Images for Surgeons

Hepatic Artery Variation and Its Impact on Cephalic Duodenopancreatectomy: A Case Report

Variação da Artéria Hepática e seu Impacto na Duodenopancreatectomia Cefálica: Relato de Caso

Arnaldo Figueiredo[1], Martim Porto[1], João Simões[1,3], Miguel Santos[1], Ricardo Martins[1,2]

1. General Surgery Department, Unidade Local de Saúde da Região de Leiria, Leiria, Portugal
2. Faculty of Medicine of the University of Coimbra, Coimbra, Portugal

Corresponding Author/Autor Correspondente:
Arnaldo Figueiredo [arnaldo.figueiredo@ulsrl.min-saude.pt]
Rua das Olhalvas, Pousos, 2410-197 Leiria

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ABSTRACT

Variations in the anatomy of the hepatic artery are frequent and are of great importance in the surgical planning of patients undergoing procedures involving the hepatobiliary and pancreatic systems.

We present the case of a patient who underwent cephalic pancreaticoduodenectomy for adenocarcinoma of the head of the pancreas, which presented with a common hepatic artery originating from the superior mesenteric artery.

It is crucial to carefully review preoperative imaging studies in patients undergoing procedures involving the hepatobiliary and pancreatic systems, as well as to take appropriate precautions during surgery. Surgeons should avoid rigidly adhering to 'standard' approaches to prevent inadvertent vascular injuries.

Keywords: Anatomic Variation; Hepatic Artery; Pancreaticoduodenectomy

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RESUMO

As variações na anatomia da artéria hepática são frequentes e são de grande importância no planeamento cirúrgico de doentes submetidos a procedimentos envolvendo os sistemas hepatobiliar e pancreático.
Apresentamos o caso de um doente que foi submetido a pancreaticoduodenectomia cefálica para adenocarcinoma da cabeça do pâncreas que apresentava uma artéria hepática comum originando-se da artéria mesentérica superior.
É crucial avaliar cuidadosamente os estudos de imagem pré-operatórios em doentes que serão submetidos a procedimentos envolvendo os sistemas hepatobiliar e pancreático, bem como tomar precauções apropriadas durante as cirurgias. Os cirurgiões devem evitar aderir rigidamente a abordagens ‹padrão› no sentido de prevenir lesões vasculares inadvertidas.

Palavras-chave: Artéria Hepática; Pancreaticoduodenectomia; Variação Anatómica

INTRODUCTION

Variations in the anatomy of the hepatic artery are frequent, occurring in approximately 13%-48% of individuals,[1] and are of great importance in the surgical planning of patients undergoing procedures involving the hepatobiliary and pancreatic (HPB) systems.[2]

These variations are most frequently categorised according to classifications proposed by Michel or Hiatt, with the most frequent alterations being the presence of a replaced right hepatic artery, followed by the presence of an accessory left hepatic artery (types III and V according to Michel's classification, respectively).[3,4]

We present the case of a patient who underwent cephalic pancreaticoduodenectomy for adenocarcinoma of the head of the pancreas and presented with a common hepatic artery (CHA) originating from the superior mesenteric artery (type IX according to Michel's classification).

CASE REPORT

A 77-year-old male patient presents for a HPB surgery consultation with complaints of abdominal pain and weight loss, which led to the identification of a cephalopancreatic mass measuring 3 cm compatible with carcinoma of the head of the pancreas. After further study, the case was presented in a multidisciplinary team consultation, and it was decided that the patient had "upfront resectable" disease and was fit for surgery. A cephalic pancreaticoduodenectomy (CPD) was proposed, to which the patient agreed.

During the preoperative computed tomography (CT) scan study, the presence of a CHA originating from the superior mesenteric artery was verified, with the celiac trunk being composed only of the splenic and left gastric arteries (shown in Fig. 1).

During surgery, the presence of an aberrant path of the CHA was confirmed, which ran posteriorly to the head of

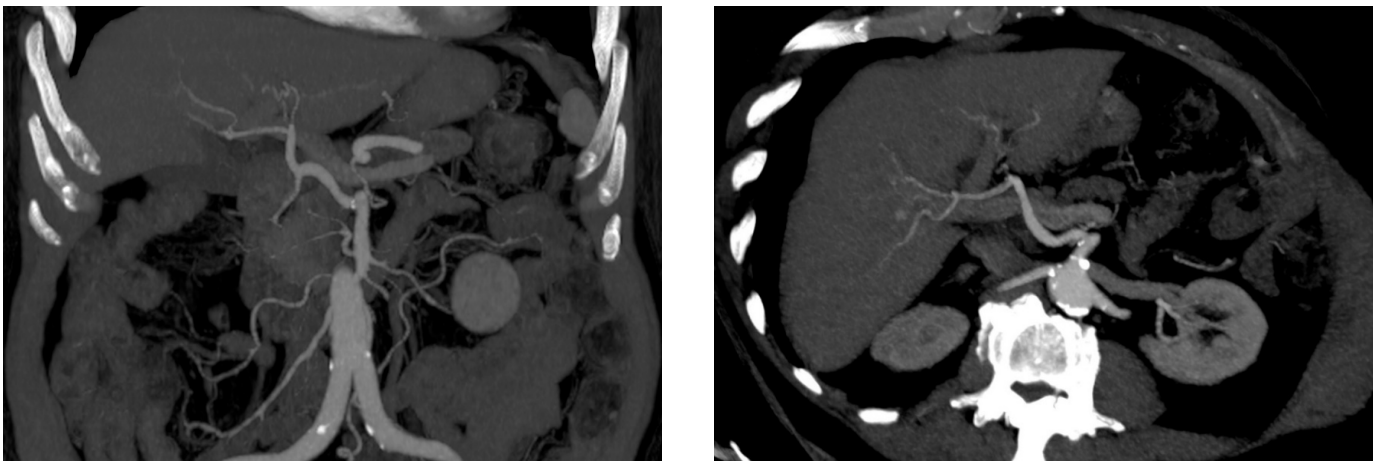

Figure 1. CT vascular reconstructions showing the common hepatic artery originating in the superior mesenteric artery.

the pancreas, crossing the portal vein posteriorly, and giving rise to the gastroduodenal artery approximately 1 cm from its emergence from the superior mesenteric artery (shown in Fig. 2).

Additional care was required during the procedure so as not to incur inadvertent damage to this vessel or its collaterals, particularly during the creation of the retropancreatic tunnel.

During mobilisation of the duodenopancreatic block, the CHA was isolated and referenced, and the gastroduodenal artery was tied after performing Bull's test.[5] Station 8 lymphadenectomy was done at this time. The remainder of the surgery was performed according to the usual technique, without complications.

The patient evolved favourably in the postoperative period and is being monitored in the outpatient setting.

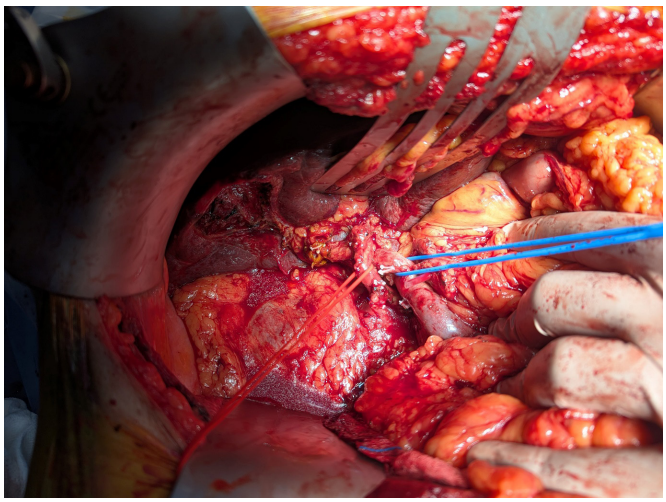

Figure 2. Common hepatic artery (red vascular elastic) arising from the superior mesenteric artery and coursing posterior to the portal vein (blue vascular elastic) towards the hepatic hilum.

DISCUSSION

In its most common conformation, the CHA appears as the right branch of the celiac trunk, running superiorly and posteriorly to the neck/head of the pancreas, and posterior to the duodenum, giving rise to the gastroduodenal artery before becoming the proper hepatic artery, which crosses the portal vein anteriorly.

However, anatomical variations are common and may imply changes in the surgical approach of patients undergoing procedures related to the hepatobiliary pancreatic system.

According to Michel's classification, the following variations on the vascular anatomy of the hepatic arteries are described: I – proper hepatic artery originating from the common hepatic artery, bifurcating into the right and left hepatic artery (classical anatomy); II - replaced left hepatic artery originating from the left gastric artery; III – replaced right hepatic artery originating from the superior mesenteric artery; IV – right and left hepatic arteries replaced as described in types II and III; V – accessory left hepatic artery originating from the left gastric artery; VI – accessory right hepatic artery originating from the superior mesenteric artery; VII – accessory right and left hepatic arteries as described in types V and VI; VIII – replaced right hepatic artery and accessory left hepatic artery or accessory right hepatic artery and replaced left hepatic artery; IX – common hepatic artery originating from the superior mesenteric artery; X – common hepatic artery originating from the left gastric artery; XI – variation not described in any other type.

A CHA originating from the superior mesenteric artery has a close relationship with the posterior aspect of the head of the pancreas, increasing the risk of iatrogenic injury in cephalopancreatic resections. Additionally, this change increases the likelihood of arterial involvement by a tumor, and the preservation of this artery may compromise an adequate oncological surgical margin.

When reviewing preoperative imaging, such as multidetector computed tomography, the surgeon must remain vigilant for potential anatomical variations. It is important to thoroughly assess the surgical anatomy of each patient to identify any atypical variations that may become apparent during the procedure. The use of vascular 3D reconstructions of abdominal CTs may help in identifying these variations.

CONCLUSION

The anatomy of the hepatic arterial vasculature is highly variable, which has significant implications for the surgical approach of patients undergoing hepatobiliary and pancreatic procedures. It is crucial to carefully review preoperative imaging studies in these patients in order to identify potential changes, as well as to take appropriate precautions during surgeries. Surgeons should avoid rigidly adhering to 'standard' approaches to prevent inadvertent vascular injuries.

WHAT IS ALREADY KNOWN ABOUT THIS TOPIC?

The anatomy of the hepatic arterial vasculature is highly variable. Vascular lesions can severely impact surgical outcomes and patient survival.

WHAT DOES THIS STUDY ADD?

Exposure to the potential pitfalls during cephalic duodenopancreatectomy may help in preventing their occurrence and improving surgical outcomes.

LEARNING POINTS/TAKE-HOME MESSAGES

It is crucial to carefully review preoperative imaging studies in these patients to identify potential changes, as well as to take appropriate precautions during surgeries.

The use of vascular reconstructions in the preoperative planning of these patients improves the chances of detecting anatomic variations.

ETHICAL DISCLOSURES

Conflicts of Interest: The authors have no conflicts of interest to declare.
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Confidentiality of Data: The authors declare that they have followed the protocols of their work centre on the publication of patient data.
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CONTRIBUTORSHIP STATEMENT

AF and MP: Writing of the article.
JS, MCS and RM: Scientific review and validation.
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DECLARAÇÃO DE CONTRIBUIÇÃO

AF e MP: Redação do artigo.
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