

Hepatic Arterioportal Fistula Following Cholecystectomy

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Sacks³²⁾, in 1892, was the first to report an intrahepatic arterioportal fistula, which had been found at autopsy in a patient who died of hemorrhage from esophageal varices. Intrahepatic arterioportal fistula has been said to result from congenital arteriovenous malformation⁴¹⁾, ruptured hepatic aneurysm²⁷⁾, trauma^{26,21)}, iatrogenic causes³³⁾, liver cirrhosis^{6,16)}, or liver tumor⁴⁰⁾. There have not been very many papers concerning post-traumatic and iatrogenic intrahepatic arterioportal fistulas. Diagnosis, usually based on abdominal pain, portal hypertension, and auscultation of abdominal bruits, is confirmed by angiography. Hepatic artery ligation, hepatic resection and suture ligation have become the standard forms of management. This paper presents our recent experience with an intrahepatic arterioportal fistula in a patient who had undergone a cholecystectomy in another hospital but was admitted to our hospital as an emergency case because of subcapsular tearing of the liver. Selective angiography revealed an intrahepatic arterioportal fistula. The patient was successively treated with catheter embolization and ligation of the right hepatic artery.

Case Report

A 37-year-old man was admitted to the Kinki University Hospital emergency room on June 11, 1981, with operative wounds in the upper midline with an abdominal drainage tube. He had been undergone cholecystectomy in the other hospital on June 9, 1981. Blood pressure was 110/60 mmHg, pulse 108 beats/min and respirations 20/min. The abdomen was rigid with muscle guarding in the right upper quadrant. Physical examination revealed no bruit over the epigastrium. Laboratory data revealed the following: hematocrit 34%, red blood cell count 394×10^4 , hemoglobin 12.3 g/dl, white blood cell count 16,100, SGOT 606 units, SGPT 754 units, AL-Pho 70 units and total protein 6.3 g/dl.

A selective celiac arteriogram was carried out via the right transfemoral route, revealing the presence of a fistula between the hepatic artery and the portal vein, stretching to the right hepatic artery suggesting a hematoma in the right hepatic lobe (Fig. 1). A selective superior mesenteric

Key words: Hepatic arterioportal fistula, Cholecystectomy, Embolization.

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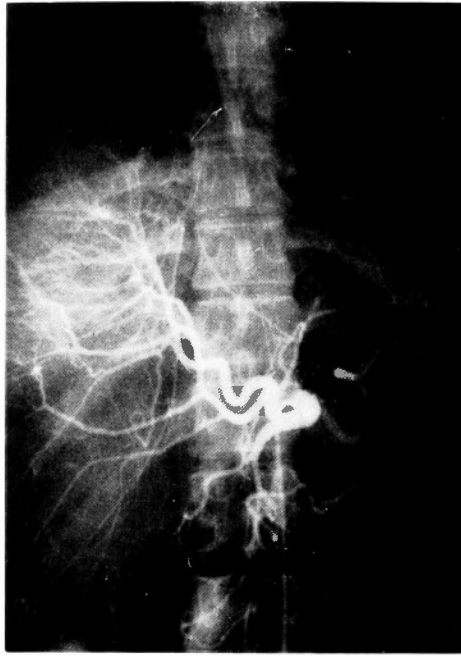


Fig. 1. Angiographic findings before embolization

arteriogram was then carried out, which was normal; so, a selective right hepatic embolization was carried out using gelfoam (Fig. 2). Post-embolization, bleeding from the abdominal drainage tube was stopped, and the patient was generally well for a week. On June 18, 1981, hematemesis and melena developed suddenly, and emergency surgery was carried out. Upon laparotomy, a hematoma in the right hepatic lobe was revealed but bleeding was no longer present. The duodenal bulb was opened by sharp dissection, revealing bleeding and oozing from the posterior wall of the bulb. Purse string sutures were taken, and bleeding was stopped; the anterior wall of the duodenal bulb was closed with interrupted sutures. The right hepatic artery was tied with 0-0 silk. The patient's postoperative course was uncomplicated.

Selective angiographic findings three months after right hepatic artery ligation demonstrated as follow (Fig. 3).

Three months after ligation of the hepatic artery, arterial branches extended from the pancreaticoduodenal and left hepatic arteries to the right hepatic lobe. This indicated that the right hepatic lobe was being supplied with blood from the portal vein as well as from the arteries three months after right hepatic artery ligation.

Changes in serum GOT, GPT, AL-Phos, and LDH after embolization and right hepatic artery ligation (Fig. 4): GOT, 606 U/L on admission, was abruptly elevated to 2,300 U/L within one day of embolization, and one week later was reduced to 220 U/L. It was, however, re-elevated to 950 U/L due to right hepatic artery ligation, returning to 43 U/L three months after the operation. GPT which was 754 U/L admission, markedly increased to 3,300 U/L within one day of embolization, was reduced to 220 U/L one week later. It again rose to 1,000 I/L after



Fig. 2. Angiographic findings after embolization

right hepatic artery ligation, and returned to 32 U/L three months after the operation. AL-Phos, 70 U/L on admission, was elevated to 129 U/L on the first day after embolization, and kept in-

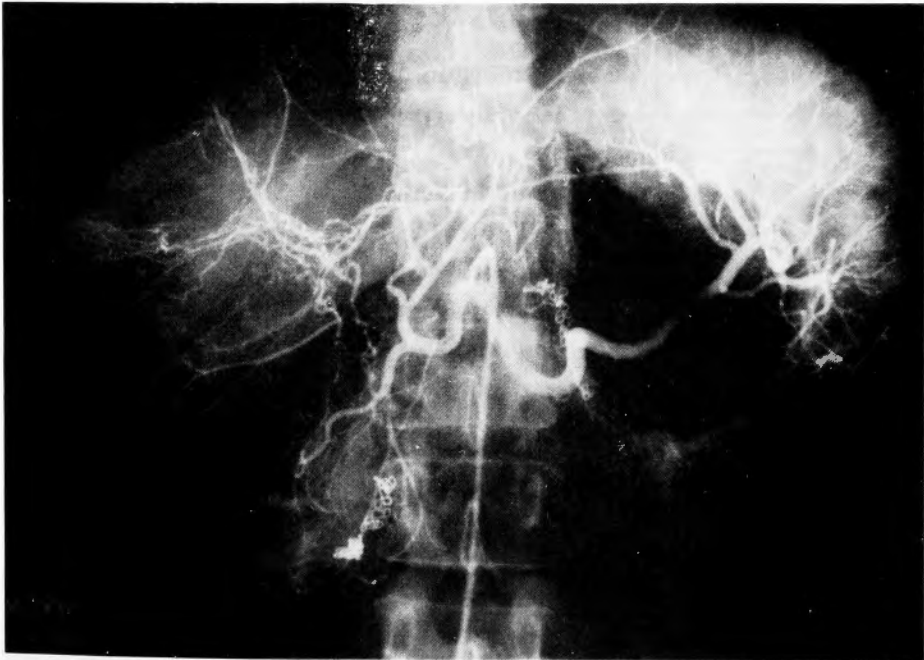


Fig. 3. Angiographic findings following embolization and ligation of right hepatic artery after three months

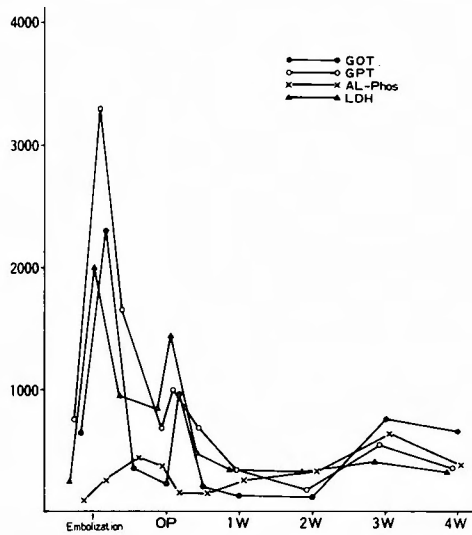


Fig. 4. Changes in serum GOT, GPT, AL-Phos and LDH after embolization and ligation of right hepatic artery

ligation, and further to 664 U/L in the third week. It eventually returned to 95 U/L in three months. LDH, 218 U/L on admission, increased to 2,000 U/L on the first day after embolization, 850 U/L on the third day, 1,450 U/L after hepatic artery ligation and 210 U/L three months later.

Discussion

There are a wide variety of causes of intrahepatic arterioportal fistula, e.g., congenital arteriovenous malformation⁴¹⁾, ruptured hepatic aneurysm²⁷⁾, trauma^{26, 21)}, iatrogenic arterioportal fistula³³⁾, cirrhosis^{6, 16)}, and tumor⁴⁰⁾.

However, available case reports on post-traumatic as well as iatrogenic intrahepatic arterioportal fistulae were few in number, in totality only 35 in the entire world: 6 in Japan and 29 in Europe and America (Table 1). 27 were males, 7 were females and one was unknown. Males far exceeded females in number. The type of trauma was as follows: liver biopsy, 9 cases; traffic accident, 8; and other trauma, 9; (gunshot wound, 7 and cholecystectomy⁴¹⁾. It should be emphasized that there were not a few cases due to liver biopsy. Selective angiography after liver biopsy might reveal a considerable number of concealed intrahepatic arterioportal fistulae.

Common clinical symptoms were right upper abdominal pain as well as gastrointestinal bleeding, portal hypertension and auscultation of abdominal bruit, which was obtained in 14 of the 35 cases.

They underwent hepatic lobectomy²⁾, hepatic artery ligation¹³⁾, or closing of the arteriovenous fistula⁴⁾. When hepatic arterioportal fistula was seen in the left hepatic lobe, left hepatic lobectomy was performed. In the case of hepatic arterioportal fistula in the right hepatic lobe, however, right hepatic artery ligation was carried out because right hepatic lobectomy was

Table 1. Review of post-traumatic arterio-portal fistulae in the world literature.

Reviewed in Japanese Literatures

| No | Authors | Date | Age | Sex | Cause | Signs and Symptoms | Operation | |
|----|-----------|------|------|-----|-------|---------------------|-------------------------------------|----------------------------------|
| 1 | Okuda | 30 | 1973 | 35 | M | Liver biopsy | Asymptomatic | None |
| 2 | Harada | 20 | 1975 | 41 | M | Stab wound | Gastrointestinal bleeding Bruit | Ligation of right hepatic artery |
| 3 | Imoto | 21 | 1977 | 38 | M | Liver biopsy | Asymptomatic | None |
| 4 | Kawashima | 23 | 1977 | 16 | M | Automobile accident | Upper abdominal pain | Repair of liver |
| 5 | Watanabe | 41 | 1979 | 45 | M | Trauma | Right upper abdominal pain Bruit | Ligation of right hepatic artery |
| 6 | Mizuno | 27 | 1981 | 27 | M | Automobile accident | Upper abdominal pain | Drainage |

Reviewed in European and American Literatures

| | | | | | | | | |
|----|-----------|----|------|---------|---|---------------------|--|----------------------------------|
| 1 | Grant | 19 | 1958 | 19 | M | Trauma | Murmur in the epigastrium | Closing of arteriovenous fistula |
| 2 | Brawning | 7 | 1959 | 33 | M | Trauma | Abdominal pain vomiting | Packing |
| 3 | Cohen | 8 | 1960 | 32 | M | Gun shot wound | Gastrointestinal bleeding Epigastric murmur | Closing of arteriovenous fistula |
| 4 | Markgraf | 24 | 1960 | 42 | M | Gun shot wound | Gastrointestinal bleeding Bruit | Laparotomy |
| 5 | Shumacker | 36 | 1961 | 41 | F | Cholecystectomy | Abdominal pain | Left hepatic lobectomy |
| 6 | Creech | 11 | 1965 | 44 | M | Trauma | Bruit | Closing of arteriovenous fistula |
| 7 | Stone | 38 | 1965 | 22 | M | Gun shot wound | Gastrointestinal bleeding | Closing of arteriovenous fistula |
| 8 | Preger | 31 | 1967 | 42 | F | Liver biopsy | Gastrointestinal bleeding Bruit | Laparotomy |
| 9 | Berner | 6 | 1967 | 21 | M | Trauma | Gastrointestinal bleeding Bruit | Drainage |
| 10 | Ryan | 32 | 1968 | 61 | M | Gun shot wound | Bruit | Porta-caval Shunt |
| 11 | Debray | 12 | 1968 | 56 | F | Liver biopsy | Bruit | Ligation of hepatic artery |
| 12 | Kaude | 22 | 1969 | 8 | F | Automobile accident | Shock | Ligation of hepatic artery |
| 13 | Donavan | 13 | 1969 | 43 | F | Gun shot wound | Gastrointestinal bleeding | Ligation of hepatic artery |
| 14 | Baillet | 4 | 1969 | unknown | | Liver biopsy | Portal hypertension | None |
| 15 | Almen | 3 | 1969 | 40 | M | Liver biopsy | Portal hypertension | None |
| 16 | Cleveland | 10 | 1970 | 24 | M | Trauma | Abdominal pain Bruit | Left hepatic lobectomy |
| 17 | Fulton | 17 | 1970 | 30 | M | Gun shot wound | Bruit | Ligation of hepatic artery |
| 18 | Foley | 14 | 1971 | 16 | F | Automobile accident | Lack of appetite | Drainage |
| 19 | Foley | 14 | 1971 | 52 | M | Trauma | Right upper abdominal Pain | Debridment |
| 20 | Foley | 14 | 1971 | 62 | M | Liver biopsy | Bruit | None |
| 21 | Foley | 14 | 1971 | 65 | M | Liver biopsy | Anemia | None |
| 22 | Malette | 26 | 1971 | 55 | M | Traffic accident | Gastrointestinal bleeding pain | Right hepatic lobectomy |
| 23 | Aakhus | 1 | 1971 | 27 | M | Traffic accident | Right hypochondralgia | Suture of right lobe |
| 24 | Aakhus | 1 | 1971 | 73 | M | Traffic accident | Edema | None |
| 25 | Aakhus | 1 | 1971 | 16 | M | Traffic accident | Abdominal pain | None |
| 26 | Baer | 5 | 1973 | 52 | M | Liver biopsy | Bruit | Porta-caval Shunt |
| 27 | Sorensen | 37 | 1978 | 62 | F | Cholecystectomy | Gastrointestinal bleeding | Porta-caval Shunt |
| 28 | Scalafani | 35 | 1981 | 24 | F | Trauma | Gastrointestinal bleeding | Embolization |
| 29 | Scalafani | 35 | 1981 | 30 | M | Gun shot wound | Shock | Drainage |

considered as constituting a major operative invasion. In the present case, celiac angiography and embolization with gelfoam were performed in order to complete the diagnostic picture and

to stop bleeding.

The first therapeutic application of embolization was carried out by Newton and Adams¹⁸⁾ in 1968, when they used the technique to treat spinal hemangioma. In 1972, Rosch³⁴⁾ and Frederick²⁰⁾ independently carried out embolization in 25 cases of upper gastrointestinal bleeding, and obtained favorable results in bleeding management in 92%.

In 1980, Vujic⁸⁾ applied angiographic embolization to the treatment of arteriportal fistula. Regarding the effects of embolization on liver function, Cho et al.³⁹⁾ based on an experiment using dogs, reported that AL-Phos was abruptly elevated within 24 hours and returned to almost normal in four to six weeks, while GPT, rapidly increasing after embolization, reached a peak on the 3rd day and returned to almost normal six weeks later. They also reported that histologic examination of the infarcted area of the livers revealed fibroblastic and vascular proliferation, hyaline fibrosis, cellular debris and coagulation necrosis. In our case, the patient required approximately three months for complete recovery because there were liver function disorders prior to surgery, and because ligation of the hepatic artery was performed one week after embolization. Selective angiography conducted three months after operation disclosed no findings of hepatic arteriportal fistula, while it showed the presence of a collateral pathway (Fig. 4). Kaude¹⁷⁾ and Donavan et al.⁹⁾ separately reported that hepatic angiography two months after operation gave evidence of collateral pathways and a small arteriportal fistula. Moreover, Aaron and co-workers¹⁴⁾ carried out ligation of the hepatic artery in 60 patients with hepatic trauma, concluding that the ligation induced an increase in oxygen pressure in the portal blood, and that the collateral pathway was restored on the 11th day after operation. All these results indicate that embolization and ligation of the hepatic artery are effective in the treatment of patients with hepatic trauma or intrahepatic arteriportal fistulae.

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和文抄録

胆嚢摘除後の肝内動脈門脈瘻の1例

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肝内動脈門脈瘻の報告は, 1892年 Sachs が食道静脈瘤の出血で死亡した症例の剖検例を報告したのが最初であり, 本邦では, 奥田が1973年肝生検後の肝内動脈門脈瘻の1例を報告したのが本邦第1例目である.

最近私達は, 某病院にて胆嚢摘除術を受け, 肝被膜下破裂を来し, 本院に緊急入院し腹腔動脈撮影にて, 肝内動脈門脈瘻を生じていたきわめて稀な症例を経験したので若干の文献的考察を加えて報告した.