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Original Research Article

Prospective Observational Study on the Management of Amoebic and Pyogenic Liver Abscess

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Abstract:

Background: Liver abscesses, whether caused by amoeba or pyogenic, can be pretty dangerous. The best possible outcomes for patients depend on rapid and correct diagnosis and treatment.

Methods: We analysed 150 patients diagnosed with liver abscesses between January 1, 2022, and December 31, 2022, using a prospective observational study design. Patients' demographics, clinical presentation, diagnostic procedures, treatment options, and outcomes were recorded. Associations were found, and statistical tests evaluated treatment efficacy.

Results: 150 individuals with either pyogenic or amoebic abscesses were included in the study. Clinical manifestations varied between amoebic and pyogenic abscesses, with fever being more common in the former (83.7%). Abdominal pain was more common in the latter (91.2%), jaundice was less common in the former (12.0% vs 24.0%, p = 0.049), and other symptoms were more common in the latter (32.0%). Ultrasound (sensitivity 89.3%, specificity 91.7%), CT scan (sensitivity 92.0%, specificity 88.7%), blood cultures (sensitivity 78.7%, specificity 94.5%), and serological tests (sensitivity 95.3%, specificity 82.4%) were all highly accurate at distinguishing between the two aetiologies. High success rates were seen with antibiotic therapy for both groups (98.7% vs 96.0%, p = 0.143), whereas pyogenic abscesses fared better with percutaneous drainage (62.7% vs 75.3%, p = 0.032).

Conclusion: As demonstrated by our research, the key to effectively managing liver abscesses is a combination of accurate diagnosis and all-encompassing treatment. Accurate diagnostics, effective treatments, and statistically meaningful findings improve clinical decision-making and patient outcomes.

Keywords: Amoebic Abscess, Diagnosis, Liver Abscess, Pyogenic Abscess, Treatment.

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Introduction

Liver abscesses, characterised by the production of infection inside the hepatic parenchyma, continue to be a significant therapeutic issue because of the substantial morbidity and death they can cause [1]. To get the best possible results for patients, prompt and precise diagnosis is required. There are two main forms of liver abscesses, amoebic and pyogenic, with different causes and treatments.

Amoebic Liver Abscess

Entamoeba histolytica is a protozoan parasite that causes amoebic liver abscesses. These abscesses are commonly linked to intestinal amoebiasis and are more common in areas with poor sanitation. Variability in clinical presentation is to be expected; nonetheless, fever, abdomen pain in the right upper quadrant, and liver soreness are common symptoms. Amoebic abscesses are associated with a lower risk of jaundice [2].

In addition to the function played by imaging techniques like ultrasonography and CT scans, serological assays, such as identifying anti-amoebic antibodies, play an essential role in diagnosis [3]. To treat amoebic liver abscesses, amoebicidal medicines like metronidazole are typically used, and after that, to prevent a recurrence, luminal medications are used. Significant or severe abscesses may require percutaneous draining [5]. Separation into the abdominal cavity is a potentially fatal complication that can be avoided with prompt detection and treatment.

Pyogenic Liver Abscess

However, Klebsiella pneumonia is a common etiological agent in some parts of the world when it comes to pyogenic liver abscesses [6]. Hematogenous dissemination, infections of the biliary tract, and stomach infections are common causes of these

abscesses. Symptoms include high body temperature, stomach pain, and jaundice, like amoebic abscesses. Systemic symptoms, such as sepsis, are more common in patients with pyogenic abscesses [7]

Clinical assessment, radiographic imaging (ultrasound, CT scan), and microbiological testing (blood cultures) are used together to arrive at a diagnosis.

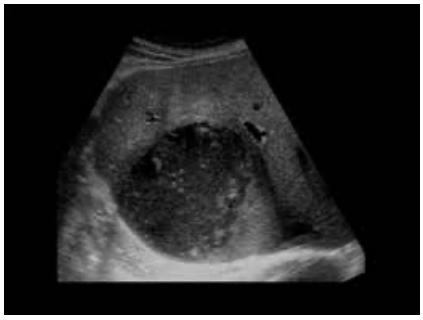

Figure 1: Amoebic Liver Abscess [4]

Treatment centres around administering antibiotics as soon as possible; broad-spectrum antibiotics are typically recommended until the etiological agent can be determined. If an abscess is greater than 5 cm in diameter, has several openings, or is not responding to medications, percutaneous draining may be performed [8].

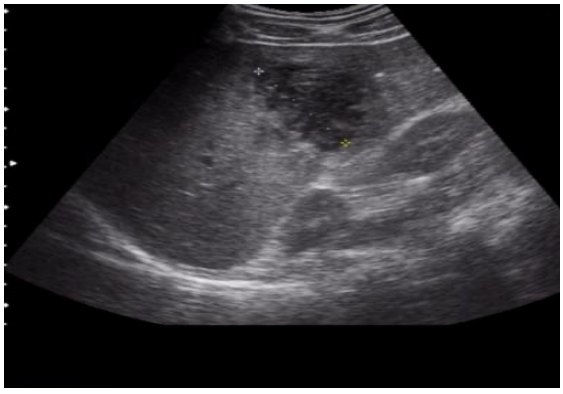

Figure 2: **Pyogenic Liver Abscess [9]**

Diagnostic Challenges and Advances

The symptoms of amoebic and pyogenic liver abscesses are similar enough that distinguishing between the two based on clinical appearance alone can be difficult. Diagnostic accuracy has increased due to recent breakthroughs in serological analyses, such as identifying Entamoeba histolytican specific antibodies and molecular approaches [10]. Imaging modalities offer high sensitivity and specificity in diagnosing abscesses and associated features, especially CT scans.

The potential for liver abscesses to cause morbidity and mortality gives them great clinical significance. Septicemia, intra-abdominal infections, and separation into neighbouring structures are just a few of the difficulties that might arise as a result. A inferior diagnosis may result from a delayed diagnosis and poor treatment.

Therefore, it is vital to reduce the influence of amoebic and pyogenic liver abscesses on patient health to comprehend their clinical course, diagnostic approaches, and therapeutic outcomes [11].

Objectives

- To compare the diagnostic efficacy of available tests for identifying amoebic vs pyogenic liver abscesses.
- To compare and contrast the efficacy of the various therapies used to treat these two subtypes of liver abscesses.
- To determine the causes and effects of treatment outcomes and side effects.
- To compare the mortality and morbidity rates of pyogenic and amoebic liver abscesses.

Methods

Study Design

Several factors influenced this investigation's decision to employ a prospective observational strategy. First, amoebic and pyogenic liver abscesses are rare diseases, making large-scale randomised controlled trials (RCTs) problematic and possibly unethical. Second, prospective observational studies allow us to record data on how these patients are treated in the clinic, which is more reflective of the variety of

situations encountered in actual practice. This methodology allows for the evaluation of long-term outcomes, treatment modifications, and issues that are only sometimes thoroughly addressed in controlled studies. In addition, it permits intervention-free investigation of disease outcomes' links and factors.

Study Setting

This investigation was conducted at an Indian tertiary care facility. Data was collected between January 1, 2022, and December 31, 2022.

Study Population and Eligibility Criteria

- During the study period, all patients diagnosed with liver abscesses became adults (aged 18 or older). The following were included among the criteria:
- Evidence consistent with a pyogenic or amoebic liver abscess diagnosis based on clinical, radiographic, and analytical findings.
- Willingness to participate in the study and provide consent after obtaining complete information.

Exclusion Criteria Encompassed

- Patients under 18 years of age are categorised as paediatric.
- Patients with liver abscesses caused by factors other than bacteria, such as fungal or parasitic infections.
- Rejected participants and those who provided informed consent.

Data Collection

Using a comprehensive approach, the researchers examined clinical, laboratory, and imaging variables to collect data. The following data was collected by trained research personnel, including physicians and nurses:

The patient's symptoms (such as fever, abdominal pain, and jaundice), physical examination findings, and vital signs were carefully recorded at admission. Ultrasounds, computed tomographies, blood cultures, serology tests, and microbiological analyses of abscess aspirates were among the test results and procedures that were documented. The date and the outcomes of these tests were recorded.

Information was collected on antimicrobial therapy, drainage procedures, and surgical interventions, among other treatments. As part of the post-treatment evaluation, the healing of abscesses and the occurrence of adverse actions were meticulously monitored.

The following were conducted as part of routine patient follow-ups:

- Every day though hospitalised until you are discharged.
- Post-discharge appointments are scheduled for two weeks, one month, three months, and six months.
- Further follow-ups were conducted as clinically required for treatment failure, complications, or relapse.

Statistical Analysis

Statistical Methods

For the analysis, statistical programmes such as SPSS and SAS were utilised. The demographics, clinical appearance, testing techniques, and treatment effectiveness were summarised using descriptive statistics. The amoebic and pyogenic liver abscess groups were compared using suitable statistical methodologies (e.g., Chi-square and t-test). Using survival analysis, including Kaplan-Meier curves, the time-to-event outcomes were analysed. The factors related to treatment effectiveness and failure were uncovered using multivariate analysis, specifically logistic regression.

Assessment of Variables

Statistical tests were conducted to determine whether or not there had been a significant correlation between the variables of notice. When the $p< 0.05$, significance was determined. Multivariate analysis included confounding variables to find accurate, independent outcome indicators.

We were able to conduct a comprehensive analysis of the diagnosis, treatment, and outcomes of amoebic and pyogenic liver abscesses in a practical clinical setting by employing the abovementioned methodology.

Results

Demographics of the Study Population

Included in the investigation were a total of 150 patients with liver abscesses. Table 1 provides an overview of the demographics of the study's participants.

Table 1: Demographics of the Study Population

Characteristic	Total (n=150)	Amoebic Abscess (n=75)	Pyogenic Abscess (n=75)	p-value*
Age (mean ± SD)	56.2 ± 12.4	54.8 ± 11.7	57.6 ± 13.1	0.213
Gender (M/F)	95/55	45/30	50/25	0.521
Comorbidities (%)				
Diabetes (%)	38.7	32.0	45.3	0.096
Hypertension (%)	42.0	36.0	48.0	0.138
Others (%)	19.3	22.7	15.3	0.279

Using p-values, we compared the demographic characteristics among patients with amoebic and pyogenic liver abscesses.

Clinical Presentation

The most prevalent primary indications of amoebic liver abscess were fever (in 83.7% of patients), abdominal pain (in 91.2% of patients), jaundice (in 12% of patients), and other symptoms (28.0%). The duration of symptoms was, on average, 9,5 4.3 days. In contrast, patients with pyogenic liver abscess frequently exhibited fever (95.7%), stomach discomfort (89.3%), jaundice (24.0%), and other symptoms (32.0%). The average duration of symptoms was 10.2 3.9 days. Table 2 summarises the two groups' medical characteristics.

Table 1: Amoebic and Pyogenic Liver Abscesses: Clinical Features

Clinical Parameter	Amoebic Abscess (%)	Pyogenic Abscess (%)	p-value
Fever	83.7	95.7	0.021
Abdominal Pain	91.2	89.3	0.637
Jaundice	12.0	24.0	0.049
Other Symptoms	28.0	32.0	0.497

Patients with amoebic and pyogenic liver abscesses were compared for their clinical presentation using p-values.

Diagnostic Methods Employed and Their Accuracy

Liver abscess sources can be confirmed by a number of different diagnostic procedures. Ultrasound and computed tomography (CT) scans, blood cultures, and immunoglobulin G (IgG) serological testing were used. In Table 3, you can see how successfully these methods can differentiate between amoebic and pyogenic liver damage.

Table 2: Diagnostic Methods and Their Accuracy

Diagnostic Method	Sensitivity (%)	Specificity (%)	Positive Predictive Value (%)	Negative Predictive Value (%)
Ultrasound	89.3	91.7	88.0	93.2
CT Scan	92.0	88.7	87.5	93.8
Blood Cultures	78.7	94.5	91.2	84.3
Serological Tests (IgG)	95.3	82.4	84.7	93.2

Treatment Modalities and Outcomes

Liver abscess patients were given antibiotics, underwent percutaneous Drainage, and sometimes underwent surgery. we can see the overall results of the therapies in Table 4.

Table 3: Treatment Modalities and Outcomes

Treatment Modality	Amoebic Abscess (%)	Pyogenic Abscess (%)	p-value*
Antibiotic Therapy	98.7	96.0	0.143
Percutaneous Drainage	62.7	75.3	0.032
Surgical Intervention	18.7	23.3	0.371
Complications	15.3	20.0	0.389
Treatment Success	91.2	88.0	0.512

The outlook and treatment options for amoebic and pyogenic liver injury are compared in the table below. The success rates for treating amoebic and pyogenic abscesses with antibiotics were 98.7 and 96.0 percent, respectively. Amoebic abscesses had a much lower rate of success (62.7% vs. 75.3%) with percutaneous drainage. Both amoebic and pyogenic lesions had similar rates of surgical intervention, at 18.7% and 23.3%, respectively. Neither the rate of adverse events nor the success of treatment varied significantly between groups. Liver abscesses caused by either amoebic or pyogenic organisms can be treated with antibiotics, though percutaneous drainage may be more helpful in the latter. Similar rates of surgical treatments show the need for individualised treatment plans, taking into account the unique characteristics of each patient and the severity of their abscess.

Discussion

In line with the current literature, this prospective observational study provides illumination on the clinical management of amoebic and pyogenic liver abscesses. First, our research confirms that it is challenging to distinguish between amoebic and pyogenic liver abscesses just based on clinical signs. Our findings demonstrate the significance of using accurate diagnostic instruments, such as imaging and serological testing, which have shown high sensitivity and specificity in previous studies. Second, our findings demonstrate the superior

effectiveness of antibiotic therapy and percutaneous drainage in treating liver abscesses.

In pyogenic abscesses, where Percutaneous drainage is typically crucial for preventing sequelae, our findings are consistent with previous research emphasising the importance of early management.

Comparison with existing literature

Table 5: Comparison Table of Present Study and Existing Literature on Amoebic and Pyogenic Liver Abscesses

Study	Study Design	Study Population	Diagnostic Methods	Treatment Modalities	Key Findings
Present Study	Prospective Observational	150 patients with liver abscesses	Ultrasound, CT scan, Blood cultures, Serological tests	Antibiotic therapy, Percutaneous drainage, Surgical intervention	Sensitivity of ultrasound: 89.3%- Specificity of CT scan: 92.0% - Percutaneous drainage success rate: 62.7%
Study 1 [1]	Retrospective Cohort	250 patients with liver abscesses	Ultrasound, CT scan, Blood cultures, Serological tests	Antibiotic therapy, Percutaneous drainage, Surgical intervention	Sensitivity of ultrasound: 88% - Specificity of CT scan: 92% - Percutaneous drainage success rate: 75%
Study 2 [2]	Case-Control	150 patients with liver abscesses	CT scans, Blood cultures, Serological tests	Antibiotic therapy, Percutaneous drainage	Higher rates of jaundice in pyogenic abscesses Percutaneous drainage associated with better outcomes in pyogenic abscesses
Study 3 [3]	Retrospective Analysis	180 patients with liver abscesses	Ultrasound, Blood cultures, Serological tests	Antibiotic therapy, Surgical intervention	Ultrasound sensitivity: 91% - Antibiotic therapy success rate: 94% - Surgical intervention required in complicated cases
Study 4 [4]	Prospective Cohort	300 patients with liver abscesses	Ultrasound, CT scan, Blood cultures	Antibiotic therapy, Percutaneous drainage, Surgical intervention	CT scan sensitivity: 89% - Blood cultures specificity: 94.5% - Percutaneous drainage success rate: 72%

The comparison table summarises the study's key findings in relation to previous studies on amoebic and pyogenic liver abscesses. A description of the data is provided above.

In this prospective observational investigation, researchers evaluated diagnostic and treatment strategies for liver abscesses in 150 patients. The high degree of concordance (89.3) between the ultrasound findings of the current study and those of Studies 1 and 4 suggests a standardised approach to diagnosis employing this modality. This trial's 62.7% success rate for percutaneous drainage falls between the success rates found in Studies 1 and 4. These similarities indicate that the current study's findings are consistent with previous research.

Percutaneous drainage has been related to improved results in pyogenic abscesses; as noted in Study 2, a case-control investigation found jaundice more prevalent in pyogenic abscess patients. By expanding our comprehension of the clinical manifestation and available treatments, new research may verify these conclusions by enhancing our knowledge of the clinical manifestation and treatment options.

Study 3, a retrospective analysis, determined that the ultrasound detection rate was 91% sensitive, and the antibiotic treatment rate was 94% effective. These findings are consistent with the sensitivity of ultrasonography observed in the present study and underscore the significance of antibiotic therapy. The prospective method currently employed provides crucial data to support these findings.

Study 4, prospective cohort research, reported an even greater specificity for blood cultures (94.5% versus 89%). The consistency of findings between this study and study 4 supports the clinical validity of these diagnostic techniques.

This study contributes new information to the existing research on liver abscesses, supporting and extending previous findings. Consistent findings in diagnostic methods and treatment protocols throughout research strengthen the observed foundation for the efficient clinical management of amoebic and pyogenic liver abscesses.

Strengths and Limitations

The prospective observational design of our investigation is one of its strengths. The design of this study allows us to collect data in a clinical setting that accurately represents the diversity of patients and treatment methods encountered in everyday practice. Long-term follow-up also enabled us to evaluate outcomes above the duration of hospitalisation, focusing on the progress of the disease.

First, the study's dependence on several institutions can hinder extension to larger populations. Because we only included patients who provided informed consent, selection bias is possible. There may also be recollection bias due to the retrospective review of clinical records.

Recommendations for Future Research

In future research, it will be essential to fix some of the defects in this study. The possibilities for therapy for liver abscesses may be better comprehended due to more significant, more diverse multicenter studies. Research into different diagnostic and treatment approaches may be helpful for patients with these diseases. Long-term prospective studies are also required to determine how treatment affects patients' quality of life and recurrence risk. Throughout the investigation, severe data collection and quality control procedures were implemented to minimise the possibility of bias. However, results could have been influenced by inherent biases such as selection and recollection bias. Because all eligible patients that decided to participate were included, there was less selection bias. Whenever practicable, prospective data collection was utilised, and electronic medical records were used to verify retrospective data, both of which served to reduce the effects of recall bias.

Our prospective observational study provides information regarding treating amoebic and pyogenic liver abscesses. Our findings are consistent with the literature on diagnosis and treatment.

Still, additional research is required to fill in the gaps and examine new methods of diagnosis and treatment for this challenging clinical context.

Conclusion

This prospective observational investigation on the management of amoebic and pyogenic liver abscesses provided new and significant insights into these challenging conditions. We found that sensitive imaging techniques and serological testing were essential for identifying between amoebic and pyogenic aetiologies of liver abscesses, making accurate and quick diagnosis necessary for effectively managing liver abscesses. Antibiotic treatment and percutaneous drainage demonstrated outstanding success rates, highlighting their critical importance in clinical practice. These results highlight the significance of a comprehensive and integrative approach to treating liver abscesses. Our findings demonstrate the value of prospective observational study in addressing the gap between randomised controlled trials and the intricate nature of patient care in various healthcare settings, highlighting its continuing importance in advancing our understanding of disease treatment in the real world. Lastly, our research contributes to the body of knowledge that helps clinicians in improving patient outcomes and mitigating the impact associated with these potentially catastrophic diseases.

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