Laparoscopic cholecystectomy: main indications and complications

Colecistectomia laparoscópica: principais indicações e complicações

Colecistectomía laparoscópica: principales indicaciones y complicaciones

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RESUMO

Objetivo: Revisar as principais indicações e descrever as complicações mais comuns associadas à colecistectomia laparoscópica. **Métodos:** Realizou-se revisão integrativa da literatura nas bases PubMed e BVS, com os descritores "laparoscopic cholecystectomy", "complications" e "indication", combinados com "AND". Dez artigos atenderam aos critérios e compuseram a amostra. **Resultados:** As principais indicações foram colelitíase sintomática, colecistite aguda e crônica, pólipos vesiculares com risco de malignidade e pancreatite biliar. Complicações relatadas incluíram sangramento, perfuração vesicular, vazamento biliar, lesão de ducto biliar, infecção de ferida e abscesso intraperitoneal. Fatores como sexo masculino, inflamação grave, obesidade, diabetes e drenagem biliar trans-hepática percutânea prévia aumentaram o risco de intercorrências. A cirurgia precoce na colecistite aguda esteve associada a menor tempo operatório, menor perda sanguínea, redução da internação e menores taxas de complicações. **Conclusão:** A colecistectomia laparoscópica é segura e eficaz, quando realizada por equipe experiente e com seleção criteriosa de pacientes. Protocolos assistenciais bem estruturados, preparo técnico e monitoramento pós-operatório rigoroso são essenciais para minimizar riscos e otimizar os resultados clínicos.

Descritores: Colecistectomia laparoscópica, Indicações, Complicações.

ABSTRACT

To review the main indications and describe the most common complications associated with laparoscopic cholecystectomy. **Methods:** An integrative literature review was conducted in PubMed and BVS databases, using the descriptors "laparoscopic cholecystectomy," "complications," and "indication," combined with "AND." Ten articles met the criteria and comprised the sample. **Results:** The main indications were symptomatic cholelithiasis, acute and chronic cholecystitis, gallbladder polyps at risk of malignancy, and biliary pancreatitis. Reported complications included bleeding, gallbladder perforation, bile leak, bile duct injury, wound infection, and intraperitoneal abscess. Factors such as male gender, severe inflammation, obesity, diabetes, and prior percutaneous transhepatic biliary drainage increased the risk of complications. Early surgery for acute cholecystitis was associated with shorter operative time, less blood loss, shorter hospital stay, and lower complication rates. **Conclusion:** Laparoscopic cholecystectomy is safe and effective when performed by an experienced team and with careful patient selection. Well-structured care protocols, technical preparation, and rigorous postoperative monitoring are essential to minimize risks and optimize clinical outcomes.

Keywords: Laparoscopic Cholecystectomy, Indications, Complications.

RESUMEN

Objetivo: Revisar las principales indicaciones y describir las complicaciones más comunes asociadas con la colecistectomía laparoscópica. **Métodos:** Se realizó una revisión bibliográfica integradora en las bases de datos PubMed y BVS, utilizando los descriptores "colecistectomía laparoscópica", "complicaciones" e "indicación", combinados con "AND". Diez artículos cumplieron los criterios y constituyeron la muestra. **Resultados:** Las principales indicaciones fueron colelitiasis sintomática, colecistitis aguda y crónica, pólipos vesiculares con riesgo de malignidad y pancreatitis biliar. Las complicaciones reportadas incluyeron sangrado, perforación vesicular, fuga biliar, lesión de la vía biliar, infección de la herida y absceso intraperitoneal. Factores como el sexo masculino, inflamación grave, obesidad, diabetes y drenaje biliar transhepático percutáneo previo aumentaron el riesgo de complicaciones. La cirugía temprana para la colecistitis aguda se asoció con un tiempo operatorio más corto, menor pérdida sanguínea, menor estancia hospitalaria y menores tasas de complicaciones. **Conclusión:** La colecistectomía laparoscópica es segura y eficaz cuando la realiza un equipo experimentado y con una cuidadosa selección de pacientes. Protocolos de atención bien estructurados, preparación técnica y un riguroso seguimiento postoperatorio son esenciales para minimizar los riesgos y optimizar los resultados clínicos.

Descriptores: Colecistectomía laparoscópica; Indicaciones; Complicaciones

Introdution

Laparoscopic cholecystectomy is a surgical procedure indicated for the removal of the gallbladder, an organ responsible for storing and concentrating bile. Since the late 20th century, in the early 1990s, with the advancement of minimally invasive techniques, the videolaparoscopic approach has become the preferred method for performing this procedure, replacing the open technique. It is now considered the gold standard in the surgical treatment of cholelithiasis and other gallbladder diseases. This technique provides reduced surgical trauma, faster recovery, shorter hospital stay, and better aesthetic outcomes when compared to the open approach [1, 2].

The main indication for videolaparoscopic cholecystectomy is symptomatic cholelithiasis, a condition characterized by the formation of gallstones inside the gallbladder, generally associated with right upper quadrant or epigastric pain, nausea, and vomiting, often triggered after fatty meals. Other indications include acute and chronic cholecystitis, gallbladder polyps with risk criteria, biliary dyskinesia, acalculous cholecystitis, and gallstone-induced pancreatitis. In some cases, the procedure may also be performed prophylactically in patients at high risk for biliary complications [1]. These indications are the same as those for open cholecystectomy.

This surgical modality is currently contraindicated in cases of uncontrolled coagulopathies, metastatic disease, and inability to tolerate general anesthesia. In cases of gallbladder cancer, although the open approach is generally preferred, current literature does not contraindicate performing the procedure via videolaparoscopy [3].

Although considered a safe procedure, videolaparoscopic cholecystectomy is not free from risks. The most frequent complications include bile duct injury, hemorrhage, surgical site infection, biliary fistula, and retained residual stones. The most serious complication is iatrogenic injury to the common bile duct [4]. Such events, although rare, may lead to serious clinical consequences. Early identification of complications and appropriate management result in better patient outcomes. For this reason, mastery of the surgical technique and proper preparation of the surgical team, along with a well-executed preoperative protocol, are essential aspects for ensuring the safety and success of the procedure [4, 5].

Given the importance of videolaparoscopic cholecystectomy in general surgical practice and the frequency with which it is performed in healthcare services, this article aims to review the main indications for the procedure and to describe the most commonly observed complications.

Methods

The present study consists of an integrative literature review, with an analytical and descriptive approach, of a qualitative nature. The guiding question that directed this review was: “What are the main indications and complications of laparoscopic cholecystectomy?”

The search for texts to be included in the review was conducted in the electronic databases BVS (Virtual Health Library) and PubMed (National Library of Medicine). For this purpose, the Health Sciences Descriptors (DeCS) “laparoscopic cholecystectomy,” “complications,” and “indication” were used in English and combined with the Boolean operator “AND” to obtain a larger sample of studies.

As inclusion criteria, the following were adopted: (I) studies published in the last five years (2020–2025), (II) written in English or Portuguese, (III) available in full free text, and (IV) addressing the objective established by the review. The exclusion criteria

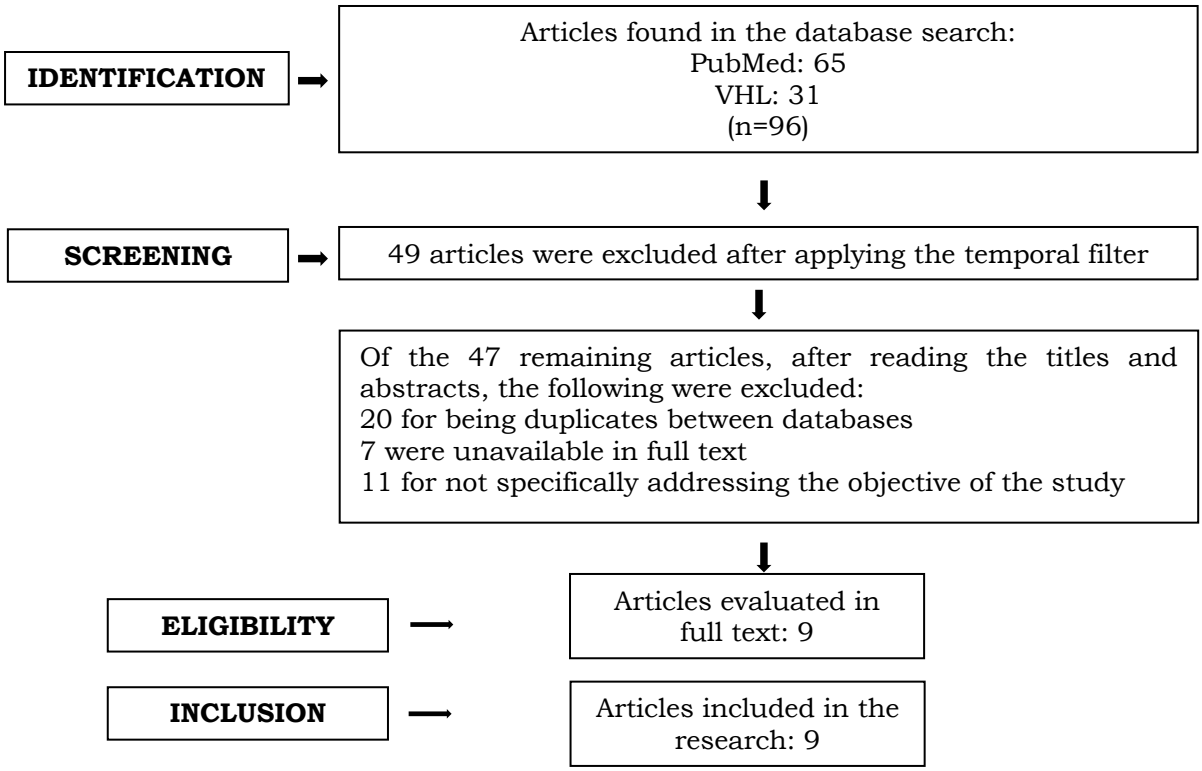
were: (I) studies published before 2020, (II) unavailable full text, (III) theses, dissertations, monographs, narrative literature reviews, or undergraduate final papers, and (IV) studies that did not address the guiding question of the review.

For the study selection, an adapted checklist was used based on the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). This process is illustrated in Figure 1. The data extracted from the texts were organized in a table comprising the following items: title, authors, year of publication, type of study, and results obtained.

Results

Initially, 65 studies were retrieved from PubMed and 31 from BVS, totaling 96. Afterward, time and full-text availability filters were applied, resulting in 20 studies from PubMed and 27 from BVS. These 47 studies were evaluated by the authors through the reading of titles and abstracts, using the established inclusion and exclusion criteria. Of these, 10 studies were selected to compose the final sample (Figure 1).

Figure 1. Flowchart of the screening process for articles identified in the bibliographic search across electronic databases.



The information extracted from the selected texts was organized in a table, divided by topics. The table below summarizes this information, including the title, authors, year of publication, type of study, and results obtained.

Table 1- Characterization of the studies selected to compose the review**.**

Title	Authors	Year	Type of study	Results
Optimal indication of single-incision laparoscopic cholecystectomy using Konyang Standard Method in benign gallbladder diseases	[6] Lee SJ et al.	2022	Single-center retrospective study	The retrospective study analyzed 1,405 patients who underwent single-incision laparoscopic cholecystectomy (SILC). Surgical indications included cholelithiasis, gallbladder polyps, chronic cholecystitis, and acute cholecystitis (AC), with the latter diagnosed in 30.4% of cases.
Optimal indication for single-incision laparoscopic cholecystectomy in benign gallbladder diseases	[7] Park MS et al.	2022	Retrospective study	The results of this retrospective study indicated that single-incision laparoscopic cholecystectomy (SILC) has limitations in certain patients. Patients with grade II or III acute cholecystitis present greater surgical difficulties and worse postoperative outcomes, making the technique not recommended for these cases. Furthermore, it was observed that performing SILC in patients with grade I cholecystitis or a body mass index (BMI) equal to or greater than 30 kg/m² requires caution, as these factors can also contribute to greater operative complexity and the risk of complications.
Laparoscopic cholecystectomy for mild acute gallstone pancreatitis-indication itself is a good predictor of (minimal) intraoperative difficulty-a retrospective cohort study	[8] Maitra I et al.	2021	Retrospective single-center case study	Laparoscopic cholecystectomy is the definitive treatment indicated to prevent recurrences and complications in cases of mild acute biliary pancreatitis. This retrospective study showed that the procedure is safe and appropriate in these patients, provided there is no significant inflammation of the gallbladder. However, in cases with associated acute cholecystitis, the surgery may be more complex, requiring greater caution and preparation by the surgical team.

Effectiveness of conservative management versus laparoscopic cholecystectomy in the prevention of recurrent symptoms and complications in adults with uncomplicated symptomatic gallstone disease (C-GALL trial): pragmatic, multicentre randomised controlled trial	[9] Ahmed I et al.	2023	Randomized, pragmatic, multicenter, parallel-group clinical trial	The clinical trial involved 434 adults followed for up to 24 months. Laparoscopic cholecystectomy offers no significant clinical advantage over conservative management for adults with uncomplicated symptomatic cholelithiasis. Complications occurred in 15% of patients in the conservative group and 20% in the surgical group, with no statistically significant difference. The main complications cited were iatrogenic injury, bleeding, bile leak, and infections.
Comparison of Postoperative Complications of Open Versus Laparoscopic Cholecystectomy According to the Modified Clavien-Dindo Classification System	[10] Khalid A et al.	2023	Retrospective observational comparative study	Laparoscopic cholecystectomy had a lower complication rate and shorter hospital stay compared to open surgery. There were no serious complications in either group. The use of the modified Clavien-Dindo classification (MCDC) is useful for standardizing and comparing surgical complications, helping to improve clinical outcomes.
Assessing incidence and risk factors of laparoscopic cholecystectomy complications in Jeddah: a retrospective study	[11] AlKhalifah et al.	2023	Retrospective observational study	The medical records of 510 patients undergoing the procedure were analyzed. Intraoperative complications occurred in 10.8% of cases, the most frequent being gallbladder perforation (5.5%), bile leak (4.9%), and bleeding (2.9%). Postoperative complications (POC) were observed in 11% of patients, with a predominance of abdominal pain (6.9%), elevated liver enzymes (2.7%), and the presence of residual stones (2.2%). The conversion rate from laparoscopic to open surgery was 1.2%.
Comparative Analysis of	[12] Iftikhar M et al.	2025	Non-randomized	The study included 118 patients with acute

Complications in Early Versus Delayed Laparoscopic Cholecystectomy for Acute Cholecystitis			prospective comparative study.	cholecystitis, divided into two groups: early surgery (up to 72 hours after symptom onset) and late surgery (6-12 weeks after the acute episode). The complication rate was lower in the early group (10%) compared to the late group (27.6%).
Increased difficulty and complications of delayed laparoscopic cholecystectomy following percutaneous transhepatic gallbladder drainage in acute cholecystitis: a retrospective study	[13] Liu YQ et al.	2023	Retrospective study	The study analyzed 113 patients with moderate (grade II) acute cholecystitis according to the 2018 Tokyo Guidelines. However, delayed laparoscopic cholecystectomy surgery after PTGBD (percutaneous transhepatic biliary drainage) is more difficult, with longer surgical time, greater blood loss and more complications.
Assessment of Postoperative Complications and Outcomes in Patients Undergoing Laparoscopic Cholecystectomy	[14] Yadav S et al.	2024	Retrospective observational study	The results of the retrospective study, conducted with 200 patients undergoing laparoscopic cholecystectomy between 2017 and 2022, revealed several relevant findings. Among the main postoperative complications identified were surgical wound infections (6%), bile duct injuries (2.5%), and bleeding (4%). The reoperation rate was 4%. The average hospital stay was 3.6 days, and the patient readmission rate was 10%.

Discussion

Conventional laparoscopic cholecystectomy has been established as the first-line treatment for almost all benign gallbladder diseases, including acute cholecystitis, gangrenous cholecystitis, and symptomatic cholelithiasis, due to its faster recovery and greater aesthetic satisfaction [6, 7].

The main indication is the treatment of symptomatic cholelithiasis, a condition characterized by the formation of gallstones within the gallbladder accompanied by typical clinical manifestations. The most common symptoms include recurrent abdominal pain in the right upper quadrant or epigastrium, often triggered by fatty meals, and may be accompanied by nausea, vomiting, and dyspepsia. In such cases, cholecystectomy is indicated to prevent complications such as acute cholecystitis, choledocholithiasis, cholangitis, and biliary pancreatitis. The laparoscopic approach is

preferred because it offers shorter recovery time, less postoperative pain, and lower infection rates compared to conventional open surgery [6].

In addition, it is also indicated for the treatment of acute cholecystitis, especially in mild to moderate cases, but also in situations with significant inflammation, such as gangrenous cholecystitis. This condition is characterized by inflammation of the gallbladder, usually resulting from obstruction of the cystic duct by a gallstone. Symptoms include continuous pain in the right upper quadrant, fever, nausea, vomiting, and leukocytosis. When performed within the first 72 hours after symptom onset, early cholecystectomy is associated with lower complication rates, shorter hospital stays, and better clinical outcomes compared to delayed surgery. Evidence shows that patients with grade II or III acute cholecystitis have a higher risk of intra- and postoperative complications when undergoing this procedure; however, even in such cases, the laparoscopic approach remains safe when performed by an experienced surgical team and is not contraindicated [7].

Laparoscopic cholecystectomy is also indicated in cases of chronic cholecystitis. This condition, characterized by persistent gallbladder inflammation and recurrent episodes of biliary colic, is one of the main elective indications for surgery. This surgical approach is recommended as a definitive treatment, both for symptom relief and for the prevention of complications [7, 8].

In the context of mild biliary acute pancreatitis, laparoscopic cholecystectomy is indicated as the definitive treatment to prevent recurrences and complications associated with gallstone disease. A retrospective cohort study demonstrated that, when performed in patients with mild biliary pancreatitis, it is considered safe and appropriate, provided there is no significant inflammation of the gallbladder. The only exception is in cases with concomitant signs of acute cholecystitis, which may make the surgery more challenging and require greater caution and better team preparation[8].

In other words, when properly indicated, laparoscopic cholecystectomy is generally a good option, and the patient's clinical case and possible inherent risks should be individually assessed.

However, the procedure is not without risks and may be associated with intraoperative and postoperative complications of multifactorial nature. Statistical analysis revealed that male sex, presence of acute cholecystitis, overweight, and diabetes were significant risk factors for the development of intra- and postoperative complications, as well as for conversion to open surgery [11].

Complications associated with laparoscopic cholecystectomy, although generally rare, can significantly affect the patient's postoperative course.

Intraoperative complications of laparoscopic cholecystectomy include bleeding, bile duct injury, bile spillage, injury to abdominal viscera, among others [9,10].

In the multicenter clinical trial C-GALL, intraoperative complications occurred in 11% of patients who underwent surgery. The most common were bile or gallstone spillage, injury to abdominal viscera, bleeding greater than 500 mL, and bile leakage from the bile ducts. From another perspective, the retrospective observational study conducted by AlKhalifah et al. (2023) reported intraoperative complications in 10.8% of cases, with the most frequent being gallbladder perforation, bile leakage, and bleeding [10,11].

The incidence of bleeding during surgery ranges from 1.0% to 2.9% of procedures and may occur due to various factors. When necessary, conversion to laparotomy should be performed to control the bleeding and prevent more severe complications, such as hemorrhagic shock [9, 11].

Gallbladder perforation with bile leakage has an incidence ranging from 4.9% to 7%, representing an extremely relevant complication in this context. This bile leakage can lead to contamination of the abdominal cavity, increasing the risk of peritonitis and more severe complications [9, 11].

Furthermore, the duration of disease progression also influences the occurrence of complications. The prospective study conducted by Iftikhar et al. (2025) evaluated 118 patients diagnosed with acute cholecystitis, divided into two groups according to the timing of laparoscopic cholecystectomy: the early group, with surgery performed within 72 hours of symptom onset, and the delayed group, undergoing surgery after conservative treatment between six and twelve weeks [12]. It was observed that operative time and blood loss were lower in the early surgery group. Regarding postoperative complications, the early surgery group had a rate of 10%, while the delayed surgery group had a significantly higher rate of 27.6%. Additionally, the length of hospital stay was shorter for patients in the early surgery group compared to those in the delayed group [12].

The incidence of bile duct injury, one of the most feared complications of this approach, was 1.7% in individuals undergoing early surgery and 6.9% in those who had delayed surgery. Wound infection occurred in 3.3% and 10.3% of patients, respectively. Intra-abdominal abscess was more frequent in patients who underwent delayed intervention (13.8%) compared to those operated on early (5.0%). These findings reinforce that performing early laparoscopic cholecystectomy reduces surgical time and hospital stay, and is also associated with a lower incidence of adverse events, thus representing a safer and more effective approach in the management of acute cholecystitis [13].

The conversion rate from the laparoscopic technique to open surgery ranged from 1.2% to 5.0%, becoming necessary in cases of hemorrhage, iatrogenic bile duct injury, gallbladder perforation, among other complications that are difficult to manage [11]. Although open surgery has a longer recovery and hospitalization time, it becomes necessary in such cases.

Postoperative complications were observed in 6% to 11% of patients, with a predominance of abdominal pain, elevated liver enzymes, residual stones, intestinal obstruction, surgical site infection, and intraperitoneal abscess, as well as systemic events such as vomiting, hypotension, hematoma, and renal failure [9,11,14].

Postoperative complications of laparoscopic cholecystectomy still represent a relevant clinical challenge, especially in patients previously submitted to percutaneous transhepatic gallbladder drainage (PTGBD). Findings suggest that the prior presence of drainage may alter anatomy and exacerbate the degree of fibrosis and inflammatory adhesions, contributing to a more complex surgical environment and increasing the likelihood of complications [14].

According to the study conducted by Yadav et al. (2024), the group that underwent PTGBD experienced a longer post-operative hospital stay, increased operative time, and greater intraoperative blood loss. Moreover, the post-operative complication rate was significantly higher in the PTGBD group (25.9%) compared to the non-PTGBD group (7.0%). Among these complications, the occurrence of acute pancreatitis post-operatively was particularly relevant in the PTGBD group, while it was not observed in the other group [14].

In the same retrospective study, an infection rate of 6% was observed, and bile duct injuries—a potentially serious complication—occurred in 2.5% of cases. In addition, the hospital readmission rate was 10%, indicating that late complications may also compromise patient recovery. These findings reinforce the importance of precise

surgical approach combined with infection control protocols and rigorous post-operative monitoring, aiming to reduce morbidity associated with the procedure [14].

After hospital discharge, additional complications occurred in approximately 1% of cases, especially cholangitis, surgical site infection, persistent bile leakage, and post-cholecystectomy syndrome (0.5%). Considering the entire 18-month follow-up period, 20% of patients in the surgical group experienced at least one complication [9].

Although most events are of low severity, such complications may prolong hospitalization time, delay functional recovery, and negatively impact quality of life. These findings reinforce the need for careful selection of surgical candidates, weighing the risks and benefits in comparison with conservative management strategies [9].

In addition, the experience and skills of the surgical team can reduce the occurrence of complications, and patients should be adequately informed about all potential risks of the procedure.

These findings reinforce that laparoscopic cholecystectomy is a safe procedure, with a low incidence of severe complications and a limited morbidity profile, with most adverse events being self-limited and easily managed clinically.

Conclusion

Laparoscopic cholecystectomy has become the surgical procedure of choice for the treatment of benign gallbladder diseases, especially symptomatic cholelithiasis and acute cholecystitis, offering significant advantages over the open technique, such as shorter recovery time, less postoperative pain, and lower infection rates. Early performance of the procedure, particularly in cases of acute cholecystitis, is associated with better prognosis, shorter operative time, reduced blood loss, and lower incidence of postoperative complications, highlighting the importance of timely intervention in the management of these conditions.

However, laparoscopic cholecystectomy is not free from risks, with intraoperative and postoperative complications reported that, although generally infrequent, may negatively affect clinical outcomes. The available evidence indicates that laparoscopic cholecystectomy, when performed by an experienced surgical team and preceded by careful patient selection, is a safe and effective intervention, with a low incidence of severe complications.

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