

To Study the Profile of Liver Abscess and its Prognosis after Conservative vs Ultrasound Guided Pigtail Drainage vs Surgical Management and Significance of Albumin and Globulin Ratio

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Abstract: *Aim and objectives:* To study the profile of liver abscess and prognosis of patients after conservative, USG guided pigtail drainage and surgical management. *Materials and method:* This prospective study was undertaken at the Department of Surgery, at Motilal Nehru Medical College, Prayagraj between October 2020 - September 2021. The patients were divided into 3 groups on the basis of their management, namely, Group I - Conservative management, Group II - USG guided pigtail drainage and Group III - Open surgical drainage. *Results:* Most commonly found in males (Male: Female ratio was 11.5: 1) and most common age group was 30 - 60 years. Most common procedure done was USG - guided pigtail drainage in 33 patients with 100% success rates. There were 24 (48%) patients with $AGR > 0.96$ and 26 (52%) patients with $AGR \leq 0.96$. The baseline data and treatment plans of the patients with high or low AGR were comparative. However, the patients with a low AGR had higher body temperature, higher WBC counts, deranged liver function tests, larger abscess volume, higher positive rate of pus culture, hence increasing the duration of hospital stay. *Conclusion:* The application of contemporary radiographic methods has shown to be of significant assistance in the early identification and therapy of liver abscess, which has resulted in a reduction in the morbidity and mortality rates associated with the condition.

Keywords: Liver Abscess, Catheter drainage, AG Ratio, Duration of hospital stay, Surgical management

1. Introduction

The liver is the most common organ to develop an abscess, and etiology and origin vary by regions around the world.^{1,2} A liver abscess is defined as an accumulation of purulent material within the liver parenchyma that may be due to bacterial, parasitic, fungal, or mixed infections. It's a common condition all over the world. Of the overall incidence of liver abscess, approximately two - thirds of cases in developing countries are amoebic and three - quarters of cases in developed countries are suppurative.¹

In a report of 540 cases of intra - abdominal abscesses (including intra - peritoneal and retroperitoneal abscesses), pyogenic liver abscesses accounted for 48% of visceral abscesses and 13% of all intra - abdominal abscesses. The incidence of liver abscess is estimated at 2.3 cases per 100, 000 population annually and is higher in men than in women (3.3 vs.1.3 per 100, 000).^{3 - 5} Taiwan has reported a significantly higher incidence of 17.6 cases per 100, 000.⁶

Amoebiasis is the third leading cause of invasive deaths nowadays.⁷ The condition is endemic in tropical countries like India because of poor hygiene and overcrowding. Amoebic liver abscess (ALA) accounts for 3 - 9% of all cases of amoebiasis.⁸ However, purulent and tubercular etiologies should always be considered in the differential diagnosis. The incidence of tuberculous liver abscess (TLA) has increased recently due to the increasing incidence of predisposing factors such as alcoholism, immunodeficiency, irrational use of antibiotics, and the emergence of drug - resistant bacteria. Of these, chronic alcoholism is the most important predisposing factor, followed by declining socioeconomic status and malnutrition.

Risk factors include diabetes mellitus, underlying hepatobiliary or pancreatic disease, liver transplantation, and regular use of proton pump inhibitors. Geographic and host factors can also play a role. For example, a primary infiltrative liver abscess syndrome caused by *Klebsiella pneumoniae* has been reported in East Asia.⁸

LA¹ was primarily treated with open surgical drainage. However, recent findings from image - guided drainage procedures show favorable results with shorter mean length of hospital stay as compared to conservative treatment.⁹ Image - guided drainage and aspiration have emerged as viable alternatives to open drainage, offering similarly high success rates but with the advantages of minimally invasive approaches. For those who prefer multiple aspirations, it is as effective and safe as catheter drainage, but with less procedural complications, less risk of postoperative sepsis and ease of doing it.^{10 - 12}

The treatments that have been used in recent decades have become first - line therapy in most cases and have greatly improved patient prognosis. The mortality rate has gone down from 70% to 6.31%.¹³ Low haemoglobin, high blood urea nitrogen, and multiple lesions of the liver may affect the prognosis of PLA. Therefore, PLA remains an important challenge for clinicians today.

Serum proteins consist of albumin and globulin. Albumin is synthesized primarily in the liver and its levels may reflect liver function. Albumin has a variety of physiological functions, including maintenance of osmotic pressure, transport of nutrients (fatty acids, bile acids, cholesterol) and scavenging of oxygen free radicals. Globulin, known as immunoglobulin, is primarily used to assess the overall state of the immune and inflammatory response.¹⁴

Recent advances in diagnostic and interventional radiology have enabled improved treatment strategies such as minimally invasive percutaneous drainage of abscess leading to better results and shorter hospital stays and thus a better prognosis as compared to conservative treatment. In addition to antibiotic therapy, percutaneous abscess drainage is the mainstay of treatment nowadays. However, few patients do not respond to percutaneous drainage and become worse. Rapid identification of patients for whom open surgery is definitive is critical.

Various authors have studied the treatment of liver abscess across India, but the disease pattern in hill country and its associated unique pathologies are unknown. In this context, accurate diagnosis of abscess etiology is critical for proper management. The design of this study was to assess trends in clinical profile, microbiological etiology, and treatment outcome in patients diagnosed with LA.

2. Materials and Method

This prospective study was undertaken at the Department of Surgery, at Motilal Nehru Medical College, Prayagraj between October 2020 - September 2021. All the patients who were prospective candidates for the study underwent detailed history and clinical examination suggestive of liver abscess and corroborated by blood investigations, attending in general surgery OPD and Emergency. The diagnosis was confirmed by USG/ CT whole abdomen. Most lesions being hypoechoic on USG or showing target - like sign on CT. All such cases of diagnosed hepatic abscess, whether new or referred, were taken into consideration during the above period, after their consent.

Study population

The study included Patients presenting with clinical features of liver abscess and confirmed by abdominal ultrasound / CT, all patient requiring interventions, left lobe abscess, abscess >5 cms, impending rupture, Patients giving informed written consent and cases of ruptured liver abscess. The study excluded Liver abscess associated with carcinoma, patients not ready to participate in the study and Pregnancy.

History of alcoholism was taken methodically, questioned about duration, amount and frequency of intake. Laboratory investigations like CBC, KFT, LFT, Serum Electrolytes, viral markers like HIV, HBsAg, Anti HCV and culture and sensitivity of drained pus was done. Plain/Digital chest X - Ray was done in all cases of liver abscess. The patients were divided into 3 groups on the basis of the their management, namely, Group I - Conservative management, Group II - USG guided pigtail drainage and Group III - Open surgical drainage.

Group I - Conservative management (antibiotics only):

Indicated for patients with abscess volume less than 200cc in our study. We advised Metronidazole 40 mg/kg body weight/ day in three divided doses. Patients showed response within 72 hours of initiation of metronidazole.

Group II - USG Guided Pigtail Drainage: USG - guided drainage pigtail drainage was done in 30 patients with intact abscess and 3 patients with ruptured abscess. Appropriate sized catheters (12 - 16 Fr pigtail) were introduced into the abscess cavity using the Seldinger technique. Exact segment /lobe/site was localised. Patient was laid supine or slightly left lateral position. Painting and draping were done and local anaesthesia was given in proposed area of pigtail insertion. A small stab was made on the area using 11 no. blade and a pigtail catheter was inserted into the centre of the abscess cavity under real time USG guidance. The catheter was connected to a urobag and routine catheter care was instituted. A daily estimate of the amount, colour and consistency of drainage fluid was recorded. Irrigation of the catheter with sterile saline water was done daily to avoid catheter blockage. Catheter was removed when catheter output dropped to <20 ml/24 hrs for 2 consecutive days, the patient showed clinical improvement and follow up sonography showed negligible residual cavity.

Group III - Open Surgical Drainage: Open surgical drainage was done through a transperitoneal approach. This allowed for abscess drainage and an abdominal exploration to identify previously undetected abscesses and if possible the location of an etiologic source. Drainage was carried out by complete removal of all pus. Intra - abscess loculations were broken down. Following drainage, the abscess cavity was flushed with saline for clearance of residual pus and necrotic debris. Abdominal drain (32 Fr) were placed within the sub hepatic region. Drainage tubes were removed only after drainage is minimal (<20 ml for 2 consecutive days). All patients were followed up to assess the time needed for clinical improvement, length of hospital stay and development of any complications. Sepsis, Surgical Site Infection (SSI), malnutrition and other complications were dealt with as per institutional guidelines and pre - existing protocols.

Statistical analysis

When the Excel data was put into SPSS version 25.0, analysis was performed on it. The data for the quantitative variables (those with numerical values) were presented as the mean and the standard deviation, whilst the data for the qualitative variables (those with categorical values) were presented as the frequency and the percentage. The student t - test was utilised in order to compare the mean values of the two groups, while the chi - square test was utilised in order to assess the frequency differences between them. It was statistically significant if the p - value 0.05 threshold was met.

3. Results

Table 1 showing symptoms and signs.

	Presentation	Present
Symptoms	Fever	31 (62.0%)
	Pain abdomen	44 (88.0%)
	Nausea / Vomiting	6 (12.0%)
	Dyspnoea	5 (10.0%)
	Malaise	22 (44.0%)
Clinical signs	Hepatomegaly	30 (60%)
	RUQ tenderness	19 (38%)
	Jaundice	10 (20%)

Most common manifesting symptoms of liver abscess was pain in right upper quadrant in 44 (88%) patients and other were fever in 31 (62%) patients, malaise in 22 (44%) patients, nausea/vomiting in 6 (12%) patients and dyspnoea in 5 (10%) patients. Most common clinical sign was hepatomegaly present in 30 (60%) patients and others were right upper quadrant tenderness in 19 (38%) patients and jaundice in 10 (20%) patients.

Table 2 showing the distribution of patients

Age	Frequency	Percentage
21 - 30 Years	6	12.00%
31 - 40 Years	15	30.00%
41 - 50 Years	16	32.00%
51 - 60 Years	9	18.00%
61 - 70 Years	3	6.00%
71 - 80 Years	1	2.00%
Gender		
Male	46	92.00%
Female	4	8.00%
Socioeconomic Status		
Upper middle	5	10.00%
Lower	45	90.00%
Alcohol use		
Alcoholics	35	70%
Procedure		
USG guided pigtail drainage	33	66%
Conservatively (IV antibiotics)	10	20%
Surgically (Laparotomy)	7	14%

12.0% of the participants had age: 21 - 30 years.30.0% of the participants had age: 31 - 40 years.32.0% of the participants had age: 41 - 50 years.18.0% of the participants had age 51 - 60 years.6.0% of the participants had age: 61 - 70 years.2.0% of the participants had age 71 - 80 years.46 (92%) patients were males and 4 (8%) were females.35 (70%) patients were alcoholic and all were males.90% patients were from lower socioeconomic status. Maximum (66%) were managed by USG guided pigtail insertion drainage, 20% patients were managed conservatively i. e by IV antibiotics and 14% patients were managed surgically by laparotomy.

Table 3 showing association of management with hospital stay duration

	Surgical	Radiological	Conservative	p value
Duration of Hospital stay	21 (19.5 - 22.5)	8 (6 - 10)	12 (10 - 12)	<0.001*
AG Ratio	0.87 (0.82 - 0.9)	1 (0.87 - 1.07)	1.04 (0.99 - 1.1)	0.018*

There was a significant difference between the 3 groups in terms of duration of hospital stay ($\chi^2 = 23.649$, $p < 0.001$), with the median duration of hospital stay being highest in patients managed surgically. The mean of AG Ratio in the patients managed by USG guided pigtail drainage was 0.98. The mean AG Ratio in patients managed conservatively was 1.03 and that in patients managed surgically was 0.84. the mean AG Ratio in all patients of liver abscess was 0.97 ± 0.31 . There were 26 (52%) patients with AG Ratio > 0.97 and 24 (48%) patients with AG Ratio < 0.97 .

Table 4 showing association of blood parameters with AG ratio

Correlation	Spearman Correlation Coefficient	P - value
TLC (/mm ³) vs AG Ratio	-0.7	<0.001*
S. Bilirubin vs AG Ratio	-0.6	<0.001*
SGOT (U/L) vs AG Ratio	-0.6	<0.001*
SGPT (U/L) vs AG Ratio	-0.7	<0.001*

There was a strong negative correlation between TLC (/mm³) vs AG Ratio, S. Bilirubin vs AG Ratio, SGOT (U/L) vs AG Ratio, SGPT (U/L) vs AG Ratio with AG Ratio, and this correlation was statistically significant.

Table 5 showing association of AG Ratio with symptoms and signs of liver abscess:

Symptoms / Signs	AG Ratio		P value
	Present	Absent	
Fever	0.92 ± 0.13	1.07 ± 0.10	<0.001
Pain abdomen	0.97 ± 0.14	0.98 ± 0.12	0.846
Jaundice	0.87 ± 0.16	1.00 ± 0.12	0.007
Nausea / Vomiting	0.96 ± 0.11	0.98 ± 0.14	0.731
Hepatomegaly	0.93 ± 0.14	1.04 ± 0.12	0.004
Dyspnoea	0.80 ± 0.09	0.99 ± 0.13	0.004
RUQ tenderness	0.91 ± 0.16	1.01 ± 0.11	0.011

It was found that the variables fever, jaundice, hepatomegaly, dyspnoea and right upper quadrant tenderness were significantly associated ($p < 0.05$) with serum albumin / serum globulin ratio. It was noticed that patients with low AG Ratio had higher body temperatures, had hepatomegaly and presented with jaundice, dyspnoea and right upper quadrant tenderness.

4. Discussion

In our study, out of 50 patients, 46 (92%) patients were males and 4 (8%) patients were females. Male to female ratio in our study was 11.5: 1. B. Paik et al.¹⁵ reported male to female ratio of 7: 1 and other studies like Aradhana Singh et al.¹⁶ and Mukhopadhyay et al.¹⁷ reported male to female ratio of 13.3: 1 and 11: 1 respectively.

The most common age group affected was between 30 to 50 years of age and the number of patients was less in extremes of age. The mean age of patients in our study was 43.92 years. The mean \pm SD of age in our study was 43.92 ± 10.80 whereas, in the study done by Chaudhary et al.¹⁸, it was found that the Mean \pm SD was 41.7 ± 13.9 years and in the study done by Aradhana Singh et al.¹⁶ Mean \pm SD was 41.2 ± 14.3 years.

90% of liver abscess patients belong to poor socio - economic status in our study, which was compared with a study done by A. Ramachandra et al.¹⁹, who found 88.6% of patients belonging to poor socio - economic status.

The most common symptoms of our study were pain in the right upper quadrant of the abdomen present in 44 (88%) patients which was positively compared with studies done by A. Ramachandra et al.¹⁹ and Chaudhary et al.¹⁸ in which they noted abdominal pain in 88.6% and 92.1% patients respectively. The next common symptom of our study was fever which was present in 31 (62%) patients which was less

in comparison with studies done by SK Gupta et al⁴¹ (2019) and A. Ramchandra et al³⁷ (2018) in which they noted 91.7% and 80% patients with fever respectively. Dyspnoea was present in 10% of patients in our study which was less as compared to the study of A. Ramchandra et al.¹⁹, which had 31.4% of patients. Patients who had vomiting in our study were 12% which was less as compared to the study of Chaudhary et al.¹⁹ which had 18.4% of patients presenting with vomiting.

The most common clinical sign present in patients of our study was hepatomegaly present in 30 (60%) patients followed by right upper quadrant tenderness in 19 (38%) patients which was less as compared to the study done by A. Ramchandra et Al.¹⁹ in which hepatomegaly and right upper quadrant tenderness were seen in 94.3% patients. In our study, 10 (20%) patients presented with jaundice which was more as compared to the study by A. Ramchandra et al.¹⁹ which had 5.7% patients with jaundice.

Total leucocyte count: In our study, 94% of patients with liver abscess had leucocytosis (TLC >11000 cells/mm³), mean \pm 2SD of TLC was 16876.00 ± 6081.67 cells/mm³, however, this study was compared with the study of S. Ghosh et al¹⁹ and mean \pm 2SD of TLC was found to be 19100 ± 9104 .

28% of patients in our study had raised S. Bilirubin level (>1.2 mg/dl) with mean \pm 2SD of 1.15 ± 0.87 mg/dl which was slightly less as compared to the study done by S. Ghosh et al.²⁰ which had mean \pm 2SD of 1.55 ± 2.18 mg/dl.

In current research, S. Alkaline phosphatase of patients was raised in most of the patients (98%) with mean \pm 2SD of 443.26 ± 302.09 IU/L which was compared with the study of S. Ghosh et al.²⁰ and they noticed mean \pm 2SD of 622 ± 446 IU/L.

In our study, 42% of patients had S. Albumin <3g/dl with mean \pm 2SD of 3.02 ± 0.26 g/dl which was favorably compared with the study of S. Ghosh et al.²⁰ in which they noticed mean \pm 2SD of 3.0 ± 0.56 g/dl.

S. Albumin / S. Globulin ratio (AG Ratio): in our study, 82% of patients had AG Ratio <1.1 (normal AG Ratio being 1.1 - 2.5) with mean \pm 2SD of 0.97 ± 0.33 which was less as compared to the study done by Jia Zhang et al.²¹ in which they found mean \pm 2SD of 1.02 ± 0.25

Alcohol intake has been identified as an important predisposing factor for ALA and is proposed to act through a multitude of mechanisms, including hepatic damage by alcohol, lowered body resistance and suppression of liver function due to poor nutritional status of habitual consumers of alcohol, increased presence of amoebae in the liquor prepared locally with poor regard to aseptic techniques, and depression of immune mechanisms in chronic alcoholics³. In our study, 35 (70%) patients were alcoholics and all were males and most commonly found in the age group of 30 - 60 years. In the study conducted by M. Mukhopadhyay et al.¹⁷ and Chaudhary et al.¹⁸, they found 61.11% and 86.86% of patients with liver abscess with chronic alcoholism respectively.

In our study, 33 (66%) patients were managed by USG - guided pigtail drainage along with iv antibiotics. Out of 33 patients, 30 patients presented with intact abscess and 3 patients were of ruptured abscess. 10 (20%) patients were managed conservatively on antibiotics alone and 7 (14%) patients were managed surgically by laparotomy.

In all patients in our study, a rapid response was seen after starting treatment. No mortality was present in our study. It was noticed that USG - guided drainage of the abscess was a superior modality in terms of resolution of symptoms and duration of hospital stay. The patients managed by USG - guided pigtail drainage had a mean duration of hospital stay of 8.00 days for intact abscesses and 9.33 days for ruptured abscesses. Patients managed on only iv antibiotics had a mean duration of hospital stay of 11.30 days and those managed by laparotomy had a mean duration of hospital stay of 21.00 days. However, in the study conducted by CK Bertel et al.²³, they concluded that surgical drainage along with iv antibiotics had less morbidity (48%) and less duration of hospital stay (26 days) than percutaneous drainage which had morbidity of 69% and duration of hospital stay of 46 days.

In our study, it was also noticed that although the baseline data and treatment plans of patients with high or low AG Ratio were comparative, the patients with low AG Ratio had higher body temperatures, leucocytosis, more deranged liver function tests, and more complications including surgical site infections and thus increasing duration of hospital stay and poor outcome.

5. Conclusion

The baseline data and treatment plans of the patients with high or low AGR were comparative. However, the patients with a low AGR had higher body temperature, higher WBC counts, deranged liver function tests, larger abscess volume, higher positive rate of pus culture, hence increasing the duration of hospital stay. The application of contemporary radiographic methods has shown to be of significant assistance in the early identification and therapy of liver abscess, which has resulted in a reduction in the morbidity and mortality rates associated with the condition. The primary therapy for liver abscess is now considered to be a combination of medical care and percutaneous drainage that is guided by USG.

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