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Review Article

An Update on Delayed Laparoscopic Cholecystectomy for Acute Calculus Cholecystitis: Review Article

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Abstract: Acute calculus cholecystitis is the most common complication of gallstone disease, and it is managed with conservative treatment with intravenous antibiotics followed by delayed laparoscopic cholecystectomy, which is performed in 8 to 12 weeks. The Tokyo Guidelines for the management of acute cholecystitis of 2013 and 2018 have recommended delayed laparoscopic cholecystectomy for patients with grade 3 acute cholecystitis, while for patients with grade 1 and 2, an early laparoscopic cholecystectomy is recommended. Patients with severe acute cholecystitis who have undergone percutaneous cholecystostomy will usually undergo a delayed laparoscopic cholecystectomy once their condition has stabilized. In this review, we will investigate the role of delayed laparoscopic cholecystectomy and compare it with early laparoscopic cholecystectomy. We will also look at the role of delayed laparoscopic cholecystectomy following percutaneous cholecystostomy.

Keywords: "Acute Calculus Cholecystitis"," Conservative Treatment"," Diagnosis"," Delayed Laparoscopic cholecystectomy"," Early Laparoscopic Cholecystectomy"," Tokyo Guidelines", and "Percutaneous Cholecystostomy".

INTRODUCTION

Acute cholecystitis is the most common complication of cholelithiasis and is seen in 1% to 3% of patients who present with symptomatic gallstone disease. The clinical presentation consists of pain in the right hypochondrium of the abdomen, accompanied by fever. Leukocytosis may be present on blood investigations, and inflammatory markers, such as C-reactive protein, may be elevated. Ultrasound will usually confirm the diagnosis of acute cholecystitis by demonstrating inflammation of the wall of the gallbladder and pericholecystic fluid collection (Chung & Duke, 2018; Elwood, 2008; Indar & Beckingham, 2002). The management of acute cholecystitis involves initial use of intravenous fluids and antibiotics, followed by a laparoscopic cholecystectomy. Early laparoscopic cholecystectomy is performed within 7 days from the onset of symptoms, and delayed laparoscopic cholecystectomy is done after eight weeks from the onset of symptoms (Duncan & Riall, 2012; Gomes *et al.,* 2017; Schuld & Glanemann, 2015).

The World Society of Emergency Surgeons (WSES), in its 2016 guidelines for acute calculus cholecystitis, recommends delayed laparoscopic cholecystectomy for patients who have symptoms of acute cholecystitis for more than 10 days. The delayed laparoscopic cholecystectomy should be performed after 45 days from the onset of symptoms (Ansaloni *et al*., 2016). The 2020 World Society of Emergency Surgeons (WSES) guidelines for the diagnosis and management of acute calculus cholecystitis recommend that a delayed laparoscopic cholecystectomy be performed for patients who present with symptoms of acute cholecystitis of more than 10 days or if early laparoscopic cholecystectomy cannot be performed(Pisano *et al*., 2020). The 2013 Tokyo Guidelines (TG13) for the surgical management of acute cholecystitis have recommended delayed laparoscopic cholecystectomy for Grade 3 acute cholecystitis (Yamashita *et al*., 2013; Yokoe *et al*., 2013). The 2018 Tokyo Guidelines (TG18) for the management of acute cholecystitis further upheld the recommendations that delayed laparoscopic cholecystectomy be performed for patients with Grade 3 acute cholecystitis, and for certain patients with Grade 2

acute cholecystitis, where early laparoscopic cholecystectomy could not be performed(Okamoto *et al*., 2018; Yokoe *et al*., 2018).

This review will look at the role delayed laparoscopic cholecystectomy plays in the surgical management of acute calculus cholecystitis. We will also look at the indications for delayed laparoscopic cholecystectomy according to severity based on the Tokyo Guidelines. We conducted a literature review using PubMed, the Cochrane Database of Clinical Reviews, and Google Scholar, searching for clinical trials, observational studies, cohort studies, systematic reviews, and meta-analyses published between 1990 and 2025. We used the following keywords: "Acute calculus cholecystitis", "delayed laparoscopic cholecystectomy", "Early laparoscopic cholecystectomy", "conservative treatment ", "Tokyo Guidelines"," Percutaneous cholecystostomy", and "diagnosis". All articles were in the English language only. Further articles were obtained by manually cross-referencing the literature. Case reports and studies with fewer than 10 patients, as well as editorials, were excluded. Adult male and female patients were included in this study.

DISCUSSION

Delayed Laparoscopic Cholecystectomy for Acute Calculus Cholecystitis

Delayed laparoscopic cholecystectomy is performed after 8 to 10 weeks following the onset of acute calculus cholecystitis and is performed in patients who have not undergone early laparoscopic cholecystectomy or following insertion of a percutaneous cholecystostomy tube (Patel *et al*., 2015). According to the severity of acute calculus cholecystitis based on the Tokyo Guidelines, delayed laparoscopic cholecystectomy is recommended for patients with type 3 severity, following insertion of percutaneous cholecystostomy and recovery of the patient. Delayed laparoscopic cholecystectomy is also recommended for certain patients with type 2 severity if the patient is not fit for surgery during the index admission for acute calculus cholecystitis (Mencarini *et al*., 2024).

Kontopodis *et al.,* conducted a retrospective study on 315 patients with acute calculus cholecystitis who had undergone conservative treatment followed by delayed laparoscopic cholecystectomy after 8 weeks. Delayed laparoscopic cholecystectomy was successful in 81.9% of cases, and the duration of hospital stay was 2 days(Kontopodis, 2011.).The optimal timing of laparoscopic cholecystectomy after conservative treatment of acute cholecystitis was assessed by Enami et al. A total of 83 patients were divided into 36 patients who underwent early laparoscopic cholecystectomy, and 31patients underwent delayed laparoscopic cholecystectomies. The patients who underwent delayed laparoscopic cholecystectomy had shorter operative time and length of hospital stay, but the conversion rate was similar between the groups (Enami *et al*., 2023).Di Martino *et al*., conducted a multicenter observational study to assess if laparoscopic cholecystectomy beyond 7 days is safe. A total of 1868 patients were included in this study, and delayed laparoscopic cholecystectomy was associated with increased postoperative complications, increased operative time, and increased length of stay in the hospital (Di Martino *et al*., 2021).

An updated meta-analysis of randomized controlled trials comparing the length of hospital stay in early and delayed laparoscopic cholecystectomy was conducted by Menahem *et al*., A total of 1220 patients were included, of which 617 underwent early laparoscopic cholecystectomy, and 603 underwent delayed laparoscopic cholecystectomy. The mean hospital stay was 5.4 days for early laparoscopic and 9.1 days for delayed laparoscopic cholecystectomy. There were no differences in postoperative morbidity and mortality between the groups (Menahem *et al*., 2015). Delayed laparoscopic cholecystectomy was compared with emergency cholecystectomy in the management of acute cholecystitis by Lucocq *et al*., A total of 811 patients were included in this retrospective study, of which 227 underwent emergency laparoscopic cholecystectomy, and 555 underwent delayed laparoscopic cholecystectomy. Delayed laparoscopic cholecystectomy was associated with reduced post operative complication, reduced bile leakage, and reduced length of stay in the hospital when compared to delayed laparoscopic cholecystectomy (Lucocq *et al*., 2022).Tan *et al*., conducted a study comparing early versus delayed laparoscopic cholecystectomy for patients who present with symptoms of acute cholecystitis beyond 7 days. Delayed laparoscopic cholecystectomy was associated with reduced postoperative morbidity, length of hospital stays, and reduced conversion rates when compared to early laparoscopic cholecystectomy (Tan *et al*., 2017).

Comparison of Delayed Laparoscopic Cholecystectomy and Early Laparoscopic Cholecystectomy in Acute Calculus Cholecystitis

Agrawal *et al*., evaluated early versus delayed laparoscopic cholecystectomy for acute cholecystitis in their prospective randomized study. A total of 50 patients were randomized to 25 who underwent early laparoscopic cholecystectomy and 50 who underwent delayed laparoscopic cholecystectomy. Early laparoscopic cholecystectomy was associated with a higher complication and conversion rate, but reduced stay in the hospital when compared to delayed laparoscopic cholecystectomy (Agrawal *et al*., 2015). A meta-analysis on the timing of cholecystectomy for acute calculus cholecystitis was conducted by Papi *et al*., A total of 12 studies with 1255 patients were included in this study, and the conversion rate for early laparoscopic cholecystectomy was 7.99%, and the length of hospital stay was shorter than that of delayed laparoscopic cholecystectomy (Papi *et al*., 2004). A meta-analysis comparing early versus delayed laparoscopic

cholecystectomy for acute cholecystitis was conducted by Wu *et al*., A total of 16 studies with 1625 patients were included in this study, and there were no differences concerning the complication, bile leakage, and conversion rates between the procedures (Wu *et al*., 2015).

A meta-analysis of randomized controlled trials comparing early versus delayed laparoscopic cholecystectomy for acute cholecystitis was conducted by Siddiqui *et al*., A total of 4 studies with 375 patients were included in this study. There were no significant differences in the complication and conversion rates between the procedures, but delayed laparoscopic cholecystectomy was associated with a reduced operative time and stay in the hospital (Siddiqui *et al*., 2008). Another meta-analysis of randomized controlled trials comparing early versus delayed cholecystectomy for acute cholecystitis was conducted by Shikata *et al*., A total of 10 studies with 1014 patients were included in this study, with 534 undergoing early cholecystectomy and 480 undergoing delayed cholecystectomy. There were no differences concerning the complication and conversion rates between the procedures, but the total hospital stay was shorter in the early cholecystectomy group (Shikata *et al*., 2005). An up-to-date meta-analysis of randomized controlled trials comparing early versus delayed laparoscopic cholecystectomy was conducted by Lyu *et al*., A total of 15 studies with 1669 patients were included in this study, with 829 patients undergoing early laparoscopic cholecystectomy and 840 undergoing delayed laparoscopic cholecystectomy. There were no significant differences regarding the complication rate, operative time, and conversion rate between the procedures (Lyu *et al*., 2018).

Table 1

Study (APA Reference)	Study Design & Timing	Complications	Length of Stay	Conversion to Open
Lyu *et al*., (2015)	Systematic review/meta-analysis,15 studies with 1625 patients- comparing early LC (<7 days) vs delayed LC (>6 weeks)	Delayed LC had higher postoperative complications (OR = 0.655, lower in early LC) [1]	Early LC reduced hospital stays by ~3.38 days (MD = –3.3807; p<0.0001) [2]	There were no differences in conversion rates between the procedures
Siddiqui *et al*., (2007)	Meta-analysis of 4 studies with 375 patients	No differences with postoperative complications (O.R. - 1.073; no differences in bile duct leaks/injuries [4]	Early LC showed significantly shorter total hospital stay [5]	No significant difference in conversion rates [6]

Table showing the comparison between early and delayed laparoscopic cholecystectomy for acute calculus cholecystitis.

Delayed Laparoscopic Cholecystectomy Following Percutaneous Cholecystostomy for Severe Acute Cholecystitis

Percutaneous cholecystostomy is used for the treatment of severe acute calculus cholecystitis, but it is associated with increased difficulty when performing a delayed laparoscopic cholecystectomy. A retrospective study was conducted by Liu *et al*., on 113 patients, of whom 27 underwent percutaneous cholecystostomy, and 86 were managed with antibiotics alone. The patients in the percutaneous cholecystostomy group who had undergone delayed laparoscopic cholecystectomy were associated with prolonged operation, increased stay in the hospital, and increased morbidity (Liu *et al*., 2023). Wael *et al*., compared early versus delayed laparoscopic cholecystectomy after percutaneous cholecystostomy for grade 2 acute cholecystitis with cardiopulmonary disease. A total of 58 patients were included in this study, with 26 undergoing early laparoscopic cholecystectomy and 32 undergoing delayed laparoscopic cholecystectomy. There were no differences in postoperative complications, bile leakage, and conversion rates between the two procedures (Wael *et al*., 2024). Similar studies by El-Gendi *et al*., and Wei Ke *et al*., who compared emergency versus delayed cholecystectomy after percutaneous cholecystostomy in grade 2 acute cholecystitis, also concluded that delayed laparoscopic cholecystectomy was associated with reduced morbidity, length of hospital stay, and reduced conversion rates (El-Gendi *et al*., 2017; Ke & Wu, 2018).

A systematic review and meta-analysis comparing early versus late interval laparoscopic cholecystectomy following percutaneous cholecystostomy was conducted by Kourounis *et al*., A total of 29 studies with 6075 patients were included, with 2946 undergoing early laparoscopic cholecystectomy and 3129 undergoing delayed laparoscopic cholecystectomy. There were no significant differences concerning morbidity, mortality, and conversion rates between the two procedures (Kourounis *et al*., 2022). Nassar *et al*., conducted a systematic review and meta-analysis of the outcomes of early laparoscopic cholecystectomy compared to percutaneous cholecystostomy and delayed cholecystectomy for acute cholecystitis. A total of 14 studies were included in this review, with 205361 patients undergoing early laparoscopic cholecystectomy and 11,565 patients undergoing percutaneous cholecystostomy and delayed laparoscopic cholecystectomy. Early laparoscopic

cholecystectomy was associated with a higher postoperative complication rate and a higher risk of conversion when compared to delayed laparoscopic cholecystectomy (Nassar *et al*., 2022).

A systematic review and meta-analysis comparing emergency cholecystectomy versus delayed cholecystectomy after percutaneous cholecystostomy in acute cholecystitis was conducted by Huang *et al*., A total of 15 studies with 1780 patients, of whom 799 underwent percutaneous cholecystostomy and delayed laparoscopic cholecystectomy, and 981 patients underwent early laparoscopic cholecystectomy. There were no differences in the postoperative complications, conversion rates, bile leakage, and mortality between the groups, but delayed laparoscopic cholecystectomy was associated with a shorter operative time (Huang *et al*., 2021).A meta-analysis comparing delayed laparoscopic cholecystectomy after percutaneous cholecystostomy versus emergency laparoscopic cholecystectomy for acute cholecystitis was conducted by Cai *et al*., A total of 17 studies with 2135 patients were included in this study, and delayed laparoscopic cholecystectomy was associated with a reduced postoperative morbidity, bile leak, and mortality when compared to emergency laparoscopic cholecystectomy but it was associated with an increased length of hospital stay(Cai & Ma, 2021).

CONCLUSION

Delayed laparoscopic cholecystectomy is increasingly being performed for patients with severe acute cholecystitis who have undergone conservative treatment or percutaneous cholecystostomy insertion. The ideal time to perform a delayed laparoscopic cholecystectomy is at 8 to 12 weeks, but constraints on the availability of operating theatre time tend to lead to delays beyond this period. Early laparoscopic cholecystectomy is now the preferred treatment of choice for acute calculus cholecystitis, but the practice of conservative treatment followed by delayed laparoscopic cholecystectomy is still being practiced by surgeons. The use of delayed laparoscopic cholecystectomy will lead to an increase in cost as it will require a second admission to the hospital to perform the surgery.

Conflict of Interest: There is no conflict of interest

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