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Pyogenic Liver Abscess : a Study of 18 Patients

Takashi YOKOYAMA[1], Nobukazu MIYOSHI[1], Takashi KODAMA[1], Tetsuhiko MASUDA[2], Shiro NAKAI[2], Shigenobu KADO[2] and Seiji OHIGASHI[2]

1) The 1st Department of Surgery, Hiroshima University School of Medicine, 1-2-3, Kasumi, Minami-ku, Hiroshima 734, Japan

2) Department of Surgery, Hiroshima Memorial Hospital, 1-4-3, Honkawa, Naka-ku, 733, Japan

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ABSTRACT

Eighteen patients with pyogenic liver abscess were treated at Hiroshima University Hospital, First Department of Surgery and Hiroshima Memorial Hospital between 1979 and August 1984.

The most frequent cause of the disease was infection of the biliary tract, accounting for 44%.

The most useful diagnostic methods were echography and CT. The use of these two techniques enabled us to establish diagnosis in almost all the patients. Sufficient drainage of the biliary tract was important in cases of hepatic abscess via the biliary tract. In other causes of hepatic abscess, drainage under echographic guidance was useful in treatment for solitary liver abscess. In cases of multiple liver abscess, it was also considered necessary to puncture the abscess under echographic guidance, to detect the causative organisms, and to use effective antibiotics against that organisms.

Admission prevalence of pyogenic liver abscess is as extremely low as 0.008-0.016%[8,13], whereas the prevalence in autopsied cases is as fairly high as 0.59-1.57%[10,16]. This seems to be attributable to the severity of this disease and the difficulty involved in its diagnosis.

The recent introduction of echography and computerized tomography (CT) have facilitated progress in diagnosis, and the use of drainage under echographic guidance and the development of new antibiotics have also markedly improved the treatment.

Hepatic abscess, however, is still a severe infectious disease. This paper reports and discusses 18 cases of pyogenic liver abscess that we have experienced.

MATERIALS

The subjects were 18 patients with pyogenic liver abscess who were treated at Hiroshima University Hospital, First Department of Surgery and Hiroshima Memorial Hospital from 1979 to August 1984. The 18 patients consisted of 10 with solitary abscess and eight with multiple abscesses.

Eleven of the 18 patients, were cured by treatment, two died of malignant tumor, which was the causative disease, despite the fact that the hepatic abscess had healed. The remaining five died of hepatic abscess.

RESULTS

1) Age distribution and etiology

Table 1 shows the age distribution and causes of hepatic abscess. Patients aged 60 or older accounted for 50% of the total, showing the prevalence of this disease in elderly persons. The most frequent cause was biliary tract infection, being found in eight out of the 18 patients.

In the group of patients aged 50 or older, there were four cases of hepatic abscess secondary to biliary infection following biliary obstruction caused by a malignant tumor in the biliary tract or the pancreas. Of the four patients with hepatic abscess due to hematogenous infection, hepatic artery, three were children. One

Table 1. Age and etiology of pyogenic hepatic abscess in 18 patients

Age \ Etiology	Biliary		Hematogenous		Cryptogenic	Contiguinous
	Benign	Malig.	Artery	Portal		
0			1			
1– 9	1		2			
10–19						
20–29			1			
30–39					1	
40–49	1				1	
50–59		1				
60–69	1	2	2			2
70 over	1	1				
	4	4	4	2	2	2

child had hepatic abscess following chest wall abscess, and the other two had chronic granulomatous disease as the underlying causes.

Cryptogenic liver abscess was present in two patients, both of whom showed no underlying disease or other infectious foci.

2) Clinical manifestations and laboratory findings (Table 2)

The symptoms observed were fever, abdominal pain and anorexia, each accounting for more than 80%. The fever continued for several weeks in many cases and was accompanied by chills, suggesting bacteremia.

The predominant signs were enlarged liver and tenderness in the right upper quadrant. The degree of hepatic enlargement varied in different cases and according to the site of abscess. Most patients with abscess in the lower margin of the liver showed a marked enlargement of the liver. Although tenderness in the right upper quadrant was found in 70.6% of the patients, muscle guarding was rare, indicating the difficulty in diagnosing this disease from abdominal findings alone. Severe jaundice was present in cases of hepatic abscess via the biliary tract, whereas cases due to other causes showed no jaundice. Laboratory examination showed an extremely high incidence of inflammatory findings such as leukocytosis and an increase in erythrocyte sedimentation rate (ESR).

The most helpful laboratory finding was an increase in alkaline phosphatase and leucine aminopeptidase, 72.2% of the patients showing abnormal values. An increase in total bilirubin was rare, being found in five of eight cases of hepatic abscess via the biliary tract.

Table 2. Clinical manifestations and laboratory findings

	No. of cases	Percent of cases (%)
Symptom		
Fever (38.0°C〈)	16/18	88.9
Abdominal pain	13/15	86.7
Nausea and Vomiting	2/17	11.8
Weight loss	8/16	50
Anorexia	14/17	82.4
Melasia	12/15	80
Sign		
Enlarged liver	12/18	66.7
Tenderness in right upper quadrant	12/17	70.6
Jaundice	4/18	22.2
Laboratory findings		
White blood cells/mm^3 〉12000	14/18	7.8
Erythrocyte sedimentation rate 1 hr〉15 mm	15/16	93.8
Total bilirubin 〉2 mg/dl	5/18	27.8
Alkaline phosphatase 〉120 u/liter and Leucine Aminopeptidase 〉55 u/liter	13/18	72.2
Abnormal chest X-ray	7/18	38.9

3) Diagnosis (Table 3)

Five cases were diagnosed during emergency surgery or autopsy, while the other 13 were diagnosed by echography, CT or angiography. Echography was performed in all 13 cases and proved to be useful in all except one.

CT, which was used for eight of the 13 cases, was also found to be very useful. Cases diagnosed during autopsy or emergency surgery

Table 3. Diagnosis and treatment of pyogenic liver abscess

Etiology	Basal disease	Method of diagnosis	Treatment	Location of Abscess	Type of Abscess	Prognosis
Biliary	Cholangiocarcinoma	Peritonitis → Lapartomy	Bile duct drainage Abscess drainage	lt lobe	Solitary	Abscess healed Cancer death
Malig. tumor	Cholangiocarcinoma	CT,ECHO	Operative bile duct drainage (Soupault's Method)	lt lobe	Multiple	dead
	Pancreas head Ca.	Autopsy		both	Multiple	dead
	Cholangiocarcinoma	ECHO,CT,PTC	PTCD + Puncture under ECHO guide → Hepatectomy	both	Multiple	Abscess healed Liver dysfunction death
	Gall stone (Intrahepatic)	ECHO,CT	PTCD → Op. (Gall stone)	lt lobe	Solitary	alive
	Gall stone (Choledochus)	ECHO	PTCD → Op. (Gall stone)	lt lobe	Solitary	alive
	Gall stone	ECHO	Puncture under ECHO → Op. (Gall stone)	lt lobe	Solitary	alive
	Congenital bile duct atresia post op.	Autopsy		rt lobe	Multiple	dead
Hematogenous	Abscess at the chest wall	ECHO,CT	Aspiration under ECHO guide	both	Multiple	alive
Artery	Chronic granulomatous disease	Liver, scintigram, ECHO	Operative drainage	lt lobe	Multiple	alive
	Chronic granulomatous disease	ECHO,CT	Aspiration under ECHO guide → Operative drainage	both	Multiple	alive
	Pericarditis	Autopsy		lt lobe	Solitary	dead
Portal	Perirectal abscess DM	Autopsy		both	Multiple	dead
	Gall stone	ECHO	Drainage under ECHO guide → Op. (Gall stone)	rt lobe	Solitary	alive
Cryptogenic		ECHO,CT	Drainage under ECHO guide	rt lobe	Solitary	alive
		ECHO,CT	Drainage under ECHO guide	rt lobe	Solitary	alive
Contiguinious spread	Gall stone	ECHO	Operative drainage and cholecystectomy	rt lobe	Solitary	alive
	Pancreatitis	ECHO,CT Augio	Splenectomy and Pancreas tail resection Operative drainage	lt lobe	Solitary	alive

lacked sufficient examination because of the severity of the underlying disease.

4) Microbiology

Organisms detected from cases with pyogenic liver abscess and the antibiotics used just before the detection of organisms are shown in Table 4.

Of 19 detected strains, *K. pneum* (6 strains) was most frequent. Following this, Enterococcus (5 strains), *E. coil* (3), Enterobacter (2), *S. aureus* (2) and *Proteus* (1) were found, showing 63% gram-negative rods. Intestinal flora including Enterococcus was detected in 89% of the patients.

From the viewpoint of etiology, intestinal flora was detected in all cases of hepatic abscess via the biliary tract.

Table 4. Causative organisms and antibiotics used before the detection of causative organisms

Etiology	Used Antibiotics just before detection of org.	Detected organisms and Sensitivity for used Antibiotics	Prognosis
Biliary	*E.cloacae, K. pneum.*	CMZ (−, ++)	Abscess healed
	K. pneum.,Enterococus	CEZ (++, −)	dead
malig	*Proteus* sp., *Enterobacter* sp., Enterococcus	CMZ (−, −, −)	dead
	K. pneum.	SBPC (−)	Abscess healed
benign	Enterococcus	CMZ (−) TOB (−)	alive
	K. pneum.	CET (++) DKB (++)	alive
	K. pneum.	CFX (++) TIPC (−) TOB (++)	alive
	Unknown	CMZ, TOB	dead
Hematogenous	*S. aureus*	MCIPC (++) ABPC (−)	alive
Artery	Not detected	CTX	alive
	S. aureus	CMZ (++) AMK (++) FOM (++)	alive
	Enterococcus	CMZ (+)	dead
Portal	*E. coli*, Enterococcus	SBPC (−, ++) GM (++, −)	dead
	E. coli	LMOX (++) SISO (++)	alive
Cryptogenic	Not detected	LMOX	alive
	K. pneum.	CTM (++) SISO (++)	alive
Contiguinous	*E. coli*	CEZ (++) DKB (++)	alive
	Not detected	PIPC, GM	alive

In cases of hematogenous pyogenic liver abscess, two cases via the hepatic artery showed the presence of *S. aureus*. When the sensitivity of the bacteria detected to the antibiotics given before the detection of the bacteria was done, the mortality was high in patients given antibiotics to which the bacteria were nonsensitive.

5) Treatment

Three of eight patients with hepatic abscess via the biliary tract received percutaneous transhepatic choledochal drainage (PTCD) followed by radical operation. The hepatic abscesses of these three patients were healed.

Operative biliary drainage was performed in two patients, one of whom had cholangiocarcinoma at porta hepatis and died because of insufficient biliary drainage. Sufficient drainage of the biliary tract was found to be important in cases of hepatic abscess via the biliary tract. In two cases of hematogenous pyogenic liver abscess, the abscess was punctured under echographic guidance, and pus was aspirated and subjected to bacterial culture. On the basis of the results of culture, antibiotics to which the bacteria were sensitive were given to the two patients, and one was cured.

Operative drainage was performed in the other patient, because antibiotics were considered to be insufficiently effective.

In both of two cases of cryptogenic pyogenic liver abscess, the abscess was healed by drainage under echographic guidance alone. In general, many cases of solitary abscess were cured by drainage under echographic guidance alone, whereas the outcome of treatment was unfavorable in many cases of multiple abscess, especially when inappropriate antibiotics were used.

DISCUSSION

The liver is an organ which frequently comes into contact with bacteria in the digestive tract through the vascular system and the biliary

system.

However, abscess rarely occurs in a healthy person, because bacteria which have invaded from the blood enter the sinusoids, where the blood flow is so slow that the bacteria are arrested by macrophages (Kupffer's cells) lining the sinusoids[6].

In contrast, abscess occurs in patients in whom general or local defence mechanisms against infection have been disturbed due to various pathological conditions. In our cases, many were associated with general host defence disturbed by chronic granulomatous disease or diabetes mellitus, or local host defense disturbed by malignant tumor in the biliary system or by cholelithiasis.

Cases of pyogenic liver abscess can be divided into the following six types according to the route of infection[13] : 1) pylephlebitis (portal vein), 2) systemic bacteremia (hepatic artery), 3) biliary tract infection (biliary), 4) direct extension from contiguous infection (contiguous), 5) trauma, and 6) cryptogenic.

Hepatic abscess via the portal vein secondary to infection in organs in the region of the portal vein, e.g., appendicitis, was formerly most frequent, but has recently decreased[11]. Hepatic abscess secondary to biliary obstruction due to malignant tumor in the biliary tract, intrahepatic gall stone, etc., and cryptogenic liver abscess have increased instead[1,3].

In our cases, hepatic abscess secondary to biliary tract infection was most frequent, accounting for 44%.

The most frequent clinical symptoms of hepatic abscess are fever and right hypochondralgia, followed by anorexia, malacia, and weight loss.

However, in general, there is no characteristic symptom suggesting hepatic abscess to be the cause of fever[3]. As signs of hepatic abscess, hepatic enlargement and tenderness in the right upper quadrant are most common.

However, muscle guarding is seldom seen clinically, and jaundice is also rare except in cases of hepatic abscess secondary to biliary tract infection. Thus, the clinical signs characteristic of this disease are few.

As laboratory findings, increases levels of alkaline phosphatase and leucine aminopeptidase are seen in addition to inflammatory signs such as leukocytosis, increased ESR, and positive CRP. These two parameters are very important in diagnosing this disease[16].

As abnormal chest x-ray findings, restricted movement of the right diaphragm, retention of thoracic fluid, atelectasis and a pneumonitis-like shadow in the right lower lung field have been reported[12,15]. However, the incidence of these findings vary widely from one report to another[12,15], and also found these symptoms in about 40% of our patients.

However, once they have appeared, they are very convincing findings, and therefore chest x-ray films should be studied carefully.

The recent, most significant advance in diagnosis of hepatic abscess is the introduction of echography and CT.

Echographic findings for hepatic abscess are 1) a hypoechonic region in the liver, 2) irregular internal echoes, 3) enhancement in the base echo, and 4) wide variations in echograms within a comparatively short period of time[4]. Echography facilitates examination from various aspects and assists precise determination of marginal conditions. Echography was extremely useful for diagnosing our cases. However, it is difficult to use echography for examination of the liver as a whole, and CT is often most useful in this respect. We used echography and CT together for diagnosis in eight cases.

In case of hepatic abscess secondary to acute suppurative obstructive cholangitis, percutaneous transhepatic cholangiography (PTC) is useful for diagnosis, providing a characteristic picture resembling a Japanese apricot flower. One of our cases was diagnosed by PTC. PTCD following PTC is effective as treatment. However, PTC requires a high degree of caution because any increase in intrabiliary pressure during PTC causes endotoxemia.

Treatment for hepatic abscess involves drainage and antimicrobial treatment. The combination of the two enables effective treatment to be conducted.

Although operative drainage alone was formerly used as a drainage method, another procedure has recently become available, by which the abscess is punctured under echographic guidance and a drainage catheter is inserted into the abscess by the aid of a guide wire. This method, used in four of our cases, proved useful. This method, in contrast to operative drainage, is ad-

vantageous in that it is non-invasive and can be used at the bedside.

However, when the primary focus is located in the peritoneal cavity, or when the abscess has perforated, operative drainage is necessary. There are two operative techniques, i.e., anterior incision and posterior incision, one of which should be selected according to the site of the abscess.

We used operative drainage in five patients, all of whom underwent anterior incision. However, this method required suturing the hepatic capsule to the peritoneum so as to avoid the leakage of pus into the peritoneal cavity.

The above drainage method was extremely effective for solitary hepatic abscess. However, it was not so effective in multiple hepatic abscess because sufficient drainage could not been achieved, resulting in a high mortality.

In one patient with multiple hepatic abscess who underwent pus aspiration under echographic guidance and bacteriological examination to select the most appropriate antibiotics, the chemotherapy was very effective. Ito et al. reported that puncture of an abscess with a 21G needle under echographic guidance was associated with almost no ensuing complications[2]. Therefore, in cases of multiple hepatic abscess, puncture under echographic guidance is also necessary for determining the causative organisms in order to select the appropriate antibiotics.

The most important point of antimicrobial chemotherapy is to administer the effective antibiotics against the cansative organisms.

Reported bacteria isolated from cases of hepatic abscess and those isolated from our cases are shown in Table 5. Although most of them are

Table. 5. Isolated organisms from pyogenic liver abscess

Investigator		McDonald[5] (1980)	Pitt[10] (1975)	Tanimura[17] (1984)	Yokoyama (1984)	Sabbaj[14]* (1972)
No. of cases		604	57	16	18	21
Gram positive cocci	*S. aureus*	23%	14%		10.5%	
	Strept. sp.	7%	7%	14.3%		19.0%
	Enterococcus	10%	12.3%	14.3%	26.3%	
	Other GPC		10.5%			
Gram netagive rods	*E. coli*	37%	45.6%	28.6%	15.8%	9.5%
	Klebsiella sp.			7.1%	31.5%	
	Enterobacter sp.	12%	33.3%	14.2%	10.5%	
	Proteus sp.	13%	15.8%	7.1%	5.3%	4.8%
	Pseud. aerug.			21.4%		
	Other pseud.	13%	7.0%			
	Other GNB			7.1%		
Anerobic bacteria	*Bacteroides frag.*		10.5%			23.8%
	Other *Bacteroides*					
	Clostridium sp.	6%	5.3%			14.3%
	Anerobic and micro-aerophillic *Strept.*		10.5%			61.9%
	Other aerobic bacteria		1.8%			33.3%
No growth		45 cases	3 cases	4 cases	3 cases	
No culture taken				2 cases	1 cases	

* Anerobic pyogenic liver abscess only

gram-negative rods, there are some gram-positive cocci including *S. aureus* and Enterococcus.

On the other hand, Sabbaj[14] reported that anaerobic bacteria were detected in 45% of cases of hepatic abscess. Therefore, examination for anaerobic bacteria is also necessary at the time of bacterial culture.

There is a report stating that continuous hepatic artery infusion is useful when systemic administration of antimicrobial agents is ineffective[9].

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