appointment; two returned after one day, what would not be prevented by a 24-hour observation period.

The economic advantage of outpatient surgery is evident<sup>(16,36)</sup>. A cost reduction of 35% in comparison to inpatient LC was found, as consistent with other reports (11%-46%)<sup>(7,23,27,31)</sup>. Furthermore, outpatient approach allows a greater flow of surgeries and availability of hospital beds, with a reduced need for staff. The social benefit is observed in the high percentages of patient satisfaction previously described (85%-95%)<sup>(7,8,28)</sup> in consequence of proper orientation and early return to normal activity, without the need of hospitalization<sup>(16)</sup>.

## CONCLUSION

Ambulatory laparoscopic cholecystectomy is safe and cost-effective. As ALC can be reproduced even in primary hospitals in almost all cases, maybe the outpatient procedure will become the standard practice after laparoscopic cholecystectomy.

## Authors' contributions

Data collection: Teixeira UF, Machry MC, Goldoni MB. Execution: Teixeira UF, Goldoni MB, Machry MC. Data analysis: Fontes PRO, Ceccon PN, Waechter FL. Writing and review of the manuscript: Teixeira UF, Fontes PRO, Ceccon PN, Waechter FL, Machry MC.

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Teixeira UF, Goldoni MB, Machry MC, Ceccon PN, Fontes PRO, Waechter FL. Colectomia laparoscópica ambulatorial é segura e custo-efetiva: a experiência de um centro Brasileiro. *Arq Gastroenterol.* 2016,53(2): 103-7.

**RESUMO - Contexto** - A colecistectomia laparoscópica é o tratamento de escolha da colelitíase, e tem sido realizada de maneira ambulatorial em diversas instituições nos últimos anos. **Objetivo** - Esse é um estudo retrospectivo de um grande centro no Brasil, que tem por objetivo analisar os resultados de 200 casos de colecistectomia laparoscópica ambulatorial realizadas pela mesma equipe de cirurgia Hepato-Pancreato-Biliar, avaliando a segurança e custo-efetividade do método. **Métodos** - Duzentos pacientes consecutivos submetidos à colecistectomia laparoscópica eletiva foram analisados retrospectivamente; alguns realizaram em conjunto outros procedimentos adicionais, como biópsias hepáticas e reparo de hérnias de parede abdominal. **Resultados** - De um total de 200 casos, o protocolo de cirurgia ambulatorial não pôde ser concluído em 22 (11%). Vinte e um (95.5%) pacientes permaneceram hospitalizados por 1 dia e um (4,5%) paciente por 2 dias apenas. Dos 178 pacientes que foram submetidos à colecistectomia laparoscópica ambulatorial, 3 (1,7%) retornaram à emergência antes da data prevista. O custo hospitalar foi em média 35% menor no grupo ambulatorial. **Conclusão** - Com critérios de seleção apropriados, a colecistectomia laparoscópica ambulatorial é factível, segura e custo-efetiva; a taxa de readmissão é baixa, assim como as complicações relacionadas ao método. A redução de custos e a satisfação dos pacientes respaldam sua realização. Outros estudos são necessários para recomendar esse procedimento como padrão no Brasil.

**DESCRITORES** - Colecistectomia laparoscópica. Procedimentos cirúrgicos ambulatoriais. Colelitíase.

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