

RESULTS OF THE ANTIBIOTICS TREATMENT COMBINED WITH LIVER ABSCESS DRAINAGE AT NGUYEN TRI PHUONG HOSPITAL

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ABSTRACT

Background: Percutaneous drainage of liver abscess is the initial treatment of choice for abscesses larger than 5 cm in size and has long been applied in many hospitals in Vietnam. However, there are not many summary reports on both antibiotic treatment and abscess drainage under ultrasound guidance. **Subjects and methods:** Retrospective study of patients with liver abscess who were treated with antibiotics and drained the abscess under ultrasound guidance at Nguyen Tri Phuong Hospital from January 2017 to March. 12/2022. **Results:** There were 61 patients included in the study. The first-line antibiotic treatment is Cephalosporin III generation combined with intravenous metronidazole, most are sensitive to third generation Cephalosporins (49.2%), 8.2% are multi-resistant ESBL-secreting bacteria using Carbapenems. The treatment success rate is high (96.7%). The time for the patient to have no fever and no pain in the right lower quadrant is from 1 to 4 days. Most of the interventions were 1 time (90.2%). The average tube retention time was 12 days. **Conclusion:** Treatment of liver abscess with antibiotics combined with ultrasound-guided drainage is an effective and safe measure. Most of the cases are only intervention 1 time with high success rate.

Keywords: *liver abscess, antibiotics, ultrasound-guided drainage*

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I. INTRODUCTION

Liver abscess is a collection of pus in the liver parenchyma, usually due to the invasion of bacteria, parasites through the blood or biliary system. The disease is common in tropical countries, including Vietnam.

In 1938, Ochsner reported for the first time the treatment of liver abscess by surgical drainage. Over the past three decades, thanks to the advent of multiple classes of antibiotics, improvements in microbiological testing, improvements in supportive care, and in particular advances in guided drainage techniques. Imaging (ultrasound, computed tomography) has brought many options in the treatment process.

Although there is no consensus on guidelines of the optimal treatment strategy for liver abscesses, percutaneous drainage is the initial treatment of choice for large abscesses. more than 5 cm has liquefied.

In Vietnam, ultrasound-guided percutaneous drainage of liver abscess has long been applied in many hospitals across the country. However, there are not many summary reports on both antibiotic treatment and abscess drainage under ultrasound guidance. The question is, is the ultrasound-guided percutaneous puncture of liver abscess effective and safe?

Therefore, I carry out the topic "Evaluating the results of treatment of liver abscess with antibiotics combined with percutaneous drainage of the abscess under ultrasound guidance" with two objectives:

1. Describe ultrasound-guided drainage specification and microbiological results.

2. Evaluation of results of treatment of liver abscess with antibiotics combined with drainage under ultrasound guidance.

II. SUBJECTS AND METHODS

2.1. Object: Retrospective descriptive study of patients (patients) diagnosed with liver abscess at Nguyen Tri Phuong Hospital from January 2017 to December 2022 who met the study selection criteria.

Disease selection criteria:

- Patient > 15 years old
- All patients were diagnosed with liver abscess according to ICD-10 diagnosis code K75.0 or A06.4, based on clinical signs and symptoms such as fever and leukocytosis, characteristic picture of pressure foci. vehicle on ultrasound or computed tomography, serology, culture evidence, and analysis of blood or pus samples.

- The patient was treated with antibiotics in combination with draining the liver abscess under ultrasound guidance at the Department of General Surgery, Nguyen Tri Phuong hospital .

- Medical record.

Exclusion criteria:

- Broken liver abscess.
- Abdominal effusion.
- Abscess liver cancer.

2.2. Conduct method:

Looking back through old records and making a case study to record variables:

- Specification: Time of procedure, number of times to place drainage. Abscess volume was recorded on day 1, day 3 and day of drain removal. The volume of pus drained by the pig-tail drainage on day 1, day

3 after drainage and the day of drain removal.

- Treatment results (from the time of drainage to 7 days after discharge): Time of patient's fever, time of patient's abdominal pain, Time of white blood cell count to normal values (<10 G/L), Hospital stay, Drainage time, treatment outcome (success/failure), Post-procedural complications

Successful treatment:

- Place the drainage tube into the abscess cavity.

- Improve clinical and subclinical symptoms.

- No need for surgical intervention.

- The abscess was clear of fluid, showing signs of regeneration and the patient was discharged afterwards.

Treatment failure:

- The drainage tube cannot be placed into the abscess cavity.

- No improvement in clinical and subclinical symptoms.

- The patient must undergo surgical intervention or die.

Data processing using SPSS 26.0 software

III. RESEARCH RESULTS

61 patients were treated with antibiotics combined with drainage of liver abscess under ultrasound guidance at the Department of General Surgery, Nguyen Tri Phuong Hospital from January 2017 to December 2022.

When studying on patients, we have the following comments and results:

3.1. Research sample characteristics (n = 61)

- Gender: 38 (62.3%) male patients and 23 (37.7%) female patients. The male/female ratio is 1.65/1.

- Age: the youngest is 28 years old and the oldest is 82 years old, the average is 56.1 ± 12.3 years old.

3.2. Specifications and microbiology

Abscess drainage technique under ultrasound guidance

- 100% of patients are drained by 8.5F pigtail tube and drained pus will be sent for

culture with 2 blood cultures, for antibiotic analysis.

- The procedure time ranges from 15 minutes to 25 minutes, the average is 19.1 ± 2.5 minutes.

- The average number of drainage placements is 1.1 ± 0.3 times. There were 55 patients (90.2%) with 1 time drainage, 6 (9.8%) cases with 2 times.

Microbiological results

Table 1. Results of blood culture and pus culture (n = 61)

		Number of patients	Ratio (%)
Blood culture	Negative	50	82
	Positive	11	18
pus culture	Negative	26	42.6
	Positive	35	57.4

Comment: Blood culture was positive in 11 patients (18%). Culture of pus was positive in 35 patients (57.4%).

Table 2. Microbiological results (n = 61)

Bacteria	Number of patients	Ratio (%)
Klebsiella pneumonia	26	42.6
Escherichia coli	6	9.8
Viridans streptococci	first	1.6
Burkholderia pseudomallei	2	3.2
Amoeba	4	6.6
Unable to identify microorganisms	22	36.0%

Comment: *Klebsiella pneumonia* had 26 patients (42.6%) accounting for the highest rate.

Antibiogram results (n = 35)

- There were 30 patients (85.7%) sensitive to third-generation cephalosporins. There were 5 patients (14.3%) multi-resistant bacteria secreting ESBL.

3.3. Treatment results

Time to improve symptoms

- The shortest time for patients to be fever-free after drainage was 1 day, the

longest was 4 days, the average was 1.9 ± 1.1 days.

- The duration of symptoms of right lower quadrant pain is from 1 to 4 days, the average is 2.2 ± 0.9 days.

- The time for leukocyte index to normalize after drainage is from 1 to 5 days, the average is 2.9 ± 1.1 days.

Comparison of paraclinical results

Table 3. Comparison of paraclinical results at day 1 and day 3 after drainage

	Day 1	Day 3	T	p
White blood cells (G/L)	13.3 ± 4.2	9.3 ± 2.5	13.5	p < 0.05
Blood bilirubin (umol/l)	15.0 ± 7.6	15.2 ± 7.8	-0.9	p = 0.341
Blood glucose (mg/dl)	133.9 ± 75.1	121.8 ± 49.8	3.2	p < 0.05
ALP (U/L)	213.6 ± 42.2	196.6 ± 34.4	12.3	p < 0.05
AST (U/L)	64.5 ± 50.1	59.4 ± 49.6	10.3	p < 0.05
ALT (U/L)	63.0 ± 48.8	60.4 ± 48.5	6.2	p < 0.05
Abscess volume (ml)	236.6 ± 46.3	138.9 ± 28.3	34.6	p < 0.05
Volume of pus / 24 hours (ml)	39.8 ± 5.7	19.8 ± 3.4	22.3	p < 0.05

Comment:

- Abscess volume on day 3 was recorded from 90 to 214 ml, average was 138.9 ± 28.3 ml, decreased compared to day 1, this difference was statistically significant (p < 0,05).
- The volume of pus in 24 hours on the 3rd day was from 15 to 25 ml, on average 19.8 ± 3.4 ml, lower than on day 1 (p < 0.05).

Table 4. Comparison of the paraclinical results at day 3 and the day of drain removal

	Day 3	The day of drain removal	T	p
White blood cells (G/L)	9.3 ± 2.5	7.2 ± 1.2	5.6	p < 0.05
Blood bilirubin (umol/l)	15.2 ± 7.8	15.3 ± 7.9	0.3	p = 0.79
Blood glucose (mg/dl)	121.8 ± 49.8	115.9 ± 37.6	2.9	p < 0.05
ALP (U/L)	196.6 ± 34.4	182.6 ± 26.7	11.0	p < 0.05
AST (U/L)	59.4 ± 49.6	57.9 ± 49.5	10.2	p < 0.05
ALT (U/L)	60.4 ± 48.5	59.3 ± 48.5	3.5	p < 0.05
Abscess volume (ml)	138.9 ± 28.3	131.8 ± 28.1	10.8	p < 0.05
Volume of pus / 24 hours (ml)	19.8 ± 3.4	2.9 ± 1.4	34.6	p < 0.05

Comment:

- The volume of the abscess on the day of drainage was 88 ml to 201 ml, the average was 131.8 ± 28.1 ml. Abscess volume decreased significantly compared to day 3 (p < 0.05).
- The white blood cells: 7.2 ± 1.2 G/L, blood glucose: 115.9 ± 37.6 mg/dl, ALP: 182.6 ± 26.7 U/L. These tests have a decrease compared to day 3, this difference is statistically significant (p < 0.05).

Time to drain drainage and hospital stay

- The retention time of the drain is 9 to 18 days; the average is 11.6 ± 2.3 days.
- The shortest mean hospital stay was 11 days, the longest was 21 days, average 13.9 ± 2.4 days.

Result evaluation

Table 5. Evaluate the result (n = 61)

	Number of patients	Ratio (%)
Success	59	96.7
Failure	2	3.3
Complications after the procedure	first	1.6

Comment: Percutaneous drainage of liver abscess under ultrasound guidance was successful in 59 patients (96.7%), failed in 2 patients. Complications after the procedure recorded 1 patient had a complication of displacement of the drainage tube after the procedure.

Correlation between abscess volume and length of hospital stay

The Pearson Correlation test showed a positive linear relationship between abscess volume and hospital stay with $p < 0.05$ and $r = 0.588$ ($0 < r < 1$). Thus, the larger the abscess volume, the longer the hospital stays.

Correlation between white blood cell count and length of hospital stay

Pearson Correlation test showed that there was a positive linear correlation between abscess volume and hospital stay with $p < 0.05$ and $r = 0.564$ ($0 < r < 1$). Thus, the higher the white blood cell count, the longer the hospital stays.

IV. DISCUSSION

4.1. Specifications and microbiology

Number of drain placements

In our study, the average number of drainage insertions was 1.1 ± 0.3 times, at least 1 time and the highest being 2 times. There were 55 patients with 1 time drainage, 6 patients with 2 times. In which, 5 patients had to be placed for the second time because the patient had many abscesses on both sides of the liver lobes. The abscess has progressed to liquefaction and should be placed later. One patient resettled due to complications of tube displacement, ineffective drainage. Abusedera et al (2014) et al also reported 44 patients with drainage, 40 patients with 1 time drainage and 4 patients with 2 times drainage. The reason is that the multi-lobed

liver abscess in these 4 patients made drainage of pus ineffective. These four cases were then assigned to a second drainage and the tube size was increased from 8F to ¹.

Time to perform the procedure

The average procedure time in our study was 19.1 ± 2.5 minutes (ranged from 15-25 minutes). Our implementation time has no difference with the author's record Abusedera (2014) is 25 minutes (ranged from 15-35 minutes) ¹.

Microbiological results

Systemic antibiotic therapy stays the mainstay of treatment. The regimen must be considered tailored to target specific microorganisms isolated from abscess fluid or blood cultures. The recommended duration of parenteral antibiotic therapy is 2 to 3 weeks or until clinical improvement occurs. Oral antibiotic therapy should be supplemented and continued for another 2–6 weeks until clinical, laboratory, and imaging evidence of complete resolution of the abscess cavity. In our study, all 61 patients were tested microbiologically for pathogens. After being diagnosed with liver abscess, a blood sample will be taken for anti-amoeba sera and cultured before using antibiotics. Abscess purulent specimens were also sent afterwards. There were 22 patients (36%) unable to isolate pathogenic microorganisms. The explanation for this problem, in addition to the reason for idiopathic liver abscess, is also due to the use of antibiotics or anti-amoeba drugs before going to the hospital.

Regarding blood and pus culture results, positive pus culture was recorded in 35 patients (57.4%) and negative in 26 patients (42.7%). Blood cultures were positive in 11 patients (18%) and negative in 50 patients (82%) (Table 1). Results of blood culture and pus culture in the study of Shuangjun He et

al (2020): the rate of positive pus culture was 70.7%, negative pus culture was 21.9%. The rate of positive blood culture was 26.8% and negative blood culture was 51.2%². The rate of isolation of pathogenic microorganisms in our study was lower than that of Shuangjun He et al., but similar in characteristics: the rate of isolation of pathogenic microorganisms from latex samples. The abscess was significantly higher from the blood sample. More importantly, we did not record any patient with negative pus culture but positive blood culture. Purulent culture is more sensitive and accurate than blood culture. Brunetti et al. found that abscess cultures were more positive than blood cultures. Microbiological results in our study recorded 26 patients (42.6%) *Klebsiella pneumoniae*, 6 patients (9.8%) *Escherichia coli*, 2 patients (3.2%) *Burkholderia pseudomallei* and 1 patient (1.6%) *Viridans streptococci*. Our results are similar to those recorded in the study: Dalong Yin et al (2020): 36.6% are *Klebsiella pneumoniae*, 1.9% are *Escherichia coli*, 2.9% are other bacteria³. Cristina Serraino et al (2018) recorded 26.5% as *Escherichia coli*, while *Klebsiella pneumoniae* accounted for only 5.6%⁴. We found *Klebsiella pneumoniae* to be the most common cause of liver abscess. Our results and Dalong Yin's are different from those reported by Cristina Serraino. The spectrum of pathogenic bacteria varies by geographical location. *Escherichia coli* is the most common cause in Western countries⁴, while *Klebsiella pneumoniae* is the most common cause in Asian countries⁴.

Regarding the results of antibiogram, the study recorded 30 patients (85.7%) sensitive to third generation cephalosporins, 5 patients (14.3%) multi-resistant bacteria secreting ESBL. With the above 30 patients, we

continued with the third-generation cephalosporin regimen in combination with metronidazole, and in 5 cases of multi-resistant bacteria, the patient was changed to carbapenem antibiotic group. These patients are all stable. There were 4 patients with amoebic liver abscess who were switched to metronidazole plus paromomycin regimen, which also responded well. In summary, most cases respond to a combination of a third-generation cephalosporin and metronidazole and should be used soon after diagnosis.

4.2. Treatment results

Drainage has been shown to be more effective than aspiration, especially for abscesses larger than 5 cm. In addition to the size of the abscess, other indications for percutaneous abscess drainage include: no clinical improvement after 48-72 hours of intensive therapy, clinical or ultrasound features suggesting a possible abscess. perforation risk⁵. Compared with aspiration of the abscess, drainage has a higher success rate, the mean time for the abscess to reduce 50% in size from baseline is significantly faster⁴.

The drainage method solves the remaining problems of the aspiration method because of its ability to continuously drain pus, good drainage due to the large size of the catheter and prevent the re-establishment of pus. Drainage quickly deflates the abscess in the initial time but does not change the time of abscess lysis.

4.4.1. Patient's time to clinical improvement

The study noted that the time to resolution of fever symptoms ranged from 1 to 4 days, with an average of 1.9 ± 1.1 days. The duration of symptoms of right lower quadrant pain is from 1 to 4 days, the average is $2.2 \pm$

0.9 days. The time to clinical improvement reported by Sukhjeet Singh et al (2013) was 4.5 ± 1.5 days⁶, reported by Arpit Bansal et al (2015) was 4.2 ± 1.7 day⁷. This result is longer than our results. In the study of the two authors above, the clinical improvement time of the drainage method was shorter than that of the aspiration method. This difference is likely due to a difference in the procedure performed. After placing the drainage tube into the abscess cavity, the operator actively aspirates as much pus as possible. This operation is repeated every day to ensure that the tube is not blocked by excessive pus and that the drainage is effective. Thanks to this, the size of the abscess decreased significantly, the clinical improvement was faster than the above studies.

Time for leukocytes to return to normal

The study recorded the time to normalize the leukocyte index after drainage from 1 to 5 days, the average being 2.9 ± 1.1 days. In the case of multifocal liver abscess, there are small non-liquefied abscesses that cannot be drained, so the leukocytes return to normal later. Multi-lobed liver abscess, pus is often dense and internal septum limits the removal of pus, so it improves slowly, it is necessary to pump the drainage tube every day.

Clinical changes on day 3 after drainage

The study noted that on the 3rd day compared to the 1st day, the blood bilirubin level still did not change significantly. Enzymes AST and ALT decreased but still increased above normal values. The average white blood cell count was 9.3 ± 2.5 G/L, improved compared to day 1, most of which were within normal values. The ALP and blood glucose indexes also improved compared to day 1. The mean abscess volume was 138.9 ± 28.3 ml, compared to day 1, 236.6 ± 46.3 ml. This difference is

statistically significant ($p < 0.05$). The volume of pus in 24 hours on day 1 was 39.8 ± 5.7 ml, day 3 was 19.8 ± 3.4 ml. The amount of pus on day 3 was lower than on day 1, the difference was statistically significant ($p < 0.05$).

Clinical changes on the date of drainage removal

Similar to the above, the bilirubin index on the day of hospital discharge also did not change significantly. AST and ALT were changed but still slightly increased. The white blood cell count was normal, the average value was 7.2 ± 1.2 G/L. The blood glucose and ALP indexes also improved compared to day 3. The mean abscess volume was 131.8 ± 28.1 ml, the pus volume in 24 hours was 2.9 ± 1.4 ml, significantly lower than the 3rd day ($p < 0.05$). On ultrasound, there was also little fluid inside the abscess, mainly solid abutments and signs of regeneration. In summary, the blood bilirubin, AST, ALT indexes had no significant changes. The white blood cell count usually improves on day 1 after drainage and is mostly normal on day 3. The ALP index also improves and blood glucose should be controlled during treatment. The volume of the abscess and the amount of pus drained in 24 hours also decreased over time. The drain is withdrawn when the 24-hour pus volume is < 10 ml for 2 consecutive days. Ultrasound showed that the abscess had very little fluid and was regenerating.

Tube retention time

Abscess drains are monitored and evaluated every day. Daily irrigation is necessary to monitor the daily amount of pus and avoid blockage of the tube. The drain is withdrawn when the amount of fluid in the tube is less than 10 ml /24h for two consecutive days. In our study, the average

drainage time was 11.6 ± 2.3 days, the lowest was 9 days and the highest was 18 days. Our results are similar to those reported in other studies: Sukhjeet Singh et al (2013) recorded 10.4 ± 3.7 days (range 6 – 23 days) ⁶. Arpit Bansal (2016) recorded a mean drainage time of 9.8 ± 3.5 days ⁷.

Length of hospital stay

The patient's treatment course lasts until the drain is removed, the tests return to normal, the clinical symptoms improve for at least 3 consecutive days, then he will be considered for discharge. The average hospital stay recorded in our study was 15.2 ± 5.0 days, the shortest was 11 days, the longest was 21 days. Authors' results: Arpit Bansal et al (2016) recorded a mean hospital stay of 10.8 ± 3.5 days ⁷, Ashish K Jha (2019) recorded a mean length of 14 ± 6.8 days ⁸. The mean hospital stays of the abscess drainage method in our study and the authors did not differ much. After performing the Pearson Correlation test, we found that the leukocyte value on admission and the abscess volume were positively correlated with the length of hospital stay. The higher the leukocyte count or the larger the abscess volume, the longer the hospital stays.

Result evaluation

Successful treatment is defined as the patient's clinical symptoms are gone, blood tests are normal without surgical intervention, the abscess is free of fluid, and the patient is discharged from the hospital afterwards. Treatment failure was defined as a patient with no clinically significant improvement or post-treatment worsening, death, or surgical intervention. Our study recorded 61 cases of liver abscess with drainage, successfully treated 59 (96.7%) patients. Treatment success rate reported in

studies: Arpit Bansal (2016) recorded 98% successful cases ⁷. Abusedera et al (2014) reported a success rate of 98% of ¹. Our treatment success rate is not much different from the authors. There were 2 (3.3%) patients who failed treatment. In the first case, the cause of failure was a large multi-lobed abscess, the drainage tube was still in place, but the drainage was not good, the biochemical tests did not improve, and the patient had signs of sepsis. The patient then underwent laparoscopic drainage of the abscess. The second case was a large multi-lobed abscess located near the liver capsule. The drainage tube is still in place, but pus leaks along the tube foot into the abdomen causing peritonitis. The patient underwent laparoscopic lavage with drainage. Both patients had clinical improvement after surgery and were discharged afterwards. Abusedera et al (2014) also reported 1 case of failure in 45 cases of drainage treatment. This case is a multi-lobed abscess, with many solid pus and pseudomembranous pus, so the drainage tube does not work effectively even though the author has replaced the 12F drainage tube. This patient was subsequently assigned to surgical drainage ¹.

V. CONCLUSION

Treatment of liver abscess with antibiotics combined with ultrasound-guided drainage is an effective and safe measure. Most of the cases only had one-time intervention with a high success rate of 96.7%. No serious complications leading to death or prolongation of treatment were recorded.

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