Common bile duct stricture due to blunt abdominal trauma: report of two cases

Satoshi Taniwaki, Yoriko Nomura, Akihiro Saruwatari, Ayako Mizoguchi
Atsuhiko Hidaka, Hisashi Kuroda, Masaya Tanaka

ABSTRACT We treated two cases of common bile duct stricture associated with blunt abdominal trauma. Case 1 was a 72-year-old male who was injured during farm work and he needed emergency surgery due to the intra-abdominal hemorrhage. A complete rupture of the pancreatic body and ecchymoma within the hepatoduodenal ligament were observed. Distal pancreatectomy and an external cholecystostomy were performed. Case 2 was a 62-year-old male who was injured in traffic accident. An abdominal computed tomography revealed an intra-abdominal hemorrhage, and emergency angiography was performed. A pseudoaneurysm was found in the gastroduodenal artery, and it was coiled for hemostasis. Stricture of the common bile duct was detected on Day 13 after the surgery and on Day 12 after interventional radiology respectively. Percutaneous transhepatic biliary drainage were performed and tube stent were kept in place for 6 months. It was speculated that obstruction of the blood flow may cause the bile duct stricture secondarily. (JJAAM. 2010; 21: 263-8)

Keywords: obstructive jaundice, bile duct blood flow, ischemic cholangiopathy

Received on November 26, 2009 (09-076)

Introduction

Bile duct stricture after blunt abdominal trauma is rare, but the following has been elucidated according to previous reports: 1. It often develops from Day 15 to Day 60 after trauma¹⁾; 2. Most sites of stenosis are in the intermediate bile duct below the merging section of the cystic duct²⁾; 3. It generally improves within 2 to 6 months after conservative management³⁾; and 4. The pathological findings of the occluded area show the exfoliation of the biliary epithelium and fibrosis of the wall^{1,4)}.

We encountered 2 cases of common bile duct stricture that developed after blunt abdominal trauma, and we herein report the same findings mainly regarding the mechanism of occurrence in addition to considerations thereof.

Case 1

A 72-year-old male was rushed to our hospital because

his abdomen had become caught between a cultivator and an iron frame during farm work, and he was consequently injured. When he was brought to our hospital, his blood pressure was 76/43 mmHg, heart rate was 104/min, and respiratory rate was 28/min, with apparent symptoms of shock, a complaint of strong spontaneous pain in the upper abdomen, and symptoms of peritoneal irritation throughout the abdomen.

A biochemical examination of the blood only showed an increase in the white blood cell count and slight anemia.

An abdominal computed tomography (CT) examination showed a rupture of the pancreatic body and a large amount of accumulation fluid in the abdominal cavity (**Fig. 1a**), so open abdominal surgery was urgently performed 2 hours after he had been brought to our hospital due to the diagnosis of hemorrhagic shock.

In the surgical findings, 3,000 ml of blood was observed in the abdominal cavity, the pancreas had been completely severed in the body, and ecchymoma was observed within the hepatoduodenal ligament. The pancreatic body and tail were removed and a percutaneous cholecystostomy was performed. No obvious biliary damage was observed in the perioperative cholangiography.

Department of Surgery, St. Mary's Hospital

Correspondence to: Satoshi Taniwaki, MD.

Department of Surgery, Tobata Kyoritsu Hospital

2-5-1 Sawami, Tobata-ku, Kitakyusyu-shi, Fukuoka 804-0093, Japan

Fig. 1. Case 1.

a	b
c	d

- a: Abdominal CT on arrival showed a rupture of the pancreatic body and a large amount of accumulation fluid in the abdominal cavity.
 b: Common bile duct stenosis (white arrow) on the anterior end of the duodenum was observed in the cholangiography on Day 13 after the surgery.
 c: PTBD was performed on Day 36 after the surgery, and a biliary tube was placed as a stent.
 d: Cholangiography at 6 months after the surgery showed an improvement of the common bile duct stenosis.
 PTBD: percutaneous transhepatic biliary drainage

No complications were observed after the surgery, but common bile duct stenosis on the anterior end of the duodenum was observed in the cholangiography on Day 13 (**Fig. 1b**), followed by the dilatation of the intrahepatic bile duct in a CT on Day 28, percutaneous transhepatic biliary drainage (PTBD) was performed on Day 36 after the surgery, and a biliary tube was placed as a stent (**Fig. 1c**). Cholangiography performed at 6 months after the surgery showed an improvement of the common bile duct stenosis (**Fig. 1d**), so the biliary tube was removed. CT during drip infusion cholangiography (DIC-CT) in the 3rd year after the surgery showed slight common bile duct stenosis, but no abnormality was found in a biochemical examination.

Case 2

A 62-year-old male had a traffic accident injury and was brought to our hospital by referral with the diagnosis of an intra-abdominal hemorrhage that was determined by the primary emergency hospital. When the patient was brought to our hospital, his blood pressure was 102/56 mmHg, pulse rate was 56/min, and respiratory rate was 16/min, and tenderness was observed in the upper abdomen.

A biochemical examination of the blood only showed mild anemia.

In an abdominal CT examination, a pseudoaneurysm of the gastroduodenal artery was suspected, and a large amount of blood from an intra-abdominal hemorrhage was observed (**Fig. 2a**). The patient's blood pressure gradually decreased, so angiography was urgently per-

Fig. 2. Case 2.

a: A pseudoaneurysm (white arrow) of the gastroduodenal artery was suspected in the abdominal CT at arrival.
 b: PTBD was performed on Day 16 after TAE, and complete occlusion developed in the common bile duct.
 c: Cholangiography at 6 months after TAE showed an improvement of the common bile duct stenosis.
 PTBD: percutaneous transhepatic biliary drainage, TAE: transcatheter arterial embolization

formed by 3 hours after he had been brought to our hospital.

The angiographic examination showed pseudoaneurysm at the origin of the gastroduodenal artery (**Fig. 3a**), so transcatheter arterial embolization (TAE) was performed. The blood flow of the common bile duct, which is supplied from the superior posterior pancreaticoduodenal artery (PSPDA) and proper hepatic artery (PHA) before hemostasis (**Fig. 3b**), diminished because of back-flow from the replaced right hepatic artery after coil embolization (**Fig. 3c, d**).

Slight bile duct dilation was observed in a CT on Day 9 after TAE, and the total bilirubin increased to 4.73 mg/dl (normal range 0.2-1.3 mg/dl) and the alkaline phosphatase increased to 924 IU/l (normal range 115-359 IU/l) on Day 16, so PTBD was performed. Complete occlusion developed in the common bile duct corresponding to the location of the coil of the hemostasis (**Fig. 2b**),

and a biliary tube was placed through the occluded part. The common bile duct stenosis appeared to have mostly ameliorated according to the cholangiography findings 6 months later (**Fig. 2c**), and therefore the biliary tube was removed. No stenosis was observed in a DIC-CT taken 1 year later.

Discussion

The occurrence of bile tract obstruction after blunt abdominal trauma is rare, but it has been reported in several reports, including a report by Skow, et al⁵.

Our cases also improved according to clinical findings and by therapeutic procedures similar to the previous reports, although they did not have pathological findings.

The mechanism of occurrence regarding common bile duct occlusion after blunt abdominal trauma is a matter of speculation³, and according to the previous reports,

Fig. 3. Case 2.

a	b
c	d
- a: The angiography showed pseudoaneurysm (black arrow) at the origin of the gastroduodenal artery.
 b: The blood flow of the common bile duct (white arrow) was supplied from the PSPDA and PHA before TAE.
 c: The blood flow of the common bile duct diminished because of back-flow from the replaced right hepatic artery after TAE.
 d: The blood flow of the common bile duct were not photographed via the PSPDA after TAE.
 PSPDA: superior posterior pancreatico-duodenal artery, PHA: proper hepatic artery, TAE: transcatheter arterial embolization

the following has been speculated: 1. Fibrous connective tissues develop during the process of healing direct trauma (tearing of the bile duct due to extension, suppression, and elevation of internal pressure)^{2, 5)}, which is described in many case reports; 2. Displacement from the surrounding tissues (ecchymoma, traumatic pancreatitis)¹⁾; and 3. Ischemia (ischemic cholangiopathy)^{6, 7)}.

Each mechanism of occurrence was studied.

Firstly, the theory of direct trauma is the theory whereby, considering the anatomic environment in which the common bile duct is present between the fixed liver and duodenum, it is easily extended and compressed and the biliary tract internal pressure is easily elevated due to external pressure, and consequently, tearing of the bile duct wall occurs, resulting in bile duct stenosis due to the proliferation of fibrous connective tissues during the healing

process⁵⁾. The presence of cases demonstrating a rupture of the bile duct evidently verifies that it is situated in an environment in which it can easily be directly damaged⁸⁾ and reflects the pathological evidence from an animal experiment in which fibrous connective tissues proliferated during the healing process after a cholangiotomy⁹⁾. However, sites that are vulnerable to a rupture of the bile duct include the gallbladder, the common bile duct, and the left hepatic duct in descending order^{8, 10)}, and there are no reports of biliary tract obstruction being caused by damage of the left hepatic duct, which has an unpredictable frequency, and in cases in which stenosis subsequently occurs, no tearing has been shown in direct photographs (endoscopic retrograde cholangiopancreatography; ERCP) at the time of an injury³⁾. Furthermore, in animal experiments, obstructive jaundice developed 3 months later¹¹⁾,

so it is questionable as to whether only damage of the bile duct wall would occur coincidentally without any bile spillage⁶⁾.

Secondly, the theory of suppression from the surrounding tissues involves a mechanism that is speculated based on the presence of a report of a case in which ecchymoma occurred at the time of an injury that cause bile duct stenosis¹⁾ as well as cases of secondary bile duct stenosis and occlusion that were caused by pancreatic trauma¹²⁾. However, biliary tract obstruction may remain even after ecchymoma disappears¹⁾, and the theory of suppression from the periphery is also questionable according to a case of bile duct stenosis in chronic pancreatitis¹³⁾ rather than in an acute phase of pancreatitis that was believed to involve severe pancreatic enlargement. In Case 1 above, there was residual occlusion after the ecchymoma disappeared.

Finally, there is the theory of ischemic cholangiopathy, but a recent study about anatomy of the blood flow in the biliary tract showed that the intermediate bile duct, which is believed to develop occlusion most frequently, is a region in which ischemia readily occurs¹⁴⁾. The blood to the common bile duct flows in from both the duodenum side and the hepatic portal region side, and dual control around the inflow part of the gallbladder duct is exerted, but beyond that part, unilateral control often dominates, so disruption in one stream of the blood flows easily causing ischemia¹⁵⁾. Furthermore, there are many individual differences in this blood flow control, and it is believed that ischemia occurs in some cases, while it does not occur in other cases, even with similar trauma. There are many reports in which ischemia of the bile duct causes bile duct stenosis such as a report in which a biloma was formed after embolic therapy had been performed in a case of intra-abdominal hemorrhage due to hepatic trauma¹⁶⁾, a report in which biloma formation and biliary tract obstruction occurred after hepatic artery embolization (using lipiodol) in a case of hepatic cancer¹⁷⁾, a report explaining that biliary tract complications, including bile duct stenosis, are frequently seen if hepatic artery occlusion occurs in cases of liver transplantation¹⁸⁾, and a report in which artery obstruction was observed in the angiography in 39 to 47% of cases of bile duct stenosis after a cholecystectomy⁷⁾. Furthermore, periductal fibrosis and denuded epithelium cells are regarded as pathological findings in cases in which bile duct stenosis develops after hepatic artery embolization¹⁷⁾, and similarly to pathological findings after blunt abdominal trauma, fibrosis is regarded as the cause of

stenosis.

In these present cases, the time of the onset of bile duct stenosis is unknown, and there are still questions and points which remain to be proven, such as the reason why many stenotic parts heal with conservative management, but it is believed that the theory of ischemic cholangiopathy is the most adequate pathogenesis in many cases of bile duct stenosis.

In Case 1, in which we observed the formation of an ecchymoma, it is also highly likely that the decrease in the bile duct blood flow due to the broken blood vessels on the duodenum side was the cause of the bile duct stenosis, and in Case 2, angiography after embolization showed a decrease in blood flow to the common bile duct, and we have therefore described these cases, because it is believed that they are important cases in which bile duct ischemia was the cause of bile duct stenosis.

Conclusion

We treated two cases of common bile duct stricture associated with blunt abdominal trauma. In both cases, it was speculated that the main cause of bile duct stricture was an obstruction of the blood flow which developed secondarily in association with the trauma.

References

- 1) Yoon KH, Ha HK, Kim MH, et al: Biliary stricture caused by blunt abdominal trauma: clinical and radiologic features in five patients. *Radiology*. 1998; 207: 737-41.
- 2) Shirai Y, Yamazaki H, Tsukada K, et al: Stricture of the bile duct after blunt abdominal injury: report of a case successfully managed by percutaneous biliary drainage. *Eur J Surg*. 1994; 160: 515-8.
- 3) Park do H, Kim MH, Kim TN, et al: Endoscopic Treatment for suprapancreatic biliary stricture following blunt abdominal trauma. *Am J Gastroenterol*. 2007; 102: 544-9.
- 4) Kita R, Hachiya T, Kimura S, et al: A case of traumatic common bile duct stricture due to traffic accident. *Nippon Shokakibyo Gakkai Zasshi*. 2001; 98: 970-6. (in Japanese)
- 5) Skow JR, Longmire WP Jr: Common duct stricture secondary to blunt abdominal trauma. *Am Surg*. 1974; 40: 576-8.
- 6) Gately JF, Thomas EJ: Post-traumatic ischemic necrosis of common bile duct. *Can J Surg*. 1985; 28: 32-3.
- 7) Deltenre P, Valla DC: Ischemic cholangiopathy. *J Hepatol*. 2006; 44: 806-17.
- 8) Rodriguez-Montes JA, Rojo E, Martin LG: Complications following repair of extrahepatic bile duct injuries after blunt abdominal trauma. *World J Surg*. 2001; 25: 1313-6.

- 9) Xu J, Geng ZM, Ma QY: Microstructural and ultrastructural changes in the healing process of bile duct trauma. *Hepatobiliary Pancreat Dis Int.* 2003; 2: 295-9.
- 10) Hills MW, Richardson AJ, Tait N, et al: Non-iatrogenic trauma to the extrahepatic biliary tract. *Aust N Z J Surg.* 1993; 63: 190-4.
- 11) Geng ZM, Yao YM, Liu QG, et al: Mechanism of benign biliary stricture: a morphological and immunohistochemical study. *World J Gastroenterol.* 2005; 11: 293-5.
- 12) Horiguchi J, Ohwada S, Tanahashi Y, et al: Traumatic biliary stricture successfully treated by transhepatic bile duct dilatation: a case report. *Hepatogastroenterology.* 1998; 45: 2038-41.
- 13) Kimura F, Miyazaki M, Itoh H, et al: Clinical features of patients with chronic pancreatitis complicated by duct strictures. *Hepatogastroenterology.* 2004; 51: 1191-5.
- 14) Chen WJ, Ying DJ, Liu ZJ, et al: Analysis of the arterial supply of the extrahepatic bile ducts and its clinical significance. *Clin Anat.* 1999; 12: 245-9.
- 15) Rath AM, Zhang J, Bourdelat D, et al: Arterial vascularisation of the extrahepatic biliary tract. *Surg Radiol Anat.* 1993; 15: 105-11.
- 16) Miyayama S, Matsui O, Taki K, et al: Bile duct disruption after blunt hepatic trauma: treatment with percutaneous repair. *J Trauma.* 2006; 60: 640-3.
- 17) Kim HK, Chung YH, Song BC, et al: Ischemic bile duct injury as a serious complication after transarterial chemoembolization in patients with hepatocellular carcinoma. *J Clin Gastroenterol.* 2001; 32: 423-7.
- 18) Bhattacharjya S, Gunson BK, Mirza DF, et al: Delayed hepatic artery thrombosis in adult orthotopic liver transplantation? a 12-year experience. *Transplantation.* 2001; 71: 1592-6.

症例報告

鈍的腹部外傷により総胆管狭窄を来した2例

谷脇 智 野村 頼子 猿渡 彰洋 溝口 彩子
日高 敦弘 黒田 久志 田中 将也

要旨 鈍的腹部外傷による総胆管狭窄の2例を経験したので報告する。症例1は72歳男性で、トラクターと鉄骨に上腹部を挟まれ受傷した。出血性ショックで緊急手術となる。臍体部の完全断裂および肝十二指腸靱帯から臍頭部領域に血腫を認め、臍体尾部切除と外胆嚢瘻造設術を施行した。症例2は62歳男性で、自動車の追突事故で受傷した。computed tomography検査で血管外漏出を認める腹腔内出血の所見より、緊急血管造影検査を行った。胃十二指腸動脈に仮性動脈瘤を認め、同部位をコイルリングし止血した。総胆管狭窄は症例1で術後13日目、症例2で止血後12日目に確認された。ともに経皮経肝胆道ドレナージを施行し、6か月間のチューブステント留置で狭窄は改善した。今回経験した遅発性胆道狭窄の発生機序は、二次的に発症した血流障害が主因であるものと推測された。

(日救急医学会誌. 2010; 21: 263-8)

キーワード: 閉塞性黄疸, 胆管血流, 胆道虚血

聖マリア病院外科

著者連絡先: 〒804-0093 福岡県北九州市戸畑区沢見2-5-1 戸畑共立病院外科

原稿受理日: 2009年11月26日 (09-076)