

Classification of Primary Hepatolithiasis According to Morphology of the Liver, Especially Atrophy of Hepatic Parenchyma

Masato Furukawa, MD. PhD,¹⁾ Junichiro Furui, MD, PhD,¹⁾ Mitsuji Otsubo, MD,²⁾ Toshiyuki Fujio, MD,²⁾ Kuniyoshi Miyazaki, MD,²⁾ Takahiro Yasaka, MD,²⁾ Satoshi Shirahama, MD. PhD.³⁾ and Toshiomi Kusano, MD. PhD.⁴⁾

1) Department of Surgery, Nagasaki Chuo National Hospital

2) Department of Surgery, Kamigoto Hospital

3) Department of Medicine, Kamigoto Hospital

4) 1st Department of Surgery, Ryukyuu University School of Medicine

One hundred twenty one patients with primary hepatolithiasis (PHL) was encountered for the last 7 years. In order to elucidate how to follow and treat PHL, PHL was classified into five types (I-V) on the basis of morphological findings obtained by CT. It depends mainly on the presence of atrophy of hepatic parenchyma (AHP) and dilatation of intrahepatic bile ducts (DIBD).

Methods of treatment were selected for each patient according to the classification.

Type I patients comprised of 43.8% in observation group. These patient were asymptomatic and just followed since neither APH nor DIBD were observed.

The remaining patients in the observation group, operation was refused or contraindicated. Most of them were asymptomatic.

Surgical treatments were done on 47 patients (hepatic resection in 32 patients, surgical lithotomy in 10 and others in 5). In Type III, IV and V, hepatic resection was often performed to remove all of stones and bile stasis since improvement in hepatic function could not be expected in view of AHP.

All patients were followed-up 79 months or less.

In the surgically treated patients, recurrence was not observed. In observation group, no new symptom developed during the follow-up period.

It was suggested, therefore, that the present classification of PHL was helpful in determining therapeutic strategy for PHL.

I. Introduction

Primary hepatolithiasis (PHL) is the most refractory and complicated condition among the various benign biliary tract diseases. There are still controversies on therapeutic choice for PHL.

Recently, exact conditions of the liver in PHL has been diagnosed by computed tomography (CT), which also contributed to detect asymptomatic PHL.

PHL was classified, on the basis of morphological findings obtained by CT, atrophy of hepatic parenchyma in particular.

In this study, we report that this classification of PHL is

helpful in determining therapeutic strategy for PHL.

II. Patients and Methods

A total of 121 patients with PHL encountered at our hospital between June, 1985 and December, 1991.

Plain CT and CT cholangiography were performed using a Toshiba 70A initially with a slice width of 1.0cm and then with a width of 0.5-1.0cm at sites showing stones.

PHL was classified into five types (Type I-V) by CT.

The classification on depends mainly on the presence of atrophy of hepatic parenchyma (AHP) and dilatation of intrahepatic bile ducts (DIBD) (Table. 1) (Fig. 1-5).

Type I comprised cases without AHP or DIBD, in which small stones were found in the periphery of intrahepatic bile ducts (53 patients).

Type II comprised cases without AHP but with DIBD (12 patients).

Type III comprised cases with AHP but without DIBD (8 patients).

Type IV comprised cases with moderate AHP and DIBD (25 patients).

Type V comprised cases with severe AHP and marked DIBD, in which major and peripheral bile ducts were filled with large stones (23 patients).

The intrahepatic type confined to the liver (type I) was observed in 90 patients, and the intrahepatic predominant type showing more intrahepatic than extrahepatic stones (type IE) in 31, which classification has been followed the rules proposed by the Research Group for the Study of Damage to Intrahepatic Bile Ducts.^{1,2)} Intrahepatic stones were located in the right lobe alone in 49 patients (40.5%), left lobe alone in 62 (51.2%), and both lobes in the other 10 (8.3%) (Table 1).

Methods of treatment for PHL were selected for each patient according to this classification (Table 2).

In Type I, most of these patients were asymptomatic and they were not treated but just followed, since neither APH

Table 1. Classification of PHL and Patient Distribution according to Findings of CT

Classification			Patient distribution					
Type	APH	DIBD	No. of patients	Location of stones				
				I	IE	R	RL	L
I	(-)	(-)	53	51	2	38	2	13
II	(-)	(+)	12	7	5	2	0	10
III	(+)	(-)	8	6	2	5	0	3
IV	(+)	(+)	25	12	13	0	5	20
V	(++)	(+~++)	23	14	9	4	3	16
Total			121	90	31	49	10	62

APH: Atrophy of Hepatic Parenchyma
 DIBD: Dilatation of Intrahepatic Bile Ducts
 I: Intrahepatic bile ducts
 IE: Intrahepatic > Extrahepatic bile ducts
 R: Right lobe of the liver
 RL: Right and Left lobes of the liver
 L: Left lobe of the liver

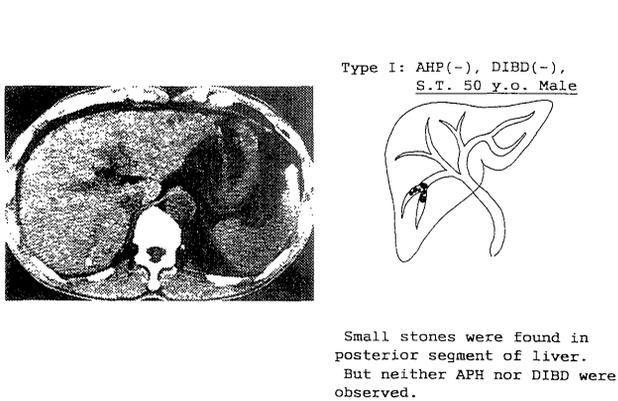


Fig. 1. Classification of PHL, Type I

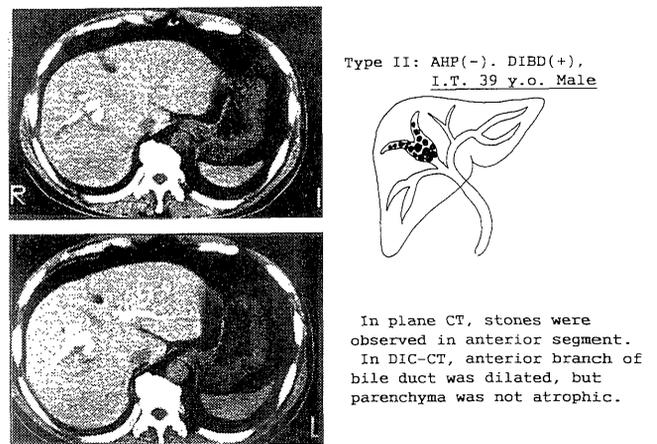


Fig. 2. Classification of PHL, Type II

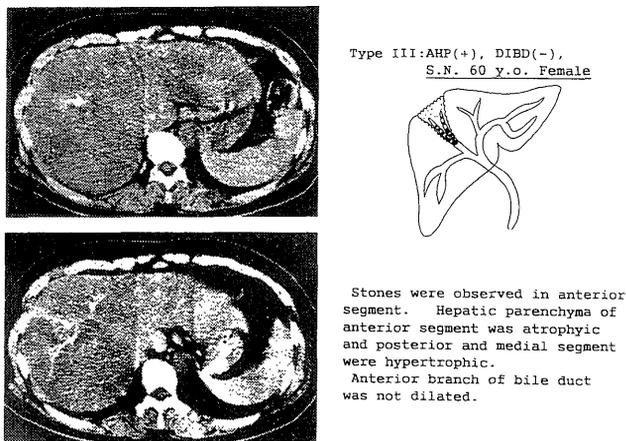


Fig. 3. Classification of PHL, Type III

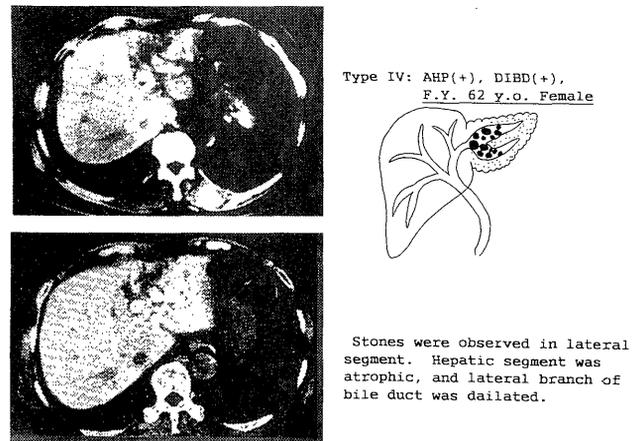


Fig. 4. Classification of PHL, Type IV

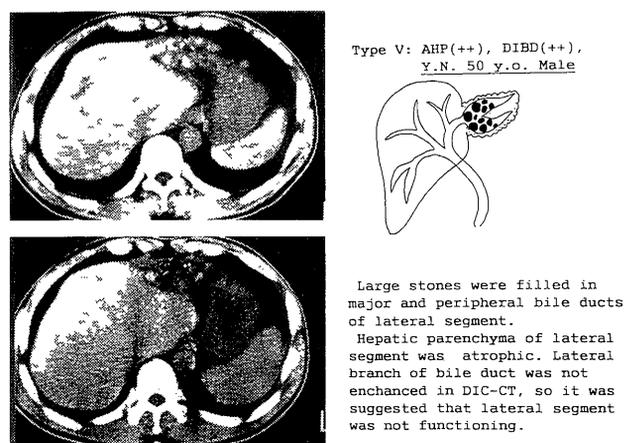


Fig. 5. Classification of PHL, Type V

nor DIBD were observed.

In Type II, APH was not found, so that improvement of liver function could be expected by removal stones and bile stasis. Of the patients with type II, 2 showing stones only in the left lobe were treated by left lateral segmentectomy for complete removal of stones, 2 by choledochojejunostomy for extrahepatic bile duct dilatation, and the other 4 by

lithotripsy under cholangioscopic guidance via an external bile duct fistula and percutaneous transhepatic cholangioscopic lithotomy (PTCSL).

In Type III, IV and V showing liver atrophy, hepatic resection was performed in 30 patients, to remove of all of stones since improvement of hepatic function could not be expected in view of hepatic parenchymal atrophy, and the other 8 in whom the function of the remaining liver was decreased due to multiple operations were treated by liver-preserving operation.

Thus, hepatectomy was performed in 32 of the 47 patients treated (68.1%), liver-preserving operation in 10, and endoscopic removal of stones in the other 5. Stones in intrahepatic bile ducts were completely removed by surgical and/or endoscopic procedures.

III. Results

The mean observation period was 39.3 months in the untreated patients, 28 months in the patients treated by PTCSL, 34.6 months in those treated by liver-preserving operation and 34.5 months in those treated by hepatectomy (Table 3).

Table 2. Choice of Treatment for PHL according to the Classification

Type	No. of patients	Observation only	Procedures of treatment		
			PTCSL	Hepatectomy (-)	Hepatectomy (+)
I	53	53	0	0	0
II	12	4	4	2	2
III	8	5	0	1	2
IV	25	6	1	4	14
V	23	6	0	3	14
Total	121	74	5	10	32

PTCSL: Percutaneous Transhepatic Cholangioscopic Lithotripsy

Table 3. Results of the Patients with PHL

Choice of treatments	No. of patients	Follow-up periods (mos)	Results
Observation only	74	66.5 (5.0~79.0)	Cholangitis (4) Death (6*)
PTCSL	5	39.8 (4.0~63.0)	Bile leak (2) Death (1**)
Hepatectomy (-)	10	50.8 (4.0~75.0)	Cholangitis (1) Death (2***)
Hepatectomy (+)	32	49.6 (3.0~73.0)	Death (2****)

() : No. of Patients

* : Cause of death

Bile duct ca.(1), Renal ca.(1), Lung ca.(1), Adult T-cell Leucamia (1), Esophageal ca.(1), Heart failure (1)

** : Cause of death

Hepatic failure (1)

*** : Cause of death

Intrahepatic bile duct ca.(1), Gall bladder ca.(1)

****: Cause of death

Bile duct ca.(1), suicide (1)

As postoperative complications in the treated group, a transient bile leakage was observed in 2 patients and cholangitis in 1 treated by liver-preserving operation with additional operation on the bile duct. Causes of death were intrahepatic bile duct cancer in 2 patients, gallbladder cancer in 1 and suicide in 1, but all the others had favorable postoperative courses and resumed ordinary lives. Recurrence was not observed.

In the group observed without treatment, 1 each died of bile duct cancer, renal cancer, lung cancer, esophageal cancer, adult T-cell leukemia, hepatic failure and renal failure. Four patients developed symptoms of gallstones due to falling of stones to the extrahepatic bile duct or other factors and underwent removal of stones.

IV. Discussion

PHL was considered to be intractable because localization of stones was difficult to diagnosis, and their complete removal was impossible. However, recent advances in imaging techniques, especially CT and US, have allowed detection of many cases of asymptomatic intrahepatic stones (especially, peripheral intrahepatic bile duct type).³⁾

Various classifications have been proposed for PHL,^{2,3,4)} mostly according to the site of stones. We classified PHL into five according to the morphology of the liver, especially liver atrophy, and selected different treatment methods according to the disease types. It was thought that Type I was the early stage of PHL, Type V the late stage.

Patients with type I were observed without treatment because most of them were asymptomatic and showed no AHP or DIBD.

In patients with type II who showed DIBD but not AHP, the liver was preserved, and stones were completely removed by methods such as PTCSL.

Patients with type III, IV, or V showing AHP, especially those with stones in one lobe alone were actively treated by hepatectomy.

Hepatectomy for intrahepatic stones has been considered to be indicated in patients with liver atrophy and stenosis or cystic dilatation of the intrahepatic bile duct. However, with recent advances in endoscopic removal of stones and the development of non-operative techniques such as release of bile duct stenosis, the treatment modalities for intrahepatic stones including indications for hepatectomy have been changed.

In case 1 showing AHP, fibrosis was observed in the hepatic parenchyma, and hepatocytes were rarely present (Fig. 6). The viability of the liver was lost. It was considered that complete removal of stones may only result in the formation of a diverticulum in which bile, produced another sites and regurgitated, stagnates. Therefore, hepatectomy was performed. CT clearly demonstrated atrophy of hepatic parenchyma and was very useful for classifying PHL.

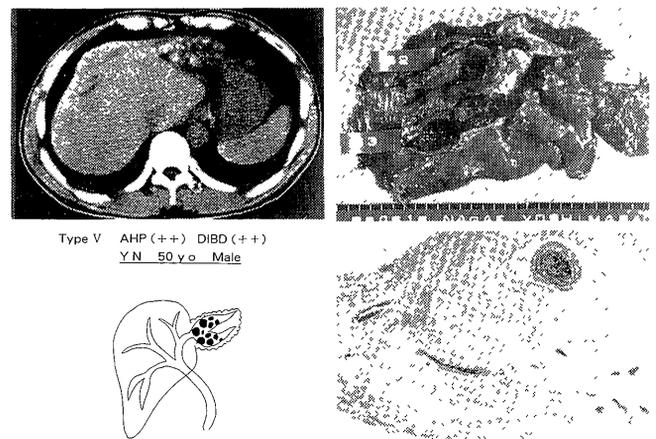


Fig. 6. Case 1. Type V, left upper: plane CT, right upper: resected liver, left lower: schema, right lower: microscopic finding (HE X 20)

On the other hand, bile duct dilatation was accurately visualized by CT combined with DIC. As shown in case 2, such dilatation sometimes improved after complete removal of stones (Fig. 7). This finding was consistent with the report by Nimura⁹⁾ that suspected stenosis disappeared, and suspected bile duct dilatation improved to the normal diameter following removal of intrahepatic stones. Since it was difficult to determine whether bile duct dilatation is reversible or not, it was excluded from indications for hepatectomy.

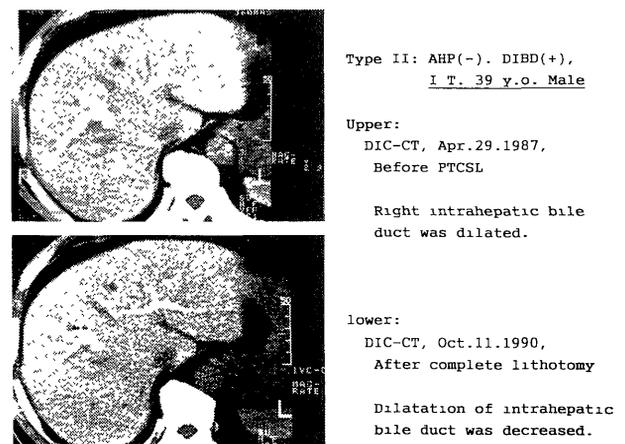


Fig. 7. Case 2. Type II

The results of our treatment based on the above treatment criteria are shown in Table 3. Postoperative cholangitis was observed only in 1 patient. In addition, stones did not recur during the observation period (maximum, 79 months) in any patient.

These results suggest that our classification of PHL is very useful for determining therapeutic approaches. However, malignant tumors in the biliary tract have been re-

ported to often complicate intrahepatic stones.⁶⁾ In this series, malignant tumors (gallbladder cancer and bile duct cancer) were also observed in 3 patients. The possible presence of malignant tumors should be taken into consideration during observation of clinical course.

V. Conclusion

One hundred twenty one patients with PHL were classified into five types, detecting by CT according to the morphology of the liver, especially liver atrophy, and discussed appropriate treatment methods for each PHL type.

In Type I, most of these patient were asymptomatic and they should not treated but just followed, since neither APH nor DIHBD were observed. In Type II, APH was not found, and they should be treated by liver-preserving operation, since improvement of liver function could be expected by removal stones and bile stasis.

In type III, IV, or V showing liver atrophy, hepatectomy should be primarily performed.

It was suggested, therefore, that the present classification of PHL was helpful in determining therapeutic strategy for PHL, although careful attention should always be paid to

the association of malignant lesions during the follow-up of this disease.

(An abstract of this paper was presented in the 3rd meeting of the World Association of the Hepatic, Pancreatic and Biliary Surgery.)

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