

## A Single Center Retrospective Study to Investigate the Effectiveness of Continuous Catheter Drainage in Comparison to Needle Aspiration in the Treatment of Liver Abscesses

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Received: 22-05-2023 / Revised: 22-06-2023 / Accepted: 28-07-2023

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Conflict of interest: Nil

### Abstract

**Aim:** The aim of the study was to evaluate the clinical presentation, and to investigate the effectiveness of continuous catheter drainage in comparison to needle aspiration in the treatment of liver abscesses.

**Methods:** This was a single-center retrospective comparative study conducted at department of Surgery, Nalanda Medical College and Hospital, Patna, Bihar, India for the duration of 1 year. A total of 60 patients were included in the study, divided into two groups, percutaneous needle aspiration (n=30) and pigtail catheter drainage (n=30).

**Results:** In presenting study the age group of the patients ranged from the 20-68 years. Highest incidence (60%) was found in 30-39 years age group. In this study 54 patients were male and 6 patients were female. 52 patients were from rural and 8 were from urban population and the incidence of alcohol consumption was 70%. It was observed that fever was present in needle aspiration and catheter drainage 94% and 92% respectively. There was 100% anorexia, pain and tenderness in right upper quadrant and hypochondrium in needle aspiration and catheter drainage respectively. It was observed that leukocytosis was 82% and 100% in needle syringe and catheter drainage. The patients in PCD group showed earlier clinical improvement and 50% decrease in abscess cavity volume as compared to those who underwent PNA. However, there was no significant difference between the duration of hospital stay or the time required for total or near-total resolution of cavity.

**Conclusion:** Percutaneous catheter drainage is a better modality as compared to percutaneous needle aspiration especially in larger abscesses which are partially liquefied or with thick pus.

**Keywords:** Liver abscess, Catheter drainage, Needle aspiration.

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### Introduction

A liver abscess is a suppurative cavity in the liver resulting from the invasion and multiplication of microorganisms, entering directly from an injury through the blood vessels or by the way of the biliary ductal system which is caused by a trauma or infection; bacterial, fungal, or parasitic microorganisms spread via the portal circulation. [1,2] The most common type of liver abscess is bacterial, with *Klebsiella pneumoniae* and *Escherichia coli* as the primary pathogenic microorganisms, followed by amebic liver abscesses. [3-5] Cryptogenic abscesses, with unknown etiology, also represent about 20% of liver abscess. [1,3] Liver abscesses, both amebic and pyogenic, continue to be an important cause of morbidity and mortality in tropical countries. It is the commonest infection affecting liver. Liver

comprises 48% of all the visceral abscesses. [6] It is common in India with 2nd highest incidence due to poor sanitation, overcrowding and inadequate nutrition. [7] Prevalence of infection is higher than 5%-10% in endemic areas. [8] Liver abscess is found more commonly in men between 20 and 40 years of age but can occur at any age. Approximately 60% of the abscesses are solitary and mainly located in the right lobe of the liver, as a result of the streaming of the portal blood flow secondary to fact that the right lobe is predominantly supplied by the superior mesenteric vein and because most of the hepatic volume is in the right lobe. When multiple abscesses are present, pyogenic or mixed is the most probable type. [9] Patients usually present with a constant dull pain in the right upper quadrant of the abdomen which may

be referred to the scapular region or the right shoulder. These patients usually have fever of between 380C and 400C.

The management of patients with liver abscess should be personalized. It is critical to have the right antibiotics and sufficient drainage. The Abscess pathogenesis, clinical features, and patient overall status should be considered during the management. However, recent advances in interventional radiology, intensive care, progress in antibiotic therapy, and liberal use of sonography and computerized tomography scanning of the abdomen have led to early diagnosis and treatment of patients with liver abscess, thus improving the patient outcome. Percutaneous drainage of liver abscess has been an important advancement in the treatment of pyogenic liver abscesses. Generally, both antibiotic intervention and sufficient drainage are essential for managing liver abscess. [1,3,10] Therefore, antibiotic treatment should include a combination of an aminoglycoside with either clindamycin or metronidazole or a beta-lactam antibiotic with an anaerobic covering (3,4,10). Drainage of liver abscess may be achieved percutaneously (ultrasound or computed tomography guided) or surgically (via laparoscopic or open approach) (4,10). Percutaneous US-guided drainage can be performed using catheter drainage (PCD) or needle aspiration (PNA). PCD is generally accepted as a safe and successful treatment option for liver abscess when combined with antibiotics. In recent years, image-guided percutaneous drainage has been increasingly used to treat liver abscesses with reported success rates ranging from 70-100%. [11,12,13] Although percutaneous placement of an indwelling catheter is the method most widely preferred to drain liver abscesses. [14]

The aim of the study was to evaluate the clinical presentation, and to investigate the effectiveness of continuous catheter drainage in comparison to needle aspiration in the treatment of liver abscesses.

### Materials and Methods

This was a single-center retrospective comparative study conducted at department of Surgery, Nalanda Medical College and Hospital, Patna, Bihar, India for the duration of 1 year. A total of 60 patients were included in the study, divided into two groups, percutaneous needle aspiration (n=30) and pigtail catheter drainage (n=30).

All the patients who had liver abscess clinically and radiologically [USG/ CT scan] were included in the study. The patients had prior intervention, ruptured liver abscess, biliary tract malignancy, uncorrectable coagulopathy was excluded from the study. In all patient's complete blood count, liver function test, PT/INR, X-ray chest, abdominal sonography and C.T. scan as & when required were performed and antibiotics were started, as soon as diagnosis was made. Abscess less than 5cm managed by needle aspiration. Abscess more than 5 cm managed by percutaneous catheter drainage.

**Percutaneous Needle Aspiration:** The patient was subjected to USG of the abdomen and the characteristics of the abscess cavities were recorded. Local anesthesia was infiltrated at the proposed puncture site using an 18 G needle. Under real-time USG guidance using 18/20 G spinal needle the abscess cavity was entered and pus was aspirated till no more pus could be aspirated further. A sample of pus was sent for culture and sensitivity. A dressing was applied.

**Percutaneous Catheter Drainage:** Seldinger technique used for catheter drainage. Abscess localized by USG, the site of drainage marked under all aseptic condition where minimum depth from skin noted. The site infiltrated with 2% xylocaine and 4 mm skin incision made and through which 18G guide wire introducer needle passed under USG guidance till it will reach the centre of cavity. A Guide wire introduced through the needle and position inside the cavity following which the needle removed keeping the guide wire in situ. Serial dilator then passed over the wire to dilate track up to 12 to 14 F sizes. A Pigtail catheter of size equal to the size of dilator passed over the wire and positioned in the center of cavity under USG guidance. The guide wire then withdrawn and Pig tail catheter fixed to the skin with suture and connected with drainage bag and pus sent for cytology and bacteriology. Amount of pus drainage in 24 hours monitored and catheter flushed daily to prevent blockage with 10ml normal saline. The drainage catheter removed when drainage become less than 20ml to 30ml/24 hours. The effectiveness of treatment was measured in terms of parameters like duration of hospital stay, days to achieve clinical improvement, days to achieve 50% reduction in abscess cavity size and days to achieve total/near total resolution of abscess cavity. The data was measured in numbers (percentage) and mean±SD.

### Results

**Table 1: Demographic details**

| Gender               | N%         |
|----------------------|------------|
| Male                 | 54 (90)    |
| Female               | 6 (10)     |
| Age groups in years  |            |
| 20-29                | 6 (10)     |
| 30-39                | 36 (60)    |
| 40-49                | 8 (13.33)  |
| 50-59                | 5 (8.33)   |
| 60-69                | 5 (8.34)   |
| Area                 |            |
| Rural                | 52 (86.65) |
| Urban                | 8 (13.34)  |
| Incidence of alcohol |            |
| Yes                  | 42 (70)    |
| No                   | 18 (30)    |

In presenting study the age group of the patients ranged from the 20-68 years. Highest incidence (60%) was found in 30-39 years age group. In this study 54 patients were male and 6 patients were female. 52 patients were from rural and 8 were from urban population and the incidence of alcohol consumption was 70%.

**Table 2: Symptoms & signs of liver**

| Characteristics                 | Percutaneous needle aspiration (n=30) | Percutaneous catheter drainage (n=30) |
|---------------------------------|---------------------------------------|---------------------------------------|
| Right upper quadrant pain       | 100%                                  | 100%                                  |
| Right upper quadrant tenderness | 100%                                  | 100%                                  |
| Anorexia                        | 100%                                  | 100%                                  |
| Fever                           | 94%                                   | 92%                                   |
| Nausea & vomiting               | 64%                                   | 58%                                   |
| Hepatomegaly                    | 55%                                   | 85%                                   |
| Respiratory symptoms            | 15%                                   | 30%                                   |
| Jaundice                        | 10%                                   | 10%                                   |
| Diarrhoea                       | 0%                                    | 0%                                    |

It was observed that fever was present in needle aspiration and catheter drainage 94% and 92% respectively. There was 100% anorexia, pain and tenderness in right upper quadrant in both needle aspiration and catheter drainage groups.

**Table 3: Laboratory Data**

| Investigation                 | Percutaneous needle aspiration (n=30) | Percutaneous catheter drainage (n=30) |
|-------------------------------|---------------------------------------|---------------------------------------|
| Leucocytosis (>11000)         | 82%                                   | 100%                                  |
| Elevated S. Bilirubin Total   | 14%                                   | 25%                                   |
| Elevated SGOT                 | 65%                                   | 82%                                   |
| Elevated SGPT                 | 65%                                   | 100%                                  |
| Hypoalbuminemia               | 54%                                   | 94%                                   |
| Elevated Alkaline phosphatase | 65%                                   | 90%                                   |
| Elevated INR                  | 65%                                   | 86%                                   |

It was observed that leukocytosis was 82% and 100% in needle syringe and catheter drainage.

**Table 4: Intervention**

| Parameters                                   | Percutaneous needle aspiration (n=30) | Percutaneous catheter drainage (n=30) | P value |
|--|---------------------------------------|---------------------------------------|---------|
|  | Mean $\pm$ SD                         | Mean $\pm$ SD                         |         |
| Mean volume cavity (cc)                      | 174.26 $\pm$ 45.85                    | 360 $\pm$ 210.5                       | <0.005  |
| Clinical improvement (Days)                  | 5.3 $\pm$ 1.6                         | 4.4 $\pm$ 1.52                        | <0.005  |
| Time taken to reduce cavity up to 50% (Days) | 7.3 $\pm$ 2.5                         | 4.7 $\pm$ 1.2                         | <0.005  |
| Time taken to total or near total            |                                       |                                       |         |

|                                     |           |           |        |
|-------------------------------------|-----------|-----------|--------|
| resolution of abscess cavity (week) | 10.6 ±4.7 | 10.5± 4.5 | >0.005 |
| Average hospital stays (Days)       | 5.80±1.20 | 6.84±1.26 | >0.005 |

The patients in PCD group showed earlier clinical improvement and 50% decrease in abscess cavity volume as compared to those who underwent PNA. However, there was no significant difference between the duration of hospital stay or the time required for total or near-total resolution of cavity.

### Discussion

Liver abscesses, both amebic and pyogenic, continue to be an important cause of morbidity and mortality in tropical countries. The primary mode of treatment of amebic liver abscess is medical; however, as many as 15% of amebic abscesses may be refractory to medical therapy. [15] Also, secondary bacterial infection may complicate 20% of amebic liver abscesses. [16] In such patients and in patients with pyogenic liver abscesses, surgical drainage has been the traditional mode of treatment. [17,18]

A liver abscess is a pus-filled cavity that occurs due to the incursion of microorganisms either from hematogenous spread or by way of the biliary ductal system. The common etiology of a liver abscess includes amoebic or pyogenic and sometimes mixed infections. In the developed world, a polymicrobial pyogenic abscess is common while amoebic etiology is more prevalent in tropical countries. Despite the improvement in sanitation and the advancement of treatment modalities, amoebic and pyogenic liver abscesses are considered an important cause of morbidity or mortality in the tropical and subtropical areas of the world. [9] The major approach for the treatment of a liver abscess is antimicrobial therapy with or without radiology guided intervention. About one-fifth of patients with liver abscesses remain refractory to antimicrobial therapy. [19] Nowadays, the generous use of sonography and computerized tomography scanning of the abdomen led to the early diagnosis and treatment of liver abscesses.

In presenting study the age group of the patients ranged from the 20-68 years. Highest incidence (60%) was found in 30-39 years age group. In this study 54 patients were male and 6 patients were female. It was comparable with the study conducted by Singh et al. [9] 52 patients were from rural and 8 were from urban population and the incidence of alcohol consumption was 70%. It was observed that fever was present in needle aspiration and catheter drainage 94% and 92% respectively. There was 100% anorexia, pain and tenderness in right upper quadrant in needle aspiration and catheter drainage respectively. On examination hepatomegaly and Jaundice was seen which were similar to those described in previous studies. [20] It was observed that leukocytosis was 82% and 100% in needle syringe and catheter drainage. The

patients in PCD group showed earlier clinical improvement and 50% decrease in abscess cavity volume as compared to those who underwent PNA. However, there was no significant difference between the duration of hospital stay or the time required for total or near-total resolution of cavity and similar finding was reported by Ghosh et al. [20]

Kulhari M et al. reported better clinical outcomes with PCD over PNA in the patients with approximately similar volumes of liver abscess (293.2±130.3 mL in the PCD group and 291.4±138.8 mL in the PNA group, P= 0.925). [21] Rajak et al. also showed that higher abscess volume was associated with PNA failure. [22] Various studies described the comparison between conservative treatment and the percutaneous aspiration approach. Most of these studies were conducted before the widespread use of PCD for the treatment of liver abscesses. Results of these studies showed that PNA was more useful in higher abscess volume. [23-25]

### Conclusion

Our study concluded that the percutaneous catheter drainage is a better and effective percutaneous treatment modality as compared to percutaneous needle aspiration in view of greater volume of pus drained in first sitting, in respect to clinical improvement, resolution of cavity, success rate but there was no significant morbidity - mortality during both the procedure.

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