Perihilar Cholangiocarcinoma on Biliary Anatomical Variant. Case Report

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ABSTRACT

Background. Perihilar cholangiocarcinoma (PCC), defined as tumors involving or in close vicinity to the main bile duct confluence, is the most frequent type of cholangiocarcinoma (CC). Nevertheless, PCC occurring on biliary anatomical variant is a rare condition, difficult to diagnose and to establish the proper surgical approach.

Case presentation. A 59-year old male, with normal liver function, is incidentally diagnosed with PCC of the left hepatic duct (LHD), associated with a biliary anatomical variant consisting in right posterior hepatic duct (RPHD) entering the LHD. The patient underwent left hemihepatectomy with en-bloc resection of segment 1 and hilar lymph node dissection, and cholangiojejunostomy for the RPHD stump.

Results. The intraoperative and postoperative outcome were remarkably uneventful. Negative resection margins of the operative specimen were observed at pathological examination. No local recurrence occurred during a 2-yr follow-up.

Conclusion. Careful preoperative assessment and identification of anatomical variants are often the key to a successful surgical treatment in PCC.

Key words: perihilar cholangiocarcinoma, bile duct cancer, biliary anatomical variant, hemihepatectomy, en-bloc resection of segment 1.

INTRODUCTION

Cholangiocarcinoma (CC) represents about 10% of primary malignant liver tumors, and about 2% of all malignancies (1), with an incidence that is continuously increasing in the past decades (2). CC originates from the malignant transformation of the bile duct epithelium along the biliary tree, encompassing three main subgroups of tumors with specific epidemiological, clinical, therapeutic, and prognostic features (3):

- intrahepatic cholangiocarcinoma (ICC), representing less than 10%,

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- originating from small intrahepatic bile ducts;
- perihilar cholangiocarcinoma (PCC) (Klatskin tumor), representing the majority of cases (about 65%), defined as tumors involving or in close vicinity to the main bile duct confluence;
- distal cholangiocarcinoma (DCC), representing about 25%.

PHC in close vicinity but not involving the biliary confluence is very common in case of the common hepatic duct, but very rarely encountered in left or right hepatic duct. This is most probably due to the fact that PHC originating from left or right hepatic duct is commonly diagnosed in late stages, when arrives to invade the main biliary confluence. Surgical management is the best option for cure in PCC (4). Surgically relevant anatomical variants of these bile ducts are as frequent as 25-37% (5, 6, 7).

PCC arising on biliary ducts with anatomical variants complicate even more the clinical and para-clinical presentation, and such patients are often erroneously considered unresectable, due to the fact that anatomical variants are practically never considered in this clinical settings.

The present paper presents such a case, with a left duct PCC arising on a particular anatomical variant of hepatic biliary ducts.

CASE REPORT

A 52-year old male, heavy smoker, with a history of lower limbs obstructive arteriopathy, without jaundice, is incidentally diagnosed with intrahepatic bile duct dilatation during an contrast-enhanced computed tomography angiography for arterial assessment. A contrast-enhanced magnetic resonance cholangiography detected a PCC with intrahepatic bile duct dilatation in the left hemiliver and the right posterior section (segments 6 and 7 according Couinaud classification) (*fig. 1*). The laboratory findings showed a close to normal total bilirubin level (1.4 mg/dl), high levels of cholestatic markers (alkaline phosphatase = 1236U/L; gama glutamil transferase = 1282U/L; total cholesterol = 249mg/dl). Tumor markers - CEA, AFP, CA19-9 - were within normal range. The condition was initially considered as a stage IV Klatskin tumor and was referred for palliative chemotherapy. After a reassessment in our

Figure 1 - Contrast-enhanced magnetic resonance cholangiography detected a PCC of the left hepatic duct (L) with right posterior hepatic duct (RP) draining into it. Note the intrahepatic bile duct dilatation of the left hemiliver and the right posterior section, but not of the right anterior section, with a non-dilated right anterior hepatic duct (RA) draining directly into the main bile duct.

tertiary HPB center, the condition was recognized as a PCC of the left hepatic duct (LHD) arising on an anatomical variant with the right posterior hepatic duct (bile duct for segments 6 and 7 according to Couinaud classification) draining into the LHD, and with the right anterior hepatic duct draining directly into the main bile duct (no right hepatic duct) (*fig. 1 and 2*). Contrast-enhanced abdominal and thoracic computed tomography showed no vascular invasion and no distant metastases. The patient was assessed by our oncology multidisciplinary board that confirmed the diagnosis, and was therefore scheduled for surgery.

The approach was through a Mercedes incision. In order to improve the access to the hepatocaval confluence, the xiphoid process was routinely

removed. The intraoperative assessment confirmed the preoperative findings. Intraoperative ultrasound showed invasion of segment 1. The type of resection was classified according to the anatomical nomenclature of Brisbane 2000 terminology of liver anatomy and resections (8). Consequently, a left hemihepatectomy with en-bloc segment 1 resection, and with hilar lymph node dissection was performed (*fig. 2 and 3*). The resection was performed using the anterior approach and intraoperative ultrasound guidance that assisted in accurately exposing the middle hepatic vein on the cut surface.

The liver transection was carried out using the crash clamping technique (Kellyclasia) (9), combining ligations (4.0 or 2.0 non-absorbable multifilament suture

Figure 2 - Schematic representations of the biliary anatomical variant, tumor localization, and surgical planning for resection. RA – right anterior hepatic duct; RP – right posterior hepatic duct; C – cystic duct.

Figure 3 - Intraoperative aspects during left hemihepatectomy with en-bloc segment 1 resection, and with hilar lymph node dissection, preserving the common bile duct and the right anterior hepatic duct. Middle hepatic vein was exposed on the cut surface. Portal vein, hepatic artery and common bile duct may be seen. Inferior vena cava was completely exposed; right hepatic vein was also exposed after resection of the paracaval portion of segment 1. The stump of the right posterior hepatic duct is indicated by the surgical instrument. Biliary reconstruction was performed for the right posterior bile duct stump, through a Roux-en-Y cholangiojejunostomy.

material, depending on the width of the pedicle to be ligated), sutures (4.0 to 6.0 non-absorbable monofilament suture material for vessels, 4.0 to 6.0 absorbable monofilament suture material for bile ducts, and 3.0 or 4.0 absorbable multifilament suture material for parenchyma), and use of monopolar cautery. To limit the backflow bleeding from the hepatic veins during liver transection, the central venous pressure was maintained whenever possible below 5mmHg. For vascular control, on demand intermittent portal pedicle clamping (periods of maximum 15 minutes of inflow occlusion with interposed minimum 5 minutes intervals of liver reperfusion) was routinely used in order to limit the ischemia-reperfusion injury. The intraoperative blood loss was approximately 750ml; one unit of blood was transfused. The biliary reconstruction was needed only for the right posterior bile duct stump, for which a Roux-en-Y cholangiojejunostomy was performed. The right anterior bile duct was preserved along with the main bile duct. The operative time was 450 min.

The pathological examination of the operative specimen (*fig. 4*) showed a well to moderated cholangiocarcinoma (G1-G2) of the left bile duct, infiltrating the segment 1. No invasion of distal part of the resected LHD was encountered (R0 resection). Two out of 8 excised hilar lymph nodes were invaded.

The postoperative outcome was remarkably uneventful, and the patient was discharged on the postoperative day 8. Adjuvant chemotherapy with gemcitabine was carried out. The patient died at 23

months postoperatively, due to peritoneal carcinomatosis. It is worth mentioning that no local recurrence was encountered.

DISCUSSION

Preoperative imaging is very important to establish the diagnosis of PCC, to identify the level of biliary obstruction, and the tumor staging (size, lymph node and vascular invasion, distant metastases). The imaging protocol includes Doppler ultrasound, endoscopic and intraductal ultrasound, contrast-enhanced computed tomography, contrast-enhanced magnetic resonance angiography and cholangiography, endoscopic retrograde cholangiography, percutaneous transhepatic cholangiography, and even positron emission tomography - computer tomography (10, 11, 12).

Variations in the anatomy of the intrahepatic bile ducts are very common, with serious implications during major hepatectomy for various liver conditions, and also for graft harvesting in living donor liver transplantation. Thus, accurate knowledge of bile duct anatomy and its variants is of utmost importance in such cases. These biliary anatomical variants may be accurately detected at magnetic resonance cholangiography, or endoscopic retrograde cholangiography (13) (14). Among these variants, drainage of the right posterior bile duct into the left hepatic duct is encountered in about 11% of cases, anomaly defined by Choi et al as type 3A (7).

Our case presented such a biliary variant, with a PCC

Figure 4 - The resected specimen comprising the left hemiliver and the segment 1. Sectioned tumor shows infiltration of segment 1.

arising from the place where the right posterior hepatic duct entered the left hepatic duct, with consequent bile duct dilatations of the left hemiliver, the right posterior section, and segment 1, while the bile ducts for the right anterior section were normal. This particular presentation was initially misinterpreted as type IV diffuse Klatskin tumor, and considered unresectable. After a thorough re-evaluation in our tertiary HBP center, the particular real condition was recognized and the patient was referred to surgery.

In PCC, R0 resection and hilar lymphadenectomy is the only curative treatment available to date (15, 16, except liver transplantation in highly selected patients 17). In most cases, the PCC extends to the caudate lobe, so radical caudate lobectomy is recommended for curative treatment, reducing the local recurrence and improving the 5-year survival (18, 19). Complete resection of segment 1 is technically feasible, that may be performed without significant intraoperative adverse events (20).

Our case benefitted from a left hemihepatectomy with en-bloc segment 1 resection, with hilar lymph node dissection. The resection of segment 1 was performed for oncological safety, as in case of biliary anatomical variants, the paracaval portion of segment 1 also may drain into the left hepatic duct. This was later confirmed at pathology. Furthermore, the resection of segment 1 allowed a wider resection of the right posterior hepatic duct, facilitating, in the same time, the access for performing the cholangiojejunostomy. Segment 1 resection insured the R0 resection in this case, as showed at pathology. The number of retrieved lymph nodes (N=8) was considered optimal, since 7 is the cut-off for proper lymph node count for prognostic staging reported in the literature for PCC (21).

Major hepatic resection for PCC has a morbidity rate of 14-76%, and a mortality rate of 0-15% (22, 23, 24, 25). Our case had an uneventful postoperative course, and was discharged in POD 8.

PCC has a poor prognosis, with a 5-year survival rate after resection of around 30% at best, in patients without lymph node invasion. The 5-year survival rate drops to 15% in patients with regional lymph node metastases, and to 12% in those with para-aortic lymph node metastases (26). Our patient died 2 years after surgery, with no local recurrence, due to peritoneal carcinomatosis.

CONCLUSION

Careful preoperative assessment and identification of anatomical variants are often the key to a successful

surgical treatment in PCC. En-bloc resection of segment 1 is a safe and useful option for such a patient, in order to achieve negative resection margins.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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