Original Article

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A Retrospective Study of Demographics and Treatment Outcomes of Culture-Negative Versus Culture-Positive Pyogenic Liver Abscess: 12 Years-Experience at A Tertiary Hospital

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Abstract:

Objective: To evaluate the demographics and treatment outcome of culture-negative pyogenic liver abscess (CNPLA), compared with culture-positive pyogenic liver abscess (CPPLA).

Material and Methods: A retrospective study of patients admitted with pyogenic liver abscess (PLA) at a tertiary hospital, from January 2011 to May 2023, was performed.

Results: A total of, 112 patients had PLA: 33 patients (29.5%) were CNPLA, and 79 patients (70.5%) were CPPLA. The median age was 60.5 years. Patients with CNPLA were significantly younger than those with CPPLA (58 vs. 62 years, p-value=0.021). The most common bacteria in CPPLA was *Klebsiella pneumoniae*. Jaundice was more common in CPPLA. CNPLA had significantly lower bilirubin (0.6 vs. 1.2 mg/dl, p-value=0.020), aspartate transferase (AST) (30 vs. 55 U/L, p-value<0.001), alanine aminotransferase (ALT) (39 vs. 57 U/L, p-value=0.011), alkaline phosphatase (ALP) (192 vs. 231 U/L, p-value=0.046) and higher albumin (3.3 vs. 2.9 g/dl, p-value=0.025) levels than CPPLA. Mortality of CNPLA and CPPLA were not different (9.1% vs. 8.9%, p-value=1.000). There was no difference in length of stay between the two groups (15 vs. 12 days, p-value=0.388).

Conclusion: Patients with CNPLA were younger than CPPLA and compared with CPPLA, CNPLA had lower bilirubin, AST, ALT, ALP, and higher albumin levels. Antibiotics combined with percutaneous aspiration or drainage are the primary treatments for PLA. Mortality and length of stay of CNPLA and CPPLA were not different. CNPLA should be treated the same as CPPLA.

Keywords: culture-negative, culture-positive, pyogenic liver abscess

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Introduction

A pyogenic liver abscess (PLA) is a suppurative infection of the liver parenchyma. The annual incidence rate of PLA is quite varied, ranging from 3.6 per 100,000 population in the United States to 17.6 per 100,000 population in Taiwan[1,2], the mortality rate was 5.6-7.4%[1,3]. The incidence rate has increased over time; however, the mortality rate is still stable[2]. Most PLA were polymicrobial, with the most prevalent organisms varying across different regions. *Klebsiella pneumoniae (K. pneumoniae)* PLA has mostly been seen in Asia; wherein, gram-negative: especially Enterobacteriaceae and gram-positive cocci, were commonly seen in Europe and the United States[1,2,4,5], with culture-negative PLA being found in 10.0-80.0% of cases[6-8]. The standard therapeutic protocol of CNPLA is still unavailable. This study was conducted to determine demographics and evaluate the treatment outcomes of culture-negative pyogenic liver abscess (CNPLA) compared to those that were culture-positive pyogenic liver abscess (CPPLA).

Material and Methods

Study design and participants

This retrospective study was conducted at the HRH Princess Maha Chakri Sirindhorn Medical Center in Thailand, from January 2011 to May 2023. Study subjects were identified using the ICD-10 codes for hospitalized patients diagnosed with PLA. Amoebic and fungal liver abscesses and infected tumors were excluded. The study was limited to patients >18 years of age. The primary investigator reviewed the medical records to confirm the diagnosis and was approved by a secondary investigator. The third-person investigator was consulted for judgment if a controversial issue was found. PLA was diagnosed based on clinical presentation, laboratory findings, and imaging. Microbiologic data was derived from blood cultures or pus cultures collected through aspiration. CPPLA was defined as an organism shown in blood or pus cultures, and CNPLA was defined as no organism found in any blood or pus culture. Invasive procedures were defined as percutaneous aspiration, percutaneous catheter drainage, and surgical interventions. This study was approved by the Institutional Review Board (IRB) of Srinakharinwirot University (SWUEC/E-257/2564).

Data collection

Demographic data, including age, gender, comorbidities, clinical features, route of infection, laboratory findings, imaging characteristics of abscess, microbiological data, treatment strategy, and clinical outcomes, were collected. Pus collected from aspiration were processed for Gram stain, bacterial cultures, and antibiotic susceptibility testing. Species identification, as well as antibiotic susceptibility, were performed using VITEK automated systems (VITEK 2-compact). The complete resolution of the abscess was documented on follow-up imaging. Metastatic infection was defined as extrahepatic manifestations, such as endophthalmitis, central nervous system infection, lung abscess, skin, and soft tissue infections. Mortality was defined as death due to any cause during hospitalization.

Statistical analysis

Continuous variables were presented as mean ±standard deviation or median with interquartile range; categorical variables were expressed as frequency and percentage. The independent samples t-test was used to analyze continuous variables, and the Chi-square or Fisher's exact was used for categorical variables. A p-value of<0.05 was considered statistically significant. Statistical analysis was performed using Statistical Analysis System (SAS) version 9.3, SAS Institute.

Results

Clinical characteristics of CNPLA and CPPLA

A total of 112 patients with PLA were included. Baseline characteristics are shown in Table 1. The median age was 60.5 years, and 67 patients (59.8%) were male. CNPLA patients were significantly younger than CPPLA patients (median [interquartile range (IQR)] 58 [50-62] vs. 62 [54-72] years, p-value=0.02). Forty-one patients (36.6%) had diabetes mellitus, 54 (48.2%) had hypertension, 9 (8.3%) had chronic kidney disease, 7 (6.3%) had hepatobiliary tract disease and 9 (8.0%) had cirrhosis. About 6.0% of PLA occurred in hepatocellular carcinoma and cholangiocarcinoma patients, with liver abscesses located in regions distinct from the tumors. The most common route of infection was the cryptogenic and biliary route (>95.0%). Other clinical characteristics were not different between both groups.

Clinical presentation and laboratory findings are shown in Table 2. Fever was the most common symptom (77.7%), and the median duration of symptoms in PLA was 7 days (IQR 3-14 days). Jaundice was significantly less prevalent in CNPLA. (0% vs. 12.7%, p-value=0.03), while their clinical presentations were not different. In the laboratory findings details, there were no significant differences between CNPLA and CPPLA in the white blood cell count (median [IQR] 12.7 [9-18] vs. 14.6 [9-19] $x10^3/mm^3$, p-value=0.31), hemoglobin (median [IQR] 10.9 [9-12] vs. 9.7 [8-12] g/dl, p-value=0.31) and creatinine (median [IQR] 0.9 [0.6-1.1] vs. 1.0 [0.7-1.4], p-value=0.31). Additionally, the CNPLA group had significantly lower bilirubin (median [IQR] 0.6 [0.5-1.5] vs. 1.2 [0.6-2.9] mg/dl, p-value=0.02), aspartate transferase (median [IQR] 30 [22-69] vs. 55 [38-107] U/L, p-value<0.01), alanine aminotransferase (median [IQR] 39 [16-81] vs. 57 [35-89] U/L, p-value=0.01), alkaline phosphatase (median [IQR] 192 [94-284] vs. 231 [156-400] U/L, p-value=0.05) and higher albumin levels (median [IQR] 3.3 [2.7-3.6] vs. 2.9 [2.6-3.3] g/dl, p-value=0.03) than the CPPLA group.

In the CPPLA group, 27 patients (34.2%) had positive pus cultures, 26 patients (32.9%) had positive hemocultures, and 26 patients (32.9%) had positive both pus and blood cultures (Table 3). The most commonly identified bacteria were *Escherichia coli (E. coli)* and *Burkholderia pseudomallei* from pus cultures and *K. pneumoniae* from blood cultures (Tables 4 and 5).

Imaging findings of CNPLA and CPPLA

Imaging findings are shown in Table 6. Most of the PLA imaging was shown at 58.9% in single abscess-forming presentation. A single abscess was reported in 57.6% of the CNPLA group and 59.5% of the CPPLA group. The average, maximal diameter of the abscess was 6.4±3.5 cm. with no differences between the two groups. The majority of abscesses involved the right lobe (56.3%), being less common in the left (19.6%) or both lobes (24.1%). Double target sign and wall enhancement were demonstrated in 17.0% and 59.8% of patients. Approximately 40.0% had septation, and 9.0% had internal gas bubbles. There were no differences in the radiological findings (double target sign, wall enhancement, septation and internal gas bubble) of CPPLA compared with CNPLA.

Management and treatment outcomes of liver abscess

Nearly 90.0% of cases received combined antibiotics. Cephalosporin combined with metronidazole was the most common empirical antibiotic therapy (Table 7). Intravenous switch to oral antibiotics were frequently used. The time interval from the initial dose of antibiotic to pus aspiration was not different between CNPLA and CPPLA (2 vs. 2 days, p-value=0.93). The median duration of antibiotic administration was 35 (IQR 28-44) days and the median time to normalize temperature was 3 (2-5) days. The proportion of patients having received drainage

by percutaneous aspiration and percutaneous catheter drainage was 21.4% and 46.4%, respectively. Percutaneous aspiration and percutaneous catheter drainage were performed in 51.6% of the CNPLA group and 74.7% of the CPPLA group. The median duration of percutaneous catheter drainage was 15 (IQR 12-20) days. No patient underwent open surgical drainage. Follow-up imaging after cessation of antibiotics was performed in 71 patients and 49 patients (43.8%) demonstrated complete resolution. The complete resolution of CNPLA and CPPLA were similar. Complications of liver abscess were pleural effusion (25.9%), metastatic infection (12.5%) septic shock (4.5%), portal vein thrombosis (3.6%) as well as rupture (1.8%). The median length of stay (LOS) was 13 (IQR 8-17) days, and the mortality rate was 8.9%. However, complications, mortality, and length of stay were not different between the two groups (Table 7). Sixteen patients in the CNPLA did not undergo aspiration or drainage. After excluding these patients from the CNPLA, there were still no differences in mortality and LOS between CNPLA and CPPLA (p-value= 0.66 and 0.59).

Table 1 Baseline characteristics of patients with CNPLA and CPPLA

Baseline characteristics	Total (n=112)	CNPLA (n=33)	CPPLA (n=79)	p-value
Age, median (IQR)	60.5 (53-68)	58.0 (50-62)	62.0 (54-72)	0.021
Gender, male, n (%)	67 (59.8)	21 (63.6)	46 (58.2)	0.595
Comorbidities, n (%)				
Diabetes mellitus	41 (36.6)	11 (33.3)	30 (38.0)	0.642
Hypertension	54 (48.2)	12 (36.4)	42 (53.2)	0.105
Chronic kidney disease	9 (8.3)	1 (3.0)	8 (10.5)	0.272
Hepatobiliary tract disease	7 (6.3)	1 (3.0)	6 (7.6)	0.672
Cirrhosis	9 (8.0)	2 (6.1)	7 (8.9)	1.000
Hepatocellular carcinoma	3 (2.7)	0 (0.0)	3 (3.9)	0.531
Cholangiocarcinoma	4 (3.6)	0 (0.0)	4 (5.1)	0.427
Route of infection, n (%)				
Biliary	34 (30.3)	8 (24.3)	26 (32.9)	0.282
Portal vein seeding	3 (2.7)	0 (0.0)	3 (3.8)	
Hematogenous artery seeding	1 (0.9)	0 (0.0)	1 (1.3)	
Direct extension	1 (0.9)	1 (3.0)	0 (0.0)	
Cryptogenic	73 (65.2)	24 (72.7)	49 (62.0)	

CNPLA=culture-negative pyogenic liver abscess, CPPLA=culture-positive pyogenic liver abscess, IQR=interquartile range, n=number

Table 2 Clinical presentation and laboratory findings of CNPLA and CPPLA

Clinical presentation	Total (n=112)	CNPLA (n=33)	CPPLA (n=79)	p-value
Clinical manifestation, n (%)				
Fever	87 (77.7)	28 (84.8)	59 (74.7)	0.239
Chill	26 (23.2)	11 (33.3)	15 (19.0)	0.101
Abdominal pain	61 (54.4)	16 (48.5)	45 (57.0)	0.411
Jaundice	10 (8.9)	0 (0.0)	10 (12.7)	0.032

Table 2 (continued)

Clinical presentation	Total (n=112)	CNPLA (n=33)	CPPLA (n=79)	p-value
Weight loss	10 (8.9)	3 (9.1)	7 (8.9)	1.000
Nausea & vomiting	6 (5.4)	0 (0.0)	6 (7.6)	0.177
Duration of symptoms (day), median (IQR)	7 (3-14)	7 (3-21)	7 (3-14)	0.177
Laboratory finding, median (IQR)				
White blood cell ($x10^3/mm^3$)	14.1 (9-19)	12.7 (9-18)	14.6 (9-19)	0.313
Hemoglobin (g/dL)	10.0 (8-12)	10.9 (9-12)	9.7 (8-12)	0.305
Platelet ($x10^3/mm^3$)	307 (174-433)	297 (208-386)	307 (132-449)	0.536
Total bilirubin (mg/dL)	1.1 (0.6-2.7)	0.6 (0.5-1.5)	1.2 (0.6-2.9)	0.020
AST (U/L)	50 (31-91)	30 (22-69)	55 (38-107)	<0.001
ALT (U/L)	54 (26-84)	39 (16-81)	57 (35-89)	0.011
ALP (U/L)	226 (150-370)	192 (94-284)	231 (156-400)	0.046
Albumin (g/dL)	2.9 (2.7-3.4)	3.3 (2.7-3.6)	2.9 (2.6-3.3)	0.025
Creatinine (mg/dL)	0.9 (0.6-1.3)	0.9 (0.6-1.1)	1.0 (0.7-1.4)	0.305

CNPLA=culture-negative pyogenic liver abscess, CPPLA=culture-positive pyogenic liver abscess, n=number, IQR=interquartile range, mm^3=cubic millimetre, g/dL=grams per decilitre, mg/dL=milligram per decilitre, AST=aspartate aminotransferase, ALT=alanine aminotransferase, ALP=alkaline phosphatase, U/L=units per liter

Table 3 Identified bacteria from the culture

Bacterial culture*	n (%)
Hemoculture only	26 (32.9)
Pus culture only	27 (34.2)
Both hemoculture and pus culture	26 (32.9)

*n=79 patients, n=number

Table 4 Pathogen identified from pus culture

The pathogen of pus culture	Number of patients
Escherichia coli	4
Burkholderia pseudomallei	4
Enterococcus spp.	3
Streptococcus spp.	3
Staphylococcus spp.	2
Moraxella osloensis	1
Multidrug resistant *Acinetobacter baumanii*	1
Methicillin-resistant *Staphylococcus aureus*	1
Pseudomonas aeruginosa with *Enterococcus casseliflavus*	1
Streptococcus with *Enterococcus* spp.	1

Table 5 Pathogen identified from blood culture

The pathogen of blood culture	Number of patients
Klebsiella pneumoniae	26
Escherichia coli	8
Burkholderia pseudomallei	6
Enterococcus spp.	4
Streptococcus spp.	3
Multidrug resistant *acinetobacter baumanii*	2
Enterobacter spp.	1
Pseudomonas aeruginosa	1
Streptococcus spp.	1

Table 6 Imaging findings of CNPLA and CPPLA

Imaging findings	Total (n=112)	CNPLA (n=33)	CPPLA (n=79)	p-value
Single abscess, n (%)	66 (58.9)	19 (57.6)	47 (59.5)	0.851
Maximal diameter of abscess, mean (S.D.)	6.4 (3.5)	5.7 (3.3)	6.7 (3.5)	0.194
Max diameter >5 cm, n (%)	70 (62.5)	19 (57.6)	51 (64.6)	0.487
Location of abscess, n (%)				
Right	63 (56.3)	21 (63.7)	42 (53.1)	0.406
Left	22 (19.6)	4 (12.1)	18 (22.8)	
Both lobes	27 (24.1)	8 (24.2)	19 (24.1)	
Double target sign, n (%)	19 (17.0)	6 (18.2)	13 (16.5)	0.824
Wall enhancement, n (%)	67 (59.8)	22 (66.7)	45 (57.0)	0.617
Septation (Multilocular), n (%)	45 (40.2)	9 (27.3)	36 (45.6)	0.072
Internal gas bubble, n (%)	10 (8.9)	3 (9.1)	7 (8.9)	1.000

CNPLA=culture-negative pyogenic liver abscess, CPPLA=culture-positive pyogenic liver abscess, n=number, S.D.=standard deviation, cm=centrimeter

Table 7 Management and treatment outcomes of CNPLA and CPPLA

Management and treatment outcomes	Total (n=112)	CNPLA (n=33)	CPPLA (n=79)	p-value
Antibiotic strategy, n (%)				
Single antibiotic type	12 (10.7)	3 (9.1)	9 (11.4)	1.000
Combined antibiotics type	100 (89.3)	30 (90.9)	70 (88.6)	
Antibiotic regimen, n (%)				
Cephalosporin and Metronidazole	63 (56.2)	21 (63.6)	42 (53.1)	0.308
Cephalosporin	6 (5.4)	2 (6.1)	4 (5.1)	1.000
Quinolones	3 (2.7)	0 (0)	3 (3.8)	0.554
Quinolones and Metronidazole	4 (3.6)	0 (0)	4 (5.1)	0.318
Others	36 (32.1)	10 (30.3)	26 (32.9)	0.788

Table 7 (continued)

Management and treatment outcomes	Total (n=112)	CNPLA (n=33)	CPPLA (n=79)	p-value
Antibiotic route, n (%)				
Intravenous only	18 (16.1)	6 (18.2)	12 (15.2)	0.757
Oral only	1 (0.9)	0 (0)	1 (1.3)	
Intravenous switch to oral	93 (83.0)	27 (81.9)	66 (83.5)	
Duration between the first dose of antibiotic and the pus aspiration, (D), median (IQR)	1 (1-3)	2 (0-3)	1 (1-3)	0.933
Duration of antibiotic (D), median (IQR)	35 (28-44)	39 (28-45)	35 (21-43)	0.660
Temperature normalization (D), median (IQR)	3 (2-5)	3.5 (2-6)	3 (2-4)	0.632
Method of drainage, n (%)				
No drainage	36 (32.2)	16 (48.4)	20 (25.3)	0.056
Percutaneous aspiration	24 (21.4)	5 (15.2)	19 (24.1)	
Percutaneous catheter drainage	52 (46.4)	12 (36.4)	40 (50.6)	
Complete resolution by imaging*, n (%)	49 (43.8)	14 (42.4)	35 (44.3)	0.919
Complication of liver abscess, n (%)				
Pleural effusion	29 (25.9)	11 (33.3)	18 (22.8)	0.245
Rupture	2 (1.8)	0 (0)	2 (2.5)	1.000
Portal vein thrombosis	4 (3.6)	1 (3.0)	3 (3.8)	1.000
Septic shock	5 (4.5)	1 (3.0)	4 (5.1)	1.000
Metastatic infection	14 (12.5)	6 (18.2)	8 (10.2)	0.312
Mortality, n (%)	10 (8.9)	3 (9.1)	7 (8.9)	1.000
Length of stay (D), median (IQR)	13 (8-17)	15 (8.5-16.5)	12 (8-18)	0.388

*Follow-up imaging was performed on 71 patients, CNPLA=culture-negative pyogenic liver abscess, CPPLA=culture-positive pyogenic liver abscess, n=number, D=day, IQR=interquartile range

Discussion

PLA is a potentially life-threatening condition, and in Thailand, its occurrence spans across the entire country[9]. The etiology of PLA varies, with the condition typically manifesting in individuals with underlying hepatobiliary diseases. *E. coli* is the most prevalent causative pathogen[10,11]. In cases associated with biliary tract diseases, the pathogens are often polymicrobial, while cryptogenic abscesses tend to be predominantly monomicrobial[11]. Notably, *K. pneumoniae* emerges as the predominant organism causing PLA in East Asia. Cryptogenic PLA is quite frequent, and diabetes mellitus is identified as the most significant risk factor for *K. pneumoniae* PLA[12-14]. In this present study, *K. pneumoniae* was the most frequently isolated bacteria, and 36.6% of cases were associated with diabetes mellitus. A substantial 65.2% of cases were categorized as cryptogenic PLA. These findings underscore the complexity and diversity of PLA and highlight the significance of understanding regional variations and associated risk factors.

In this study, it was observed that individuals diagnosed with CNPLA were younger compared to those with CPPLA. A conceivable explanation for this age disparity may be attributed to a confluence of factors; including diminished immune function. The alterations in the aging immune system, are characterized by reduced production of B and T cells in the bone marrow and thymus, along with diminished functionality of mature lymphoid tissue. It is noteworthy that elderly patients diagnosed with PLA often present with atypical symptoms[15]. Several studies on

PLA indicated no notable difference in mortality between younger and aging individuals, while others reported a higher mortality rate in the elderly[15-17].

PLA is predominantly localized in the right lobe[18]. The possible explanation for this preferable localization of PLA was a larger size, a denser network of bile canaliculi, and more blood flow from the systemic circulation of the right lobe[19]. Consistent with these findings, our study showed that the majority of PLAs were singular and confined to the right lobe. In the context of PLA, the presence of elevated bilirubin levels, noted at approximately 12.0%, is considered an uncommon occurrence[5,20]. In comparing patients with CNPLA, those with CPPLA exhibited elevated levels of bilirubin, AST, ALT, and ALP. The increased bilirubin observed in PLA may stem from various factors, including concurrent biliary tract disease, cholestasis of sepsis, and, in rare instances, compression of the biliary tree by the abscesses. Lower levels of albumin in CPPLA may serve as an indicative marker of a potentially more aggressive disease course when compared with CNPLA.

Positive pus cultures exhibit substantial variability. The sensitivity of blood cultures was only 30.0% for Gram-positive cocci and 39.0% for Gram-negative bacilli[21]. In our study, the percentage of positive pus cultures was 34.2%, positive blood cultures were 32.9%, and positive for both cultures was 32.9%. The occurrence of CNPLA may be linked to limitations in laboratory capabilities, the lack of widespread availability of advanced microbial detection techniques, an absence of routine pus sampling, improperly collected specimens for anaerobic culture, and the collection of pus after antibiotic administration[6]. However, our investigation revealed no significant difference in the duration between the first antibiotic dose and pus aspiration for CNPLA or CPPLA. The sequencing of the 16S ribosomal RNA gene emerges as a more sensitive approach than traditional culture methods; additionally, it harbors the capacity to augment microbiological diagnostic capabilities[22,23]. Nevertheless, this technique does not provide antibiotic susceptibility data, and its use is limited in resource-constrained settings. Pus culture significantly augments pathogen detection in our study, advocating for percutaneous aspiration or percutaneous catheter drainage being advisable whenever feasible. Nonetheless, our findings underscore that if only one type of specimen is collected; such as hemoculture or pus culture, a diagnosis can be established in only 2⁄3 of cases. Therefore, it is recommended to collect specimens inclusive of both hemoculture and pus culture, as this approach markedly enhances the diagnostic yield for identifying pathogens.

Antibiotics and drainage are the mainstay of treatment, with initial empirical treatment often involving broad-spectrum antibiotics, which are later refined based on antimicrobial susceptibility test results. However, implementing step-down antibiotic therapy poses challenges in the cases of CNPLA. CNPLA can usually be excluded from data analysis, and scant attention is directed towards studying its clinical course, prognosis, and treatment outcomes. CNPLA is usually treated the same as CPPLA, although adjusting oral step-down antibiotics could be contemplated for CNPLA patients. It becomes crucial to assess the activity of intravenous antibiotics in conjunction with the clinical response, taking into account local epidemiology and antibiotic susceptibility for informed decisions.

While the overall incidence of PLA continues to rise, there has been a decline in the mortality rate over the past few decades[2]. The mortality rate of PLA ranges between 6.0-10.0%[1,24], with this study reporting a 8.9% mortality rate; which is lower than a previous study in Thailand[9]. Identified risk factors contributing to PLA mortality encompass older age, the presence of sepsis, cancer, cirrhosis, chronic renal failure, human immunodeficiency virus infection,

and significantly delayed diagnosis[1,9,25,26]. Advanced age, fever, coagulopathy, and elevated urea levels emerged as predictors of CNPLA mortality[6]. As in the previous study[6,8,27], the mortality and length of stay of CPPLA and CNPLA were not different. Both groups commonly received cephalosporin and metronidazole as part of their treatment regimen. According to the results of this study, CNPLA can effectively be treated with the same antibiotic regimen as CPPLA. In a setting in which percutaneous aspiration is not available or the abscess is too small, empirical antibiotic treatment based on local microbiological data is recommended.

This study is constrained by its retrospective nature in addition to its confinement to a single center, which may limit the generalizability of the findings. Additionally, the absence of routine anaerobic cultures and lack of data on over-the-counter drugs before admission are significant limitations. Due to the diverse nature of pathogens involved, a more comprehensive understanding could be gained through further investigations conducted in multiple centers.

Conclusion

CNPLA was found in younger patients compared with CPPLA, and jaundice was more common in CPPLA. Antibiotics and percutaneous aspiration or drainage are the principal treatments for PLA. Complete resolution of liver abscesses was similar between CNPLA and CPPLA. Mortality and length of stay of CNPLA and CPPLA were not different: CNPLA should be treated as CPPLA.

Conflict of interest

There are no potential conflicts of interest to declare.

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