J HK Coll Radiol. 2010;13:26-8

CASE REPORT

The Focal Hepatic 'Hot Spot' Sign of Superior Vena Cava Obstruction in Contrast-enhanced Computed Tomography

J Joseph, H Narayanan, H Babu, A Praveen

Department of Radio-diagnosis, Trivandrum Medical College, K-11B, Kailas Nagar, Kesavadasapuram, Trivandrum, Kerala, India 695011

ABSTRACT

In patients with superior vena caval obstruction, computed tomography of the liver in its arterial or early portal phase may show abnormal hyperattenuation in segment IV of the left hepatic lobe. This abnormal enhancement is due to porto-systemic venous shunting between the superior vena cava and portal vein. The 3 major collateral pathways after central venous obstruction in the thorax are the superior, posterior, and the anterolateral routes. In one of the anterolateral pathways, collateral veins return blood to the left hepatic lobe via the internal mammary and paraumbilical veins, thereby creating a 'hot spot' in the left hepatic lobe, around the union of the paraumbilical vein and left main branch of the portal vein. This is the equivalent of a similar sign described initially for radionuclide liver scans. The focal hepatic 'hot spot' sign in computed tomography should strongly suggest central venous obstruction in the thorax. We report a rare case, in which a radiological diagnosis of lung cancer and associated superior vena cava obstruction yielded an abnormal strong enhancement in the medial segment of left lobe of the liver during the arterial phase of helical computed tomography.

Key Words: *Liver; Portal vein; Superior vena cava syndrome; Technetium Tc 99m sulfur colloid; Tomography, X-ray computed*

中文摘要

上腔靜脈阻塞在電腦斷層增強掃描上的局灶性肝臟「熱灶」

J Joseph, H Narayanan, H Babu, A Praveen

上腔靜脈阻塞患者的肝臟電腦斷層掃描動脈期或門脈早期可能顯示肝左葉IV段異常高密度。這種異常强化由上腔靜脈與門靜脈之間的門－體分流導致。胸部中央靜脈阻塞後主要形成上方、後方及前外側三種側枝循環通路。內乳靜脈及臍周靜脈的血液經前外側側枝循環之一回流至肝左葉，在臍周靜脈與門靜脈左主枝的匯合處周圍形成「熱灶」。肝臟放射性核素掃描研究曾描述過類似現象。電腦斷層掃描中的局灶性肝臟「熱灶」强烈提示胸內中央靜脈阻塞。本文報告一罕見病例，因肺癌伴發上腔靜脈阻塞，其左肝葉內側段在螺旋電腦斷層掃描掃描動脈期出現高度强化。

INTRODUCTION

In the presence of obstruction of the superior vena cava (SVC), the left lobe of liver may show increased blood flow due to collaterals, which can be visualised by imaging. Collateral flow to the left lobe is through internal mammary and paraumbilical veins, thus creat-

Correspondence: *Dr John Joseph, K-11B, Kailas Nagar, Kesavadasapuram, Trivandrum, Kerala, India 695011.*
Tel: (91) 009 447467795; Email: johnjosephjj@yahoo.co.in

Submitted: 12 Oct 2009; Accepted: 13 Jan 2010.

ing a 'hot spot' where the paraumbilical vein and left main branch of the portal vein join. The equivalent of this sign, which was initially described in radionuclide scans, can be appreciated as areas of hyperattenuation in post-contrast computed tomography (CT).[1] We report a case of radiological lung cancer with SVC infiltration, in which an abnormal strong enhancement ('hot spot') was noted in the medial segment of left lobe of the liver during the arterial phase of helical CT.

CASE REPORT

A 40-year-old male presented with respiratory distress and facial oedema. Clinically there were signs of SVC obstruction. Chest radiography revealed a mass lesion in right hilar region.

Figure 1. Post-contrast computed tomographic image of the thorax showing a mass lesion in right hilum with infiltration and thrombosis in the superior vena cava and abnormal collaterals in anterior and posterior walls of the chest.

Contrast-enhanced CT scan in our department revealed a mass lesion in the right hilum infiltrating and obstructing the SVC with abnormal collaterals in the anterior and posterior chest wall (Figure 1). The CT also revealed a hyperdense area involving segment IV of left lobe of liver in the early arterial phase, which was consistent with the focal hepatic 'hot spot' sign of SVC obstruction due to collateral drainage (Figure 2). In the portal venous phase, the lesion was much less apparent (Figure 3) and isodense in delayed images.

DISCUSSION

In the presence of SVC obstruction, the left hepatic lobe may occasionally demonstrate areas of focally increased blood flow in the collateral veins, which can be detected by imaging. Typically, the collateral venous pathway comprises the internal mammary and paraumbilical veins, which create a 'hot spot' due to high blood flow around the area of union of the paraumbilical vein and the left main branch of the portal vein.

This was initially described in radionuclide imaging of liver, i.e. on ^{99m}Tc-sulfur colloid scans, as an area of increased activity, specifically in segment IV of the liver (i.e. the medial segment of the left hepatic lobe in what

Figure 2. Early arterial phase image of the liver showing an ill-defined hyperdense area involving segment IV of the left lobe of the liver. Contrast is also noted in the inferior vena cava as well as abnormal collaterals in the anterior abdominal wall.

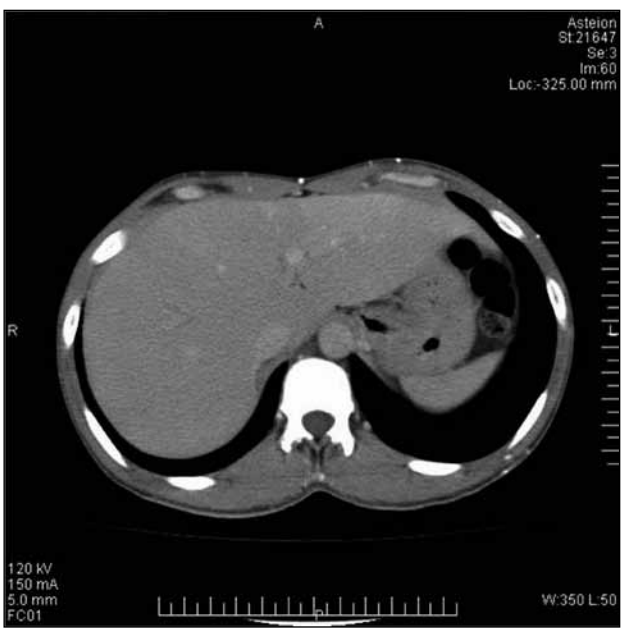

Figure 3. In late portal venous phase, the area is faintly hyperattenuated and much less apparent.

was formerly known as the quadrate lobe). This feature was referred to as the focal hepatic 'hot spot' sign.[2] Its equivalent may rarely also be seen on post-contrast CT scans, as a focal area of hyperattenuation in segment IV during the arterial or early portal venous phases.[1] This appearance has been well documented in patients with SVC obstruction and is described as the focal hepatic 'hot spot' sign.[2,3] Surprisingly, such focal liver enhancement was seen in only one of 22 patients with either SVC, brachiocephalic, or subclavian vein obstruction in a series reported by Bashist et al.[4]

After central venous obstruction in the thorax, 3 major collateral venous pathways are available: the superior route, the posterior route, and the anterolateral route.[5] The superior route comprises the anterior jugular venous system, which connects the internal jugular and subclavian veins. This is seen in obstruction of more peripheral veins of the thorax such as the subclavian or brachiocephalic veins. The posterior route involves the azygous-hemiazygous system and paravertebral veins. The azygous-hemiazygous system is usually involved in cases of obstruction of the terminal portion of SVC, beyond the insertion of azygous vein. The anterolateral route connects the anterior intercostal, internal mammary and long thoracic veins to the inferior vena cava via the pericardiophrenic, musculophrenic, lumbar, and hepatic veins. It is one of the anterolateral pathways which is responsible for the phenomenon described in this report.[5]

To conclude, abnormal arterial phase enhancement of segment IV of the liver in CT scans is seen in SVC obstruction, and is described as the focal hepatic 'hot spot' sign. It should not be mistaken as a hepatic lesion and more importantly, its detection should immediately prompt the radiologist to search for central venous obstruction within the thorax.[3,6]

Acknowledgements

We sincerely thank Dr N Roy, Head of the Department of Radiodiagnosis, Trivandrum Medical College, India for the guidance offered.

REFERENCES

1. Maldjian PD, Obolevich AT, Cho KC. Focal enhancement of the liver on CT: a sign of SVC obstruction. J Comput Assist Tomogr. 1995;19:316-8.
2. Yamada T, Takahashi K, Shuke N, et al. Focal hepatic "hot spot" in superior vena cava obstruction: correlation between radiocolloid hepatic SPECT and contrast-enhanced CT. Clin Nucl Med. 1999;24:533-4.
3. Dickson AM. The focal hepatic hot spot sign. Radiology. 2005;237:647-8.
4. Bashist B, Parisi A, Frager DH, Suster B. Abdominal CT findings when the superior vena cava, brachiocephalic vein, or subclavian vein is obstructed. AJR Am J Roentgenol. 1996;167:1457-63.
5. Gosselin MV, Rubin GD. Altered intravascular contrast material flow dynamics: clues for refining CT diagnosis. AJR Am J Roentgenol. 1997;169:1597-603.
6. Al Mane KA, Al Maziad GA, Al Wabil AS. Pseudolesion in left lobe of the liver due to superior vena cava obstruction. Saudi Med J. 2000;22:74-5.