

Percutaneous Transhepatic Drainage of Pyogenic Liver Abscess under Ultrasonography Guidance

Kunihide Izawa, Kimiro Tanaka,* Makoto Sasaki,* Tsutomu Tomioka,* Toshifumi Eto,* Takashi Yamaguchi,* Tohoru Segawa,* Tukasa Tsunoda* and Takashi Kanematsu*

Emergency Department and *Second Department of Surgery, Nagasaki University School of Medicine

Summary: Nineteen patients with liver abscess were treated in our department over a period of 14 years. The cause of the liver abscess was biliary disease in 13 of the 19 or 68%, and 8 of these 13 patients had undergone surgical procedures. The 13 patients with liver abscess received both percutaneous transhepatic abscess drainage (PTAD) under ultrasonography (US) guidance and antibiotics. The remaining 6 were treated with antibiotics alone. Among the 13 cases treated with PTAD, 11 (84%) were cured in an average of 22 hospital days. One case (8%) with liver abscess caused by tuberculosis was unchanged and 1 (8%) died of hepatic failure due to liver cirrhosis. There were no complications related to PTAD, but the mortality rate among patients receiving antibiotics only was 33%. PTAD is the most advisable treatment for liver abscess and should be followed by appropriate supplemental management of the original conditions. Moreover, amputation of the distal bile duct is an indispensable part of bile diversion procedures because it prevents reflex cholangitis which may cause future liver abscesses.

Introduction

In 1938, Ochsner reported the varied pathogenesis and clinical course of pyogenic abscess and emphasized the high mortality rate without surgical treatment.¹⁾ Subsequent papers concerning liver abscess have described changes in average age, clinical course and bacteriologic factors, and recommended better diagnostic methods and treatments.²⁻⁵⁾ However, in spite of the development of modern diagnostic tools, such as ultrasonography and computed tomography (CT) and the improvement of treatment methods, the prognosis of pyogenic liver abscess is still far from satisfactory. In this paper we report the successful treatment of liver abscess by percutaneous transhepatic abscess drainage (PTAD) under US guidance.

Patients and Methods

Between June 1977 and December 1990, 19 patients with liver abscess were treated at the Second Department of Surgery, Nagasaki University School of Medicine. We reviewed the clinical records of all these patients, analyzed

the clinical features of liver abscess and the important factors affecting the prognosis, and discuss here the most ideal treatment methods.

Result

Ten males and 9 females with liver abscess were treated at the Second Department of Surgery, Nagasaki University School of Medicine. The age of the patients ranged from 32 to 78 years with a mean of 52. All 19 patients were found to have various types of abscess in the liver by US, CT and endoscopic retrograde cholangiography (ERC). The original diseases causing the liver abscess are summarized in Table 1. The most common cause of the liver abscess was biliary tract infection, 6 (32%) benign and 7 (36%) malignant arising from obstruction of the bile duct. Two cases (11%) were caused by diverticulitis of the colon infected via the portal vein system. One (5%) was caused by liver tuberculosis and the remaining 3 (16%) had no original infection.

Table 1. Underlying disease

	Patients	%
Biliary disease		
Benign	6	32
Malignant	7	36
Colonic disease		
Diverticulitis	2	11
Tuberculosis	1	5
Cryptogenic	3	16
	19	100

Ten of the 13 patients whose liver abscesses were caused by biliary tract infection had undergone surgical treatment before. As shown in Table 2, the surgical procedures consisted of 6 choledocho-jejunostomies, 1 choledocho-duodenostomy, 1 papiloplasty and 2 hepatic resections. Repeated reflux cholangitis after operation was thought to be the cause of the liver abscess in 8 of the 13 patients. Three of the 8 patients had undergone choledocho-

Table 2. History of surgery in biliary diseases

Method	Patients	%
Choledochojejunostomy (side to side anastomosis without resection of the common bile duct)	6 (3)	46
Choledochoduodenostomy	1	8
Papilloplasty	1	8
Hepatic resection	2	15
NO operation	3	23
	13	100

jejunostomy by side-to-side anastomosis without resection of the common bile duct. One patient who had undergone hepatic resection for hepatocellular carcinoma with liver cirrhosis had a bile fistulae between the hepatectomized stump and the skin. Another who had undergone hepatic resection for carcinoid tumor had marked jaundice due to recurrence. The other 3 patients, that is, 2 suffering from malignant disease and 1 from intrahepatic lithiasis, had no history of biliary tract surgery.

The locations and types of liver abscess are listed in Table 3. Of the 19 patients with liver abscess, 12 (68%) had solitary lesions, of which 9 were located in the right lobe. Among the remaining 7 patients with multiple liver abscess, 3 had lesions in both lobes. Thus, the most common site of the liver abscess was the right lobe. There were 8 solitary lesions in the right lobe, all of which were secondary complications of biliary tract disease. In 3 patients with multiple small abscesses complicated by acute obstructive suppurative cholangitis, percutaneous transhepatic cholangiography (PTC) revealed the characteristic "plum blossom" appearance of the abscesses.

Table 3. Classification, location and type

Underlying disease	Cases	Location, type (%)				
		r-lobe		l-lobe		both lobes
		solitary	multiple	solitary	multiple	
Biliary	13	8 (62)	2 (15)	2 (15)	1 (8)	
Diverticulitis	2	1		1		
Tuberculosis	1				1	
Cryptogenic	3		2		1	
Total	19	9 (47)	4 (21)	3 (16)	3 (16)	
		13 (68)				
		12 (63)				

The bacteriologic findings of each liver abscess are summarized in Tables 4 and 5. Fifteen of 19 patients had positive cultures of the abscess. Pure rod was isolated in 4 patients (27%) and pure cocci in 1 (7%), and mixed infection was demonstrated in 10 cases (66%). Among the 10 cases with mixed infection, 2 kinds of bacterium were found in 5 (33%), 3 kinds in 3 (20%) and 4 or more kinds

Table 4. Bacteriologic findings

Organism	Patients (%)
Pure rod	4 (27)
cocci	1 (7)
Mixed infection	
2 kinds	5 (33)
3 kinds	3 (20)
4 or more kinds	2 (13)
Total	15

Table 5. Organisms cultured from abscess

Organism	Patients (%)
rod	
E. coli	4 (12)
Klinsiella	5 (15)
Pseudomonas	2 (6)
Enterobacter	4 (12)
Serratia	1 (1)
Proteus	2 (6)
Cocci	
Enterococci	3 (9)
Staphylococcus	2 (6)
Streptococcus	4 (12)
Gram-negative anaerobes	
Bacteroides	3 (9)
Tuberculosis	1 (1)
Others	2 (6)
Total	33
β -Lactamase (+)	3 (9)

in 2 (13%). Mixed infection of rod and cocci were detected in 4 (27%) and aerobic and anaerobic in 3 (20%). Klebsiella, Escheria coli, Enterobacter and Streptococci were the most commonly isolated organisms, followed by Enterococci and Bacteroides fragilis. Bacteria producing β -lactamase were found in 3 patients and tuberculosis was found in 1 patient. The patients whose abscesses were infected with Bacteroides fragilis suffered the most severe clinical symptoms.

All the patients with liver abscess underwent systematic administration of broad-spectrum antibiotics from the beginning of admission. Thirteen of 19 patients were treated by PTAD under US guidance, and the antibiotics were changed after identification of the bacterium. Six (31%), however, were managed by antibiotics only. PTAD was performed safely and successfully without any complication. Three different drainage procedures were applied according to the locations of the abscesses. The abscess near the dome of the liver was punctured and drained easily by the anterior approach avoiding the pleura. The lesion in the left lobe of the liver were also approached via the anterior wall. On the other hand, the lesions in the inferior lobe were drained via the lateral wall. Double catheters were inserted into the abscess cavity in 3 patients whose liver abscesses were septated or multiloculated. Lavage of

the abscess using physiological saline with antibiotics via the catheter was conducted several times every day until the contents of the cavity were completely eliminated.

Of the 13 patients treated by PTAD, 11 showed a favorable medical course, 1 was unchanged and 1 died of liver failure. Two patients whose liver abscess originated from diverticulitis and became granulomatous after PTAD received lateral segmentectomy of the liver and right hemicolectomy. Neither has suffered any recurrent abscess in the liver. The patient who died of liver failure had bile fistulae after liver resection and suffered from reflux cholangitis. The patient with tuberculous liver abscess who did not respond to PTAD had bronchobiliary and gastro-biliary fistulae, but antituberculous chemotherapy succeeded in reducing the size of the liver abscess and in closing the fistulae. However, the patient soon developed a liver abscess again and has been suffering from rupture of the

esophageal varices due to portal hypertension. Among the 6 patients treated with antibiotics alone, 4 cases with comparatively small liver abscesses were cured but 2 died as a result of underlying malignancy followed by multiple organ failure and sepsis (Table 6 and 7).

Table 6. Treatment and outcome

Treatment	Patients (%)	
Percutaneous drainage		
Cured	11 (84)	
Died	1 (8)	Liver failure
No change	1 (8)	Tuberculosis
Antibiotics		
Cured	4 (67)	
Died	2 (33)	Sepsis Multiple organ failure
Total	19	

Table 7. Mortality

No	Age	Sex	Underlying disease	Past-history	Complication	Treatment	cause
1	47	M	Bile fistulae after hepatic resection	Hepatic resection	Liver cirrhosis Jaundice	PTAD	60 days death Liver failure
2	55	M	Bile duct carcinoma	Choledocho- jejunostomy	(-)	Antibiotics alone	12 days death Septic shock
3	78	F	Cystoadenocarcinoma	(-)	Jaundice	Antibiotics alone	20 days death Multiple organ failure

PTAD: Percutaneous transhepatic abscess drainage

Discussion

In 1938 Ochsner and DeBakey reviewed about 187 cases of liver abscess and reported a mortality rate of 95% in patients receiving no surgical treatment. They also emphasized the importance of primary disease and the role of the portal venous system which drains bacteria into the liver. The high mortality among cases of liver abscess has long been considered to be due to the difficulty of accurately determining the location and distribution of the lesions.⁶⁻¹²⁾ However, modern diagnostic image techniques such as US, CT and magnetic resonance imaging (MRI), which can be done repeatedly without any pain, have facilitated the accurate and early diagnosis of liver tumor.¹³⁻¹⁵⁾

Among the routes of infection in liver abscesses, the portal vein was stressed by many authors prior to the 1960s.¹⁶⁻¹⁸⁾ Acute appendicitis was previously the most common cause of liver abscesses, but the incidence of liver abscesses secondary to acute appendicitis has decreased as a result of the use of effective antibiotics after surgery.¹⁹⁻²⁰⁾ On the other hand, however, the liver abscess occurring as a secondary complication of obstruction of the bile duct has increased.²¹⁻²²⁾ In our series, 13 cases (68%) of liver abscess were caused by biliary disease and 8 (62%) of the 13 had undergone some surgical procedure before. Considering the fact that repetition of cholangitis can lead to liver

abscesses, amputation of the distal bile duct is indispensable in the prevention of reflux cholangitis.²⁴⁻²⁷⁾

The ideal treatment for liver abscesses is surgical drainage. However, the usual procedures such as exploratory laparotomy and open drainage are associated with a high rate of complications and mortality. In 1954, McFadzen advocated the revolutionary idea of the percutaneous needle drainage of liver abscesses, but the procedure did not come into common use until reliable imaging techniques became available.²⁸⁾ Surgeons implementing CT-guided percutaneous drainage of liver abscesses reported a high success rate, few complications and shorter hospital stay than surgery, but it is still difficult to demonstrate liver abscess during this PTAD procedure.²⁹⁻³¹⁾ On the other hand, PTAD under US guidance simultaneously allows the accurate detection and puncture of the liver abscess.³²⁻³³⁾ In our series, the mortality rate of patients treated with PTAD was 8% and there were no complications.

In conclusion, PTAD is the most advisable treatment for liver abscess and should be followed by appropriate supplemental management of the original conditions. Moreover, amputation of the distal bile duct is an indispensable part of bile diversion procedures because it prevents reflex cholangitis which may cause future liver abscesses.

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