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Surgical Management Strategy for Acute Cholangitis: Overview

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Abstract: **Cholangitis was initially described by Charcot as a serious and dangerous illness; nonetheless, it is currently acknowledged that the severity can range from mild to life-threatening. In this review we want to discuss the background of this illness to understand it better and medical diagnosis methods to find out acute cholangitis, we also highlight treatment and surgery methods. We conducted a comprehensive review of literature on surgical management strategy for acute cholangitis through electronic search in several databases; MIDLINE, EMBASE, GOOGLE Scholar, up to December 2017. Acute cholangitis is a serious infective condition of the biliary tract that requires prompt therapy. The application of therapeutic endoscopy and interventional radiology has significantly improved the morbidity and mortality related to the condition. Endoscopic therapy plays a significant role in both the acute stage of acute cholangitis and the definitive treatment of choledocholithiasis. However, it must be highlighted that if endoscopic intervention is not successful or if the patients do not recover after endoscopic treatment, surgical or radiological intervention has to be performed prior to the patients deteriorate further. The definitive treatment of the biliary stones depends on surgical risks of the patients and the accessibility of endoscopic and surgical expertise at various centers. Open surgical procedure, nonetheless, has been associated with high morbidity and death. Medical diagnosis of acute cholangitis, which is based on patient's clinical presentations, laboratory outcomes and diagnostic imaging, provides an international platform for its early diagnosis and assists to improve morbidity and mortality.**

Keywords: **Acute Cholangitis, choledocholithiasis, Endoscopic therapy.**

1. INTRODUCTION

Acute cholangitis is a possibly life-threatening systemic problem defined by an infection of the bile, which is normally sterile, and biliary blockage. This problem was first described in 1877 by Charcot as having a set of three of right upper abdominal discomfort, fever and jaundice (Charcot's triad) [1].The medical diagnosis of acute cholangitis is made based upon professional discussion, laboratory outcomes and diagnostic imaging. If acute cholangitis is not acknowledged early and treated appropriately, it could rapidly turn into systemic inflammatory response syndrome (SIRS), sepsis and mortality. Acute cholangitis carried a mortality rate of greater than 50% [2] in the 1970s and less than 7% in the 1980s [3].Severe acute cholangitis had a mortality rate of between 11 and 27% in the 1990s [4].Early treatment with intravenous anti-biotics and biliary decompression with drainage is fundamental in the management of acute cholangitis. As most of the latter situations also call for procedure, the timing of surgical procedure is important.

Cholangitis was initially described by Charcot as a serious and dangerous illness; nonetheless, it is currently acknowledged that the severity can range from mild to life-threatening. In this review we want to discuss the background of this illness to understand it better and medical diagnosis methods to find out acute cholangitis, we also highlight treatment and surgery methods.

2. METHODOLOGY

We conducted a comprehensive review of literature on surgical management strategy for acute cholangitis through electronic search in several databases; MIDLINE, EMBASE, GOOGLE Scholar, up to December 2017. We identified most important studies that discussing the impact of surgical management strategy for acute cholangitis, we limited our

search to English language, we also involve animal trails in this review. Additionally, we scanned the references of included studies for more relevant articles.

3. DISCUSSION

- **Pathogenesis and cause**:

Acute cholangitis results from both an obstruction of the biliary ducts and superposing bacterial infection. Root causes of biliary obstructions are benign biliary strictures (post-surgical, acute and chronic pancreatitis, autoimmune cholangitis, primary sclerosing cholangitis, complicated stone or congenital anomalies), malignant biliary strictures (pancreatic cancer, gallbladder cancer, cholangiocarcinoma, small intestine hatred or liver metastases), biliary stent blockage, haemobilia or parasitical infections. One of the most typical reason for biliary obstruction is choledocholithiasis [5].Bile is sterile, and bacterial infection of the bile results from rising migration of pathogens or portal bacteraemia. The typical pressure at which hepatic bile is secreted is 12-- 15 cm H2O, and the typical extrahepatic bile duct pressure is 10-15 centimeters H2O. Those pressures are regulated by the relaxation and tightening of the sphincter of Odi, which keeps bile circulation from the usual bile duct to the duodenum and helps in preserving the sterility of bile. If the pressure goes beyond 30 centimeters H2O, secretion of bile from the liver is hindered [5].Hepatic defense mechanism are compromised when the choledochal pressure is more than 25 cm H2O. Cholangiovenous reflux complies with, and pathogens have accessibility to intrahepatic canicules, hepatic veins and lymphatics, creating bacteraemia and SIRS leading to sepsis. Infection of the biliary tree without obstruction does not normally lead to clinical acute cholangitis [6].The most typical microorganisms triggering acute cholangitis are Escherichia coli, Enterococcus sp., Klebsiella sp. and Pseudomonas aeruginosa [7].A couple of studies revealed that E. coli is the main pathogen separated in bile cultures from patients with acute cholangitis [9] Weber et al. found that the Enterococcus sp. and P. aeruginosa were most commonly isolated from bile societies in patients with acute cholangitis with biliary stent endoprosthesis compared with acute cholangitis patients without biliary stent endoprosthesis [7] Rerknimitr et al. also found a higher incidence of Enterococcus sp. in patients with acute cholangitis with biliary stent endoprosthesis [8].Isolated Enterococcus sp. and P. aeruginosa from bile cultures were revealed to have a higher risk of bacteraemia [7].Additionally, the presence of biliary stent endoprosthesis itself enhances the risk of bacteraemia and polymicrobial infections [8].Biliary stent endoprosthesis is sometimes inserted during endoscopic retrograde cholangiopancreatography (ERCP) after biliary drainage as part of the treatment of acute cholangitis. Due to the fact that biliary stent endoprosthesis itself poses a danger of bacteraemia and polymicrobial infection, the modification or elimination of the endoprosthesis every 3 months is suggested.

- **Etiology:**

Acute cholangitis is the outcome of bacterial infection superimposed on partial or complete blockage of the biliary system. It happens in 6% to 9% of patients confessed with cholelithiasis. In the past, about 80% of situations were related to choledocholithiasis [10].Nevertheless, as a result of the boost in endoscopic and radiological treatment and long term survival in patients with deadly condition, more patients with cholangitis belong to malignant biliary obstruction. Other feasible usual etiologies are provided in table1. The illness can present with a wide range of extent, from lowgrade high temperature to extreme sepsis and shock with frank pus within the biliary tree, which is also known as acute suppurative cholangitis. The reported mortality rate for acute suppurative cholangitis was as high as 88% [11]. The infecting microorganism is generally one of the digestive tract flora and gram-negative bacillus are generally encountered. These consist of Escherichia coli, Enterococcus faecalis, Klebsiella pneumoniae, Pseudomonas, Streptococcus, Proteus and Enterobacter varieties. Anaerobes consisting of Bacteroides and Clostridium types can be found in about 25% of patients. In about 20% of patients, two microorganisms are isolated yet there are hardly ever more than 2 [12]. Sepsis from cholangitis can be specifically serious since there is no endothelial cellular lining in between the bile canaliculi and the capillary system in the liver. Raised intraductal pressure brings about bacteremia and concerning 50% of the patients have favorable blood cultures.

Table1. Possible etiology of acute cholangitis

Biliary stones	**Malignant stricture**
Choledocholithiasis	Cholangiocarcinoma
Hepatolithiasis (recurrent pyogenic cholangitis)	Carcinoma of pancreas
Mirizzi syndrome	Carcinoma of ampulla
	Carcinoma of gallbladder

Parasitic infestation Clonorchis sinensis Ascaris lumbricoides	**Indwelling tubes or stents**
Benign biliary condition Benign stricture Anastomotic stricture Ampullary stenosis Choledochal cyst Periampullary diverticulum Primary sclerosing cholangitis	**Cholangiography** T-tube Percutaneous transhepatic Endoscopic retrograde

- **Prognostic indicators and risk factors**:

Organ dysfunction is one of the most typical predictor of a poor prognosis [14] Complication and shock are good clinical indications of organ dysfunction. Laboratory results of acute cholangitis suggesting body organ disorder are serum creatinine (> 132 to > 176 μmol/ L), reduced platelet count (37.6 to > 171 μmol/ L) and urea (> 7.4 to > 28 mmol/L) [14] Old age is also related to dramatically higher mortality and morbidity [15] Rosing et al. discovered that a complete bilirubin of > 171 μmol/ L on admission has 56% sensitivity, 85% uniqueness, 21% positive anticipating value and 96% negative predictive value for predicting death [16] Moreover, white cell count on admission has 50% sensitivity, 92% uniqueness, 63% favorable anticipating worth and 88% negative predictive worth for body organ failing or death [16] Agarwal et al. revealed that the surge in white blood cell matter is much less in elderly patients compared with younger patients with acute cholangitis [17] The visibility of Charcot's triad or Reynolds's pentad at presentation was not dramatically related to a greater death [18] The timing of ERCP and biliary decompression is fundamental in acute cholangitis as a hold-up can result in raised in mortality and morbidity [19] Hui et al. showed that patients with acute cholangitis having tachycardia (heart rate > 100 beats/min), albumin less than 30 g/L, prolonged prothrombin time of greater than 14 s and total bilirubin of greater than 85 μmol/ L are significantly more likely to fail preliminary medical treatment, hence calling for a rising ERCP [20] Likewise, Pang and Chun located that a prolonged prothrombin, older age and dilated common bile duct forecasted an immediate ERCP.34 Based on their multivariate evaluation, Gigot et al. located that there are 7 statistically significant danger consider forecasting mortality (old age, women sex, acute kidney failure, liver abscesses or liver cirrhosis and acute cholangitis additional to malignant biliary strictures or post-percutaneous transhepatic cholangiography) [13]

- **Diagnosis:**

Clinical features:

The diagnosis of acute cholangitis is typically made, or at least suspected, on the basis of the history and physical examination. Charcot's triad of high temperature, jaundice and ideal top quadrant abdominal pain is the classical demonstration of acute cholangitis [21].Nevertheless, only 50% to 70% of the patients exhibit all the three features [22].The most constant symptom is fever, which is present in over 90% of the patients. Abdominal pain occurs in regarding 80% of the patients and medical jaundice occurs in similar incidence. In extreme acute cholangitis, patients could create shock and a transformed psychological condition known as Reynolds' pentad. Various other possible providing symptoms consist of paralytic ileus and occult sepsis. The principal abdominal problems that confuse with acute cholangitis are acute cholecystitis, acute pancreatitis, acute liver disease, liver abscess, acute pyelonephritis and perforated peptic ulcers.

Blood tests:

Blood examinations may show elevated white blood cell count, serum bilirubin, alkaline phosphatase and transaminases. Serum amylase may rise in about onethird of the patients and is considerably raised in regarding 10% of the patients when concomitant acute pancreatitis exists [23].

Radiological investigations:

Percutaneous ultrasonography of the abdomen typically reveals dilated biliary tree and detects the existence of cholecystolithiasis yet it can just detect regarding 35% of the choledocholithiasis. Compared with ultrasonography, computed tomography is more effective in showing the reason and the level of biliary obstruction. It could imagine the

distal typical bile duct and show common bile duct stones if they have a greater calcium thickness. Direct cholangiography including percutaneous transhepatic cholangiography (PTC) or endoscopic backward cholangiopancreatography (ERCP) could show the biliary tree properly [24].Nonetheless, direct cholangiography can exacerbate the cholangitis leading to severe sepsis and should always be combined with therapeutic drainage treatment whenever biliary obstruction is demonstrated.

Poor prognostic factors:

Poor prognostic elements consist of seniority, women sex, acute kidney failure, concomitant medical problems, pH < 7.4, bilirubin > 90 μmol/ L, albumin < 30 g/L, platelet count < 150 × 109/L, preexisting cirrhosis, existence of liver abscess and malignant biliary obstruction.

- **Treatment:**

Surgical drainage:

Prior to the arrival of interventional radiology and therapeutic endoscopy, surgical decompression of the biliary tree was the only therapy for patients with severe cholangitis. Surgical treatments for drainage consist of stone extraction, T-tube insertion, transhepatic intubation of bile duct or bilio-enteric bypass [28] Open surgical procedure, however, has been connected with high morbidity and mortality. The reported death rate of emergency surgery for acute cholangitis varied from 20% to 60%. Age, comorbidities, jaundice, kidney failing, acidosis, thrombocytopenia and malignant diseases are danger aspects connected with increased perioperative mortality.

Endoscopic drainage:

Since the description of endoscopic sphincterotomy and stone removal in 1973, endoscopic management has become the optimal setting of therapy for numerous patients with different problems including acute cholangitis. Numerous researches have reported the use of endoscopic treatment for patients with acute cholangitis and the association with reduced morbidity and death. Leese et al. reported [26] in 1986 that endoscopic therapy transcended to both medical management and surgical procedure in a retrospective, nonrandomized analysis of the outcome of 82 patients with acute cholangitis related to choledocholithiasis. Patients undertaking endoscopic sphincterotomy had substantially reduced death (4.7%) than patients undergoing surgical procedure (21.4%), although that patients in the endoscopic group were dramatically older and with poorer medical dangers than those treated surgically. In an additional retrospective research study, Lai et al. (1990) [25] found that endoscopic drainage utilizing a nasobiliary catheter after performing a small sphincterotomy led to lower morbidity (40% versus 65%) and lower mortality (6.7% versus 20%) compared to surgical procedure. These retrospective researches suggested that endoscopic therapy was superior to surgical procedure in the management of patients with acute cholangitis.

The advantages of endoscopic therapy over surgery in patients with extreme cholangitis wased initially demonstrated in a potential randomized trial reported by Lai et al. [27] from Hong Kong in 1992. In this research study, 82 critically unwell patients with severe cholangitis were randomized to either endoscopic drainage or emergency surgical treatment after choledocholithiasis was confirmed with endoscopic cholangiography. Endoscopic drainage included little papillotomy and positioning of a 7 Fr. nasobiliary catheter. No attempt was made to draw out the rocks in preliminary endoscopic treatment. After resolution of cholangitis, 16 patients underwent definitive surgical procedure and 25 went through clear-cut endoscopic therapy. Patients dealt with surgically went through emergency laparotomy and choledochotomy. It was located that patients that were treated operatively had substantially greater occurrence of complications (64% versus 34%) and healthcare facility mortality (32% versus 10%) compared with those who went through endoscopic therapy. It was as a result wrapped up that endoscopic biliary drainage was a safe and efficient measure for the initial control of extreme acute cholangitis as a result of choledocholithiasis and in reducing mortality related to the condition.

Further studies likewise validated that endoscopic water drainage can be carried out with a much reduced death rate and fewer difficulties than open surgical drainage and can effectively soothe the endotoxemia associated with acute cholangitis. In a current large series, ERCP was made use of to treat 898 patients with cholangitis because of gallstone blockage and 49 with cholangitis due to ductal stenosis. All patients were efficiently dealt with endoscopically with a mortality rate of 0.42% and an issue rate of 6%. Only two patients in the series required open surgery: one for pancreatitis and one for perforation. Both morbidity and mortality increase with boosting delay from the onset of cholangitis to the

time of biliary water drainage; as a result patients with serious acute cholangitis or those that have revealed a bad action to traditional procedures require immediate endoscopic biliary decompression.

4. CONCLUSION

Acute cholangitis is a serious infective condition of the biliary tract that requires prompt therapy. The application of therapeutic endoscopy and interventional radiology has significantly improved the morbidity and mortality related to the condition. Endoscopic therapy plays a significant role in both the acute stage of acute cholangitis and the definitive treatment of choledocholithiasis. However, it must be highlighted that if endoscopic intervention is not successful or if the patients do not recover after endoscopic treatment, surgical or radiological intervention has to be performed prior to the patients deteriorate further. The definitive treatment of the biliary stones depends on surgical risks of the patients and the accessibility of endoscopic and surgical expertise at various centers. Open surgical procedure, nonetheless, has been associated with high morbidity and death. Medical diagnosis of acute cholangitis, which is based on patient's clinical presentations, laboratory outcomes and diagnostic imaging, provides an international platform for its early diagnosis and assists to improve morbidity and mortality.

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