ORIGINAL ARTICLE

Postcholecystectomy Duodenal Injuries, Their Management, and Review of the Literature

Jair Diaz-Martinez[1], Nayelli Pérez-Correa[2]

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Abstract

Backgrounds: Laparoscopic cholecystectomy (LC) is the gold standard for treating gallstones; however, it is not free of complications. Postcholecystectomy duodenal injuries are rare but challenging complications after cholecystectomy. The objective of this study was to analyze the management of postcholecystectomy duodenal injuries and to review the related literature.

Materials and methods: An observational and retrospective study was conducted. We included all patients with postcholecystectomy duodenal injuries treated at a reference center, from January 2019 to December 2023. In addition, a review of the literature was carried out.

Results: Fifteen patients were found, mostly women; with gallbladder wall thickening on ultrasound (mean of 8 mm). The majority were emergency ($n = 12$, 80%) and LCs ($n = 8$, 53.33%). Cholecystectomies were reported to be associated with excessive difficulty ($n = 10$, 66.66%). The most injured duodenal portion was the first portion ($n = 9$, 60%), and blunt dissection was the most common mechanism of injury ($n = 7$, 46.66%). Most of these injuries were detected in the operating room ($n = 9$, 60%), and treated with primary closure ($n = 11$, 73.33%). Three patients with delayed injuries died (20%). According to the literature reviewed, 93 duodenal injuries were found, mostly detected intraoperatively, in the second portion, and treated with primary closure. A minority of patients were treated with more complex procedures, for a mortality rate of 15.38%.

Conclusion: Postcholecystectomy duodenal injuries are rare. Most of these injuries are detected and repaired intraoperatively. However, a high percentage of patients have high morbidity and mortality.

Keywords: Complications, Duodenal injuries, Duodenum, Laparoscopic cholecystectomy, Perforation.

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Introduction

Laparoscopic cholecystectomy (LC) is the most commonly performed surgery worldwide and is currently the gold standard for the treatment of gallstones.[1–3] The introduction of this new technique has led to improvements in the treatment of gallstones but also to an increase in certain complications.[4] Regarding severity, bile duct injury (BDI) is the most common postcholecystectomy complication.[5] However, there are also nonbiliary injuries that are equally complex and challenging. Extrabiliary injuries include injuries of the colon, stomach, and small intestine and injuries of the duodenum.[6,7] Duodenal injury is exceptionally rare but challenging to treat, and its management is complex, with high morbidity and mortality. In a large series of LCs, these injuries are reported with a frequency of 0.03–0.2%. Despite the infrequent nature of these injuries, their mortality rate is high and is reported to reach 10–18%. Due to their low frequency and insidious presentation, these injuries have rarely been studied and reported. There are few reports in the literature of this fearsome and challenging complication, and perioperative factors are unknown.[8,9]

The objective of this study was to increase awareness of these injuries by reporting the perioperative factors, injury mechanisms, management strategies, and evolution of patients with postcholecystectomy duodenal injuries. In addition, we analyzed the relevant literature to expand the body of related knowledge to try to prevent these life-threatening injuries.

Materials and Methods

Study Design

An observational and retrospective study was conducted from January 2019 to December 2023. We included all adult patients with postcholecystectomy duodenal injuries and complete medical records from a referral center. We included patients who underwent elective or emergency cholecystectomy, as well as patients referred by other institutions. In addition, we performed a review of the English literature on postcholecystectomy duodenal injuries. This review was carried out in the Medline, PubMed central database for all patients reported through January 2023. Case reports and case series about duodenal injuries and postcholecystectomy complications were included. The keywords used were as follows: Duodenal injury, duodenal perforation, cholecystectomy, cholecystectomy complications, and iatrogenic complications. The variables we searched for were the type of cholecystectomy, duodenal portion affected, mechanism type of injury, time of injury detection, type of injury, treatment, and survival.

[1]Department of General and HPB Surgery, Hospital de Alta Especialidad Centenario de la Revolución Mexicana ISSSTE, Zapata, Morelos, Mexico
[2]Department of General Surgery, Hospital General Regional c/MF No. 1, IMSS, Cuernavaca, Morelos, Mexico
Corresponding Author: Jair Diaz-Martinez, Department of General and HPB Surgery, Hospital de Alta Especialidad Centenario de la Revolución Mexicana ISSSTE, Zapata, Morelos, Mexico, Phone: +52 7771011400, e-mail: diazjairmd@gmail.com

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Clinical and Surgical Evaluations

The patients' files were retrospectively reviewed. For every patient evaluated, demographic variables (sex, age, and comorbidities), preoperative variables (characteristic of preoperative hepatobiliary ultrasound; injury detection time), operative variables (type of cholecystectomy, the difficulty of cholecystectomy based on the Parkland score, bleeding, surgical findings, injured duodenal portion, mechanism of injury, type of repair, use of drainage, added injuries, and BDIs based on Strasberg classification), and postoperative variables (postoperative complications, reoperations, in-hospital stay, follow-up, and mortality) were included. The follow-up data were documented until discharge, and the morbidity and mortality were described.[10,11]

Ethical Considerations

The Local Ethics Committees approved this study (number 40/2023). Only the information from the databases and clinical records was manipulated. This study adheres to the research guidelines and checklist for observational studies (STROBE) and meets specific standards for human research.[12] The present study is also subject to the regulations of the General Health Law on Health Research, the Declaration of Helsinki, and the Declaration of Taipei, as well as institutional norms and instructions on scientific research.

Statistical Analysis

We use descriptive statistics to perform the analysis. The statistical analysis was performed using Microsoft Excel and the Statistical Package for Social Sciences (SPSS, version 24.0, IBM, Inc., Chicago, Illinois, USA).

Results

Patient Characteristics

During the period studied, we found 15 patients. The majority were women ($n = 10$, 66.66%), with a mean age of 56 years (range, 32–78 years). Two patients had comorbidities, diabetes, and high blood pressure (13.33%). According to the presurgical ultrasound results, all patients exhibited gallbladder wall thickening, with a mean of 8 mm (range, 6–10 mm). In two patients (13.33%), abnormalities on ultrasound were reported with an inflammatory mass at the level of the right hypochondrium; in the remaining patients, gallbladder wall thickening was the only abnormality reported. Most of these patients were evaluated in the emergency room ($n = 12$, 80%), and the remaining cholecystectomies were elective surgeries (Table 1). The demographic and preoperative conditions are shown.

Surgical Conditions

Most patients underwent LC ($n = 8$, 53.33%). Four patients underwent open cholecystectomies (26.66%), and three underwent conversions to open cholecystectomies (20%). Open cholecystectomies were due to suspicion of high difficulty, and conversions were due to added injuries. The majority of our patients underwent emergency cholecystectomies ($n = 12$, 80%). Five patients underwent cholecystectomies at other peripheral hospitals and were referred to our hospital (33.33%). A difficult cholecystectomy was reported in all the patients. To classify the difficulty of cholecystectomy, the Parkland scale was used. From grade I to grade V, most cholecystectomies were reported to be associated with excessive difficulty and adhesions with Parkland V ($n = 10$, 66.66%). Among the surgical findings in ten patients, abundant adhesions to the duodenum were reported, making dissection difficult (66.66%). Firm adhesions to the colon and stomach were reported in one patient (6.66%). In six patients (40%), there was no clear identification of the hepatocystic triangle, and landmarks for performing a safe cholecystectomy were not achieved. In three of these patients (20%), Mirizzi syndrome was reported, increasing the complexity of the procedure. The average bleeding volume per surgery was 165 mL (range, 20–600 mL). Drainage was used in 14 patients (93.33%), and drainage was not used in only one patient (6.66%). Table 2 shows the characteristics of the cholecystectomies.

Injury Characteristics

The most injured duodenal portion was the first portion ($n = 9$, 60%). In four patients, the second portion was injured (26.66%), and two patients had injuries in the first and second portions of the duodenum (13.33%). The most reported mechanism of injury during cholecystectomy was duodenal section by blunt dissection ($n = 7$, 46.66%), followed by thermal injury in three patients (20%), retraction was reported in four patients (26.66%), and injury by scissors in one patient (6.66%). Most of these injuries were detected on the operating table ($n = 9$, 60%). In six patients, the injury was detected after cholecystectomy (40%), with a mean detection time of 3 days (range, 0–6 days). Of these patients, one was detected 6 hours after cholecystectomy (6.66%), two were detected 48 hours after cholecystectomy (13.33%), and three were detected 5 days after cholecystectomy (20%). These three patients with late injury detection were referred from other hospitals.

Six patients (46%) had added injuries. Of these, BDI was the most common added injury ($n = 5$, 38%), and the others were colon and stomach injuries (6.66%). The most common BDI reported was bile leakage (Strasberg type A). In two patients, lateral injury of the main bile duct (Strasberg D type) was reported, and in one patient, a complete section of the main bile duct (Strasberg E1 type) was reported. For this patient, a protocol was required for bile duct repair, and a percutaneous transhepatic catheter and multiple reoperations were used. Most duodenal injuries were repaired via primary closure (duodenorrhaphy) ($n = 11$, 73.33%). In one patient, in addition to primary closure, a jejunostomy was performed (6.66%). Primary closure and gastrojejunostomy were performed in one patient (6.66%). One patient required pyloric exclusion with gastrojejunostomy (6.66%). Another patient required a duodenostomy tube, pyloric exclusion, and gastrojejunostomy. Table 3 shows the characteristics of the injuries and differences between survivors and nonsurvivors.

Postsurgical Evaluation and Follow-up

In the postoperative period in this case series, five patients (33.33%) had a postsurgical complication type 3b according to the Clavien–Dindo classification. These patients required reoperations under general anesthesia. In two patients, one reoperation was required (13.33%), and in three patients, three or more reoperations were required (20%). The average overall hospital stay in these case series was 16.13 days, with a range of 5–65 days. For patients with added injuries, the hospital stay was longer, with a mean of 24 days and a range of 10–30 days, unlike for patients without added injuries, whose hospital stay was 5.2 days. Patients with added injuries required multiple reoperations, and four of these patients required a stay in the intensive care unit (ICU). Three patients died, for a mortality rate of 20%. The cause of death was abdominal sepsis, which occurred five days after injury in two patients (13.33), and in one patient the cause of death was hemodynamic instability (6.66%).

Table 1: Demographic and clinical characteristics of the case series

Patient	*Age (years)*	*Gender*	*Type of cholecystectomy*	*Duodenal portion affected*	*Injury mechanism*	*Time to detection*	*Type of repair*	*Mortality*
1	60	M	LC	First portion	Blunt dissection	On table	Primary closure	No
2	54	M	LC	First portion	Retraction	On table	PC + jejunostomy	No
3	42	F	OC	First portion	Blunt dissection	On table	Primary closure	No
4	65	M	LC	First portion	Blunt dissection	On table	Primary closure	No
5	62	F	C	First portion	Blunt dissection	On table	Primary closure	No
6	60	F	LC	Second portion	Retraction	6 days	Primary closure	Yes
7	78	F	LC	First and second portion	Retraction	6 hr.	Primary closure	No
8	68	F	LC	First portion	Blunt dissection	2 days	Primary closure	No
9	53	F	LC	First portion	Thermal dissection	2 days	Primary closure	No
10	66	F	C	Second portion	Blunt dissection	On table	PC + gastrojejunostomy	No
11	56	M	OC	First portion	Blunt dissection	On table	Pyloric exclusion + gastrojejunostomy	No
12	59	F	OC	Second portion	Thermal dissection	5 days	Primary closure	Yes
13	44	F	C	First portion	Thermal dissection	On table	Primary closure	No
14	32	M	OC	Second portion	Retraction	4 days	Duodenostomy tube + pyloric exclusion + gastrojejunostomy	Yes
15	42	F	LC	First and second portion	Scissor cutting	On table	Primary closure	No

C, conversion; F, female; LC, laparoscopic cholecystectomy; M, male; OC, open cholecystectomy; PC, primary closure

Table 2: Preoperative characteristics of our cases

Factor	*n = 15*	*%*
Gender		
Female	10	66.66%
Male	5	33.33%
Age (years; mean)	56	32–78, range
Comorbidities		
No comorbidities	11	73.33%
Diabetes/hypertension	4	30.76%
Ultrasound		
Gallbladder wall (mean/range)	8 mm	6–10 mm, range
Mass in right upper abdominal quadrant	2	13.33%
Without other alterations	13	86.66%
Type of surgery		
Emergency	12	80%
Elective	3	20%
Type of cholecystectomy		
Laparoscopic	8	53.33%
Open	4	26.66%
Converted	3	20%
Parkanld scale		
Type III	2	13.33%
Type IV	3	20%
Type V	10	66.66%
Bleeding (mean/range)	165 mL	20–600 mL
Duodenal portion affected		
First portion	9	60%
Second portion	4	26.66%
First and second portion	2	13.33%
Mechanism of injury		
Blunt dissection	7	46.66%
Electrocautery	3	20%
Retraction	4	26.66%
Scissors	1	6.66%
Injury detection		
On table	9	60%
First 48 hours	1	6.66%
48–96 hours	2	13.33%
96 hours	3	20%
Type of injury repair		
Primary repair	11	73.33%
Primary repair + jejunostomy	1	6.66%
Primary repair + gastrojejunostomy	1	6.66%
Pyloric exclusion + gastrojejunostomy	1	6.66%
Duodenostomy tube + pyloric exclusion + gastrojejunostomy	1	6.66%

Literature Review

A total of 38 articles mentioned one or more cases of postcholecystectomy duodenal injury. A total of 28 case series and 10 case reports were found. In total, 93 patients were analyzed. Few articles have reported a precise description of these injuries; most have not reported complete demographic or treatment information, especially in case series of general postcholecystectomy injuries. However, we included all these reports.

Eighteen studies reported the sex of the patients. Sixteen of these patients were men (50%), and 16 were women (50%).

Table 3: Differences between survivors and nonsurvivors

Factor	*Survivors (n = 12)*	*Nonsurvivors (n = 3)*	*Total (n = 15)*
Age			
Mean (years)	57	50	56
Range (years)	42–78	32–66	32–78
Gender			
Male	4 (26.66%)	1 (6.66%)	5 (33.33%)
Female	8 (53.33%)	2 (13.33%)	10 (66.66%)
Parkland			
Grade III	1 (6.66%)	1 (6.66%)	2 (13.33%)
Grade IV	2 (13.33%)	1 (6.66%)	3 (20%)
Grade V	9 (60%)	1 (6.66%)	8 (66.66%)
Duodenal portion affected			
First portion	9 (60%)	0	9 (60%)
Second portion	1 (6.66%)	3 (20%)	4 (26.66%)
First and second portion	2 (13.33%)	0	2 (13.33%)
Duodenal injury mechanism			
Blunt dissection	7 (46.66%)	0	7 (46.44%)
Electrocautery	2 (13.33%)	1 (6.66%)	3 (20%)
Retraction	2 (13.33%)	2 (13.33%)	4 (26.66%)
Scissors	1 (6.66%)	0	1 (6.66%)
Average bleeding in cholecystectomy	152 mL	200 mL	163.07 mL
Injury detection time			
On table	9 (60%)	0%	9 (60%)
First 48 hours	1 (6.66%)	0%	1 (6.66%)
48–96 hours	2 (13.33%)	0%	2 (13.33%)
More than 96 hours	0%	3 (20%)	3 (20%)

Twenty-one studies included the age of the patients with a mean age of 56 years (range, 23–88). Thirty-four cases reported the type of cholecystectomy. Conversion to open cholecystectomy was the most common procedure in 21 patients (61.76%), followed by LC in 11 patients (32.35%) and less commonly, open cholecystectomy in two patients (5.88%). The duodenal portion affected was reported in 21 patients, and the most commonly affected duodenal portion was the second portion in 11 patients (52.38%), followed by the first portion in 6 patients (28.57%). Injuries to the first and second portions simultaneously occurred in two patients (9.52%), injuries to the third portion occurred in one patient (4.76%), and injuries to the second and third portions occurred in one patient (4.76%). The mechanism of injury associated with these injuries was reported in 33 patients. Thermal injury was the most common mechanism in 18 patients (54.54%), followed by blunt dissection in 11 patients (33.33%), and a retraction mechanism was reported in four patients (12.12%).

Regarding the time to injury detection, 41 cases showed this time. These injuries were mostly reported at the time of cholecystectomy in 17 patients (41.46%). For the remaining patients, the average time to injury detection was 3.8 days (range, 1–16 days). Injuries were detected on postoperative day (POD) 3 or later in 13 patients (31.70%). Six patients (14.63%) were diagnosed on POD 2, and five patients (12.19%) were diagnosed on POD 1.

Among the 43 patients in whom injury management was reported, the majority underwent primary closure (duodenorrhaphy) of the duodenal perforation 24 patients; 55.81%. Four patients (9.30%) received percutaneous management. Endoscopic management ($n = 2$, 4.65%), gastric resection ($n = 2$, 4.65%), and conservative management ($n = 4$, 9.30%) were reported for four patients each. In two patients, T-tube duodenostomy was used (4.65%). In two patients, pyloric exclusion was reported (4.65%). In one patient (2.32%), duodenal diverticulization was used; in one patient, a duodenopancreatectomy procedure (2.32%) was reported; and in one patient, an omental patch (2.32%) was used to treat duodenal injury. Table 4 shows the treatment of duodenal injuries in these 43 patients. For 78 patients, follow-up was reported; 66 patients were alive (84.61%), and 12 patients died (15.38%).

Discussion

Laparoscopic cholecystectomy has undoubtedly brought great benefits. However, post LC injuries are serious. Fortunately, the injuries that we present in this series are rare complications of cholecystectomy. According to our experience, these injuries were reported in our hospital at an extremely low frequency, which does not differ from what has been reported in the literature. In our review, we found 93 cases reported in the literature. A total of 38 articles reported postcholecystectomy duodenal injuries (28 case series and 10 case reports). Unfortunately, there is a lack of data in many case reports and case series about these injuries. This limits the study and analysis of these fearsome injuries. In a large series of postcholecystectomy complications, Huang et al. reported 19 duodenal injuries of 39,238 cholecystectomies, for a frequency of 0.04.[13] In another large series reported by Deziel and Millikan involving 77,604 cholecystectomies, 12 duodenal injuries were found, for a reported frequency of 0.014%.[14] In an extensive review in 2016, Machado NO reported 74 cases of postcholecystectomy duodenal injuries, which marked a low frequency.[8] On average, the reported frequency is approximately 0.04%, with a range of 0.01–4%. Other complications, such as small intestine perforations, are reported in 0.07–0.9% of patients, and major complications

Table 4: Literature review—type of surgical procedures used to treat postcholecystectomy duodenal injuries

Type of surgical repair	*n*	*Percentage*	*References*
Primary repair (duodenorrhaphy)	24	55.81	18, 22–24, 29, 32, 34, 38–44, and 51
Percutaneous management	4	9.30	36 and 47
Conservative management	4	9.30	47, 48, 50 and 51
Endoscopic management	2	4.65	45 and 46
T tube – duodenostomy	2	4.65	27
Gastric resection	2	4.65	27 and 36
Pyloric exclusion	2	4.65	9 and 30
Omental patch	1	2.32	37
Duodenal diverticulization	1	2.32	49
Duodenopancreatectomy	1	2.32	27
Total	43	100	

after cholecystectomy are reported in the range of 2–3%. These findings are described in a general series on postcholecystectomy complications, and duodenal injuries continue to be rare complications.[7,8,13–17]

In our cases, the majority were women with an average age of 56 years, possibly due to a greater frequency of gallbladder stones in females.[1,5] The risk factors for postcholecystectomy BDIs are well documented but not well documented for nonbiliary injuries. However, nonbiliary complications are equally life-threatening conditions.[18–20] Ultrasonographic factors such as gallbladder wall thickness, pericholecystic collection, and distended gallbladder have already been identified as risk factors for difficulty in LC.[21,22] In our experience, we found similarities in terms of gallbladder wall thickening in duodenal injuries, which was 8 mm on average, and two patients presented a mass in the right upper quadrant. In addition, abundant adhesions to the duodenum and an average bleeding volume of 165 mL per cholecystectomy were reported.

The diagnosis of a duodenal injury is difficult and depends on many factors, such as the extent of the injury, the affected duodenal portion, the patient's conditions, and the detection of the injury time. Timely identification is highly important because it is key and can change the disease evolution and patient prognosis. Clinical suspicion and physical examination should be crucial in these patients. Patients with difficult cholecystectomies and abundant adhesions to the duodenum should be closely monitored.[8,23,24] In imaging studies, contrast-enhanced abdominal tomography is also a great tool for identifying duodenal injuries, which can be identified as periduodenal collections, abscesses, or contrast medium leaks. Other imaging studies include gastrografin upper gastrointestinal (GI) series, and even intraoperative cholangiograms are reported as screening tools in cases of doubt.[24,25]

The location, extent of duodenal injury, and detection time are variable, and the type of repair depends on this. Different mechanisms have been described for duodenal injury. Among these, thermal injuries caused by cautery, grasper retraction, the insertion of trocars or Veress needles, and injuries caused by surgical scissors have been reported.[6,8,9,23,26] In our experience, we found the first duodenal portion to be the most frequently affected, and blunt dissection was the most frequent mechanism of injury. This probably contributed to the fact that 60% of the injuries in our study were identified intraoperatively. In contrast to what has been reported in the literature, the duodenal portion most affected is the second portion, and cautery is the most frequent mechanism.[8,17,27] In our literature review, we also found that thermal injury due to cautery was the most common mechanism, occurring in 54% of the patients. This thermal injury is attributed to the dissection of the Calot triangle with cautery. This dissection results in a burn due to direct contact with thermal energy; if not recognized, it can result in full-thickness necrosis of the duodenal wall.[9]

One of the most influential factors in the evolution and prognosis of these injuries is injury detection time.[6,8] The injury could be identified intraoperatively or postoperatively. The earlier the injury is identified, the better the prognosis.[8,23,28] Intraoperative identification of the injury involved leakage of intestinal material in some portion of the duodenum after dissection of adhesions to the duodenum.[18,29,30] When the injury is detected postoperatively, it can present as fluid, collections, periduodenal abscesses, or drainage leaks.[29,31] However, identifying postoperative injuries is more challenging due to the inflammatory response generally secondary to emergency cholecystectomies.[32,33] In our cases, as in the literature, most of these injuries were identified on the operating table. For the remaining patients, identification was performed after an average of 3 days (in a range of 6 hours to 6 days). The three patients who had longer detection times also had important complications, such as sepsis, and had fatal outcomes. These findings coincide with what was reported by Machado NO, who reported a survival rate of 94% if the injury was detected on the first day, and 80% if the injury was detected within the second day; moreover, the probability of surviving decreased drastically if the injury was detected after the second day.[8,34]

Duodenal injury repair depends on the extent of the injury, the time of identification, the affected duodenal portion, and the patient's conditions. Injuries detected early and in the duodenal cap have a better prognosis than injuries detected late and located in the descending part of the duodenum.[8,18,27,35] Different surgical procedures have been described for treating these injuries, ranging from primary closure (duodenorrhaphy) to omental patch, duodenostomy tube, pyloric exclusion, gastrojejunostomy, pancreaticoduodenectomy, endoscopic management, percutaneous procedures, and conservative management.[9,18,27,36,37] Appropriate surgical treatment must be timely and prompt, and the faster the surgical management is, the better the prognosis.[8,30] Once surgical revision has been performed, it is important to evaluate the extent of the injury to the duodenal portion. The Kocher maneuver helps to identify the margins of the lesion and relieves the tension associated with injury closure.[18] If the injury is detected intraoperatively or within the first hours after cholecystectomy, primary closure (duodenorrhaphy) can

be considered adequate.[24,38–43] In our patients who underwent intraoperative detection of the injury, double-layer closure (duodenorrhaphy) without an omental patch was well accepted and associated with little morbidity. Primary closure has been reported to be effective in both laparotomic and laparoscopic surgery depending on the experience of the surgeon. Most of the injuries reported in the literature are identified intraoperatively or within the first hours after surgery and are successfully treated with primary closure (duodenorrhaphy).[23,28,29,38,44]

Endoscopic management is an option in the absence of sepsis. This management approach has been used for injuries ranging from 12 mm even to larger defects. In these cases, the use of a Vicryl mesh plug or prosthesis fixed with endoclips has been used, reporting good results.[45,46] Percutaneous management is also useful for treating these injuries. This management has been reported in cases where drainage and aspiration of collections are needed. In some cases, sonographically guided collection drainage via needle and percutaneous aspiration has been reported successfully.[47,48]

In injuries detected late, the inflammation of the duodenal wall and the edema produced by the duodenal–pancreatic fluid complicate the repair of these injuries.[14,18,27] According to our experience with injuries detected late, duodenorrhaphy has a high risk of failure, and more elaborate procedures are required for its management. An important aspect of these procedures is to divert the gastric contents to reduce fluid pressure. In complicated injuries detected after the second day, successful pyloric exclusion has been reported.[9] In our series, we also showed a case of complicated duodenal injury that was difficult to control and benefited from pyloric exclusion with gastrojejunostomy. In these difficult duodenal injuries, more aggressive procedures for resolution have also been reported. There are few case reports in which duodenal diverticulization and pancreaticoduodenectomy have been used to treat these injuries. These procedures require additional anastomosis, which can be more difficult to perform if inflammation persists. Despite this complexity in the literature, cases treated with duodenal diverticulization and pancreaticoduodenectomy have been successful. In our experience, it has not been necessary to use these techniques.[27,49]

The majority of these injuries are treated surgically once detected, especially in the case of peritonitis. However, in patients without signs of peritonitis, conservative management has also been reported. This management has even been used in patients with injuries detected late, in the absence of peritonitis. In one reported case of late detection injury, injury to the duodenum was observed to create a hole and a walled area with adjacent organs and correct drainage.[47] In these cases, the use of drainage is essential. Monitoring the decrease in the volume of the injury drainage tube and the absence of signs of sepsis and peritonitis are essential.[47,48,50,51]

Duodenal injuries after cholecystectomy are rare, but the mortality rate is high, and the prognosis depends on many factors. In the literature, the reported mortality rate can reach 18%. Among our patients, three died, for a mortality rate of 20%. In these three patients, injury was detected late, causing peritonitis, and later sepsis was the cause of death. Late detection of these injuries is one of the important factors that has been reported to be a risk factor for mortality, and in our cases, we observed this risk.[8,18] On the contrary, early detection of injuries has a good prognosis. For these reasons, detection time is very important in the prognosis of these fearsome injuries.[18,27,30] The majority of these injuries are small and can be repaired via primary closure if they are detected intraoperatively or within the first few hours. In the minority, these injuries require more complex management.[14,18,27,48]

This study has limitations due to the small sample size. For the same reason, performing a strong statistical analysis that reinforces and generalizes the results is difficult. Similarly, the infrequency of these injuries reported in the literature and the small number of studies on these injuries make their analysis difficult. Therefore, our results must be handled carefully. It is important to continue studying these serious injuries to understand their behavior but, most importantly, to limit and prevent their appearance.

Conclusion

Postcholecystectomy duodenal injuries are rare. Most of these injuries are detected and repaired intraoperatively. However, a high percentage of patients have high morbidity and mortality. The management of these injuries requires high suspicion, and timely surgical management is needed to reduce morbidity and mortality.

Authors' Contributions

Conceptualization: JDM; Data curation: JDM and NPC; Methodology: JDM and NPC. Visualization: JDM and NPC. Writing—original draft: JDM. Writing—review and editing: JDM and NPC.

Orcid

Jair Diaz-Martinez https://orcid.org/0000-0002-7581-6739
Nayelli Pérez-Correa https://orcid.org/0000-0002-3281-1305

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