

Comparative Study of Percutaneous Needle Aspiration versus Percutaneous Catheter Drainage in Diagnosed Cases of Liver Abscess and Its Complications

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Abstract: Liver abscess undiagnosed and untreated had a high mortality of almost 100%. With early diagnosis and prompt treatment prognosis is excellent and mortality is extremely low. Over the last three decades with the advancement of amoebicidal agents, newer and effective antibiotics, newer imaging modalities and percutaneous methods, treatment has been changed dramatically. Before 1900, the treatment of liver abscess was treated primarily by incision and drainage, which was associated with high morbidity and mortality of about 60%. The advances in USG and CT that provide earlier and more accurate diagnosis also have enabled these modalities to facilitate treatment through guided aspiration and drainage, thus shifting management away from open surgery to minimally invasive techniques. Percutaneous drainage combined with antimicrobial has become the first line and mainstay of treatment for most of the abscesses. In this study of 100 patients we have compared the outcome of two interventional modalities –needle aspiration and percutaneous drainage. The study was conducted at G.R. Medical College, Gwalior. Our study showed that patients undergoing percutaneous drainage had better outcome as compared to needle aspiration.

Keywords: liver abscess, amoebicidal drugs, needle aspiration, percutaneous drainage.

INTRODUCTION

Liver abscess is the commonest infection affecting the liver and is a common condition in India. Based on etiology it is classified into bacterial, parasitic and fungal. Amoebic liver abscess is more common than pyogenic liver abscess (PLA) on a global scale, but in tropical areas like India both amoebic and pyogenic liver abscess continues to be an important cause of morbidity and mortality [1].

The world health organization reported that *Entamoeba histolytica* causes approximately 50 million cases and 100,000 deaths annually [2]. The vast majority of these infections are acquired in the developing countries like India where majority of population lives below poverty line and basic sanitary facilities are lacking. This coupled with overcrowding, urban slums and outdoor unhygienic eating habits sets the stage for communicable diseases like amoebiasis. Locally made alcoholic drinks like Neera, Arrack may be the faeco-oral route for amoebic cysts.

In developed parts of the world, pyogenic liver abscess is relatively common to amoebic liver abscess. Pyogenic infections may be due to portal infection, and may be of biliary, arterial, or traumatic origin (often in young people secondary to acute appendicitis, and other intra-abdominal inflammatory condition). Ascending infection of the biliary tree secondary to obstruction is now the most identifiable cause of PLA. The etiology

of biliary obstruction has some geographic differences; in Western countries this scenario is common in patients with malignant disease, while in Asia, gall stone disease is more common. Immunosuppression as in AIDS, intensive chemotherapy or transplant recipients is also increasing the number of liver abscesses due to opportunistic organisms in India [3]. Between 15 to 55% patients in different series, no identifiable cause or source for PLA was found hence called cryptogenic [4-6].

Though a readily treatable disease, if left untreated, liver abscess can be potentially fatal, leading to mortality ranging from 60-80% [7]. However, with the advances in radiological investigations like ultrasonography and CT scan for diagnoses together with interventional radiology has reported a success rate ranging from 75-100% for treatment of liver abscess, decreasing mortality to 5-30%, and surgical intervention which is associated with significant

morbidity and mortality ranging from 10-47% is now becoming unnecessary [8].

Primary prevention by Improving sanitation, health education, early diagnosis and prompt treatment may result in lowering morbidity and mortality associated with the disease. Primary mode of treatment of amoebic abscess is medical; however many cases are refractory to medical therapy. Also secondary bacterial infection may complicate about 20% of amoebic liver abscess. In such patients and patients with pyogenic liver abscess may require aspiration or percutaneous placement of indwelling catheter to drain liver abscess. Our tertiary center is situated in the region where 70% of population belongs to rural areas, where they lack proper sanitation, health education, along with increasing incidence of alcoholics and immune-compromised states. Thus we get large number of patients with liver abscess every day in out-door and emergency basis. With this changing scenario in incidence, environmental conditions, diagnostic methods, treatment and complications associated with liver abscess has inspired us to do in-depth study regarding clinical profile, risk factors, and diagnostic and management strategies of liver abscess.

MATERIALS AND METHODS

Participants

Patients admitted in the Department of General Surgery, J.A. Group of Hospitals, G.R. Medical College, and Gwalior (M.P). All the patients diagnosed with liver abscess on clinical and radiological basis were included in the study.

Study period: June 2015 to May 2016.

Study design: Randomized study

Sample size: 100 patients

Group A: Odd number - Percutaneous needle aspiration (n=50)

Group B: Even number - Percutaneous catheter drainage (n=50)

Inclusion criteria

- Male and female 15-60 years
- Liver abscess size > 100 cc
- Solitary liver abscess
- Aspirable/partially aspirable content of abscess

Exclusion criteria

- Patients age <15 years and age >60 years
- Liver abscess with very small volume or multiple liver abscess
- Already presented with any complication (ruptured liver abscess, any systemic complication)
- Non-aspirable content of abscess

- Patients included in study but underwent more than one procedure (aspiration, drainage or laprotomy) for treatment of liver abscess

Methods

All the subjects satisfying the inclusion criteria were carefully worked up in terms of a detailed history and clinical examination. Lab and imaging investigations included complete haemogram; liver function tests; prothrombin time; imaging-CXR; abdominal USG with or without CT scan of the abdomen; and other investigations as per specific indications in different patients. Diagnosis of liver abscess was done with the help of clinical examination, x-ray and was confirmed by ultrasonography. Initially, all patients were given empirical treatment as per availability at hospital. Treatment was revised based on the culture and sensitivity report. The diagnosis of amoebic liver abscess was made, if aspirated pus had a typical anchovy sauce color and was odorless, bacteriologically sterile. Additional criteria used were the clinical features, past history of amoebic dysentery and demonstration of *Entamoeba Histolytica* in stool.

A pyogenic liver abscess was defined as an acute or chronic abscess. They were usually multiple. Pus aspirated was purulent and yellowish or yellowish green colored. The regression of the abscess cavity size was evaluated on the basis of ultrasound findings and if needed repeated aspiration was done.

After discharge oral metronidazole was continued for 2-3 weeks depending on the regression of size of abscess on ultrasound examination.

Follow up was done for three months from the day of admission or initiation of treatment. Abscess was noted for size and residual volume and liquefaction. If needed again USG guided percutaneous needle aspiration was performed. The procedures were carried out in Department of Radiology, G.R. Medical College, and Gwalior.

Percutaneous Needle Aspiration

Percutaneous needle aspiration was done under local anesthesia and with help of USG guidance using 18G needle. Pus was aspirated till no more pus could be aspirated further. Pus was sent for Gram stain, culture, sensitivity and wet mount for *Entamoeba histolytica* trophozoites.

Percutaneous catheter drainage

Percutaneous drainage of the abscess was performed under sonographic guidance under local anesthesia. A percutaneous nephrostomy pigtail catheter set (12-16 Fr) was used for drainage. The catheter was attached to a collecting bag via the supplied connector.

Evaluation of the response to intervention

The clinical response (temperature) and laboratory parameters- Total Leukocyte Count, Liver Function Test were recorded on a daily basis.

In the patients undergoing Percutaneous needle aspiration or percutaneous catheter drainage. USG was repeated after a gap of two weeks up to 3 months and procedure was repeated if the cavity size was still found to be greater than 100cc. In patients who underwent Percutaneous catheter drainage, besides recording the clinical and laboratory parameters of the patient every day, daily output of the catheter was measured and the catheter was flushed with 20 cc of normal saline (this volume was deducted from the total drainage). A

decision to remove the pigtail catheter was made when the total drainage from the catheter decreased to less than 10 ml/24 h for two consecutive days.

STATISTICAL ANALYSIS

The effectiveness of either treatment was measured in terms of duration of hospital stay. Independent T-test was used to analyze these parameters. The level of significance was set at $P < 0.05$. Volume of abscess cavity and duration of drainage (applicable to PCD group only) were also analyzed and range and mean values were calculated for both the parameters.

RESULTS & OBSERVATIONS

Table-1: Frequency of symptoms in patients

Symptoms	Number of patients (n=100)	Percentage %
Pain in abdomen	100	100.0%
Fever	97	97.0%
Jaundice	20	20.0%
Malaise	66	66.0%
Vomiting	30	30.0%
Appetite loss	92	92.0%
Cough	62	62.0%
Dyspnea	48	48.0%
Bowel habits change	24	24.0%

Abdominal pain was present in all cases (100.0% of patients). Fever was the most consistent symptom occurring in (97%). Malaise is the most common nonspecific symptom present in (66%). Bowel

habit change occurring in (24%). Jaundice was present in (20%) of patients 62 patients (62%) presented with respiratory symptoms like cough and (48%) with dyspnea.

Table-2: Treatment modality

Treatment	Number of patients	%	Range of days of hospital stay	Mean of days of hospital stay	95% CI	Interventions required
ASP (Percutaneous Aspiration) + Antibiotic Coverage	50	50	2-20	6.2	4.6-7.8	1 to 6
Pig Tail Catheter drainage + antibiotic coverage	50	50	3-10	6.7	5.9-6.4	1

100 cases having liver abscess with aspirable content, of size > 100 cc were subjected to intervention.

Out of 100 cases 50% cases (n=50) underwent Percutaneous aspiration under antibiotic coverage with mean hospital stay of 6.2 days. 50% cases underwent USG guided Pigtail catheter drainage under antibiotic coverage with mean hospital stay of 6.7 days.

Comparing the mean hospital stay of aspiration under antibiotic coverage (6.2) with pigtail catheter drainage under antibiotic coverage (6.7) percutaneous needle aspiration under antibiotic

Table-3: Complications after interventions

Complications	Number of patients	Total	Per cutaneous needle aspiration	Percutaneous catheter drainage
Intraabdominal rupture and peritonitis	16	16	12	4
Pleural effusion with or without consolidation	51	51	11	20
ICTD insertion	8	8	3	5
Subcapsular rupture	4	4	2	2
Ascites	7	7	3	4
Splenomegaly/splenic abscess	7	7	4	3
Other organ complication	2	2	0	2
Deaths	0	0	0	0

The various complications in the 100 cases of liver abscesses were analyzed.

Intra-abdominal rupture with peritonitis was seen in 16% of cases. With percutaneous needle aspiration it was present in 12 patients out of 50 and 4 out of 50 in PCD group. Pleural effusion (right/left or both, mild or moderate/gross) with or without lung consolidation was the most frequent complication found in 51% of cases (Group A- 31 and Group B-20). ICTD insertion was required in 8% cases (group A- 3 and group B-5). Subcapsular rupture occurred in 4% cases (group A- 2 and group B-2). Other organic complication (rupture in right perinephric region presenting as perinephric abscess) was present only in 2%. Both patients were from percutaneous catheter drainage group. Death didn't occur in our study.

DISCUSSION

Abscess of the liver has been described since the time of Hippocrates (400 BC), with the first published review by Bright appearing in 1936. In 1938, Oschner and DeBakey's classic review heralded surgical drainage as the definitive therapy and the use of IV antibiotics [7]. However, despite the more aggressive approach to treatment, the mortality was reduced to about 50%, from almost a fatal disease with mortality 90-100%.

The changing scenario in incidence, diagnostic methods, treatment & complications associated with liver abscess due to increasing percentage of alcoholics and Immunocompromised population; the current

serious problem in our country, has inspired me in doing an in depth study, regarding Liver Abscess, which assumes more importance in our country where rural population constitutes approximately 70% and therefore it mandates, appropriate & realistic guidelines to be drawn up for early diagnosis and change in management strategies, in order to reduce the morbidity and mortality associated with it.

The observations and calculated means were subjected to statically analysis. The statically analysis was done by using: - 95% CI, Student T-test

Analysis of symptoms & signs

All of the patients who presented in this series presented with abdominal pain. Most of the patients had right hypochondriac pain; some shows epigastrium and generalized abdominal pain. Fever was also significant (97%) symptom in our study as compared to other studies listed below. Non-specific symptoms like malaise, nausea, vomiting, and decreased appetite was also significantly noted in our study. Symptoms related to respiratory complications like dyspnoea, cough with or without expectoration were comparable to other studies. Right upper quadrant tenderness (100.0%) and Hepatomegaly (84.0%) were common presentation in our series and were comparable to the studies listed below but Jaundice (20.0%) was more common clinical presentation compared to study done by Hyo Min Yoo *et al.* (7.0%).

Table-4: Incidence of signs and symptoms in different studies

SYMPTO MS	Shyam Mathur et al	Khee-Siang Chan et al	Hyo Min Yoo et al	D. Lynche et al	Present Study
Pain in Abdomen	80.0%	57.0%	85.0%	83.0%	100.0%
Fever	87.0%	97.2%	71.0%	97.0%	97.0%
Nausea/vomiting	33.0%	25.2%	23.0%	6.6%	30.0%
Decreased appetite	33.0%	-	-	-	92.0%
Diarrhea	7.0%	-	13.0%	14.0%	16.0%
Cough	10-15%	-	-	60.0%	62.0%
Dyspnea	-	-	-	33.0%	48.0%
SIGNS					
RUQ Tenderness	73.0%	-	88.0%	73.0%	100.0%
Hepatomegaly	91.0%	-	41.0%	47.0%	84.0%
Jaundice	-	-	7.0%	-	20.0%
Signs of peritonitis	-	-	59.0%	-	16.0%

Analysis of treatment

Controversies in the management of liver abscess still exist. Interventional drainage of liver

abscess has been an accepted therapy for decades. The diagnosis and treatment of liver abscess has changed due to advances in imaging techniques.

Table 5: Analysis of treatment modalities used studies

Treatment Modality	Hyo Min Yoo <i>et al</i>	Present Study
Aspiration	79.0%	50%
Pigtail Catheter Drainage	-	50%
Surgical (Open Laparotomy) after complication with aspiration or drainage	21.0%	0%

50% patients out of 100 with odd serial number were odd (group A) with solitary liver abscess size 100cc or more with aspirable content were considered for percutaneous needle aspiration with antibiotic coverage and those whose serial number were even (group B) underwent percutaneous catheter drainage with antibiotic coverage, i.e, 100% underwent intervention as compared to Hyo Min Yoo *et al.* Study where 100.0% patients underwent intervention. In our study all patients were started on antibiotics which were continued for 10- 14 days depending on improvement.

Majority of patients responded excellently to percutaneous aspiration and pigtail catheter drainage

under antibiotic coverage with mean hospital stay days less than antibiotic only.

Analysis of complications

The various complications that arose in the patients with liver abscesses in this study were analyzed. Complications like Intra-abdominal rupture with peritonitis was accounting highest rate of 16% in our study as compared to Study by Hyo Min Yoo *et al.* (5.0%) which was significant, other complications were of almost same as compared to Study by Hyo Min Yoo *et al.* Overall incidence of complications in our study was 51% which equal to the Study by Hyo Min Yoo *et al.* (59.0%).

Table-6: Comparison of analysis of complications with different studies

Complications	Hyo Min Yoo <i>et al.</i>	Present study
Intraabdominal rupture and peritonitis	5.0%	16%
Pleural effusion with or without consolidation	53.0%	51%
Subcapsular rupture	5.0%	4%
Other organ complication	5.0%	2%
Death	11.0%	0%
Total	59.0%	52.0%

CONCLUSION

Liver abscess is a very common condition in India. India has 2nd highest incidence of liver abscess in world. Liver abscesses occurred most commonly between 26-45 years. Most of the cases had an acute presentation (<7days after onset of symptoms). Males were affected more than females. Pain abdomen, fever were the most common symptom present in 100% and 97% cases respectively. Abdominal tenderness was present in all 100 cases. Poor socio-economic status and cramped living conditions were found as most common etiological factor for causation of liver abscesses.

Ultrasound Guided Percutaneous Catheter drainage was found to be a better modality in treatment of liver abscess in terms of

- Single intervention needed in percutaneous catheter drainage group, whereas percutaneous needle aspiration multiple aspirations were needed (41 out of 50 cases required more than single aspirations out of 41 cases, 19 cases required 2 aspirations, 2 cases required 3 aspirations, only 1 case required 5 aspirations and 19 patients required 6 Or more aspirations.)
- Faster symptomatic relief in percutaneous catheter drainage group. Patients in whom percutaneous catheter drainage was done, experienced rapid pain relief rapid fever subsidence and laboratory investigations came to near normal limit in less time period as compared to percutaneous needle aspiration.
- Faster decrease in abscess volume even in patients with partially aspirable content.
- Less associated complications in percutaneous catheter drainage patients. As peritonitis, pleural effusion, and sub capsular rupture was more commonly associated with percutaneous needle aspiration group.
- End results were far better for percutaneous catheter drainage group (>75 % decrease in abscess cavity volume in 45 patients out of 50, >50% in other 5 patients) as compared to percutaneous needle aspiration (where only 27 cases out of 50 showed >75% decrease in abscess cavity volume,

20 showed >50% decrease in cavity volume and 3 showed around >25% improvement) during the treatment.

Patients with Immunocompromised state showed more rapid decrease in abscess cavity volume in later weeks (after initiating treatment for immunocompromised state) as compared to initial weeks of follow up (when immunocompromised state was not assessed and no treatment was initiated for it). Hence our study shows important role of assessment of immunocompromised state and its treatment in liver abscess patients. Mortality rate was 0% in this study.

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