

A Retrospective Observational Assessment of Computed Tomography Findings and Clinical Features of Intraabdominal Ruptured Liver Abscess

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Abstract

Aim: To investigate the computed tomography findings and clinical features of intraabdominal ruptured liver abscess.

Material and Methods: This study was conducted in the Department of Radio-diagnosis, Madhubani Medical College and Hospital, Madhubani, Bihar, India from March 2022 to Jan 2023. This is a retrospective observational study of patients with intraabdominal ruptured liver abscess. All diagnosed cases of ruptured liver abscess based on radiology and laparoscopic investigation were included in the study. Details of demographics, clinical features, Computed Tomography were recorded.

Results: The mean time interval between the onset of fever and CT was 8.3 days (range, 1-30 days). The mean size of the liver abscess was 8.4 cm (range, 4.0-14 cm). A single abscess was found in 11 patients, and multiple abscesses were seen in 21 patients. Unilobar involvement was seen in 29 patients, with the right lobe affected more commonly (68.8%, 22 of 32). The abscesses were completely liquefied in 25 patients and gas in the abscess cavity in 7 patients. Free intraperitoneal fluid was seen in all patients.

Conclusion: A ruptured hepatic abscess is more life-threatening than an unruptured one. A rapid and accurate diagnosis and prompt surgical intervention are essential. Most of the cases had an acute presentation and the right lobe is commonly affected. Pain in the abdomen was the most common symptom which presented in most cases. Computed Tomography is an ideal tool for diagnosing hepatic abscesses and its complications.

Keywords: Computed tomography, Clinical features, Intraabdominal ruptured, liver abscess

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Introduction

Intraabdominal ruptured liver abscess is a severe and potentially life-threatening condition that requires prompt diagnosis and intervention. Liver abscesses are localized collections of pus within the liver parenchyma, often caused by bacterial, parasitic, or fungal infections. The rupture of a liver abscess into the peritoneal cavity or adjacent structures can lead to widespread infection and sepsis, significantly increasing morbidity and mortality rates. Advances in imaging techniques, particularly computed tomography (CT), have played a critical role in the early detection, characterization, and management of ruptured liver abscesses. The clinical presentation of a ruptured liver abscess can be variable and non-specific, often mimicking other intraabdominal pathologies. [1,2] Common symptoms include fever, right upper quadrant abdominal pain, jaundice, and signs of peritonitis such as abdominal rigidity and rebound tenderness. Due to the often insidious onset and non-specific nature of symptoms, a high index of suspicion is required,

especially in patients with predisposing factors such as diabetes, liver cirrhosis, immunosuppression, or a history of biliary tract disease. Computed tomography (CT) has emerged as the imaging modality of choice for the diagnosis of liver abscesses and their complications. CT imaging provides detailed information on the size, number, and location of abscesses, as well as the presence of gas-forming organisms, which can aid in the differentiation between pyogenic and amebic liver abscesses. [3,4] The use of contrast-enhanced CT further enhances the ability to detect abscess rupture by delineating the spread of infected material into the peritoneal cavity, subphrenic space, or other adjacent structures. In addition to its diagnostic capabilities, CT imaging plays a crucial role in guiding therapeutic interventions for ruptured liver abscesses. Percutaneous drainage, often performed under CT or ultrasound guidance, has become the preferred initial treatment modality due to its minimally invasive nature and high success rates. [5-

9] However, in cases of extensive peritoneal contamination or failed percutaneous drainage, surgical exploration and drainage may be required. The prognosis of patients with ruptured liver abscesses depends on several factors, including the promptness of diagnosis, the extent of the rupture, the presence of underlying comorbidities, and the adequacy of treatment. Early recognition and intervention are paramount to improving outcomes and reducing the risk of complications such as sepsis, multiple organ failure, and death. The integration of clinical features with advanced imaging techniques, particularly CT, enhances the ability to diagnose and manage this challenging condition effectively. [10-14]

Material and Methods

This study was conducted in the Department of Radio-diagnosis, Madhubani Medical College and Hospital, Madhubani, Bihar, India from March 2022 to Jan 2023. This is a retrospective observational study of patients with intraabdominal ruptured liver abscess. All diagnosed cases of ruptured liver abscess based on radiology and laparoscopic investigation were included in the study. Details of demographics, clinical features, Computed Tomography were recorded. Data will be analyzed using SPSS software. Demographic and clinical characteristics comprised age, sex, underlying medical conditions (diabetes mellitus, biliary disorders, hemodialysis, liver cirrhosis, malignancy, immunosuppression, cavities from old calcified echinococcus cysts, simple benign liver cysts), symptoms and signs at presentation and origin of the abscess. Patients receiving empiric therapy with antibiotics prior to admission were also recorded.

Liver CT Characteristics

All patients underwent contrast enhanced CT of the liver before laparoscopic drainage of the liver abscess. In some patients, CT studies were also performed during follow-up to assess the size of the abscess cavity, monitor complications. However, we only reviewed the contrast-enhanced CT images obtained before drainage of the liver abscess, for the purpose of this study. The CT examinations were performed using Somtum Sensation 64, Siemens,

Germany. The scanning parameters varied during the study period and with different scanners: collimation ranged from 1.25 mm to 7 mm; pitch ranged from 0.75 to 1.5; section thickness ranged from 1 mm to 5 mm. Liver examinations were conducted using 100 ml of intravenous non-ionic iodinated contrast medium (Sultrist, Schering, Berlin, Germany) and dosage was calculated based on the patients' weight and administered via a power injector at a rate of 3 mL/sec.

Ixil sections of 3-5 mm thickness were reconstructed, reported, and archived. The scans were reviewed by two radiologists who reached agreement between them. The following features were recorded:

- Lobe involvement (unilateral [right or left] or bilateral);
- Number of abscesses (single or multiple);
- Maximal abscess diameter, with the largest abscess measured when there were multiple abscesses;
- Unilocular or multilocular (presence of ≥ 1 -mm-thick septations), multilocular abscess;
- Solid or cystic appearance ($>50\%$ of the abscess cavity appears hypodense or liquefied, with an attenuation value of ≤ 20 HU) in most of the sections showing the abscess cavity, cystic abscess;
- Gas within the abscess cavity;
- Spontaneous rupture of the abscess (based on CT and clinical symptoms).

Results

The study group consisted of 32 patients with a median age of 53.3 ± 15.3 years (range, 24-85 years). There were more men than women in the study, with a male-to-female ratio of 1.9:1. Diabetes mellitus was the most common underlying medical condition (25.0%), followed by bacterial pneumatize (18.8%), hypertension (6.3%), bile duct stones (3.1%) showed in Table 1. Most of the patients were suffering from abdominal pain (96.9%), malaise and anorexia (96.9%), fever (78.1%), peritonitis (78.1%), and other positive clinical signs showed in Table 2.

Table 1: Underlying diseases of patients with intraabdominal ruptured liver abscess.

Underlying diseases	Frequency	Percentage (%)
Hypertension	2	6.3
Diabetes mellitus	8	25
Bacterial pneumatize	6	18.8
Bile duct stones	1	3.1

Table 2: Clinical presentations of intraabdominal ruptured liver abscess.

Clinical presentations	Frequency	Percentage (%)
Abdominal pain	31	96.9
Malaise and anorexia	31	96.9
Nausea / vomiting	20	62.5
Fever > 38°C	25	78.1
Jaundice	5	15.6
Peritonitis	25	78.1
Hepatomegaly	4	12.5

Table 3: CT characteristics of intraabdominal ruptured liver abscess.

CT findings	All patients (n=32)
Abscess size (cm)	8.4 (4.0–14)
No. of abscesses	11 (34.4)
1 >1	21 (65.6)
Lobar involvement	29 (90.6)
Unilobar Bilobar	3 (9.4)
Abscess appearance Completely liquefied	25 (78.1%)
Gas in the abscess cavity	7 (21.9)
Peritoneal effusion	32 (100%)

Table 4: Presentation symptoms according to other studies.

Symptoms	Shrikant Perka et al. (2016) ²⁵	Alexopoulou A et al. (2010) ³	Mukhopadhyay Met al. (2010) ⁴
Pain	100%	75.70%	83%
Fever	86.70%	96.70%	80%
Vomiting	43.30%		
Cough / pleurisy	30%		26.40%
Diarrhea	53.30%		
Jaundice		12.10%	

The mean time interval between the onset of fever and CT was 8.3 days (range, 1-30 days). The mean size of the liver abscess was 8.4 cm (range, 4.0-14 cm). A single abscess was found in 11 patients, and multiple abscesses were seen in 21 patients. Unilobar involvement was seen in 29 patients, with the right lobe affected more commonly (68.8%, 22 of 32). The abscesses were completely liquefied in 25 patients and gas in the abscess cavity in 7 patients. Free intraperitoneal fluid was seen in all patients. The liver CT characteristics of intraabdominal ruptured liver abscess was shown in Table 3.

Discussion

Liver abscess is an important tropical gastrointestinal disorder. [15,16] Liver abscess can be classified into pyogenic and amebic, both having its serious implications, especially when presented late. In developing countries, it forms a major cause for mortality and morbidity. [17,18] With the advent of modern radiological modalities, diagnosis of hepatic abscess is possible in early stages resulting in nonsurgical management; however, fraction of patients either due to late presentation or refractory disease presents with ruptured liver abscess thereby increasing the mortality, presents with fatal disease

course, and requires surgical intervention at the earliest. [19] Intraperitoneal rupture is one of the serious complications of liver abscesses [20, 21] The frequency of intraperitoneal rupture of an liver abscess varies from 2.5% to 17%. [22] Clinically, increasing hepatic tenderness should indicate an impending rupture. [22] Computed Tomography may provide important information regarding the extent of intraperitoneal spread of the liver abscess. Dal Mo Yang et al [23] study 81 patients who had a confirmed pyogenic hepatic abscess, the complication was encountered in 3 patients (3.7%) and 2 types could be recognized: a loculated perihepatic abscess (n=2) and diffuse peritonitis (n=1). In diffuse peritonitis secondary to rupture of a hepatic abscess, a large amount of ascites and diffuse thickening of the parietal peritoneum could be seen on CT. Although an amebic peritonitis secondary to rupture of a hepatic amebic abscess showed a poor survival rate despite surgical intervention, all the patients with intraperitoneal rupture of the pyogenic hepatic abscess could be treated with percutaneous drainage and antibiotic treatment. The most common presentation was abdominal pain (96.9%), malaise and anorexia (96.9%), fever (78.1%), peritonitis (78.1%), nausea/vomiting (62.5%), jaundice and

hepatomegaly (15.6% and 12.5%, respectively). This results were comparable to study by Hind S. Alsaif with the most common presentation was fever and/or chills, followed by gastrointestinal symptoms (eg, gastrointestinal upset, diarrhea, vomiting, nausea, discomfort, pain), respiratory symptoms (eg, cough, dyspnea, chest distress), and jaundice. [24] The clinical features of ruptured liver abscess according to other studies was summarized in the Table 4. The CT appearance of liver abscess is variable and nonspecific. One or more round or oval low-density lesions 2-16 cm in diameter may be seen. The margin of the abscess may be smooth or nodular, and one or more internal septations may be present. An enhancing wall is common but not universal. However, the wall may not be apparent if unenhanced CT is not performed. Thus, the CT differential diagnosis of amebic liver abscess in the adult includes simple hepatic cyst, infected or hemorrhagic cyst, pyogenic liver abscess, echinococcal cyst, hematoma, biloma, cystic or necrotic hepatic metastasis, undifferentiated embryonal sarcoma, and biliary cystadenoma. In the few cases in which a rim of edema is seen peripheral to the lesion, diagnostic consideration may be limited to inflammatory conditions. [26] A feature of amebic liver abscess that may aid in distinguishing it from other focal hepatic lesions is its tendency to extend beyond the surface of the liver. Our results of liver CT characteristics were comparable to other studies. Alsaif HS et al showed that the median time interval between the onset of fever and CT was 3 days (range, 1-24 days). The median size of the liver abscess was 7 cm (range, 1.7-14 cm). A single abscess was found in 95 patients, and multiple abscesses were seen in 36 patients. Unilobar involvement was seen in 100 patients, with the right lobe affected more commonly (55.0%, 72 of 131). The abscesses were predominantly solid and masslike in 67 patients and cystic in 64 patients. Multilocular appearance of the abscesses was present in 115 patients (87.8%). Thrombophlebitis was present in 30 patients; pylephlebitis, in three; gas in the abscess cavity, in 17; and pneumobilia, in six. Three patients had both gas in the abscess cavity and pneumobilia.²⁴ Sutdy by Alexopoulou A et al. the majority (69.7%) of liver abscess involved the right lobe, they were 5-9 cm in size (63.6%) and solitary (75.7%). Multiple abscesses were observed in 24.2% of patients. The presence of elevated hemidiaphragm (42.4%), pleural effusion (18.2%) and basilar infiltrate (6%) in chest radiography was also noted. Liver abscess was accompanied by pylephlebitis in 1 patients. Gas forming were observed in 4 patients (12.1%) and loculated subcollections in the abscess in 3 (9%).³ A single abscess was found in 54 (81.8%) patients, and multiple abscesses were seen in 12 (18.2%) patients in the study of Chang Z et al. [27] Among the patients with multiple abscesses, the average

number of lesions per patient was 2.5-0.67. Unilobar involvement was seen in 54 (81.8%) patients, and multilocular abscess was present in 50 (75.8%) patients. The abscesses were predominantly solid in 38 (57.6%) patients and cystic in 28 (42.4%) patients. Thrombophlebitis was present in 9 (13.6%) patients, and gas in the abscess cavity was present in 11 patients (16.7%). There were 4 (6.1%) patients with liver abscess who experienced a spontaneous rupture of the abscess. A definitive diagnosis of liver abscess requires imaging, with both sonography and CT being useful. Sonography is operator-dependent and the operator may have difficulty picking out a small, solitary abscess. Its sensitivity is round 79%, compared with 98% for CT [28], but emergency bedside sonography may be very useful in making a rapid diagnosis. Kim et al. suggested certain CT characteristics suggestive of a Klebsiella abscess, such as a hairball sign or air-fluid level. [29] However, while such imaging distinctions may be sought, culture and sensitivity results are the key to choosing the appropriate antibiotics. The advancement in radiologic techniques has been credited with the improvement in mortality rates. Ultrasonography and CT evaluation with contrast remain the radiologic modalities of choice in screening procedures and also can be used as techniques for guiding percutaneous aspiration and drainage. With advancement in multidetector CT scan technology, image quality has improved dramatically, allowing for improved detection. Besides, gallium and technetium radionuclides can be used in diagnosis.

Conclusion

A ruptured hepatic abscess is more life-threatening than an unruptured one. A rapid and accurate diagnosis and prompt surgical intervention are essential. Most of the cases had an acute presentation and the right lobe is commonly affected. Pain in the abdomen was the most common symptom which presented in most cases. Computed Tomography is an ideal tool for diagnosing hepatic abscesses and its complications.

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