**Brief Reports**

**DSA analysis of hepatic arteriovenous fistula concurrent with hepatic cancer and its clinical significance**

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**Subject headings** liver neoplasms; hypertension, portal; hepatic arteriovenous fistula; angiography, digital subtraction

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**INTRODUCTION**

Intervention therapy has become one of the main therapies of hepatic cancer[41,43,46,50]. The introduction of hepatic arterial perfusion and embolization has provided opportunities for a secondary operation on patients with intermediate and advanced cancer[42,51-53], thus prolonging patients'life and improving their life quality[5]. However, intractable ascites and hemorrhage of upper digestive tract caused by portal hypertension[3,6,12,18,26-28,31,32,34,54,59]. In the present study, a series of observation and analysis were made for 110 cases of hepatic arteriovenous fistula concurrent with intermediate and advanced hepatic cancer.

**MATERIALS AND METHODS**

**Clinical data**

One hundred and ten cases were selected from the 583 cases of hepatic cancer, which were clinically verified by radiological images and admitted to our department from 1989 to 1999. The cases were diagnosed as hepatic arteriovenous fistula by Seldinger technique with DSA, among which, 102 were males and 8 females aged between 27 years and 70 years (average 48.5 years). One hundred and three cases were primary and 7 were secondary hepatic cancer. The latter include 3 cases of primary carcinoma of colon, 2 carcinoma of ampulla, 1 carcinoma of pancreas and 1 cardiac cancer. Among the 110 cases, there were 58 (52.72%) cases of concurrent ascites and 31 (28.18%) hemorrhage of upper digestive tract.

**Examination**

**Examination of hepatic arteriovenous fistula** All the cases underwent percutaneous femoral puncture by Seldinger technique. Guided by X-ray, the head of the conduct cannula was placed in the celiac artery and upper mesenteric artery. Through the cannula, 38% cardiografin or Ultravis t of 20mL-25mL at a time and at a rate of 4mL/S-5mL/S was perfused with high pressure while the arteries were photographed continuously at 2 frames per second until the pyloric stem was developed or the photography lasted up to 20 seconds. The DSA results indicate that portal vein, hepatic vein or inferior caval vein in hepatic arterial phase or hepatic parenchymic phase developed ahead of the expected time could be diagnosed as concurrent hepatic arteriovenous fistula. The 110 cases of hepatic arteriovenous fistula received DSA examination for a total of 273 times, for some cases once at least and some 9 times at most.

**Barium meal examination of upper digestive tract** Thirty cases received routine pneumobarium double contrast examination.

**Gastrofiberscopy** Thirty-three cases took routine gastrofiber scope.

**Statistical analysis** $\chi^2$ test and U test were performed according to NoSA software package.

**RESULTS**

Among the 583 patients with hepatic cancer, 110 were found to have hepatic arteriovenous fistula, which indicated an average incidence rate of 18.86%. From 1989 to 1999, the annual incidence
rate of hepatic arteriovenous fistula ranged from 2.38% to 47.72%, as shown in Figure 1.

Of the 110 cases of hepatic arteriovenous fistula, 57 had their focuses in the right lobe (51.81%), 13 in the left lobe (11.81%) and 40 involved both (36.36%). Seventy-four were massive (67.27%), 21 nodular (19.09%) and 15 diffuse (13.63%). Eleven were aberrant in their hepatic arterial origins (10.00%), of which 7 were of the right vagohepatic artery, 1 of the common vagohepatic artery, 1 of the right vagoaccessary hepatic artery (all the above-mentioned 9 aberrant cases originated in the superior mesenteric artery), and the others, 1 left vagohepatic artery originated in the left arterial gastric and 1 common vagohepatic artery in the right diaphragmatic artery. DSA detected sufficient blood supply in 89 cases (89.90%), moderate blood supply 14 (12.72%) and poor supply 7 (6.36%).

According to the locations of the fistula or the abnormal split-flow, the 110 cases can be divided into two main types: 95 peripheral (86.36%) and 15 central (13.63%). Hepatic arteriovenous fistula usually occurs in the cases with sufficient blood supply and massive hepatic cancer (Table 1). There were 103 simple cases (93.63%) and 7 complicated cases (6.36%) (Table 2).

Table 1 The relationship between locations of hepatic arteriovenous fistula and the typing as well as neoplastic blood supply

| Location | Typing | Neoplastic blood supply |
|----------|--------|-------------------------|
|          | Massive| Nodular | Diffuse | Sufficient | Moderate | Poor |
| Peripheral | 95 | 67 | 18 | 10 | 79 | 9 | 7 |
| Central | 15 | 7 | 3 | 5 | 10 | 5 | 0 |
| N=110 | 74 | 21 | 15 | 89 | 14 | 7 |

*aPeripheral cases significantly outnumbered central ones (P<0.05, χ²=6.05).

*bMassive cases significantly outnumbered diffuse ones (P<0.05, χ²=6.09). There is no difference between massive ones and nodular ones, or nodular ones and diffuse ones (P>0.05).

Peripheral ones outnumbered central ones in blood supply (P<0.05, χ²=7.34). Sufficient blood supply cases significantly outnumbered cases of moderate blood supply (P<0.05, χ²=5.83). There is no difference between those with sufficient and poor supply, or with moderate and poor supply (P>0.05).

One hundred and three cases (93.63%) are simple ones which indicate hepatic arterioportal vein fistula in 97 cases (88.18%) (Figure 2), hepatic arteriovenous fistula in 4 cases (Figure 3), hepatoinferior vena cava fistula in 2 cases (Figure 4). Seven cases are complicated ones which indicate both HA-IV fistula and HA-PV fistula in 3 cases, both HA-IV fistula and HA-V fistula in 1 case, first HA-V and then HA-IV fistula in 1 case, HA-IV fistula first and then HA-PV fistula in 1 case, three HA-PV fistulas in 1 case (Figures 5-7). The simple ones are more than complicate ones significantly (Table 2).
Portal hypertension is clinically characterized by ascites and hemorrhage of the upper digestive tract. Barium meal examination and gastrofiberscopy of upper digestive tract of the portal hypertension cases indicated that the positive rate of varices of esophagus detected by gastrofiberscopy was significantly higher than that by barium meal examination. The positive rate of ascites by gastrofiberscopy was 100% whereas that by barium meal check up was only 56.66% ($P<0.01$, $U=4.08$). The positive rate of hemorrhage of upper digestive tract detected by gastrofiberscopy was 96.96% whereas that by barium meal checkup was 53.33% ($P<0.01$, $U=3.77$). It is worth notice that among the 52 patients with concurrent hepatic arteriovenous fistula who received neither gastrofiberscopy nor barium meal exam, the incidence rates of ascites and hemorrhage of upper digestive tract were 46.15% and 19.23% respectively, from which the possible existence of esophageal varices could not be excluded.

**DISCUSSION**

In the present study, we analyzed the relationship between the incidence rate and typing of hepatic arteriovenous fistula and the typing and blood supply of hepatic cancer, compared and analyzed ascites and hemorrhage of upper digestive tract by gastrofiberscopy, barium meal checkup and DSA. According to the results of these investigations, we have come to the following conclusions.

Hepatic arteriovenous fistula claims a relatively high incidence rate [3,5,35-40] among hepatic cancer cases, with an average of 18.86% and every 4 or 5 years as a cycle of change. Primary hepatic cancer accounts for 93.63% of concurrent hepatic arteriovenous fistula cases.

Hepatic arteriovenous fistula is usually found in cases of sufficient blood supply and massive type hepatic cancer, which usually indicates the severity of lesion.

The incidence rate of hepatic arterio-pyloric fistula (HA-PV) is significantly higher than that of other types of abnormal hepatic arteriovenous split flow, which indicates that hepatic arteriovenous fistula is an important factor that leads to concurrent portal hypertension of moderate and advanced hepatic cancers [39].

Portal hypertension caused by hepatic arteriovenous fistula is clinically and chiefly characterized by ascites (52.72%) and secondarily by hemorrhage of upper digestive tract (28.18%) [8,11,30].

Barium meal checkup and gastrofiberscopy of upper digestive tract of concurrent portal hypertension cases indicate that the positive rate of esophageal varices detected by gastrofiberscopy was much higher than that by barium meal checkup [44,48,49]. Ascites and hemorrhage accounted for 46.15% and 19.23% of the 52 patients with hepatic arteriovenous fistula who did not receive barium meal checkup and gastrofiberscopy [19,29]. It
Hepatic cancers of the peripheral type\[47\], which hepatic arteriovenous fistula is usually found in tract\[5,6,16,17,33,34\].
especially to hepatic cancer patients with concurrent arteriovenous fistula early and treat the patients advanced hepatic cancer. In order to detect hepatic examinations for the treatment of moderate and included as an important part of the routine early as possible and treat it timely\[15,17,18\].

The current therapies applied to the treatment of hepatic cancer mainly include hepatic arterial perfusion, embolisation, local injection of absolute alcohol guided by ultrasonography, radio frequency therapy, etc\[45,55,58\]. However, it is difficult for ultrasonography and CT to preliminarily detect hepatic arteriovenous fistula which is highly incidental to primary hepatic cancer of massive and sufficient blood supply types. Besides, the abnormal split-flow between hepatic arteries and veins may inhibit the effect of these therapies and even give rise to some complications\[12,26,31,36\].

Therefore, we conclude that DSA should be included as an important part of the routine examination for the treatment of moderate and advanced hepatic cancer. In order to detect hepatic arteriovenous fistula early and treat the patients with embolisation timely, DSA should be given especially to hepatic cancer patients with concurrent ascites and hemorrhage of upper digestive tract\[5,6,16,17,33,34\].

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