

## Original Research

### Prognostic factors of Pyogenic liver abscess

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#### Background

Pyogenic liver abscess is not uncommonly seen disease in the emergency department, and the symptom of presentation might be subtle initially.

#### Objective

For the majority of pyogenic liver abscess (PLA), fever is one of the commonly seen symptoms. We want to find some characteristics or different outcome of afebrile patients presenting to our emergency department (ED) who had PLA. Otherwise, we found the prognostic factors of length of stay (LOS) and mortality rate.

#### Materials and methods

We retrospectively reviewed consecutive 130 pyogenic liver abscess (PLA) patients hospitalized in a medical center in northern Taiwan from January 1, 2007 to June 30, 2008. We divided into two groups, one is febrile patients presenting to ED who had PLA (FPLA), and the other is afebrile patients presenting to ED (APLA). We collected data of PLA patients for statistical analyses of prognostic factors. T-test analysis and Chi-square test are used to analyze and when the p value is less than 0.05, we consider it reaching clinical significance statistically.

#### Results

The APLA group had significantly lower mortality rate than the FPLA group (0.7% vs. 3.5%,  $p=0.042$ ). The APLA group had longer hospital stay than FPLA group with significant difference (30.5 vs. 23.1 days; 95% CI, 8.6-72.3;  $p=0.035$ ). In patients having shock and elevated liver function tests also had longer length of stay (LOS). Patients had high relative risk (R.R.) of mortality rates in the having diabetes history and shock presentation (R.R. = 6.9, and 4.1).

#### Conclusion

Patients of afebrile pyogenic liver abscess, elevated liver function tests, and shock presentation have longer length of stay. However, febrile pyogenic liver abscess had higher mortality rate than afebrile ones. Patients having diabetes and shock presentation are high risky of mortalities.

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#### Introduction

Here we are interested in pyogenic liver abscess (PLA) who were afebrile status presenting to the emergency department (ED), whether they had different clinical characteristics and outcome or not. Pyogenic liver abscess (PLA) is not an often seen infectious disease in

the ED. The initial presentations of PLA are usually non-specific symptoms, such as fever, chills, anorexia, malaise, mild abdominal pain, and diarrhea, so the PLA patients often went to hospital for help without specific complaints. It leads to be difficult to diagnose PLA ear-

Table.1 Consecutive 130 hepatic abscess, from 1 January 2007 to 30 June 2008.

		n (%)		n (%)
Gender	Female	45 (34.6)	Male	85 (65.4)
Age, years old	< 65	85 (65.4)	≥ 65	45 (34.6)
Body temperature	Afebrile	18 (13.9)	febrile	112 (86.1)
DM history	Have	55 (42.3)	No	75 (57.7)
Abdominal pain	Have	69 (53.1)	No	61 (46.9)
Diarrhea	Have	15 (11.5)	No	115 (88.5)
WBC count (/ μL)	≤ 10000	32 (24.6)	> 10000	98 (75.4)
GOT (IU/L)	≤ 40	41 (29.5)	> 40	89 (70.5)
Shock in ED	Have	25 (19.2)	No	105 (80.8)
Mortality	Dead	6 (4.6)	Alive	124 (95.4)

	Minimum, Maximum		Mean ± SD	95% C.I
Age, years old	25,	93	57.1 ± 15.4	28.3~86.7
WBC count / μL	900,	38800	14745 ± 6943	3528~31265
Glucose, mg/dL	47,	684	222 ± 134	86.5~537.5
GOT	16,	940	88 ± 107	18.6~312.3
Hospital Stay	6,	89	24.1 ± 13.8	8.6~72.3

ly. Halvorsen RA Jr, et al. ever reported that 31% of PLA patients were afebrile; 23% had normal white blood cell (WBC) count, and 13% had normal liver function tests in the year of 1988. So we know that absence of fever, lack of leukocytosis, or normal liver function tests all do not indicate exclusion the possibility of PLA. Nowadays computerized tomography (CT) remains the most reliable imaging modality in detection of hepatic abscess. We also found some prognostic factors of PLA in LOS and mortality rates.

### Study design

We are interested in the characteristics and outcome of afebrile pyogenic liver abscess (PLA) patients. We retrospectively reviewed medical records of consecutive PLA patients from January 1, 2007 to June 30, 2008 hospitalized in a medical center in northern Taiwan. Of them, we divided into two groups, one is afebrile PLA group (APLA) and the other is febrile PLA (FPLA) group presenting to the emergency department (ED). We collected the data of PLA patients including age, fever (body temperature > 37°C by ear thermometer) or not, days of fever on arrival of ED, symptoms of diarrhea, abdominal pain, history of diabetes mellitus (DM), shock presentation (systolic blood pressure < 90 mmHg) or not, mortality or not, hospital stay by days, and laboratory data of WBC count, glucose, liver function test for statistical analyses. T-test analysis and Chi-square test are used to compare the APLA with FPLA group in clinical characteristics and outcome. For all analyses, comparisons were considered to be statistically significant if  $P < 0.05$ .

### Materials and methods

There were 135 consecutive PLA patients hospitalized

from January 1, 2007 to June 30, 2008 in a medical center at northern Taiwan. Of them, five cases did not complete the therapeutic course due to some personal reasons. So we enrolled 130 PLA (45 ladies and 85 men aged from 25 to 93 years old) cases into our study. We collect data of PLA patients including fever or not, days of fever on arrival of ED, symptoms of diarrhea or not, abdominal pain or not, history of diabetes mellitus (DM) or not, shock presentation to ED (systolic blood pressure less than 90 mmHg) or not, mortality or not, hospital stay (days), and laboratory data of WBC count, serum glucose, glutamate oxalate transaminase (GOT) for statistical analyses. We collected data of PLA patients for statistical analyses of prognostic factors. We used SPSS 11.5.0 (SPSS Inc. Chicago, Illinois) to compare the APLA with FPLA group by student T test and Chi-square test in the characteristics and outcome. For all analyses, comparisons are considered to be statistically significant if  $P < 0.05$ .

### Results

The enrolled 130 PLA cases are male predominant with M: F ratio of 1.89: 1. There are forty-five ladies and 85 men aged from 25 to 93 years old with a mean ± SD (57.1 ± 15.4) years old. Forty-one cases (29.5%) had normal GOT; 32 cases (24.6%) had no leukocytosis, and 13.9% cases are afebrile on arrival of ED. Fifty-five cases (42.3%) had history of diabetes mellitus (DM). Sixty-nine cases (53.1%) experienced abdominal pain; 15 cases (11.5%) had diarrhea, and 25 cases (19.2%) had shock (systolic blood pressure less than 90mmHg). Six cases (4.6%) were expired in hospital. The mean ± S.D. (Standard Deviation), minimum, and maximum values of age, WBC count, glucose, GOT, hospital stay are showed in (Table 1)

Blood cultures were not available in 4 cases, and the positive culture rate was 53.2%. Of the bacteria-growth 67 cases, 79.1% cases grew Klebsiella

**Table 2.** Pathogen distribution of cultures

	Blood culture	Pus culture
Total (n)	126	95
Not available (n)	4	35
No growth (n)	59	20
Positive rate (%)	53.2	78.9
Klebsiella pneumoniae (n)	53	59
(%)	79.1	78.7
Non-K.P	(%) 20.9	21.3

**Table 3.** Comparisons of afebrile hepatic abscess patients in clinical symptoms and multivariate parameters (\*=Statistical significance).

	afebrile 18 (13.9%)	febrile 112 (86.1%)	p value
Age, years old	59.7 ± 16.1	56.7 ± 15.3	p=0.44
WBC/ $\mu$ L	15597 ± 8475	14608 ± 6699	p=0.58
Glucose (mg/dL)	191 ± 105	227 ± 138	p=0.29
GOT (IU/L)	101 ± 211	86 ± 81	p=0.58
Hospital stay, days	31 ± 16	23 ± 13	p=0.03*
Abdominal pain (%)	72.2	50	p=0.08
Diarrhea (%)	11.1	11.6	p=0.95
Shock in ED (%)	16.7	19.6	p=0.08
DM history (%)	38.9	42.9	p=0.09
Mortality (%)	0.7	3.5	p=0.04*

pneumoniae (K.P.). Pus cultures were available in 95 cases, and positive culture rate was 78.9%. Of the bacteria-growth 75 cases, 78.7% cases grew K.P. (**Table 2**).

Eighteen cases (13.9%) were afebrile, and 112 cases (86.1%) were febrile. In age, APLA group are older than FPLA group without significant difference (59.7 ± 16.1 vs. 56.7 ± 15.3 years old, p=0.443). In WBC count, APLA group had higher WBC count than FPLA group without significant difference (15597 ± 8475 vs. 14608 ± 6699/  $\mu$  L, p=0.577). In serum glucose, APLA group had slightly lower glucose level than FPLA group without significant difference (191 ± 105 vs. 227 ± 138 mg/dL, p=0.292). In GOT level, APLA group had higher GOT level than FPLA group without significant difference (101 ± 211 vs. 86 ± 81 IU/L, p=0.580). APLA group had longer hospital stay than FPLA group with significant difference (30.5 ± 16.3 vs. 23.1 ± 13.2, p=0.035). The symptom of abdominal pain is more commonly appeared in APLA group than FPLA group without clinical significance (72.2% vs. 50%, p=0.081). In symptom of diarrhea, there is similar incidence in two groups (11.1% vs. 11.6%, p=0.951). In shock presentation to the ED, the APLA group is lower rate than FPLA group without significant difference (16.7% vs. 19.6%, p= 0.088). APLA group had lower rate of DM history than the FPLA group (38.9% vs. 42.9%, p= 0.099). The APLA

group had lower mortality rate than the FPLA group with significant difference (0.7% vs. 3.5%, p= 0.042) (**Table 3**).

In length of stay (LOS), we found that patients with shock, elevated GOT, and afebrile status had a longer LOS with significant difference. In elevated WBC (white blood cell) count, glucose level, presentation of abdominal pain or diarrhea, and results of blood cultures are not significant factors influencing LOS (**Table 4**).

In the having history of diabetes, shock presentation, and K.P. in the pus culture had high relative risk (R.R) = 6.9, 4.1, and 1.8 of mortality rates. For the factor of elevated GOT, it is not significantly influenced the mortality rate (R.R. =1.1) (**Table 5**).

## Discussion

Pyogenic liver abscess (PLA) is relatively seldom seen infectious disease in the ED. The initial presentations of PLA are usually non-specific, so delay diagnosis is not uncommon nowadays. The common causes of hepatic abscess are cryptogenic, amoebic, fungi, trauma, biliary and iatrogenic (1). The PLA is predominantly in the developed countries; however amebic abscesses are more common in areas where Entamoeba histolytica is endemic (2). In Taiwan, pyogenic cause is also the major part of liver abscess, and it commonly happened to the fifth to sixth decades

	Length of stay (LOS) days	p value
Shock (n=25)	30 ± 20	
Without shock (n=105)	23 ± 12	p=0.02*
GOT > 40 IU/L (n=89)	26 ± 14	
GOT ≤ 40 IU/L (n=41)	20 ± 12	p=0.03*
Febrile (n=112)	23 ± 13	
Afebrile (n=18)	31 ± 16	p=0.03*
Elevated WBC (n=98)	24 ± 13	
Normal WBC (n=32)	26 ± 15	p=0.48
Glucose > 140 mg/dL (n=80)	25 ± 16	
Glucose ≤ 140 mg/dL (n=50)	23 ± 13	p=0.44
Abdominal pain (n=69)	23 ± 12	
No abdominal pain (n=61)	25 ± 16	p=0.47
Diarrhea (n=15)	25 ± 10	
Without diarrhea (n=115)	24 ± 14	p=0.72
B/C K.P (n=52)	26 ± 15	
B/C Non-K.P (n=17)	28 ± 12	p=0.56
B/C No growth (n=59)	22 ± 13	p=0.12

Table.4 Multivariate parameters comparisons in LOS, \* = statistical significance, p <.05

Shock = systolic blood pressure < 90 mmHg in emergency department.

Febrile = body temperature > 37°C

Elevated WBC = white blood cell count > 10000/μL

B/C = result of blood culture. K.P = *Klebsiella pneumoniae*.

in age of adults. The male: female ratio of PLA is 1.89: 1 in our study. The mean age of PLA patients in our study is 57.1 years old, and it seems to be older than the data from United States of America (52 years old) (1). Diabetes mellitus (DM) is 3.6-fold risk for experiencing PLA, and there is also 6.9-fold risky of mortality than they have not DM history in our study (3).

The most common presentations of liver abscess (LA) are fever, abdominal pain, chills, diarrhea, nausea, vomiting, fatigue, malaise and anemia (1, 4, and 5). But not every PLA patient had fever upon arrival of ED. Afebrile status does not be equal to exclude the possibility of PLA (6). In our study of one and half year 130 PLA cases, 13.9% were afebrile presenting to ED. So we are interested in figuring out the characteristics and outcome of these PLA patients without fever in ED. Additionally we find 29.5% of PLA patients had normal serum GOT level, and 24.6% PLA patients had no leukocytosis. Abdominal pain is the second common symptom appeared, and it only appeared in 53.1% of PLA patients. The most common site of abdominal pain of PLA is at the right upper quadrant (RUQ) area.

Positive pus culture rate (78.9%) is higher than positive blood culture rate (53.2%), and *Klebsiella pneumoniae* was the most common pathogen in blood and pus culture (79.1%, 78.7%). This is similar to the report from east and southern ASIA (7, 8). In the image study, CT remains the most sensitive imaging modality available for the detection of hepatic abscess (6). The afebrile PLA (APLA) patients had longer hospital stay than the febrile PLA (FPLA) patients (30.5 vs. 23.1

days, p= 0.035), because the APLA patients are 3 years older than the FPLA ones (59.7 vs. 56.7, p=0.443), and having higher WBC count than FPLA ones (15597 vs. 14608, p= 0.577). Patients with shock, elevated GOT and afebrile status had longer LOS than the patients without shock, normal GOT, and febrile ones. The WBC counts, glucose level, symptoms of abdominal pain, diarrhea, and which kind of bacterial, microorganisms are not significant factors influencing the LOS in PLA.

The APLA patients had lower mortality rate than the FPLA patients (0.7% vs. 3.5%, p=0.042), because APLA patients had lower shock rate upon arrival of ED (16.7% vs. 19.6%), and 4% less DM history (38.9% vs. 42.9%) than FPLA patients. For mortality rate of PLA, is associated with large abscess, diabetes mellitus, sepsis and septic shock (3, 7, and 9). In our study, in-hospital mortality rate is 4.6%, lower than the 10-year series reported in the year of 2001 from a medical center in southern Taiwan (6%) (7). The recent trend of decreasing mortality of PLA is ever reported in the year of 2004 from New York, a 10-year study of 79 PLA cases with a mortality rate of only 2.5% (10). Having history of diabetes, shock presentation, and K.P. in the pus cultures are high risky of mortalities. About the factor of elevated GOT, it influenced the LOS rather than mortality risk.

### Limitation

In our study, there are still some confounding factors such as previous medication for fever or flu symptom, single center study, and only one and half year duration

**Table 5.** Comparisons of multivariate parameters in odds ratio of mortality rates.

	Mortality rate	Odds ratio of Mortality rate
DM history (n=55)	9 %	6.9
Without DM history (n=75)	1.3%	
Shock (n=25)	12 %	4.1
Without shock (n=105)	2.9%	
K.P in Pus culture (n=59)	5.1%	1.8
Non-K.P in Pus culture (n=16)	2.8%	
Normal GOT (n=41)	4.9%	1.1
Elevated GOT (n=89)	4.5%	
Febrile (n=112)	4.5%	0.8
Afebrile (n=18)	5.6%	
K.P in Blood culture (n=53)	3.8%	0.5
Non-K.P in Blood culture (n=14)	7.1%	

of cases. These are our concern and limitations to our study.

### Conclusion

Afebrile hepatic abscess patients are older, having higher WBC count, so we should early diagnose and treat the afebrile PLA patients in ED. They had longer hospital stay and lower mortality rate than febrile PLA patients because of less shock presentation to ED. Afebrile pyogenic liver abscess patients had relative lower mortality, but had a longer LOS. Patients of afebrile pyogenic liver abscess, elevated liver function tests, and shock presentation have longer length of stay. Patients having diabetes and shock presentation are high risky of mortalities.

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