Preoperative Portal Vein Embolization in Major Hepatectomy for Hilar Cholangiocarcinoma : A Case Report

WEERAWUT IMSAMRAN, M.D., F.R.C.S.T.*,
THAWEE RATANACHU-EK, M.D., F.R.C.S.T.*

Abstract

We herein, report a 48-year-old Thai man with underlying Child A cirrhosis from chronic hepatitis B who complained of right upper abdominal pain. The imaging studies revealed an incomplete obstruction of the hepatic duct confluence with intrahepatic bile duct dilatation, predominantly on the right side. Hilar cholangiocarcinoma Bismuth Type IIIa was considered to be the diagnosis. Portal embolization of the right portal vein was performed by transileocecal approach, combined liver and bile duct resection with bilio-enteric anastomosis was carried out three weeks later. The postoperative course was uneventful. We believe that portal embolization may benefit patients with hilar cholangiocarcinoma by decreasing postoperative liver failure.

Hilar cholangiocarcinoma or so-called "Klatskin tumor" had never been considered as an unresectable tumor. Until now, it is still a leading cancer especially in the North-eastern part of Thailand where is an endemic area of Opisthochis viverrini. With advances in diagnostic imaging and surgical techniques, extrahepatic bile duct resection combined with extensive liver resection with or without portal vein resection and reconstruction has been performed for hilar cholangiocarcinoma[1-7]. Such an aggressive operation with curative intent, however, carries high morbidity and mortality rates following posthepatectomy liver failure[3,5-8]. To prevent this fatal complication, preoperative Portal Embolization (P.E.) induces atrophy of the corresponding lobe together with contralateral lobe hypertrophy[9-13]. P.E. is also indicated for patients with hepatocellular carcinoma with underlying cirrhosis or chronic hepatitis before performing major hepatectomy[9,14].

* Hepatopancreatobiliary and Liver Transplantation Unit, Division of General Surgery, Department of Surgery, Rajavithi Hospital, Bangkok 10400, Thailand.

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In this report we describe the technique of TransIleocecal Portal Embolization (TIPE) for a patient with hilar cholangiocarcinoma.

Patient

A 48-year old man was admitted to the hospital because of right upper abdominal pain of two months. He is also a chronic hepatitis B carrier. On physical examination, there was only tenderness of the right upper quadrant of the abdomen without palpable mass or icteric. The liver function test showed a reversed ratio of albumin to globulin (3.1/5.1) and the level of alkaline phosphatase was 437 U/L (normal 39-117 U/L)

For the tumor marker, CEA was 2.2 ng/ml (normal 0-2.5 ng/ml) and CA 19 - 9 was 151.9 U/ml (normal 0 - 37 U/ml). Computerized tomography of the upper abdomen showed obstruction of the common hepatic duct with dilatation of the intrahepatic bile duct. (Fig. 1) Endoscopic retrograde cholangiopancreatography was the same as the CT scan and the infiltrative lesion was extended to the right hepatic bile duct more than to the left one.

Technique of P.E.

Under general anesthesia, a right lower quadrant incision was made and the iliocecal vein was identified. The vein was cannulated and a guide wire radiofocus (Terumo Co Rt GA 32153, 0032, angle type) having a diameter of 0.81 mm and a length of 150 cm was advanced under fluoroscopic control to the level of the portal bifurcation. A 7 French balloon catheter (Sumitomo Medic Co MD 42107A) was introduced and portography was performed. (Fig. 2) The Main Portal Vein Pressure (MPVP) was measured 14.5 cm H_2O before embolization. The balloon catheter was inserted into the right portal vein and the balloon was inflated with 2 ml of normal saline solution. The embolic material which consisted of mixture of gelfoam 1 g, distrizoate sodium meglumine (60% Urograffin) 40 ml and gentamicin 40 mg was injected until a second-order branch of the right portal vein was obstructed as shown in Fig. 3.

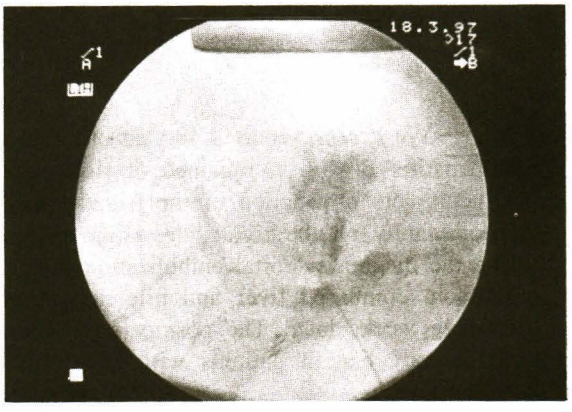

Fig. 2. Pre-embolization portography.

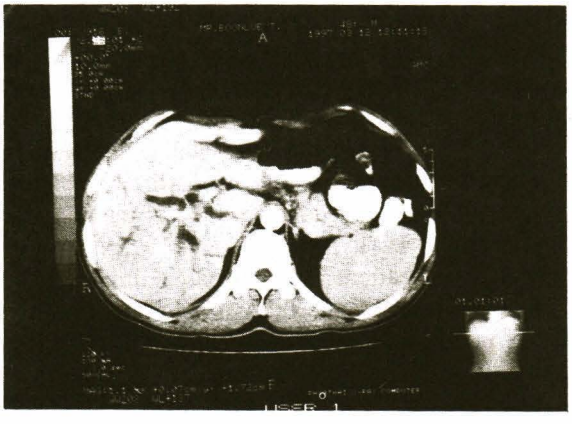

Fig. 1. CT Scan shows obstruction of the common hepatic duct with dilatation of the intrahepatic bile duct.

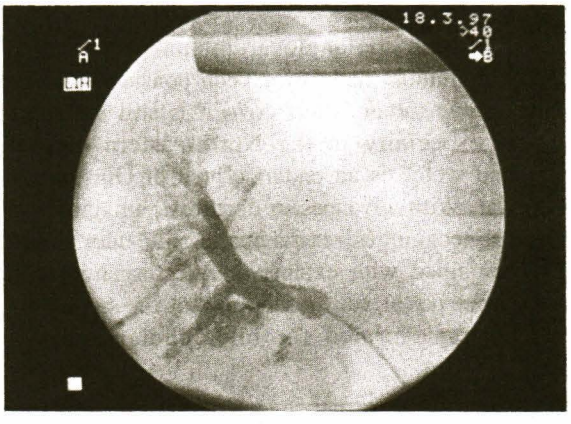

Fig. 3. Postembolization portography shows the embolic material in the anterior and posterior portal veins.

After 5 minutes, the balloon was deflated and the catheter was withdrawn to the main portal vein. MPVP was measured after embolization and showed 17 cm H_2O.

Clinical course after P.E.

The patient did not develop fever. He had some abdominal discomfort but did not have the abdominal pain. He had a transitory leukocytosis (WBC 13,600/mm^3) on the second postoperative day. Serum total bilirubin was slightly increased (0.87 mg/dl to 1.42 mg/dl) but within the normal limit (0-1.5 mg/dl). Serum transaminase was elevated and returned to baseline within 2 weeks.

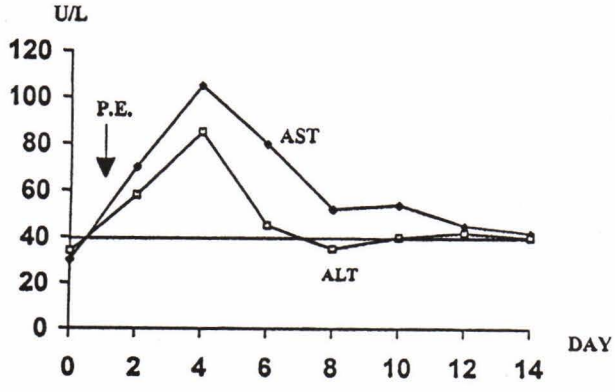

Fig. 4. Change of AST & ALT values after P.E. Upper limit of normal is 40 U/L.

(Fig. 4) Three weeks after portal embolization, combined liver and bile duct resection and bilio-enteric anastomosis for curative intent were performed.

Operative procedure

The exploratory laparotomy showed atrophy of the right lobe and hypertrophy of the left lobe of the liver which was confirmed by injection of the methylene blue into the right hepatic artery. (Fig. 5) The operation consisted of the extended right hepatectomy plus total caudate lobectomy, extrahepatic bile duct resection, hepatoduodenal lymph node dissection and Roux-En-Y left hepaticojejunostomy. The operative time was 9 hours and estimated blood loss was 800 ml.

Postoperative course

The postoperative course was uneventful. One week after the operation, tube cholangiography was performed *via* the intrahepatic stent and showed no leakage of the contrast media from the bilio-enteric anastomosis. (Fig. 6) The patient was discharged on the tenth postoperative day. Computerized tomography was performed a month later and showed compensated hypertrophy of the left lobe without intrahepatic bile duct dilatation. (Fig. 7) The patient has been well, without jaundice or cholangitis during the follow-up period of nine months.

Fig. 5. Operative finding shows atrophic right lobe and hypertrophic left lobe after injection of methylene blue.

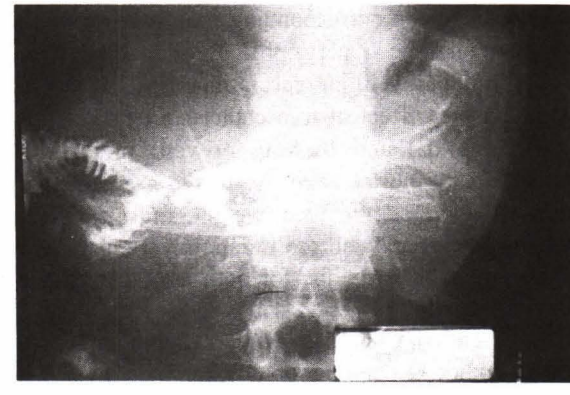

Fig. 6. Postoperative tube cholangiography shows no leakage of contrast from left hepaticojejunostomy.

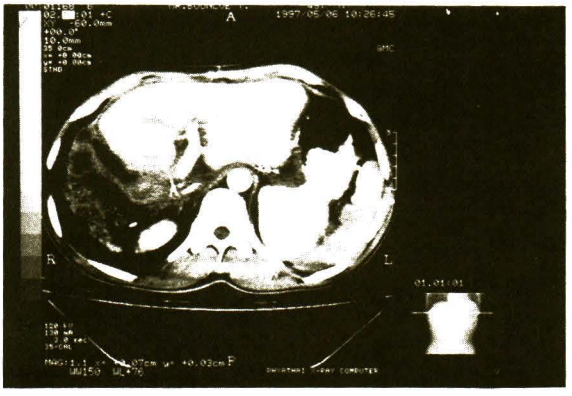

Fig. 7. Postoperative CT scan shows absence of right and caudate lobes with compensated hypertrophy of left lobe of liver.

DISCUSSION

Portal vein embolization was first reported by Kinoshita et al[8] for hepatocellular carcinoma with cirrhosis or chronic hepatitis and Makuuchi et al[9] for hilar bile duct carcinoma. According to the interesting phenomenon, Rous and Larimore tied a portal branch in rabbits, the affected lobe shrank and the nonligated lobe hypertrophied[14]. Honjo et al tried portal branch ligation as a treatment for liver cancer in 20 patients in whom hepatic resection was not indicated. The lobe supplied by the ligated portal branch and the tumor in that lobe atrophied and the nonligated lobe hypertrophied[15].

The main objective of P.E. is the induction of atrophy of the corresponding lobe together with contralateral lobe hypertrophy. Another benefit of P.E. for hepatocellular carcinoma is to increase the anticancer effect of transcatheter arterial embolization (TAE) and to help prevent metastatic spread *via* the portal vein[16]. In the experimental study, they found the liver weight, mitotic index, DNA synthesis and cell proliferation were increased in the nonembolized lobe for both normal rats and rats with cirrhosis[11].

The risk of liver failure after liver resection is major depending on the remnant liver reserve and the amount of resected volume. For hilar cholangiocarcinoma, extended lobectomy with removal of caudate lobe is usually needed for curative intent[2]. After such extensive resection, liver failure leading to death within 30 days occurred in about one fifth to one sixth of cases[1,3,18]. This risk of liver insufficiency is great because the remnant liver has no compensatory enlargement and is damaged by cholestasis.

There are two approaches of P.E., Transileocecal and Percutaneous Transhepatic Portal Embolization. (TIPE & PTPE)

PTPE is undertaken by experienced radiologists under guidance of real-time ultrasonography,[9,11-13,19,20] whereas, TIPE is per formed by surgeons under general anesthesia[10,14]. Under fluoroscopic guidance, the technique of TIPE is simple. As for the embolic material, many are used such as gelatin sponges[13] (GELFOAM), thrombin,[13] mixture of cyanoacrylat and iodized oil, [13] mixture of fibrin glue and iodized oil,[11,12, 20] mixture of gelatin sponges, Urograffin and gentamicin[10,14]. The best portal occlusive agent to date seems to be fibrin glue and cyanoacrylat due to complete embolization when compared to gelatin sponges[11,13]. We used a mixture of gelatin sponges, urograffin and gentamicin because the cost was cheaper and the same pattern of hypertrophy was obtained.

The difference in the main portal vein pressure (MPVP) before and immediately after embolization in our case was 2.5 cm H_2O. With the postembolization pressure 17 cm H_2O, this value did not produce portal hypertension. Another advantage of P.E is the avoidance of a sudden increase in portal pressure after hepatectomy. The combined elevated portal pressure and minor operative trauma to the remnant liver caused congestion with liver dysfunction[10,20].

The clinical course after P.E. was well tolerated by the patient. There was minor and transient elevation of the white blood cell count and transaminase enzymes. The reported side effects of P.E. contrasted to arterial embolization. P.E. did not cause nausea, vomitting, high fever or severe pain[10].

As for the hypertrophy of non-embolized lobe, the superior rate of hypertrophy was found in noncirrhotic liver when compared to cirrhotic liver. Baere et al studied[13] P.E. in the non cirrhotic liver, they found 64 per cent hypertrophy after 4-5 weeks. For HCC with cirrhosis, Kinoshita[9] reported 40 per cent hypertrophy in one of his 21 patients. The extent of liver hypertrophy seems to be better in a noncirrhotic liver after P.E., which

was probably due to the absence of underlying hepatic disease and the higher regenerative capacity of a healthy liver. According to the study of Chen et al[22] the extent of liver regeneration is better in a noncirrhotic liver after extended hepatectomy (28% at 3 months and 48% at 6 months in noncirrhotic livers versus 8% and 13% in cirrhotic livers)

Makuuchi and co-workers[10] performed two CT volumetric studies after P.E. in patients with hilar cholangiocarcinoma and achieved hypertrophy of 33 per cent and 44 per cent of the unembolized area 2 weeks after embolization. Unfortunately, in our patient we could not perform CT volumetric study due to the lack of special software for volume calculation. However, injection of the methylene blue in the right hepatic artery showed the small sized right lobe and hypertrophic left lobe.

We decided to perform the liver resection with curative intent 3 weeks after P.E. when all liver function tests had returned to the baseline. Surgery should not be postponed because of the risk of tumor progression and the possibility of portal recanalization.

Major hepatectomy is associated with hypoalbuminemia, cholestasis and coagulopathy before the remnant lobe has regenerated[22]. This favors sepsis, hemorrhage and leakage from the bilio-enteric anastomosis. A preoperatively, hypertrophied remnant liver minimizes these metabolic changes, and we did not find bile leakage after P.E. and biliary reconstruction[10].

In conclusion, we believe that portal embolization may benefit patients with hilar cholangiocarcinoma by decreasing postoperative liver failure.

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การทำให้เส้นเลือดดำพอร์ทัลอุดตัน ก่อนการผ่าตัดตับ ในผู้ป่วยโรคมะเร็งทางเดินน้ำดีบริเวณขั้วตับ : รายงานผู้ป่วย†

วีรวุฒิ อิ่มสำราญ, พ.บ., ทวี รัตนชูเอก, พ.บ.**

รายงานผู้ป่วยชายไทย อายุ 48 ปี เป็นไวรัสตับอักเสบบีเรื้อรัง และ Child A cirrhosis มาด้วยเรื่องปวดท้องใต้ชายโครงขวา จากการตรวจค้นพบว่ามี incomplete obstruction บริเวณ hepatic duct confluence ลามไปทางขวา และมีการขยายตัวของท่อน้ำดีในตับ ให้การวินิจฉัยว่าเป็น มะเร็งทางเดินน้ำดีบริเวณขั้วตับ ชนิด Bismuth Type IIIa ได้ทำให้มีการอุดตันของ Portal vein ข้างขวา โดยผ่านทาง ileocecal vein หลังจากนั้น 3 สัปดาห์ ผู้ป่วยได้รับการผ่าตัดตับ และท่อน้ำดีร่วมกับการต่อท่อน้ำดีข้างซ้ายกับลำไส้เล็ก ผู้ป่วยไม่มีภาวะแทรกซ้อนใดๆ หลังผ่าตัด

ผู้รายงานเชื่อว่าการทำให้เส้นเลือดดำพอร์ทัลอุดตันอาจจะช่วยเพิ่มความปลอดภัยในการผ่าตัดตับ สำหรับผู้ป่วยโรคมะเร็งทางเดินน้ำดีบริเวณขั้วตับ โดยการลดโอกาสเกิดตับวายหลังการผ่าตัด

* หน่วยศัลยกรรมตับ, ตับอ่อน และทางเดินน้ำดี, งานศัลยกรรมทั่วไป, กลุ่มงานศัลยกรรม, โรงพยาบาลราชวิถี, กรุงเทพฯ 10400

† นำเสนอ ณ ที่ประชุมวิชาการ ครั้งที่ 22 ของราชวิทยาลัยศัลยแพทย์แห่งประเทศไทย ประจำปี 2540 พัทยา วันที่ 18-21 กรกฎาคม 2540