Liver Abscess

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Liver abscess is a relatively uncommon but potentially life-threatening condition which has been described since the time of Hippocrates. The advances in bacteriology and diagnostic techniques, improvement in drainage techniques, as well as improved supportive care, have reduced morbidity and mortality significantly over the past few decades.

The two major forms of liver abscesses are,

- Pyogenic abscess, which is most often polymicrobial and
- Amoebic abscess which is common in tropical regions mainly where "*Entamoeba histolytica"* is endemic.

Rarely Fungal abscess can be recognized most often due to *Candida* species.

14.1 Pyogenic Liver Abscess (PLA)

Although a significant proportion of liver abscesses are cryptogenic, most often microorganisms enter the liver tissues via either hepatic artery, portal vein, or biliary system. Attempt should be made to find out correctable causes.

- Biliary disease—Biliary disease is the commonest cause for the PLA. It occurs following ascending cholangitis secondary to extrahepatic biliary obstruction associated with choledocholithiasis, benign and malignant tumors, or postoperative strictures. Biliary-enteric anastomoses, endoscopic biliary procedures, and

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intrahepatic rupture of gangrenous gall bladder also contribute to the formation of abscess.

- Infection via portal system (portal pyaemia)—With the use of antibiotics for intra-abdominal infections, portal pyaemia is now less common but it still can occur with appendicitis, acute diverticulitis, inflammatory bowel disease, and perforated hollow viscus.
- Hematogenous (via hepatic artery)—This usually occurs from systemic bacteremia due to a distant infection such as bacterial endocarditis, dental and ENT infections, or urinary sepsis.
- Traumatic—Blunt or penetrating trauma and interventions for liver masses such as embolization and ablations can be complicated with pyogenic abscesses.

14.1.1 Presentation

Early symptoms are nonspecific. A febrile illness and right upper quadrant pain are the most common complaints. These can be mistaken for acute cholecystitis or hepatitis. A chronic history is typical and may be associated with anorexia, malaise, and jaundice. In some cases, patients present with symptoms related to the primary cause. During clinical assessment, an attempt should be made to identify the cause and related complications.

14.1.2 Examination

Swinging pyrexia and a tender right upper quadrant are common signs. Jaundice is more of a feature if it is associated with the biliary system. Apart from these, lung signs due to effusion or atelectasis may be evident. Assessment of circulatory status is essential as the patient may be in septic shock.

14.1.3 Laboratory Studies

The routine blood tests are nonspecific. Neutrophilic leukocytosis in full blood count (FBC) and elevated CRP are common findings and serial testing is done to monitor response and progress. Hypoalbuminemia and elevation of alkaline phosphatase are the most common abnormalities in liver functions while elevations of transaminase and bilirubin levels are variable. Renal functions and electrolytes are important in resuscitation and recognizing organ failure.

Blood cultures are positive in roughly 50% of cases while culture of abscess fluid yields more than 75% positive rates. Most commonly isolated microorganisms include *Escherichia coli*, *Klebsiella pneumoniae*, *Bacteroides* species, and *Streptococcal* species and sensitivities determine final antibiotic choices.

14.1.4 Imaging

Plain abdominal and chest radiographs have less diagnostic value in liver abscess. Indirectly, there may be an elevation of the right hemidiaphragm and respiratory complications such as effusion and atelectasis. Rarely gas loculi in the abscess may be visible.

Ultrasound scan (USS) is the initial imaging modality of choice. It has a sensitivity of 75–95%. It also provides information about the biliary tract pathology, the presence of gallstones and their complications. It avoids radiation exposure and thus is widely used in pediatric age group.

Disadvantages of USS include difficulty in detecting an abscess high in the dome of the liver and especially multiple small PLAs. When the fluid is dense, it may be confused with a solid lesion.

A CT scan is more accurate than USS in the differentiation of PLA from other liver lesions and has a sensitivity of approximately 95%. Apart from detecting smaller liver lesions, it will provide more details of causative pathology as well as abdominal and respiratory complications.

Magnetic resonance imaging (MRI) does not seem to have any advantage over CT or USS.

14.1.5 Management

Management include the following steps;

- Resuscitation,
- Initiation of appropriate antibiotics,
- Drainage of purulent collections—aspiration, drainage, or surgery, and
- Establishing the source and its management.

14.1.5.1 Antibiotics

Broad-spectrum antibiotics should be started parenterally to cover Gram-negative and positive aerobes and anaerobes. Initial therapy with amoxicillin, an aminoglycoside, and metronidazole or a third-generation cephalosporin and metronidazole generally covers the causative organisms most commonly found. Once an offending agent is identified, antibiotic regimes can be streamlined. Regardless, the regimes are of longer durations. Traditionally antibiotics are continued for 2 weeks and converting to oral forms and continuation for a prolonged period will depend on the patient's clinical response, culture results, and institution policies. Expert microbiological opinion may help in the decision-making at this stage. During this period the patient should be monitored regularly with clinical and biochemical parameters and also with repeat imaging.

- In patients with multiple PLAs that are too small to drain, antibiotics may be the only treatment. This regime has been shown to be effective in patients with unilocular abscesses that are smaller than 3 cm.

14.1.5.2 Percutaneous Procedures

Percutaneous procedures are performed under USS or CT guidance. Aspiration of PLA is usually followed by the insertion of a drain.

Primary treatment by percutaneous catheter drainage (PCD) is performed when:

- The fluid is too dense to be aspirated
- The abscess is greater than 5 cm in diameter
- The wall is thick and non-collapsible after aspiration

Once positioned, the catheter should be irrigated with isotonic sodium chloride solution and placed to allow gravity drainage. The drain is removed when it dries off and the abscess cavity collapses, as confirmed by imaging. An abscess with biliary communication may also be treated by PCD but the continuous output of bile for a prolonged period should be expected even after endoscopic decompression. Close proximity to vital structures will be a contraindication for percutaneous drainage.

14.1.5.3 Surgical Treatment

Although the above measures are successful in 80–90% of cases, surgical drainage has to be considered in the following situations.

- Failure of nonoperative treatment.
- Intraperitoneal rupture or impending rupture.
- Abscess not amenable for drainage—complicated, multi-loculated, thick-walled abscess with viscous pus.
- Complications of percutaneous drainage, such as bleeding or intraperitoneal leakage of pus.
- Coexistence of intra-abdominal disease that requires operative management.

Open surgery can be performed using the following approaches.

- Transperitoneal approach via midline or right upper quadrant incision which allows abscess drainage and abdominal exploration to identify previously undetected abscesses and the location of an aetiologic source.
- Posterior transpleural approach for high posterior lesions which limits the access for intra-abdominal organs.
- Extraperitoneal approach which avoids peritoneal contamination.

Laparoscopic approach with the help of endoscopic ultrasound is also used in selected cases and affords the opportunity to explore the entire abdomen and it may reduce the morbidity.

14.1.5.4 Treatment of Underlying Pathology

When the biliary system is obstructed, decompression with ERCP and stenting will be the preferred method. Percutaneous transhepatic biliary drainage can be used if ERCP fails.

Most antibiotic regimes used in PLA will also cover the distant septic foci.

Strict glucose monitoring in diabetic patients, stabilization of renal function, and measures to improve immunodeficiency status should be implemented as required.

14.2 Amoebic Liver Abscess (ALA)

This is the most common extraintestinal site of *E. histolytica* infection. It is more common in men between 20 and 40 years of age who reside in or had a recent travel to an endemic region. ALA lesions are usually single and mostly found in the right lobe of the liver. Main risk factors include heavy alcohol intake, immunodeficiency, crowding with poor hygiene, and malnutrition.

Amoebic cysts are usually transmitted to the human gut via contaminated food and water. The cyst wall is broken down by trypsin in the small intestine to release the trophozoites which colonize the caecum. These trophozoites penetrate the mucosal layer to enter into mesenteric venules and then find the pathway to the liver via the portal circulation to form the abscess.

14.2.1 Clinical Features

Most of the clinical features are as above. Diarrhea may be present in less than one-third of patients at the time of diagnosis and some patients describe a history of having had dysentery within the previous few months. When the patient describes a recent visit to an endemic region, the onset of symptoms usually occurs within 8–12 weeks from the date of travel.

On examination, a febrile illness complemented with right upper quadrant tenderness and hepatomegaly are prominent features.

14.2.2 Investigations

Amoebic abscess may cause leukocytoctosis and liver function derangement. Understandably, these are again nonspecific. Blood cultures are negative unless the abscess becames secondarily infected with bacteria.

When amoebic origin is suspected, serologic testing is the most widely used method of diagnosis. EIA (enzyme immune assays) detects antibodies specific for *E histolytica* in approximately 95% of patients with extraintestinal amoebiasis. EIA serology reverts to being negative in 6–12 months following eradication of infection. Serum antigen testing is another option with an advantage of diagnosing acute infection.

Although positive results in stool examination for cysts and microbial antigen suggest the diagnosis, negative results are not reliable as less than a third of patients with ALA have concomitant intestinal amoebiasis.

Aspiration of the abscess may not be helpful in diagnosis either as the centre of the abscess is filled with necrotic material and amoebae are usually found in the marginal wall.

14.2.3 Imaging

As with pyogenic abscess, both USS and CT scans are used in diagnosis with almost similar sensitivities. Rarely, nuclear imaging is used to differentiate the two abscesses. Amoebic abscesses appear as a cold lesion with hot halo while pyogenic abscesses appear as a hot lesion.

14.2.4 Management

Management principles are similar to that of pyogenic abscesses. Fortunately, most uncomplicated amoebic liver abscesses can be treated successfully with conservative management with amoebicidal drug therapy alone which eradicate the invasive trophozoites in the liver. Metronidazole remains the drug of choice for amoebic liver abscess and is usually given for 5–10 days. Chloroquine and Tinidazole are used as alternatives.

This has to be followed by a course of luminal amoebicides such as Paromomycin or Diloxanide Furoate for the eradication of the asymptomatic colonization state otherwise this can lead to relapse of infection.

When there is no improvement in 3–4 days of adequate medical therapy aspiration is considered. There should be a low threshold to aspirate left lobe abscesses which can cause cardiac complications and ones with a risk of impending rupture. Like PLA, percutaneous drainage is indicated when a thick collection is not readily aspirated by needle or when repeated aspiration is required.

Surgical intervention is only rarely required when the patient is not improving with the above measures and to deal with complications such as rupture.

14.2.5 Monitoring

The response to treatment is assessed clinically and biochemically due to lag in radiological changes of response. The complete sonographic disappearance of the lesion may take several months and relapses are very uncommon.

14.3 Complications

The complications of hepatic abscess result from rupture of the abscess into adjacent organs or body cavities. If rupture occurs into pleural cavity it can result in pleurisy and pleural effusion, empyema, and bronchohepatic fistula while intra-abdominal rupture may cause subphrenic abscess and generalized peritonitis. Most often these patients need a multidisciplinary approach in management.

14.4 Low Resource Alternatives

Due to the vague clinical features and laboratory findings, imaging is necessary for the diagnosis. USS is sufficient is in most cases. Resuscitation with fluids and optimization of clinical and biochemical parameters are of prime importance in initial management irrespective of the definitive diagnosis. With the diagnosis, trial of broad-spectrum antibiotics and anti-amoebic therapy is commenced and the patient is monitored with clinical and biochemical parameters. Culture results will then guide antibiotic therapy.

If amoebic abscess is suspected and serology tests are not available, stool examination can help in diagnosis in some patients.

If the USS is negative in a patient with symptoms suggestive of a liver abscess, CT scan needs to be considered as it will demonstrate smaller lesions.

When the medical therapy is unsuccessful and a guided aspiration is indicated in the absence of an interventional radiologist, an experienced surgeon may be able to aspirate a large superficial abscess under USS guidance safely. The procedure can be repeated several times if there is no response. Risks and benefits should be balanced in deciding on operative intervention as surgery carries significant morbidity.

When the operative expertise is not available and if the patient is not improving with adequate medical and interventional radiological measures then it is best to transfer the patient as soon as possible to a unit that has this capability. The same will apply for the patients with ruptured abscess with peritonitis, patients with complications due to guided procedures, and when the causative pathology needs to be addressed with operative measures.

Although open surgery carries relatively high morbidity compared with laparoscopy, it is safe in experienced hands, and with transperitoneal approach it gives access to other related pathologies. When the pyogenic abscess is not resolving due to ongoing biliary obstruction and if ERCP facility is not available, open bile duct exploration with T-tube placement is an alternative.

Some of these patients especially with PLA are acutely unwell and septic requiring ongoing supportive care in an intensive care unit. Decision on optimum management of these patients has to be done by a multidisciplinary team including gastroenterologist, radiologist, surgeon, and intensivist.

14.5 Conclusion

Liver abscess share many clinical features and biochemical derangements with other hepatobiliary pathologies requiring imaging for diagnosis. Because of the difficulty in differentiating between PLA and ALA, anti-amoebic therapy is usually recommended in addition to broad-spectrum antibiotics initially. Medical therapy alone is effective in most cases of ALA. Some form of intervention is usually needed for PLA.