

Obstructive Jaundice Due to Compression of the Common Hepatic Duct by Right Hepatic Artery

—A case associated with the absence of the lateral segment of the left hepatic lobe—

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Various benign and malignant conditions can cause biliary obstruction. We present a rare case of obstructive jaundice due to the compression of the common hepatic duct by the anteriorly overriding right hepatic artery. This case was also associated with the absence of the lateral segment of the left hepatic lobe. The patient was a 39 year-old housewife with a 4-day history of jaundice and occasional febrile sensation. An abdominal computed tomography showed absence of the lateral segment of the left hepatic lobe and a percutaneous transhepatic cholangiography showed a band-like filling defect of 2 mm width at the level of the upper common hepatic duct. The anteriorly overriding right hepatic artery compressing the common hepatic duct and the absence of the lateral segment of the left hepatic lobe were confirmed by operation.

Key Words : Obstructive jaundice, compression of common hepatic duct, right hepatic artery, absence of a hepatic segment

In the biliary region, anatomic variation is relatively common. Arterial anomalies are not infrequent findings during biliary surgery and variations in the position of the cystic or hepatic arteries are well known (Tsuchiya *et al.* 1984). However, it has rarely been reported that the extrahepatic bile duct is compressed by the vessels of the hepatobiliary region. The reported cases of the compression of the extrahepatic bile duct by arteries were due to

aberrant celiac artery (Luttwak and Schwartz 1961), hepatic artery aneurysm (Lewis *et al.* 1982), and right hepatic artery (Taboga *et al.* 1969; Watanabe *et al.* 1978; Doi *et al.* 1979; Kumada *et al.* 1981; Kim *et al.* 1992). It was also reported that the venous system, such as enlarging collateral veins in cases of portal hypertension was a cause of the extrahepatic bile duct compression (Hunt 1965).

In the meantime, the absence of one lobe or segment of the liver is a relatively rare condition, although it has no clinical significance (Ham 1979). However, it might create some diagnostic and therapeutic problems.

We present a rare case of benign biliary obstruction due to the compression of the common hepatic duct by the anteriorly overriding right hepatic artery combined with the absence of the lateral segment of the left hepatic lobe.

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CASE REPORT

A 39 year-old woman was admitted to the hospital with a 4-day history of jaundice and occasional febrile sensation. She had suffered from intermittent dyspepsia for the past 10 years. Six years ago, she had esophagogastroduodenoscopic examination at a different hospital, which revealed no significant findings. She had an appendectomy 10 years ago and a thyroid problem 8 years ago which was cured only with medical treatment. Her past medical and family histories were not remarkable. On admission, she complained of general weakness and mild pruritus. On examination, the blood pressure was 110/70 mmHg, the pulse rate 87/min, and the body temperature 36.5°C. She appeared well except mild icterus of the skin and the sclerae. The examination of the abdomen revealed only mild direct tenderness on the right upper quadrant abdomen. On laboratory examinations, the hematocrit

was 39.4%, the white blood cell count 5,900/mm³ and the platelet count 215,000/mm³. Total protein was 6.4 g/dl, albumin 3.8 g/dl, total bilirubin 3.1 mg/dl (direct bilirubin 1.3 mg/dl), alkaline phosphatase 115 IU/L, aspartate transaminase 140 IU/L, alanine transaminase 207 IU/L, and gamma-glutamyltranspeptidase 135.0 IU/L. Viral markers for hepatitis B and C were negative. The serum CEA value was less than 0.1 ng/ml.

An abdominal ultrasonography revealed mild intrahepatic bile ducts dilatations without identifying definite cause. An endoscopic retrograde cholangiography (ERC) showed complete obstruction of the extrahepatic bile duct at the level of the upper common hepatic duct (Fig. 1). Gall bladder was not visualized during ERC. A computed tomography (CT) of the abdomen revealed mild intrahepatic ducts dilatations without definite stones or masses around the porta area. Absence of the lateral segment of the left hepatic lobe was found incidentally (Fig. 2). In order to define the cause of this upper bile duct obstruction, a percutaneous transhepatic cholangio-

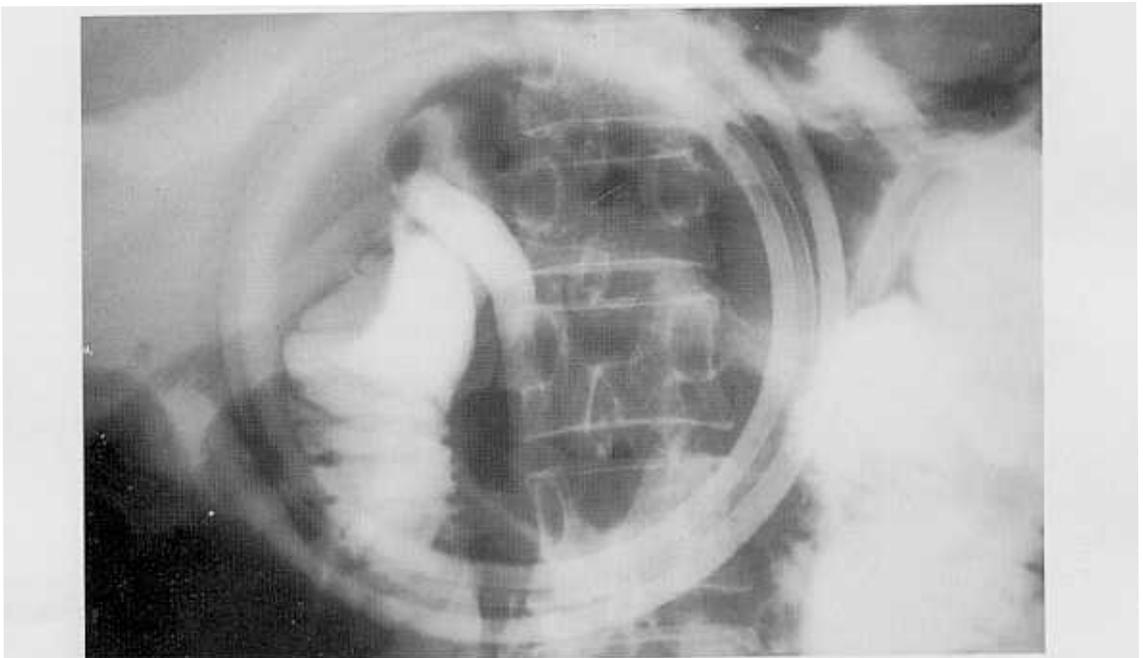


Fig. 1. Endoscopic retrograde cholangiography shows the complete obstruction of the bile duct at the level of the common hepatic duct.



Fig. 2. Abdominal CT scan shows the absence of the lateral segment of the left hepatic lobe (white arrow) and mild dilatation of the central portion of the intrahepatic ducts (black arrow).

graphy (PTC) was performed. The PTC showed a band-like filling defect of 2 mm width at the level of the upper common hepatic duct (Fig. 3). Radio-opaque dye went downward through a thread-like channel. Left hepatic duct was not visualized, but this time the gall bladder was filled well without abnormal findings. Under the presumptive diagnosis of the compression of the common hepatic duct by an anteriorly overriding right hepatic artery and the absence of the lateral segment of the left hepatic lobe, an operation was performed.

The operation showed that the lateral segment of the left hepatic lobe was replaced with a fibrotic remnant (Fig. 4A). Although the surgeon was not able to identify the left hepatic artery, the right hepatic artery was crossing the common hepatic duct anteriorly, and thus compressing the common hepatic duct (Fig. 4B). After mobilization of the right hepatic artery, the common hepatic duct was free of compression. After the cholecystectomy, the right hepatic artery became even

more mobile. Only the cholecystectomy and T-tube choledochostomy were performed because Bake's number 6 dilator was freely passed through the stenotic area.

The patient was discharged uneventfully on the 8th post-operative day (POD) with normalized liver function. A T-tube cholangiography performed on the 18th POD showed the good passage of dye without definite stones (Fig. 5). At this time, the left intrahepatic ducts were partially visualized. The T-tube was removed on the 20th POD. After removal of the T-tube, she felt right upper quadrant abdominal pain. The patient was re-admitted on the 27th POD, but discharged 5 days later with symptomatic improvement. She has been in good health till now (6 months after the operation).

DISCUSSION

The benign causes of filling defect at the level of the common hepatic duct are various

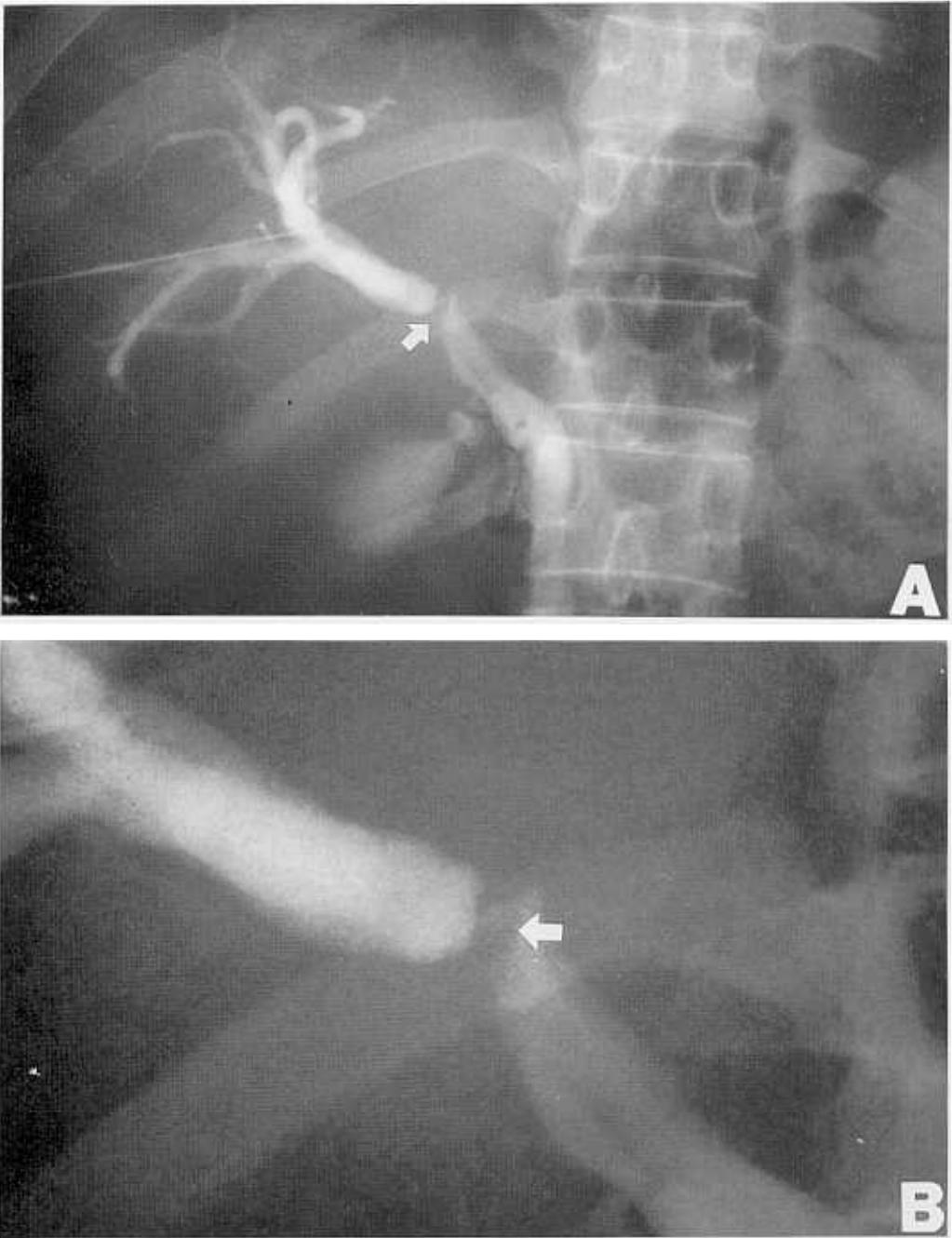
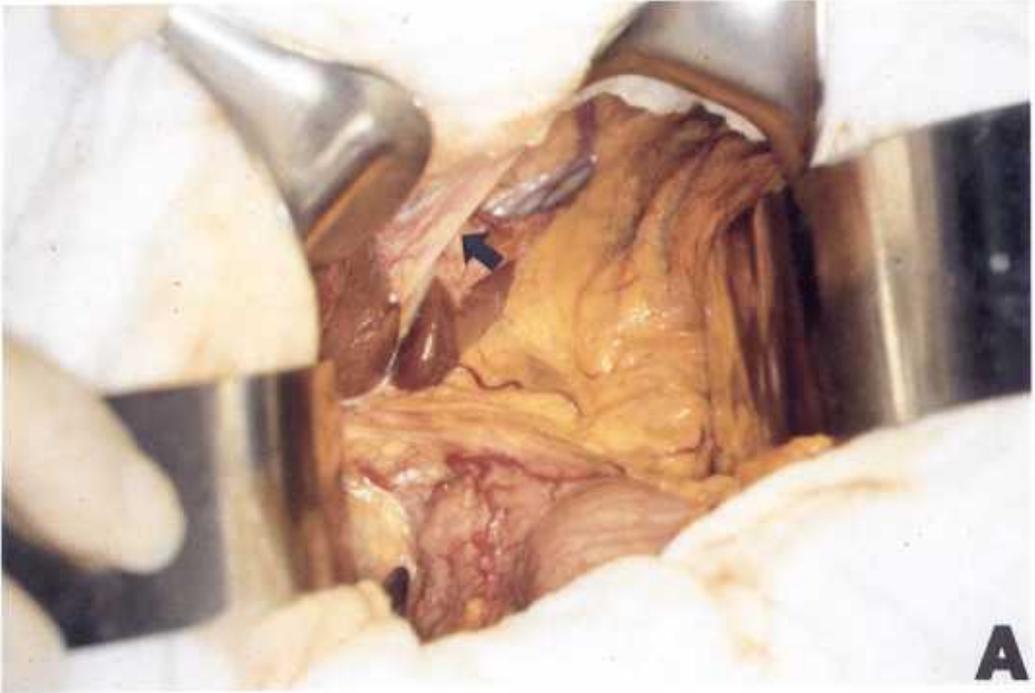


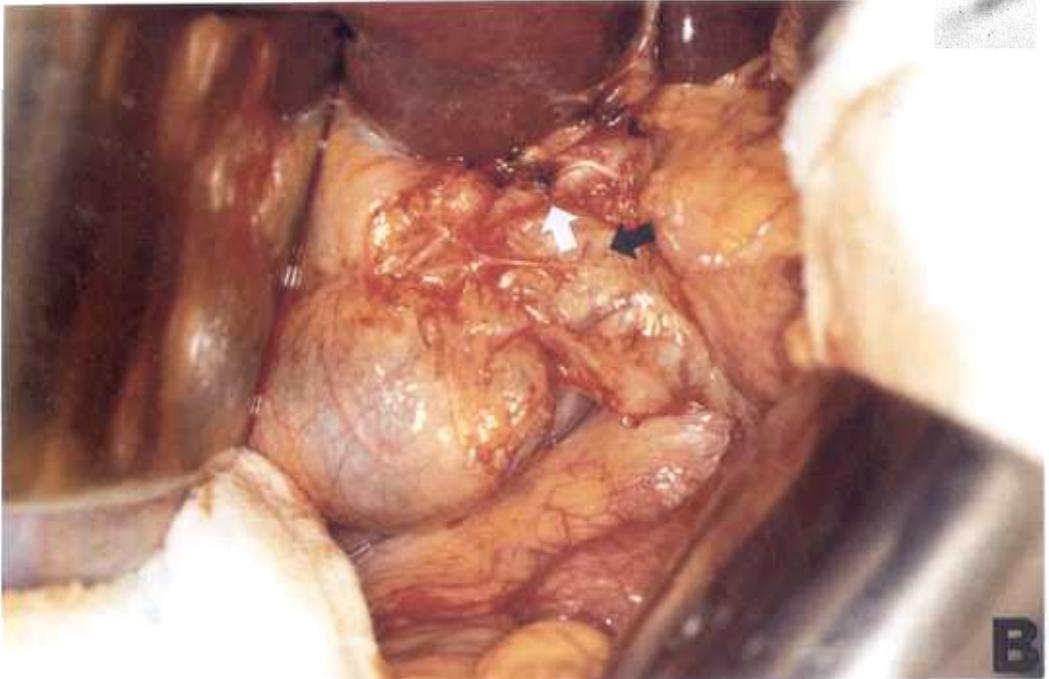
Fig. 3. Percutaneous transhepatic cholangiography shows a band-like filling defect (arrow) at the level of the upper common hepatic duct (A: a whole view of PTC, B: a close-up view of the portion of the stricture).

such as stones, Mirrizzi's syndrome, polyps, or post-operative stricture. Also malignant lesions

such as bile duct cancer, emboli of hepatocellular carcinoma, or metastatic lymph nodes



A



B

Fig. 4. Pictures taken during the operation. Fig. 4A. shows the fibrotic remnant of the lateral segment of the left hepatic lobe (arrow). Fig. 4B. shows the anterior crossing of the right hepatic artery (white arrow) compressing the common hepatic duct (black arrow).

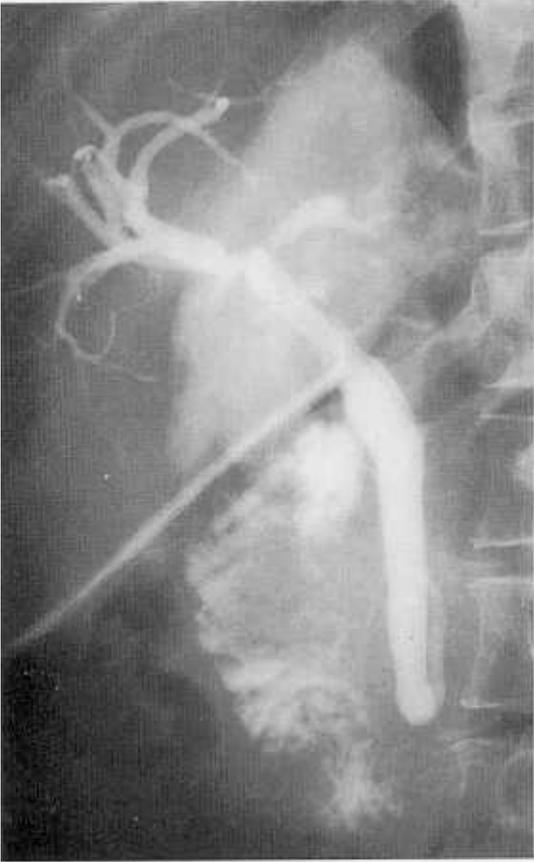


Fig. 5. T-tube cholangiography taken on the 18th POD shows good passage of dye without significant narrowing and a part of the left intrahepatic ducts is also visualized.

around the porta hepatis can cause obstruction at the level of the common hepatic duct. However, it has rarely been reported that the compression of the extrahepatic bile duct by neighboring vessels is the cause of the obstructive jaundice with or without intrahepatic stones. Cases of biliary obstruction by an anomalous celiac artery (Luttwak and Schwartz 1961), a hepatic artery aneurysm (Lewis *et al.* 1982), and an enlarging collateral vein in a case of portal hypertension (Hunt 1965) had appeared in the English literature. Tsuchiya *et al.* (1984) reported two cases of compression of the common hepatic duct by the anteriorly overriding right hepatic artery and this report seems to be the first article appeared in the

English literature. However, several similar reports have been found in the Italian literature (Taboga *et al.* 1969) and the Japanese literature (Watanabe *et al.* 1978; Doi *et al.* 1979; Kumada *et al.* 1981). Such a case was also reported in the Korean literature (Kim *et al.* 1992).

The incidence of the anterior crossing of the right hepatic artery to the extrahepatic bile duct was 12% according to the study of Michels (1951). Tsuchiya *et al.* (1984) reviewed the relationship of the bile duct and the hepatic artery from the cholangiographic and operative findings in 79 of 102 patients with intrahepatic stones treated at their hospital during a 12-year period. They found that 11 out of 79 patients (14%) had the right hepatic artery crossing anteriorly to the bile duct, but only 2 of these 11 patients showed a filling defect or a stenotic appearance of the common hepatic duct corresponding to the crossing site of the right hepatic artery. On the contrary, of the 68 patients in the posterior crossing group, none was reported to show the compression of the common hepatic duct. In view of the disproportionately small incidence of hepatolithiasis in patients with anterior crossing of the hepatic artery, they asserted that there must be some aggravating factors such as stenosis of the bile duct, infected bile, cholangitis or racial predisposition. However, since Watanabe *et al.* (1978) and Kumada *et al.* (1981) also reported similar cases of intrahepatic stones associated with compression of the common hepatic duct by right hepatic artery, Tsuchiya *et al.* (1984) suggested that the compression of the common hepatic duct resulted in prolonged bile stasis which played an important role in the formation of intrahepatic gallstones.

On the contrary, our case was presented as obstructive jaundice. A PTC showed near-total obstruction of the upper common hepatic duct without definite intrahepatic stones. Doi *et al.* (1979) reported a case of the compression of the common hepatic duct by right hepatic artery only associated with gallbladder stone. It is not uncommon that congenital anomalies cause symptoms only in adult life without any apparent reasons. In our case, however, a ten-

sion produced by the cystic artery might have played some roles in causing obstructive jaundice because it was apparent that the right hepatic artery became more redundant after cholecystectomy. According to the literature review, racial predisposition and sex might play some roles in producing intrahepatic stones or obstructive jaundice, because most of the reported cases were female Orientals (Japanese and Korean).

As Tsuchiya *et al.* (1984) suggested, the pre-operative diagnosis of this condition can be made by simultaneous direct cholangiography and selective celiac angiography. Our case showed complete obstruction at the level of the upper common hepatic duct on ERC and a sharp band-like filling defect at the same level on PTC. These findings led us to regard this condition as extrinsic compression by a neighboring structure such as vessels. For definitive diagnosis and treatment, we decided to perform operation without an angiographic examination.

Complete absence of one segment or lobe of the liver is regarded as a pathological curiosity (Ham 1979). This may occur as a result of atrophy or aplasia of an affected lobe or segment. Atrophic lesions of the liver are not infrequently encountered and may be present in postnecrotic cirrhosis, bile duct obstruction, venoocclusive disease or hydatid disease. Aplasia, however, is a rare finding. In a series of 1,900 autopsies at Johns Hopkins Hospital, it was found in only one case (Merrill 1946). Aplasia or atrophy of the liver segment or lobe was reported to occur more commonly in the left lobe of the liver with some reasons (Benz *et al.* 1953; Ham 1979).

In this case, the lateral segment of the left hepatic lobe was in a state of a fibrous membrane, and this finding is indicative of agenesis rather than atrophy. This case was also associated with congenital absence of the left hepatic artery which might contribute to the absence of the lateral segment of the left hepatic lobe. Although the present case had an upper bile duct obstruction, it was not likely that this upper bile duct obstruction was the cause of the absence of the lateral segment of the left lobe, because the medial segment of

the left lobe which was also under the influence of bile duct obstruction was totally intact.

Absence of one segment or lobe of the liver itself is of no clinical significance. It may, however, create some diagnostic and therapeutic problems (Benz *et al.* 1953; Ham 1979). For example, it may produce an appearance compatible with a space-occupying lesion in the liver scintiscans leading to erroneous diagnosis such as tumor. Also it can give rise to the distortion of the configuration of the liver, the loss of the normal anatomic relations of the ductal structures, and the reduced functional capacity of the absent lobe or segment (Hadjis *et al.* 1986). With the advent of the CT, however, absence of the liver lobe or segment could be diagnosed without difficulty (Belton and VanZandt 1983; Yamamoto *et al.* 1988).

In conclusion, the compression of the common hepatic duct by an anteriorly overriding right hepatic artery should be considered one of the possible benign causes of obstructive jaundice and we report this rare cause of obstructive jaundice associated with the absence of the lateral segment of the left lobe of the liver in a 39 year-old female patient.

REFERENCES

- Belton RL, VanZandt TF: Congenital absence of the left lobe of the liver: a radiologic diagnosis. *Radiology* 147: 184, 1983
- Benz EJ, Baggenstoss AH, Wollaeger EE: Atrophy of the left lobe of the liver. *Arch Pathol* 53: 315, 1952
- Doi S, Yoshimoto S, Hikita K, Beppu M: Compression of the common hepatic duct by right hepatic artery in a case with cholecystolithiasis (in Japanese). *Stom Intest* 14: 687, 1979
- Hadjis NS, Hemingway A, Carr D, Blumgart LH: Liver lobe disparity consequent upon atrophy. *J Hepatol* 3: 285, 1986
- Ham JM: Partial and complete atrophy affecting hepatic segments and lobes. *Br J Surg* 66: 333, 1979
- Hunt AH: Compression of the common bile-duct by an enlarging collateral vein in a case of portal hypertension. *Br J Surg* 52: 636, 1965

- Kim MH, Lee SK, Min YI, Kwon TW, Ahn SH, Lee SG, Min PC: Secondary intrahepatic stones due to compression of common hepatic duct by right hepatic artery (in Korean). *Korean J Gastr* 24: 901, 1992
- Kumada S, Nakano H, Kitamura K, Watahiki H, Takeda I, Ozawa H, Shibata T, Sugiyama K, Hachisuga K: A case of the obstructive jaundice due to compression of the common hepatic duct by right hepatic artery (right hepatic artery syndrome) (in Japanese). *Biliary Tract Pancreas* 2: 533, 1981
- Lewis DR, Kung H, Connon JJ: Biliary obstruction secondary to hepatic artery aneurysm: cholangiographic appearance and diagnostic considerations. *Gastroenterology* 82: 1446, 1982
- Luttwak EM, Schwartz A: Jaundice due to obstruction of the common duct by aberrant artery. *Ann Surg* 153: 134, 1961
- Merrill GG: Complete absence of the left lobe of the liver. *Arch Pathol Lab Med* 42: 232, 1946
- Michels NA: The hepatic, cystic and retroduodenal arteries and their relations to the biliary ducts. *Ann Surg* 133: 503, 1951
- Taboga V, Braggion G, Marchesin G: Colostasi da anomalia non nota dell'arteria epatica destra. *Acta Chir Ital* 15: 491, 1969
- Tsuchiya R, Eto T, Harada N, Yamamoto K, Matsumoto T, Tsunoda T, Yamaguchi T, Noda T, Izawa K: Compression of the common hepatic artery by the right hepatic artery in intrahepatic gallstones. *World J Surg* 8: 321, 1984
- Watanabe O, Maekawa T, Miyakawa T, Matsumoto T, Kidokoro K: A case of intrahepatic gallstones associated with compression of the common hepatic duct by the right hepatic artery (in Japanese). *Surg Diagn Treat* 20: 583, 1978
- Yamamoto S, Kojoh K, Saito I, Yamamoto R, Ideguchi S, Ohmoto K, Ohumi T, Hino K, Yamamoto M, Wada A, Hirano Y: Computer tomography of congenital absence of the left lobe of the liver. *J Comput Assist Tomogr* 12: 206, 1988
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