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Case Report
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Quadruple Hepatic Arteries in Patient with Hepatocellular Carcinoma: Case Report

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Abstract

A 58-year-old woman who had recently developed vague right-sided abdominal pain. Pre-contrast and triphasic CT scans were performed by using a 64 multi-detector CT scanner. Patient underwent hepatic resection. The preoperative findings of multi-detector row CT data sets were compared with intra-operative findings, which served as the standard of reference. There were 4 hepatic arterial supplies. 1st hepatic artery was small and originated from aorta. 2nd artery originated from aorta. 3rd artery originated from celiac trunk. 4th artery was left hepatic artery and originated from LGA. Segment and distal subsegmental branches were clearly delineated.

Keywords: 64 Multidetector; CT angiography; Hepatic artery

Case Presentation

A 58-year-old woman who had recently developed vague right-sided abdominal pain. A physical examination revealed cirrhotic liver and splenomegaly; otherwise, the findings were unremarkable. Ultra-sonography performed for suspicion of a gall or renal stones revealed hepatic mass. Her medical history included hepatitis C virus positive. The laboratory study on admission showed the following results: mild elevated total bilirubin 1.4 mg/dL (normal 0.1–1.1), aspartate aminotransferase (AST) 95 IU/mL (up to 40), alanine aminotransferase (ALT) 105 IU/L (up to 40). Serum a –fetoprotein level was 550 ng/mL (550 m g/L) (normal level, 5.0 ng/mL [5.0 m g/L]). Pre-contrast and triphasic CT scans were performed by using a 64 multi-detector CT scanner (Brilliance 64; Philips Healthcare, Best, The Netherlands).

Patient underwent hepatic resection. The preoperative findings of multi-detector row CT data sets were compared with intra-operative findings, which served as the standard of reference. The study was approved by our institutional review board, and informed consent was waived.

CT data obtained were transferred to the workstation (Extended Brilliance Workspace V3.5.0.2254) (EBW) for post processing and analysis. Contrast-enhanced CT revealed right liver lobe hepatic focal lesion. The lesion heterogeneously enhanced in arterial phase, washout in portal and delayed phases. Arterial phase images were analyzed. The imaging analysis was based on source images and three dimensional (3D) post processing images (maximum intensity projections and shaded surface display) (MIP and SSD) as well as multiplanar reformation (MPR). There were 4 hepatic arterial supplies. These were arranged in clock wise location. 1st, 2nd, 3rd and 4th arteries are pink, green, yellow and red respectively (Figure 1 and 2). 1st hepatic artery was small and originated from aorta. 2nd artery originated from aorta. 3rd artery originated from celiac trunk. 4th artery was left hepatic artery and originated from LGA. Segment and distal sub segmental branches were clearly delineated. Portal vein was patent. No vascular malformation, distortions, stenosis or arterio-venous shunting were depicted

Discussion

Preoperative knowledge of variant anatomy can assist in the selection of treatment options, facilitate surgical dissection, and help avoid iatrogenic hepatic injury [1]. Three-dimensional MDCT angiography is accurate for classification of hepatic arterial anatomy before hepatic resection [2].

Michels' classic autopsy series of 200 dissections, published in 1966, defined the 10 basic anatomic variations in hepatic arterial supply have served as the benchmark for all subsequent contributions in this area. In the standard anatomy, the celiac axis gives rise to three branches. The first branch is the LGA, after which the vessel divides into the splenic artery and CHA. The CHA

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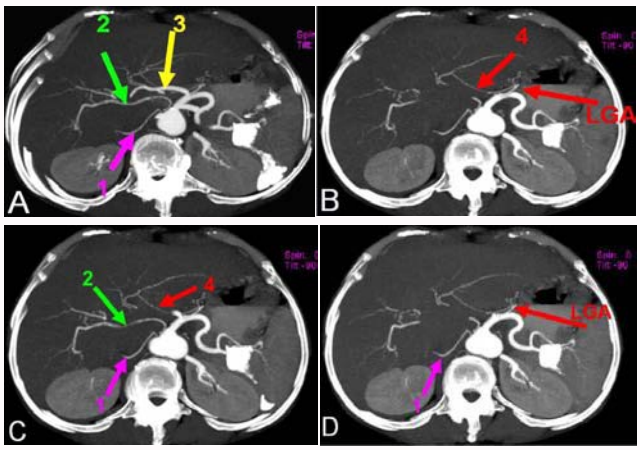

Figure 1 (A-D): Axial oblique MIP image demonstrates 4 hepatic arterial supplies. These are in clock wise location. 1st, 2nd, 3rd and 4th arteries are pink, green, yellow and red respectively. 1st hepatic artery originates from aorta. 2nd artery originates from aorta. 3rd artery originates from celiac trunk. 4th artery is left hepatic artery and originated from LGA. Segment and distal subsegmental branches are clearly delineated.

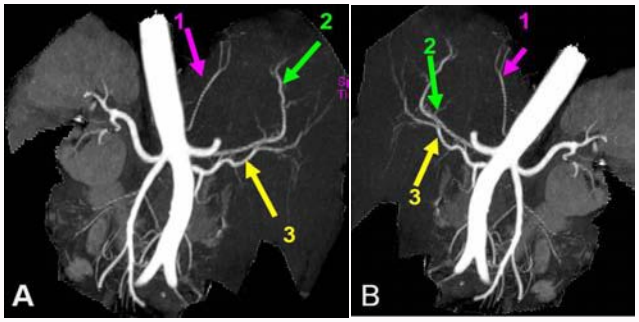

Figure 2: Coronal oblique MIP image (A and B posterior & anterior views) demonstrates 1st, 2nd and 3rd arteries. 1st hepatic artery (pink) originates from aorta. 2nd artery (green) originates from aorta. 3rd artery (yellow) originates from celiac trunk. Segment and distal subsegmental branches are clearly delineated.

then bifurcates into the GDA and PHA, and the PHA bifurcates into the RHA and LHA [3]. Another subsequent studies evaluated hepatic arterial variants [1,2,4-6].

The technological development of the multidetector computed tomography (MDCT) scanner allows not only a more rapid acquisition of axial images but also volumetric scanning in a desired anatomic area during selected phases of contrast enhancement. MDCT angiography (MDCTA) has become an established noninvasive imaging method to define vascular anatomy and pathology affecting vascular structures, as well as for presurgical treatment planning [7,8].

CT has been combined with 3D CT angiography not only for the depiction of the hepatic vascular anatomy but also for the assessment of the number of lesions and their size, segmental location, and hypervascularity [9-11].

MDCTA is an effective, high-resolution, noninvasive imaging technique that readily demonstrates the presence of vascular and neoplastic pathology, with a direct impact on treatment decisions including patient selection for surgical management [12].

The advent of 64-row multidetector computed tomography (MDCT), thanks to isotropic spatial resolution, the extremely fast CT data acquisition, and the consequent optimization of enhancement, has made MDCT invaluable in the evaluation of vascular arterial anatomy [4].

The new generation of 64-row MDCT allows optimal visualization of splanchnic vascular anomalies with a minimally invasive examination. This visualization is extended to those vessels with a small caliber and slow flow resulting in difficult recognition by classic angiographic studies. The knowledge of anomalous arterial patterns could be very useful in the preoperative planning of surgical and interventional liver procedures [4]. So, the non previously described anatomical variant of hepatic arteries has been encountered as in our case.

For evaluation of hepatic arterial supply, we used axial source and reformatted images. Reformates included SSD, MIP and MRP that created in different angles of views for more delineation of arterial trees. Two hepatic arteries originate from aorta at the same level of celiac trunk, but they are small. The hepatic arterial supplies are visualized up to their terminal sub capsular branches. 2D data sets and 3D 64-row MDCT angiogram provide better visualization and accurate vascular mapping of hepatic arterial anatomy. This is in agreement with previous studies [4,12].

Our study presents a rare anatomical variant of hepatic arterial supply in a patient with hepatocellular carcinoma (HCC) using 64 multidetector CT angiography. The new generation of 64 multidetector CT angiography permits comprehensive and accurate assessment of the hepatic vascular anatomy in liver resection. Preoperative knowledge of the range of hepatic arterial anomalies and their specific frequencies is of greater importance in the planning and performance of hepatic resection.

In conclusion, we have presented a case of quadruple hepatic arterial supply in case of hepatocellular carcinoma, to our knowledge, the present case is the first published report to four hepatic arteries. The new generation of 64 multidetector CT angiography permits comprehensive and accurate assessment of the hepatic vascular anatomy in liver resection. Awareness' of this rare anatomical variant is very important of hepatic surgery to facilitate surgical dissection, and help avoid iatrogenic hepatic injury.

Teaching point

Quadruple hepatic arterial supply is a very rare. Preoperative knowledge of the range of hepatic arterial anomalies is of greater importance in the planning and performance of hepatic resection. The new generation of 64-row MDCT allows optimal visualization of hepatic vascular anomalies with a minimally invasive examination.

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