ORIGINAL RESEARCH PAPER
Volume-9 | Issue-2 | February-2020 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ULTRASONOGRAPHIC AND PATHOLOGICAL CORRELATION OF LIVER ABSCESS.

Radiodiagnosis

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ABSTRACT

INTRODUCTION- USG is cheaper, effective, quick, painless, non-invasive investigation for Sonographic features of liver abscess with no radiation hazard. Guided FNAC of the liver is a safe, simple, cost-effective and accurate method for cytological diagnosis of hepatic abscess.
AIMS AND OBJECTIVES- Sonographic features of liver abscess. Microscopic & Culture evaluation of aspirate. Co-relation between sonographic features and pathological evaluation.
MATERIALS & METHODS- Patients referred to the department of Radiodiagnosis for Sonological evaluation of pain in abdomen and fever. Patients with liver SOL with suspicion of liver abscess were included in the study .Protocols included History, Routine laboratory investigations followed by USG guided FNA of the abscess & cytological co-relation of the aspirate.
RESULTS- Out of 40 patients (37 male and 03 females), 39 patients had sterile aspirate and only 1 patient was diagnosed positive for entamoeba histolytica. Maximum no of cases in the age group of 21-30 & 41-50 years.The most common complaint was pain abdomen followed by fever.
CONCLUSION- Most patients were treated by blanket treatment which included the Antibiotics as well as Antiamoebics, the isolation rate for presence of any microorganism in this study was very low.

KEYWORDS

Hepatic Abscess, Fine Needle Aspiration Cytology, Ultrasound

INTRODUCTION

Liver abscess is not uncommon but potentially life-threatening disease with significant morbidity and mortality[1]. In 1890, Sir William Osler was the first to describe the presence of amoebae in a liver abscess and stools; however, it took until the early 20th century to conclude that *Entamoeba histolytica was* causally correlated to abscess formation in the liver. In addition to pyogenic bacteria and *E. histolytica*, other pathogens, such as fungi and cytomegalovirus, can also cause liver abscess, although rarely and especially in immune suppressed patients[2]. The 3 types of hepatic abscess, according to the etiology, are-

A. **Pyogenic abscess** mainly caused by E. coli followed by streptococcus species.
B. **Amoebic abscess** mainly caused by Entamoeba histolytica,
C. **Fungal abscess**, mostly due to Candida species, less common.

Although no distinct clinical criteria exist for distinguishing Pyogenic liver and Amoebic liver abscess. The differential diagnosis from other liver SOL can be made based on the following criteria- younger age, diarrhea, and marked abdominal pain, fever raise clinical suspicion of Amoebic liver abscess. The diagnosis of amoebic abscess is confirmed by ultrasonography, reddish brown (anchovy paste like material) aspirate from the abscess, positive wet mount, rapid resolution after metronidazole treatment[3].

The diagnosis of pyogenic liver abscess is based on picket fence configuration of temperature chart, nausea, vomiting, anorexia, hematological analysis of leukocytosis, anemia, positive pus aspirate and culture for bacterial etiology[4].

MATERIAL & METHODS

This prospective cross-sectional study was carried out in the department of Radio diagnosis in collaboration with department of Pathology, Medicine and General Surgery at Shri Ram Murti Smarak Institute of Medical Sciences, Bhojipura, Bareilly over a period of 18 months (January 2018 to June 2019) on patients suspected with liver abscess on ultrasonography.

INCLUSION CRITERIA:
1. All the patients suspected to have liver abscess on ultrasonography.
2. All cases in which pathological correlation done

EXCLUSION CRITERIA:
1. Prior intervention
2. Uncorrectable coagulopathy.

Fourty (40) patients of either sex were included in study as per inclusion/exclusion criteria. The study was conducted with Siemens Acuson S 2000 color Doppler ultrasound machine having 3.5 MHz Convex sector and 5 - 7.5 MHz linear transducer. The patient fasted for a minimum of 6 hours prior to examination so that bowel gas is limited and gallbladder is not contracted.

Following protocols were followed,
1. History.
2. Routine laboratory and investigations.
3. Ultrasonography & colour Doppler examination
4. USG guided Aspiration of the lesions with 18 gauge needle & cytological confirmation.

METHODS OF CULTURE COLLECTION

All patients were subjected to ultrasound guided aspiration of liver abscess either by percutaneous needle or pigtail catheter. Interventions were done after correction of INR below 1.4 to those who presented with raised coagulopathy. Aspirate was collected in sterile containers and BACTEC culture vials and sent immediately to Microbiology Department for microscopic examination of wet mount for trophozoites of Entamoebahistolytica, Gram's staining, KOH or fungal hyphae. Samples were plated in aerobic, anaerobic, and fungal culture media.

OBSERVATION AND RESULTS

A total number of 40 cases were included in this study. All these patients had hepatic abscess as suspected by Ultrasonography and colour Doppler flow imaging (CDFI) and the diagnosis was confirmed by USG guided aspiration study.

Age and Gender wise distribution of patient enrolled for study were mentioned in the table (Table1). Max number (10 each), were in age group of 21-30 & 41-50 yrs.

Table No. 1: Distribution of patients on the basis of age

Age (in years)	Frequency (number=40)	Percentage
≤ 10	3	7.5
11 – 20	3	7.5
21 – 30	10	25.0
31 – 40	6	15.0
41 – 50	10	25.0
51 – 60	7	17.5
>60	1	2.5
Mean ± Standard Deviation (range)	36.33±16.27 (1-72)	

Most patients were in the age group of 21-30 years and 41-50 years.

Table no.2: Distribution of patients on the basis of Gender

Sex	Frequency (number=40)	Percentage
Male	37	92.5
Female	3	7.5

Amongst 40 patients, 37 were male and 03 were female.

Table no.3: Distribution of patients on the basis of their Clinical Symptoms.

Clinical Symptoms	Frequency (number=40)	Percentage
Pain in abdomen	40	100.0
Fever	19	47.5

Most common symptom was pain in abdomen in all patients followed by fever in 19 (47.5%) patients.

Table no.4: Distribution of patients on the basis of Ultrasound finding

Ultrasound findings		Frequency (n=40)	Percentage
Size of liver	Normal	21	52.5
	Enlarge	19	47.5
No of lesions	Single	25	62.5
	Multiple	15	37.5
Echogenicity	Heteroechoic	28	70.0
	Hypoechoic	12	30.0
Location	Right lobe	31	77.5
	Left Lobe	5	12.5
	Both	4	10.0
Margins	Regular	17	42.5
	Irregular	23	57.5
Wall Thickness (mm)	Mean ± SD	7.29±3.35	

About 52.5% patients had normal size of liver whereas only 19 (47.5%) patients had enlarged liver. Multiple numbers of lesions was found in 15 (37.5%) patients. In the findings of Echogenicity, 28 (70%) patients had Heteroechoic whereas remaining 12 (30%) had Hypoechoic echogenicity.

In 31 (77.5%) patients abscess was found in right lobe and 5 (12.5%) patients in left lobe whereas 4 (10%) patients were found abscess in both lobes. Irregular margins were found in 23 (57.5%) patients. IHBRD, PV and HV were found normal in all patients.

Table no 6: Color Doppler Flow Imaging findings of studied patients

Color Doppler findings	Frequency (n=40)	Percentage
Avascular	24	60.0
Peripheral wall vascularity	16	40.0

In the color doppler findings of liver, mostly 24 (60%) were found Avascular followed by 15 (37.5%) peripheral wall vascularity.

Table 7: Culture report findings of patients

Culture Report	Frequency (n=40)	Percentage
Sterile	39	97.5
Entameba histolytica	1	2.5

All most all patients (39, 97.5%) were found sterile, only 1 (2.5%) culture was found to be Entameba histolytica.

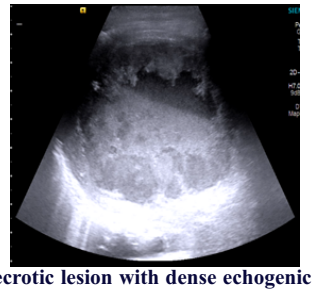
Table 8: Provisional Ultrasonographic diagnosis based on Lesion characteristics

Lesion characteristics	Provisional Ultra-sonographic diagnosis	No. of patients (%)
Round/ oval sharply defined hypoechoic mass abutting liver capsule with homogenous internal echoes.	Amoebic abscess	17 (42.5)
Variable in shape and echogenicity, margins irregular & poorly demarcated, septa / debris / fluid level. Cluster sign(+)	Pyogenic abscess	23 (57.5)

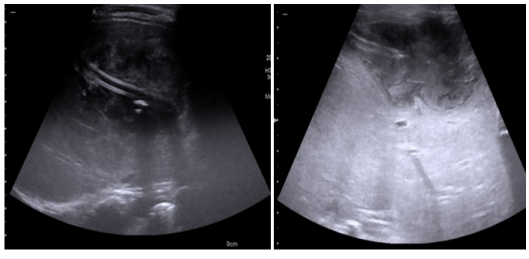
Pyogenic abscesses on ultrasound, may appear as variable in shape and echogenicity with irregular margins and presence of septa / debris with positive cluster sign. At histopathologic analysis, the abscess cavity may reveal multiple locules, usually filled with thick, purulent material and lined by pale fibrous tissue. The fibrous cuff around the abscess wall is often a centimeter or more thick and gradually merges into the liver parenchyma. Amebic abscess may appear as a round/ oval sharply defined hypoechoic mass abutting liver capsule with homogenous internal echoes.

PHOTOGRAPHS

CASE 1

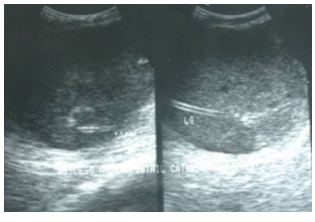


Well defined necrotic lesion with dense echogenic flakes and less echogenic fluid component –Amoebic abscess



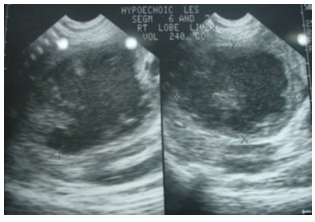
Tube drainage of Amoebic abscesses

CASE 2



Amoebic abscess with Tube drainage.

CASE 3



Well defined abscess with solid and liquefied component with irregular margins in right lobe of liver

CASE 4

Multiple anechoic pyogenic hepatic abscesses with positive Cluster sign.

DISCUSSION

Liver abscess is common in the developing countries like the Indian subcontinent. The most common causative agents for hepatic abscess are E. histolytica (amoebic) or bacterial (pyogenic). Out of them, amoebic liver abscess is largely a disease of tropical areas like India. They especially affect younger population mostly males. Common presenting complains are abdominal pain and pyrexia. It is also an important cause for pyrexia of unknown origin (PUO).

In our study, we aimed to study sonographic features of liver abscess and to evaluate the correlations between sonographic and pathological findings.

This was a prospective observational (cross sectional) study conducted in a tertiary care teaching hospital in north India. Similar study was done by **Hathila T N et al**[5]**, GhoshS et al,**[6] **Paul SN et al**[7]**, Patel S et al**[8] **& Jha AK et al**. We haven't gone for a case control study because it was impossible for us to convince a healthy person to take part in the study and went through all the test for no reason while the majority of the studies were case reports in which only 1 or 2 cases are discussed, so this cross-sectional study was best suited for present study. A total of 53 patients were screened, 7 were rejected to participate in the study and 6 patients were not fit according to inclusion/exclusion criteria and finally 40 patient were found fit according to inclusion criteria diagnosed with Liver Abscess were studied in this study.

Sample size of Following studies:-

Study	Year	Sample Size
GhoshS et al[6]	2014	200
Mangukiya D O et[10] al	2014	400
Jha AK et al[9]	2015	125
Hathila T N et al[5]	2014	100
Patel S et al[8]	2017	77
Paul SN et al[7]	2019	50
Present study	2019	40

In our study, a total 40 patients diagnosed with Liver Abscess were studied with similar sample Size previously studied by **Paul SN et al** & **Patel S et alii**. Study done by **GhoshS et al, Mangukiya D O et al, & Jha AK et al** had larger sample size than our study, this difference of sample size may be occurs due to the inclusion criteria of both studies.

Age distribution

In our study, most patients were in were in 21-50 years of age &maximum incidence of disease was found in 21-40 years (40.0%) followed by greater than 50 years of age (20.0%). The mean age of all studied patients was 36.33±16.27 ranged 1-72 years. Our study was in accordance with **Paul SN et al.** who has reported the maximum incidence of disease was in 21-40 years of age group, with age group 41-60 years being the second most common. **Jha AK et al.** also reported maximum number of patients were in 21-40 years of age (60.8%) followed by 41-60 years of age (39.8%). **Hathila T N et al** has depicted 40.0% of patients were in 20-39 years of age followed by 40-49 years with 25% patients. **GhoshS et al.** & **Mangukiya D O et al.** Reported mean age of patients was 41.13 years & 35 years respectively in their studies. This indicates that the prevalence of liver abscess is generally takes place in middle to older age that is in 3rd to 4th decade of human life. This observation is similar with the work of other researchers who reported it to be more common in young people at peak of their productive life and almost all observed maximum incidence of the disease the third to fourth decades in these patients.

Gender

In our study the majority of patients were male 37 (92.5%) and only 3 (7.5%) were female; means males were more affected than females(12.3:1) . A high predominant factor of male was also reported by **Hathila T N et al**[5] **,**where males were 94% and females (6%) only which were similar to the present study whereas **Ghosh S et al**[6] also reported a high prevalence of male in their respective study where male to female ratio was 13.3:1. Our results were in accordance with the results of other studies **Mangukiya D O et al**[10] **.** reported male to female ratio as 4:1. **Jha AK et al**[4] reported male to female ratio was 101:9 in his study. Some authors **Pillai DR et al**[11]**, Makkar RP et al**[12]**, Mukhopadhyay M et al**[13] & **Mathur S et al**[14]**,** also reported that the Liver abscess is more common in males. However, in their study **Gyorffy et al**[15] they found slightly higher incidence in females (male: Female-13:20), which contradicts our findings. Gender distribution of the patients with liver abscess revealed that both the types of liver abscess were more common (>93%) in male gender than in female patients[5].

Clinical Symptoms

In present study, all of patients were having abdominal pain (100%) and 47.5% patients were had fever. In **Paul SN et al** study complication or symptom was found pain abdomen in almost all patients. **Hathila T N et al** reported the most common clinical manifestations were right upper quadrant pain (95%) followed by fever (60%) whereas **GhoshS et al** also reported pain abdomen was the most common symptom (99%) flowed by fever (94%). In a retrospective review of Liver Abscess patients from three tertiary care centers over a period of 10 years, from 1995 to 2005, conducted by **Ali Albenmousa et al**[16] also found that upper abdominal pain and fever were the commonest symptoms, each reported in 87% of the cases of their study.

Pathological & laboratory findings

According to Radiological characteristics of the abscess, provisional diagnosis of liver abscess was made, which was amoebic in 17 patients (42.5%) and pyogenic in 23 patients (57.5%). In different studies the rates of pyogenic and amoebic are different. In **Hathila T N et al**[5] study reported out of 100 studied patients 57 (57%) were pyogenic and 43 (43%) amoebic liver abscess. Another study **Paul SN et al**[7] 44 (88%) had diagnosed with Amoebic liver abscess and 6 (l2%) with Pyogenic liver abscess. **Mangukiya D O et al** reported majority of patients 390 (97%) with pyogenic liver abscess in his study. In Another study **Jha AK et al**[4] reported of the total 125 patients screened, 110 (88%) had amoebic liver abscess and 15 (12%) had pyogenic liver abscess.

In our study, pathological & laboratory findings noted and raised total leucocyte count (≥10000) was found in 34 (85%) of patients, raised international normalized ratio(>1.2) was found in 10 (25%), raised Serum glutamic oxaloacetic transaminase (>50) was found in only 4 (10%) patients (all of them were males), raised Serum glutamic pyruvic transaminase(>50) was found in only 11 (27.5%) patients and raised bilirubin (>1.2) was found in only 8 (20%) patients. **Hathila T N et al**[5] also reported raised total leucocyte count was found in 60%, raised bilirubin≥1 was in 28%, Serum glutamic oxaloacetictransaminas≥40 34%. **Ghosh S et al**[6] reported raised total leucocyte count (>11000) in 40.5% patients, raised INR (>1.2) in 75% patients, raised Serum glutamic oxaloacetic transaminase &Serum glutamic pyruvic transaminase(>50) was in 47% & 42% patients respectively.

Ultra Sonography findings

In our study, about 52.5% patients had normal size of liver whereas only 19 (47.5%) patients had enlarged liver. Multiple numbers of lesions was found in 15 (37.5%) patients. In the findings of Echogenicity, 28 (70%) patients had Heteroechoic whereas remaining 12 (30%) had Hypoechoic echogenicity. In 31 (77.5%) patients abscess was found in right lobe and 5 (12.5%) patients in left lobe whereas in 4 (10%) patients absness were found in both lobes. Irregular margins were found in 23 (57.5%) patients. These observations were in accordance with the results of other studies i.e. **Hathila T N et al**[5] reported liver abscess most commonly involved the right lobe of liver (78%); **GhoshS et al**[6] reported involvement of right lobe of liver in

these cases was most predominant (73%); **Mangukiya D O et al**[10] reported majority of hepatic abscesses (85%) were found in the right lobe in their study, about 4.5% of liver abscesses were confined to the left lobe only. In our study both lobes were involved in 12.5% of patients and more than 50% of abscesses were solitary at the time of presentation. Multiple abscesses were found in 21% of patients. There is a preferential blood supply to the right hepatic lobe through the large right branch of portal vein. This explains the high incidence of the right lobe liver abscess.

In our study, according to ultrasound characteristics of the abscess and clinical symptoms , provisional diagnosis was suspected, which was amoebic in 17 patients (42.5%) and pyogenic in 23 patients (57.5%). **Koenraad et al**[17] reported radiologic findings may be sufficient to obviate aspiration or histologic examination, although in most instances they are less specific. Nevertheless, imaging findings taken together with appropriate clinical information may provide the most likely diagnosis, even aspiration is sometimes required for confirmation.

In our study, in the color Doppler flow indices(CFI) findings of liver, mostly 24 (60%) were found Avascular followed by 14 (35.0%) peripheral wall vascularity and in culture reports of patients (39, 97.5%) were found sterile, only 1 (2.5%) culture was found to be Entamebahistolytica.

As SRMS IMS is a tertiary care medical centre and higher referral centre for the patients of Bareilly and accompanying area of Bareilly district, so the cases included in our study were already under the treatment of some local practitioner from last 10-15 days. As in our study there was only 1 patient who showed the presence of Entamoeba.Histolytica in his abscess fluid as he came to the institute on 2nd day of USG advised by the local practitioner and that patient had not started any treatment advised by his physician. Rests of patients probably were partially treated by blanket treatment which included the Antibiotics as well as Antiamoebics. That may be the reason of low the isolation rate for presence of microorganism in my study is very low.

Mangukiya D O et al[10] reported most common causative organism isolated in abscess culture were Klebseilla species (7.57%), E. coli (5.3%), and anaerobes (1.51%). **GhoshS et al**[6] reported E. Coli (8.5%) most common etiological agents in positive pus culture followed by Klebsiella (5.5%).

In our study, correlation of laboratory and bio-chemical findings with ultra sonography findings of liver were done. Total Leukocyte count and Serum Bilirubin were found to be statistically correlated with ultra Sonography finding of liver ($p<0.05$) whereas all other parameters were found to be statistically non-significant association among them ($p>0.05$). Similarly, Total Leukocyte count was significant associated with echogenicity of liver in our study ($p<0.05$); only. Receiver operating characteristic (ROC) analysis was used to predict the cutoff value of various laboratory and biochemical findings on the basis of size of liver and Total Leukocyte count,Monocytes, Basophils and Platelet Count were found more sensitive (>70%) in predicting Liver abscess.

Strength of the study

- This study was prospective cross sectional study design and the enrollment of consecutive patients across large representative geographical region.

Limitations of the study

- The number of patients was relatively small due to the short recruitment period.
- This was an cross sectional study, there was no specific follow-up protocol defined for surveillance of patients with Liver Abscess.

Recommendations

Further studies involving the multiple centers and more number of patients with a specified period of follow up are required.

CONCLUSION-

Liver abscess was most common in third to fourth decade and was uncommon in female patient. Receiver operating characteristic analysis was used to predict the cutoff value of various laboratory and biochemical findings on the basis of ultra Sonography findings and it was observed that total leucocyte count and Serum Bilirubin has high accuracy for prediction of Liver Abscess. Most common symptom was pain in abdomen in all patients followed by fever. According to Ultrasonographic characteristics of the abscess, provisional diagnosis was suspected, which was amoebic in 17 patients (42.5%) and pyogenic in 23 patients (57.5%). All most all patients (39, 97.5%) were found sterile, only 1 (2.5%) culture was found to be Entameba histolytica. Because most of patients were treated by blanket treatment which included the Antibiotics as well as Antiamoebics. That is why the isolation rate for presence of any microorganism in our study is very low.

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