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ACUTE CHOLANGITIS WITH OBSTRUCTIVE JAUNDICE DUE TO COMMON BILE DUCT STONES: A TG18-GUIDED EVALUATION

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ABSTRACT

Background: Acute cholangitis is a life-threatening condition caused by ascending bacterial infection of the biliary tree. The risk of mortality is high if this condition is not treated promptly with antibiotics and biliary decompression is not achieved with appropriate methods. This paper presents a case of acute cholangitis accompanied by a discussion based on the Tokyo Guideline 2018.

Case: A 48-year-old female patient was diagnosed with acute cholangitis, presenting with right upper quadrant abdominal pain and jaundice that had persisted for two weeks. Physical examination revealed anemic conjunctiva, scleral and generalized jaundice, and a positive Murphy's sign. Laboratory findings showed anemia, leukocytosis, thrombocytopenia, hyperbilirubinemia, and renal dysfunction. A CT scan revealed dilatation of the biliary ducts, multiple cholelithiasis with cholecystitis. The patient was classified as having grade III acute cholangitis. She was administered supportive therapy and definitive treatment, including antibiotics and cholecystectomy. The patient was hospitalized for six days postoperatively and discharged in improved condition.

Conclusion: The management of acute cholangitis involves prompt and accurate diagnosis, determination of severity, and appropriate treatment. Early administration of antibiotics, biliary drainage therapy, and etiological management lead to favorable outcomes.

Keywords: *Antibiotics, Biliary drainage, Acute cholangitis, Tokyo Guideline 2018*

INTRODUCTION

Acute cholangitis is a clinical entity caused by bacterial infection of the biliary system, most often resulting from partial or complete obstruction of the bile duct or hepatic duct. The diagnosis is established through characteristic clinical symptoms and signs of infection, abnormal laboratory findings indicating infection and bile obstruction, and abnormal radiological findings indicating bile duct obstruction (Kiriyama et al., 2018).

Initial medical therapy relies on early fluid resuscitation and appropriate antibiotic administration. Delayed treatment may lead to septic shock. Depending on the course and severity, biliary drainage procedures may be performed with the assistance of endoscopic and surgical resources (Virgile J, 2023).

This paper discusses a patient with acute cholangitis presenting with abdominal pain and jaundice. The patient had a history of cholelithiasis and had undergone cholecystectomy before being diagnosed with cholangitis. The patient was treated with antibiotics and underwent exploratory laparotomy on the common bile duct (CBD). The discussion of diagnosis and management in this paper refers to the Tokyo Guideline (TG 18) for acute cholangitis.

CASE REPORT

A. Patient Information

Name	: Mrs. S
Gender	: Female
Age	: 48 years
Date of Birth	: January 5, 1975
Date of Admission	: July 13, 2023

B. History Taking (Anamnesis)

1. Chief Complaint : Right upper quadrant abdominal pain
2. History of Present Illness:
   The patient presented with right upper quadrant abdominal pain persisting for two weeks, which had worsened over the past two days. She had developed jaundice ten days prior to presentation. Fever was noted over the last two days. The patient also reported weakness, nausea, and vomiting, with three episodes of vomiting on the day of admission. Urinary frequency was normal but was observed to be darker than usual. Bowel movements were normal in frequency, although stools appeared pale.
3. Past Medical History:
   - Hypertension: Present, uncontrolled.
   - Diabetes Mellitus: Absent.
   - History of similar complaints: None.
   - Previous ultrasound at X Hospital revealed multiple cholelithiasis.
   - Underwent exploratory laparotomy on the CBD on July 13, 2023.
4. Family Medical History:
   No family history of similar complaints.

C. Physical Examination

1. General Condition: Moderate illness, compos mentis, well-nourished
2. Vital Signs:

- Blood Pressure: 155/69 mmHg
- Pulse: 110 beats per minute
- Respiratory Rate: 20 breaths per minute
- Temperature: 37.5°C
- Visual Analog Scale (VAS): 6/10

3. Head and Neck Examination:
   - Head: Normocephalic
   - Eyes: Conjunctival pallor (+/+), scleral icterus (+/+), round and isocoric pupils (diameter = 2.5 mm both eyes), positive pupillary reflexes, no palpebral edema.
   - Nose: No septal deviation, no nasal flaring, non-hyperemic mucosa, no rhinorrhea.
   - Mouth: No pallor, no cyanosis, no gum bleeding, clean tongue, no pharyngeal erythema.
   - Ears: Symmetrical, no otorrhea.
   - Neck: Jugular venous pressure (JVP) at R+2 cm H2O, no lymphadenopathy, no thyroid enlargement.
4. Thorax and Lung Examination:
   - Inspection: Symmetrical chest wall movement
   - Palpation: Symmetrical vocal fremitus, no tenderness, no masses.
   - Percussion: Resonant over both hemithoraxes.
   - Auscultation: Vesicular breath sounds, no rhonchi, no wheezing.
5. Cardiac Examination:
   - Inspection: Apical impulse visible in the 5th left intercostal space.
   - Palpation: Apical impulse palpable in the 5th left intercostal space.
   - Percussion: Right heart border at the 5th intercostal space, parasternal line; left heart border at the 6th intercostal space, anterior axillary line; upper heart border at the 2nd intercostal space.
   - Auscultation: Regular S1/S2, no murmurs, no gallop.
6. Abdominal Examination:
   - Inspection: Supple abdomen, moving with respiration.
   - Auscultation: Normal bowel sounds.
   - Percussion: Tympanic
   - Palpation: Tenderness in the right hypochondrium, Murphy's sign (+).
7. Extremities Examination:
   - Upper: Warm, no edema, capillary refill <2 seconds.
   - Lower: Warm, no edema, capillary refill <2 seconds.
8. Skin Examination:
   - Generalized pale yellow discoloration of the skin.

D. The laboratory test

Results from July 19, 2023 are as follows:

Test	Result	Reference Range	Unit
Complete Blood Count (CBC)			
Hemoglobin (Hb)	**6.1**	12.0 – 15.0	g/dL
White Blood Cells (WBC)	**20,100**	4,000 – 10,000	/µL
Platelets (PLT)	**100,000**	150,000 – 400,000	/µL
Hematocrit (HCT)	18	37.0 – 43.0	%
Mean Corpuscular Volume (MCV)	87	82 – 92	fL
Mean Corpuscular Hemoglobin (MCH)	29	27 – 31	pg
Mean Corpuscular Hemoglobin Concentration (MCHC)	34	32 – 37	%
Diabetes Test			
Random Blood Glucose (RBG)	108	<200	mg/dL
Liver Function			
Total Bilirubin	**21.3**	<1.0	mg/dL
Direct Bilirubin	**11.7**	<0.25	mg/dL
Kidney Function			
Urea	**68**	10 – 50	mg/dL
Creatinine	**2.9**	0.6 – 1.1	mg/dL
Coagulation Studies			
Bleeding Time	5	1 – 6	minutes
Clotting Time	11	6 – 14	minutes

E. Radiology Findings:

1. Chest X-ray (PA view) - July 13, 2023
   - Impression:
     - Heart size is normal.
     - No infiltrates in both lungs.
2. Abdominal CT Scan with Contrast - July 15, 2023
   - Impression:
     - Hepatomegaly with dilatation of intra- and extrahepatic bile ducts up to the distal common bile duct (CBD) with a stone (target sign) in the distal CBD at the level of the pancreatic head (obstruction).
     - Multiple cholelithiasis with cholecystitis, fat stranding, and prominent veins in the right abdomen. Differential diagnoses: (1) Postoperative changes (2) Focal peritonitis.

- Drain in place with the tip in the falciform ligament and balloon catheter in the right intra-abdomen.
- Right renal cyst.
- Dilatation of the small intestine in the left abdomen (jejunum).
- Cystic adnexal lesion on the right: Differential diagnosis includes (1) Follicular cyst (2) Ovarian cyst.
- Right pleural thickening: Differential diagnosis includes pleuritis.
- Lower left lung fibrosis.
- Thickening of the subcutaneous tissue on the right abdominal wall: Postoperative edema.

F. Diagnosis:

1. Working Diagnosis:
    - Obstructive jaundice
    - Cholelithiasis with cholecystitis
    - Grade I hypertension
    - Sepsis
    - Anemia
    - Thrombocytopenia
    - Acute Kidney Injury (AKI) with possible acute on chronic kidney disease (CKD)
2. Definitive Diagnosis:
    - Acute cholangitis

G. Management:

- IVFD asering 20 TPM
- Viccilin SX 1,5 gram/8 jam/IV
- Omeprazole 40 mg/24 jam/IV
- Amlodipin 10 mg/24 jam/oral
- PRC transfusion, 2 bags during surgery
- Planned exploratory laparotomy of the CBD on July 20, 2023

H. **Inpatient Follow-up**

1. Post operative Day 1 (July 20, 2023)

Subjective	Post-operative pain, nausea, vomiting frequency 1 time.
Objective	Composmentis BP 142/91 mmHg HR 110 bpm RR 20 bpm Temp 36.8°C SpO2 97% **Sclera : icteric +/+** **Thorax : Vesicular breath sounds +/+, no rhonchi, no wheezing.** **Abdomen :** *supple*, **postoperative wound present, drain in place.** **Extremities : warm, capillary refill time <2 seconds, jaundice (+).**
Assessment	- Acute cholangitis - Post-exploratory laparotomy - Post-cholecystectomy - Sepsis - Anemia - Thrombocytopenia - Acute Kidney Injury DD Acute on Chronic Kidney Disease
Plan	- NPO (Nil per os) until the patient regains full consciousness - Insert NGT (Nasogastric Tube) - Allow free drinking of water - SmofKabiven 1440 ml/24 hours - IVFD Asering 500 ml/12 hours - Tramadol 100 mg/12 hours/IV - Ondansetron 4 mg/12 hours/IV - Viccillin SX 1.5 grams/8 hours/IV - Metronidazole 500 mg/8 hours/IV - Tranexamic acid 100 mg/8 hours/IV - Vitamin C 1000 mg/24 hours/IV - Omeprazole 40 mg/24 hours/IV - Human albumin 20% 100cc/24 hours (Day 1) - PRC (Packed Red Cells) transfusion 1 unit (3rd unit) - Check blood count and albumin post-transfusion

2. Post operative day 2 (July 21, 2023)

Subjective	The patient is fully conscious. Complains of postoperative pain. Nausea (-), vomiting (-), fever (-). Generalized jaundice (+).

	Flatus (-), bowel movements (-).
Objective	**Compos mentis** **BP**: 142/71 mmHg **HR**: 79 bpm **RR**: 18 breaths/min **Temp**: 36.8°C **SpO2**: 97% Sclera: Icteric +/+, Chest: Vesicular sounds +/+, rhonchi -/-, wheezing -/- Abdomen: Supple, post operative wound (+), drain in place Extremities: Warm, capillary refill time < 2 seconds, jaundice (+) Urine: 1100 cc/11 hours, dark reddish-yellow Drain: 100 cc/11 hours, red **Fluid balance** : Intake – Output = 1400 – 1647.15 = -247.15 cc/11 hours Urine output (UO) = 1.53 cc/kg/hour **Laboratory Examination:** a. **Complete Blood Count :** WBC: 26,800 /mm³ Hb : 8.7 g/dL PLT : 64,000 /mm³ b. **Electrolytes:** Natrium : 140.3 mg/dL Kalium : 3.37 mg/dL Chloride: 104.5 mmol/L Calcium: 1.08 mmol/L c. **Liver Function:** Albumin: 1.88 g/dL
Assessment	- Acute cholangitis - Post-exploratory laparotomy - Post-cholecystectomy - Sepsis - Anemia - Thrombocytopenia - Acute Kidney Injury DD Acute on Chronic Kidney Disease - Hypoalbuminemia
Plan	- NPO **until the patient is fully conscious** - **Insert Nasogastric Tube (NGT)** - **Allow free intake of plain water** - **Consume milk 6x50 cc** - **Mobilize by sitting** - **Smof Kabiven 1440 mL/24 hours** - **IVFD Asering 500 mL/12 hours** - **Tramadol 100 mg/12 hours/IV**

	- **Ondansetron 4 mg/12 hours/IV** - **Viccillin SX 1.5 grams/8 hours/IV** - **Metronidazole 500 mg/8 hours/IV** - **Tranexamic Acid 100 mg/8 hours/IV** - **Vitamin C 1000 mg/24 hours/IV** - **Omeprazole 40 mg/24 hours/IV** - **Human Albumin 20% 100 cc/24 hours (Day II)** - **PRC Transfusion: 2 bags (4th and 5th bags)**

3. Post operative day 3 (July 22, 2023)

Subjective	Patient is fully conscious. Postoperative pain. Nausea (-), vomiting (-). Fever (-), jaundice (+). Flatus (-), bowel movements (-)
Objective	Compos mentis BP : 156/114 mmHg HR : 92 beats/min RR : 20 breaths/min T : 36.5°C SpO2 : 97% Sclera: Icteric +/+ Thorax: Vesicular breath sounds +/+, Rales -/-, Wheezes -/- Abdomen: Supple, posto perative wound +, drain in place Extremities: Warm, Capillary Refill Time <2 seconds Laboratory Examination: Complete Blood Count : WBC : 25,800 /mm³ Hb : 10.6 g/dL PLT : 34,000 /mm³
Asessment	- Acute cholangitis - Post-exploratory laparotomy - Post-cholecystectomy - Sepsis - Anemia - Thrombocytopenia - Acute Kidney Injury DD Acute on Chronic Kidney Disease - Hypoalbuminemia
Plan	- Sitting position at 90 degrees - NGT removed - Allowed to drink plain water freely - Smof Kabiven 1440 mL/24 hours - IVFD Asering 500 mL/12 hours - Tramadol 100 mg/12 hours/IV - Ondansetron 4 mg/12 hours/IV - Viccillin SX 1.5 grams/8 hours/IV - Metronidazole 500 mg/8 hours/IV

	- Tranexamic Acid 100 mg/8 hours/IV - Vitamin C 1000 mg/24 hours/IV - Omeprazole 40 mg/24 hours/IV - Human Albumin 20% 100 cc/24 hours (Day III) - Dulcolax Supp 2x1 - Peptisol milk diet 3x150 cc - Rice porridge 3x1 cup - 1 egg 3x1

4. Postoperative day 4 (July 23, 2023)

Subjective	Finished eating rice porridge and drinking milk. Nausea (-), vomiting (-) Fever (-) Jaundice (+) Flatus (+), bowel movement (+)
Objective	Compos mentis BP: 183/95 mmHg HR: 99 beats/min RR: 20 breaths/min Temperature: 36.5°C SpO2: 97% Sclera : Icteric +/+ Thorax : Vesicular breath sounds +/+, rales -/-, wheezes -/- Abdomen : Supple, postoperative wound +, drain in place Extremities : Warm, capillary refill time <2 seconds
Asessment	- Acute cholangitis - Post-exploratory laparotomy - Post-cholecystectomy - Sepsis - Anemia - Thrombocytopenia - Acute Kidney Injury DD Acute on Chronic Kidney Disease - Hypoalbuminemia
Plan	- Sitting position at 90 degrees - Allowed to drink plain water freely - B Fluid 500 cc/24 hours - IVFD Asering 500 mL/12 hours - Tramadol 100 mg/12 hours/IV - Ondansetron 4 mg/12 hours/IV - Viccillin SX 1.5 grams/8 hours/IV - Metronidazole 500 mg/8 hours/IV - Tranexamic Acid 100 mg/8 hours/IV - Vitamin C 1000 mg/24 hours/IV - Omeprazole 40 mg/24 hours/IV

	- Albumin tablet 1x1 - Dulcolax Suppository 2x1 - Peptisol milk diet 3x150 cc - Rice porridge 3x1 cup - 1 egg 3x1

5. Postoperative day 5 (July 24, 2023)

Subjective	Finished eating rice porridge and drinking milk. Nausea (-), vomiting (-) Fever (-) Jaundice (+) Flatus (+), bowel movement (+)
Objektif	Compos mentis BP: 126/68 mmHg HR: 112 beats/min RR: 20 breaths/min Temperature: 36.6°C SpO2: 97% Sclera : Icteric +/+ Thorax : Vesicular breath sounds +/+, rales -/-, wheezes -/- Abdomen : Supple, postoperative wound +, drain in place Extremities : Warm, capillary refill time <2 seconds
Asessment	- Acute cholangitis - Post-exploratory laparotomy - Post-cholecystectomy - Sepsis - Anemia - Thrombocytopenia - Acute Kidney Injury DD Acute on Chronic Kidney Disease - Hypoalbuminemia
Planning	- Sitting position at 90 degrees - Allowed to drink plain water freely - Soft diet - Mobilize by walking - B Fluid 500 cc/24 hours - IVFD Asering 500 mL/12 hours - Tramadol 100 mg/12 hours/IV - Ondansetron 4 mg/12 hours/IV - Viccillin SX 1.5 grams/8 hours/IV - Metronidazole 500 mg/8 hours/IV - Tranexamic Acid 100 mg/8 hours/IV - Vitamin C 1000 mg/24 hours/IV - Omeprazole 40 mg/24 hours/IV - Albumin tablet 1x1 - Dulcolax Suppository 2x1

	- Remove catheter - Remove IV line - Remove drain if output <100 cc/24 hours

6. Postoperative day 6 (July 25, 2023)

Subjektif	Finished eating rice porridge and drinking milk. Nausea (-), vomiting (-) Fever (-) Jaundice (+) Flatus (+), bowel movement (+)
Objektif	Compos mentis BP: 159/100 mmHg HR: 119 beats/min RR: 20 breaths/min Temperature: 36.5°C SpO2: 97% Sclera : Icteric +/+ Thorax: Vesicular breath sounds +/+, rales -/-, wheezes -/- Abdomen : Supple, postoperative wound + Extremities : Warm, capillary refill time <2 seconds Laboratory Examination: Complete Blood Count (CBC): WBC : 23,500 /mm³ Hb : 9.6 g/dL PLT : 231,000 /mm³
Asessment	- Acute cholangitis - Post-exploratory laparotomy - Post-cholecystectomy - Sepsis - Anemia - Acute Kidney Injury DD Acute on Chronic Kidney Disease - Hypoalbuminemia
Planning	- Cefixime 2x200 mg - Omeprazole 2x40 mg - Asam mefenamat 3x500 mg - Channa 3x1 - The patient is allowed outpatient care

LITERATURE REVIEW

ACUTE CHOLANGITIS

A. Definition

Jaundice, also known as hyperbilirubinemia, is a yellowing of body tissues due to excessive accumulation of bilirubin. Bilirubin accumulation occurs only when there is an excess of bilirubin, indicating increased production or impaired excretion. Normal serum bilirubin levels are less than 1 mg/dL; clinical jaundice usually becomes apparent when bilirubin levels exceed 3 mg/dL. With further increases in serum bilirubin, the skin color progressively changes from lemon yellow to apple green, especially if the process is prolonged; the green color is due to biliverdin. (Joseph, 2023)

Acute cholangitis occurs when biliary stenosis, caused by various benign conditions (usually bile duct stones) or tumors, leads to cholestasis and bacterial infection of the bile ducts. (Kiriyama et al., 2018) Acute cholangitis, also known as ascending cholangitis, is a life-threatening condition caused by ascending bacterial infection of the bile tree. Choledocholithiasis is the most common cause, with stones causing infection in the bile ducts, leading to partial or complete obstruction of the biliary system. (Virgile J, 2023)

B. Epidemiology

Acute cholangitis is relatively rare. On average, in the United States, there are fewer than 200,000 cases of acute cholangitis each year. The average age of affected individuals is between 50 and 60 years. The incidence is similar between males and females. (Ahmed, 2018) Among hospitalized patients with gallbladder disease, 6-9% are diagnosed with acute cholangitis in the United States. (Mohammad Alizadeh, 2017) The prevalence of cholelithiasis varies among different ethnic groups. It is more common in Native American and Hispanic populations, less common in Caucasians, and much less common in Asians and African-Americans. Additionally, Asian populations and countries with intestinal parasites, as well as individuals with sickle cell disease, are at higher risk. (Virgile J, 2023)

C. Etiology

Biliary obstruction is most commonly caused by choledocholithiasis. Other causes of obstruction include benign or malignant strictures of the bile ducts or hepatic ducts, pancreatic cancer, ampullary adenoma or cancer, tumors or metastases at the porta hepatis, bile duct obstruction (due to microbial biofilm formation, bile sludge deposition, and duodenal reflux of food contents), primary sclerosing cholangitis, amyloid deposits in the biliary system, Mirizzi syndrome (gallstones impacting the cystic duct or gallbladder neck causing compression of the bile ducts or hepatic ducts), Lemmel syndrome (peri-ampullary diverticulum causing distal biliary obstruction), roundworms (Ascaris lumbricoides) or tapeworms (Taenia saginata) invading the bile ducts, AIDS cholangiopathy, and strictured biliary-enteric anastomoses. Choledochal cysts and narrow bile ducts are other risk factors for acute cholangitis. Since cholelithiasis is the most important risk factor, similar risk factors, such as high fat (triglyceride) intake, a sedentary lifestyle, obesity, and rapid weight loss, may play a significant role in the development of acute cholangitis. Heavy alcohol consumption can lead to liver cirrhosis, which is a risk factor for gallstone formation. (Ahmed, 2018)

D. Pathophysiology

Acute cholangitis is a condition caused by inflammation and acute infection of the bile duct system, coupled with biliary obstruction leading to increased bacteria and endotoxins in the vascular and lymphatic drainage systems. Normally, as bile flows through the bile duct system, the epithelial cells of the bile ducts secrete IgA, which acts as an anti-adhesion factor to bacteria to clear the ducts. However, when intra-biliary pressure exceeds the bacteriostatic capacity of the bile duct epithelium, this leads to increased inflammation and infection, potentially resulting in life-threatening complications such as biliary septicemia and liver abscess. (Virgile J, 2023)

For biliary obstruction, most commonly due to underlying mechanical cholestasis such as choledocholithiasis, it is believed that cholesterol bile duct stones are colonized by bacterial biofilm, which during replication is thought to cause mucosal inflammatory cytokine production induced by the obstruction. Primary bile duct stones are thought to be caused by the infection of bile itself, with both processes leading to ascending infection throughout the bile system. (Virgile J, 2023)

E. Clinical Manifestations

Acute cholangitis presents a spectrum of clinical manifestations, ranging from mild to severe, including very severe fulminant sepsis. Symptoms include fever, chills, malaise, rigidity, abdominal pain, jaundice, pruritus, and pale stools. Medical history, including cholelithiasis, previous cholecystectomy, post-ERCP, history of previous cholangitis, and history of AIDS, may increase the risk of cholangitis. Individuals with cholangitis often appear very ill and frequently present with severe sepsis or septic shock. Physical examination may reveal fever, right upper quadrant pain, jaundice, abdominal distension, altered mental status, or hemodynamic instability. (Virgile J, 2023)

A definitive diagnosis of acute cholangitis will include evidence of systemic infection as well as confirmation of purulent bile via endoscopy, percutaneous, or surgical methods. Charcot's triad describes cholangitis as a clinical finding consisting of fever, right upper quadrant pain, and jaundice. Reynolds' pentad adds altered mental status and sepsis to the triad. Many patients with acute cholangitis do not exhibit the classic signs and symptoms. (Virgile J, 2023)

F. Diagnosis

Acute cholangitis has long been diagnosed based on Charcot's triad, which relies on clinical signs. Charcot's triad demonstrates very high specificity. The Tokyo Guidelines 2018 (TG 18) state that the presence of Charcot's triad strongly indicates acute cholangitis. However, due to its low sensitivity, Charcot's triad cannot be used as a diagnostic criterion for acute cholangitis. (Level D) (Kiriyama et al., 2018)

Table 1. Diagnostic criteria for acute cholangitis according to TG 18 (Kiriyama et al., 2018)

a.	**Systemic Inflammation**
1.	Fever or chills
2.	Laboratory: Evidence of an inflammatory response
b.	**Kolestasis**

1.	Jaundice
2.	Laboratory: Abnormal liver function tests
c.	**Radiologi**
1.	Biliary dilation
2.	Radiological evidence of etiology (stricture, stone, stent, etc.)
Suspected: 1 item from A + 1 item from either B or C	
Definitive : 1 item from A, 1 item from B, and 1 item from C	

Notes:

- **A-2 :** Abnormal leukocyte count, elevated C-reactive protein (CRP) levels, and other changes indicating inflammation.
- **B-2 :** Elevated levels of ALP, GGT, AST, and ALT.
- Other factors that can aid in the diagnosis of acute cholangitis include abdominal pain (right upper quadrant or upper abdomen) and a history of biliary disease such as gallstones, previous biliary procedures, and bile duct stent placement.
- In acute hepatitis, a systemic inflammatory response is rare. Virological and serological tests are necessary if differential diagnosis is challenging.

Thresholds			
A-1	Fever		>38°C
A-2	Evidence of Inflammatory Response	WBC Count (×1,000/μL)	<4 or >10
B-1	Jaundice		Total Bilirubin ≥2 mg/dL
B-2	Abnormal Liver Function	ALP (IU)	>1.5 times the normal value
		γGTP (IU)	>1.5 times the normal value
		AST (IU)	>1.5 times the normal value
		ALT (IU)	>1.5 times the normal value

According to the TG18 diagnostic criteria, the diagnosis of acute cholangitis can be established if the patient presents with three pathologies: systemic inflammation (must be present), cholestasis, and bile duct lesions (from radiological findings).

1. Systemic Inflammation

   In the TG18 diagnostic criteria for acute cholangitis, the diagnosis requires evidence of systemic inflammation, based on fever or an elevated inflammatory response (increased leukocytes, high CRP). Fever is defined as a temperature of 38°C or higher, but mild cases may only show a slight increase in body temperature. In such cases, the diagnosis can still be confirmed with additional blood tests. However, the potential inability to diagnose mild cases has been noted as a limitation of the TG18 diagnostic criteria. (Kiriyama et al., 2018)

2. Cholestasis

Cholestasis is a key clinical feature of acute cholangitis. Jaundice, one of the symptoms in Charcot's triad, is observed in only 60-70% of patients with acute cholangitis. According to the TG18 diagnostic criteria for acute cholangitis, the diagnosis can still be made without the presence of jaundice, based on elevated alkaline phosphatase (ALP), gamma-glutamyltransferase (GGT), leucine aminopeptidase, and transaminases (aspartate aminotransferase (AST) and alanine aminotransferase (ALT)) in blood tests. (Kiriyama et al., 2018)

3. Radiological Findings

Diagnostic radiological findings are considered a method to directly identify bile duct stenosis/obstruction that may cause acute cholangitis or to describe cholangiectasis, which can be used as indirect evidence to support the diagnosis. Imaging modalities capable of producing such findings include abdominal ultrasound, CT scan, and MRI/magnetic resonance cholangiopancreatography (MRCP), while plain X-rays are not suitable for diagnosis. Endoscopic retrograde cholangiopancreatography is performed for therapeutic purposes (drainage) but is not suitable as a primary diagnostic option. (Kiriyama et al., 2018)

Abdominal ultrasound can easily detect abnormal dilation of the bile ducts and can be used to identify the cause. Bile duct stones appear as highly echogenic nodular lesions causing acoustic shadowing, whereas in malignant bile duct stenosis, a mass around the obstructed bile duct may be identified as a normal and poorly echogenic area. Various limitations related to the accuracy of abdominal ultrasound exist, such as a higher likelihood of being affected by the technician’s experience and the patient’s clinical condition compared to CT scan; however, abdominal ultrasound should be performed on patients suspected of having acute cholangitis due to its minimally invasive nature, wide availability, comfort, and cost-effectiveness. (Kiriyama et al., 2018)

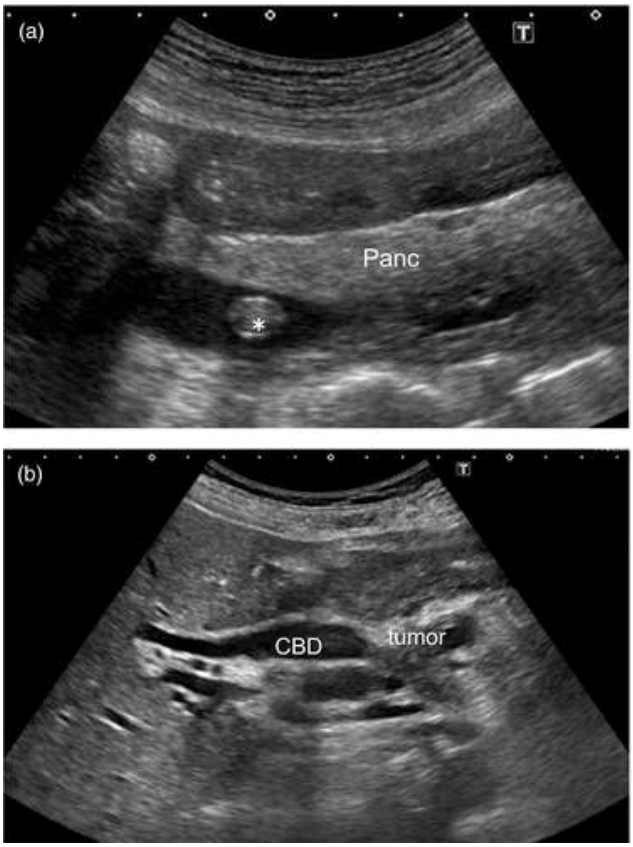

Figure 1. Abdominal Ultrasound (a) Gallbladder stones are visible as hyperechoic nodules with minimal acoustic shadowing within the intrapancreatic bile duct. (b) Cholangitis caused by pancreatic head cancer. The bile duct is clearly dilated and obstructed by a pancreatic head tumor. (Kiriyama et al, 2018)

Unlike abdominal ultrasound, a CT scan is not affected by intestinal gas, making it useful for objectively identifying nodules in the bile ducts. However, because the CT value of bile duct stones depends on the amount of calcium phosphate or calcium carbonate in the stones, the sensitivity of CT detection ranges from 25-90%. CT scans can clearly identify bile duct dilation and contribute significantly to the diagnosis of bile duct stenosis causes (e.g., bile duct carcinoma, pancreatic cancer, or sclerosing cholangitis). CT scans are also useful for diagnosing local complications such as liver abscesses or portal vein thrombosis. (Kiriyama et al, 2018)

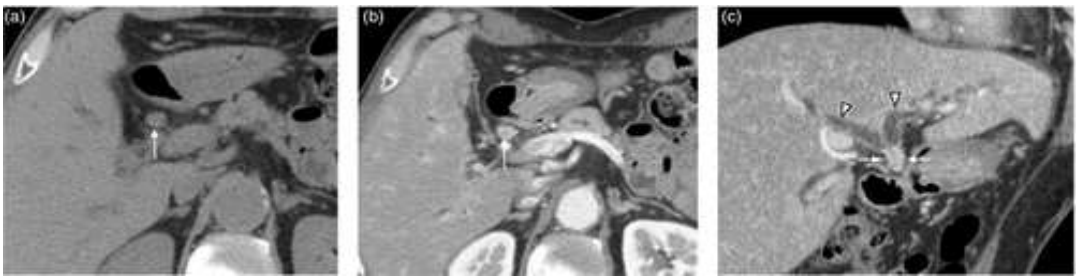

Figure 2. Extrahepatic bile duct cancer. (a) Pre-contrast CT, (b) Early dynamic contrast-enhanced CT phase, and (c) Coronal reconstruction image (Kiriyama et al, 2018).

Due to limited accessibility, MRI/MRCP is generally used for imaging only when the diagnosis is difficult or uncertain with abdominal ultrasound or CT scan. MRI provides superior contrast resolution and allows the operator to image any cross-sectional area; MRCP can visualize the bile ducts clearly without the use of contrast agents. Therefore, MRI/MRCP is undoubtedly a valuable modality for bile duct abnormalities. However, MRI/MRCP is recommended when abdominal ultrasound or CT imaging does not provide a definitive diagnosis. (Kiriyama et al, 2018)

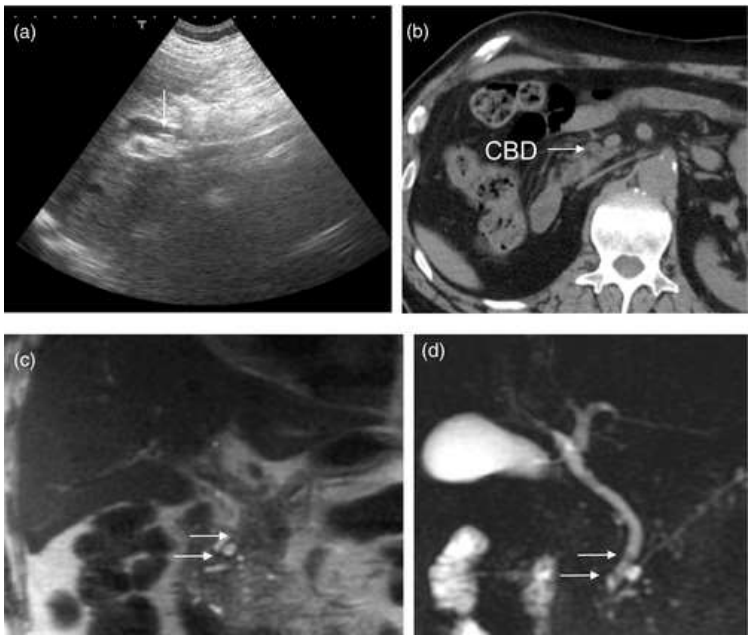

Figure 3. Bile duct stones. (a) Abdominal ultrasound, (b) non-contrast CT scan, (c) coronal T2-weighted MRI, and (d) MRCP image. (Kiriyama et al, 2018)

Charcot's Triad is a criterion used to diagnose acute cholangitis, characterized by symptoms of fever, right upper quadrant pain, and jaundice. The Reynolds Pentad adds changes in mental status and sepsis to the Charcot's Triad criteria. However, many patients with acute cholangitis do not present these classic symptoms and signs, which is why the Tokyo Guidelines 2018 complement these existing criteria. Charcot's Triad has a high specificity (95.9%) but a low sensitivity (26.4%). In contrast, the Tokyo Guidelines have a sensitivity of 100% and specificity of 87.4%, which is significantly higher compared to Charcot's Triad. Both Charcot's Triad/Pentad Reynolds and the Tokyo Guidelines are valuable tools for diagnosing acute cholangitis. (Virgile J, 2023)

G. Severity Assessment

The TG13 severity assessment criteria for acute cholangitis are important for predicting prognosis and determining therapeutic strategies, particularly identifying patients who require early biliary drainage. TG13 severity assessment criteria are recommended for use alongside TG18, as these criteria can identify patients who may benefit from early biliary drainage to improve prognosis.

Table 2. Severity of Acute Cholangitis Based on TG18 (Kiriyama et al, 2018)

Grade III (Severe) Acute cholangitis "Grade III" is defined as acute cholangitis associated with the development of dysfunction in at least one of the following organ systems: 1. **Cardiovascular Dysfunction** : Hypotension requiring dopamine ≥5 μg/kg per minute or any dose of norepinephrine. 2. **Neurological Dysfunction** : Altered consciousness. 3. **Respiratory Dysfunction** : PaO2/FiO2 ratio <300. 4. **Renal Dysfunction** : Oliguria, serum creatinine >2.0 mg/dL. 5. **Hepatic Dysfunction** : PT-INR >1.5. 6. **Hematological Dysfunction** : Platelet count <100,000/mm³.
Grade II (Moderate) Acute cholangitis "Grade II" is associated with one of the following conditions: 1. Abnormal white blood cell count (>12,000/mm³ or <4,000/mm³). 2. High fever (≥39°C). 3. Age (≥75 years). 4. Hyperbilirubinemia (total bilirubin ≥5 mg/dL). 5. Hypoalbuminemia (<STD × 0.7)
Grade I (Mild) Acute cholangitis "Grade I" does not meet the criteria for "Grade III (Severe)" or "Grade II (Moderate)" acute cholangitis at initial diagnosis.

H. Management

Initial management of a patient with suspected acute biliary infection begins with the measurement of vital signs to assess the urgency of the situation. If the case is deemed urgent, immediate medical intervention should be initiated, including respiratory and circulatory support if needed, without waiting for a definitive diagnosis. (Miura et al., 2018)

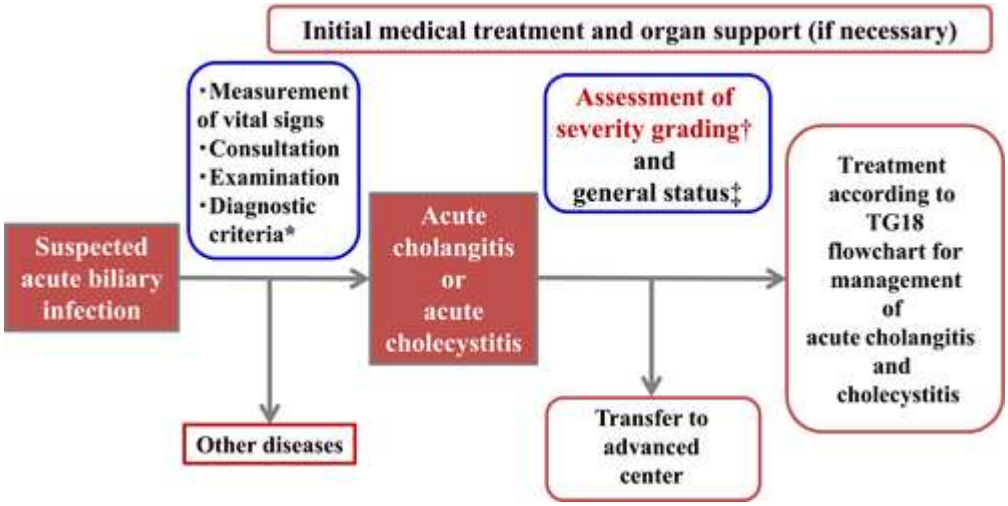

Figure 4. Flowchart of Initial Management for Acute Biliary Infection. (Miura et al., 2018)

1. Initial Management

After a definitive diagnosis of acute cholangitis or acute cholecystitis is made, initial management includes initiating adequate fluid infusion, administering antibiotics, and providing analgesics, while carefully monitoring blood pressure, pulse, and urine output. Although there is no high-quality evidence regarding the benefits and risks of fasting in acute cholangitis/cholecystitis, patients should generally fast to facilitate emergency drainage. (Miura et al., 2018)

In severe cases, such as the onset of shock (hypotension), altered consciousness, acute dyspnea, acute renal dysfunction, liver dysfunction, or disseminated intravascular coagulation (DIC), thrombocytopenia, emergency bile drainage should be considered along with appropriate organ support and respiratory/circulatory management (artificial ventilation, endotracheal intubation, and antihypertensive medications). (Miura et al., 2018)

2. Management According to Severity

Acute cholangitis should be managed according to its severity. Bile drainage and antibiotics are the two main pillars of managing acute cholangitis. In some cases of acute cholangitis, acute cholecystitis may also occur; in such cases, therapeutic strategies should be determined considering the severity of both conditions and the patient's overall status. If blood cultures have not been performed as part of the initial response, blood cultures should be obtained before starting antibiotics. If bile drainage is performed, bile samples should always be sent for culture. (Miura et al., 2018)

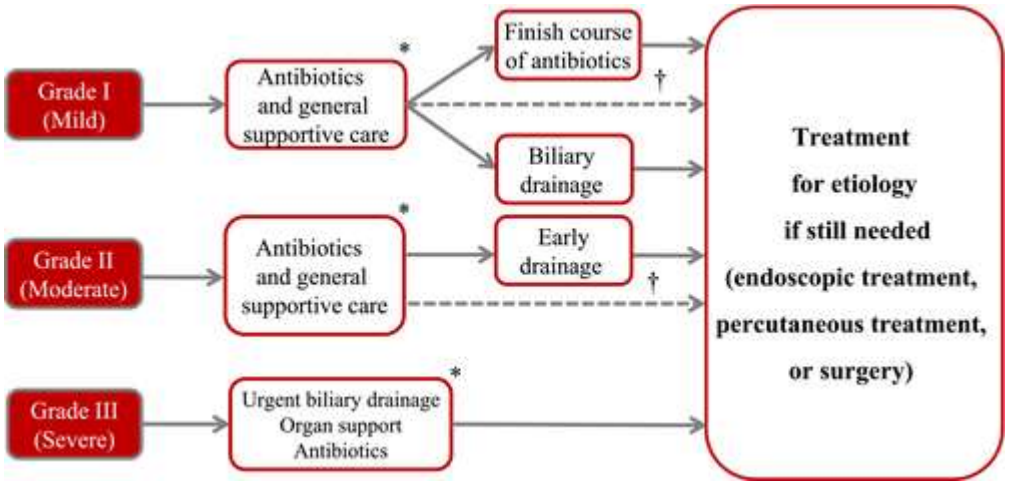

Figure 5. Flowchart for the Management of Acute Cholangitis (Miura et al., 2018)

Grade I (Mild)

In most cases, initial therapy, including antibiotics, is sufficient, and most patients do not require bile drainage. However, bile drainage should be considered if the patient does not respond to initial therapy. Endoscopic sphincterotomy (EST) and choledocholithotomy may be performed along with bile drainage.

Postoperative cholangitis typically improves with antibiotic therapy alone, and bile drainage is usually not necessary. (Miura et al., 2018)

Grade II (Moderate)

Endoscopic or percutaneous transhepatic bile drainage is indicated. If the underlying etiology requires therapy, it should be administered once the patient's general condition improves, and EST and choledocholithotomy can then be performed along with bile drainage. (Miura et al., 2018)

Grade III (Severe)

Because the patient's condition can deteriorate rapidly, a swift response is critical, including proper management of respiration and circulation (tracheal intubation followed by mechanical ventilation and use of vasopressors). Transhepatic endoscopic or percutaneous bile drainage should be performed as soon as possible after the patient's condition improves with initial treatment and respiratory/circulatory management. If treatment for the underlying etiology is necessary, it should be administered once the patient's general condition improves. (Miura et al., 2018)

Referral Criteria

a) **Grade III**

Patients requiring emergency bile drainage and critical care should be promptly transferred to a hospital equipped to provide such care.

b) Grade II

Patients should be admitted to a hospital where bile drainage and systemic management can be performed. If the hospital is not equipped to perform bile drainage, the patient should be transferred to a hospital that can provide it.

c) Grade I

If there is a stone in the bile duct or no response to initial therapy (within 24 hours), management similar to that for moderate acute cholangitis should be considered. (Miura et al., 2018)

3. Antibiotic Therapy

Table 3 summarizes the recommended antibiotics that may be used. It is important to remember that source control (drainage) is a crucial part of the management of cholangitis. Recommendations for antimicrobial therapy are primarily based on extrapolation of microbiological efficacy and the behavior of these agents against more susceptible isolates treated in clinical trials. (Gomi et al., 2018)

Table 3. Recommended Antibiotic Choices for Acute Cholangitis Based on TG18 (Gomi et al., 2018)

	Community-acquired biliary infections			Healthcare-associated biliary infections
	Grade I	Grade II	Grade III	Grade I-III
Penicillin	Ampicillin/sulbactam is not recommended if resistance rates exceed 20%.	Piperacillin/tazobactam	Piperacillin/tazobactam	Piperacillin/tazobactam
sefalosporine	Cefazolin Cefotiam Ceforuxime Ceftriaxone ± Metronidazole Ceftemazole Cefoxitine Flomoxef Cefoperazone/sulbactam	Cefotaxime Cefepime Cefozopran Ceftazidime ± Metronidazole Cefoperazone/sulbactam	Cepefime Ceftazidime Cefozopran ± Metronidazole	Cepefime Ceftazidime Cefozopran ± Metronidazole
Carbapenem	Ertapenem	Ertapenem	Imipenem/cilastatin Meropenem Doripenem Ertapenem	Imipenem/cilastatin Meropenem Doripenem Ertapenem
Monobactam	-	-	Aztreonam ± Metronidazole	Aztreonam ± Metronidazole
Fluoroquinolone	Ciprofloxacin Levofloxacin Pazufloxacin ± Metronidazole moxifloxacine	Ciprofloxacin Levofloxacin Pazufloxacin ± Metronidazole moxifloxacine	-	-

The use of disease severity as a guide for selecting antimicrobial agents has been questioned in the face of increasing numbers of ESBL-producing *E. coli* and *Klebsiella* in the community. These organisms are not susceptible to cephalosporins, penicillin derivatives, or fluoroquinolones. Previous guidelines have recommended that if more than 10-20% of *E. coli* isolates in the community are highly resistant, then empirical coverage for these organisms should be provided until susceptibility data indicate sensitivity to narrower-spectrum agents. Carbapenems, piperacillin/tazobactam, tigecycline, amikacin, and newer agents such as ceftazidime/avibactam and ceftolozane/tazobactam can also be used to treat these isolates. (Gomi et al., 2018)

For acute cholangitis and acute cholecystitis acquired in the community, Grade III cases should be treated with empirical therapy using agents with anti-pseudomonal activity until the causative organisms are identified. *Pseudomonas aeruginosa* is a virulent pathogen, and failure to empirically cover this organism in critically ill patients can result in excessive mortality. *Enterococcus spp.* is another important pathogen to consider in Grade III community-acquired acute cholangitis and cholecystitis. Vancomycin is recommended for treating *Enterococcus spp.* in these cases until culture results are available. Ampicillin may be used if the isolated *Enterococcus spp.* strain is susceptible to ampicillin. However, many hospitals have *Enterococcus spp.* strains resistant to vancomycin, requiring treatment with linezolid or daptomycin. (Gomi et al., 2018)

For Grade I and II community-acquired cholangitis and cholecystitis, Table 3 also provides appropriate agents. Clindamycin resistance among *Bacteroides spp.* is significant, and clindamycin is no longer recommended for intra-abdominal infections. Cefoxitin, cefmetazole, flomoxef, and cefoperazone/sulbactam are cephalosporins with activity against *Bacteroides spp.* Local availability of agents and local susceptibility results should be considered when choosing empirical therapy. (Gomi et al., 2018)

For empirical therapy (presumptive therapy) for healthcare-associated acute cholangitis and acute cholecystitis, vancomycin is recommended when patients are infected with resistant Gram-positive bacteria such as methicillin-resistant *Staphylococcus aureus* and/or *Enterococcus spp.*, or other multi-drug-resistant Gram-positive bacteria. *Staphylococcus aureus* is not a common isolate in acute biliary infections compared to *Enterococcus spp.* Recent studies show that *Staphylococcus aureus* is isolated in less than 1% of cases from both blood and bile in patients with acute cholangitis. Vancomycin-resistant *Enterococcus* (VRE) should be managed empirically with linezolid or daptomycin if these organisms are known to colonize the patient, if previous therapy included vancomycin, and/or if VRE is commonly encountered in the community. (Gomi et al., 2018)

Regarding the duration of antibiotic therapy, TG18 recommends administering antibiotics for 4-7 days after the infection source has been controlled. Patients with acute cholangitis and cholecystitis who can tolerate oral intake may be treated with oral therapy. Depending on the susceptibility patterns of the identified organisms, oral antimicrobial agents such as fluoroquinolones (ciprofloxacin, levofloxacin, or moxifloxacin), amoxicillin/clavulanate, or cephalosporins may also be used. (Gomi et al., 2018)

Table 4. Recommendations for Antibiotic Duration for Acute Cholangitis Based on TG 18 (Gomi et al., 2018)

	Community-acquired biliary infections			Healthcare-associated biliary infections
	Grade I	Grade II	Grade III	Grade I-III
Duration of therapy	Antimicrobial therapy may be discontinued within 24 hours after cholecystectomy.	Once the source of infection is controlled, a duration of 4-7 days is recommended. If there is bacteremia with Gram-positive cocci, such as Enterococcus spp. and Streptococcus spp., a minimum duration of 2 weeks is recommended		If bacteremia with Gram-positive cocci, such as Enterococcus spp. and Streptococcus spp., occurs, a minimum duration of 2 weeks is recommended
Special conditions for prolongation of therapy	In the presence of perforation, emphysematous changes, or necrosis of the gallbladder noted during cholecystectomy, a duration of 4-7 days is recommended	If there are residual stones or obstruction in the bile duct, therapy should be continued until the anatomical issue is resolved. If there is a liver abscess, therapy should be continued until clinical, biochemical, and radiological follow-up indicates complete resolution of the abscess		

4. Gallbladder Drainage

a. **Percutaneous Transhepatic Gallbladder Drainage (PTGBD)**

PTGBD should be considered as the first alternative to surgical intervention in high-risk patients with acute cholangitis, as several studies have shown PTGBD to be less invasive and associated with fewer side effects compared to cholecystectomy. The PTGBD procedure is described in previous guidelines and is relatively straightforward for general practitioners to perform. Briefly, after performing a transhepatic gallbladder puncture guided by ultrasound with an 18-G needle, a 6 to 10-Fr catheter is placed within the gallbladder using a guidewire under fluoroscopy. It is worth noting that PTGBD for Grade III (severe) cases, based on the TG 13 severity assessment, has been associated with higher mortality rates, increased hospitalization rates, and longer hospital stays. (Mori et al., 2018)

b. **Endoscopic Drainage**

Recently, endoscopic transpapillary gallbladder drainage (ETGBD) under endoscopic retrograde cholangiopancreatography (ERCP), including endoscopic naso-gallbladder

drainage (ENGBD) and gallbladder stenting (EGBS), as well as endoscopic ultrasound-guided gallbladder drainage (EUS-GBD), have been reported as effective alternative gallbladder drainage procedures for patients with acute cholangitis. Internal drainage achieved with endoscopic gallbladder drainage (EGBS/EUS-GBD) results in less post-procedural pain compared to external drainage with PTGBD. However, due to the complexity of the endoscopic techniques and the fact that almost all reports on endoscopic drainage are from skilled pancreatic endoscopists at high-volume centers, these techniques have not yet become standard procedures. Therefore, ETGBD and EUS-GBD should be considered at high-volume institutions by skilled pancreatic endoscopists; otherwise, PTGBD should be selected as the standard drainage procedure. (Mori et al., 2018)

ENGBD and EGBS Procedures

Endoscopic transpapillary gallbladder drainage (ETGBD) may be considered at high-volume institutions by skilled endoscopists. ETGBD can be divided into two different methods: ENGBD and EGBS. ENGBD involves the placement of a naso-gallbladder drainage tube (NGBT) and generally does not require sphincterotomy. The detailed technique for ENGBD is as follows: After successful cannulation of the bile duct, a 0.025 or 0.035-inch guidewire is advanced into the cystic duct (Figure 6a) and subsequently into the gallbladder (Figure 6b). The catheter is then withdrawn, and the guidewire remains in the gallbladder, with an NGBT of 5-Fr to 8.5-Fr being inserted into the gallbladder (Figure 6c). In comparison, the EGBS procedure is similar to ENGBD, but an internal stent of 6-Fr to 10-Fr is placed in the gallbladder. Stent placement is not always successful because the cystic duct is often not visible on cholangiography, severe cystic duct stenosis and/or impacted stones at the gallbladder neck can obstruct the advancement of the guidewire and stent, and the tortuous Heister's valve can be difficult to navigate with standard guidewires. This procedure requires skilled technique, as prolonged or unsuccessful procedures can lead to serious complications such as post-ERCP pancreatitis and perforation of the cystic duct or gallbladder. Therefore, endoscopists must have accurate knowledge and technical skills, including selective bile cannulation and proper guidewire techniques. (Mori et al., 2018)

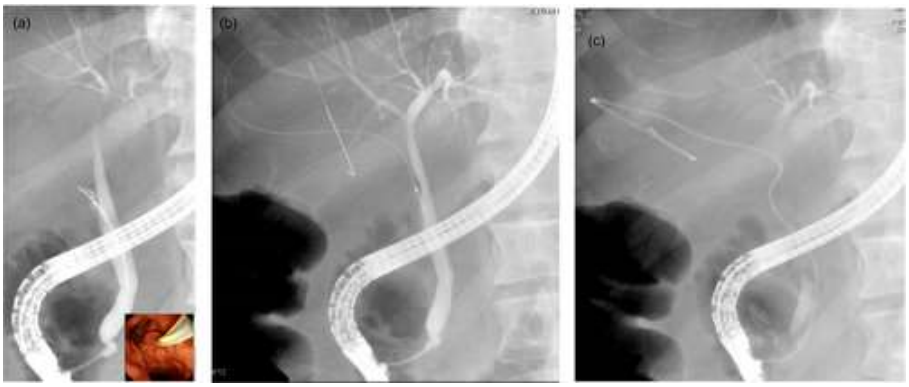

Figure 6. ENGBD Procedure. (Mori et al., 2018)

EUS-GBD Procedure

The gallbladder is punctured from the corpus or antrum of the stomach or the duodenal bulb under direct EUS visualization. A 0.035-inch guidewire is inserted through the outer sheath, and ductal dilation is then performed using a mechanical dilator, electrocautery dilator, or balloon dilator. Finally, a naso-gallbladder tube (NGBT), double-pigtail plastic stent (PS), or self-expandable metal stent (SEMS) is inserted into the gallbladder (Figure 7). Recently, lumen-apposing metal stents (LAMS) (Figures 8a and 8b), expanded-end SEMS (Figure 8c), and bifurcated metal stents (Figure 8d) have provided effective and safe drainage for the gallbladder contents. (Mori et al., 2018)

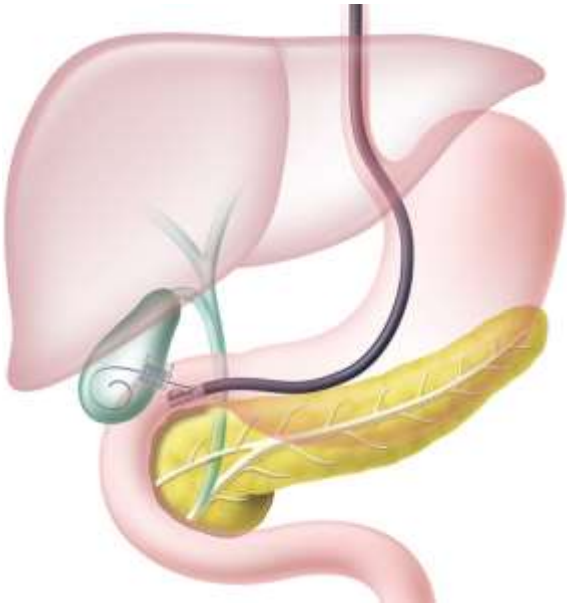

Figure 7. Schematic of EUS-GBD. (Mori et al., 2018)

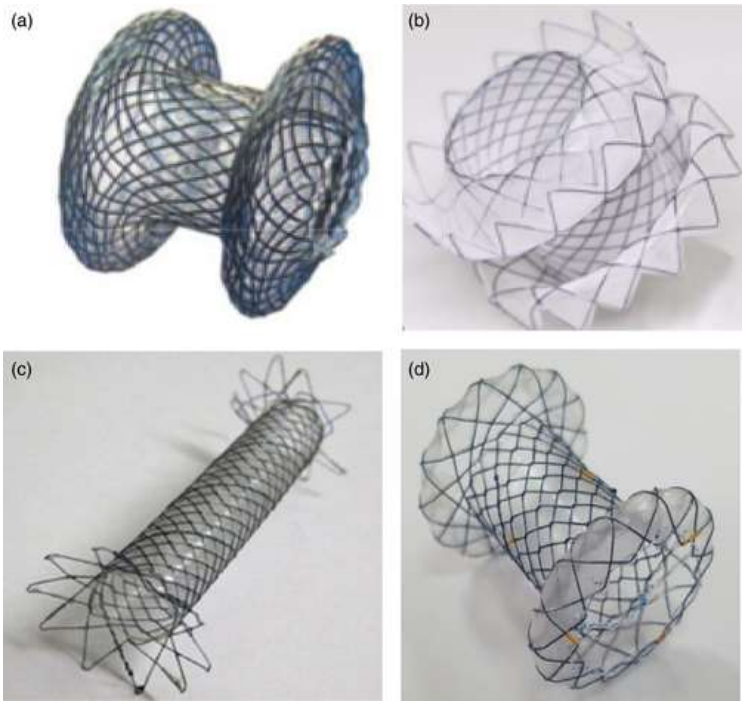

Figure 8. Metal Stents for EUS-GBD. (Mori et al., 2018)

c. **Percutaneous Transhepatic Gallbladder Aspiration (PTGBA)**

Although PTGBA without catheter placement appears to be a simple and easy decompression method, aspiration can fail due to the replacement of bile with thick bile sludge or pus. Therefore, PTGBA should not be recommended as a standard procedure for all patients with acute cholangitis. However, recent international multi-center studies have shown that the clinical success rate within 3 days after PTGBA is significantly higher compared to PTGBD and EGBS, although there is no significant difference at 7 days. Additionally, the complication rate for PTGBA is lower than for PTGBD and EGBS. Several reasons, including the possibility that the PTGBA group includes patients with mild or moderate cholecystitis, and the use of saline lavage during PTGBA may be more effective than simple drainage. (Mori et al., 2018)

d. **Gallbladder Drainage for Patients with Coagulopathy or Those on Antithrombotic Agents**

There are several reports discussing PTGBD for patients with acute cholangitis and coagulopathy or those on antithrombotic agents. The Society of Interventional Radiology guidelines suggest that PTGBD can be performed without discontinuing aspirin if the patient has a high risk of thromboembolism; however, these guidelines also recommend stopping clopidogrel 5 days prior to PTGBD. The guidelines also recommend that PTGBD in patients on anticoagulants should be performed with a PT-INR <1.5 and heparin substitution. PTGBD for patients receiving antiplatelet and anticoagulant agents should be avoided as there is no reliable data on these patients.

ETGBD should be considered under such conditions when skilled pancreatic endoscopists are available at the institution. (Mori et al., 2018)

5. **Cholecystectomy**

Once acute cholangitis has resolved, early cholecystectomy is optimal. The optimal timing for surgery is within 14 days after recovery from acute cholangitis. Early cholecystectomy is performed when the patient's overall condition is stable and the patient can tolerate general anesthesia. An aggressive surgical approach may be beneficial in preventing recurrent bile duct infections and reducing the incidence of intraoperative bile duct injuries. (Abe, 2019)

Cholecystectomy can be performed using either open cholecystectomy or laparoscopic cholecystectomy methods. Currently, 92% of all cholecystectomies are performed laparoscopically, although open cholecystectomy remains more common in many resource-limited countries. Extensive inflammation, adhesion, anatomical anomalies, bile duct injuries, residual bile duct stones, and uncontrolled bleeding are indications for switching to an open procedure. (Jones, 2019)

Severe comorbid conditions such as shock, advanced cardiac and respiratory disease, anticoagulation, neurological disorders, and other life-threatening illnesses are relative contraindications for laparoscopic surgery.

I. Complications

The complications of acute cholangitis include multi-organ failure and shock, which can lead to death due to sepsis. After the acute phase of cholangitis, heart failure and pneumonia are also potential complications that can result in death. More commonly described complications of acute cholangitis include liver abscess, liver failure, acute cholecystitis, portal vein thrombosis, acute pancreatitis, and acute liver failure. (Farrell et al., 2023)

J. Prognosis

The prognosis depends on the timing of bile drainage, antibiotic administration, and the patient's comorbidities. Early bile drainage leads to rapid clinical improvement. However, if bile drainage is delayed, the patient's condition may deteriorate rapidly and result in death. The overall mortality rate of acute cholangitis is less than 10% after bile drainage. In the pre-ERCP era, severe acute cholangitis was associated with a mortality rate of over 50%. Emergency surgery for severe acute cholangitis also has a high mortality rate, around 30%. (Ahmed, 2018)

Poor prognostic factors in acute cholangitis include advanced age, high fever, leukocytosis, hyperbilirubinemia, and hypoalbuminemia. Patients with comorbidities such as cirrhosis, malignancy, liver abscess, and coagulopathy also have a poor prognosis. (Ahmed, 2018)

Patients with high pre-drainage serum creatinine levels are also associated with higher mortality. A recent study also indicated that serum IL-7 levels less than 6.0 and serum procalcitonin levels greater than 0.5 are associated with higher mortality. (Ahmed, 2018)

DISCUSSION AND CONCLUSION

A. Patient Summary

A 48-year-old female patient was admitted to the hospital with complaints of right upper abdominal pain that had been present for the past 2 weeks and had worsened over the last 2 days. The patient had been jaundiced over her entire body for the past 10 days. Fever had been present for 2 days, and she experienced weakness. Nausea was present, with vomiting occurring 3 times. Her urine appeared more yellow than usual, and her stool was noted to be paler. She had a history of long-standing hypertension that was not well controlled, and an ultrasound showed multiple cholelithiasis. She had undergone exploratory laparoscopy on July 13, 2023.

Physical examination revealed moderate distress, alertness, and good nutritional status. Vital signs were: blood pressure 155/69 mmHg, pulse 110 beats per minute, respiration 20 breaths per minute, and temperature 37.5°C. Local examination showed conjunctival anemia, scleral icterus, normal lung and thoracic findings. Abdominal examination revealed tenderness in the right upper quadrant, with a positive Murphy sign. Extremities were warm, with a capillary refill time of less than 2 seconds. The skin appeared pale yellow throughout.

Laboratory tests on July 17, 2023, showed anemia (Hb 6.1 g/dl), leukocytosis (20,100/µl), thrombocytopenia (100,000/µl), hyperbilirubinemia (total bilirubin 21.3 mg/dl), and renal dysfunction (urea 68 mg/dl, creatinine 2.9 mg/dl). A CT scan revealed dilatation of intra- and extrahepatic bile ducts to the distal CBD with stones (target sign), multiple cholelithiasis, and cholecystitis.

The patient met the “definitive diagnosis” of acute cholangitis according to TG 18 with criteria A-2 (evidence of inflammatory response: leukocytosis), B-1 (jaundice + total bilirubin 21.3 mg/dl), C-1 (biliary dilatation on CT scan), and C-2 (multiple cholelithiasis on CT scan). The severity according to TG 18 was grade III due to the presence of renal dysfunction (serum creatinine >2.0 mg/dl).

The patient was treated with antibiotics (Viccilin SX, Ampicillin-Sulbactam) 1.5 grams per day, underwent exploratory laparotomy with cholecystectomy, and had a drain inserted. Laparotomy was performed due to suspicion of bleeding and widespread inflammation, as indicated by an elevated white blood cell count. Post-operatively, the patient was hospitalized for 6 days, with intravenous antibiotic therapy (Viccilin SX + Metronidazole) administered until postoperative day 5 (POD-5). The patient did not have bowel movements until POD-3, so Dulcolax suppositories were administered. The patient showed clinical improvement during postoperative care. The drain, catheter, and infusion were removed on POD-5. The patient was allowed to be discharged on POD-6.

B. **Tokyo Guideline 2018 Summary**

The Tokyo Guidelines published a special journal containing a bundle of essential items and procedures for the effective implementation of TG 18.

Bundle Management for Acute Cholangitis:

1. If acute cholangitis is suspected, perform diagnostic tests every 6-12 hours using TG 18 diagnostic criteria until a diagnosis can be established.
2. Conduct abdominal ultrasound, followed by CT scan, MRI, and MRCP as needed.
3. Use severity assessment criteria to evaluate severity repeatedly: at diagnosis, within 24 hours after diagnosis, and from 24-48 hours after diagnosis.
4. Immediately after diagnosis is confirmed, initiate early management. This includes adequate rehydration, electrolyte compensation, and full-dose intravenous antibiotics and analgesics.
5. In patients with grade I (mild) disease, if there is no response to initial therapy observed within 24 hours, perform bile duct drainage promptly.
6. In patients with grade II (moderate) disease, perform bile duct drainage immediately along with initial management. If initial drainage cannot be performed due to lack of facilities or expertise, consider transferring the patient.
7. In patients with grade III (severe) disease, perform bile duct drainage immediately along with initial therapy and provide general supportive care. If immediate drainage cannot be performed due to lack of facilities or expertise, consider referring the patient.
8. In patients with grade III (severe) disease, provide organ support immediately (positive pressure ventilation/non-invasive or invasive, use of vasopressors and full-dose antibiotics).
9. Perform blood or bile cultures, or both, in patients with grade II (moderate) and III (severe) disease.
10. Consider managing the etiology of acute cholangitis with endoscopic, percutaneous, or surgical interventions after the acute illness is resolved. Cholecystectomy should be performed for cholecystolithiasis after recovery from acute cholangitis.
11. If the hospital is not equipped to perform endoscopic or percutaneous bile drainage or provide intensive care, transfer patients with moderate or severe cholangitis to a facility that can provide this care. (Mayumi et al., 2018)

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