Acute cholecystitis – early surgery or an attempt at conservative treatment?

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Abstract

Acute cholecystitis is a common disease, which often requires admission to hospital and surgical treatment. Acute cholecystitis is defined as inflammation of the gallbladder and usually occurs due to cystic duct obstruction from stones or sludge. It is a relatively common complication of gallstones, but it can also occur without gallstones. A combination of relevant clinical symptoms and ultrasound evidence is required to make a diagnosis of acute cholecystitis. Early surgery is recommended for all patients who are in good physical condition. There is still a debate how to treat high-risk and critically-ill patients. Laparoscopic cholecystectomy is the method of choice for treatment of patients with acute cholecystitis. Early laparoscopic cholecystectomy should be done within 72 hours from the onset of symptoms.

This article presents current guidelines according to the Tokyo guidelines and the World Society of Emergency Surgery guidelines, and at the end, experiences of some clinical trials.

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1. Introduction

Acute cholecystitis is a condition that often requires admission to hospital and surgery. It occurs most commonly in individuals with gallstones, yet it can also develop in the absence of gallstones (1). Acalculous cholecystitis often affects critically-ill patients on long-term parenteral nutrition, patients with multiple trauma or severe burns and patients following cardiac surgery (2). Acute cholecystitis is a common cause of morbidity and mortality in the elderly, diabetic patients and pregnant women (3). Factors associated with cholelithiasis include obesity, old age and some drugs, such as oral contraceptives.(4) Acute cholecysitis represents a difficult diagnostic problem in diabetics, pregnant women and immunocompromised patients because of unclear clinical manifestations. Early diagnosis and early operative treatment are imperative in these patients, provided that their general condition allows it (5). Early cholecystecomy reduces the rate of peri- and postoperative complications, and the risk of recurrence following conservative treatment (3). Thanks to its safety and acceptable risk of postoperative complications, early laparoscopic cholecystectomy is recommended in elderly patients. Early surgery, compared with delayed operation, significantly decreases morbidity, hospital stay and

recovery time, and therefore significantly lowers the costs of treatment (6). There is still a debate about how to treat patients with concomitant diseases and high-risk patients. In the latter, percutanous gallbladder drainage is used as a bridge to surgery until the patient's general condition improves to permit surgical intervention. In some cases, percutaneous transhepatic gallbladder drainage can be considered a definitive treatment (7-9).

2. Complications of acute cholecystitis

The rate of complications in advanced forms of cholecystitis ranges from 7.2 % to 26 % (4). In patients with acute cholecystitis, gallbladder perforation most often occurs due to impaired circulation and necrosis of the gallbladder wall. The resulting leakage of bile into the abdominal cavity causes biliary peritonitis, or localised peritonitis with the formation of pericholecystic abscess may occur (6,10), Acute inflammation of the gallbladder may be complicated by the formation of biliary fistula, i.e. an abnormal connection between the gallbladder and the biliary tree or a nearby hollow structure, most commonly the duodenum (cholecysto–duodenal fistula), the colon (cholecysto-colic fistula) and the stomach (cholecysto-gastric fistula) (10). Cholecyto-duodenal fistulas are most commonly due to the erosion of a large gallstone through the wall of the gallbladder and the duodenum. The stone may enter into the duodenum and then migrate through the digestive tract. A very large gallstonestone may become impacted in the terminal ileum on the ileocecal valve, causing mechanical obstruction of the intestine, called biliary ileus. Proximal ileus due to impaction of a gallstone in the duodenum is referred to as Bouveret's syndrome (10). Biliary fistulas fall roughly into two categories: primary fistulas related to gallstones, and secondary fistulas related to surgical complications (11). The incidence of primary biliary fistulas is 1 to 2 %. Secondary biliary fistulas most frequently occur following open or laparoscopic cholecystectomy. The incidence of secondary biliary fistulas is low (0.3–0.6 % of all cholecystectomies). Secondary biliary fistulas are characterized by bile leakage in the abdominal cavity or through the abdominal drain. If abdominal drainage is not used after surgery, bile collection in the abdominal cavity may lead to the development of biliary peritonitis (11). Patients with a suspected biliary fistula should have an abdominal ultrasound to assess the presence of free fluid or larger fluid collections in the abdominal cavity. The next step is contrast-enhanced imaging of the biliary tree, either by endoscopic retrograde cholangiopancreatography (ERCP) or magnetic resonance cholangiopancreatography (MRCP). These investigations allow visualization of the biliary system anatomy and demonstrate possible biliary leak by visualizing the contrast agent pooling outside the biliary tree due to biliary fistula or iatrogenic bile duct injury. Patients with bile duct leaks are treated by ERCP with biliary stent placement to bridge areas of the damaged bile duct wall. The biliary stent is removed at a later date (11).

3. Clinical classification

According to the Tokyo guidelines, the severity of local and systemic signs of inflammation in acute cholecystitis is classified into three grades: mild (Grade I), moderate (Grade II) and severe (Grade III) (Table 1).

In 2016, the World Society of Emergency Surgery (WSES) defined recom-

mendations for the management of patients with acute calculous cholecystitis. These recommendations are based on the review and analysis of the most recent literature and include the Tokyo guidelines. However, the recommendations are limited to patients who are good candidates for surgical treatment. The management of critically-ill patients or high-risk surgical patients with acute cholecystitis still remains undefined (14,15).

4. Clinical features and diagnosis

Diagnosis of acute cholecystits is based on symptoms and clincial signs in patients with abdominal pain felt in the upper right quadrant bellow the right costal margin (RCM) (16). Acute cholecystitis is differentiated from biliary colics by the constant pain in the right upper quadrant bellow RCM and by positive Murphy's sign (i.e. pain elicited by pressure on the right upper quadrant bellow RCM with the patient taking a deep breath). Patients with acute cholecystitis may present with a history of biliary colics or they may have been asymptomatic until the presenting episode (16). Laboratory tests in patients with acute cholecystitis show elevated inflammation markers (WBC and CRP levels), while in patients presenting with biliary colics, as a rule, these markers are within the normal reference range (3,4,16). Abdominal ultrasound examination is the first-line imaging modality in these cases. In acute cholecystitis ultrasound usually discloses pericholecystic fluid, and enlarged and distended gallbladder with a thickened, layered and hyperemic wall; and occasionally calculi in the gallbladder. X-ray of the abdomen reveals radiopaque gallstones in 10 % of patients with acute cholecystitis, and shows gas in the gallbladder wall in patients with emphysematous cholecystitis (17).

If the diagnosis remains unclear after ultrasound examination, the patient is further assessed by computed tomography of the abdomen performed with or without contrast media or by gallbladder scintigraphy using hydroxyiminodiacetic acid (HIDA scan) (16).

Table 1: Classification of acute cholecystitis according to Tokyo guidelines (13).

Grade I (mild)	Acute inflammation with mild inflammatory changes of the gallbladder in patients with no co-morbidities or organ dysfunction
Grade II (moderate)	• Leukocytosis (> 18,000/mm^3) • Duration of symptoms > 72 hours • Marked local inflammation of the gallbladder (gangrenous cholecystitis, emphysematous cholecystitis, pericholecystic abscess, pericholecystic liver abscess, biliary peritonitis).
Grade III (severe)	• Cardiovascular dysfunction (hypotension requiring vasoactive support with norepinephrine or dopamine of > 5 µg) • Neurological symptoms (disturbances of consciousness) • Respiratory dysfunction (PaO_2/FiO_2 ratio < 300) • Renal failure (oliguria, serum creatinine > 2 mg/dL) • Liver dysfunction (INR > 1.5) • Thrombocytopenia (< 100,000/mm^3)

5. Treatment options in acute cholecystitis

5.1. Conservative management

Conservative management of acute cholecystitis involves supportive treatment with intravenous fluids, analgesics and antibiotics. In the acute phase of inflammation *nil per os* for 2 to 3 days is recommended to block stimuli for gallbladder contractions elicited by feeding, and to allow the gallbladder adequate rest during acute inflammation process. In the course of treatment the patient's general clinical condition and the dynamics of inflammation markers (WBC, CRP) are monitored. Conservative treatment for acute cholecystitis is considered to be effective if the patient's clinical condition has improved and the levels of inflammation markers have decreased (18).

While the results of cultures and antimicrobial sensitivity testing are awaited, the patient with suspected infection is treated empirically with antibiotics selected with the intent to cover pathogens most commonly associated with the specific disease. Acute cholecystitis is most commonly caused by pathogens from the upper digestive tract (19). Once the results of bacterial cultures and antimicrobial susceptibility tests are available, targeted antibiotic treatment is instituted. The patient is initially given empiric therapy with an antibiotic considered to be effective against pathogens most commonly associated with the disease, yet once the results of cultures are available, the patient is given antibiotics selected on the basis of antimicrobial susceptibility testing (19). Unnecessary and prolonged therapy with broad-spectrum antibiotics should be avoided because of the risk of antibiotic resistance. According to Tokyo guidelines, antibiotics should be selected in accordance with the severity grade classified in the guidelines (19). Slovene national recommendations have been formulated in line with the international and Japanese guidelines. In addition, national guidelines point out that antibiotics should be selected based on current epidemiological situation and susceptibility of most common pathogens to antibiotics. Mild (Grade I) inflammation is usually caused by *Escherichia coli.*, therefore treatment with a single antibiotic is sufficient (Table 2). Oral amoxicillin-clavulanic acid is recommended (19,20). Intravenous or oral ciprofloxacin in combination with metronidazol or intravenous ertapenem can be used.The therapy of choice for moderate (Grade II) and severe (Grade III) acute cholecystitis is treatment with a broad-spectrum antibiotic (second generation-cephalosporin) (Table 3). In patients with severe most often polymicrobial disease, empiric treatment with third-generation cephalosporins, fluoroquinolones and carbapenems is recommended. It should be pointed out, however, that misuse or overuse of third and fourth generation-cephalosporins and carbapenemes leads to the creation of multidrug-resistant forms of bacteria (19). Immediate institution of broad-spectrum antibiotic therapy is particularly important in high-risk patients with comorbidities, in immunocompromised patients, diabetics, in patients with implants (vascular stents, grafts and internal fixation materials) and in patients infected with antibiotic-resistant strains of bacteria (19,20).

After surgical removal of the inflammed gallbladder, it is recommended to stop antibiotic therapy 24 hours postoperatively, except in patients with overt signs of pericholecystitis (1). Intraoperative swab cultures of pericholecystic fluid, gallbladder contents or gallblad-

der wall should be taken. The cultures are sent to the microbiology laboratory, so that after the operation targeted antibiotic therapy based on susceptibility testing can be initiated. In patients with perycholecystic abscess, gallbladder perforation, emphysematous and gangrenous cholecystitis, Tokyo guidelines recommend prolonged antibiotic treatment for 4 to 5 days postoperatively, or targeted antibiotic therapy based on antimicrobial susceptibility testing for at least 14 days in confirmed gram-positive bacteremia (1).

According to meta-analysis of multiple studies, conservative treatment of acute cholecystitis is successful in 87 % of all patients with acute calculous cholecystitis, and in 96 % of patients with Grade I disease. In patients with a confirmed diagnosis of acute cholecystitis, immediate institution of antibiotic therapy is necessary. Delayed antibiotic treatment is associated with increased risk of complications, such as gangrene and perforation of the gallbladder. If there is no improvement after 3 days of conservative therapy, cholecystectomy or percutaneous cholecystostomy should be considered in high-risk surgical patients (18).

5.2. Surgical treatment

Acute cholecystitis is treated by minimally invasive surgery (laparoscopic cholecystectomy) or classical open cholecystectomy (1).

Table 2: Antibiotic therapy for mild acute cholecystitis (Grade I) according to Tokyo guidelines (19).

oral fluoroquinolones	ciprofloxacin, levofloxacin
oral cephalosporins	cefotiam, cefcapene
broad-spectrum cephalosporins	cefazolin
broad-spectrum penicillin with β-lactamase inhibitor	ampicillin/sulbactam

Table 3: Antibiotic therapy for moderate (Grade II) and severe (Grade III) acute cholecystitis according to Tokyo guidelines (19).

Moderate disease (Grade II)	
broad-spectrum penicillin with beta-lactamase inhibitor cephalosporine of 2nd generation	piperacillin/tazobactam, ampicillin/sulbactam, cefmetazole, cefotiam, oxacefem, flomoxef
Severe disease (Grade III) – first-line antibiotic cephalosporine of 3rd or 4th generation	cefoperazon/sulbactam, ceftriaxon, ceftazidim, monobactams cefepime, cefazopran aztreonam
one of the above listed antibiotics + metronidazole (in suspected or confirmed infection with anae-robic bacteria)	
Severe disease (Grade III) – second line antibiotic fluoroquinolones carbapenems	one of the above listed antibiotics+metronidazole (in suspected or confirmed infection with anaerobic bacteria) ciprofloxacin, levofloxacin, pazufloxacin+metronidazol (in suspected or confirmed infection with anaerobic bacteria) meropenem, imipenem/cilastatin, panipenem/ betamipron

In the past, acute cholecystitis was considered to be a contraindication of laparoscopic cholecystectomy, therefore treatment by open cholecystectomy was recommended (21). With advances in minimally invasive surgery, laparoscopic cholecystectomy was gradually adopted as the method of choice for the operative management of acute gallbladder inflammation. Early laparoscopic removal of the inflammed gallbladder, performed as early as possible after the onset of symptoms or hospital admission is recommended in the majority of cases (22,23). The only exception are patients at increased risk for postoperative complications. Those advocating early surgical treatment believe that delayed surgery increases the risk of biliary sepsis and secondary complications in patients with unsuccessful conservative therapy. They maintain that even with successful conservative treatment, biliary colics or inflammation are very likely to recur (21). Early surgery is also believed to be associated with shorter hospital stay and lower rate of readmissions, and hence with lower costs of treatment. Many authors recommend that early laparoscopic cholecystectomy be done within 72 hours of the onset of symptoms, stressing that delayed surgery is associated with increased risk for early and late postoperative complications (1).

The Tokyo guidelines recommend treatment by early laparoscopic cholecystectomy for all patients with mild (Grade I) cholecystitis. If initial acute inflammation subsides with conservative treatment, delayed elective laparoscopic cholecestectomy is recommended after 8 to 12 weeks in order to prevent recurrence (23). According to the updated guidelines, laparoscopic approach is also recommended in moderate (Grade II) inflammation because several studies have shown that there is no difference in the rate of peri- and postoperative complications between patients with mild inflammation and those with moderate disease (12). Surgery should be performed by an experienced surgeon, as it has been shown that in the hands of experienced operating surgeons, laparoscopic approach is safe even in advanced forms of gallbladder inflammation (21-23). In severe (Grade III) acute cholecystitis, single or multiple organ failure may develop. In addition to supportive treatment, these patients with biliary peritonitis due to gallbladder perforation require emergency cholecystectomy. High-risk surgical patients can be treated initially by percutaneous drainage of the gallbladder or by percutaneous cholecystostomy. Once the patient is stable and shows improvement, elective cholecystectomy is done (24).

According to the updated recommendations of the World Society of Emergency Surgery (WSES), early laparoscopic cholecystectomy is the therapy of choice in patients with acute inflammation of the gallbladder. Patients with uncomplicated inflammation do not need postoperative antibiotic therapy. Therapeutic strategies for patients who are poor surgical candidates have not yet been established, and there is no agreement on how to define the risks for perioperative complications. In high-risk patients, conservative treatment or percutanous cholecystostomy may be considered (14,15).

A treatment algorithm for the management of acute calculous cholecystitis was developed by WSES to estimate the probability of concurrent common bile duct stones on the basis of clinical features, abdominal ultrasound and liver enzyme tests (14,15). In low probability patients, treatment by early laparoscopic cholecystectomy is recommend-

ed (14,15). In patients with moderate or high probability, endoscopic ultrasound or MRCP should be done prior to the procedure. In patients with confirmed choledocholythiasis, optimum management involves endoscopic removal of stones using ERCP, followed by immediate laparoscopic cholecystectomy. Another option is intraoperative bile duct exploration and removal of bile stones during cholecystectomy. In these cases the procedure is technically demanding and requires great surgical expertise. Bile duct stones can also be removed following surgical procedure using ERCP (14,15).

In Slovenia, WSES and Tokyo guidelines have been adopted for the management of patients with acute cholecystitis (13-15). Our policy is to operate on patients with confirmed acute cholecystitis as soon as possible after their admission to hospital (22). The only exception are high-risk surgical patients, who are treated conservatively and sometimes with percutaneous drainage of the gallbladder. Patients suspected of harboring concurrent common bile duct stones are assessed by preoperative endoscopic ultrasound to either confirm or refute the diagnosis of choledocholithiasis, whereafter ERCP may be done. At our institution, early laparoscopic cholecystectomy is the method of choice for treating patients with acute cholecystitis (23).

5.3. Percutanous gallbladder drainage – percutaneous cholecystostomy

Critically-ill patients and high-risk surgical patients with acute cholecystitis can be treated by percutaneous drainage of the gallbladder or percutaneous cholecystostomy. This minimally invasive procedure under ultrasound control is carried out by the interventional radiologist (24). The recommended option is transhepatic biliary drainage, i.e. drainage of the gallbladder with the catheter advanced through the liver parenchyma in order to prevent spillage of the gallbladder contents into the abdominal cavity and thereby reduce the risk of biliary peritonitis (24). Placement of the drainage catheter into the gallbladder is a brief and minimally invasive procedure, which can improve the patient's condition in a very short time. In the hands of an experienced interventional radiologist the procedure is technically feasible in 95 to 100 % of patients (24). The estimated mortality rate following percutanous cholecystostomy is 0 to 3 %; mild complications occur in 4 to 18 % of patients. The most common complication of percutaneous cholecystostomy is leakage of bile into the abdominal cavity and the resulting biliary peritonitis (25,26). Drainage of the gallbladder through the liver parenchyma is recommended to reduce complications after the procedure. The anterior transperitoneal approach can be used in patients with a greatly enlarged gallbladder, or when transhepatic approach is considered to be contraindicated because of liver disease or coagulation disorders (25,26).

6. Results of meta-analyses of clinical studies

According to the literature data, approximately 20 % of patients with acute cholecystitis require emergency surgical treatment. Surgery is necessary when the patient's clinical condition deteriorates despite conservative treatment, and when there are signs of generalized peritonitis or emphysematous cholecystitis (14), indicating a risk of gangrene or gallblader perforation. Optimal timing of surgery in stable patients without signs of gangrene

or gallbladder perforation has not yet been established. In the past, classical open cholecystectomy used to be done 6 to 12 weeks after initial symptoms and tissue inflammation have cleared up, thus providing more propitious conditions for delayed interval surgery (14). Acute inflammation of the bladder was considered a contraindication of laparoscopic management, therefore classical cholecystecomy was the recommended therapeutic option in those patients (22). The experience of the operating surgeon is an important factor that impacts the length of the procedure and the rate of postoperative complications in patients with acute cholecystitis (1). Patients with acute inflammation of the gallbladder are most often examined and operated on by duty surgeons, who lack experience in laparoscopic hepatobiliary surgery. The learning curve in laparoscopic cholecystectomies is considered to be 30 procedures, as 75 % of the documented complications ocurred during the learning curve (27). Even after completion of their learning curve, surgeons differ in the level of expertise needed to perform laparoscopic cholecystectomy in unfavourable conditions. It is therefore recommended that patients with acute cholecystitis be operated on by surgeons who have the largest experience with laparoscopic and hepatobiliary procedures (1).

According to the most recent guidelines, early laparoscopic cholecystectomy is the recommended treatment option in all patients with acute inflammation of the gallbladder who are fit for surgery, provided that it is done within 72 to 96 hours of the onset of symptoms (16). These patients had lower complication rates, shorter hospital stay and less conversions to open surgery than patients treated by delayed (interval) cholecystectomy (16). Early surgery (within 72 hours of the onset of symptoms) is associated with lower conversion rates compared with delayed operative treatment undertaken after several days of unsuccesful conservative management. Longer duration of symptoms before hospital admission is statistically significantly correlated with advanced forms of gallbladder inflammation (16). Complications most commonly associated with delayed surgery include bile duct injury, abscess, hematoma in the gallbladder resection bed and need for prolonged antibiotic therapy. Minor bile duct injuries leading to biliary fistulas can be managed by ERCP and placement of a plastic prosthesis. If this treatment option is not feasible, surgical exploration and repair of the injured bile duct with primary suture of the bile duct and biliary drainage, or creation of a bilioenteric anastomosis should be considered (27). Abscess collections or hematomas in the gallbladder resection bed are mostly amenable to conservative treatment that includes percutaneous drainage performed by an interventional radiologist, and prologed antibiotic therapy (16). Meta-analysis of the studies by Indar and Beckingham showed that early laparoscopic cholecystectomy for acute cholecystitis is a safe and feasible therapeutic modality, especially if performed within 72 hours of the onset of symtpoms (16). The updated 2013 Tokyo guidelines too recommend early laparoscopic cholecystectomy within 72 hours of the onset of symptoms (13).

Shinke et al., in their retrospective study, analyzed a group of 233 patients with acute cholecystitis subjected to emergency laparoscopic cholecystectomy within 7 days of the onset of symptoms. They were divided into a group operated on within 72 hours

of the onset of symptoms (early phase group), and a group of patients who underwent surgery between day 4 and day 7 after the onset of symptoms (late phase group) (27). The rate of conversions to open surgery in the early-phase group was 3 %, compared with 8 % documented in the late-phase group. There were no statistically significant differences between the groups in the operation time, postoperative complications and length of hospital stay (27). Patients undergoing surgery within 4 to 7 days of the onset of symptoms showed increased rate of conversions to open surgery (8 %) and nearly a twofold increase in intraoperative blood loss. Within a few days, the progressing local inflammation leads to fibrosis of the gallbladder wall with indistinct anatomic layers. Resection is therefore hindered by poor visualization of the indinstinct, normally present, avascular part of the subserosal layer, which accounts for increased intraoperative blood loss (27). Increased blood loss, however, was found to have no influence on the postoperative course and the authors maintain that it is a clinically and hemodynamically insignificant factor (27).

Advanced inflammation impedes identification of the anatomical structures within Calot's triangle required for accurate recognition and safe ligation of the cytic duct and cystic artery (28). Poor recognition of these structures is responsible for increased rates of common bile duct injuries and iatrogenic biliary fistulas, and the resulting increase in postoperative morbidity and mortality rates (29). Patients who were initially treated conservatively and had elective surgery several weeks later showed more conversions to open surgery (12–24 %), more overall postoperative complications (29–34 %), and longer hospital stay. The authors threfore conclude that delayed elective laparoscopic cholecystectomy following initial conservative management is not superior to emergency laparoscopic cholecystectomy perfomed 4 to 7 days after the onset of symptoms. Early laparoscopic cholecystectomy is therefore considered to be a safe and feasible therapeutic option in patients with acute cholecystitis, even in the late phase, i.e. 4 to 7 days after the onset of symtpoms (27).

Blohm et al. analyzed data from the Swedish national registry gathered for for 87,108 patients operated on for acute cholecystitis (30), with a focus on postoperative complications. They found that patients undergoing surgery within 4 days of hospital admission were at a significantly lower risk for postoperative complications, and that they needed less conversions to open surgery. Conversions from laparoscopic to classical surgery were documented in 16.6 % of patients operated on within 4 days of hospital admission compared to 27.8 % in the group of delayed surgery patients (30). Intraoperative blood loss was comparable in both groups, yet patients undergoing delayed surgery sustained more bile duct injuries. The authors conclude that optimal timing for operation is within 48 hours of admission to hospital. Surgery performed later than 96 hours after admission carries higher risk of postoperative complications (30).

A retrospective study of 967 patients admitted to hospital because of acute cholecystitis by Gonzalez-Munoz showed that patients operated on soon after admission stayed in hospital less time than patients who underwent delayed surgery (31). Conservative treatment too was associated with shorter hospital stay compared with delayed surgery. Also, patients undergoing delayed surgery had higher rates of postoperative

complications, especially biliary fistulas (31). The authors recommend that all patients with acute gallbladder inflammation be operated on as soon as possible, the only exception being patients with comorbidities and high-risk surgical patients, who are candidates for conservative management. Delayed surgery is disadvised because of longer hospital stay, more peri- and postoperative complications and higher costs of treatment (31).

As shown by a French multicentric study, patients with acute cholecystitis operated on within 3 days of hospital admission had significantly lower rates of postoperative complications (32). The analysis of results showed higher complications rates also in patients operated on immediately on admission or within 24 hours of admission. These findings indicate that optimal timing for the operation is 2 to 3 days after hospital admission, provided that there are no reservations about surgery (32). Similar results, based on the data from the national registry of patients operated on for acute cholecystitis, were reported by the researchers from the United States (33).

Bile duct injury, leading to biliary fistula formation is the worst complication of cholecystectomy. A meta-analysis by Oneil Machado indicates that bile duct injuries occur in 0.3 to 0.6 % of all laparoscopic cholecystectomies (34). Duca et al. report on the results of their retrospective analysis of 9,542 patients undergoing cholecystectomy (35). Emergency surgery for acute cholecystitis was required in 13.9 % of the patients. Seventeen (0.1 %) patients sustained intraoperative bile duct injuries, and 184 (1.9 %) needed conversion to open surgery because of unclear anatomical situation and severe inflammation (35). According to other studies the rate of conversions in patients undergoing emergency surgery was 6 to 35 % (1). A retrospective study by Terho et al. found significantly more conversions in patients with advanced inflammation and high CRP levels (36). As reported by Ackerman et al. in their retrospective study, delayed-surgery patients and patients with initial conservative treatment showed higher rates of overall postoperative complications and conversions, and longer hospital stay than patients who underwent early surgery (37). Studies by Yuval and Kmalapurkar have shown that early cholecystectomy is a safe and effective option even for patients with advanced inflammation (38,39). As reported by Mizrahi et al., patients treated by delayed surgery and previous percutaneous biliary drainage had increased rates of complications, including infections, conversions, biliary fistulas, hospital readmissions and longer duration of hospital stay (40).

7. Conclusions

Early laparoscopic cholecystectomy is recomended for all patients with acute gallbladder inflammation who are fit for surgery, except for patients with comorbidities who are identified as high-risk for operative treatment and are therefore candidates for conservative therapy. If no improvement occurs after 3 days of conservative treatment, or if the patient's clinical condition deteriorates, percutaneous cholecystostomy should be performed. In patients who fail to improve after 3 days of percutaneous biliary drainage of the gallbladder, emergency cholecystectomy should be done. Early surgery represents definitive therapy of acute cholecystitis. The results of multiple clinical studies, meta-analyses and the accumulated experience indicate

that early cholecystectomy is the method of choice in the treatment of acute cholecystitis. Whenever possible, early laparoscopic cholecystectomy should be performed as early as possible, i.e. within 72 hours of the onset of symptoms.

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