DOI: 10.36347/sjams.2017.v05i02.011

Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2017; 5(2A):356-362 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com

Original Research Article

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

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Abstract: This clinical study was conducted on 100 patients of liver abscess admitted in the department of surgery, J.A Group of hospitals and G.R. Medical College, Gwalior (M.P.) during February 2015 to March 2016 after getting ethical approval from college ethical committee and well written informed consent from the patients. The ultimate goal of the study was to compare and correlate the therapeutic effectiveness of percutaneous catheter drainage versus percutaneous needle aspiration in the treatment of liver abscess.
Keywords: Percutaneous Needle Aspiration, Percutaneous Catheter Drainage

INTRODUCTION

Liver abscess is the commonest infection affecting the liver and is a common condition in India. Based on aetiology 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 Organisation 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 also 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 aetiology 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 and hepatolithiasis are 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/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 [9].

Our tertiary centre 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

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 to have liver abscess clinically and radiologically [on ultrasonography (USG) and/or CT scan] were included in the study.

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 hemogram; liver function tests; prothrombin time; international normalized ratio; activated partial thromboplastin time; blood culture; amebic serology; imaging-CXR; abdominal USG with or without CT scan of the abdomen; and other investigations as per specific indications in different patients. An informed consent was obtained from the participating patients and all the consenting patients were started on medical treatment as per our protocol. Randomization was done at the time of admission, patients with odd serial numbers are grouped as group A and patients with even serial numbers are grouped as group B. Once a participating subject gave valid consent the pre-determined intervention was carried out as follows: Diagnosis of liver abscess was done with the help of clinical examination, x-ray and was confirmed by ultrasonography. In some patients CT scan was used.

Initially, all patients were treated with combinations of antibiotics available in hospital supply (Injection Ciprofloxacin, Injection Ceftriaxone, injection meropenam, injection augmentin, Injection Metronidazole, Tab. Ciprofloxacin, Tab. Metronidazole). The empirical treatment was revised based on the culture and sensitivity report. However, patients in whom pus culture was sterile continued on the same treatment. The antibiotics and metronidazole were given for duration of 10 and 14 days respectively. Routine investigations were done for all patients; chest x-ray was done to note any pulmonary complications in terms of elevation of diaphragm and pleural effusion. Aspirated pus was sent for culture and sensitivity.

OBSERVATIONS AND RESULTS

A Prospective study with 100 patients diagnosed to have Liver Abscess, who underwent treatment in Department of Surgery, G.R. Medical College, Gwalior (M.P.) between February 2015 to march 2016 to study the Clinical, Pathological and Management Strategies in Liver Abscess was done. The Statistical software namely, SPSS version 20.0, were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc**.** Following results were obtained:

Table 1: showing age distribution of patients studied

Age in years	Number of patients	Percentage %
15-25	21	21
26-35	28	28
36-45	25	25
46-55	14	14
56-60	12	12
Total	100	100.0

- Age of the patients included in this study varied from 15-60 years.
- The mean age was (37.5)years
- The highest incidence was noted in the age group of 26-35 years (28%) and 36-45 years (25%).

Table 2: gender distribution of patients studied

Gender	Number of patients (n=100)	Percentage %
Male	71	71
Female	29	29
Total	100	100.0

- 71% of patients were males
- 24% were females.

Table 3: frequency of symptoms of patients studied

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
Bowel habits change	24	24

- 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
- 62patients (62%) presented with respiratory symptoms like cough and 48 with dyspnoea.

Table 4*:* per abdominal findings of patients studied

Clinical signs	Number of patients (n=100)	Percentage %
Abdominal tenderness	100	100.0
Hepatomegaly (>14cms)	84	84.0
Signs of peritonitis	16	16.0

- Abdominal tenderness was elicited in right hypochondrium and in some cases in epigastrium in all 100 cases.
- Hepatomegaly defined as liver span > 14 cm was seen in 84% of cases. Hepatomegaly was usually tender, smooth, and soft to firm.
- In the present study, signs of peritonitis defined as guarding and rigidity findings were present in 16%of the cases.

Table 5: past history of patients studied

	Number of patients (n=100)	Percentage %
H/o liver abscess	20	20
H/o liver disease	0	0
H/o systemic illness	4	4
H/o steroid, chemotherapy	0	0

- None of the patient has h/o liver disease, steroid or chemotherapy consumption.
- H/o of liver abscess was present in 20% of patients and had been taken treatment in the past in terms of medical therapy or invasive technique or both.
- H/o systemic illness was present in 4.0% of patients.

Table 6: alcoholism in cases of liver abscess

	Number of patients (n=100)	Percentage %
Alcoholic	68	68
Non-alcoholic	32	32

- 68.0% of the patients were Alcoholic or having history of alcohol consumption in past.

Table 7: routine blood investigations of patient studied

Laboratory Investigations	Number of patients (n=100)	Percentage %
Hemoglobin <10 gm/dl	38	38
TLC >11000 cells/cumm	41	41
RBS >110 gm/dl	13	13
ESR >20 mm/hr	97	97

- Leucocytosis (> 11,000cells/cumm) was found in 41.3% of cases. Mean WBC count was 11640 cells/cumm and it ranged from 3800-31000 c/cumm.
- Anemia (Hb %< 10 gm/dl) were found in 38% of the cases. Mean Hb% in this study group was 10.6 gm/dl. The Hb% of the patients ranged from 4.7-14.5 gm%.
- In 38% patients were found to have blood sugar level more than normal range (RBS>110mg/dl). The mean RBS was 87 mg/dl

Table 8: liver function test analysis of patient studied

LFT	Number of patients (n=100)	percentage %
S. albumin(<3mg/dl)	30	30
ALP (>140 IU /L)	52	52.0
SGOT>40 IU	73	73.o
SGPT>40 IU	82	82.0
Prolonged PT (>14 seconds)	82	82.0
Total S. Bilirubin (>1.2 mg/dl)	60	60.0

Liver function tests were done in all 100 patients included in this study.

- The liver function tests which were most consistently raised were with prothrombin time (>14 sec), SGPT (>40 IU/L), SGPT (>40 82%, (82. %), (73.3%) respectively.
- Alkaline phosphatase was found to be raised in (52.0%) of cases in this study.
- Hypoalbuminaemia (<3gm/dl) was observed in 30%) of the cases.
- Raised bilirubin level more than normal limit (>1.2gm/dl) was found in 60.0% of the cases in this study.

Table 9: pus culture analysis of patients studied

PUS culture	Number of patients (n=100)	Percentage %
Enterobacter	4	4
Klebsiella	7	7
E. coli	12	12
Staph aureus	12	12
Acinetobacter	2	2
Streptococcus	4	4
Proteus	1	1
No growth	58	58

- E.coli & S.aureus were most common organism's cultured 12.0% each.
- Klebsiella, Acinetobacter, Enterobacter were the other organism cultured in our study, 7%, 2%, 4% respectively.
- Proteus species was found only in 1 patient (1%).
- 58% of the Cultures showed no growth.

Table 10: incidence of HIV and HBsAg in patients of liver abscess

	Number of patients (n=100)	**Percentage %**
HIV	0	0
HBsAg	6	6
TUBERCULOSIS	37	37

All patients in this study were tested for HIV and HBsAg serology.

- Only 6% of cases were found to have Positive HBsAg serology
- None of the patients found HIV positive
- 37% were having tuberculosis

Table 11: chest x-ray findings of patients studied

Chest X-ray findings	**Number of patients (n=100)**	**Percentage%**
Normal	49	49
• RPEF with or without consolidation	48	48
• B/L PE	3	3

- Chest X-Ray findings were analyzed in all patients:-
- They were normal in 49% of the cases.
- Abnormal Chest X-ray findings was present in 51% cases with most common abnormality was right pleural effusion with or without lung consolidation or basal lung atelectasis.
- Bilateral pleural effusion was found only in 3 cases.
- Right dome of diaphragm was elevated "Tenting effect" in 40.0% of cases.

Table 12: USG findings of patients studied

USG findings	Number of patients (n=100)	%
Lobe involved		
Right lobe abscess	81	81
Left lobe abscess	19	19
Volume		
= or>100cc to < or = 500cc	16	16
>500cc or more	84	84

USG abdomen was done in all cases.

- Isolated right lobe abscess was the most common finding seen in 81.3% of cases (only solitary liver abscess considered for study).
- Left lobe abscess was seen in 19.0% of cases.
- No. of cases with abscess volume= or>100cc to < or = 500cc was 16%
- Patient with abscess cavity volume >500cc was 84%.

Table 13: treatment modality

Treatment	Number of patients (n=100)	%	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 aspirations
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 coverage is better modality and statistically significant (P value<0.05)

Table 14: complications of patients studied

Complications	Number of patients (n=100)	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
Sub capsular 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 per cutaneous 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).
- Sub capsular 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:

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.

Age and sex incidence: Most of the patients who presented with liver abscess were in the middle age with patients in third to fifth decade, accounting for 71.0% of the cases. Mean age of presentation is 37.5yrs, which is comparable to other Studies.

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.

Alcoholism in cases of liver abscess: Alcoholism was found to be present in 68.0% of cases in our study which was comparable to the study by Shyam Mathur *et al.;* where 70% of the cases were alcoholic which concludes Alcoholism has a strong association with liver abscess patients.

Analysis of laboratory investigations: In our study hemoglobin level, blood sugar level and hypoalbuminemia shows some consistency with the study of Hyo Min Yoo *et al.;* study, but the liver

profile was entirely different with that study, which showed more elevated level of alkaline phosphatase than SGOT and SGPT level and our study showed vice-versa. Present study showed 60.0% patients had total serum bilirubin more than normal and prothrombin time (>14 sec) in 29.0%.

We have done ESR in all patients with wintrobe's method, which was found to be raised in 97% cases; it was comparable to the Shyam Mathur *et al.;* study which stated ESR was raised in 2/3 of the cases (66.6%). It can be compared to the CRP (inflammatory marker) level measured in the study of Khee-Siang Chan *et al.;* which was found highly raised in all the patients in whom they had performed tests.

Pus culture analysis: In our study E.coli along with S.aureus (12.0% each) were most common organisms isolated as compared to the study of Hyo Min Yoo *et al.;* where only E.coli accounts for 63.0%. Klebsiella was found common in culture findings in Khee-Siang Chan *et al.;* (82.3%), Hyo Min Yoo et al (28.0%) and it was next to the E.coli with 12% in our study.

In our study 58% of cases showed no growth, out of this only 6% cases had positive stool examination for amoebic cyst, so they might be cases of amoebic abscess with no secondary bacterial infection or pyogenic abscesses that had been taken empirical antibiotic treatment which rendered the pus sterile or low bacterial load in pus to show growth in culture.

HIV AND HBsAg serology in patients with liver abscess: According to our study, 37 were having tuberculosis, only 6 patients were HBsAg positive and none of the patient was HIV positive.

Chest x-ray findings analysis: Chest x-ray findings were normal in 49% of the cases and abnormal in 51% of the cases and was comparable to the study of D. Lynche *et al.;* (54.0%) but recent study i.e. World J Gastroenterol 2008 April 7; 14(13): 2089-2093 showed 41.09%of abnormal cases. In our study most cases had right sided pleural effusion with or without consolidation (48.0%) which was comparable to the study of D. Lynche *et al.;* 2.6% cases had bilateral pleural effusion.

Analysis of usg findings of liver abscess: Ultrasound abdomen was done to all patients in this study and various findings were analyzed. Isolated right lobe involvement Chaturbhul Lal Rajak *et al.;* (20.0, Khee-Siang Chan *et al.;* (17.9%) and World J Gastroenterol 2008 April 7; 14(13): 2089-2093 (23.7%).

Analysis of complications:

The various complications that arose in the patients with liver abscesses in this study were analyzed. Complications like Intraabdominal 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%).

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.

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.

SUMMARY AND CONCLUSION

A clinical study of liver abscesses was chosen as this is a fairly commonly disease in this part of the country. An attempt was made in this study to define the various symptom complex, modes of presentation, methods used in diagnosis, treatment options and complications occuring in cases of liver abscesses undergoing aspiration or catheter drainage. This study also aimed at knowing which USG guided intervention (percutaneous needle aspiration or percutaneous catheter drainage) is better in management of liver abscess. The study was carried out in GRMC Gwalior during period of June 2015 to May2016.

- 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.
- SGOT and SGPT were most consistently elevated among all Liver Function Tests.
- 37 out of 100 cases were diagnosed to be having tuberculosis and be the most frequently associated immunocompromised state with liver abscess in our study.13 cases were having Diabetes mellitus, especially associated with Pyogenic liver abscess cases. The incidence of positive anti HBsAg serology was only 6% in this study, while HIV was 0%
- Staph aureus was the most common organism isolated in pyogenic liver abscess.
- Pleural effusion with or without consolidation was the most common complication associated with liver abscess found to be in 51outof 100 cases. All 51were reactive out of which 8 ruptured through right dome of diaphragm.
- Ultrasound Guided Percutaneous Catheter drainage was found to be a better modality in treatment of liver abscess in terms of

a. 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 3aspirations, only 1 case required 5 aspirations and 19 patients required 6 0r more aspirations.)
b. 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.
c. Faster decrease in abscess volume even in patients with partially aspirable content.
d. 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.
e. 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
    - 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. As, treatment of immunocompromised state along with management of liver abscess accelerates the recovery of the patient.
    - Mortality rate was 0% in this study.

LIMITATIONS OF STUDY

Science our study was conducted in a relatively small sample, it is recommended to repeat similar studies in larger and more variable study sample to fortify the stastical power of the observation.

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