

Right hepatic arterial supply to the posterior aspect of segment IV of the liver: analysis by CT during hepatic arteriography

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Abstract

Objective: To examine the frequency of the right hepatic arterial supply to the posterior aspect of segment IV (PASIV) of the liver shown on computed tomography (CT) during hepatic arteriography (CTHA).

Materials and methods: Seventy-four patients who underwent CTHA from the right and/or left hepatic artery were studied. The right arterial supply to the PASIV was determined when the PASIV was stained on CT during right hepatic arteriography without any opacified arteries originating from the right hepatic artery and distributing to segment IV through the left hepatic hilum or when no staining was seen in the PASIV on CT during left hepatic arteriography. The frequency of the right hepatic arterial supply to the PASIV demonstrated on CTHA was analyzed.

Results: In six of 74 patients (8%), the PASIV was supplied from the right hepatic artery.

Conclusion: This PASIV was supplied by the right hepatic artery in a significant proportion of cases.

Key words: Hepatic artery—Segment IV—Blood supply—Liver.

The posterior aspect of segment IV (PASIV) of the liver has unique imaging characteristics. We previously showed that these characteristics have a close correlation with the portal supply at the PASIV [1–5]. According to a previous analysis by computed tomography (CT) during arterial portography (CTAP) with a helical CT system, the portal supply of the PASIV outside the medial segmental portal branch was seen in 60% of cases, and approximately 18% of these cases was supplied from the

right portal vein [1]. In addition to portal venous supply, there have been several cases of hepatocellular carcinoma at the PASIV fed by arteries originating from the right hepatic artery [1]. However, there has been no report analyzing precisely the right arterial supply to the PASIV because of methodologic difficulties in the analysis.

In the present study, we examine the frequency of right hepatic arterial supply to the PASIV of the liver by CT during hepatic arteriography (CTHA) and discuss its clinical significance.

Materials and methods

Seventy-four consecutive patients examined by CTHA from the right and/or left hepatic artery separately with a helical CT system between April 1994 and September 1997 were reviewed and analyzed. Forty men and 34 women, aged 40–74 years, were seen. CTHAs were performed for the precise evaluation of hepatic tumors in all patients, including 70 patients with liver cirrhosis and hepatocellular carcinoma and four patients with metastatic liver cancers. The patients with liver tumors in segment IV were excluded from the study.

In all patients, the right hepatic artery branched from the superior mesenteric artery, and the left hepatic artery branched from the celiac artery. CTHAs were performed with a helical CT scanner (HiSpeed Advantage, General Electrics, Milwaukee, WI, or Xvision SP, Toshiba, Tokyo, Japan). For CTHA, a catheter was inserted into the proximal portion of the right or left hepatic artery, and iohexol (300 mg/mL iodine, Daiichi, Tokyo, Japan) was infused at a rate of 1.0–1.5 mL/s during the scanning of the entire liver. Helical CTHA was performed with 2–5-mm collimation, a table speed of 2–5 mm/s, and an axial reconstruction interval of 1.0–3.5 mm.

The frequency of right hepatic arterial supply to the PASIV visualized on CTHA was analyzed. Right arterial supply to the PASIV was determined when the PASIV was stained on CT during right hepatic arteriography without any opacified arteries originating from the right hepatic artery and distributing to segment IV through the left hepatic hilum or when no staining was seen in the PASIV on CT during left hepatic arteriography. The origin of the artery supplying blood to the PASIV from the right hepatic artery was also evaluated by arteriography with a digital angiography system or CTHA.

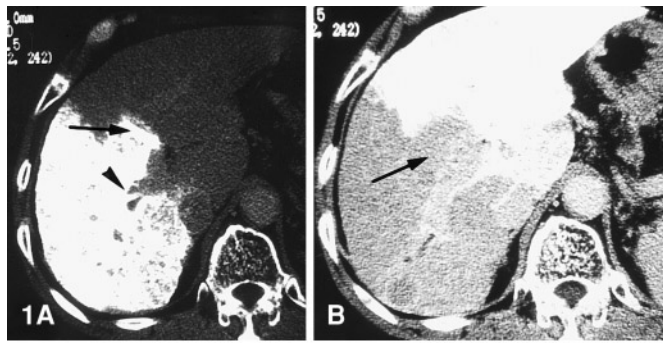


Fig. 1. Blood supply from the proximal portion of the right anterior segmental artery to the posterior aspect of segment IV. **A** CT during right hepatic arteriography shows opacification of the posterior aspect of segment IV and a tiny supplying artery (*arrow*) branching from the proximal portion of the right anterior segmental artery (*arrowhead*). **B** CT during left hepatic arteriography shows a stain defect in the posterior aspect of segment IV (*arrow*).

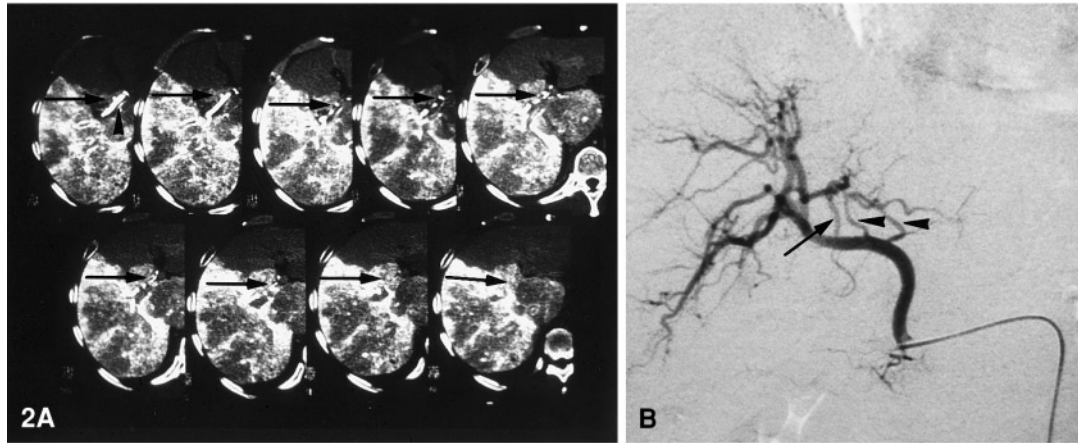


Fig. 2. Blood supply from the main trunk of the right hepatic artery. **A** Caudocranial sequential slices (from upper left to lower right) of CT during right hepatic arteriography show opacification of the posterior aspect of segment IV and a tiny supplying artery (*arrows*) branching from the main trunk of the right hepatic artery (*arrowhead*). **B** Right hepatic arteriography shows the supplying artery directly branching out from the main trunk of the right hepatic artery (*arrow*). *Arrowheads* indicate the caudate artery.

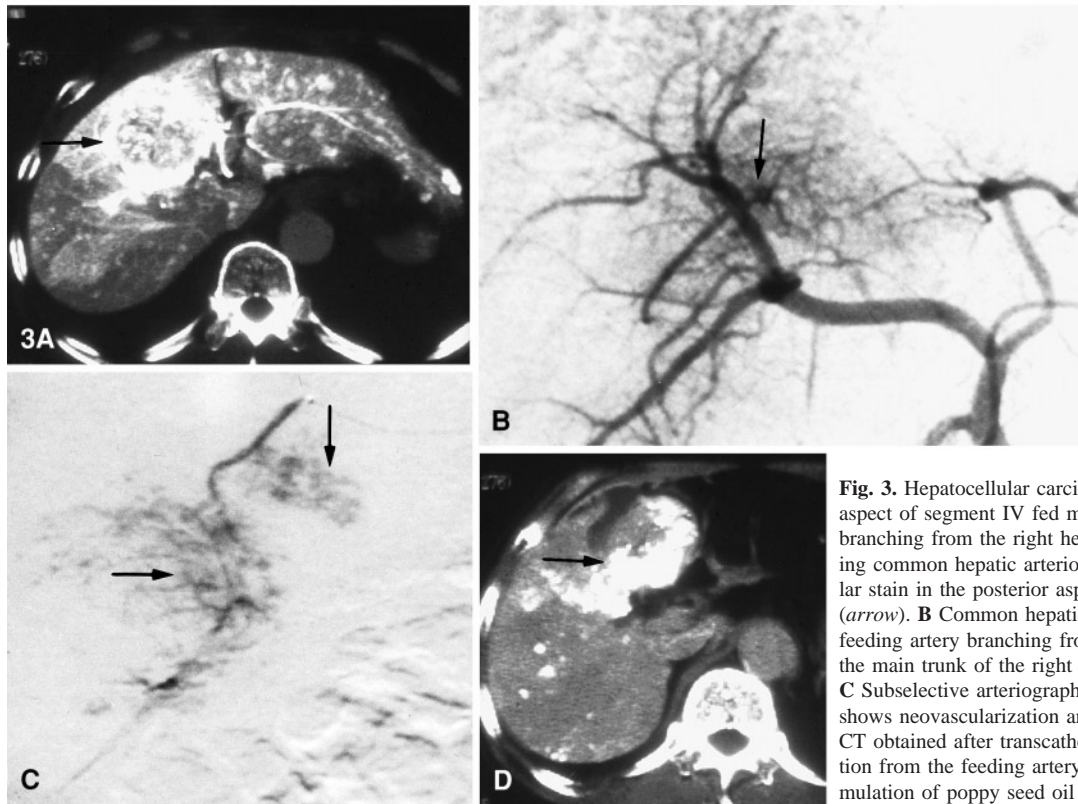


Fig. 3. Hepatocellular carcinoma in the posterior aspect of segment IV fed mainly by the artery branching from the right hepatic artery. **A** CT during common hepatic arteriography shows a nodular stain in the posterior aspect of segment IV (*arrow*). **B** Common hepatic arteriography shows a feeding artery branching from the distal portion of the main trunk of the right hepatic artery (*arrow*). **C** Subselective arteriography of the feeding artery shows neovascularization and staining (*arrows*). **D** CT obtained after transcatheter arterial embolization from the feeding artery shows diffuse accumulation of poppy seed oil in the tumor (*arrow*).

Results

In six of 74 patients (8%), the PASIV was supplied from the right hepatic artery on CTHA. In five of these six patients, the supplying artery could be identified by arteriography or CTHA. The supplying artery branched from the proximal portion of the right anterior segmental artery in three patients (Fig. 1), the caudate branch in one patient, and the main trunk of the right hepatic artery in one patient (Fig. 2).

Discussion

Blood for the entire portion of segment IV has been thought to be supplied by the arteries originating from the left hepatic artery. In our review of the literature, there has been no report describing right arterial blood supply to segment IV. However, we previously reported that on CTAP the PASIV was supplied from the right portal vein in about 18% of patients [1]. Therefore, we thought that there must be a right arterial supply to the PASIV in some cases. In the present study, we have shown that on CTHA the PASIV was supplied from the right hepatic artery in 8% of patients. We do not know what can account for the difference in frequencies between these two analyses. One reason for this discrepancy may be the difference in sensitivity of each of modality to identify the supplying vessels and complexity of the anatomy of the arterial system. Another reason may be the study population in the present study, in whom branching of the aberrant right hepatic artery from the superior mesenteric artery was

seen. In any case, the right hepatic arterial supply to the PASIV was demonstrated in 8% of these patients. This frequency is considered to be relatively high, and it should not be overlooked in clinical practice. This fact is especially important in the arteriographic diagnosis and transcatheter arterial embolization of hepatic tumors. Figure 3 shows a case of hepatocellular carcinoma in the PASIV supplied mainly by the artery originating from the right hepatic artery. For transcatheter arterial embolization of this kind of tumor, recognizing the right arterial supply is very important.

In conclusion, the right arterial supply to the PASIV was verified on CTHA in 8% of patients. Knowledge of this vascular anatomy is clinically important.

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