Original articles

Tropical liver abscess

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Summary

Forty-one consecutive cases of liver abscesses seen at the National University Hospital, Singapore from 1988 to 1994 were reviewed. Twenty-seven cases (65%) were pyogenic, six (15%) amoebic, two (5%) tuberculous and six (15%) indeterminate. The predominance of pyogenic abscesses is in marked contrast to previous studies from the region a decade ago in which amoebic abscesses were the commonest type. The commonest pathogen causing pyogenic abscess was *Klebsiella pneumoniae*. Two cases were due to *Mycobacterium tuberculosis*, and this organism needs to be actively looked for in smears and cultures of aspirated material. As the majority of organisms isolated were resistant to ampicillin, empirical antibiotic treatment for suspected pyogenic abscess should include gentamicin or a cephalosporin. Percutaneous needle aspiration of the abscess was performed for 85% of pyogenic abscesses and surgery was necessary in only two cases because of complications. We found that percutaneous aspiration of liver abscess is helpful to confirm the diagnosis, provides a better bacteriological culture yield, gives a good outcome, and may uncover clinically unsuspected conditions like malignancy and tuberculoma which may mimic the presentation of liver abscesses. We recommend routine cytological examination of aspirated abscess material as well as stains and cultures for acid-fast bacilli.

Keywords: liver abscess, *Klebsiella pneumoniae*, *Mycobacterium tuberculosis*, aspiration

profound impact on the management of liver abscesses in our centre, dramatically reducing the need for open surgical drainage.

We describe our experience with 41 consecutive cases of liver abscesses seen between 1988 and 1994. Changes in epidemiology and management of liver abscess by comparison with previous studies in Singapore and the region are discussed.

Materials and methods

The case records of consecutive patients with liver abscesses admitted to the Division of Gastroenterology in the National University Hospital, Singapore, from January 1988 to June 1994 were reviewed. A definitive diagnosis of liver abscess was made based on compatible clinical features and the following investigations: ultrasonography or computed tomography (CT) scan, aspiration or drainage of pus, or at autopsy. Criteria for diagnosing the various types of abscesses were as follows:

- amoebic abscess was diagnosed based on a positive indirect fluorescent antibody test (titre greater than 1 : 64) or demonstration of *Entamoeba histolytica* trophozoites in aspirated pus or in a biopsy of the abscess wall.
- pyogenic abscess was diagnosed based on positive cultures of blood or aspirated pus.
- if both of the above sets of criteria were satisfied, the abscess was considered to be of mixed aetiology.
- tuberculous abscess was diagnosed by the identification of acid-fast bacilli in aspirated material.
- the abscess was classified as indeterminate if none of the above criteria were satisfied.

Results

ABSCCESS TYPE

There were 41 patients with confirmed liver abscesses, 27 of whom (65%) had pyogenic abscess, six (15%) amoebic, and two (5%) tuberculous, while six (15%) were classified as indeterminate.

PATIENT CHARACTERISTICS

The male to female ratio was 1.7:1 with a mean age of 57 years (range 28 to 82 years). The racial distribution approximated that of the general population of Singapore. A history of recent overseas travel was obtained in a fifth of all patients, including four of the six patients with amoebic abscesses. The most common underlying conditions were diabetes mellitus and biliary tract disease (box 1). Intestinal disease was uncommon in our series.

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CLINICAL PRESENTATION

The most common features at presentation were fever (90%), abdominal tenderness (46%), hepatomegaly (44%) and right upper quadrant pain (29%). Jaundice was seen in less than a fifth of the patients; while 12% presented with hypotension.

LABORATORY FINDINGS

Leukocytosis was documented in 90% of cases (box 2). All patients had at least one abnormality in the panel of liver function tests (serum bilirubin, serum albumin, alanine aminotransferase, aspartate aminotransferase, gamma glutamyl transferase, alkaline phosphatase). Ultrasonography and CT scan were performed in 66% and 83% of patients, respectively, and successfully demonstrated the abscess in 96% and 100% of cases, respectively.

MICROBIOLOGY

Bacteriological yield from aspirated abscess material (82%) was superior to that from blood cultures (47%). The commonest pathogen was *Klebsiella pneumoniae* followed by *Escherichia coli* (box 3). The former organism was uniformly sensitive in *in vitro* tests to gentamicin, ceftriaxone and cephalexin but was usually resistant to ampicillin (table). Eleven of 41 patients (27%) reported receiving antibiotics from another doctor prior to hospital admission and this may have affected culture results. The majority had a single abscess (66%) located mostly in the right lobe (80%). All six cases of amoebic abscesses had a single cavitation in the right lobe of the liver. Of the 14 cases of multiple abscesses, 10 were pyogenic, two were tuberculous and two were indeterminate in aetiology.

Underlying diseases associated with pyogenic abscess (n=41)

Underlying disease	No (%)
• biliary disease	
gall bladder calculi	7 (26)
gall bladder sludge	1 (4)
carcinoma of the gallbladder	1 (4)
• colonic cancer	1 (4)
• diabetes mellitus	10 (37)
• extra-hepatic sites of sepsis	
peritonitis	1 (4)
pneumonia	2 (8)

Box 1

Results of laboratory investigations and radiology (n=41)

Investigation	No (%)
• leukocytosis (total white cells $>10 \times 10^9/l$)	37 (90)
• hypoalbuminemia (albumin <35 U/l)	33 (80)
• raised serum alkaline phosphatase (>126 U/l)	33 (80)
• raised serum bilirubin (>30 umol/l)	7 (17)
• raised serum alanine aminotransferase (>56 U/l)	28 (68)
• ultrasound: demonstrated abscess	26/27
• CT scan: demonstrated abscess	34/34

Box 2

Microbiology of pyogenic abscesses, (n=27)

	No (%)
<i>Klebsiella pneumoniae</i>	22 (81)
<i>Escherichia coli</i>	3 (11)
<i>Enterobacter</i>	2 (7)
<i>Salmonella</i>	1 (4)
<i>Staphylococcus aureus</i>	1 (4)

Two patients had two organisms cultured

Box 3

Table Antibiotic sensitivities of pyogenic microorganisms; R=resistant; S=sensitive

Organism (n)	Ampicillin	Gentamicin	Ceftriaxone
<i>Klebsiella pneumoniae</i> (18)			
<i>E coli</i> , strain 1 (2)	R	S	S
<i>E coli</i> , strain 2 (1)	R	S	S
<i>Enterobacter</i> (2)	S	S	S
	R	S	S

CYTOLOGY

Of the 41 patients in the series, needle aspiration material was sent for cytology in 31 (76%) cases (20 pyogenic, four amoebic, five indeterminate, two tuberculous). Of the pyogenic abscesses, 14 (70%) were characterised by abundant neutrophils admixed with macrophages and necrotic debris, while the remainder showed mainly necrotic cells and debris. Of the amoebic abscesses, two showed necrotic granular debris lacking in neutrophils, while two showed features similar to pyogenic abscess. No amoebic trophozoites were identified. Both cases of tuberculous abscess showed a paucity of neutrophils and presence of necrotic debris. Of the five cases of indeterminate abscess type, three showed abundant neutrophils and necrotic debris, one showed mainly necrotic debris and one specimen was nondiagnostic because of nonrepresentative material.

MANAGEMENT

In the majority of cases, the presenting clinical features did not allow a definitive diagnosis of the type of abscess. Hence our initial antimicrobial regime included either a cephalosporin or combination of ampicillin and gentamicin, with metronidazole for coverage of *Entamoeba histolytica* and anaerobic organisms. When culture results were obtained, the antibiotics were altered as appropriate. For confirmed amoebic abscesses, metronidazole was the treatment of choice. Percutaneous aspiration of the abscess was performed for 34 of 41 cases (73%) including 23 of 27 (85%) cases of pyogenic abscesses and four of six amoebic abscesses before definitive diagnosis. Indications for this procedure were: to confirm the diagnosis, to drain large abscesses (more than 5 cm in diameter on radiological imaging) and for nonresponse to initial treatment with parenteral antibiotics. Open surgical drainage was necessary in only two cases of

pyogenic abscess, in which it was performed because of nonresponse to antibiotic treatment and rupture, respectively. The overall mortality rate was 7% and of the three fatalities, two patients had advanced carcinoma whilst the other was an elderly patient with diabetes mellitus.

Discussion

Our series had markedly fewer amoebic (15%) than pyogenic abscesses. This is in contrast to a study from Singapore a decade earlier in which amoebic abscesses were more common.¹ This changing trend is probably due to improved socio-economic conditions locally. It may be relevant that four out of the six cases of amoebic abscesses in our series had a history of recent travel outside Singapore.

We found *Klebsiella pneumoniae* to be the commonest pathogen in pyogenic abscesses, in concurrence with previous regional studies.^{1,5-8} This is in contrast to Western series⁹⁻¹² in which *E coli* was usually the predominant organism, although in recent years *Klebsiella pneumoniae* has been cited in some Western reports as the most common pyogenic organism.^{13,14} There was also a paucity of anaerobic organisms in our culture results; this may be due to failure to use anaerobic culture bottles and/or because a significant percentage of patients (27%) had received prior antibiotic treatment. Superimposed bacterial infection in an amoebic abscess was not seen. Knowledge of likely pathogens has implications in guiding the choice of empirical antibiotic therapy before culture results are known, especially since the *Klebsiella* species isolated locally was usually resistant in *in vitro* tests to ampicillin. *Salmonella typhi* and *Pseudomonas pseudomallei* are endemic in South East Asia and may cause liver abscess,^{1,2,15} although the latter was not seen in the present series. *Pseudomonas pseudomallei* is an organism found in soil and is a cause of chronic infection with abscess formation in rural agricultural communities. In one series from northeastern Thailand, melioidosis accounted for 34 out of 50 cases of pyogenic abscess.¹⁵ Typically multiple liver abscesses are found in melioidosis and concomitant splenic abscess is common. The occurrence of two abscesses due to *Mycobacterium tuberculosis* in our series and one case in the series of Goh *et al*² suggests that this organism should be routinely looked for in smears and cultures of aspirated material, as its presentation may be indistinguishable clinically from other causes of liver abscess. It should certainly be considered as a possible cause in this part of the world when an abscess fails to respond to standard treatment.

In our series the most common underlying conditions were diabetes mellitus and biliary tract disease. Diabetes mellitus was more commonly associated with pyogenic abscess (37%) than with amoebic abscess (17%). Unlike Western series,¹⁶ intestinal disease was infrequently present, reflecting the low prevalence of inflammatory bowel disease locally.

Guidelines for investigation and treatment of suspected liver abscess

Useful investigations

- blood counts
- liver function tests
- blood cultures
- cultures of aspirated material if obtained
- ultrasonography or CT

Consider percutaneous aspiration if

- abscess diameter larger than 5 cm
- failure to respond to medical treatment by 48-72 hours

Choice of antimicrobial agents

- pyogenic abscess - combination of intravenous ampicillin and aminoglycoside or intravenous cephalosporin
- amoebic abscess - metronidazole

Box 4

Learning points

- liver abscesses are most commonly caused by pyogenic organisms in developed countries and *Entamoeba histolytica* in developing countries
- Gram-negative bacilli especially *Escherichia coli* and *Klebsiella pneumoniae* are the organisms most frequently cultured from pyogenic abscesses
- melioidosis and *Salmonella typhi* are potential causes of liver abscess in endemic areas
- malignant or tuberculous involvement of the liver may mimic the presentation of liver abscess
- percutaneous aspiration of the abscess is helpful to confirm the diagnosis, and culture of the aspirate is more sensitive than blood culture; cytologic examination of the aspirate helps to exclude malignancy and tuberculoma which may mimic abscesses

Box 5

Ultrasonography and CT have superseded the use of radionuclide isotope scans which were used in previous studies.^{2,5} We found both these techniques to be reliable in the diagnosis and follow-up of abscesses. Ultrasonography is less costly but the results are operator-dependent. Halvorsen *et al*¹⁷ reported CT to be the most sensitive imaging modality for the detection of hepatic abscesses. Recently, magnetic resonance imaging has been used to characterise liver abscesses.¹⁸

Management of liver abscesses has also undergone major changes following the advocacy of percutaneous aspiration.^{4,19} In our series, radiologically guided percutaneous needle aspiration was performed in 85% of pyogenic abscesses with good results and only two cases (5%) required open surgical drainage. In contrast, surgical drainage had been performed in 40% to 70% of abscesses in previous local studies. We have found percutaneous aspiration of a liver abscess to be helpful for the following reasons:

- it helps to confirm the diagnosis if pus is aspirated
- it gives a better bacteriological culture yield (82% *vs* 47% from blood cultures)

- it gives an equally good outcome to surgical drainage and has less procedure-related morbidity
- unsuspected underlying conditions may be diagnosed from aspirated material.

Two cases of hepatoma were diagnosed from cytological examination following clinical presentation indistinguishable from that of pyogenic liver abscess; two cases of tuberculosis were also diagnosed by finding acid-fast bacilli in aspirated abscess material. If the diagnosis of amoebic abscess is confirmed, then percutaneous drainage is not necessary in the majority of cases^{20,21} and surgery is usually only needed for complications.²² Two prospective studies have compared ultrasound-guided needle aspiration combined with medical treatment against the latter alone, and found that aspirated patients had a more rapid clinical recovery,^{23,24} but a third study found no significant difference.²⁵ Recent innovations in

the treatment of liver abscesses include the intra-cavitary instillation of antibiotics following needle aspiration of pyogenic abscesses²⁶ and laparoscopically guided drainage of abscesses.²⁷

In conclusion, amoebic abscesses are becoming less frequent in Singapore compared to a decade ago. The most common organism isolated from pyogenic abscesses was *Klebsiella* spp. As the majority of organisms isolated were resistant to ampicillin, empirical antibiotic treatment for suspected pyogenic abscess should include gentamicin or a cephalosporin. Percutaneous aspiration of liver abscess is helpful to confirm the diagnosis, provides a better bacteriological culture yield, gives a good outcome, and may uncover clinically unsuspected conditions like malignancy and tuberculoma which may mimic the presentation of liver abscesses. We recommend routine examination of aspirated material by cytology as well as stains and cultures for acid-fast bacilli.

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