

## **Role of CT in Evaluating the Efficacy of Laparoscopic Treatment in the Management of Intra-Abdominal Ruptured Liver Abscess**

**Ajay Ranjan<sup>1</sup>, Raunak Deo<sup>2</sup>**

<sup>1</sup>Senior Resident, Department of Radio-Diagnosis, Lord Buddha Koshi Medical College and Hospital, Saharsa, Bihar, India

<sup>2</sup>Senior Resident, Department of Radio-Diagnosis, Lord Buddha Koshi Medical College and Hospital, Saharsa, Bihar, India

---

Received: 10-01-2023 / Revised: 14-02-2023 / Accepted: 11-03-2023

Corresponding author: Dr. Raunak Deo

Conflict of interest: Nil

---

### **Abstract**

**Aim:** The aim of the study was to assess the role of CT in evaluating the efficacy of laparoscopic treatment in the management of intra-abdominal ruptured liver abscess.

**Methods:** This was retrospective observational research that was carried out on patients diagnosed with intra-abdominal burst liver abscess at the Department of Radio-diagnosis, Lord Buddha Koshi Medical College and Hospital in Saharsa, Bihar, India, for five months. The study was given the green light by the Hospital Ethical Board. The study consisted of participation from fifty different patients. In this study, we included all of the cases that were diagnosed with a burst liver abscess based on radiology and laparoscopic investigation. The information that was recorded included demographics, clinical features, and computed tomography.

**Results:** The mean age of the 50 people in the study group was 54.615.5 years (range: 24-85 years). In the study, there were more guys than women. Most of the people had diabetes mellitus (30%), followed by bacterial pneumonia (20%), high blood pressure (8%) and bile duct stones (4%). Most of the patients had abdominal pain (94%), felt sick and didn't want to eat (94%), had a fever (80%), and had peritonitis (76%). The average amount of time between getting a fever and getting a CT was 8.4 days (the range was 1-30 days). The size of the liver abscess ranged from 4 to 14 cm, with an average of 8.2 cm. In 18 patients, there was only one abscess, and in 32 patients, there were more than one. Unilobar involvement was seen in 46 patients. In 40 patients, the abscesses were fully drained, and in 10 patients, there was gas inside the abscess. All of the patients had free fluid inside their peritoneum. Most of the time, the right lobe was affected and not the left.

**Conclusion:** A liver abscess that has burst is more dangerous to your life than one that hasn't burst. It is important to get a quick and accurate diagnosis and to start surgery right away. Most of the cases came on quickly, and most of the time, the right lobe is affected. The most usual sign was a pain in the stomach. CT scans are the best way to find out about hepatic abscesses and their complications.

**Keywords:** Liver abscess; Ruptured; Laparoscopic.

---

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

---

## Introduction

Pyogenic liver abscess (PLA) is a rare cause of hospitalization, related to a high mortality rate ranging between 15% and 19%. Its incidence is difficult to define since it varies from one country to another, but overall, it is estimated at 3.59 per 100,000, and it increases with the patient's age and comorbidities (diabetes, malnutrition, immunosuppression, kidney failure, cirrhosis). [1-3] Disease symptoms and signs are not specific neither are laboratory tests: liver function tests may be more or less normal, depending on the extent of abscess, its causes and sepsis severity. The diagnosis is mainly based on imaging. Ultrasound (US) and computed tomography (CT) scans allow diagnosis in over 90% of cases and often give information about etiology.<sup>2</sup> Treatment of choice is represented by image-guided percutaneous drainage in combination with antibiotic therapy, but, in some selected cases, surgical treatment is necessary although associated with increased morbidity and mortality. [2,3] In extremely rare cases, spontaneous rupture of liver abscess may occur, free in the peritoneal cavity or in neighboring organs, an event which is generally considered a surgical emergency. [4,5]

Improving imaging techniques have aided the clinicians in the diagnosis of hepatic abscesses and have subsequently become important treatment tools, decreasing the number of cases treated with surgical intervention. Furthermore, the demographics of the hepatic abscess have changed. [6] Disease symptoms and signs are not specific neither are laboratory tests: liver function tests may be more or less normal, depending on the extent of the abscess, its causes and sepsis severity. The diagnosis is mainly based on imaging. Ultrasound (US) and computed tomography (CT) scans allow diagnosis in over 90% of cases and often give information about etiology. [7] Treatment of choice is represented by image-guided

percutaneous drainage in combination with antibiotic therapy but, in some selected cases, surgical treatment is necessary although associated with increased morbidity and mortality. [7,8]

Computed tomography (CT) is the best way to find out if someone has a hepatic abscess. CT has an accuracy of 97% when it comes to finding hepatic abscesses. On CT, an abscess in the liver looks like a single or multiple-loculated mass with low attenuation. [9] A pyogenic hepatic abscess can cause serious health problems and even death if it is not treated quickly and correctly. When the abscess is only in the liver, the death rate is low. However, the death rate goes up when the abscess spreads to the chest, peritoneal cavity, or pericardial cavity. [10] So, it's important to find complications related to hepatic abscesses as soon as possible. Different problems have been linked to hepatic abscess [11–13], and the rate of problems was said to be 10.3%.<sup>10</sup> Rarely have problems been reported with pyogenic hepatic abscess, and only a small number of patients have had their MRIs looked at. [13,14]

The aim of the study was to assess the role of CT efficacy of laparoscopic treatment in the management of intra-abdominal ruptured liver abscesses.

## Materials and Methods

This was a study of people who had a burst liver abscess inside their abdomen at the Department of Radio-diagnosis, Lord Buddha Koshi Medical College and Hospital in Saharsa, Bihar, India, for five months. The Hospital Ethical Board said it was okay to do the study. There were 50 people in the study. The study looked at all cases of open liver abscess that were found by radiology and laparoscopic investigation. Details about the person's background, their health, and their computed tomography were written down.

### Clinical parameter

Demographic and clinical characteristics included age, sex, underlying medical conditions (diabetes, biliary disorders, hemodialysis, liver cirrhosis, malignancy, immunosuppression, cavities from old calcified echinococcus cysts, and simple benign liver cysts), symptoms and signs at presentation, and the source of the abscess. Patients who were given antibiotics before being admitted were also written down.

### Characteristics of a Liver CT

Before the liver abscess was drained laparoscopically, a CT scan with contrast was done on all of the patients' livers. During follow-up, CT scans were also done on some patients to measure the size of the abscess cavity and check for complications. But for this study, we only looked at the contrast-enhanced CT images that were taken before the liver abscess was drained. Somatom Sensation 64, made by Siemens in Germany, was used to do the CT scans. During the study time and with different scanners, the scanning parameters changed. The collimation ranged from 1.25 to 7 mm, the pitch ranged from 0.75 to 1.5, and the section width ranged from 1 to 5 mm. For liver

exams, 100 ml of intravenous non-ionic iodinated contrast medium (Ultravist, Schering, Berlin, Germany) was given at a rate of 3 mL/sec using a power syringe. The dosage was based on the patient's weight. Axial pieces with a thickness of 3–5 mm were put back together, recorded, and stored.

The scans were reviewed by two radiologists who reached an agreement between them. The following features were recorded: (a) lobe involvement (unilobar [right or left] or bilobar); (b) number of abscesses (single or multiple); (c) maximal abscess diameter, with the largest abscess measured when there were multiple abscesses; (d) unilocular or multilocular (presence of  $\geq 1$ -mm-thick septations), multilocular abscess; (e) solid or cystic appearance ( $>50\%$  of the abscess cavity appears hypodense or liquefied, with an attenuation value of  $\leq 20$  HU) in most of the sections showing the abscess cavity, cystic abscess; (f) gas within the abscess cavity; and (g) spontaneous rupture of the abscess (based on CT and clinical symptoms).

### Results

**Table 1: Underlying diseases of patients with intra-abdominal ruptured liver abscess**

Underlying diseases	Frequency	Percentage (%)
Hypertension	4	8
Diabetes mellitus	15	30
Bacterial pneumoniae	10	20
Bile duct stones	8	4

The study group consisted of 50 patients with a mean age of  $54.6 \pm 15.5$  years (range, 24–85 years). There were more men than women in the study. Diabetes mellitus was the most common underlying medical condition (30%), followed by bacterial pneumoniae (20%), hypertension (8%), and bile duct stones (4%).

**Table 2: Clinical presentations of intra-abdominal ruptured liver abscess**

Clinical presentations	Frequency	Percentage (%)
Abdominal pain	47	94
Malaise and anorexia	47	94
Nausea/vomiting	30	60
Fever $>38^{\circ}\text{C}$	40	80
Jaundice	8	16
Peritonitis	38	76
Hepatomegaly	6	12

Most of the patients were suffering from abdominal pain (94%), malaise and anorexia (94%), fever (80%), and peritonitis (76%).

**Table 3: CT characteristics of intra-abdominal ruptured liver abscess**

CT findings	N
Abscess size (cm)	8.2 (4.0–14)
<b>No. of abscesses</b>	
1	18 (36)
>1	32(64)
<b>Lobar involvement</b>	
Unilobar	46 (92)
Bilobar	4 (8)
<b>Abscess appearance</b>	
Completely liquefied.	40 (80)
Gas in the abscess cavity	10 (20)
<b>Lobe involved.</b>	
Right	35 (70)
Left	15 (30)
Peritoneal effusion	50 (100)

The mean time interval between the onset of fever and CT was 8.4 days (range, 1-30 days). The mean size of the liver abscess was 8.2 cm (range, 4.0-14 cm). A single abscess was found in 18 patients, and multiple abscesses were seen in 32 patients. Unilobar involvement was seen in 46 patients. The abscesses were completely liquefied in 40 patients, and gas in the abscess cavity in 10 patients. Free intraperitoneal fluid was seen in all patients. The right lobe is affected more commonly than the left lobe.

### Discussion

In tropical countries, liver abscess is a common problem that is linked to a lot of illness and death. Hepatic abscesses have been put into two main groups for a long time: pyogenic and amoebic. [15,16] Hepatic abscesses can cause a number of problems, the most common of which is for the abscess to burst. [17,18] Intraperitoneal rupture of a liver abscess is a rare but potentially fatal disease that usually affects older people who are at high risk for surgery because they already have a lot of health problems. [19,20] Liver abscess is one of the most important digestive problems in the tropics. [21,22]

Liver abscesses can be classified into pyogenic and amoebic, both having serious implications, especially when presented late. In developing countries, it forms a major cause of mortality and morbidity. [23,24] With the advent of modern radiological modalities, diagnosis of hepatic abscess is possible in the early stages resulting in nonsurgical management; however, a fraction of patients, either due to late presentation or refractory disease, present with ruptured liver abscess, thereby increasing the mortality, presents with fatal disease course, and requires surgical intervention at the earliest. [25]

Most of the patients had abdominal pain (94%), felt sick and didn't want to eat (94%), had a fever (80%), and had peritonitis (76%). This study's results were similar to those of a study by Hind S. Alsaif. The most common symptoms were fever and/or chills, followed by gastrointestinal symptoms (like upset stomach, diarrhea, vomiting, nausea, discomfort, or pain), respiratory symptoms (like cough, shortness of breath, or chest pain), and jaundice. [26]

The way a liver abscess looks on a CT scan varies and is not always the same. There may be one or more round or oval low-density lesions that are 1.6 cm to 2.1 cm in size. The edge of the abscess may be smooth or bumpy, and it may have one or more internal splits. A wall that makes things better is common, but not everywhere. But if an unenhanced CT is not done, the wall might not be seen. So, a CT scan could show a simple hepatic cyst, an infected or bleeding cyst, a pyogenic liver abscess, an echinococcal cyst, a hematoma, a biloma, a cystic or dead hepatic metastasis, an undifferentiated embryonal sarcoma, or a biliary cystadenoma. In the few cases where there is a rim of edema around the lesion, the diagnosis may be limited to inflammatory diseases. [27]

In 18 patients, there was only one abscess, and in 32 patients, there were more than one. Unilobar involvement was seen in 46 patients. In 40 patients, the abscesses were completely drained, and in 10 patients, there was gas inside the abscess. All of the patients had free fluid inside their peritoneum. Most of the time, the right lobe was affected and not the left. In a study by Alexopoulou A. et al., most liver abscesses were in the right lobe (69.7%), were 5-9 cm in size (63.6%), and were single (75.7%). 24.2% of the patients had more than one abscess. On the chest x-ray, there was also an elevated hemidiaphragm (42.4%), pleural effusion (18.2%), and basilar infiltrate (6%). One person who had a liver abscess also had pylephlebitis. Four (12.1%) of the patients had gas forming, and three (9%) had small pockets of pus inside the abscess. [17]

Imaging, like sonography or CT, is needed to find out for sure if someone has a liver abscess. Sonography depends on the operator, and it may be hard for the operator to find a small, single abscess. Its sensitivity is about 79%, compared to 98% for CT, but emergency bedside sonography may be very helpful for making a quick

diagnosis. Kim et al. suggested that a hairball sign or air-fluid level on a CT scan could be a sign of a Klebsiella abscess. [28,29] But even though these imaging differences may be looked for culture and sensitivity results are the best way to pick the right antibiotics.

With the development of laparoscopic techniques, laparoscopic drainage may replace traditional open drainage in the treatment of liver abscesses. A laparoscopic drainage group is better than an open drainage group in terms of operation time, blood loss, and length of hospital stay, and laparoscopic drainage are safe and feasible in patients who have no response to conservative treatment. [30,31] All surgically accessible liver abscesses are candidates for laparoscopic drainage. If a coexisting abdominal pathology is present that cannot be resolved by laparoscopy, then open surgery should be preferred. Laparoscopic drainage of ruptured liver abscess has been successfully attempted. The laparoscopic method decreases the size of the incision and avoids post-operative complications like burst abdomen commonly associated with open surgery for ruptured liver abscess. It also has the added advantage of being able to give ample peritoneal lavage and insight into other intra-abdominal pathology. [32,33]

### Conclusion

A hepatic abscess that has burst is more dangerous to life than one that hasn't burst. It is important to get a quick and accurate diagnosis and to start surgery right away. Most of the cases came on quickly, and most of the time, the right lobe is affected. The most common sign was pain in the stomach. CT scans are the best way to find out about hepatic abscesses and their complications.

### References

1. Alkofer B, Dufay C, Parienti JJ, Lepennec V, Dargere S, Chiche L. Are Pyogenic Liver Abscess Still a

- Surgical Concern? HPB Surgery. 2012;2012.
- Lardièrre-Deguelte S, Ragot E, Amroun K, Piardi T, Dokmak S, Bruno O, Appere F, Sibert A, Hoeffel C, Sommacale D, Kianmanesh R. Hepatic abscess: diagnosis and management. *Journal of visceral surgery*. 2015 Sep 1;152(4):231-43.
  - Meddings L, Myers RP, Hubbard J, Shaheen AA, Laupland KB, Dixon E, Coffin C, Kaplan GG. A population-based study of pyogenic liver abscesses in the United States: incidence, mortality, and temporal trends. *Official journal of the American College of Gastroenterology*. ACG. 2010 Jan 1;105(1):117-24.
  - Jun CH, Yoon JH, Wi JW, Park SY, Lee WS, Jung SI, Park CH, Joo YE, Kim HS, Choi SK, Rew JS. Risk factors and clinical outcomes for spontaneous rupture of pyogenic liver abscess. *Journal of digestive diseases*. 2015 Jan;16(1):31-6.
  - Chong VH, Zainal-Abidin Z, Hassan H, Chong CF. Rare complications of pyogenic liver abscess. *Singapore Med J*. 2010 Oct 1;51(10):e169-172.
  - Serraino C, Elia C, Bracco C, Rinaldi G, Pomero F, Silvestri A, Melchio R, Fenoglio LM. Characteristics and management of pyogenic liver abscess: A European experience. *Medicine*. 2018 May;97(19).
  - Lardièrre-Deguelte S, Ragot E, Amroun K, Piardi T, Dokmak S, Bruno O, Appere F, Sibert A, Hoeffel C, Sommacale D, Kianmanesh R. Hepatic abscess: diagnosis and management. *Journal of visceral surgery*. 2015 Sep 1;152(4):231-43.
  - Meddings L, Myers RP, Hubbard J, Shaheen AA, Laupland KB, Dixon E, Coffin C, Kaplan GG. A population-based study of pyogenic liver abscesses in the United States: incidence, mortality, and temporal trends. *Official journal of the American College of Gastroenterology*. ACG. 2010 Jan 1;105(1):117-24.
  - Halvorsen RA, Korobkin M, Foster WL, Silverman PM, Thompson WM. The variable CT appearance of hepatic abscesses. *AJR Am J Roentgenol*. 1984 May;142(5):941-6.
  - Muñoz LE, Botello MA, Carrillo O, Martinez AM. Early detection of complications in amebic liver abscess. *Archives of Medical Research*. 1992 Jan 1;23(2):251-3.
  - Mondragon-Sanchez R, Cortes-Espinoza T, Sanchez-Cisneros R, Parra-Silva H and Hurtado-Andrade H. Rupture of an amebic liver abscess into the pericardium. Presentation of a case and review of current management. *Hepatogastroenterology*. 1994; 41:585-8.
  - Mowji PJ, Cohen AJ, Potkin B, Viltuznik J. Amebic liver abscess with hepatoduodenal fistula. *American Journal of Gastroenterology (Springer Nature)*. 1987 Jun 1;82(6).
  - Tandon N, Karak PK, Mukhopadhyay S and Kumar V. Amoebic liver abscess: rupture into retroperitoneum. *Gastrointest Radiol*. 1991; 16:240-2.
  - Yamada S, Maruo H, Mori K, Kosaka A. An unusual case of pyogenic hepatic abscess rupturing into the pericardial cavity. [*Zasshi*][*Journal*]. *Nihon Kyobu Geka Gakkai*. 1996 Nov 1;44(11):2072-5.
  - Akhondi H and Sabih DE. Liver Abscess, in *StatPearls*. Treasure Island (FL). 2019.
  - Chia DW, Kuan WS, Ho WH, Sim TB, Chua MT. Early predictors for the diagnosis of liver abscess in the emergency department. *Internal and Emergency Medicine*. 2019 Aug 1;14: 783-91.
  - Alexopoulou A, Dimopoulou H, Soutati A, Panetsos G, and Dourakis SP. Factors related to complications and mortality in pyogenic liver abscesses. *Annals of Gastroenterology*. 2010; 23:296-301.

18. Mukhopadhyay M, Saha AK, Sarkar A and Mukherjee S. Amoebic liver abscess: presentation and complications. *Indian J Surg*. 2010; 72 :37-41.
19. Kumar S, Sathyanarayana BA, Gupta A, Vupputuri H. A study of predictors for identification of risk of complications in patients with liver abscess. *Tropical Gastroenterology*. 2015 Oct 31;36(2):96-100.
20. Elechi EN, Etawo SU. Management of intraperitoneal rupture of amoebic liver abscess: a 6-year experience with 11 cases in Port Harcourt, Nigeria. *Tropical doctor*. 1991 Jan;21(1):43-4.
21. Cook GC. Gastroenterological emergencies in the tropics. *Baillieres Clin Gastroenterol*. 1991;5(4):861-86.
22. Reeder MM. Tropical diseases of the liver and bile ducts. *Semin Roentgenol*. 1975;10(3):229-43.
23. Blessmann J, Van Linh P, Nu PA, Thi HD, Muller-Myhsok B, Buss H, et al. Epidemiology of amebiasis in a region of high incidence of amebic liver abscess in central Vietnam. *Am J Trop Med Hyg*. 2002;66(5):578-83.
24. Kannathasan S, Murugananthan A, Kumanan T, de Silva NR, Rajeshkannan N, Haque R, et al. Epidemiology and factors associated with amoebic liver abscess in northern Sri Lanka. *BMC Public Health*. 2018; 18(1):118.
25. Short M, Desai AP. Laparoscopy and transdiaphragmatic thoracoscopy in management of ruptured amebic liver abscess. *J Laparoendosc Adv Surg Tech A*. 2008;18(3):473-6.
26. Alsaif HS, Venkatesh SK, Chan DS and Archuleta S. CT appearance of pyogenic liver abscesses caused by *Klebsiella pneumoniae*. *Radiology*. 2011; 260:129-38.
27. Gabata T, Kadoya M, Matsui O, Kobayashi T, Kawamori Y, Sanada J, Terayama N and Kobayashi S. Dynamic CT of hepatic abscesses: significance of transient segmental enhancement. *AJR Am J Roentgenol*. 2001; 176:675-9.
28. Pearl R, Pancu D and Legome E. Hepatic abscess. *J Emerg Med*. 2005; 28:337-9.
29. Kim SB, Je BK, Lee KY, Lee SH, Chung HH and Cha SH. Computed tomographic differences of pyogenic liver abscesses caused by *Klebsiella pneumoniae* and non-*Klebsiella pneumoniae*. *J Comput Assist Tomogr*. 2007; 31:59-65.
30. Cioffi L, Belli A, Limongelli P, Russo G, Arnold M, D'Agostino A, et al. Laparoscopic Drainage as First Line Treatment for Complex Pyogenic Liver Abscesses. *Hepatogastroenterology*. 2014;61(131):771-5.
31. Wang W, Lee WJ, Wei PL, Chen TC, Huang MT. Laparoscopic drainage of pyogenic liver abscesses. *Surg Today*. 2004;34(4):323-5.
32. Siu WT, Chan WC, Hou SM, Li MK. Laparoscopic management of ruptured pyogenic liver abscess. *Surg Laparosc Endosc*. 1997;7(5):426-8.
33. Abdulhadi Z. T., & Muhsin Z. Y. Footprints to achieve digital smile design and esthetic: Narrative review. *Journal of Medical Research and Health Sciences*, 2023; 6(2): 2430–2440.