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PYOGENIC LIVER ABSCESS: REVIEW OF 54 CASES

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ABSTRACT

Background: Historically open surgical drainage has been the treatment of choice for pyogenic liver abscess. The records of 54 patients with pyogenic liver abscess were reviewed to determine whether earlier diagnosis with current imaging tests and definitive treatment with antibiotics and aspiration drainage was an effective alternative to surgery.

Methods: The clinical features, laboratory tests, imaging, and microbiologic findings, management strategy and final outcome were studied.

Results: Twenty-nine patients were treated with broad-spectrum antibiotics and diagnostic aspiration. Twenty-three (79%) recovered uneventfully, and six required catheter or operative drainage. Twenty-three patients (including five who failed aspiration) underwent drainage with percutaneusly placed catheters. Nineteen (83%) recovered, four required open drainage, and of seven patients who required open drainage, six recovered. One (2%) of the 54 patients died following failed aspiration and catheter and surgical drainage. Four patients were successfully treated with antibiotics alone without aspiration.

Conclusion: This study confirms that pyogenic liver abscess can be successfully treated with broad spectrum antibiotics and aspiration or percutaneous catheter drainage.

Open surgical drainage is reserved for patients in whom treatment fails or who require celiotomy for concurrent disease.

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INTRODUCTION

The advent of highly accurate diagnostic hepatic imaging techniques and the availability of potent antibacterial agents have had a profound impact on the diagnosis and therapy of pyogenic liver abscess. Historically, the cornerstone of therapy for pyogenic liver abscess was open surgical drainage, based on the classic work of Ochsner in 1938.[1]

Their emphasis on open extraserous drainage reduced the mortality rate from 100% to 33%, and subsequent development of broad-spectrum antibiotics permitted more liberal use of transperitoneal drainage as primary therapy. Recently the ability to precisely localize the abscess with noninvasive techniques has led to a shift away from open surgical drainage to percutaneous drainage.

Current therapeutic options for pyogenic liver abscess include surgical drainage, catheter drainage, or aspiration in conjunction with antibiotics, or antibiotics alone.

Mortality and morbidity rates continue to decline as

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the number of therapeutic options increases, however mortality rates of 11% to 32% continue to be reported.[2,5] The aim of this study is to present our experience and outline the clinical course in pyogenic liver abscess.

MATERIAL AND METHODS

Between 1980 and 1995, 54 patients with pyogenic liver abscess were treated at the Imam Reza Medical Center. The charts of these patients were retrospectively reviewed to determine clinical features, diagnostic tests, methods of treatment, and results of therapy. Primary hepatic amebic abscess and infected hydatid cyst were excluded from this review. Posttraumatic hepatic sequestrae were also excluded due to the inability to determine whether they were a direct extension of intra-abdominal abscess caused by associated injuries. All of the patients were followed for one year.

RESULTS

The 54 patients consisted of 32 men (59%) and 22 women (41%) with a mean age of 47 years (range 17 to 80 years). The presenting symptoms first seen at a mean of 15 days before admission (range 1 to 90 days) were pain 43 (80%), fever 42 (78%), nausea 30 (56%), chills 24 (44%), vomiting 22 (41%) and jaundice 10 (19%). The proportions of patients with abnormal laboratory tests are depicted in Table I. Amebic hemagglutination titers were obtained in 35 patients. Thirty-one of 35 patients had negative amebic titers. Four patients with elevated amebic titers (more than 1/2000) had pus and bacteria recovered from the hepatic abscess. Three of these patients denied diarrhea or recent travel history to endemic areas. One patient was admitted with diarrhea, and proctitis was seen on sigmoidoscopic examination. Non-invasive imaging was performed in all patients. Ultrasound examination was performed in 47 patients, and the abscess was identified in 44.

Computed tomography accurately localized the abscess in all 48 patients in whom it was performed. Thirty-one of the 51 fluid collections were unilocular (57%), and multiple abscesses were seen in 23 patients (43%). Thirty-two abscesses (59%) were confined to the right hepatic lobe, 8 were in the left lobe, and 14(26%) involved both lobes of the liver. Fifty patients (93%) had their abscess cavity aspirated either percutaneously under roentgenographic guidance or at the time of operative drainage.

The frequency of positive cultures is summarized in Table II.

The microbiologic findings of the blood and abscess are listed in Table III. The primary cause of the abscess could not be identified in 20 (32%) patients. Gastrointestinal disease was seen in 14 (26%) patients, biliary tract abnormalities in 10 (19%) and hematogenous spread in 10 (19%). The underlying causes are listed in Table IV. The mean abscess diameter was 6.2 cm (range 2 to 15 cm).

Broad spectrum parenteral antibiotic therapy (ampicillin-metronidazole and cefuroxime) was initiated to treat aerobic and anaerobic bacteria in all patients following identification of an abscess with ultrasound or CT. The mean duration of hospitalization was 23 days (range 6 to 49 days). 29 patients had aspiration and antibiotic therapy, 18 patients had percutaneous catheter drainage, 3 patients underwent early operative drainage and the final four were treated solely with antibiotics.

Twenty-three (79%) of the 29 patients recovered. Their mean time to defervescence was 10.5 days (range 2 to 24 days). Six patients with persistent fever and leukocytosis underwent drainage a mean of 12.3 days (range 7 to 25 days) after initial aspiration.

Table I. Laboratory findings at presentation.

Laboratory test	**No. (%) of patients**
Total bilirubin, μmol/L	
<25.7	34(63)
>25.7	20(37)
Alanine aminotransferase, U/L	
<40	20(37)
>40	34(63)
Aspartate aminotransferase, U/L	
<40	23(43)
>40	31(57)
Alkaline phosphatase, U/L	
<115	5(9)
>115	49(91)
White blood cells, $\times 10^9$/L	
<10	8(15)
10-15	21(39)
>15	25(46)
Amebic titers	
Positive	4/35(14)
Negative	31/35(86)

Table II. Yield of blood and abscess cultures.

Abscess	Blood	No. of patients (%)	
Positive	Positive	25	46%
Positive	Negative	18	33%
Negative	Positive	4	8%
Negative	Negative	3	5%
Not Aspirated	Positive	4	8%
Total		54	100%

Table III. Microbiologic findings of abscess and blood isolates.

Organism	Abscess	Blood
Escherichia coli	14	7
Klebsiella	12	10
Enterococcus	3	-
Citrobacter	2	2
Proteus	2	1
Pseudomonas aeruginosa	1	1
Serratia	1	-
Enterobacter	1	-
Streptococcus		
Microaerophilic		
α	7	3
β	6	2
γ	6	2
Staphylococcus aureus	3	1
Diphtheroids	2	1
Bacteroides fragilis	1	-
Fusiform bacteria	7	8
Candida	1	2
	2	-

Four of the six patients had percutaneous catheter drains placed and recovered. One patient with diverticulitis and multiple hepatic abscesses underwent transperitoneal operative drainage of the hepatic abscesses 15 days after aspiration. The final patient, a 61-year old man with diabetes, was transferred to our hospital with cryptogenic abscesses. Computed tomogaphy guided aspiration was performed on the third hospital day. He suffered a cardiac arrest on day 4, and his subsequent septic course was marked by hemodynamic instability and coagulopathy. A percutaneous catheter drain was placed on day 12, followed by transperitoneal operative drainage on day 14. Hepatic and renal failure developed after surgery, and he died on hospital day 24.

Table IV. Breakdown of causative agents.

Causes	No. (%) of patients
Cryptogenic	20(36)
Gastrointestinal	
Appendicitis	4
Diverticulitis	2
Colitis	2
Amebic colitis	1
Perforated ulcer	2
Ileocecal leiomyosarcoma	1
Intramural cecal lesion	1
Colonoscopic perforation	1
Total	14(26)
Biliary	
Previous choledochoenterostomy	4
Gallstones	2
Postcholecystectomy	2
Gallbladder carcinoma	1
Total	9(8)
Hematogenous	
Urinary tract	4
Pulmonary	3
Endocarditic	1
Intravenous drug abuse	1
Sinusitis	1
Total	10(19)

Primary catheter drainage of the abscess cavity was accomplished concurrent with initial aspitation in 18 patients. Five patients failed initial diagnostic aspiration and underwent secondary catheter drainage. The 23 patients had a mean abscess diameter of 6.6 cm (range, 2 to 15cm). There were 16 single and seven multiple abscesses.

The mean duration of hospitalization was 22.5 days (range 8 to 72 days).

Nineteen (83%) of the 23 patients recovered without surgery. The mean time to defervescence was 8.5 days (range, 1 to 17 days). Two patients required two catheters, and one patient had three catheters placed prior to recovery. Four (17%) of the 23 patients treated with catheter drainage required subsequent operative drainage.

In two patients a left lobe abscess was drained with a percutaneous catheter. After drainage, one patient developed fever (temperature, 40°C), hypotension, and coagulopathy. On hospital day 6, transperitoneal exploration revealed intraperitoneal rupture of the abscess by the catheter. Left lateral hepatic segmentectomy was performed and the patient recoved and was discharged on hospital day 25. The third patient failed catheter drainage of a 9.5 cm right lobe posterior abscess. On hospital day 29, the patient underwent successful 12th rib extrapertoneal drainage, and was discharged 9 days later. The fourth patient died.

Three patients underwent primary operative drainage of the abscess. In the first, the radiologist was reluctant to place a catheter in a patient with colitis, marked sepsis, and thrombocytopenia. Extraperitoneal dependent drainage through the bed of the 12th rib was performed on hospital day 4. He recovered and was discharged on hospital day 19. The second patient with a periappendiceal abscess and pylephlebitis had an appendectomy and operative drainage of the periappendiceal and intrahepatic abscess on hospital day 6, and was discharged on hospital day 12. The third patient was a pregnant 27 year old in labor, admitted with septic shock secondary to appendicitis. An 8cm abscess was identified by CT. She underwent urgent appendectomy and drainage of a hepatic abscess. The patient was discharged on the 36th hospital day.

Three complications were related to therapy. One subcapsular liver hematoma developed after aspiration, and the patient required a 2-U transfusion. A transpleural aspiration caused a hemothorax, and thoracotomy was required for hemostasis. In the third patient, the percutaneously placed drainage catheter ruptured the hepatic abscess and caused peritonitis. This was treated with operation.

DISCUSSION

Pyogenic liver abscess is the most common form of liver abscess. Historically, the appendix and colon were the major sources of pyogenic abscess, seeding the liver via the portal vein.[1,2]

Although transient portal bacteremia is usually controlled by the reticuloendothelial Kupffer cells in most patients, in elderly or immunocompromised patients, the bacterial inoculum can overwhelm the Kupffer cells and lead to an abscess. The gastrointestinal tract was the most common etiologic source in our series (14 of 54 patients, 26%); however, most series implicate the biliary tract as the most common etiologic source.[3,4,5] Less commonly, the liver can be seeded via the hepatic artery as occurred in 10 of our patients. Despile recent diagnostic advances, the etiologic source could not be identified in 20 (40%) of our patients.

Nevertheless every attempt should be made to localize and treat the source of infection. Careful and thorough evaluation of the biliary and GI tract can reduce the incidence of cryptogenic abscess to 10%.[4]

Patients with a pyogenic liver abscess often have a prodrome lasting several weeks. Symptoms were present for approximately 2 weeks in the majority of our patients. The syndrome usually includes right upper quadrant pain, fever, chills, nausea, and vomiting. Leukocytosis and abnormalities of liver function, particularly the alkaline phosphatase level, are invariably present. The clinical syndrome often cannot be distinguished from amebic liver abscess. The presence of an amebic liver abscess must be ruled out with appropriate serologic tests, such as the indirect hemagglutination test.[7] This was likely in at least three of our patients. A precise diagnosis is essential, because therapy is radically different between amebic and pyogenic liver abscess. Whereas the majorty of pyogenic liver abscesses will have aspiration or drainage as part of therapy, amebic liver abscesses are best left intact and treated with appropriate antimebicides.[7,8] Ready availability and improved resolution of both ultrasound and CT importantly relate to the earlier and more accurate diagnosis of liver abscess.[9] Ultrasound is the preferred diagnostic test. It will often identify associated biliary tract abnormality. It is cost effective and remarkably accurate,[9] as seen in the 44 abscesses in 47 patients in this series.

Ultrasound is of added benefit in helping to distinguish pyogenic from amebic liver abscess. The former often appear hypoechoic with irregular margins, while the latter are more homogenous, oval or round with well-defined margins.[9] Computed tomography accurately identified the abscess in the 48 cases in which it was employed. It is value in identifying underlying intra-abdominal abnormalities, or other intraabdominal abscesses.

When a hepatic abscess is suspected and confirmed by an imaging test, parenteral broad spectrum antibiotics, designed to eradicate aerobes and anaerobes, should be administered.[10] The majority of infections will be polymicrobial and the organisms usually of enteric ori-

gin. Initially, a combination, including penicillin and an aminoglycoside, and metronidazole should be employed. If the patient proves to have amebiasis, the penicillin and aminoglycoside can be discontinued.[4]

Aspirates of the abscess cavity are more accurate than blood cultures in identifying the bacteria involved.[1] Parenteral antibiotic therapy should be continued until the patient is afebrile, aymptomatic, and without leukocytosis for at least 48 hours.

The majority of our patients were treated with oral antibiotics for an additional 2 weeks. In patients with impaired renal function an appropriate third generation cephalosporin can be used instead of an aminoglycoside.

However, antibiotic therapy is believed to be merely adjunctive to drainage of the abscess. In the preantibiotic era non-operative treatment was associated with a 100% mortality rate.[2] Their advocacy of extraperitoneal drainage as a method of avoiding spillage and diffuse peritonitis has been credited with subsequent dramatic reduction in mortality rate. Fadzean in a report in 1953 described 14 patients successfully treated with diagnostic aspiration and antibiotics without drainage.[11] By 1964 this series had grown to include 108 patients with only one death.[1] These reports went relatively unheeded and open surgical drainage continued, and the mortality rate remained at up to 32%. Until 1990 open surgical drainage continued to be advocated.[12]

The ready availability and liberal use of ultrasound and CT for early diagnosis, combined with the expertise of interventional radiologists in aspirating or catheterizing and successfully treating a wide variety of abscesses, led to the employment of these techniques in the diagnosis and treatment of pyogenic liver abscess.[3,4,5,8,13]

These radiologic aspiration techniques although initially employed by us for diagnosis and for obtaining material for bacteriologic studies, soon proved to be remarkably effective as definitive therapy, and began to be employed as primary therapy. This retrospective review of the cases aspirated or drained offers convincing evidence that diagnostic aspiration and parenteral antibiotics will, in the majority of patients, result in cure.

This occurred in 23 (79%) of 29 patients so treated. It proved equally effective in patients with single (n= 12) or multiple (n= 17) abscesses. Four of the six failures, however, did occur in patients with multiple abscesses. Patients usually respond rapidly to this therapeutic regimen. Those in whom fever and leukocytosis persisted were treated with percutaneous catheter drainage. Often the individual clinician elected primary catheter drainage (17 cases) rather than aspiration. Occasionally multiple catheters were required to achieve success.

Nineteen (83%) of 23 patients treated with catheter drainage recovered, a success rate similar to that for aspiration.

There were no meaningful differences in size or number of abscesses, time to effervescence, or duration of hospitalization in patients treated with one or the other modality. It is possible that avoidance of an open surgical drainage minimized morbidity, the associated preoperative risks and the possible spread of pus throughout the abdomen.

Barnes reported experience with 48 cases of pyogenic liver abscess during a 5-year period.[14]

Surgical drainage was performed in 42% of cases and percutaneous drainage in 17%. In the current reports 45% of cases underwent catheter drainage and only 15% underwent surgical drainage. These figures document the profound impact of the newer imaging techniques on the diagnosis and therapy of pyogenic liver abscess.

Obviously, in a problem as complex as pyogenic liver abscess, no single therapeutic option is likely to cure all cases, and a mortality rate of zero is probably an elusive goal.

Considering the associated disease and duration of the septic process, open surgical drainage has a role in the treatment of patients in whom aspiration or catheter drainage fails. Of the 54 patients in the current series, seven required surgical drainage. In four patients, this was done as a result of failure of catheter drainage. Three recovered, and one patients with multiple comorbid illnesses died. Of the three patients who had primary surgical drainage, two recovered, and drainage failed in one due to an inability to locate the abscess intraoperatively.

The excellent results and minimal morbidity related to aspiration or catheter drainage as opposed to open surgical drainage has resulted in the following approach to treating patients with suspected pyogenic liver abscess with no coexistent intra-abdominal abnormality who require emergency exploratory celiotomy.

1) Parenteral broad antibiotic therapy to treat aerobes, anaerobes and amebiasis.

2) Amebic hemagglutination test to exclude amebiasis.

3) Immediate ultrasound or CT to confirm the diagnosis of liver abscess.

4) Concurrent aspiration of the abscess for bacteriologic data to guide subsequent antibiotic therapy.

5) If sepsis persists repeated noninvasive imaging 7 to 10 days later.

6) Operative therapy for catheter drainage failures or for patients with coexistent intra-abdominal

abnormality; in the former extra-peritoneal or trans-peritoneal drainage of the hepatic abscess will accomplish this.

In the latter when possible sepsis should be controlled before definitive surgical therapy for the underlying abnormality. This may obviate the need for concurrent drainage of the abscess.

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