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Correlation of amoebic liver abscess with computed tomography findings in a tertiary care centre: An original research

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***Abstract*---**Aim: The purpose of the present research was to co-relate the clinical findings of amoebic liver abscess cases in tertiary care centre with the respective computed tomographic findings. Methodology: CT images of 112 symptomatic patients with ALA were analysed to identify the imaging features distinctive of each morphological type. The following CT findings were investigated: the presence of abscess wall, rim enhancement, edge characteristic, septa, intermediate density zone, and peripheral hypodensity. Abscesses from each type were further evaluated for their clinical presentations, laboratory findings and outcomes. Results: We identified three types of ALAs: type I, II and III. Type I abscesses (66%) were characterized by absent or incomplete walls, ragged edges and peripheral septa; their edges exhibited irregular and interrupted enhancement. Type II

(28%) had a complete wall characterized by rim enhancement and peripheral hypodense halo. Type III (6%) demonstrated a wall but without enhancement. Clinically, type I abscesses presented acutely with severe disease. They had significantly deranged laboratory parameters, higher incidence of rupture and higher rate of inpatient or intensive care unit admission. The severity of the disease prompted immediate percutaneous drainage in most type I abscesses (81%). The type II or III abscesses, on the other hand, had delayed presentations with mild to moderate disease, with near normal laboratory findings. Conclusion: ALAs have three different CT morphological types, with different clinical and laboratory features. Percutaneous drainage is indicated in most of type I abscesses.

***Keywords*---**Severe liver abscess, Rim enhancement, Amoebic colitis, Percutaneous drainage.

Introduction

Liver abscess are associated with mortality of up to 20% and are categorized into various types based on etiology, of which amoebic (ALA) and pyogenic (PLA) liver abscess are major types. Interestingly, ALA is more common in the developing nations.[1] PLA constitutes the bulk of hepatic abscesses in developed nations. PLA result from ascending biliary tract infection, hematogenous spread through portal venous system, septicemia with involvement of liver by way of hepatic arterial circulation and secondary spread from intraperitoneal infection. Escherichia coli, Klebsiella, and Streptococcus are the most common etiology of PLA. Although no distinct clinical criteria exist for distinguishing ALA and PLA, the differential diagnosis can be made based on the following criteria- younger age, resident, or recent travel to areas of endemic amoebiasis, diarrhea, and marked abdominal pain raise clinical suspicion of ALA. The diagnosis is confirmed by ultrasonography (USG), serological tests such as indirect hemagglutination test, reddish brown (anchovy paste like material) aspirate from the abscess, negative gram stain, rapid resolution after metronidazole treatment. The diagnosis of PLA is based on picket fence configuration of temperature chart, nausea, vomiting, anorexia, hematological analysis of leukocytosis, anemia, and positive blood or aspirate culture for bacterial etiology. The treatment of liver abscesses has evolved remarkably with minimal invasive drainage taking the centre stage. Radiological imaging has improved diagnostic competence and has altered therapeutic strategy by allowing the possibility of percutaneous approach using needle aspiration or catheter drainage. While open surgery should be reserved for management of complicated cases. The characteristic CT appearance of ALAs is considered non-specific and has been described as a round or oval hypodense lesion with a thick enhancing wall and peripheral edema.[2,3] Although considered to be classical, these features are suggestive of resolving ALAs. Studies have recognized that wall formation and rim enhancement are late findings identified while the healing process proceeds.[4,5] This appearance therefore tends to reflect mild drug responsive disease. In our experience, the abscesses that present acutely rarely exhibit these features. Clinically, such abscesses are associated with severe symptoms or with deranged laboratory profile. It is therefore important to

distinguish such aggressive abscesses from those with mild symptoms. Imaging morphology of ALAs is known to vary considerably depending on the effect of treatment and time of presentation.[6-9] Two studies (both in non-English literature)) have indicated that ALAs can be classified into several morphological types according to their sonographic features; the classification was useful in identifying the abscesses that should be considered for percutaneous drainage.[10,11] Percutaneous drainage has been found necessary in fewer patients in earlier series, but recently, early use of drainage procedures in uncomplicated abscesses is increasing.[12] Rapid urbanization, improved sanitation and hygiene in India in the last few decades have led to the transition of disease epidemiology towards the dominance of noncommunicable disease and injuries.[13] But recent changes in epidemiological and clinical patterns in ALA are not well studied. No study, however, has considered that different morphological types could be related to varying clinical and laboratory features. This understanding can add much value for radiologists, physicians and surgeons.

Aim of the Present Study

The purpose of the present research was to co-relate the clinical findings of amoebic liver abscess cases in tertiary care centre with the respective computed tomographic findings.

Methodology

A cross-sectional study was planned and conducted amongst 112 patients at our tertiary care centre from October 2021 to April 2022. Ethical clearance was taken from institutional ethical committee. All radiologically confirmed liver abscess cases which were above 18 years of age were considered for the study. Immunosuppressed patients, cases of bleeding diathesis and hydatid cyst were excluded from the study. Informed consent was taken from all subjects prior to their inclusion into study. All patients underwent physical examination, hematological, biochemical and radiological investigations. The age of the study subjects ranged between 18 years to 90 years, with the mean age being 37.1 years. The young age group (20-40 years) comprised the maximum cases (64.1%). The ratio of male to female was 8.7:1. About 74.3% patients were presented with history of alcoholism. All CT examinations were performed on a dual-source 256 slice CT system (Siemens SOMATOM Definition Flash; Siemens, Germany). Portal venous or hepatic venous images (acquired at 60 and 120 s after about 80–100 mL of iohexol injection, respectively) and non-contrast images were reviewed. The CT images of 0.6 mm slice thickness were evaluated on workstations. We attempted to classify the abscesses into different morphological types based on the following characteristics: (1) presence of wall, (2) rim enhancement, (3) characteristics of the abscess edge, (4) presence of the septa, (5) presence of intermediate density zone on non-contrast CT, and (6) presence of peripheral hypodensity. The largest abscess was considered for the analysis in patients with multiple abscesses. The sonographic images were also reviewed in conjunction with the CT images, particularly for the presence of solid necrotic tissue. Three radiologists, blinded to clinical findings, independently reviewed the images. Decisions about types of abscess morphology and other imaging characteristics were reached by consensus. To assess whether different morphological types

might have different clinical features, we reviewed the clinical symptoms and laboratory data at the time of CT examination. The laboratory data included total leukocyte count, albumin, total bilirubin, alanine aminotransferase, aspartate aminotransferase, and alkaline phosphatase. Also, the time interval between the onset of symptoms and CT examinations were recorded. The additional CT findings recorded were as follows: (1) size, (2) number of abscesses, (3) presence of rupture, (4) presence of haemorrhage or gas-bubbles, (5) presence of intrahepatic duct dilation, (6) colonic thickening, (7) presence of ascites, and (8) presence of pleural effusion. To examine the differences in each variable between the different types of ALA, we used one-way analysis of variance and the Chi-square test or the Fisher exact test. Data were analysed using SPSS software (version 22.0). A p-value less than 0.05 was considered significant.

Results

On the basis of the CT morphology, we were able to classify all abscesses into three types: type I, type II and type III. Type I abscesses had absent or incomplete walls; their edges were ragged. (Table 1) Of the 74 abscesses, 24 (32%) displayed no contrast enhancement at the edges. The remaining 68% showed irregular and interrupted enhancement. All abscesses—despite the presence of septa—were unilocular because the septa never divided the abscess cavities. 51 abscesses (69%) showed a diffuse or wedge-shaped hypodensity. Type II abscesses had a complete wall characterized by rim enhancement and relatively smooth outline. In 25 abscesses (81%), a peripheral halo-like hypodensity was observed to form a double-target appearance. Type III abscesses, like the type II, also demonstrated a complete wall. However, the wall was distinct in that it was much smoother and did not enhance with contrast. A faint ill-defined peripheral hypodensity was observed in 4 abscesses; it helped to distinguish the type III abscesses from other cystic lesions, such as hydatid or simple hepatic cysts. Overall, most abscesses were round or oval; however, they assumed variable shapes with polycyclic or lobulated borders when multiple lesions coalesced together. Type I abscesses were frequently multiple (mean 2.4 vs 1.4 vs 1.1, p=0.039) compared to type II or type III abscesses. Ascites and pleural effusion were more frequently observed in patients with type I abscess. Gas-bubbles, haemorrhage, and intrahepatic duct dilatation were almost exclusively observed in type I abscesses. Most patients with type I abscesses presented earlier than those with type II or III (mean, 10.5 vs 27.6 vs 41.5 days, $p < 0.001$). (Table 2)

Discussion

We identified three distinct morphological patterns of ALA—type I, II and III—with variable clinical and laboratory findings. Clinically, type I abscesses presented acutely with severe disease, whereas the other types presented with mild to moderate disease. Most type I abscesses responded poorly to anti-amoebic therapy and consequently required percutaneous drainage. Type I abscesses—characterized by an absent or incomplete wall, ragged edges, multiple septa and interrupted or no enhancement—were observed in 66% of our cases. Brandt and Tamayo et al. state that liver changes produced by amebae are quite characteristic and only rarely are they confused with lesions of a different nature, such as pyogenic abscesses or malignant neoplasms.[14] This pattern of ALA

consists of liquefied necrotic tissue in the centre and solid necrotic tissue adherent to the edges. The solid necrotic tissue can occasionally be identified by non-contrast CT as an intermediate density zone, but usually not by contrast-enhanced CT.[15] The septa are known to be present in about one-third of ALAs on CT examinations, but their importance has not been recognized. The septa of amoebic abscesses are the cords of connective tissue which resists initial necrosis, but is subsequently resorbed as healing progresses.[16] As shown in the results, the CT-based morphological types paralleled clinical severity. The type I abscesses presented with severe clinical and biochemical findings. Several additional CT findings of type I abscesses indicated increased disease severity: multiplicity of lesions, large size, local complications (rupture, intrahepatic duct dilatation, intracavitary haemorrhage or gas)—and remote complications (peritonitis, amoebic colitis, appendicular or caecal perforation, ascites and pleural effusion). Katzenstein et al. emphasized the need to distinguish acute abscesses (those presenting within 10 days of onset of symptoms) from chronic.[17] They found that over half of the patients with acute abscess, designated as acute aggressive type, had severe clinical symptoms and laboratory profile; they frequently required surgery; multiple abscesses were common in this group. Rupture is the most common fatal complication of ALA. The two well established risk factors include large size and left lobe location; drainage has been advocated in presence of these factors, fearing that they will rupture.[18] This study classified ALAs based on CT features, and all involved patients had received medical treatment, either partial or complete, before the examination; this might have influenced the morphological patterns.

Conclusion

To conclude, ALAs can present with three different morphological types. The type I pattern is associated with severe clinical symptoms and deranged laboratory parameters, and higher incidence of local and remote complications. This pattern often has poor response to medical therapy and therefore requires percutaneous drainage.

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TABLES

Table 1- Distinguishing CT features of the three morphological types of amoebic liver abscesses

CT features	Type I	Type II	Type III
Wall	Absent or incomplete	Present	Present
Edge appearance	Ragged	Smooth	Smooth
Enhancement pattern	Absent or interrupted	Rim	Absent
Septa	Present	Absent	Absent

Table 2- Additional CT findings of the three morphological types of amoebic liver abscesses

Variables	Type I (n=74)	Type II (n=31)	Type III (n=7)	p-value
Size of abscess (cm)	10.1±2.5	8.6±1.4	9.7±1.9	0.010
Number of abscesses	2.4±2.4	1.4±0.9	1.1±0.4	0.039
Rupture	42 (57%)	2 (6%)	0	<0.001
Intracavitary haemorrhage	4 (5%)	1(3%)	0	0.744
Ascites	23 (31%)	2 (6%)	0	0.007