

ORIGINAL ARTICLE

Influence of aberrant right hepatic artery on perioperative course and longterm survival after pancreatoduodenectomy

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Abstract

Objectives: An aberrant right hepatic artery (aRHA) is the most frequently encountered vascular anomaly during pancreatoduodenectomy (PD). This study was performed to investigate the incidence of aRHA in a large series of PDs and to explore its relationship with complications and survival.

Methods: In a consecutive series of 790 PDs, aRHA could be identified or ruled out in 758 patients by reviewing operation reports. Patients with and without aRHA were compared. Main outcome measures were complications and survival (only in patients with a malignancy).

Results: The aRHA group consisted of 143 patients (19%). Characteristics of patients in the aRHA and normal RHA groups were comparable. There were no differences in surgical complications. The aRHA was preserved without damage in 130 patients (91%). Two patients in whom the aRHA was either sacrificed or damaged suffered complications (haemorrhage and intra-abdominal abscess in the right upper quadrant) that may have been related. Longterm survival in patients with a malignancy and an aRHA was not compromised.

Conclusions: An aRHA is frequently encountered during PD. Preservation is generally feasible without compromising survival in patients with malignant tumours. Surgical morbidity is not higher in patients with an aRHA. Preservation is technically possible in most patients and does not negatively impact on outcomes.

Keywords

pancreatic neoplasia, adenocarcinoma, periampullary tumours, resection, outcomes, vascular anomalies

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Introduction

Pancreatoduodenectomy (PD) represents the only chance for cure in patients with a pancreatic or periampullary tumour and is therefore the procedure of choice.¹ It is a complex surgical procedure that is associated with high morbidity rates of up to 50%. Some of the most feared postoperative complications are anastomotic leakage at the site of pancreaticojejunostomy or hepaticojejunostomy, and post-pancreatectomy haemorrhage.²⁻⁶

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Morbidity after PD may be even higher in the presence of aberrant hepatic arterial supply, which is reported to occur in up to 49% of patients.⁷⁻⁹ Anatomic variations in the hepatic arterial supply increase the risk of complications through several mechanisms. There is a higher risk of intraoperative vascular injury, especially when aberrant arteries are encountered unexpectedly or are not recognized promptly.¹⁰ Damage or ligation of an aberrant artery may induce bile duct or liver ischaemia, which can lead to breakdown of the bilioenteric anastomosis and liver dysfunction or abscesses.¹¹ Excessive manipulation while trying to preserve an aberrant artery may result in damage to the vessel's adventitia and thus make it more prone to the formation of pseudoaneurysms, especially in the presence of pancreaticojejunostomy leakage.¹² This implies a higher risk for life-threatening bleeding

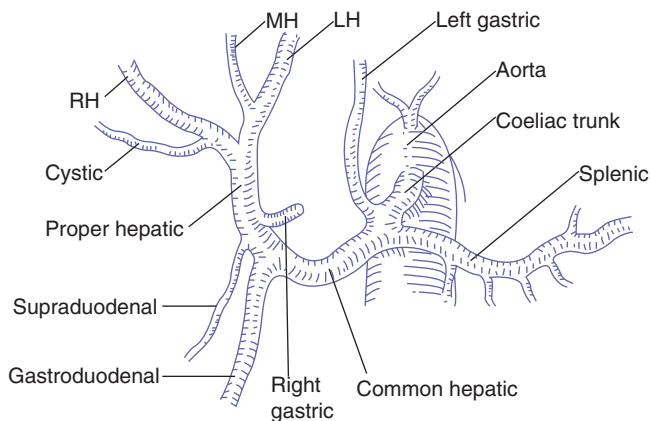


Figure 1 Normal hepatic arterial anatomy. RH, right hepatic artery; MH, middle hepatic artery; LH, left hepatic artery. (Source: Blumgart *et al.*²⁵)

Table 1 Overview of the Michels and Hiatt classifications of hepatic artery types

Description	Michels type	Hiatt type
Normal anatomy	I	I
Replaced LHA from LGA	II	II
Replaced RHA from SMA	III	III
Replaced RHA + LHA	IV	IV
Accessory LHA	V	II
Accessory RHA	VI	III
Accessory RHA + LHA	VII	IV
Replaced RHA + accLHA or replaced LHA + accRHA	VIII	IV
CHA from SMA	IX	V
CHA from LGA	X	–
CHA from aorta	–	VI

LHA, left hepatic artery; LGA, left gastric artery; RHA, right hepatic artery; SMA, superior mesenteric artery; acc, accessory; CHA, common hepatic artery

complications. Attempts to preserve aberrant vessels may also hinder radical oncological resections.

Normal hepatic arterial supply involves a common hepatic artery (CHA) arising from the coeliac trunk (Fig. 1). The section of artery subsequent to the branching off of the gastroduodenal and right gastric arteries is referred to as the proper hepatic artery; this bifurcates into the right and left hepatic arteries (RHA and LHA).

The two most widely accepted classifications of hepatic arterial variations are those by Michels, based on 200 autopsies, and Hiatt, based on 1000 angiographic analyses (Table 1).^{7,9} In both series, the most common reported vascular anomaly is an aberrant RHA (aRHA) (Fig. 2). Michels makes a distinction between a replaced and accessory aRHA. A replaced RHA (rRHA) arising from the superior mesenteric artery (SMA) is classified as Michels type III.

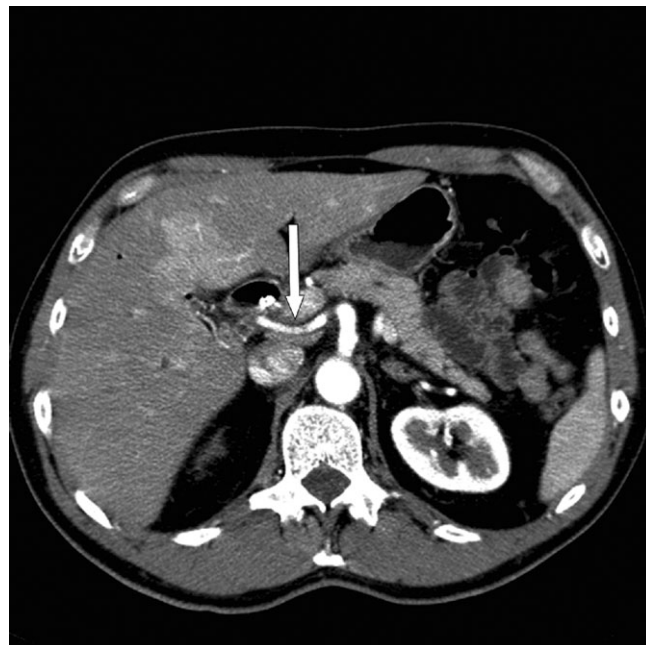


Figure 2 Computed tomography scan showing a replaced right hepatic artery (white arrow) arising from the superior mesenteric artery

It may course posterior to the pancreas, as well as within the pancreatic parenchyma or along the ventral side of the pancreas. Reported incidences vary from 8% to 14%.^{8,9,13,14} An accessory RHA (accRHA) follows the same course as a rRHA, in addition to a normal RHA. It is classified as Michels type VI and is reported to occur in up to 7% of patients.^{8,9} In the Hiatt classification, both rRHA and accRHA are classified as type III and reported incidences vary from 7% to 21%.^{7,15–17}

An aRHA represents the vascular anomaly encountered most frequently during PD and, because of its course, is the hepatic arterial anomaly that is most susceptible to intraoperative damage and tumour involvement.¹⁴

Therefore, the aim of the present study was to investigate the incidence of aRHA in a large cohort of patients undergoing PD and to explore its relationships with the occurrence of complications and with longterm survival in patients with a malignancy.

Materials and methods

Patients and study outline

In a consecutive series of 790 PDs performed from 1992 to 2009, clinicopathological data, perioperative outcomes and longterm follow-up were prospectively recorded. Patients with an aRHA were identified by reviewing operation reports. In cases of doubt, preoperative computed tomography scans were reviewed to determine aberrant or normal RHA anatomy. The present study involved a retrospective analysis of anonymized data, for which Dutch ethical review board regulations do not require informed consent.

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