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Enhanced visualization of the portal vein system in superior mesenteric arterial portography using prostaglandin E1.

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Abstract

The portal vein system was clearly visualized in superior mesenteric arterial portography using prostaglandin E1. Angiographic examination was performed in 68 patients with various liver diseases during the 2 year period from 1980 to 1981. Twenty microgram of prostaglandin E1 was injected into the superior mesenteric artery 30 seconds before injection of 60 ml of contrast medium. The main portal vein was visualized in all of 68 cases. A high rate of success for visualization of the intrahepatic portal vein system by prostaglandin E1 was achieved. The first branches of the intrahepatic portal vein were visualized in 100% of the cases, the second branches in 82%, the third branches in 44%, and the fourth branches in 4% in the right portal vein system. In the left portal vein system, the first branches were visualized in 87%, the second branches in 41%, and the third branches in 3% of the cases. The intrahepatic portal vein system was more clearly visualized in females than in males (P less than 0.05). This procedure is simple, safe and useful for clear visualization of the portal vein system.

KEYWORDS: superior mesenteric arteriography, arterial portography, portal vein system, prostaglandin E1

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ENHANCED VISUALIZATION OF THE PORTAL VEIN SYSTEM IN SUPERIOR MESENTERIC ARTERIAL PORTOGRAPHY USING PROSTAGLANDIN E1

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Key words : superior mesenteric arteriography, arterial portography, portal vein system, prostaglandin E1.

Angiographic examination is one of the most important procedures for determining the diagnosis, the extent of the lesion and the operability of various liver diseases (1-5). Especially, for malignant diseases of the liver, the portogram is an essential addition to the arteriogram, since most of primary and secondary cancers or the liver tend to invade the portal vein system (6). However, evaluation of portal vein invasion has been difficult, since direct portography via transsplenic (7-9), transhepatic (10, 11), transumbilical (12, 13) or transjugular (14, 15) veins has not always been possible in every case, and conventional celiac or superior mesenteric arterial portography has only given obscure portograms. Recently, prostaglandin E1 has been used for arterial portography instead of other vasodilating agents (16-19). In this paper, further experience with arterial portography using prostaglandin E1 is described and the incidence of visualization of the intrahepatic portal vein system is reported.

MATERIALS AND METHODS

Sixty-eight patients with various liver diseases were submitted to selective celiac and superior mesenteric arteriography during the 2 year period from April 1980 to October 1981. Twenty μg of prostaglandin E1 (Prostandin, Ono Pharm. Co., Osaka) in 5 ml of saline was injected into the superior mesenteric artery. Thirty seconds after the injection, 60 ml of contrast medium (Isopaque 440, 82.3%, Torii Pharm. Co., Tokyo) was injected at a rate of 10 ml per second. Five films were exposed in the first 2.5 seconds, 5 films in the next 5 seconds, and 10 films in the last 20 seconds.

RESULTS

The portal vein system began to be visualized 10 seconds after injection of the contrast medium and was outlined most clearly 12 to 15 seconds after the injection. The main portal vein was visualized in all of 68 cases. The incidence of visualization of the intrahepatic portal vein system is shown in Table 1. Intrahepatic portal veins were more clearly visualized in females than in males ($P < 0.05$).

TABLE 1. VISUALIZATION OF PORTAL VEIN SYSTEM IN SUPERIOR MESENTERIC ARTERIAL PORTOGRAPHY USING PROSTAGLANDIN E1

Portal vein system		Male 47	Female 21	Total 68
Main portal vein		47 (100)	21 (100)	68 (100)
Right	1st branch	47 (100)	21 (100)	68 (100)
	2nd branch	35 (75)	21 (100)	56 (82)
	3rd branch	12 (25) *	18 (86) *	30 (44)
	4th branch	0 (0)	3 (14)	3 (4)
Left	1st branch	38 (81)	21 (100)	59 (87)
	2nd branch	9 (19) *	19 (90) *	28 (41)
	3rd branch	0 (0)	2 (10)	2 (3)

Numbers in parentheses indicate percent. * $p < 0.05$

In most cases of primary liver cancer (Figs. 1, 2) and in one of metastatic liver cancer (liver metastasis of duodenal leiomyosarcoma, Figs. 3, 4), obvious neovascularity and tumor vessels were observed in the arterial phase (Figs. 1, 3). In the portal phase, stretching and displacement of the intrahepatic portal veins were observed (Fig. 4) and the hypervascular area in the arterial phase was observed as a hypovascular area (Figs. 2, 4).

In one case in which a large cyst occupied the right lobe of the liver, both intrahepatic arteries (Fig. 5) and the portal veins (Fig. 6) were stretched and displaced. The border of the cyst was clearly visualized in the portogram (Fig. 6).

In one case of giant cavernous hemangioma (30 × 15 cm) in the right lobe of the liver, numerous spotty stains 1-5 mm in size were observed in the arterial phase of the celiac arteriogram (Fig. 7). In the portal phase, the hemangioma portion lacked portal veins and the main portal vein was bent to the left (Fig. 8).

In one case of cancer of the head of the pancreas, the main portal vein was occluded by cancer invasion, and the superior mesenteric vein flowed into the liver through hepatopetal collaterals (Fig. 9).

DISCUSSION

Superior mesenteric arteriography with vasodilating agents has been performed to obtain clear portograms using tolazoline (20) or papaverine (21). Intraarterial injection of prostaglandin E1 has resulted in clearer portograms than other vasodilators (16-19). To evaluate the extent or prognosis of primary or metastatic liver cancer, it is important to demonstrate the portal vein system clearly. Patency of the main or intrahepatic portal veins dominates the indication of transcatheter arterial embolization therapy for primary liver cancer (22). In this paper, one method of superior mesenteric arterial portography using prostaglandin E1 which allowed a high incidence of visualization of the intrahepatic portal vein was described. There has been no description of the incidence of visualization of the intrahepatic portal veins in the previous literature. In the present series, the second intrahepatic portal branches were visualized in 82% of the cases for the right portal vein system, and in 41% in the left portal vein system. Better visualization of the right portal veins is explained by the facts that they are sited lower than the left portal veins in the supine position, and that the contrast medium is heavier than blood. Better visualization of intrahepatic portal veins in the female than in the male is probably due to the volume of contrast medium being relatively larger in the female than in the male on account of the difference in stature.

The arterial portography using prostaglandin E1 provided detailed visualization of the portal vein system. Moreover, it is a simple and safe procedure. Therefore, it is recommended for use in evaluating the portal vein system in malignant diseases of the liver. In conclusion, the incidence of visualization of the intrahepatic portal vein system was improved by superior mesenteric arteriography using prostaglandin E1.

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Minakuchi, K., Yamaguchi, S., Tamaki, M., Monna, T., and Yamamoto, S.: Transcatheter arterial embolization therapy in unresectable hepatomas. Experience in 15 cases. *Acta Hepatol. Jpn.* **20,** 595-603, 1979 (in Japanese).

LEGENDS FOR FIGURES

Fig. 1. Celiac arteriogram of primary liver cancer. The patient is a 53-year-old female. An irregular round tumor stain (arrows), 3 cm in diameter is observed in the caudate lobe supplied by the left hepatic artery. Intrahepatic arteries are irregular suggesting liver cirrhosis.

Fig. 2. Superior mesenteric arterial portogram of the patient shown in Fig. 1. The hyperlucent hypovascular area (arrows) is equivalent to the tumor stain in the arterial phase in Fig. 1.

Fig. 3. Celiac arteriogram of metastatic liver cancer originating from duodenal leiomyosarcoma. The patient is a 44-year-old female. Branches of right hepatic artery show stretching and displacement (arrows) and irregular tumor vessels are increased around the displaced arteries.

Fig. 4. Superior mesenteric arterial portogram of the patient shown in Fig. 3. Stretching and displacement of right portal branches (thin arrows) are shown. Portal branches are not evident in the tumor. Superior mesenteric vein shows shift to the left (thick arrows).

Fig. 5. Celiac arteriogram of a large liver cyst. The patient is a 58-year-old female. Intrahepatic branches of the right hepatic artery are stretched. Arterial branches are scarce in the right lobe, in which a large round liver cyst, 15 cm in diameter, was observed by peritoneoscopy.

Fig. 6. Superior mesenteric arterial portogram of the patient shown in Fig. 5. Portal branches are stretched like the arterial stretching in Fig. 5 in the right lobe. The border of the cyst is clearly demonstrated (arrows).

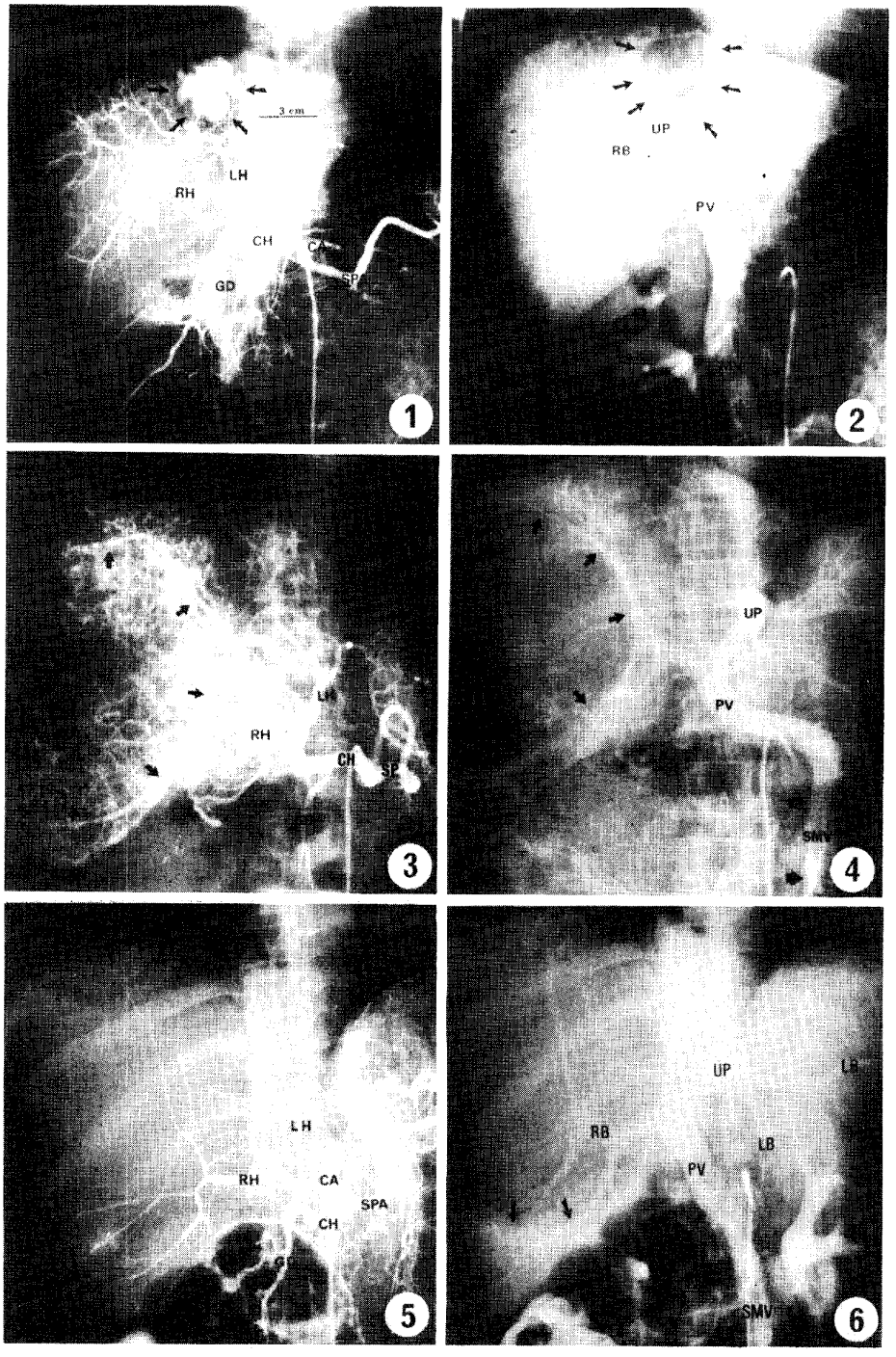
Fig. 7. Celiac arteriogram of a giant liver hemangioma. The patient is a 40-year-old female. The central portion of the hemangioma is supplied by the celiac artery. Numerous spotty stains, 1-5 mm in diameter, are observed in the right lobe. Arterial branches of the left hepatic artery are stretched and displaced. Arrows show the border between the central and inferior portions of the hemangioma (compare with Fig. 8).

Fig. 8. Superior mesenteric arterial portogram of the patient shown in Fig. 7. Superior and inferior portions of the hemangioma are supplied by the right hepatic artery originating from the superior mesenteric artery. Typical hemangioma stains are observed as in Fig. 7. Arrows indicate the border between the central and the superior or inferior portions of the hemangioma.

Fig. 9. Superior mesenteric arterial portogram of cancer of the head of the pancreas. The patient is a 48-year-old male. The main portal vein is occluded due to cancer invasion (thick arrows). The superior mesenteric vein flows into the liver through hepatopetal collaterals (thin arrows).

FOOT NOTE

RH, right hepatic artery; LH, left hepatic artery; CH, common hepatic artery; GD, gastroduodenal artery; CA, celiac artery; SPA, splenic artery; UP, umbilical portion; RB, right branch; LB, left branch; PV, portal vein; SPV, splenic vein; SMV, superior mesenteric vein.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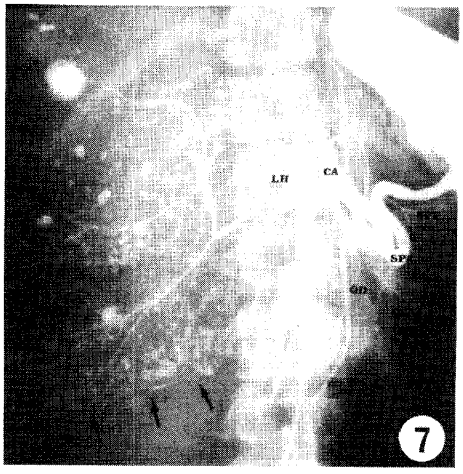
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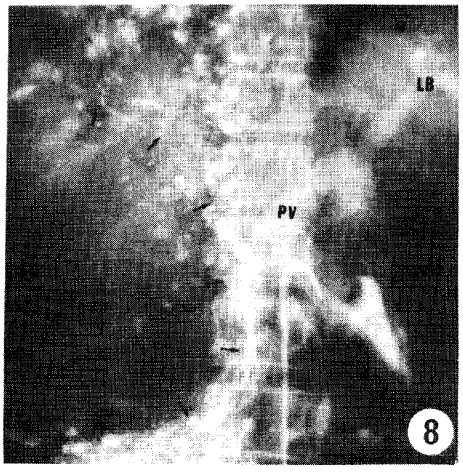
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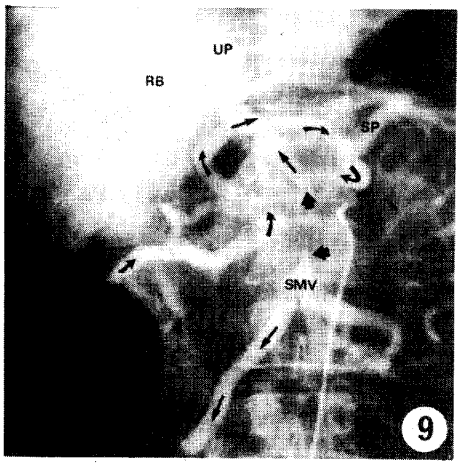
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