

ORIGINAL ARTICLE

Liver resection for perihilar cholangiocarcinoma – why left is sometimes right

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Abstract

Introduction: Left-sided liver resection (LLR) for perihilar cholangiocarcinoma (PHC) may require right hepatic artery (RHA) resection and reconstruction because of its intimate relationship with the biliary confluence. Consequently right-sided resections (RLR) are preferred for Bismuth-Corlette IIIb tumours, and resections avoided in Bismuth-Corlette IV tumours with left lobar atrophy when the RHA is involved by tumour.

Methods: A retrospective analysis of patients with PHC who presented between December 2009 and June 2015.

Results: Thirty-six patients underwent resection for PHC (23 LLR, 13 RLR). The number of Bismuth-Corlette IV patients undergoing LLR was significantly greater than those undergoing RLR (8/23 vs 0/13, $p = 0.032$). The need for arterial reconstruction (AR) was significantly greater during LLR than RLR (10/23 vs 0/13, $p = 0.006$). Postoperative liver dysfunction was greater after RLR (5/13 vs 0/23, $p = 0.003$), and hospital stay was shorter after LLR (10 vs 15 days, $p = 0.013$).

Conclusions: Safe AR increases the ability to perform potentially curative LLR for PHC. This improves the resectability rate for PHC, particularly for Bismuth-Corlette Type IV tumours. The larger liver remnant after LLR results in less postoperative liver dysfunction and shorter hospital stay without increased operating time, blood loss or morbidity.

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Introduction

Complete surgical resection provides the best chance of cure for perihilar cholangiocarcinoma (PHC).^{1,2} Adequate surgery for this condition requires margin-free resection of the tumour, adjacent lymph nodes, the caudate lobe of liver and varying amounts of liver parenchyma.² Although logic dictates that right-sided tumours (Bismuth-Corlette Stage IIIa) should be best treated by right-sided liver resections (RLR), and left-sided tumours (Bismuth-Corlette Stage IIIb) by left-sided liver resections (LLR), the anatomy of the liver hilum causes many surgeons to prefer right hepatectomy or right trisectionectomy even for left-sided PHC whenever possible. The long, extra-hepatic course of the left hepatic duct and the left portal vein make it easier to achieve tumour clearance on the hepatic duct and to perform portal vein resection respectively during right hepatectomy or

right trisectionectomy. More importantly, the right hepatic artery, vital for preservation of the liver remnant after left-sided resection, is intimately related to the posterior surface of the biliary confluence and is often involved by tumour. Complete tumour clearance may require en-bloc resection and reconstruction of an involved artery, a procedure traditionally associated with high morbidity and mortality.³ This does not apply to right-sided resections because the left hepatic artery lies well away from the biliary confluence, enters the umbilical fissure at the extreme left of the hilum, and is rarely involved by tumour.

However RLR preserve a smaller liver remnant than corresponding LLR and is consequently associated with greater operative mortality in patients with cholestatic liver.⁴ Those undergoing these resections are more likely to require optimisation of the planned remnant with preoperative biliary drainage

(PBD) and/or portal vein embolisation (PVE), and have to bear the additional time, expense and associated risk.^{4,5} In the past few years, renewed efforts have been made to overcome the technical challenges of left hepatectomy and left trisectionectomy for PHC.^{6–9} The success of these efforts has increased margin-free resectability rates of Bismuth-Corlette Stage IV tumours with left-sided vascular involvement, atrophy or tumour extension beyond the left margin of the umbilical fissure.

Over the past 6 years the authors have taken an aggressive approach towards arterial resection for PHC. In patients with Bismuth-Corlette Type IIIb (as an alternative to right trisectionectomy) and Type IV tumours the authors have considered LLR with resection and reconstruction of the RHA whenever it was involved by tumour. The aim of this study was to present the authors experience with this approach, focussing on the difference between right-sided and left-sided hepatic resections for this disease.

Methods

The medical records of all patients with PHC operated between October 2009 to June 2015 were evaluated.

All patients were evaluated by triphasic multislice CT scan. MRI was performed selectively whenever greater clarity on biliary anatomy was necessary. Endosonography, PET scan and preoperative biopsy were not performed.

LLR was performed in patients with left lobe atrophy and in those with Bismuth-Corlette Type IV tumours extending beyond the segment 4 hepatic duct. AR was preferred over PBD (\pm PVE) and right trisectionectomy in patients with Bismuth-Corlette Type IIIb tumours whenever possible. PBD was performed through the planned future liver remnant in all patients with cholangitis, serum bilirubin above 250 μ mol/L (15 mg%) or those requiring prolonged preoperative optimisation. It was avoided if the estimated remnant volume was greater than 40%.⁷ Some patients presented after PBD had already been performed elsewhere. Once PBD had been instituted, surgery was performed after the serum bilirubin fell below 5 mg%. PVE was not performed in any of the patients in this series. When PBD was necessary for the above stated reasons in patients with Bismuth-Corlette Type IIIb tumours, right trisectionectomy was preferred if the artery was involved.

All patients underwent laparoscopy prior to laparotomy. Laparotomy was not performed in the presence of cirrhosis, peritoneal or liver metastases. Hilar lymph node metastases or direct infiltration of adjacent bowel were not considered contraindications to resection if complete resection was deemed feasible. For LLR the right lobe of liver was not mobilised. The caudate lobe was mobilised and resected entirely from the left side. Exploration was begun in Rouviere's sulcus to the right of the porta hepatis to identify tumour-free hepatic artery, portal vein and hepatic duct. The right posterior sectoral hepatic artery was followed towards the tumour to determine the optimal tumour-free right hepatic

artery for potential arterial reconstruction (Fig. 1). With a reconstructable artery confirmed, the remaining operation was carried out as per established procedure. Left trisectionectomy was preferred over left hepatectomy when it was felt that left hepatectomy would not clear tumour extension into the right posterior sectoral duct, when there was right anterior sector atrophy, or when there was vascular involvement preventing preservation of the right anterior sectoral artery.

In LLR, vascular reconstructions were performed at the completion of parenchymal transection to avoid traction on the anastomosis during transection. Reconstruction of the hepatic artery (AR) when necessary was carried out by direct end-to-end anastomosis between healthy proximal right hepatic artery or proper hepatic artery to healthy distal right hepatic artery or right posterior sectoral artery using interrupted 8/0 prolene (Fig. 2). The gastroduodenal artery was divided and the common hepatic artery mobilised to its origin so as to approximate the two ends of the artery for reconstruction. In rare instances when direct anastomosis was still not feasible, an interposition vein graft using the inferior mesenteric vein or gonadal vein was used.

Portal Vein reconstruction (PVR) was carried out by end-to-end anastomosis using continuous 5/0 prolene. When performed during RLR the left-sided PVR was carried out prior to parenchymal transection.

The liver was never simultaneously deprived of both arterial and portal inflow at any time during vascular reconstruction. When both vessels had to be clamped PVR was performed first to reperfuse the liver quickly and reduce gut congestion.

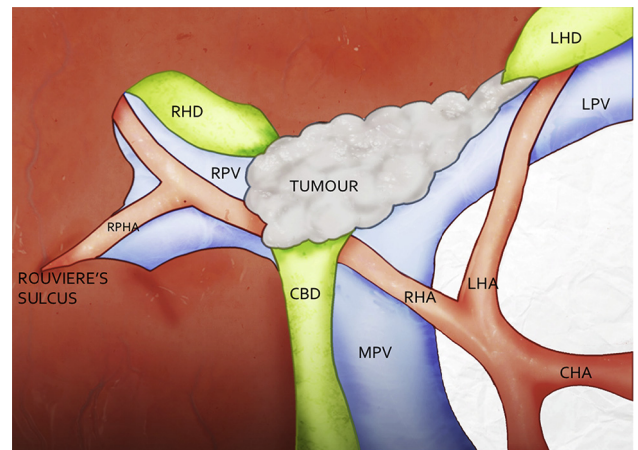


Figure 1 Identification of a reconstructable right posterior sectoral artery in Rouviere's sulcus to the right of the tumour is a prerequisite to arterial reconstruction for tumours involving the right hepatic artery. (CHA: Common Hepatic Artery, RHA: Right Hepatic Artery, LHA: Left Hepatic Artery, RPHA: Right Posterior Sectoral Hepatic Artery, MPV: Main Portal Vein, LPV: Left Portal Vein, RPV: Right Portal Vein, RHD: Right Hepatic Artery, LHD: Left Hepatic Artery, CBD: Common Bile Duct)

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