



Laparoscopic one-step approach for the management of acute biliary pancreatitis: 10 years experience in a high volume center

Juliana Di Menno Stavron^{1,2^}, Victoria Ardiles^{1,2}, María Eugenia Fratantoni^{1,2}, Pedro Uad^{1,2}, Rodrigo Sanchez Clariá^{1,2}, Martín de Santibañes^{1,2}, Juan Pekolj^{1,2}, Oscar Mazza^{1,2}

¹HPB Unit, General Surgery Service, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina; ²General Surgery Service, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina

Contributions: (I) Conception and design: J Di Menno Stavron, O Mazza, M de Santibañes, R Sanchez Clariá; (II) Administrative support: J Di Menno Stavron, V Ardiles, J Pekolj, O Mazza; (III) Provision of study material or patients: J Di Menno Stavron, P Uad, ME Fratantoni; (IV) Collection and assembly of data: J Di Menno Stavron, P Uad, V Ardiles; (V) Data analysis and interpretation: J Di Menno Stavron, V Ardiles, O Mazza, M de Santibañes, ME Fratantoni; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Juliana Di Menno Stavron. HPB Unit, General Surgery Service, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina. Email: juliana.dimenno@hospitalitaliano.org.ar.

Background: Gallstone disease is the most common etiology for acute pancreatitis (AP). The surgical strategy to resolve acute biliary pancreatitis (ABP) remains controversial, especially in cases with choledocolithiasis. The aim of our study was to analyze the effectiveness and safety of laparoscopic one-step approach for the management of ABP performing laparoscopic cholecystectomy (LC) and transcystic common bile duct instrumentation when necessary.

Methods: We conducted a retrospective cohort study between January 2009 and December 2019 at the General Surgery Department of the Hospital Italiano of Buenos Aires and Hospital Italiano of San Justo. All adult patients (aged ≥ 18 years) with a confirmed diagnosis of ABP according to the Atlanta Guidelines who underwent LC with systematic intraoperative cholangiography (IOC) were included. We analysed demographic features, preoperative images, type of surgery, conversion rates, and complications.

Results: From the 481 patients admitted diagnosed with ABP, a total of 395 were included in the study. The incidence of choledocolithiasis was 26% (103 patients), diagnosed or confirmed by IOC. The effectiveness of laparoscopic one-step approach for resolution of underlying biliary pathology in ABP was 99.24% (392 patients), given the fact that in those cases it was the only procedure required. In contrast, it was ineffective in 3 patients (0.76%): 2 patients (0.5%) were converted from laparoscopic to open surgery as a consequence of multiple previous interventions—1 also needed choledocotomy and primary closure due to choledocolithiasis; and in 1 patient (0.25%) endoscopic retrograde cholangiopancreatography (ERCP) after surgery was required because of residual lithiasis of the common bile duct. Recurrence was observed in 10 patients (2.53%).

Conclusions: Laparoscopic one-step approach with systematic IOC and eventual instrumentation of the common bile duct if necessary for the management of ABP is an effective and safe method as a definitive treatment of underlying biliary etiology.

Keywords: Pancreatitis; laparoscopic; choledocolithiasis; cholangiography; cholecystectomy

Received: 18 May 2021; Accepted: 17 September 2021; Published: 25 October 2021.

doi: 10.21037/ls-21-12

View this article at: <https://dx.doi.org/10.21037/ls-21-12>

[^] ORCID: 0000-0002-7737-257X.

Introduction

Being one of the most frequent gastrointestinal diseases, acute pancreatitis (AP) greatly affects humans in different ways—emotionally, physically and financially. In developed countries, the most frequent etiology for AP are gallstones: acute gallstone pancreatitis represents nearly 50% of worldwide AP cases, according to prior studies (1-3).

The obstruction of the ampulla is the pathophysiological mechanism that causes it (4) and 5% to 30% of these patients with pancreatitis will have common bile duct stones at the time of exploration (5,6). Almost one-fifth of AP episodes will end in severe AP with a mortality of 15–30% (7).

When cholecystectomy is not performed following the index episode, it has been proved that acute biliary pancreatitis' (ABP) recurrence rate increases, ranging from 25% to 63% (8,9). According to the American College of Gastroenterology practice guideline, cholecystectomy should be performed during the index hospitalization when treating patients with mild biliary pancreatitis (10). However, when treating patients with necrotizing ABP and in order to prevent infection, cholecystectomy should not be performed until the acute inflammation status resolves and fluid collections alleviate. In the initial handling of AP (11), computed tomography (CT) and magnetic resonance imaging (MRI) are key diagnostic tools that allow not only confirming the AP diagnosis with a 90% specificity (12), but also its severity and etiology.

Although it is generally accepted that laparoscopic cholecystectomy (LC) is the indicated treatment for ABP, there is no consensus on which is the best initial approach to solve associated choledocolithiasis (13). While some authors prefer early endoscopic retrograde cholangiopancreatography (ERCP) with endoscopic sphincterotomy (ES) (14,15), laparoscopic transcystic common bile duct exploration represents an effective and safe alternative for the clearance of the bile duct (16). It has as well some benefits such as shorter hospital stay and lower costs due to the need of only one procedure instead of two. Additionally, this approach also maintains the function of the sphincter of Oddi (17).

Our center has wide experience managing ABP, doing since 1991 systematic intraoperative cholangiography (IOC) with eventual choledochotomy or transcystic exploration of the common bile duct for the treatment of choledocolithiasis, both on an elective and urgent setting (18-20).

The objective of our study was to analyze the effectiveness and safety of laparoscopic one-step approach for the

management of ABP with bile duct instrumentation if necessary, performed in the same admission in patients without systemic inflammatory response syndrome (SIRS) or local complications, as early as possible (21), or during a second admission if required in cases of severe AP.

We present the following article in accordance with the STROBE reporting checklist (available at <https://dx.doi.org/10.21037/ls-21-12>).

Methods

A retrospective cohort study was performed with prospectively collected data entered into the patient database. All consecutive adult patients (over 18 years), with confirmed diagnosis of ABP, who underwent LC at the General Surgery Department of the Hospital Italiano of Buenos Aires and Hospital Italiano of San Justo, between January 2009 and December 2019 were included. Exclusion criteria were patients not suitable for surgery due to high surgical risk (ASA \geq IV according to the American Society of Anesthesiologists Classification) (22) and those who were already cholecystectomized. Patients who have developed SIRS as well as acute cholangitis (bilirubin greater than 4 mg/dL, fever and/or leukocytosis) according to Tokyo Guidelines, or with local image complications (Balthazar D/E) underwent delayed surgery, either during the same admission after the acute severe disease have been resolved (10) or after discharge, on an elective setting during a second admission. Pregnant women during the third trimester were also discharged and cholecystectomy was performed during an elective second hospitalization.

CT and MRI were the imaging methods employed for the initial handling of AP. Of the selected patients, 93% underwent a contrast-enhanced abdominal CT at the time of hospital admission. MRI with cholangiopancreatography was performed in 30.8% of patients, as it was reserved for those cases with biochemical signs of cholestasis to assess for choledocolithiasis. Other indications for MRI were patients with a contrast allergy and/or renal insufficiency, in whom CT was contraindicated.

The diagnosis of AP was defined according to the Atlanta Revised Guidelines in 2019 (7) and needed at least two of the following three features: epigastric pain, serum amylase or lipase levels at least three times the upper limit of normal, and, characteristic findings of AP on cross-sectional abdominal imaging. Mild pancreatitis was defined by absence of persistent organ failure ($>$ 48 h), and local complications such as pancreatic necrosis or peripancreatic

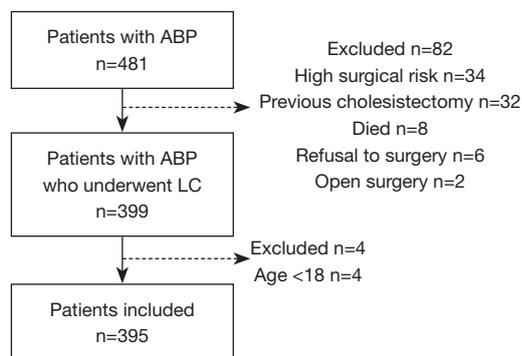


Figure 1 Inclusion of patients in the study. ABP, acute biliary pancreatitis; LC, laparoscopic cholecystectomy.

fluid collections on CT. Severe AP was defined by the presence of persistent (fails to resolve within 48 h) organ failure and/or death (23).

To evaluate local imaging complications we used the Balthazar degrees (24) by CT—A: normal pancreas; B: pancreatic enlargement; C: pancreatic inflammation and/or peripancreatic fat; D: single peripancreatic fluid collection; E: two or more fluid collections and/or retroperitoneal air.

In most cases, surgery was performed in the first available surgical shift in the operating room. In highly symptomatic patients, surgery was deferred until improvement of symptoms assessed by anamnesis and physical examination. The American technique of LC was used, as previously described (18). In all cases, intraoperative cholangiogram (IOC) was systematically performed, assessing the presence or absence of associated CBD stones (19). When choledocolithiasis was confirmed under IOC, a transcystic approach with a Dormia basket (Cook®) was used to extract the stones. A balloon-dilating catheter was used to free large impacted stones unable to be retrieved by the Dormia basket. If the transcystic approach was unsuccessful, laparoscopic choledochotomy was performed to clear the CBD (20).

We analyzed the effectiveness of laparoscopic one-step approach for the management of APB. Those who required an additional procedure or were converted to open surgery were considered as ineffective.

Demographic features were described by age and sex, and preoperative characteristics, such as: amylasemia (IU/L) at the time of diagnosis and at the time of surgery; bilirubinemia, alkaline phosphatase (ALP), glutamic oxaloacetic transaminase (GOT) and glutamic pyruvic transaminase (GPT) at the time of diagnosis; the grade of

CT pancreatitis according to Balthazar (A, B and C), and findings in MRI in those who needed it. We evaluated the type of surgery performed to establish the effectiveness of laparoscopy, as well as the transcystic approach: LC, LC with transcystic choledocholithotomy (with or without stent placement), LC with choledochotomy and primary closure, and conversion of laparoscopy to conventional surgery. We considered those who needed subsequent ERCP to resolve choledocolithiasis.

Time to surgery was determined as the period between the date of the onset of symptoms and surgery, regardless if the patient was operated on in the same admission or in a second hospital stay.

Follow-up was carried out at days 7, 30 and 90 for assessment of complications or recurrence of pancreatitis.

Postoperative complications at 90 days were defined according to Clavien-Dindo classification (25,26): mild (CD I/II), severe (CD III–IV) and death (CD V). The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Ethical Committee Board of the Hospital Italiano de Buenos Aires (approval number 5389). Since it is a retrospective study, informed consent was not necessary.

Statistical analysis

Data were reported as means \pm standard deviation or median and interquartile range for continuous variables according to observed distribution, and frequency and percentages for categorical ones. Comparisons were performed using Student's *t*-test or the Mann-Whitney test for continuous variables, and the Chi-squared test or Fisher's exact test for categorical variables. A value of $P < 0.05$ was considered statistically significant. Statistical analyses were performed using STATA version 10.1 (Stata Corp., USA).

Results

A flow chart of this study is shown in *Figure 1*. From the 481 patients admitted with ABP, 82 (17%) were excluded because LC was not performed: 34 (7%) due to high surgical risk, 32 (6.7%) already cholecystectomized, 8 (1.66%) died because of severe pancreatitis, 2 (0.4%) went to upfront open surgery and 6 (1.24%) due to refusal of the patient. Of the remaining 399, 4 were excluded for being pediatric. Finally, 395 patients were included.

A total of 240 patients (60.76%) were admitted at Hospital Italiano of Buenos Aires, while 155 (39.24%) were

Table 1 Demographics and preoperative characteristic

Characteristics	Value
Age (years)	53 (IQR: 37–70)
Gender (female), n (%)	191 (48.31)
Balthazar, n (%)	
A	114 (30.00)
B	115 (31.00)
C	129 (35.00)
D	8 (2.17)
E	2 (0.54)
Admission amylasemia (UI/L)	1,105 (IQR: 572–1,963)
Admission total bilirubin (mg/dL)	1.4 (IQR: 0.8–209)
Admission direct bilirubin (mg/dL)	0.5 (IQR: 0.2–1.4)
Admission ALP (UI/L)	151 (IQR: 87–205)
Admission GOT (UI/L)	130 (IQR: 57–286)
Admission GPT (UI/L)	170 (IQR: 64–351)
Preoperative amylasemia (UI/L)	69 (IQR: 65–118)
Time to surgery (days)	3 (IQR: 2–6)
Surgery in same admission, n (%)	335 (84.8)

IQR, interquartile range; ALP, alkaline phosphatase; GOT, glutamic oxaloacetic transaminase; GPT, glutamic pyruvic transaminase.

Table 2 Intraoperative characteristics

Characteristics	Value
Effectiveness of laparoscopic one step approach, n (%)	392 (99.24)
Conversion to open surgery, n (%)	2 (0.50)
Intraoperative choledocolithiasis, n (%)	103 (26.00)
LC + transcystic common bile duct exploration	90 (87.00)
LC + transcystic common bile duct exploration + stent	3 (2.91)
LC + choledochotomy and primary closure	4 (3.88)
LC + flushing	7 (6.80)
LC + ERCP	1 (0.97)
LC + conversion + choledochotomy	1 (0.97)

LC, laparoscopic cholecystectomy; ERCP, endoscopic retrograde cholangiopancreatography.

treated at Hospital Italiano of San Justo. Demographics and preoperative characteristics, including biochemical results are detailed in *Table 1*.

The incidence of choledocolithiasis was 26% (103 patients), diagnosed or confirmed by systematic IOC. Of those patients, 90 (87%) were resolved by LC with transcystic common bile duct exploration—3 of them with stent placement (2.91%), 4 (3.88%) with LC with choledochotomy and primary closure, and 7 (6.8%) had spontaneous passage through the papilla after flushing with hypertonic physiological solution. Only 1 patient (0.97%) with choledocolithiasis needed post ERCP to treat it after ineffective transcystic exploration, and 1 patient (0.97%) was converted to open surgery with choledochotomy and primary closure (*Table 2*).

The effectiveness of laparoscopic one-step approach for resolution of underlying biliary pathology in AP was 99.24% (95% CI: 97.8–99.8%) (392 patients), given the fact that in those cases it was the only procedure required. In contrast, it was ineffective in 3 patients (0.76%): 2 patients (0.5%) were converted from laparoscopic to open surgery due to multiple previous surgical antecedents—1 also needed choledochotomy and primary closure due to choledocolithiasis; and in 1 patient (0.25%) ERCP after surgery was mandatory because of residual lithiasis of the common bile duct.

The median time to surgery was 3 [interquartile range (IQR): 2–6] days, despite 60 patients (15.2%) were operated in other hospitalization and 335 patients (84.8%) in the same admission. There was no significant association between the severity grade of pancreatitis according to Balthazar and the performance of surgery in a second hospitalization ($P=0.012$).

The median follow-up time was 50 (IQR: 25–75) months. Postoperative complications were observed in 25 cases (6.32%): 24 patients (6.07%) had mild complications (CD I–II), and 1 patient (0.25%) was CD IVB due to the need of intensive care unit and reoperation as a consequence of hemoperitoneum. Neither biliary leak nor mortality were observed in our series.

Recurrence of ABP was observed in 10 patients (2.53%). The median time from surgery to recurrence was 7 (IQR: 1–29) months and of those cases 4 patients (40%) needed an additional intervention (ERCP to manage *de novo* choledocolithiasis) (*Table 3*).

Table 3 Postoperative characteristics

Characteristics	Value
Follow up (months)	50 (IQR: 25–75)
Postoperative complications, n (%)	25 (6.32)
Mild complications (CD I–II), n (%)	24 (6.07)
Severe complications (CD III–V)	1 (0.25)
Recurrence of ABP, n (%)	10 (2.53)
Time to recurrence (months)	7 (IQR: 1–29)
Required ERCP, n (%)	4 (40.00)

CD, Clavien-Dindo; ABP, acute biliary pancreatitis; ERCP, endoscopic retrograde cholangiopancreatography.

Discussion

“Acute pancreatitis associated with gallstone disease is frequently caused by transient blockage of the ampulla of Vater by migrating gallstones” (27). Acosta and Ledesma described this situation already in 1974. Despite the etiopathology of this problem is already clear, authors describe different approaches to handle it, and the effectiveness of the diverse strategies varies according to the center and the surgical team’s preferences.

Our study shows that laparoscopic one-step approach is effective and safe for the management of ABP, since 392 of the 395 patients of our series did not need an additional procedure, whether or not they presented associated choledocolithiasis. It’s been previously addressed that LC with bile duct exploration can be safely performed early in the same admission of the ABP (21), with no increase in the prevalence of common bile duct stones (28). In cases of severe ABP, it’s a safer strategy to manage the acute scenario and perform surgery during a second elective hospitalization. Morbidity associated with this approach was low, as 6.07% of the entire cohort had mild complications and only one patient needed reoperation. It is important to highlight that there were no cases of biliary leak or bile duct injury in our cohort.

In 2014, Mustafa *et al.* (29) analyzed the effectiveness of cholecystectomy and ES in the management of gallstone pancreatitis, showing that recurrent pancreatitis after definitive treatment was more common among patients treated with ES (6.7%) than among those treated with cholecystectomy (4.4%) or ES followed by cholecystectomy (1.2%). They confirmed that cholecystectomy offers better protection than ES alone against further episodes of AP, but

for them, cholecystectomy in patients treated initially with ES was the most effective method of preventing recurrence. In our study the recurrence performing LC alone as a single approach was 2.53%. This difference may be explained by the fact that in our center, IOC is routinely performed, allowing for intraoperative detection of choledocolithiasis, and eventual resolution of it with no need for a second procedure, decreasing the risk of pancreatitis recurrence.

Ricci *et al.* (30) evaluated in 2018 a total of 20 randomized clinical trials comprising 2,489 patients, comparing different laparoscopic and intraoperative techniques for the management of choledocolithiasis. The results were that LC plus intraoperative ERCP had the highest probability of being the most successful and safest method with respect to morbidity. When AP was considered, the technique with the least probability to be the best was the preoperative ERCP followed by cholecystectomy. As regards biliary leak, the worst approach was laparoscopic common bile duct exploration, opposite to what happened in our study where we had no biliary leak or bile duct injury.

We perform systematic IOC, which gives us the possibility of confirming or diagnosing the presence of common bile duct stones. Once choledocolithiasis is proved, our first strategy to resolve it is by simultaneous transcystic bile duct exploration (87% of the patients in our study), although our center has also experience in performing choledochotomy if necessary in complex cases.

In our series only 2 patients (0.5%) were converted from laparoscopic to open surgery due to the impossibility of performing pneumoperitoneum because of adhesions of previous surgeries. Of the recently mentioned, one patient also needed choledochotomy and primary closure due to choledocolithiasis. And in just one patient (0.25%) ERCP after surgery was needed because of residual lithiasis of the common bile duct. This reflects that patients are successfully treated by laparoscopy, supported by the fact that it is a high volume center.

As suggested by El-Dhuwaib *et al.* (31), following an episode of ABP cholecystectomy should be offered to all patients preferentially prior to discharge. And if patients are not fit for surgery, an ES should be performed as definitive treatment. Giuffrida *et al.* (21) also supported the laparoscopic procedure, carried out after 48 h from the onset of symptoms in mild ABP.

Our study has some limitations as this is a retrospective cohort. In spite of this, all consecutive patients with ABP were included in the analysis and data was collected prospectively in an AP registry. We consider a virtue the

fact that we stand behind in precise imaging studies and specialized physicians with knowledge in laparoscopy as well as in the physiopathology of ABP. The advantage of performing IOC to all consecutive patients is also valuable.

Since laparoscopic one-step approach for the management of ABP is an effective and safe method, we assume that there is no need to follow other strategies in patients with adequate conditions for surgery. Our satisfactory experience in the last 10 years highlights the tendency towards laparoscopic technique.

Conclusions

In patients with ABP, laparoscopic one-step approach with systematic IOC and common bile duct instrumentation if necessary, is an effective method as a definitive treatment of underlying biliary etiology.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the Guest Editor (Nadia Russolillo) for the series “Amplifying the voices of women surgeon scientists” published in *Laparoscopic Surgery*. The article has undergone external peer review.

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at <https://dx.doi.org/10.21037/ls-21-12>

Data Sharing Statement: Available at <https://dx.doi.org/10.21037/ls-21-12>

Peer Review File: Available at <https://dx.doi.org/10.21037/ls-21-12>

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://dx.doi.org/10.21037/ls-21-12>). The series “Amplifying the voices of women surgeon scientists” was commissioned by the editorial office without any funding or sponsorship. The authors have no other conflicts of interest to declare.

Ethical Statement: The authors are accountable for all

aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Ethical Committee Board of the Hospital Italiano de Buenos Aires (approval number 5389). Since it is a retrospective study, informed consent was not necessary.

Open Access Statement: This is an Open Access article distributed in accordance with the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License (CC BY-NC-ND 4.0), which permits the non-commercial replication and distribution of the article with the strict proviso that no changes or edits are made and the original work is properly cited (including links to both the formal publication through the relevant DOI and the license). See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

References

1. Peery AF, Dellon ES, Lund J, et al. Burden of gastrointestinal disease in the United States: 2012 update. *Gastroenterology* 2012;143:1179-87.e3.
2. Yadav D, Lowenfels AB. Trends in the epidemiology of the first attack of acute pancreatitis: a systematic review. *Pancreas* 2006;33:323-30. Erratum in: *Pancreas* 2007;34:174.
3. Johnson CD, Besselink MG, Carter R. Acute pancreatitis. *BMJ* 2014;349:g4859.
4. Barkun AN, Barkun JS, Fried GM, et al. Useful predictors of bile duct stones in patients undergoing laparoscopic cholecystectomy. McGill Gallstone Treatment Group. *Ann Surg* 1994;220:32-9.
5. Pellegrini CA. Surgery for gallstone pancreatitis. *Am J Surg* 1993;165:515-8.
6. Acosta JM, Pellegrini CA, Skinner DB. Etiology and pathogenesis of acute biliary pancreatitis. *Surgery* 1980;88:118-25.
7. Colvin SD, Smith EN, Morgan DE, et al. Acute pancreatitis: an update on the revised Atlanta classification. *Abdom Radiol (NY)* 2020;45:1222-31.
8. Nguyen GC, Rosenberg M, Chong RY, et al. Early cholecystectomy and ERCP are associated with reduced readmissions for acute biliary pancreatitis: a nationwide, population-based study. *Gastrointest Endosc* 2012;75:47-55.
9. da Costa DW, Bouwense SA, Schepers NJ, et al. Same-admission versus interval cholecystectomy for mild

- gallstone pancreatitis (PONCHO): a multicentre randomised controlled trial. *Lancet* 2015;386:1261-8.
10. Tenner S, Baillie J, DeWitt J, et al. American College of Gastroenterology guideline: management of acute pancreatitis. *Am J Gastroenterol* 2013;108:1400-15; 1416. Erratum in: *Am J Gastroenterol* 2014;109:302.
 11. Stimac D, Miletić D, Radić M, et al. The role of nonenhanced magnetic resonance imaging in the early assessment of acute pancreatitis. *Am J Gastroenterol* 2007;102:997-1004.
 12. Fagenholz PJ, Fernández-del Castillo C, Harris NS, et al. Direct medical costs of acute pancreatitis hospitalizations in the United States. *Pancreas* 2007;35:302-7.
 13. McGrath MF, McGrath JC, Gabbay J, et al. Safe laparoendoscopic approach to biliary pancreatitis in older patients. *Arch Surg* 1996;131:826-31; discussion 831-3.
 14. Fan ST, Lai EC, Mok FP, et al. Early treatment of acute biliary pancreatitis by endoscopic papillotomy. *N Engl J Med* 1993;328:228-32.
 15. Siegel JH, Veerappan A, Cohen SA, et al. Endoscopic sphincterotomy for biliary pancreatitis: an alternative to cholecystectomy in high-risk patients. *Gastrointest Endosc* 1994;40:573-5.
 16. Soper NJ, Brunt LM, Callery MP, et al. Role of laparoscopic cholecystectomy in the management of acute gallstone pancreatitis. *Am J Surg* 1994;167:42-50; discussion 50-1.
 17. Lauter DM, Froines EJ. Laparoscopic common duct exploration in the management of choledocholithiasis. *Am J Surg* 2000;179:372-4.
 18. Pekolj J, Alvarez FA, Palavecino M, et al. Intraoperative management and repair of bile duct injuries sustained during 10,123 laparoscopic cholecystectomies in a high-volume referral center. *J Am Coll Surg* 2013;216:894-901.
 19. Alvarez FA, de Santibañes M, Palavecino M, et al. Impact of routine intraoperative cholangiography during laparoscopic cholecystectomy on bile duct injury. *Br J Surg* 2014;101:677-84.
 20. Czerwonko ME, Pekolj J, Uad P, et al. Laparoscopic transcystic common bile duct exploration in the emergency is as effective and safe as in elective setting. *J Gastrointest Surg* 2019;23:1848-55.
 21. Giuffrida P, Biagiola D, Cristiano A, et al. Laparoscopic cholecystectomy in acute mild gallstone pancreatitis: how early is safe? *Updates Surg* 2020;72:129-35.
 22. Doyle DJ, Goyal A, Bansal P, et al. American Society of Anesthesiologists Classification. In: *StatPearls*. Treasure Island: StatPearls Publishing, 2021.
 23. Banks PA, Bollen TL, Dervenis C, et al. Classification of acute pancreatitis--2012: revision of the Atlanta classification and definitions by international consensus. *Gut* 2013;62:102-11.
 24. Balthazar EJ. Acute pancreatitis: assessment of severity with clinical and CT evaluation. *Radiology* 2002;223:603-13.
 25. Clavien PA, Barkun J, de Oliveira ML, et al. The Clavien-Dindo classification of surgical complications: five-year experience. *Ann Surg* 2009;250:187-96.
 26. Dindo D. The Clavien-Dindo classification of surgical complications. In: Cuesta M, Jaap Bonjer H. editors. *Treatment of postoperative complications after digestive surgery*. London: Springer, 2014:13-7.
 27. Acosta JM, Ledesma CL. Gallstone migration as a cause of acute pancreatitis. *N Engl J Med* 1974;290:484-7.
 28. Fratantoni ME, Giuffrida P, Di Menno J, et al. Prevalence of persistent common bile duct stones in acute biliary pancreatitis remains stable within the first week of symptoms. *J Gastrointest Surg* 2021. [Epub ahead of print]. doi: 10.1007/s11605-021-05068-0.
 29. Mustafa A, Begaj I, Deakin M, et al. Long-term effectiveness of cholecystectomy and endoscopic sphincterotomy in the management of gallstone pancreatitis. *Surg Endosc* 2014;28:127-33.
 30. Ricci C, Pagano N, Taffurelli G, et al. Comparison of efficacy and safety of 4 combinations of laparoscopic and intraoperative techniques for management of gallstone disease with biliary duct calculi: a systematic review and network meta-analysis. *JAMA Surg* 2018;153:e181167.
 31. El-Dhuwaib Y, Deakin M, David GG, et al. Definitive management of gallstone pancreatitis in England. *Ann R Coll Surg Engl* 2012;94:402-6.

doi: 10.21037/ls-21-12

Cite this article as: Di Menno Stavron J, Ardiles V, Fratantoni ME, Uad P, Sanchez Clariá R, de Santibañes M, Pekolj J, Mazza O. Laparoscopic one-step approach for the management of acute biliary pancreatitis: 10 years experience in a high volume center. *Laparosc Surg* 2021;5:42.