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Liver abscess: An observational study of clinical presentation and its management

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Abstract
Liver abscesses, both amoebic and pyogenic, continue to be an important cause of morbidity and mortality in tropical countries. However, different modalities of treatment of liver abscess are conservative (medical management), percutaneous needle aspiration, percutaneous catheter drainage, surgical drainage and endoscopic drainage. The aim of the study is to evaluate the clinical presentation and the different management done for liver abscess. This is an observational prospective study for presentation of liver abscess and its management done in the department of general surgery, simmer hospital, Surat, Gujarat, India from 1st January 2018 to 31st December 2018. In this study, 35patients (23 males and 12 females; age range, 2-72 years; average age, 35 years) with liver abscesses (amebic 08; pyogenic 27) underwent either percutaneous needle aspiration, percutaneous catheter drainage, or surgical intervention along with appropriate antimicrobial therapy. In patients assigned to the needle aspiration group, an 18-gauge spinal needle under local anaesthesia was used to aspirate the abscess cavity. For catheter drainage, 8- to 12-French catheters were introduced into the abscess cavity using the Seldinger technique. Patients were followed up to assess the outcome of the treatment, length of hospital stay, and development of any complications. Sonography was performed every third day during hospitalization in cases of percutaneous needle aspiration and percutaneous catheter drainage. After discharge of the patient, periodic clinical and sonographic examinations were done until total resolution of abscesses was achieved. Improvement in clinical features, liver function tests, ultrasonic evidence of decrease in the size of abscess cavity was considered as criteria for successful treatment.

Keywords: Amoebic, liver abscess, percutaneous drainage, pigtail catheter, pyogenic

Introduction
A liver abscess is a suppurative cavity in the liver resulting from the invasion and multiplication of microorganisms, entering directly from an injury through the blood vessels or by the way of the biliary ductal system. Liver abscesses are most commonly due to pyogenic, amebic or mixed infections. Less commonly these may be fungal in origin. Liver abscess has been recognized since Hippocrates (circa 400 B.C.) who speculated that the prognoses of the patients were related to the type of fluid within the abscess cavity [1]. Liver abscess is found more commonly in men between 20 and 40 years of age, but can occur at any age. Approximately 60% are solitary and mainly located in the right lobe of the liver, as a result of the streaming of portal blood flow secondary to the fact that the right lobe is predominantly supplied by the superior mesenteric vein, and because most of the hepatic volume is in the right lobe. When multiple abscesses are present, pyogenic or mixed is the most probable type. Patients usually present with a constant dull pain in the right upper quadrant of the abdomen which may be referred to the scapular region or the right shoulder. These patients usually have fever of between 38^0 C and 40^0 C. Rrecent advances in interventional radiology, intensive care, progress in antibiotic therapy, and liberal use of sonography and computerized tomography scanning of the abdomen have led to early diagnosis and treatment of patients with liver abscess, thus improving the patient outcome. Percutaneous drainage of liver abscess has been an important advancement in the treatment of pyogenic liver abscesses. The primary mode of treatment of amebic liver abscess is medical; however, as many as 15% of amebic abscesses may be refractory to medical therapy [2]. Also, secondary bacterial infection may complicate 20% of amebic liver abscesses [3]. In such patients and in patients with pyogenic liver abscesses, surgical drainage has been the traditional mode of treatment [4].

However, operative drainage is associated with significant (10-47%) morbidity and mortality [5]. In recent years, image-guided percutaneous drainage has been increasingly used to treat liver abscesses with reported success rates ranging from 70-100% [6-8]. Although percutaneous placement of an indwelling catheter is the method most widely preferred to drain liver abscesses [9], recent studies have claimed needle aspiration to be a simpler, less costly, and equally effective mode of treatment.

Material and methods

This was a single-center observational study conducted by the Departments of Surgery, simmer hospital, Surat, Gujarat, India. A total of 35 patients diagnosed to have liver abscess clinically and radio logically [on ultrasonography (USG) and/or CT scan] were included in the study, in which percutaneous needle aspiration (PNA) (n=15), pigtail catheter drainage (PCD) (n=17) and surgical management was done (n=3). The patients were studied from January 2018 till December 2018. The patients were selected from those attending the outpatient department and emergency department at the hospital. The age of patients varied from 2-75 years with most of the patients falling within the range from 31-40 years. Patients with Prior intervention, Concomitant biliary tract malignancy, liver malignancy and Uncorrectable coagulopathy were excluded from the study. All the subjects satisfying the inclusion criteria were carefully worked up in terms of a detailed history and clinical examination. Laboratory and imaging investigations included complete hemogram; liver function tests; prothrombin time; international normalized ratio; activated partial thromboplastin time; blood culture; amebic serology; imaging-CXR; abdominal USG with or without CT scan of the abdomen; and other investigations as per specific indications in different patients. An informed and written consent was obtained from the participating patients and all the consenting patients were started on medical treatment as per our protocol. All the patients empirically received injection Metronidazole 800 mg IV every t.i.d., injection Ceftriaxone 2 g IV b.i.d. The empirical treatment was revised based on the culture and sensitivity report. However, patients in whom pus culture was sterile continued on the same treatment. The antibiotics and metronidazole were given for duration of 10 and 14 days respectively. Once a participating subject gave valid consent the pre-determined intervention was carried out as follows: The percutaneous procedures were carried out under local anesthesia (2% lignocaine) with IV analgesia and sedation if required, under continuous real-time USG guidance.

Percutaneous needle aspiration (PNA)

The patient was subjected to USG of the abdomen and the characteristics of the abscess cavity (IES) were recorded. Local anesthesia was infiltrated at the proposed puncture site using a 26 G needle. Under real-time USG guidance and using 18 G spinal needle the abscess cavity was entered and pus was aspirated till no more pus could be aspirated further. A sample of pus was sent for Gram stain, culture, sensitivity. A sterile dressing was applied at the needle puncture site.

Percutaneous catheter drainage (PCD)

The PCD was accomplished by placing a 12-Fr pigtail catheter in the abscess cavity under USG guidance using the Seldinger technique. The patient was subjected to USG of the abdomen and the characteristics of the abscess cavity (IES) were recorded. Local anesthetic was infiltrated in the proposed area of puncture. Using a No. 11 blade, a small stab was made on the anesthetized skin. Under real time sonographic guidance, the initial puncture needle (18 G, 21 cm long with three parts) was inserted through the skin stab and guided to the center of the abscess cavity. The stylet was taken out and pus was aspirated to reconfirm the position and the aspirated pus was sent to the lab for testing. A 0.038 straight tip guide wire was inserted through the needle and the needle was taken out without displacing the guide wire. The tract was dilated with plastic dilators serially up to 12 Fr size. The 12-Fr pigtail catheter was then passed over the guide wire which was taken out, and the catheter was fixed to the skin using 1-0 Silk suture. The catheter was attached to a collecting bag via the supplied connector.

Evaluation of the response to intervention

The clinical response (temperature) and laboratory parameters [total leukocyte count (TLC), liver function test (LFT), etc.] were recorded on a daily basis. In the patients undergoing PNA, USG was repeated after a gap of there days and aspiration repeated if the cavity size was still found to be greater than 5 cm. The same procedure was repeated after a gap of another three days and aspiration repeated if needed. The failure of clinical improvement in terms of fever, abdominal pain and tenderness and leukocytosis or decrease in size of the abscess cavity after a third attempt of aspiration was taken as failure of needle aspiration. These patients underwent PCD and were added to the PCD group. There were two such patients in whom PNA was converted to PCD. In patients who underwent PCD, besides recording the clinical and laboratory parameters of the patient every day, daily output of the catheter was measured. A decision to remove the pigtail catheter was made when the total drainage from the catheter decreased to less than 10 mL/24 h for two consecutive days along with USG findings suggestive of reduced cavity size.

Follow up

The patients were followed up weekly for a month, monthly for three months and at the end of six months, for clinical evaluation and USG assessment of abscess cavity until complete resolution of the abscesses was achieved. Data were collected and recorded in the printed proforma.

Results

A total of 35 patients were included in the study. The following observations were made.

General characteristics

The age of the patients varied from 2 years to 58 years with most of the patients falling within the age range from 31-50 years. The number of patients was less in extremes of age. There were 24 male and 11 female patients with liver abscess involved in the study. The male to female ratio was 2.1:1.

Symptoms and signs

It was observed that pain in the right upper quadrant of the abdomen was the most common symptom, found in 93% of the cases. Weakness (90%) and fever (88%) were other frequently presenting symptoms. Approximately half of the patients had symptoms of anorexia, weight loss and night sweats. Pain in the right shoulder region and cough were present in 15% and 18% of the patients respectively. Only 20% of the patients gave a history of diarrhea prior to illness. In this study, hepatomegaly was found to be present in 24 of 30 patients (80%) whereas pleural effusion was found in 7 of 30 patients (23%). It was observed that 22 of 30 patients (73%) had leukocytosis.

Elevation of serum alkaline phosphatase was also observed in 75% of the patients.

Pus culture

Pus aspirated from all abscesses was sent for culture and sensitivity. Cultures were found to be positive in 14 of 35 (40%) of the cases. The rest were sterile. Among the pus culture positive cases *Escherichia coli* was isolated most frequently i.e. 7 of 14 culture positive patients. It was closely followed by *Klebsiella* spp. which was isolated in 4 cases. *Pseudomonas* and *Staphylococcus aureus* were isolated in 2 and 1 patients each.

Type of abscess

Pyogenic liver abscesses (27) were encountered more frequently, compared to amoebic (8).

Location of the abscess

In majority 21 patients abscesses were located in the right lobe of liver, in 8 patients in the left lobe and in 6 patients in both lobes.

Number of abscess

24 of the 35 cases studied were found to have solitary liver abscess cavity, whereas the rest of the patients had multiple abscesses.

Volume of the abscess

It was observed that the volume of the abscess cavities was mostly between 150-450 ml.

Discussion

Liver abscess is a major tropical disease of the gastrointestinal system [13, 14]. The liver abscess is mainly classified into amebic and pyogenic. Pyogenic liver abscess which used to be mainly tropical in location is now more common due to increased biliary interventions, stenting, cholecystitis, cholangitis etc. The clinical presentation of the patients studied in our series was similar to the descriptions in previous reports [16]. The common symptoms and signs of liver abscess in our study were fever (88%), right upper quadrant pain and tenderness (93%) and hepatomegaly (80%). These clinical manifestations are similar to those described in previous studies [17, 18].

In our study, 60% of the abscesses were located in the right lobe of liver, similar to previous studies [16, 19], and 70% of our patients had solitary abscesses, similar to a previous report [20]. We encountered multiple liver abscesses in 30% of the patients, similar to the 20-25% incidence of multiple liver abscesses reported by Sharma *et al* [21]. The type of abscess was determined on the basis of amebic serology and pus culture reports and appearance of the pus [22]. In our study we found 27% of the abscesses to be amebic in etiology and 73% to be pyogenic. Khan *et al* in their series reported 68% amebic, 21% pyogenic, 8% indeterminate [22].

It can be said that in recent years image-guided percutaneous treatment (needle aspiration or catheter drainage) has replaced surgical intervention as the primary treatment for liver abscess [6-9, 33, 34].

The major advantages of PNA over PCD are:

1. It is less invasive and less expensive;
2. Avoids problems related to catheter care; and
3. Multiple abscess cavities can be aspirated easier in the same setting [10, 11].

However, in our study we had a success rate which was significantly lower than with percutaneous drainage (77% versus 100%, P=0.006). There are some problems with catheter drainage like discomfort to the patient, pain, cellulites at the insertion site and sometimes catheter dislodgement as compared to PNA.

The success rate of PNA in the literature varies from 79-100% [10, 35], where as in our study it is 77%. The average size of abscess in our study was 302±122 mL and 249±121 mL for the PCD and PNA group respectively, comparable to the study reported by Rajak *et al* (335 mL and 221 mL respectively) [32].

In contrast to some of the earlier reports that show that the initial size of the abscess cavity did not affect the ultimate outcome [11, 29], larger abscesses are more difficult to evacuate completely in one attempt, necessitating subsequent aspirations [32].

The average volume of the 2 patients in whom PNA failed was significantly larger than the average volume of the patients who could be successfully treated with PNA (403.6 mL and 201.4 mL respectively).

These two patients were successfully treated with catheter drainage.

The patient in whom PNA was converted to surgical drainage (Explorative Laparotomy with peritoneal lavage) had 70 cc of liver abscess which showed rupture on the 7th day of hospitalization, even after two attempts of PNA.

Another important reason for failure of needle aspiration is the inability to completely evacuate the thick viscous pus that may be present in some of the abscesses. Rapid re-accumulation of pus in the abscess is another reason described for failure of needle aspiration [35].

Placement of an indwelling drainage catheter addresses all three of these issues as it provides continuous drainage, drains thick pus because of wider caliber catheter, and prevents re-accumulation. This explains the higher success rates (100%) observed in our study and several previous studies [10, 32, 33, 36].

The only reasons for failure of PCD as reported in some of the earlier series [37, 38] have been either thick pus not amenable to percutaneous drainage (this can be overcome by placement of a wider bore catheter) or premature removal of drainage catheter. No recurrence occurred in any of our cases during the follow up period. The time required for 50% reduction in the cavity size was significantly less in the PCD compared to PNA group (4.9 days and 7.1 days respectively). Similar observations were recorded by other investigators as well [9, 32]. Complications such as hemorrhage, pleural effusion/empyema, persistent bile drainage, catheter displacement, sepsis etc., have been reported with both PNA (4% in series of Baek *et al*) [10] and PCD (12% in the series of Lambiase *et al)* [30]. Baek *et al* and Giorgio *et al* described the much lower incidence of complications with PNA than with PCD as one of the major advantages of needle aspiration over catheter drainage. Patients in whom there was ruptured liver abscess with a low volume (30cc, 40cc) were treated successfully with diagnostic laparoscopy with peritoneal lavage, hence reducing the need of more invasive laparotomy and decreasing morbidity. However, in our study and some recent studies (Rajak *et al* 1998 [32], Yu *et al* 2004 [39]), both the procedures were found to be safe if performed properly with minimal complications. There was no mortality in either of the study groups.

Singh and Kashyap, 1989 [9] reported a 15% incidence of secondary bacterial contamination after repeated needle aspirations; however, others (Baek SY *et al* [10], Giorgio *et al* [11], Rajak *et al* [32]) have not encountered this problem. Although secondary bacterial infection remains a possibility with indwelling drainage catheters this complication has been rarely reported in liver abscess [7].

One limitation of our study is that the etiology of abscess was not uniform and formed a heterogeneous group with abscesses of both amebic and pyogenic etiology existing in both groups.

Conclusion

Liver Abscess is associated with a relatively high mortality and morbidity, and several serious complications.

A very prompt recognition is important in instituting effective management and achieving good outcomes.

Because of the nonspecific symptoms and laboratory findings, the presence of predisposing factors can be helpful in increasing the level of diagnostic suspicion.

The key to successful outcome in the management of liver abscess is early diagnosis and institution of appropriate therapy.

Different modalities of treatment of liver abscess are available, each having different indications, merits and demerits.

More prospective trials with large cohorts are needed to refine our understanding of this serious condition.

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