

“To determine the role of ultrasonography in the management of liver abscess and the etiological factors associated with liver abscess.”

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Abstract

Objective: To determine the role of ultrasonography in the management of liver abscess and the etiological factors associated with liver abscess.

Materials and methods: All patients with liver abscess 2015 to 2018 were included in this study. 50 patients with liver abscess who reported to various departments of Subharti Medical College, Meerut, were included in the study. USG was done to determine the size, location, number and to know which lobe of the liver is involved. The pus was collected after procedures like PNA or PCD and was sent for culture and sensitivity, Elisa test to know the causative organism.

Results: On ultrasonography, 31 out of 50 patients were found to have solitary abscess and 19 patients were found to have 2 or more abscesses. Of these 41 patients had abscess in right lobe of liver, 5 had abscess in left lobe and the remaining 4 had abscess in both the lobes of liver. Pus culture was done in all 50 patients. Out of a total of 50 patients in the study group, 24 patients had pus culture negative and Elisa was done which showed *E. histolytica* as the causative organism. *Klebsiella* genus was found to be the causative organism in 10 patients, followed by *E. coli* in 7 patients & *Staph.* genus in pus culture of 4 patients. *Bacteroides* was found in pus culture of 3 patients with *Citrobacter* genus in only 2 patients. Blood culture was done in 10 patients of which 4 were negative while 3 showed *Klebsiella* genus and 3 showed *E. coli* as the infective organism. 11 patients out of 50 were found to have the habit of alcohol intake. Of these 6 patients had history of alcohol intake for less than 10 years and 5 patients were taking alcohol for more than 10 years.

Conclusion: Solitary abscess is more common than multiple abscess as on ultrasonography, as nearly 62% patients were found to have solitary abscess. Right lobe of the liver was more commonly involved as seen in 82% of the patients. The study showed that parasitic infestation in the form of *Entamoeba histolytica* is the most common cause of liver abscess involving 48% of patients. Among bacterial causes *Klebsiella* genus was found to be the most common organism seen in culture of 20% patients. The study shows that alcohol does have a significant role in the pathogenesis of liver abscess with 22% patients having history of alcohol intake of which duration of alcohol intake was less than 10 years in 54.5% patients and more than 10 years in 45.5% patients. The study showed that early diagnosis with USG had a significant role in decreasing the morbidity and mortality, in deciding the mode of treatment and in managing the liver abscess conservatively through percutaneous needle aspiration (PNA) or Pigtail catheterisation (PCD).

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I. Introduction

Liver abscess is a common condition in India. India has 2nd highest incidence of liver abscess in the world. Liver abscesses are caused by bacterial, parasitic or fungal infection. It is of 2 types. Amoebic liver abscess which is a common extra-intestinal manifestation of infection with *Entamoeba histolytica* carries significant morbidity and mortality rate. Pyogenic abscess also carries significant mortality so early diagnosed prompt treatment are necessary to further improve our results of management. The World Health Organisation reported that

Entamoeba histolytica causes approximately 50 million cases and 100,000 deaths annually. The vast majority of these infections are acquired in the developing world. In a country like India where majority of population lives below poverty line, basic sanitary facilities are lacking. This problem coupled with overcrowding and urban slums with unhygienic eating habits sets the stage for communicable diseases like amoebiasis. Primary prevention by improving sanitation, health education, early diagnosis and prompt treatment

may result in lowering mortality / morbidity associated with the disease. This study is directed towards the clinical profile, risk factors and management strategies of liver abscesses.

II. Aims And Objectives

To determine the role of ultrasonography in the management of liver abscess and the etiological factors associated with liver abscess

III. Materials And Methods

The present study was conducted in the Department of General Surgery Subharti Medical College, Meerut. Ethical approval was taken from ethical committee prior to commencement of the study.

50 patients with both pyogenic and amoebic liver abscess admitted to our institution between September 2015 to October 2017 were enrolled. Patient data was collected from attending, general surgery outdoor patient department, casualty and inpatient departments, irrespective of gender background socioeconomic status. Detailed history of patient was entered in a proforma. Complete hemogram, renal function test, function test (LFT), prothrombin time, bleeding time, and viral markers were done. Preliminary ultrasound was done on the same day and x-ray whole abdomen erect was also done. Patients were treated according to respective protocol daily. Patient on conservative line was followed up daily. Patient was informed about any surgical procedure and consent was taken for the same.

Patient data collected regarding:

Age, gender, complaints, past-surgical history, past history of liver abscess, history of alcoholism, diabetes, any immunodeficiency states, any history of biliary tract disorder, history of amoebic dysentery, jaundice was taken. Patient was examined in detail. If the patient was referred from elsewhere the details of the same were considered at the time of admission. Blood investigations and X-rays & other radiological modalities performed were added. Complications if developed were assessed in detail and management of the same and the further complications were followed up.

Percutaneous Catheter Drainage (USG Guided)

The drainage technique is a trocar method with an 8-French multiple-side hole pigtail catheter (Boston Scientific) introduced into the abscess cavity. The procedure will be performed with local anaesthesia (xylocaine 2%), the patient supine. Conscious sedation will not be used. Careful localization of the abscess and proper selection of the entry site will be required. The optimal route of access traversed the least possible amount of liver tissue and avoided diaphragm and pleura. Aspiration will be performed with the catheter until no more pus is removed. The catheter then will be secured to the skin for continuous external drainage and will be left in place until production of content stopped.

Needle Aspiration (USG Guided)

Evacuation of pus from an abscess will be performed with an 18-gauge disposable trocar needle. Sonography will be performed every 3 days, and the size of the abscess cavity will be recorded. If there will be no significant reduction in the abscess cavity on control examination, aspiration will be repeated. Repeated aspiration will be attempted a maximum of twice for each patient not responding; lack of response to a third aspiration attempt will be considered failure of treatment, and a catheter for continuous drainage will be introduced. Patients who will need this treatment shall not be included in the PCD group.

INCLUSION CRITERIA:

1. All cases of liver abscess diagnosed clinically and/or ultrasonographically.
2. All cases of bacterial and parasitic liver abscess
3. All cases in evolving, liquefied & ruptured stage with or without peritonitis
4. All cases of clinical liver abscess with elevated total leucocyte count (TLC), LFT, Increased Prothrombin time and/or Serologically amoebic antigen positive.
5. All cases of Diagnosed Liver Abscess being referred to SIMS

EXCLUSION CRITERIA:

- Secondaries mimicking Liver abscess.

OBSERVATION AND RESULT

50 patients with Liver abscess who reported to various departments of Subharti medical College, Meerut, were included in the study. Out of total 50 patients in the study group, 43 were males & 7 were females. The maximum patients were in the age group of 41-50 yrs.

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It was observed that pain in abdomen was present in 49 out of 50 patients of study group which is 98% of total patients. The second most common symptom noticed was fever seen in 46(92%) patients, followed by cough in 18(36%) patients & jaundice in 07(14%). Diarrhoea was found to be the least common symptom present only in 6(12%) patients.

It was observed that abdominal tenderness was present in all 50 patients of study group which is 100% of total patients. The second most common sign noticed was fever seen in 47(94%) patients, followed by hepatomegaly in 39(78%) patients & respiratory signs in 19(38%). Icterus was found in only 8(16%) patients whereas pallor was seen in only 7(14%) patients. Splenomegaly was seen in 5(10%) patients. The least common sign present only in 3(6%) patients was shock.

Clinical sign	Number of patients	Percentage
Abdomen tenderness	50	100%
Fever	47	94%
Hepatomegaly	39	78%
Respiratory findings	19	38%
Icterus	08	16%
Pallor	07	14%
Splenomegaly	05	10%
Shock	03	06%

On ultrasonography, 31 out of 50 patients were found to have solitary abscess and 19 patients were found to have 2 or more abscesses. Of these 41 patients had abscess in right lobe of liver, 5 had abscess in left lobe and the remaining 4 had abscess in both the lobes of liver.

USG finding	No of patients	Percentage
Solitary Abscess	31	62%
Rt lobe abscess	41	82%
Li lobe abscess	05	10%
Multiple Abscess	19	38%
Both lobe abscess	04	08%

Pus culture was done in all 50 patients. The study shows maximum number of patients had E. histolytica as the causative organism. Out of a total of 50 patients in the study group, 24 patients had pus culture negative and Elisa was done which showed e. histolytica as the causative organism.

Klebsiella genus was found to be the causative organism in 10 patients, followed by e. coli in 7 patients & staph. genus in pus culture of 4 patients.

Bacteroides was found in pus culture of 3 patients with citrobacter. genus in only 2 patients. Blood culture was done in 10 patients of which 4 were negative while 3 showed klebsiella genus and 3 showed e coli as the infective organism.

ORGANISM	NO OF PATIENTS	Percentage
Amoebic	24	48%
Klebsiella	10	20%
Ecoli	07	14%
Staphylococcus	04	08%
Bacteroides	03	06%
Citrobacter	02	04%

11 patients out of 50 were found to have the habit of alcohol intake. Of these 6 patients had history of alcohol intake for less than 10 years and 5 patients were taking alcohol for more than 10 years.

ALCOHOLISM	Total pts	Percentage
DURATION <10 YEARS	6	12%
DURATION >10 YEARS	5	10%

IV. Discussion

Our study supports that the most common etiological organism of liver abscess is *Entamoeba histolytica* with 48% patients which is similar with **C L Rajak ,et al (1998)**¹, **Rustam Khan et al (2008)**² who found similar findings. This observation is different from that **S. ChYu,et al(1997)**³, **A.H. Mohsen,et al(2002)**⁴, **LübbertC,et(2014)**⁵ which showed bacterial infection as the most common etiological organism. Our study further shows that among bacterial causes *Klebsiella* genus was most commonly found organism with 20% patients. The clinical features of liver abscess are so distinctive that the diagnosis of disease can be easily made on the basis of clinical features. The disease starts with prodromal symptoms and then advances to produce marked clinical features and ultimately leading to abscess rupture and other complications. In present study, nearly all cases of liver abscess showed symptoms of pain abdomen (98%), fever (92%) which is very similar to the findings of **Alpesh B. Amin**⁶, who also found 96% patients having pain abdomen, 68% cases having fever. The frequency of clinical signs of abdominal tenderness (100%), fever (94%) as found in our study was quite similar to other studies like that by **P Malik, et al (2014)**⁷ **Abhinav Mittal(2014)**⁸ Serum bilirubin levels >1.3mg/dl were seen in 14(28%) patients however clinical jaundice was seen only in 8 patients with serum bilirubin levels of >3mg/dl.

3 patients with ruptured abscesses showed features of peritonitis with guarding and rigidity and abdominal distension. USG in the patients showed free fluid in peritoneal cavity. Our study showed that right lobe of the liver was most commonly involved with 41 out of 50 patients (82%) which is consistent with the study of **José A. Alvarez,et al(2001)**⁹, **Kurland JE,et al (2004)**¹⁰ The study further showed that solitary abscess is more common than multiple abscesses with 62% patients having single abscess which is consistent with the study of **Seeto RK,et al(1996)**¹¹ . However the observation is different from the study of **Alton Ochsner,et al(1938)**¹² which showed multiple abscesses in 71.1% patients.

Role of USG.

Ultrasound (USG) is the imaging modality used in the initial evaluation. The appearance on USG varies according to the stage of evolution of the abscess. Initially the abscess is hyperechoic and indistinct, but with maturation and pus formation, it becomes hypoechoic with a distinct margin. When the pus is very thick, a fluid-containing lesion may be confused with a solid lesion on USG. USG has a sensitivity of 75% to 95%, but has difficulty in detecting an abscess high in the dome of the right hemiliver and especially multiple small PLAs. By showing gallstones, dilated bile ducts, and hepatolithiasis, USG has the advantage of imaging underlying biliary tract pathology.¹

Ultrasound is the most commonly used imaging technique for diagnosis of liver abscess. It offers a high sensitivity and specificity in diagnosis, though it can not differentiate pyogenic from amoebic abscess.

Diagnosis of a liver abscess is easy on ultrasound even with a less sophisticated machine and a less experienced person. Careful scanning of liver is essential in all planes. Patients should be scanned in different positions. Decubitus position for scanning of posterior surface of liver is essential to pick up small abscess situated posteriorly. Presence of small right pleural effusion could be a clue to underlying abscess.

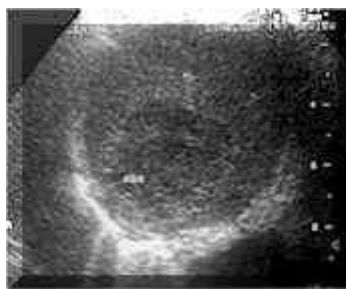
Most often sonography is diagnostic and no other imaging technique is needed. Ultrasound is useful not only for accurate diagnosis of an abscess but also in guiding aspiration if required. It is a cheaper, easier and reliable technique to follow up patients.¹⁰⁰

The normal liver parenchyma is of medium homogenous echogenicity, usually slightly darker than the spleen and slightly brighter than the renal cortex independently of the age except in childhood.

. Liver surface and vessels borders are smooth and vascular architecture with its classic dichotomy in branching is perceived as a harmonic and detailed aspect. The image of the normal parenchyma varies very little among individuals.⁹⁹

Very early stage

In the initial stage, cell death occurs but entire dissolution and liquefaction is not complete as the contents are not liquid. This may be termed as solid abscess. On ultrasound these lesions are usually small and probably are the most challenging as compared to the other stages of the liver abscesses. The margins of the abscess may be ill defined, the abscess is hypoechoic as compared to the surrounding liver. However, there is no true liquefaction at this stage and therefore there is poor or no posterior acoustic enhancement. The demarcation between the abscess and the surrounding liver is also poor (see Picture 1).



Picture1. Early abscess

Recentlyformedamoebicabscesses

At this stage, the differential diagnosis of fat spared area in a fatty liver or an early neoplastic lesion have to be considered. An abscess of recent onset has a distinct central liquefied area. This is seen on ultrasound as a sonolucent or anhypoechoic area usually with fine internal echoes. Because of the liquefaction, there is associated posterior acoustic enhancement. The cavity may be round, oval or branching. The walls of the abscess at this stage are usually not very thick and sometimes the demarcation between the wall and the surrounding tissue can be poor. Sometimes the walls may be thicker and these may be seen as shaggy, ill-defined echogenic areas along the walls (see Picture2). It is at this stage of the abscess that aspiration may be required. Small amount of air in the abscess because of secondary infection or following an aspiration is seen as highly reflective dots.



Picture2.

Abscesses of some duration

It is at this stage of the abscess that differential diagnosis of a cyst in the liver, a cyst with haemorrhage, cystic metastatic deposit or sometimes a hydatid cyst and haematoma are to be considered. The basic difference between an acute abscess and an abscess of some duration is that, in the latter the body has had time to wall up the lesion by producing a layer of fibrous tissue around it. On sonography an abscess shows thick walls which may vary from a few mm to 1.5 cm in thickness. The echogenicity of the abscess also varies, abscesses generally become more sonolucent at this stage, some abscesses become more echogenic because of organisation of fluid (see Picture3).



Picture3.

HealingStage

The abscess heals, the liquid contents dry up, which has been described as putty appearance. On ultrasound it is seen again as a lesion with thick walls fairly echogenic as compared to surrounding organs. This shadow can be seen on ultrasound for a long time, even years. It is usually at this stage that the differential diagnosis of a neoplasm, haemangioma or granuloma in liver come into picture.

The diagnosis of liver abscess is easy on ultrasound and besides pointing out the diagnosis, the number of abscesses and helping in aspiration, If the sonologist can predict the stage of evolution then it could help a clinician in deciding the management of a patient.¹⁰⁰

Two sonographic features were significantly more prevalent in amoebic abscesses: the lesions had a round or oval shape and the lesions had an echogenicity that was lower than that of normal liver and were internally homogeneous on high-gain scans. Amoebic abscesses were round or oval in 92 instances (82%), while 18 pyogenic abscesses (60%) (p less than .01) had these shapes. Fifty-nine (58%) of 101 amoebic abscesses displayed low echogenicity and homogeneous internal echoes with high-gain settings compared with nine (36%) of 25 pyogenic abscesses (p less than .04). Despite these different sonographic patterns, image findings alone were inadequate in distinguishing pyogenic from amoebic liver abscesses. (Ralls PW et al, 1987)¹³

A review of surgical literature has disclosed 80-100 percent mortality of untreated abscesses and even with surgical drainage the mortality was about 30% (Karlson et al, 1982).¹⁴ The high mortality in untreated abscesses emphasizes importance of early diagnosis & treatment.

Operative drainage of liver abscess is done because of the depth of abscess within the liver, its occasional multiplicity & difficulty with intraperitoneal localisations of small pus (Stephen et al, 1985).¹⁰³

Accurate localisations of intra-abdominal abscess is crucial in planning the treatment as the morbidity following missed or recurrent abscess is high.

For early diagnosis of liver abscess several imaging techniques are now available e.g. ultrasound, C.T., sulphur colloid scintigraphy, ⁶⁷Ga scanning & ¹¹¹In leukocyte scanning.¹⁰⁰

In the era of ultra sonography, lower morbidity and mortality for operative drainage of solitary liver abscess is reported to be 9% (Gerzof et al, 1985). However, operative drainage remains much less effective in treatment of multiple abscesses 36% (Gerzof et al, 1985)²⁹

Percutaneous aspiration and drainage have proven efficient and effective in several recent series (Van Sonnenberg et al, 1982,¹⁰⁴ Martin et al, 1981¹⁰⁵). The advantage of percutaneous aspiration and drainage over surgical drainage are, a lower recurrence, lower complication rate, lesser mortality and lesser cost to the patient (Reuvers et al, 1988)¹⁰⁶

Unlike large operative incisions require for accurate assessment of all portions of the liver harbouring the abscess, percutaneous routes and cutaneous entry sites are selected based on the exact location of the abscess shown by ultrasound. Superficial abscess in the caudal aspect of right lobe of the liver and in the left lobe are easy for the percutaneous drainage since they can be approached perpendicular by the ultrasound. Abscess, high in the dome of the liver, require cephalocaudal angulation to avoid costophrenic angle and the lung. This can be performed directly by ultrasound.

In last few years there is a change in trend in etiology and treating these abscesses more conservatively and by less traumatic means compared to open surgical procedures. The primary mode of treatment of amoebic liver abscess is medical. However, as many as 15% of amoebic abscesses may be refractory to medical therapy. In such patients and in patients with pyogenic liver abscesses, surgical drainage has been the traditional mode of treatment. However operative drainage is associated with significant (10-47%) morbidity and mortality. In recent years imaging guided percutaneous drainage using catheters has been increasingly used to treat liver abscesses with reported success rates ranging from 70-100%. Also few studies have shown therapeutic needle aspiration to be a simpler and less costly mode of treatment, but needs repeated aspiration, with more failure rates. Though every abscesses should be treated on its individual merits, there is a need to define indications to adopt particular method of treatment so as to reduce morbidity, avoid mortality, make the treatment affordable and to achieve a highest cure rate.

Follow up of patients:

- A. Patients will be followed up for a period of 2 months:
- B. 1) once in 2 weeks for 2 months

V. Conclusion

The following conclusions were drawn.

In our sample we observed that

1. Liver abscess was much more common in males than females with a preponderance of almost (86%) in males. The peak incidence seen in the age group of 41-50 yrs which accounted for almost (26%) of the cases. Pain abdomen was the most common symptom which accounted for almost (98%) of patients followed by fever seen in 92% of patients. All patients with liver abscess presented with abdominal tenderness on clinical examination with fever as the second most common sign involving 94% of patients. Solitary abscess is more common than multiple abscess as on ultrasonography, as nearly 62% patients were found to have solitary abscess. Right lobe of the liver was more commonly involved as seen in 82% of the patients. The study showed that parasitic infestation in the form of *Entamoeba histolytica* is the most common cause of liver abscess involving 48 % of patients. Among bacterial causes *Klebsiella* genus was found to be the most common organism seen in culture of 20% patients. The study shows that alcohol does have a significant role in the pathogenesis of liver abscess with 22% patients having history of alcohol intake of which duration of alcohol intake was less than 10 years in 54.5% patients and more than 10 years

in 45.5% patients. The study showed that early diagnosis with USG had a significant role in decreasing the morbidity and mortality, in deciding the mode of treatment and in managing the liver abscess conservatively through percutaneous needle aspiration(PNA) or Pigtail catheterisation(PCD).

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