A Rare Variation of Hepatic Arteries (Michels Type IV): MDCT Angiographic Findings

Nadir Bir Hepatik Arter Varyasyonu (Michels Tip IV): ÇKBT Anjiyografi Bulguları

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Abstract

Recently, evaluation of hepatic artery variations has become increasingly important as liver transplantation from live donors gains in popular. Many diagnostic tools can be used to evaluate hepatic artery anatomy. Multi-detector computed tomography angiography (MDCTA) is one these methods. In this case report, we represent MDCTA findings of Michel type IV variation, which is a very rare condition of hepatic arteries.

Keywords: Hepatic artery, Michel's Classification, MDCT, Variations

Özet

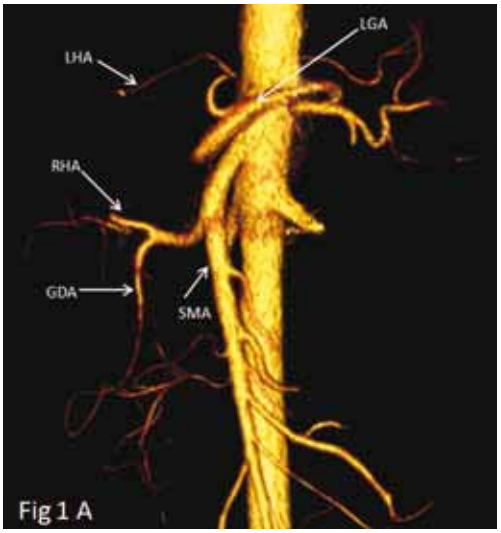
Günümüzde özellikle canlıdan karaciğer nakli yaygınlaştıkça hepatik arteriyel varyasyonların değerlendirilmesi de büyük önem kazanmıştır. Karaciğer arteriyel yapılarının değerlendirilmesinde birçok yöntem kullanılır. Çok kesitli bilgisayarlı tomografi anjiyografi (ÇKBTA) de bu yöntemlerden biridir. Bu yazımızda hepatik arterlerin nadir görülen bir varyasyonu olan Michel' s Tip IV varyasyonu olan olgunun, ÇKBTA bulgularını sunduk.

Anahtar Kelimeler: *Hepatik arter, Michel's Sınıflaması, ÇKBT, Varyasyonlar*

Introduction

Recently, due to the rapid increase in the number of liver transplants from live donors, the importance of hepatic artery anatomy has become apparent. Appropriate evaluation of hepatic arteries is essential for reducing operative and post-operative morbidity and mortality both in donors and recipients. Many techniques are used for this purpose, including MDCTA, which can be used to delineate the hepatic vascular anatomy.

Conventional angiography represents the gold standard of vessel imaging. Multi detector-row CT (MDCT) provides significant advantages over single detector-row CT (SSCT). The simultaneous acquisition of more slices during a complete rotation of the gantry, together with an increased rotational speed (0.5 s and less), lead to a decrease in the acquisition time, allowing for the analysis of large anatomical volumes with better spatial and temporal resolution of images, justifying the use of contrast medium [1,2,3].



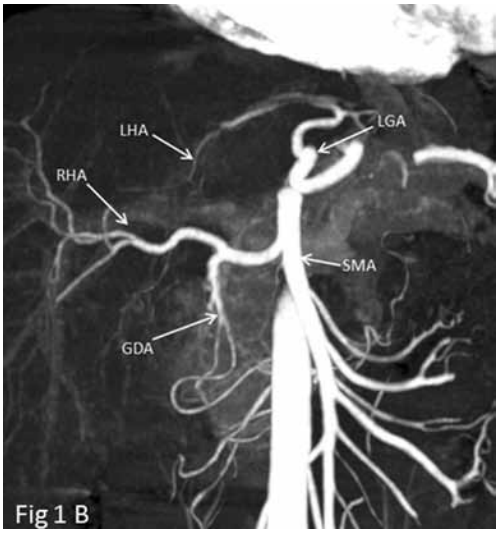


Fig. 1 A, B— Contrast-enhanced MDCT scan. (A) Volume-rendered 3D image showing Michel's Tip IV hepatic arterial variation. (B) Coronal MIP images showing Michel's Tip IV hepatic arterial variation. SMA; Superior mesenteric Artery, GDA; Gastro Duodenal Artery, LHA; Left Hepatic Artery, RHA; Right Hepatic Artery, LGA; Left Gastric Artery.

Case Report

The patient was a 32-year-old male donor candidate referred to our clinic. Clinical history and physical examination were unremarkable. Contrast-enhanced MDCT was performed. Arterial phase images were acquired 22 seconds after an IV contrast agent was administered. In these images, the splenic artery and left gastric artery arose from the aorta via a separate root. The images also demonstrated that the left hepatic artery and gastroduodenal artery originated from the superior mesenteric artery (SMA) and that the left hepatic artery arose from the left gastric artery (Fig 1A. B).

Discussion

Variant hepatic and celiac arterial anatomies have been reported in 55% of patients on the basis of initial cadaveric dissections by Michels [5] (Table 1). Vascular mapping and planning of vascular reconstructions are important for the safety of both the donor and the recipient. To prevent ischemia in the recipient, all arteries that vascularize the donating lobe must be preserved [4]. In donors for pediatric patients receiving left lobe transplantation, an accessory or replaced left hepatic artery (LHA) is an important arterial variation (Michel Classification, Type II and V).

Table 1. Michel's classification

Type	Description
I	Arteria hepatica propria originates from the common hepatic artery and bifurcates into the right and left hepatic arteries (classical anatomy)
II	Replaced left hepatic artery arising from left gastric artery
III	Replaced right hepatic artery arising from superior mesenteric artery (SMA)
IV	Replaced right+left hepatic arteries described as Type II and III
V	Accessory left hepatic artery arising from left gastric artery
VI	Accessory right hepatic artery arising from SMA
VII	Accessory right hepatic artery arising from SMA and accessory left hepatic artery arising from left gastric artery
VIII	Replaced right hepatic artery and accessory left hepatic artery or replaced left hepatic artery and accessory right hepatic artery
IX	The common hepatic artery arising from SMA
X	The common hepatic artery arising from left gastric artery
XI	For any variant not described for types I-X

In left lobe donation, knowledge of LHA variation is important. Before transplantation surgery, determination of major hepatic vascular variations and the origin of the segment 4 artery are particularly essential for right lobe resection [4]. The large number of arteries that require anastomosis creates technical difficulties during surgery that could lead to donor rejection. Insufficient arterial perfusion may result in biliary stricture, cholangitis, and eventually graft failure because the biliary ducts are vascularized only by the hepatic arteries [6]. In right lobe transplantation, when the segment 4 artery originates from the right hepatic artery (RHA), RHA division must be made distal to the segment 4 artery origin. Otherwise, the left lobe of the donor may turn ischemic and fail [4]. In the case of the RHA originating from common hepatic artery (CHA) or an anomaly in which the LHA arises before the gastroduodenal artery, because the clamping of the CHA will prevent the perfusion of the stomach and the duodenum, knowledge of these variations would determine the surgical process. Trifurcation of the gastroduodenal artery and the left and right hepatic arteries from the common hepatic artery similarly requires utmost attention in arterial ligation during the operation [4].

Conventional angiography represents the gold standard of vessel imaging. However, although generally considered safe, DSA may be associated with complications that result from the procedure itself, with a complication rate of up to 1% depending on the experience of the operators, site of vascular access, diameter of the catheter, and administered contrast material [7-9].

Due to these drawbacks, MDCT angiography has become a valuable, minimally invasive tool for the visualization of normal vascular anatomy and its variants, as well as pathological conditions of the celiac trunk and its vessels. In contrast to DSA, MDCT allows in one step the ability to correctly assess both the abdominal arteries and parenchyma. Furthermore, reformatted three-dimensional MDCT images allow for the visualization of vascular structures in angiography-equivalent planes other than the axial plane, reducing the risk of iatrogenic injuries in cases of complex vascular anatomy. MDCT angiography is accurate and minimally invasive for the evaluation of the celiac trunk, allowing for the description of normal anatomy as well as anatomical variants; it spares the patient the discomfort and the associated morbidity of angiography, analgesia, and post-procedural observation [10].

In conclusion, delineating the hepatic vascular anatomy of liver donors plays an important role in operative and post-operative prognosis. MDCTA is a fast, reliable, non-invasive and definitive modality of choice that can easily be used under such circumstances.

Conflict interest statement The authors declare that they have no conflict of interest to the publication of this article.

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