Case report

An experience of treatment of postoperative biliary stricture at a single Japanese institute

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Running title: Postoperative biliary strictures

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ABSTRACT

Background/Aims: Many cause of biliary stricture is iatrogenic including postoperative complication such as a cholecystectomy. **Methodology:** We examined the clinical demographics, surgical records and outcome in 7 patients undergoing biliary surgery between 1994 and 2006. **Results:** Diseases included gall stone in 6 patients and neuroendocrine tumor of the pancreas head in one. Causes of biliary stricture included bile duct injury during cholecystectomy in 4 patients, and stenosis of hepaticojejunostomy in 3（Repair of biliary injury in two and reconstruction after pancreaticoduodenectomy (PD) in one）. Treatment modalities included surgical resection of stricture and reconstruction in 4 patients, extension by balloon catheter in one, and conservative treatment in two. Six patients have been cured and, however, one patient died of biliary cirrhosis and progressive hepatic failure at 4 years after PD. **Conclusions:** When improvement by the extension of stricture was not observed, surgical approach should be necessary. Complete resection of stricture and anastomosis between normal bile duct and intestine might be necessary. Indication of placement of metallic stent in stricture was thought to be carefully considered.

KEYWORDS: biliary stricture, cholecystectomy, biliary injury, pancreatoduodenectomy

ABBREVIATIONS: pancreatoduodenectomy (PD)

INTRODUCTION

Causes of biliary stricture without malignant neoplasm are iatrogenic biliary injury, inflammation, trauma and others (1-3). Bile duct stricture after biliary surgery was the most frequent cause and, particularly, majority of operation was cholecystectomy (4). At the era of laparoscopic surgery, such a complication was not rare in laparoscopic cholecystectomy (5, 6). In case of postoperative biliary strictures, the inadequate choice of treatment modality for biliary stricture causes multiple operations, lost of quality of life in patients, and chronic diseases such as hepatolithiasis and biliary cirrhosis (6). In these diseases, as a cause is iatrogenic, many patients are relatively young and a disease is benign, adequate diagnosis and treatment strategy should be necessary by considering long-term patient prognosis (6, 7). In the present report, we examined the clinical demographics, surgical records and outcome in 7 patients who underwent surgical or conservative treatments in the Division of Surgical Oncology, Department of Translational Medical Sciences, Nagasaki University Graduate School of Biomedical Sciences (NUGSBS) between 1994 and 2006.

CASES

Patients included 6 men and a woman with age ranged 35-74 years old (**Table 1**). Primary diseases are cholecystlithiasis in 6 patients and a malignant neuroendocrine tumor of pancreas head in one. Primary procedure was laparoscopic cholecystectomy in 2 patients, cholecystlithiasis in 2, hepaticojejunostomy converted from cholecystectomy

during operation due to biliary injury in 2, and pancreaticoduodenectomy in one. Symptoms or sign of stricture was jaundice or cholangitis in all patients (**Table 2**). Time of occurrence of stricture was within a few days in 2 patients and over 1 month in 5. Cause of stricture included intraoperative bile duct injury in 4 patients, stenosis of anastomosis in 2, and injury of right and middle hepatic arteries in one. Portion of stricture was hepatic hilum in 3 patients, division of right and left hepatic ducts in 2, and common hepatic duct in 2. Treatment for stricture was tube stent with or without a balloon catheter in 3 patients, hepaticojejunostomy in 2, and hepaticojejunostomy with partial liver resection at segment 4 and 5 of the liver in 2 (**Table 3**). Six patients showed no recurrence of biliary stricture for a long time. One patient died of biliary cirrhosis due to uncontrolled biliary stricture at 43 months after pancreaticojejunostomy.

Case presentation

Case 1

64-year-old male with severe cholecystitis by gall stones, who had chronic renal failure. At day 2 after cholecystectomy, bile fistula and jaundice were observed and percutaneous transhepatic biliary drainage (PTCD) was performed. However, a tube stent was failed because of complete obstruction of hilar bile duct (**Fig. 1A**). As improvement of severe stricture has not been improved for 5 months, resection of partial hepatectomy at segment 4 and 5 was performed and the hilar plate was exposed and opened by incision.

Then hepaticojejunostomy was accomplished (**Fig. 1B**). Symptoms were remarkably improved in this patient for 15 months.

Case 2

52-year-old male with malignant neuroendocrine tumor of pancreas who underwent pancreticoduodenectomy (PD). During operation, the right and middle hepatic arteries were injured and this injury was not repaired. At day 14, anastomosis of hepaticojejunostomy showed no stenosis (**Fig. 2A**). At 10 months after operation, biliary stricture at hepaticojejunostomy and jaundice were observed (**Fig. 2B**) and tube stent under PTCD was placed for 6 months. As the stricture has not been improved, balloon extension was performed at 2 years. Although the symptoms were transiently improved, biliary stricture was recurred again and an expandable metallic stent was placed in the stricture (**Fig. 2C**). Congestion of bile juice and hepatolithiasis occurred in the left liver, and biliary cirrhosis has been progressed and the patient died of hepatic failure at 6 years after PD.

DISCUSSION

Treatment modalities for postoperative biliary stricture are two options of non-surgical and surgical procedures (4, 8). As the non-surgical treatment, extension by balloon catheter via endoscopic trans-papillary or percutaneous transhepatic route, and placement of tube stent and metallic stent can be selected (6, 9-12). Balloon extension needs repeated procedures in many cases but a useful and non-invasive treatment (9, 10).

Therefore, this treatment is thought to be a first option. In our series, one patient was dramatically recovered by this technique. Plastic tube stent is ease to perform and remove but dislocation or cholangitis due to small caliber are not rare (12). Efficacy of improvement of bile juice congestion may be low. Recently, tube stent with stopper to prevent dislocation might be used via trans-papillary approach using endoscopy. In our series, one patient was recovered by a plastic tube stent. On the other hand, expandable metallic stent is more effective to extend stenotic space compared to tube stent, which is often used for biliary stricture by a malignant tumor (6, 10, 11, 13). Indication of metallic stent has been controversial at this stage because removal of stent is quite difficult and hepatolithiasis based on chronic cholangitis is not rare (14). By considering long-term outcome in patients with benign diseases, this technique should be carefully considered to perform. In our series, one patient underwent this treatment and, however, obstruction of inside the metallic stent by sludge formation and severe cholangitis was rapidly progressed. The patient died of irreversible biliary cirrhosis for a short period after insertion of metallic stent. This technique may be avoid for benign biliary stricture as a first line option.

Hepaticojejunostomy or hepaticoduodenostomy was considered as a surgically radical treatment (7, 15, 16). Although the non-surgical treatment should be considered as well as possible, surgical reconstruction is effective to improve status in some cases (17). Furthermore, in some cases, delay of time to surgical option would be associated with poor outcomes (7). Therefore, it is necessary to stick to non-surgical options and

judge the adequate timing of surgical treatments at some stages. In case of surgical reconstruction of biliary strictures, the important points are degree of stenosis (simple and fibrotic short nodule, or wide stricture by inflammation for a long period), location of stenosis (hilar bile duct or lower extrahepatic bile duct), and existence of dilatation of peripheral bile duct in the liver (18). Difficulty of operation would be depending on degree of these factors and, therefore, preoperative accurate decision of degree of stricture should be necessary (19). With respect to operative procedure, complete resection of stricture and anastomosis between non-inflammatory bile duct and intestine are necessary to avoid re-stenosis or anastomotic leakage. Re-stenosis after reconstruction for biliary stricture was observed at the late period (20). Therefore, long-term observation over a decade would be necessary in such patients who undergo re-anastomosis.

In conclusion, we examined 7 patients with postoperative biliary stricture who were treated by surgical or non-surgical treatments. This complication may be considered to choice non-surgical treatment such as a balloon extension or tube stent as a first-line option and, however, metallic stent should be avoided for benign stricture because removal is difficult. Although surgical repair is not easy to perform, timing converted from non-surgical treatment is important before the patient had biliary cirrhosis. Preoperatively accurate diagnosis, careful management and complete resection of stricture would be necessary in case of surgical treatment for benign biliary strictures.

REFERENCES

1. **Lillemoe KD, Pitt HA, Cameron JL:** Current management of benign bile duct strictures. Adv Surg. 1992;25:119-174.
2. **Lillemoe KD:** Benign post-operative bile duct strictures. Baillieres Clin Gastroenterol. 1997;11:749-779.
3. **Bajaj JS, Dua KS:** The role of endoscopy in noniatrogenic injuries of the liver. Curr Gastroenterol Rep. 2007;9:147-150.
4. **Sikora SS, Pottakkat B, Srikanth G, Kumar A, Saxena R, Kapoor VK:** Postcholecystectomy benign biliary strictures - long-term results. Dig Surg. 2006;23:304-312.
5. **Sikora SS, Kumar A, Das NR, Sarkari A, Saxena R, Kapoor VK:** Laparoscopic bile duct injuries: spectrum at a tertiary-care center. J Laparoendosc Adv Surg Tech A 2001;11:63-68.
6. **Kassab C, Prat F, Liguory C, Meduri B, Ducot B, Fritsch J, Choury AD, Pelletier G:** Endoscopic management of post-laparoscopic cholecystectomy biliary strictures. Long-term outcome in a multicenter study. Gastroenterol Clin Biol. 2006;30:124-129.
7. **Sicklick JK, Camp MS, Lillemoe KD, Melton GB, Yeo CJ, Campbell KA, Talamini MA, Pitt HA, Coleman J, Sauter PA, Cameron JL:** Surgical management of bile duct injuries sustained during laparoscopic cholecystectomy: perioperative results in 200 patients. Ann Surg. 2005;241:786-795.
8. **Costamagna G, Familiari P, Tringali A, Mutignani M:** Multidisciplinary approach to benign biliary strictures. Curr Treat Options Gastroenterol. 2007;10:90-101.
9. **Köcher M, Cerná M, Havlík R, Král V, Gryga A, Duda M:** Percutaneous treatment of benign bile duct strictures. Eur J Radiol. 2007;62:170-174.
10. **Matlock J, Freeman ML:** Endoscopic therapy of benign biliary strictures. Rev Gastroenterol Disord. 2005;5:206-214.
11. **Siriwardana HP, Siriwardena AK:** Systematic appraisal of the role of metallic endobiliary stents in the treatment of benign bile duct stricture. Ann Surg. 2005;242:10-19.
12. **Draganov P**, **Hoffman B**, **Marsh W**, **Cotton P**, **Cunningham J**: Long-term outcome in patients with benign biliary strictures treated endoscopically with

multiple stents. Gastrointest Endosc. 2002;55:680-686.

13. **Chen JH**, **Sun CK**, **Liao CS**, **Chua CS**: Self-expandable metallic stents for malignant biliary obstruction: efficacy on proximal and distal tumors. World J Gastroenterol. 2006;12:119-122.
14. **Yoon HK**, **Sung KB**, **Song HY**, **Kang SG**, **Kim MH**, **Lee SG**, **Lee SK**, **Auh YH**: Benign biliary strictures associated with recurrent pyogenic cholangitis: treatment with expandable metallic stents. AJR Am J Roentgenol. 1997;169:1523-1527.
15. **Negi SS**, **Chaudhary A**: Analysis of abnormal recovery pattern of liver function tests after surgical repair of bile duct strictures. J Gastroenterol Hepatol. 2005;20:1533-1537.
16. **DiFronzo LA**, **Egrari S**, **O'Connell TX**: Safety and durability of single-layer, stentless, biliary-enteric anastomosis. Am Surg. 1998;64:917-920.
17. **Tocchi A**, **Mazzoni G**, **Liotta G**, **Costa G**, **Lepre L**, **Miccini M**, **De Masi E**, **Lamazza MA**, **Fiori E**: Management of benign biliary strictures: biliary enteric anastomosis vs endoscopic stenting. Arch Surg. 2000;135:153-157.
18. **Tocchi A**, **Costa G**, **Lepre L**, **Liotta G**, **Mazzoni G**, **Sita A**: The long-term outcome of hepaticojejunostomy in the treatment of benign bile duct strictures. Ann Surg. 1996;224:162-167.
19. **Ahmetoğlu A**, **Koşucu P**, **Kul S**, **Dinç H**, **Sari A**, **Arslan M**, **Alhan E**, **Gümele HR**: MDCT cholangiography with volume rendering for the assessment of patients with biliary obstruction. AJR Am J Roentgenol. 2004;183:1327-1332.
20. **Lillemoe KD**, **Melton GB**, **Cameron JL**, **Pitt HA**, **Campbell KA**, **Talamini MA**, **Sauter PA**, **Coleman J**, **Yeo CJ**: Postoperative bile duct strictures: management and outcome in the 1990s. Ann Surg. 2000;232:430-441.

FIGURE LEGEND

Fig. 1 Cholangiography by percutaneous transhepatic biliary drainage (A); Arrows show the complete obstruction of hilar bile duct. Cholangiography after hepaticojejunostomy (B); arrow shows the anastomosis.

Fig. 2 Postoperative Cholangiography showed no abnormality (A). Cholangiography by percutaneous transhepatic biliary drainage (B); Arrows show the severe stricture of hepaticojejunostomy. Cholangiography after placement of expandable metallic stent in right and left hepatic ducts (C); arrows show the metallic stent.

Table 1 Clinical demographics of patients

Case	Age	Gender	Primary disease	Primary operation
1	65	Male	Cholecystolithiasis	Laparoscopic cholecystectomy
2	64	Male	Cholecystolithiasis	Cholecystectomy
3	52	Male	Neuroendocrine tumor of pancreas	Pancreaticoduodenectomy
4	36	Male	Cholecystolithiasis	Hepaticojejunostomy due to biliary injury during laparoscopic cholecystectomy
5	35	Female	Cholecystolithiasis	Hepaticojejunostomy due to biliary injury during laparoscopic cholecystectomy
6	60	Male	Cholecystolithiasis	Laparoscopic cholecystectomy
7	74	Male	Cholecystolithiasis	Cholecystectomy

Table 2 Content of biliary stricture

	Symptoms or signs	Time of occurrence	Cause	Portion
1	Jaundice	A few days	Intraoperative bile duct injury	Hepatic hilum Bismuth type III
2	Jaundice and biliary fistula	A few days	Intraoperative bile duct injury	Hepatic hilum Bismuth type III
3	Jaundice and cholangitis	4 months	Injury of right and middle hepatic arteries	Right and left hepatic ducts Bismuth IV
4	Cholangitis and liver stones	Day 32	Stenosis of anastomosis	Hepatic hilum Bismuth type III
5	Cholangitis	Day 40	Stenosis of anastomosis	Right and left hepatic ducts Bismuth IV
6	Jaundice	2 months	Intraoperative bile duct injury	Common hepatic duct Bismuth II
7	Jaundice and cholangitis	1 month	Intraoperative bile duct injury	Common hepatic duct Bismuth II

Table 3 Treatment and outcomes

	Treatment	Prognosis
1	Tube stent and extension by balloon catheter	No recurrence at 14 months
2	Resection of stricture with partial hepatectomy, hepaticojejunostomy	No recurrence at 15 months
3	Extension by balloon catheter and placement of metallic stent	Death by biliary cirrhosis at 43 months
4	Hepaticolithotomy, Hepaticojejunostomy	No recurrence at 29 months
5	Tube stent	No recurrence at 65 months
6	Hepaticojejunostomy	No recurrence but death by other disease at 15 months
7	Partial hepatectomy, hepaticojejunostomy	No recurrence at 10 months

Fig. 1A

Fig. 1B

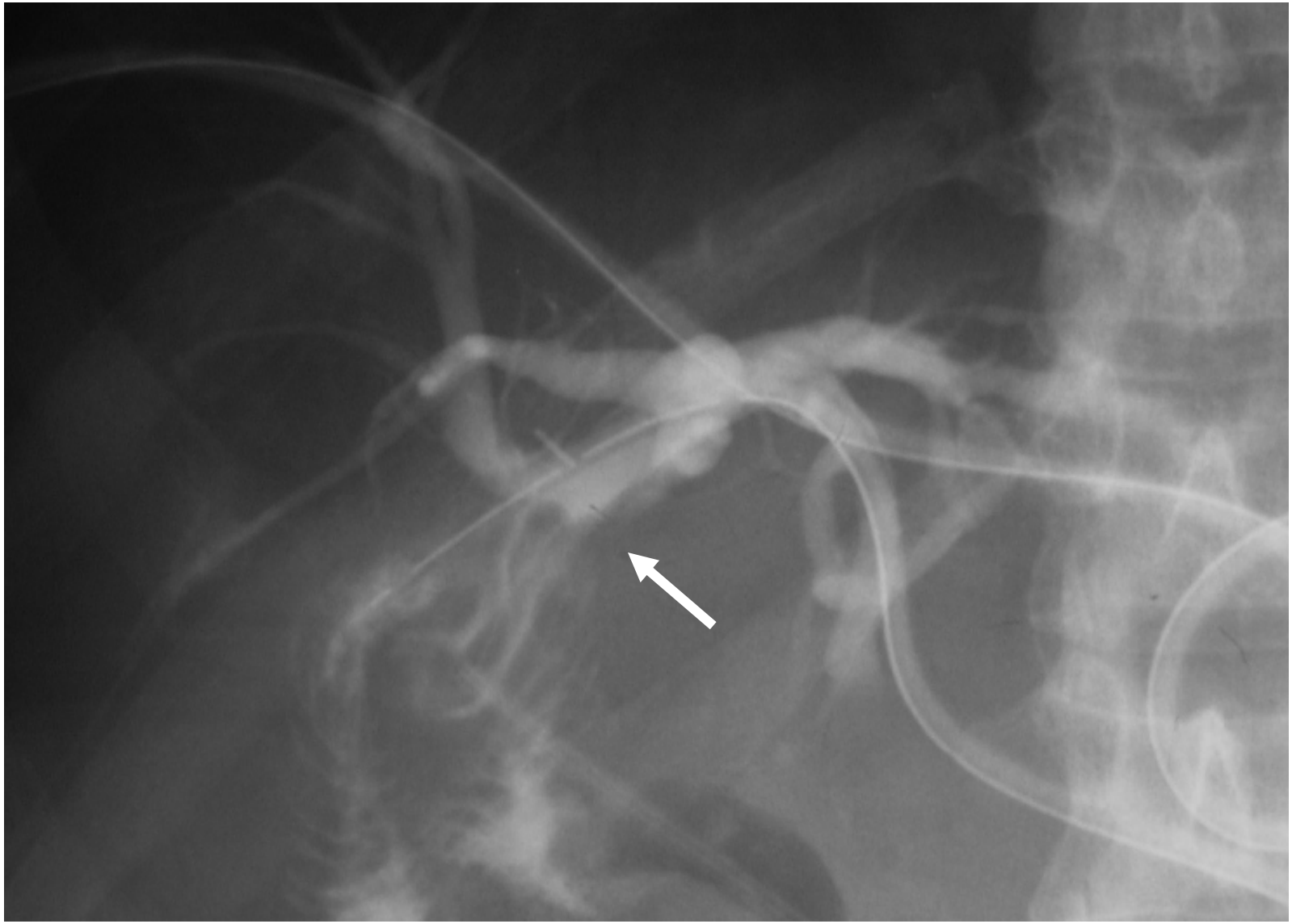

Fig. 2A

Fig. 2B

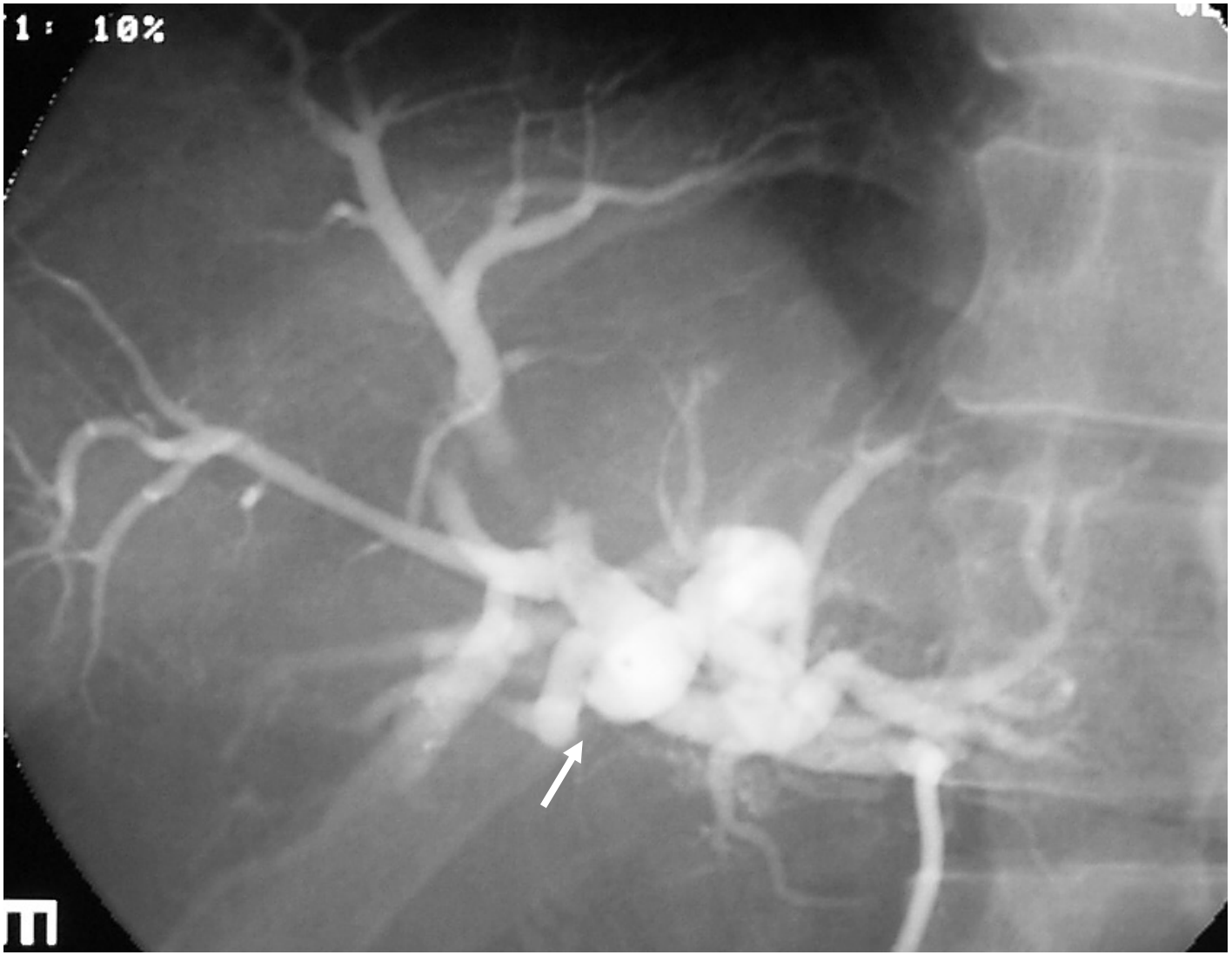

Fig. 2C