Original Research Article

Evaluation of predictors of mortality in patients of ruptured liver abscess: a prospective study

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ABSTRACT

Background: Ruptured liver abscess is a rare condition which is associated with high mortality. Ruptured liver abscess should be assessed carefully especially in patients with poor prognostic factors, which highlight the need for early diagnosis to further improve our results of management. The aim of the present study was to evaluate the predictors of mortality in patients of ruptured liver abscess.
Methods: This was a prospective study, performed at Jawaharlal Nehru medical college, AMU, Aligarh between October 2015 to October 2017. For each case-patient, we reviewed demographic data, underlying medical conditions, clinical features, laboratory data, imaging and microbial findings and treatment. The prognostic factors independently related to mortality were then identified using univariate and multivariate analysis considering significance at p<0.05.
Results: The overall in-hospital mortality was 27% (11 out of 40). On multivariate regression analysis, the factors that independently predicted mortality were shock at presentation, time of presentation (>48 hours), left lobe abscess and APACHE II score on admission more than 15.
Conclusions: The independent predictors of mortality in ruptured liver abscess are shock at presentation, delayed presentation, higher APACHE II score on admission and left lobe abscess.

Keywords: Liver abscess, Mortality, APACHE, Shock

INTRODUCTION

Liver abscess is a major health concern in countries like India as complications associated with it are uniformly fatal.[1] In 1938, Ochsner et al advised surgical therapy for liver abscess and further described a significant reduction in mortality with surgical treatment.[2] Ruptured liver abscess was once thought to be a rare condition but its increasing incidence is seen in the current surgical practice. It is a life-threatening condition that warrants immediate emergency laparotomy without which the mortality is extremely high. Ruptured liver abscess is a less frequently encountered condition, though it can cause significant morbidity and mortality.[3,4]

Liver abscess presents with a conglomerate of signs and symptoms that further lead to a number of complications and mortality, which highlight the need for early diagnosis and prompt management.[5,6] Awareness among surgeons about various manifestations of ruptured liver abscess is more important to fast track its management. Despite continuous improvement in imaging modalities, availability of potent antibiotics and advancement in the knowledge for the treatment ruptured liver abscess, mortality remains high. The predictors of mortality need

to be determined to decide whether aggressive intervention therapy should be used.[7]

Amoebiasis causes diarrhea, colitis and amoebic liver abscess in tropical countries.[8-10] Simultaneous amoebic caecal perforation and amoebic liver abscess rupture is a rare complication of invasive amoebiasis with a higher rate of mortality.[11]

In view of the recent alarming increase in the incidence of the ruptured liver abscess and scanty available high literature, the aim of the present study was to evaluate the various predictors of mortality in patients of ruptured liver abscess and its association with caecal pathology.

METHODS

This was a prospective study carried over a period of 2 years from October 2015 to October 2017. All patients who presented to the Jawaharlal Nehru medical college and hospital, AMU, Aligarh and diagnosed with ruptured liver abscess were considered for inclusion in the study. Those patients having other causes of peritonitis and those who expired before surgery had been excluded. A total of 40 patients were included in the study. The study was approved by the institute's ethical review committee.

The diagnosis of ruptured liver abscess was made on the basis of detailed history, clinical features, general condition, laboratory investigations, radiology, culture from the aspirate and operative findings.

The collected data were analysed with respect to the presentation by the patients age, sex, etiopathogenesis, risk factors and treatment data for mortality. Socioeconomic status of patients was assessed by modified Kuppuswamy classification.[12] Alcoholism was screened using the CAGE questionnaire.[13] The anatomy of the liver segment was classified by the Couinaud classification. The acute physiology and chronic health evaluation II (APACHE II) score was calculated on admission. Mortality was defined as death within 30 days of rupture or before discharge from hospital. The treatment option would be decided by clinician on duty based on patient general condition. If the patient general condition was very poor, then abdominal tube drainage would be done, otherwise emergency laparotomy would be treatment of choice. The patients were kept on regular follow up.

Statistical analysis

Statistical analysis were performed using SPSS 21.0 (SPSS Inc., Chicago, IL, USA). Continuous variables were expressed as mean±standard deviation and discrete variables were expressed as numbers and percentages or frequencies. The factors that were significant in the univariate analysis were included in the multivariate analysis to determine what risk factors retained statistical significance and were dependent on other factors. Null

hypotheses of no differences were rejected if p values were less than 0.05 or equally, if the 95% confidence interval (CI) of the odds ratio (OR) estimates excluded 1.

RESULTS

A total of 40 patients were included in the study. Overall, the mortality was 11 out of 40 cases, which constituted 27% of the total cases.

Risk factors

The known risk factors for ruptured liver abscess that were evaluated were male sex, low socioeconomic status, alcoholism, smoking, diabetes and old age. The age distribution of ruptured liver abscess was highest between 31-50 years, accounting for 17 (42.5%) patients in the study. The age group between 16-30 years comprised of 12 (30%) patients, followed by 8 (20%) patients in age group of more than 50 years. Males predominated the study with 37 (93%) of cases. In our study, 53% of the patients belonged to upper lower class, followed by lower middle (37%) and lower class (10%). No one was from upper middle or upper class. Smoking habit was seen in 50% patients. A significant percentage (55%) of patients were known alcoholic. A total of 13 (33%) patients were diabetic. There was no statistical significance (p>0.05) with mortality for alcoholism, smoking, diabetes, age >50 years, male sex and lower socioeconomic status.

Clinicopathological profile

In this study, 21 (53%) of the patient presented 48 hours after the onset of symptoms and 14 (35%) patients presented with shock. The APACHE II score more than 15 was found in 17 (42%) patients. The most common presentation was pain abdomen which was present in all patients. Tenderness was seen in 37 (93%) of the patients. Of the total of 40 cases, sterile abscess was present in 25 (63%) of the cases. The most common organism isolated in infected abscess was *Escherichia coli* followed by *Klebsiella pneumoniae*. The TLC was found to be >10000 /mm^3 in 27 (68%) of the patients. The total bilirubin (>3 mg/dl) was raised in 8 (20%) of the patients (Table 1). There was no statistical significance (p>0.05) with mortality for serum bilirubin (>3 mg/dl), serum albumin (<3 g/dl) and leucocyte count (>10000 /mm^3).

Treatment data

On transabdominal ultrasound, 31 (77%) of the abscess cavities were found to be single, while rest of 9 (23%) were multiple. Large abscess cavity (>6 cm) was found in 29 (72%) patients. A left lobe abscess was reported in 11 (27%) cases.

The most common site of rupture was seen in peritoneal cavity, 36 (90%) cases followed by pleural cavity 4 (10%) cases. The number of patients who underwent emergency laparotomy was 33 (83%). Some of the

patients who were critical, underwent abdominal tube drainage and among them who survived were later considered for laparotomy. The mean hospital stay was 13.33 with standard deviation of 7.76. The most common pathology associated with ruptured liver abscess was found to be caecal perforation in 13 (33%) cases (Table 2). There was no statistical significance with mortality for large abscess cavity (>6 cm), multiple abscesses, any site of rupture, emergency laparotomy or associated bowel pathology.

A number of variables were compared by univariate and multivariate analysis to identify predictors of mortality. On univariate logistic regression, the factors which associated mortality included shock at presentation, time of presentation (>48 hours), total bilirubin (>3 g/dl), serum albumin (<3 g/dl), leukocytosis (>10000/mm^3), left lobe abscess and APACHE II score on admission more than 15. On multivariate regression analysis, the factors that independently predicted mortality were shock at presentation, time of presentation (>48 hours), left lobe abscess and APACHE II score on admission more than 15 (Table 3).

Table 1: Abnormal laboratory parameters.

S. no.	Parameters	Number of patients (n=40)	
		Frequency	Percentage
1.	Increased TLC (>10000 /mm^3)	27	68
2.	Hematocrit (<36%)	20	50
3.	Total bilirubin (>3 mg/dl)	8	20
4.	Raised ALP (u/l)	27	68
5.	Raised AST (u/l)	29	73
6.	Raised ALT (u/l)	12	30
7.	Abnormal prothrombin time	8	20
8.	Serum albumin (<3 g/dl)	23	58
9.	Random blood sugar (>140 mg/dl)	19	48
10.	Serum creatinine (>1.5 mg/dl)	14	35

TLC, total leucocyte count; ALP, alkaline phosphatase; ALT, alanine aminotransferase; AST, aspartate aminotransferase.

Table 2: Associated bowel pathology.

S. no.	Pathology	Number of patients (n=40)	
		Frequency	Percentage
1.	Caecal perforation	13	33
2.	Colonic perforation	2	5
3.	Ileal perforation	1	3
4.	No pathology	24	60

Table 3: Predictors of mortality using multivariate analysis.

Variables		Mortality freq. (%)	Unadjusted OR	Adjusted OR	P value
Sex	Male	10 (91)	0.7 (0.06- 9.1)		
	Female	1 (9%)	Ref		
Age (years)	>50	3 (27%)	1.8 (0.34-9.3)		
	<50	8 (73)	Ref		
Socio economic status	Lower	1 (9)	1.3 (0.1-17.8)		
	Lower middle	7 (64)	2.0 (0.4-9.5)		
	Upper lower	3 (27)	Ref		
Alcoholism	Yes	6 (55)	0.9 (0.2-3.9)		
	No	5 (45)	Ref		
Smoking	Yes	7 (64)	2.2 (0.5-9.0)		
	No	4 (36)	Ref		
Diabetes	Yes	2 (18)	0.4 (0.06-2.0)		
	No	9 (82)	Ref		
Abscess cavities	Single	10 (91)	4.5 (0.5-40.0)		
	Multiple	1 (9)	Ref		
Large cavity >6 cm	Yes	9 (82)	0.5 (0.1-2.8)		
	No	2 (18)	Ref		

Variables		Mortality freq. (%)	Unadjusted OR	Adjusted OR	P value
Left lobe abscess	Yes	7 (64)	32.0 (4.7-210.0)	25.0 (3.9-149.0)	<0.001
	No	4 (36)	Ref	Ref	
Site of rupture	Peritoneal	10 (91)	1.2 (0.1 – 12.4)		
	Pleural	1 (9)	Ref		
Emergency laparotomy	Yes	8 (73)	0.4 (0.1 – 2.3)		
	No	3 (23)	Ref		
Caecal perforation	Yes	6 (55)	3.8 (0.9- 16.2)		
	No	5 (45)	Ref		
Shock at presentation	Yes	10 (91)	22.7 (3.0-135.4)	14.7 (2.9-95.4)	<0.001
	No	1 (9)	Ref	Ref	
Time of presentation (>48 hr)	Yes	9 (82)	6.3 (1.1-34.9)	5.4 (1.1-29.4)	0.039
	No	2 (18)	Ref	Ref	
Total bilirubin (>3 g/dl)	Yes	6 (55)	6.2 (1.5-32.3)	5.8 (0.9 – 29.2)	0.08
	No	5 (45)	Ref	Ref	
Serum albumin (<3 g/dl)	Yes	7 (64)	1.5 (1.0-9.7)	1.5 (1.0-9.5)	0.052
	No	4 (36)	Ref	Ref	
Leukocytosis (>10000 /mm³)	Yes	10 (91)	1.3 (1.0-8.3)	1.2 (0.9-8.0)	0.08
	No	1 (9)	Ref	Ref	
APACHE II score on admission >15	Yes	10 (91)	24.4 (3.6-158.4)	28.5 (3.4-198.6)	<0.001
	No	1 (9)	Ref	Ref	

OR- Odds ratio.

DISCUSSION

The predictors of mortality in ruptured liver abscess needed to be thoroughly evaluated. Although we have included all the patients of ruptured liver abscess, but still the sample size was less and the study was conducted at a single center.

Majority of cases in the study presented with signs of peritonitis and a significant percentage with shock (p<0.001). This was in accordance with the available literature and the surgeon should be well aware as these were abdominal emergencies. If septic shock and diffuse abdominal pain were found in a patient with liver abscess with abnormal liver laboratory parameters and raised blood glucose, then ruptured liver abscess should be suspected.[3]

Leukocytosis (>10000 /mm³) (p=0.08) was seen in 10 out of 11 patients who died. Similar trend had been seen in the previous studies with one reporting leukocytosis (>15000 /mm³) (p=0.04) in 14 out of 32 operated patients.[14] Serum bilirubin >3 g/dl (p=0.08) along with other elevated liver enzymes ALT (30%), AST (73%) and ALP (68%) patients was seen. In a prospective randomized controlled study, Kumar et al 2013 reported that due to obstructive etiology, hyperbilirubinemia was frequently associated with amoebic liver abscess.[15] In one study, hypoalbuminemia (p<0.05) was found to be significantly associated with complications in amoebic liver abscess.[16] Serum albumin less than 3 g/dl (p=0.052)

was seen in 7 out of 11 patients who died in the present analysis.

Before the advancement of radiographic techniques, chest radiographic findings served as diagnostic clues. The investigation of choice was ultrasonography as it was cost effective, easily accessible and diagnostic for ruptured liver abscess. It was also useful in the follow up by assessing resolution of the pathology. In a retrospective study, Jun et al 2015 stated that the liver abscess more than 6 cm tended to rupture more often than those that were smaller. The predilection for ruptured abscess in the segment VII may result from a higher incidence of right lobe liver abscess.[17] The ruptured liver abscess was mainly seen in right lobe with segment VII (in 50% patients) being the most common site in this study.

In another prospective study, Ndong et al 2019 concluded that left lobe abscess, large abscess diameter and subcapsular localization to be risk factor for liver abscess to rupture.[18] The left lobe abscess (p<0.001) was present in 27% patients and was seen to be significantly associated with mortality in the present study. The most common site for abscess rupture was peritoneal cavity, which was seen in 90% patients. The rupture inside peritoneal cavity may be free or contained. Free rupture causes generalized peritonitis. The peritoneal site of rupture and multiple hepatic abscess (p>0.005) was also insignificantly associated with mortality in this study.

A study done in Taiwan found the presence of gas-forming abscesses, high level of BUN and high APACHE II score (>15) at admission were independent prognostic factors for mortality in liver abscess.[19] Other authors also stated that size of abscess was one of the most important prognostic factors, other being distance from the capsule, comorbidity and sepsis.[20] Jindal et al 2016 reported that septic encephalopathy and acute kidney injury (serum creatinine >2 mg/dl) were independent factor for mortality in liver abscess.[21] In a study conducted by Chen et al 2008 the factors that independently correlated with mortality were the presence of acute respiratory failure (p=0.003) and APACHE II score >16 (p=0.026) in patients of liver abscess.[22]

Further Christein et al 2006 reported that septic shock (p=0.04), needed for a second operation (p≤0.001), leukocytosis (WBC) count >15000 (p=0.04) and multiple abscess cavity (p=0.01) were significantly associated with mortality.[14] Jha et al 2019 concluded that male gender, hypoalbuminemia and larger volume of abscess (>8 cm) were significantly (p<0.05) associated with interventional treatment in patients of complicated amoebic liver abscess.[16] In a retrospective analysis by Jun et al 2015, it was found that underlying cirrhosis (p=0.009), gas forming abscess (p=0.026), abscess cavity size >6 cm (p=0.002) and other septic metastases (p=0.047) were independent variables on multivariate analysis related to ruptured liver abscess.[17] In the present study the factors that independently predicted mortality were shock at presentation (p<0.001), time of presentation (>48 hours) (p=0.039), left lobe abscess (p<0.001) and APACHE II score on admission more than 15 (p<0.001).

A diagnosis of dual amoebic pathology must be kept in mind in patients with liver abscess presenting along with gut pathology. Nishanth et al 2017 reported 16% incidence of caecal perforation in ruptured liver abscess.[11] In our study, (13) 33% patients had concomitant caecal pathology with ruptured liver abscess. Out of these, six patients expired. There was no statistical significance with mortality for associated bowel pathology.

The present study had some limitations as this was a single center analysis. Further the sample size was small which reduced the reliability of the data.

CONCLUSION

Ruptured liver abscess should be assessed carefully especially in patients with poor prognostic factors, which highlight the need for early diagnosis to further improve our results of management. The independent predictors of mortality are shock at presentation, time of presentation (>48 hours), APACHE II score on admission >15 and left lobe abscess.

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