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Case Report
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Replaced Common Hepatic Artery Arising from the Superior Mesenteric Artery Discovered Over a Pancreaticoduodenectomy: A Case Report

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Abstract

Knowledge of the anatomic variations of the hepatic artery is crucial in the planning and performance of pancreaticoduodenectomy to avoid irreversible complications. This can be revealed by preoperative imaging of the hepatic blood supply. However, sometimes the diagnosis is made intraoperatively and often a surprise too many surgeons. We report the case of a 44-year-old female patient who was admitted for a mass of the neck and the body of the pancreas. She underwent a pancreaticoduodenectomy extended to the body of the pancreas. A common hepatic artery originating from the superior mesenteric artery was not identified on preoperative imaging and was discovered intraoperatively. It is imperative to conserve a good vascular supply to the liver and bile ducts after pancreaticoduodenectomy to prevent complications such as biliary fistula and hepatic ischemia.

Keywords: Hepatic artery; Superior mesenteric artery; Pancreaticoduodenectomy; Vascular anomalies

Introduction

The anatomy of the hepatic artery is highly variable. Artery variants are found in almost 50% of the population [1]. A Replaced Common Hepatic Artery (RCHA) arising from the Superior Mesenteric Artery (SMA) is uncommon; its incidence is arranged between 1.5 and 4.0% [2]. This case study aims to describe the anatomic variation of the Common Hepatic Artery (CHA) originating from the SMA which can be encountered during pancreaticoduodenectomy to highlight the possible existence of such variants, especially if the diagnosis is not made on preoperative imaging.

Case Presentation

A 44-year-old female patient with a BMI of 35 kg/m^2 was addressed to our surgical department for surgical treatment of a mass of the pancreas. She had a two-month history of epigastric pains. Regarding her medical history, she had bilateral uveitis under local treatment, surgical history of umbilical hernia repair, and open cholecystectomy 5 years ago. Physical examination revealed tenderness in the epigastric region without any palpable mass. Basic blood work showed a WBC 4000/mm, Hemoglobin 12 g/dl, CRP was normal at 2.2 mg/l, with normal electrolytes, renal and liver function test. Serum tumor markers such as CA 19-9 et ACE were also normal. Abdominal ultrasound showed the presence of a coarsely rounded hypoechogenic nodular mass of 2.5 cm located in the body of the pancreas. The patient had an abdominal CT scan which revealed a 25 mm × 20 mm mass of the neck and the body of the pancreas without vascular invasion (Figure 1). The SMA and the celiac trunk were intact. An abdominal MRI also showed a hyper signal tumor process of the pancreas measuring 46 mm × 39 mm (Figure 2). RCHA was not seen. An echo-endoscopy of the pancreas also confirmed the MRI findings. Fine-needle aspiration of the mass was negative. The patient underwent a midline laparotomy. Intra-operatively, a mass of the neck and body of the pancreas and magma of lymphadenopathy to the hepatic hilum were noted. During the dissection of the hepatic pedicle, we found an anatomical variant of a CHA originating directly from the SMA, which was carefully dissected from its origin at the SMA and preserved, after the section of the pancreas parenchyma (Figure 3). The postoperative course was marked on day 15 by a collection in the lesser omental sac which was drained radiologically. The histopathological analysis concluded a chronic epithelioid granulomatous pancreatitis. An anti-bacillary treatment was started using rifampicin, isoniazid, pyrazinamide, and ethambutol for 2 months, followed by the combination of

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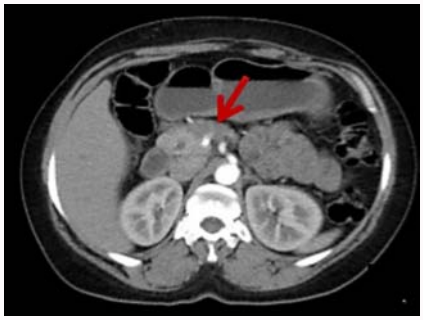

Figure 1: CT scan showing 25 mm × 20 mm mass of the neck and the body of the pancreas.

Figure 2: Intraoperative image after section of the pancreas showing the common hepatic artery coursing (a) behind the portal vein (b).

rifampicin and isoniazid for 4 months was prescribed. The patient has been followed up in the hepato-gastroenterology department.

Discussion

The celiac trunk in normal or classical anatomy trifurcates into three branches which are the Left Gastric Artery (LGA), splenic artery, and CHA that branches off the Gastroduodenal Artery (GDA) and proper hepatic artery, this one gives rise to the Right Hepatic Artery (RHA) and the Left Hepatic Artery (LHA) [3]. Anatomy variations of the hepatic artery are seen in 24% to 45% of cases [2]. Numerous studies over the past century have examined the anatomy of the hepatic arteries. Based on the results of 200 cadavers autopsy Michel described anatomical variations of hepatic artery and identified a classification of 10 types, type I: Normal pattern, type II: A replaced LHA from the left gastric artery, type III: A replaced RHA from the SMA, type IV: Replaced RHA and LHA; type V: An accessory LHA, type VI: An accessory RHA, type VII: Accessory RHA and LHA, type VIII: A replaced RHA or LHA with other hepatic artery being an accessory one, type IX: The hepatic trunk as a branch of the SMA, and type X: The CHA from the left gastric artery. This classification was updated by Hiatt who defined 6 categories of anatomical variations of the hepatic artery, Hiatt type I: The normal anatomy, Hiatt type II: The LHA arising from the left gastric artery, Hiatt type III: The RHA originating from the SMA, Hiatt type IV: Every combination of a double replaced model, Hiatt type V: The CHA arising from the SMA, Hiatt type VI: Abnormality that consists of the CHA isolated aortic origin [4-6]. According to its position relative to the pancreas after arising from SMA, RCHA may have various pathways; it can pass behind the pancreas, through it, or along its ventral side. In a study performed by Michel et al. half of RCHA passed through the pancreas while the other half passed behind it. Higashi et al. described the course of RCHA relative to the superior mesenteric vein into types III-A (the artery coursing in front of the superior mesenteric vein) and IV-A (the artery coursing behind the superior mesenteric vein) (Figure 3) [7]. Our patient had type IV-A, and then behind the head of the pancreas. Preoperative imaging can help identify vascular variations, a routine preoperative CT angiography enables anticipating the pancreatic vascular anomalies, therefore, allowing preparation and management of abnormal vascular intraoperatively [5]. In our case, the arterial variant was not visible on the CT angiography, it has been discovered intraoperatively. Pancreaticoduodenectomy is a complicated surgical procedure linked to elevated morbidity and even mortality risk [5]. It is of utmost importance for a surgeon to recognize anatomical variations of liver and pancreas arteries to avoid vessel injuries and thus catastrophic complications during pancreaticoduodenectomy. Injury to the CHA, the proper hepatic artery, or one of its branches may result in ischemia of the biliary tract system or hepatic parenchyma in severe cases, lead to hepatic failure or death [6]. The existence of accessory RHA and replaced CHA should be systematically investigated by a meticulous dissection of the hepatic pedicle. For patients with hepatic artery variation, it is safer to start with a division of the pancreatic

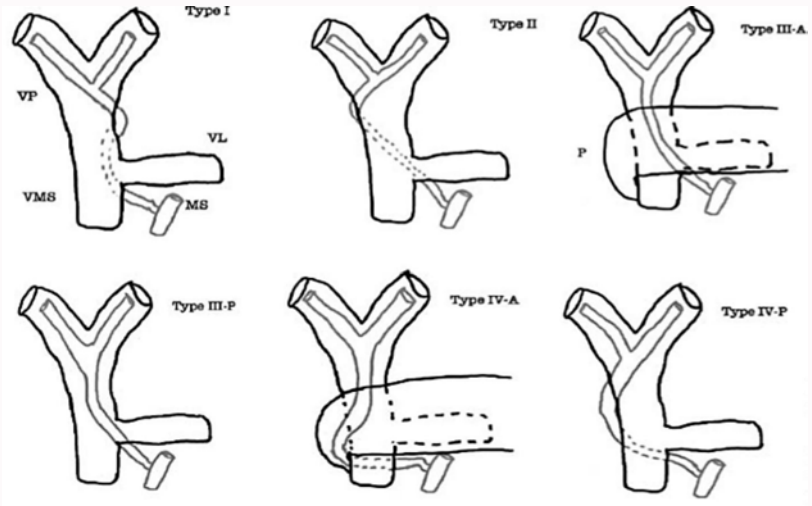

Figure 3: Different courses of the hepatic artery after arising from the superior mesenteric artery.
VP: Portal Vein; VMS: Superior Mesenteric Vein; VL: Splenic Vein; MS: Superior Mesenteric Artery; P: Pancreas

parenchyma before continuing the dissection and ligation of the GDA which may be mistaken for the common hepatic artery. Retraction of the pancreas head to the patient's right side will allow dissection of both of common hepatic and superior mesenteric arteries [6-8]. In our case, we opted for this approach, initially, it was performed a section of the pancreas followed by dissection of the arteries and ligation of the gastro-duodenal artery, thus the tumor was removed without vascular injury.

Conclusion

Knowledge of the anatomical variations of the hepatic arteries is crucial for hepatic and pancreatic surgery. Preoperative imaging with a good interpretation usually allows the identification of those aberrations. The surgeon must be careful and the dissection of GDA and CHA must be meticulous, to avoid vascular damage and therefore serious and irreversible complications.

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