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Original Research Article

A Comparative Study of Catheter Drainage and Needle Aspiration for the Treatment of Liver Abscess

Sujit Suman[1], Sourav Suman[2], Rajesh Narayan[3]

[1]Senior Resident Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India

[2]Senior Resident Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India

[3]Professor, Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India

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Corresponding Author: Dr. Sourav Suman
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Abstract

Aim: This study aims to compare the efficacy of catheter drainage vs needle aspiration in treatment of liver abscesses.

Method: This study presents a comparative examination of 97 individuals who received treatment in both outpatient care and the Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India. The individuals were randomly randomized into two groups: one group had percutaneous needle aspiration, while the other group received pigtail catheter drainage. The surgeon who performed the surgeries was unaware of the group designations, which were determined by an independent assessor. The effectiveness of each treatment was evaluated by considering the duration of hospitalization, the time required to achieve decrease in clinical improvement, abscess cavity size, and total or almost complete elimination of the abscess cavity.

Result: The group that underwent catheter drainage had a significant improvement in their success rate. The individuals who had pigtail catheter drainage experienced rapid clinical improvement and a reduction in the size of the abscess cavity, unlike those who experienced percutaneous needle aspiration.

Conclusion: Percutaneous catheter drainage is more effective than percutaneous needle aspiration when it addresses larger abscesses that have pus that is either completely thick or partially liquefied.

Keywords: Amebic serology, Catheter-drainage, Hepatomegaly, Liver abscess, Needle aspiration

Introduction

The liver is a vital organ of the human body. This organ is prone to systemic infections produced by bacteria, viruses, and parasites. It is placed at the very end of the portal circulation's lumen [1]. The existence of a liver abscess has been recognized from the period of Hippocrates (about 400 B.C.), who thought that patient outcomes were linked to the composition of the fluid present in the abscess chamber. There is no text provided. Hepatic abscesses are infected lesions that occupy space within the liver. Pyogenic and amoebic are the two most prevalent kinds of abscess [2]. Pyogenic Liver Abscess (PLA) is an uncommon yet potentially lethal illness, the seriousness of which is determined by the origin of the bacterial infection and the person's pre-existing health state. Amoebic Liver Abscesses (ALA) are frequently found in tropical areas, particularly in countries where the parasite 'Entamoeba histolytica' is widespread [3]. This condition is more common in young males with compromised cellular immune responses.

The most prevalent site of infection in both types of hepatic abscess is the right side of the liver. A mild clinical appearance of either form of sickness may include fever, liver enlargement, right side abdominal discomfort, and yellowing of the skin and eyes. In tropical nations, liver swellings remain the primary cause of illness and death [4]. Recent developments in the treatment of antibiotics, the use of sonography surgical critical care, and CT scan (computed tomography scan) of the abdomen have resulted in earlier identification and management of liver abscesses, leading to better patient outcomes [5.6]. Previously, a liver abscess was considered a serious condition that necessitated open surgical drainage. The death rates varied from 9% to 80%. If neglected, it was always fatal. Over the last 25 years,

there have been a substantial shift in how to treat pyogenic hepatic lesions including Amoebic Liver Abscesses (ALA), with death rates dropping by 5-30% [7]. Four Through per-cutaneous of liver abscess has emerged as a notable breakthrough and is now commonly used in the treatment of both types of liver.

Methodology

Study area

The study was conducted at the Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India from 29/07/2023 to 30/08/2024.

Study type

A retrospective investigation was undertaken at a hospital. The researchers used a purposive sample strategy to choose the patients for the study.

Inclusion and exclusion criteria

Individuals were designated from the hospital and emergency department. Each patient was identified with liver abscesses after a physical exam and either an USG or a computed tomography scan. The study encompassed individuals aged 16 to 60. The study excluded patients with abscessed cavities smaller than five-centimetre, biliary tract cancer, or uncorrectable coagulopathy ruptured liver an abscess. In keeping with the established protocol, obtained informed consent from individuals participating in the study before beginning medical treatment.

Procedure

All eligible subjects underwent a comprehensive clinical history and examination, as well as a battery of diagnostic tests such as a complete blood count, The function of the liver test, prothrombin a period International Normalized Ratio, culture of blood, amebic the study of serology chest X-ray, and abdominal imaging ultrasound regardless of a CT scan. After the procedure, all investigations, including pus culture, were conducted. The trial comprised all eligible patients who gave informed consent and received the predetermined intervention by the defined procedure. The percutaneous procedures were carried out under regional anesthetic (2 percent lignocaine), by intravenous analgesics and sedation as needed. The procedures were carried out with the help of the ultrasonography equipment, which provided real-time USG guidance. The study initially included 99 subjects. However, following a thorough examination, two people were removed from the testing due to the presence of a hydration cyst. As a result, the study had an overall sample size of 97 cases.

PNA (Percutaneous Needle Aspiration)

The individual underwent abdominal ultrasonography (USG) to document the features of the abscess cavity. An injection of local anesthetic was administered at the intended point of puncture using a 23 G needle. Using live ultrasound guidance and a 16/18G BD spinal needle, the abscess cavity was accessed, and pus was aspirated until no further drainage was possible. A specimen of purulent material was submitted for gram staining, culturing, and susceptibility testing. A dressing was administered at the place where the needle punctured the skin.

PCD (Percutaneous catheter drainage)

The Percutaneous catheter drainage approach involves the insertion of a 28-Fr pigtail catheter into the cavity of the abscess using the Seldinger technique, with guidance from ultrasound imaging. The patient underwent abdominal ultrasonography (USG) to determine the characteristics of the abscess cavity. An injection of a local anaesthetic was administered at the targeted location of puncture. A little incision was created on the anesthetized skin using a No. 11 scalpel. Drainage was performed using a 28 Fr catheter from the Blue Neem Percutaneous Suprapubic Pigtail Catheter Set. A punctured needle was inserted by the skin puncture and guided in real-time using ultrasound to reach the central part of the abscess chamber. The stylet was extracted, and the pus was taken out to ensure the position. The obtained pus was sent to the laboratory for analysis. The pigtail catheters were removed after two consecutive days of discharge less than 10 mL per 24 hours.

Follow-up

The participants underwent weekly monitoring for one month, followed by monthly assessments for 3months, and subsequently a clinical assessment and ultrasound inspection of the abscess cavity at the end of six months until complete resolution of the abscesses. The investigator collected and documented data using the provided proforma.

Data analysis

The efficacy of the treatment was evaluated by considering the duration of hospitalizations, the time required to achieve clinical improvement, the time required to achieve a fifty percent reduction in abscess cavity size, and the time taken to achieve complete or nearly complete clearance of the abscess cavity. The parameters were analysed using an independent t-test. The significance threshold was established at P.

Result

Table 1 shows the distribution of variables such as age, gender, and symptoms among the respondents. Most of the participants constituted 78.35% between ages 31-40 years, while 21.64% of the participants

were aged between 21-30 years. Most participants were male 86.59%, with a smaller proportion being female 13.40%. Symptoms most frequently reported in the workup included fever in 17.52% of participants, nausea/vomiting in 15.46%, right upper quadrant pain in 9.27%, diarrhoea in 9.27%, weakness in 8.24%, anorexia in 7.21%, night sweats in 7.21%, cough in 7.21%, rigors in 6.18%, and weight loss in 5.15%. The less commonly encountered symptoms were dyspnoea at 4.12% and right shoulder pain at 3.09%. These symptoms are in descending order of their frequency, with fever being more frequent, followed by nausea and right upper quadrant pain.

Table 1. The symptoms are given in descending order of frequency

Variables		Frequency	Percentage
Age	21 – 30 yrs.	21	21.64
	31 – 40 yrs.	76	78.35
Gender	Female	13	13.40
	Male	84	86.59
Symptoms	Fever	17	17.52
	Anorexia	7	7.21
	Nausea/Vomiting	15	15.46
	Right Upper Quadrant Pain	9	9.27
	Weakness	8	8.24
	Weight Loss	5	5.15
	Night Sweats	7	7.21
	Dyspnea	4	4.12
	Diarrhea	9	9.27
	Rigors	6	6.18
	Cough	7	7.21
	Right Shoulder Pain	3	3.09

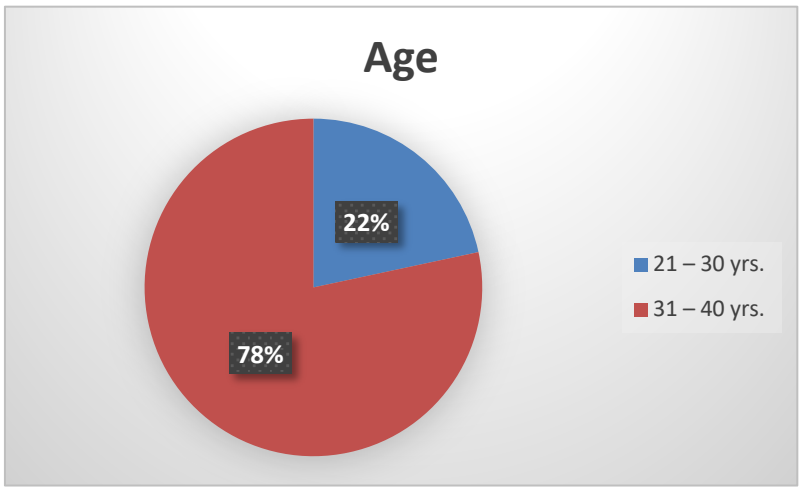

Figure 1: Age distribution of respondents

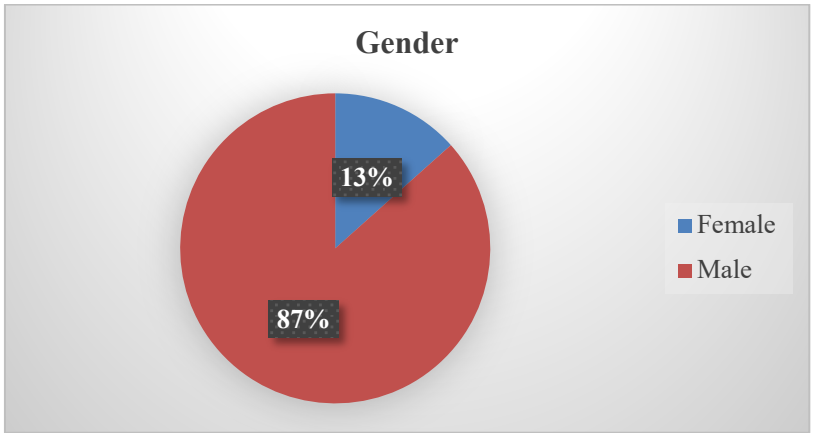

Figure 2: Gender distribution of respondents

Table 2A categorizes the amebic abscess types by pus culture and amebic serology results that indicate an exact etiology of the infection. A negative pus culture coupled with positive amebic serology indicates the etiology as amebic. A positive pus culture with positive amebic serology indicates the underlying abscess type as amebic with secondary infection, indicating a bacterial infection that has set in along with the infection. When the culture of pus is positive with negative amebic serology, the abscess is considered pyogenic, indicating a purely bacterial origin without an amebic component.

Table 2A: types of abscesses by pus and culture amebic serology

Pus culture	Amoebic serology	Etiology
-	+	Amebic
+	+	Amoebic with secondary infection
+	-	Pyogenic

Table 2B provides the distribution of different types of abscesses among the two groups, which are PCD and PNA. In the PCD group, the respective numbers of amoebic abscesses, mixed pyogenic, and undetermined were 6, 55, 55, and 3 cases, respectively. Among these, in the PNA group, 6 amoebic abscesses, 42 of mixed abscesses, 42 of pyogenic abscesses, and 3 undetermined abscesses were observed. Both amoebic and indeterminate abscesses were equal in number in both groups, but the mixed and pyogenic abscesses were greater in the PCD compared with the PNA group.

Table 2B: types of abscesses in each group

	Amoebic	Mixed	Pyogenic	Middle
PCD	6	55	55	3
PNA	6	42	42	3

Table 3 compares two interventions in cavity management: per-cutaneous aspiration of needle versus catheter drainage. The largest cavity treated in the group that had pigtail catheter drainage had a volume that was 305 ± 112 c.c., which was significantly higher than the volume of the largest cavity treated in the group that had percutaneous needle aspiration, which was 258 ± 126 c.c., with a significant $p < 0.05$. The duration of drainage was limited to the group with the pigtail catheter, with an average of 8.8 ± 2.5 days. The time taken to achieve a 50% reduction in cavity size was also shorter for the cavities drained by the pigtail catheter when compared to percutaneous needle aspiration (4.0 ± 1.2 days versus 8.5 ± 3.4 days, $p < 0.05$). Also, the time to total or near-total resolution of the cavity was shorter in cases treated with pigtail catheter drainage, 8.1 ± 3.2 weeks, compared with those treated by needle aspiration, 9.6 ± 2.5 weeks; the latter was also statistically significant at $p < 0.05$. Regarding the rate of successful resolution, it was also higher in the pigtail catheter group, which accounted for 98%, compared to 77% within the needle aspirations; the p-value was less than 0.05. Clinical improvement was more rapid in the pigtail catheter group, 5.2 ± 1.6 days versus the needle aspiration group, which was 6.5 ± 2.3 days, again with an overall p-value of <0.05. The duration of stay in hospital was, however, a bit longer for the patients who underwent pigtail catheter drainage: 10.8 ± 3.5 days, compared to 9.6 ± 4.5 days for those with needle aspiration, with a p-value of <0.05.

Table 3: displays the interventions used and their corresponding outcomes

Parameter	Percutaneous needle aspiration		Pigtail catheter drainage		P value
	No. of patients	Mean±SD	No. of patients	Mean±SD	
Volume of the largest cavity (c.c.)	19	258 ± 126	13	305 ± 112	<0.05
Time duration of drainage (days)	17	NA	15	8.8 ± 2.5	NA
Time period for fifty percent deduction in cavity-size (days)	10	8.5 ± 3.4	12	4.0 ± 1.2	<0.05
Period for total or near total resolve of the cavity (weeks)	12	9.6 ± 2.5	12	8.1 ± 3.2	<0.05
Success	13	77%	11	98%	<0.05
Clinical improvement (days)	11	6.5 ± 2.3	19	5.2 ± 1.6	<0.05
Hospital stays (days)	15	9.6 ± 4.5	17	10.8 ± 3.5	<0.05

Discussion

Liver abscesses are a common tropical illness that affects the gastrointestinal system. Pyogenic liver abscesses are more frequently observed and are caused by factors such as cholecystitis, biliary operations, cholangitis, and stenting. Men have a 3 to 10 times higher likelihood of developing liver abscesses compared to women. The age group most commonly affected is between 30 and 40 years, with

a male-to-female ratio of 7:1. The symptoms observed in patients with liver abscesses include anorexia (7.21% of cases), weakness (8.24% of cases), right upper quadrant discomfort and soreness (9.27% of cases), and fever (17.52% of cases) [8,9]. Serological testing for amebic liver abscesses could provide inaccurate results in the first phases of the disease, leading to misdiagnosis owing to ongoing undiagnosed amebic infections. High levels of antibodies can be used to diagnose and screen out the unreliable results [10].

In this Current investigation, performed image-guided laparoscopic intervention on 97 individuals with uncomplicated liver abscesses, with no deaths or major problems that required treatment. Out of 52 patients, 40 had successful treatment, with the largest cavity having an average volume of 358 ± 136 cubic centimetres. The average duration for clinical improvement was 5.5 ± 2.2 days, and it required 7.5 ± 2.4 days on average to reduce the cavity size by 50 percent. The average duration of hospitalization was 9.6 ± 4.5 days. Several studies have shown that individuals can be effectively treated by combining antibiotics delivered through the bloodstream with percutaneous drainage, resulting in outstanding outcomes. In this present experiment, 69 patients diagnosed with PCD had 67 of the 69 instances successfully treated, while two were able to properly minimize the dimensions of

the hole because of alcohol addiction [11,12]. PNA has numerous key advantages over PCD, including being less invasive and expensive, removing the need for device maintenance, and enabling easier evacuation of several abscesses' cavities in just one session [13]. However, current study found a lower success rate for PNA compared with catheter evacuation (76% versus 100%). Both therapy methods resulted in fast clinical relief, with a majority of recipients experiencing sign and symptom clearance within the first three days after surgery.

Conclusion

The present study data suggest that percutaneous catheter draining is a more effective technique than percutaneous needle aspiration in terms of clinical improvement, cavity clearance, and success rate. However, there was no discernible disparity in the duration of hospitalization. There were no significant issues throughout the procedure. The likelihood of failure of percutaneous aspiration with a needle increased as the size of the cavity requiring aspiration extended.

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