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ORIGINAL ARTICLE

Percutaneous needle aspiration for liver abscess: Clinical profile and outcome analysis from Adam Malik General Hospital, Medan

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ABSTRACT

Ultrasonography (USG)-guided percutaneous needle aspiration (PNA) is an easy-to-perform, minimally invasive, low-risk, and cost-effective procedure for managing liver abscesses. However, only a few studies have described the clinical characteristics of liver abscess patients treated with this technique. This study aimed to evaluate the effectiveness of PNA in patients with liver abscesses treated at Adam Malik General Hospital, Medan. This observational descriptive study included 25 patients with liver abscesses admitted to Adam Malik General Hospital, Medan, in 2023. Participants were selected through total sampling. Variables assessed included demographic characteristics, history of alcohol or toddy consumption, length of hospital stay, number of aspiration sessions, clinical symptoms, ultrasonography findings, and antibiotic use. Data were collected as primary data through direct interviews and clinical observations during hospitalization. A total of 25 liver abscess cases underwent PNA during the study period. Most patients were male (23 patients, 92%) with a mean age of 42 years, and 23 patients (92%) had a history of alcohol consumption. All patients (100%) presented with fever and right upper quadrant pain. The mean hospital stay was 6.96 days. Clinical recovery was achieved in all patients, with 20 (80%) requiring only a single aspiration. In conclusion, USG-guided percutaneous needle aspiration combined with antibiotic therapy is an effective and safe approach for liver abscess management, resulting in shorter hospital stays and high recovery rates.

Keywords: percutaneous needle aspiration, liver abscess, ultrasonography, amoebic, pyogenic

INTRODUCTION

A liver abscess is a localized inflammatory process within the hepatic parenchyma containing pus, resulting from a life-threatening complication of bacterial, fungal, protozoal, or parasitic infections.[1] The two most common types are amebic liver abscess and pyogenic liver abscess. The amebic type represents the most frequent extraintestinal manifestation of *Entamoeba histolytica*. Intra-abdominal biliary infections in patients with benign or malignant biliary disease currently account for the majority of pyogenic liver abscesses (50–60%), with *Escherichia coli*, *Klebsiella pneumoniae*, and *Enterococcus* species being the most common causative bacteria. The severity of disease depends on the source of infection and the patient's underlying condition. Differentiating amebic from pyogenic liver abscesses is essential because their clinical course, treatment, and prognosis differ.[2]

Early and accurate diagnosis of both amebic and pyogenic liver abscesses is critical, as symptoms are often nonspecific and complications can be fatal. Mortality rates have declined markedly over recent decades due to advances in interventional radiology, critical care, and antimicrobial therapy.[2] Diagnosis is established through a combination of clinical presentation, laboratory investigations, and imaging studies. The management of pyogenic liver abscess has significantly evolved over the past two decades. Antibiotic therapy remains the cornerstone of treatment, while surgery is reserved for refractory or complicated cases, multiple abscesses, lesions in inaccessible locations, or when abdominal source control is required.[3]

In addition to antibiotics, management of liver abscesses may include aspiration procedures using two main techniques: percutaneous needle aspiration (PNA) and percutaneous catheter drainage, which are selected based on abscess size.[3] Image-guided percutaneous drainage has significantly reduced the need for

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surgical intervention and improved outcomes, with lower morbidity and mortality rates and reported success rates of 70–100%. Both percutaneous needle aspiration and catheter drainage have been shown to be effective and safe.[3] Not all liver abscess cases require catheter drainage. Ultrasound-guided PNA is simple, minimally invasive, associated with a low risk of post-procedural septicemia, and more cost-effective.[4] Therefore, PNA has become the preferred method for managing liver abscesses at Adam Malik General Hospital in Medan. However, limited studies have described the characteristics and clinical profiles of patients undergoing PNA. This study aims to evaluate the effectiveness and patient outcomes of the PNA procedure at Adam Malik General Hospital, Medan.

METHOD

This observational study employed a descriptive design to evaluate the clinical characteristics and outcomes of patients diagnosed with liver abscesses. It was conducted at Adam Malik General Hospital in Medan and included all patients treated during 2023. A total of 25 patients with liver abscesses who underwent percutaneous needle aspiration (PNA) at the hospital during that year were enrolled using a total sampling method.

The study sample was defined by specific inclusion and exclusion criteria. Inclusion criteria comprised patients aged 18 years or older who were diagnosed with liver abscess based on clinical assessment and ultrasonographic findings and who underwent PNA during hospitalization. Exclusion criteria included patients with ruptured liver abscesses, those with severe comorbidities leading to hemodynamic instability, and patients who refused to provide informed consent.

Patient characteristics assessed in this study included demographic data, history of alcohol or palm wine consumption, length of hospital stay, number of aspiration sessions, clinical manifestations, ultrasonographic findings, and antibiotic use. Alcohol or palm wine consumption was determined through patient history and categorized as “yes” if the patient had ever consumed either alcohol or palm wine, and “no” if the patient had never consumed either. Clinical response to treatment was described based on clinical improvement and ultrasonographic findings.

Primary data were collected directly from the patients through face-to-face interviews and physical examinations during hospitalization. The researchers recorded relevant information, including demographic details, clinical symptoms, and history of alcohol consumption, using standardized observation forms. Informed consent was obtained from all participants before data collection.

RESULTS

The descriptive analysis of liver abscess cases managed with percutaneous needle aspiration (PNA) at Haji Adam Malik General Hospital, Medan, in 2023 included 25 patients. Among these, 23 patients (92%) were diagnosed with amoebic liver abscess, while 2 patients (8%) had pyogenic liver abscess. The data demonstrate a marked predominance of amoebic cases over pyogenic ones.

Most patients were male, accounting for 92% of all cases, while only 8% were female. The mean patient age was approximately 42 years, with a standard deviation of 2.47 years, indicating that middle-aged adults constituted the most affected group. A history of alcohol consumption was reported in 23 patients (92%), whereas 2 patients (8%) had no such history. This finding suggests a potential association between alcohol use and the occurrence of amoebic liver abscess.

The mean duration of hospitalization for all patients was 6.96 days. When analyzed by etiology, patients with amoebic liver abscess had a mean hospital stay of 5.88 days, while those with pyogenic liver abscess had an average stay of 9.25 days. The mean number of aspiration sessions was 1.04 per patient, indicating that most cases required only a single PNA procedure.

In terms of clinical presentation, all 25 patients experienced right upper quadrant abdominal pain, fever, and hepatomegaly, representing 100% of the cases. These three features constituted the most consistent clinical triad observed in liver abscess. Jaundice was noted in two patients (8%), and nausea or vomiting occurred in nine patients (36%).

Ultrasonographic evaluation revealed that 80% of patients had a single abscess lesion, whereas 20% had multiple lesions. The right hepatic lobe was the most frequently involved site, observed in 80% of cases, while both lobes were affected in 20%. No case exhibited an isolated left-lobe lesion. Most abscesses appeared hypoechoic on ultrasonography or abdominal CT imaging, consistent with the typical radiologic characteristics of liver abscess.

Table 1. Frequency distribution of liver abscess patients undergoing PNA at Adam Malik General Hospital

Parameter	Amoebic (n = 23)	Pyogenic (n = 2)	Total (n = 25)
Sex			
Male	23 (92.00)	0 (0)	23 (92.00)
Female	0 (0)	2 (8.00)	2 (8.00)
Age (years), Mean ± SD	42.23 ± 3.00	42.87 ± 4.63	42.44 ± 2.47
History of Alcohol Consumption			
Yes	23 (92.00)	0 (0)	23 (92.00)
No	0 (0)	2 (8.00)	2 (8.00)
Length of Hospital Stay (days), Mean ± SD	5.88 ± 0.54	9.25 ± 1.17	6.96 ± 0.60
Number of Aspiration Sessions, Mean ± SD	1.00 ± 0.00	1.12 ± 0.13	1.04 ± 0.40
Clinical Manifestations			
Right Upper Quadrant Pain	23 (92.00)	2 (8.00)	25 (100.00)
Fever	23 (92.00)	2 (8.00)	25 (100.00)
Hepatomegaly	23 (92.00)	2 (8.00)	25 (100.00)
Jaundice	1 (4.00)	1 (4.00)	2 (8.00)
Nausea/Vomiting	7 (30.40)	2 (8.00)	9 (36.00)
Ultrasonography Findings			
Number of Lesions			
Single	19 (82.60)	1 (50.00)	20 (80.00)
Multiple	4 (17.39)	1 (50.00)	5 (20.00)
Lobes Involved			
Right Lobe	19 (82.60)	1 (50.00)	20 (80.00)
Left Lobe	0 (0)	0 (0)	0 (0)
Both Lobes	4 (17.39)	1 (50.00)	5 (20.00)
Antibiotic Use			
Metronidazole	23 (92.00)	0 (0)	23 (92.00)
Culture-Based	0 (0)	2 (8.00)	2 (8.00)

With regard to treatment, all patients with amoebic liver abscess received metronidazole, resulting in favorable outcomes. Both patients with pyogenic liver abscess were treated with antibiotics selected based on culture and sensitivity results. Overall, the combination of metronidazole therapy and percutaneous needle aspiration led to effective clinical improvement and successful management of liver abscess cases in this study.

DISCUSSION

Liver abscesses, both amebic and pyogenic, remain significant causes of morbidity and mortality in tropical countries. In these regions, amebic liver abscess is the most common type. Jindal et al.[2] reported 1,630 cases of liver abscess at the Institute of Liver and Biliary Sciences, New Delhi, from January 2010 to May 2020, with 81% caused by Entamoeba infection. Percutaneous drainage (either needle aspiration or catheter drainage) combined with systemic antibiotics has become the preferred treatment for managing liver abscesses.[5]

In the present retrospective analysis, most participants had amebic liver abscesses, accounting for 23 cases (92%). The high prevalence of amebic liver abscess corresponds with the global incidence of amebic infection, which affects approximately 50 million individuals annually and leads to an estimated 100,000 deaths. Most Entamoeba histolytica infections, particularly amebic colitis, may progress to amebic liver abscess. Furthermore, Kannathasan et al.[6] identified several risk factors for liver abscess, including age, alcohol consumption, and specifically the type of alcohol consumed (toddy). They reported that the majority of liver abscess cases occurred in males (98.6%) aged 41–50 years (62.4%) with a habit of drinking toddy. This finding aligns with the current study, where most patients were male (92%) with a mean age of 42.44 ± 2.47 years.

The most common symptoms observed in this study were fever, right upper quadrant abdominal pain, and hepatomegaly, all present in 100% of cases, followed by nausea and vomiting (36%) and jaundice (8%). These findings are consistent with those of Wang et al.[7] who reported that most patients with liver abscess at the Nanjing Teaching Hospital from January 2013 to December 2015 presented with fever, chills, and abdominal pain. Such symptoms reflect the inflammatory response to abscess formation as the body attempts to eliminate pathogens, which may further promote suppuration. Similarly, Sepulveda et al.[8] found that patients with liver abscess at Dr. Jose Eleuterio Gonzalez Teaching Hospital, Mexico, between 2011 and 2015 most commonly presented with abdominal pain (78.6%) and fever with chills (68%).

This study also showed that the majority of patients (80%) had a single liver abscess, most frequently located in the right lobe (80%). Gajera et al.[5] reported comparable findings among patients at GMERS Medical College and Hospital, Vadodara, between July 2019 and May 2022, where 62% had single abscesses,

predominantly in the right lobe (88%). This predilection is attributed to the larger caliber of the right portal vein branch, which increases susceptibility to abscess formation in the right hepatic lobe.[8]

Recently, ultrasound-guided percutaneous procedures (needle aspiration or catheter drainage) have largely replaced open surgery as the mainstay treatment for both pyogenic and amebic liver abscesses. According to Barshak and Kasper[9], the primary management strategy is abscess drainage, either percutaneous or open, similar to other intra-abdominal abscesses. Antibiotic therapy parallels that used for intra-abdominal sepsis or secondary peritonitis, with optimal selection guided by Gram stain and culture of aspirated pus. They also noted that open surgery is associated with a longer hospital stay compared to percutaneous drainage. However, percutaneous drainage may fail in cases of large or multiple abscesses, viscous contents obstructing the catheter, concurrent surgical pathology, or lack of clinical improvement within 4–7 days.

Many studies have found that percutaneous needle aspiration (PNA) is a less invasive and more cost-effective alternative to catheter drainage, with comparable outcomes. Patients treated with PNA often experience earlier clinical recovery, faster cavity reduction, and a shorter duration of systemic antibiotic therapy. These findings are statistically significant and consistent with the results reported by Kulhari and Mandia[10]. Although some studies have shown that percutaneous catheter drainage (PCD) may reduce abscess size more rapidly, both PNA and PCD are considered safe and effective methods for liver abscess drainage. Moreover, among patients who achieved recovery, PNA demonstrated superior therapeutic outcomes compared to PCD.[11]

In this study, the mean number of aspiration sessions was one, combined with metronidazole therapy, indicating that PNA provided an effective therapeutic response in nearly all cases, thus avoiding repeated aspiration. This resulted in a shorter hospital stay averaging 6.96 ± 0.60 days. These findings are consistent with literature indicating that percutaneous drainage significantly reduces hospitalization time compared to open surgery, often by nearly half.[9] The use of metronidazole in this study aligns with the predominant amebic etiology of liver abscess, particularly Entamoeba histolytica. As a nitroimidazole antibiotic, metronidazole acts by chemically reducing microbial cells, generating reactive byproducts that are toxic to bacteria and protozoa.[12]

CONCLUSION

This study demonstrates that ultrasound-guided percutaneous needle aspiration (PNA) combined with antibiotic therapy is an effective and safe management approach for liver abscesses treated at Adam Malik General Hospital. The findings indicate that most cases were amoebic liver abscesses occurring in middle-aged men with a significant history of alcohol use. Patients commonly presented with the clinical triad of fever, right upper quadrant pain, and hepatomegaly. The procedure achieved favorable clinical outcomes, with 80% of patients requiring only a single aspiration session to recover. In addition, the treatment was associated with a relatively short mean hospital stay of 6.96 days. These results support PNA as a practical, minimally invasive, and cost-effective alternative to catheter drainage for the management of uncomplicated liver abscesses.

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