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Hilar cholangiocarcinoma: surgical and endoscopic approaches

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Tumors of the bile duct, cholangiocarcinoma, are an uncommon malignancy in the United States, with fewer than 5000 cases diagnosed each year [1]. The majority of these are diagnosed in elderly patients, and if left untreated, patients will rarely live more than 6 months [2–4]. Surgery remains the primary curative modality in the treatment of cholangiocarcinomas, though most patients are unable to undergo curative resection. The reasons for unresectability are related to patient related causes (ie, medical comorbidities precluding the indicated resection), local anatomic causes (ie, local tumor extension preventing resection with negative margins), or tumor biology (ie, metastatic disease beyond the field of resection). Although there has been recent enthusiasm for extending the surgical treatment of cholangiocarcinoma through improvements in surgical techniques, the treatment of cholangiocarcinoma more frequently involves palliative measures [5].

Cholangiocarcinomas are classified into three main subgroups defined by the anatomic location: (1) hilar tumors involving the confluence of the left and right hepatic ducts and the common hepatic duct (CHD), (2) mid-duct cholangiocarcinomas involving the supraduodenal common bile duct (CBD), and (3) distal cholangiocarcinomas involving the intraduodenal bile duct [6]. This classification is not based upon modality of therapy or prognosis, but instead on the technique required for curative resection. Hilar tumors require excision of the common hepatic duct and frequently concomitant hepatic parenchymal resections, mid-duct tumors rarely require concomitant hepatic resections, and distal tumors necessitate pancreaticoduodenectomy. Hilar tumors account for nearly two thirds of cholangiocarcinomas and therefore are the most frequently encountered biliary

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tumors. Although the current discussion focuses on the preoperative, intraoperative, and palliative management of hilar cholangiocarcinoma (HCCa), these principles are applicable to all bile duct tumors.

Clinical presentation

The majority of patients with HCCa present with jaundice in the absence of cholangitis [2,3]. Although patients with either partial or complete obstruction of the CHD/CBD may harbor bacteria in the obstructed biliary tree, cholangitis is rarely part of the initial presentation. Depending on the severity of jaundice, patients may also experience pruritus, though it has been our experience that serum levels of bilirubin less than 10 mg/dl are rarely associated with pruritus. Additional symptoms may be attributed to extent of disease; patients with metastatic disease can harbor associated symptoms such as fatigue, lethargy, and weight loss. Finally, not all patients with HCCa will present with jaundice, as obstruction of one hepatic duct without complete obstruction of the CHD may allow for sufficient bile excretion to prevent its development.

Rarely does the surgeon perform the initial evaluation; more commonly the patient presents to his or her primary care physician for evaluation of jaundice. Given the uncommon nature of cholangiocarcinoma, the initial evaluation is focused on much more common diseases (ie, viral hepatitis, choledocholithiasis, etc). Therefore, the surgeon may not become involved in the diagnosis and management until a variety of radiologic examinations and even invasive procedures have been performed. Often these studies are performed without forethought as to the yield of the test, or even whether it is the most optimal procedure to further the evaluation of a suspected cholangiocarcinoma. It has been our experience that very few gastroenterologists will defer performing endoscopic retrograde cholangiopancreatography (ERCP) for HCCa, though this may not be the optimal method of evaluation of the ductal anatomy. It is for these reasons that it is essential that a surgeon be an available resource for evaluation of obstructive jaundice, and in the optimal situation, the surgeon would primarily coordinate diagnostic evaluation and treatment planning.

Radiologic imaging and preoperative evaluation

The goal of accurate preoperative imaging is to truly identify those patients who demonstrate clinical or radiologic conditions that would preclude a potentially curable resection [7–9]. The absolute contraindications to resection include such things as distant metastases (peritoneum, lung, or distant regional nodal metastases; celiac, superior mesenteric, pancreaticoduodenal lymph nodes). Local factors include complete encasement or thrombosis of the main portal vein, lobar atrophy with contralateral portal vein invasion, or involvement of secondary biliary radicals within the hepatic lobe that is contralateral to the major tumor site. Lobar atrophy tends to be underestimated and unrecognized as a sign of vascular involvement [10]. When seen on preoperative imaging, careful attention must be given to the relationship of the tumor to the contralateral portal vein, as invasion would be a significant indicator of extensive vascular involvement. Given the high portion of patients who are found to be unresectable at exploration, the argument for accurate preoperative radiologic imaging becomes much more important [11].

Unfortunately, up to half of patients who are thought to harbor localized disease amenable to curative surgical resection are found to have unresectable disease at exploration [12–23]. Although there have been advances in both the surgical therapy of hilar cholangiocarcinoma as well as in the palliative therapy, the more important aspect for surgeons remains preoperative imaging to identify patients who are candidates for surgical resection with a high degree of certainty. The causes that preclude curative resection include: (1) hepatic ductal extension preventing complete resection, (2) soft-tissue extension (hepatic parenchyma at the hilum or unresectable vascular involvement), and (3) distant metastases (either distant nodal disease [N2] or systemic metastases) (Table 1). Therefore, this section focuses on the radiologic imaging alternatives that address each of these points, with a final discussion of our preferred management algorithm.

Ductal evaluation

The preoperative evaluation of biliary ductal extent of HCCa is essential to determine whether the patient harbors resectable disease, as well as to define the resection required to perform a curative operation (ie, requirement for hepatic parenchymal resection) with histologically negative margins. One part of the preoperative radiologic management of patients with HCCa has consisted of defining the biliary extent of the tumor. The two traditional methods are ERCP and percutaneous transhepatic cholangiography (PTC). Although there has been little prospective comparative evaluation of the optimal modality of invasive biliary radiologic investigation, it seems that PTC is preferable, because ERCP tends to underestimate the extent of the tumor involvement into the primary and secondary biliary radicals [24,25]. This is simply a technical factor in the inability to inject contrast through the obstruction and adequately define the areas of tumor involvement of the ductal system. Therefore, PTC has become the most commonly used invasive radiographic evaluation of the biliary ductal extent of HCCa [26]. Although some have promoted the role of preoperative biliary decompression before surgical resection, jaundice rarely requires palliation before curative resection, and does not appear to adversely affect postoperative outcomes [27–28].

Table 1
Selected review of reports on the surgical management of HCCa with reference to rate of curative resection and etilogies preventing curative resection

					Unresectable due to		
Authors	Year	Patients	Curative resections	Local extension	Nodal metastases	Distant metastases	Medical causes (eg, cirrhosis)
Nakeeb et al [12]	1996	196	109 (56%)	56 (29%)	N.A.	31 (16%)	N.A.
Kosuge et al [13]	1999	89	54 (61%)	8 (8%)	7 (8%)	8 (8%)	N.A.
Lee et al [14]	2000	151	90 (60%)	N.A.	N.A.	N.A.	N.A.
Nimura et al [15]	2000	177	108 (61%)	N.A.	N.A.	N.A.	N.A.
Launois et al [16]	2000	307	98 (32%)	N.A.	N.A.	N.A.	N.A.
Gazzaniga et al [17]	2000	159	75 (47%)	N.A.	N.A.	N.A.	N.A.
Chamberlain et al [4]	2000	72	33 (48%)	8 (11%)	14 (19%)	9 (12%)	8 (11%)
Jarnagin et al [18]	2001	160	80 (50%)	26 (16%)	25 (16%)	22 (14%)	7 (4%)
Total		1311	647 (49%)	98/517 (19%)	46/321 (14%)	70/517 (14%)	15/232 (6%)

Abbreviations: N.A. = not available.

Although some have promoted the utility of PTC to both define the biliary anatomy and to decompress the liver, there are increasing reports that this preoperative radiologic imaging may increase operative complications. The infectious complications in patients who undergo curative resection following preoperative PTC appear to be increased relative to those in resected patients who did not undergo preoperative biliary instrumentation [29–30]. This sequela of biliary manipulation has also been observed in pancreatic cancer, in which patients who undergo some form of preoperative biliary instrumentation have a higher risk of infectious complications following a pancreaticoduodenectomy [31–33]. Therefore, it would seem reasonable that if an alternate modality of radiologic imaging is available that provides the same degree of anatomic evaluation, it would be preferable if it were not associated with an increase in operative complications.

Magnetic resonance cholangiography (MRC) has been promoted as such a complimentary modality without the invasive nature of PTC [8,34–38]. The extent of resolution obtained on MRC for biliary anatomy is remarkable when compared with either ERCP or PTC (Fig. 1). Indeed, MRC can reveal obstructed or isolated ducts that were not appreciated at endoscopic or percutaneous study, due to the ability of this imaging modality to visualize the biliary tree independent of contrast injection through an area of biliary obstruction. Furthermore, the ability of computer software to manipulate the acquired data into additional images (eg, three-dimensional reconstruction) provides added information that can be useful for preoperative surgical planning. Although there are few prospective comparative studies of these three biliary tract imaging modalities (ERCP, PTC, and MRC) with correlation to surgically resected specimens, anecdotal evidence supports the benefits of MRC over either invasive imaging technique. Reported accuracy of ERCP in the evaluation of the proximal extent can be as low as 50%, whereas MRC is accurate in over 90% of patients [25,36,39,40].

Local soft-tissue extension

CT scan has been promoted as the optimal modality to evaluate the soft-tissue extent of the tumor and the relationship of the primary tumor with the hilar vasculature. This is based on the fact that extensive hilar vascular involvement precludes resection. The development of magnetic resonance imaging (MRI) has dramatically changed the preoperative management of hilar cholangiocarcinoma. Again, there are limited studies that compare these on a prospective basis, but the momentum seems to be gathering to promote MRI as the primary modality for evaluation of this tumor.

Because of the advent of MRC, MRI has also been promoted to compliment or supplant CT scan (Fig. 2). This is especially true for determination of the vascular extent of the primary tumor [8,41].

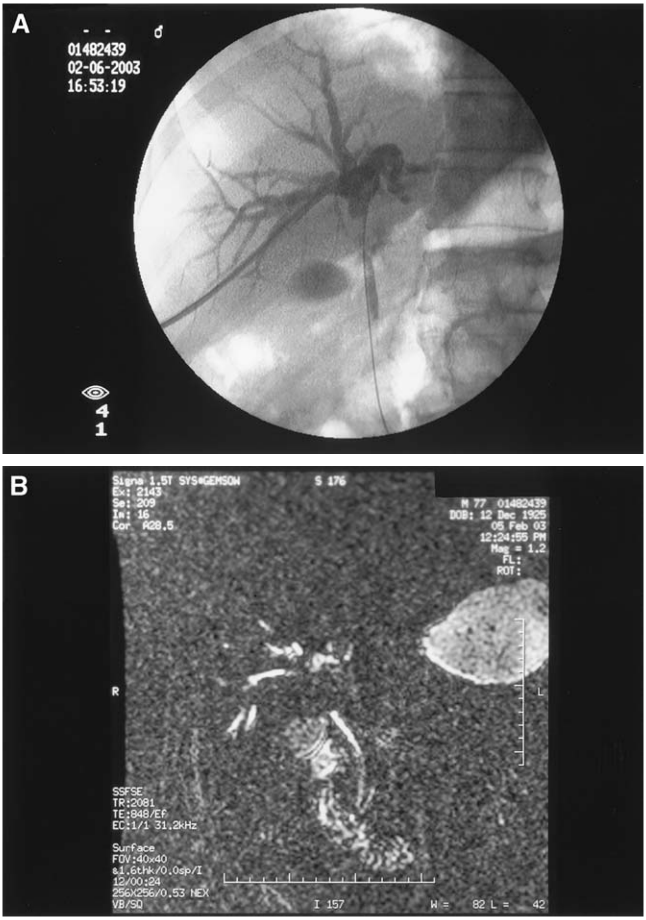

Fig. 1. (*A*) Percutaneous transhepatic cholangiogram (PTC) and (*B*) magnetic resonance cholangiography (MRC) in a patient with HCCa. The tumor appears to be limited to the common hepatic duct on the PTC, with the stricture beginning a short distance below the confluence of the right and left hepatic ducts, though the MRC clearly demonstrates involvement of the right and left hepatic ducts (lack of opacification of the confluence of the right and left hepatic ducts above the common hepatic duct).

Technologic advances in contrast agents, as well as magnet-related variables, have yielded more accurate imaging of the hepatic hilus in the evaluation of hilar cholangiocarcinoma. A complete MR examination of the liver requires extensive support by radiologic services, due to the requirement for several different imaging sequences. These include basic pulse sequences that are T1- or T2-weighted, the use of contrast enhancement agents such as gadolinium, and finally, image manipulation such as fat suppression [8,9,42,43]. Advances in MR technology have also

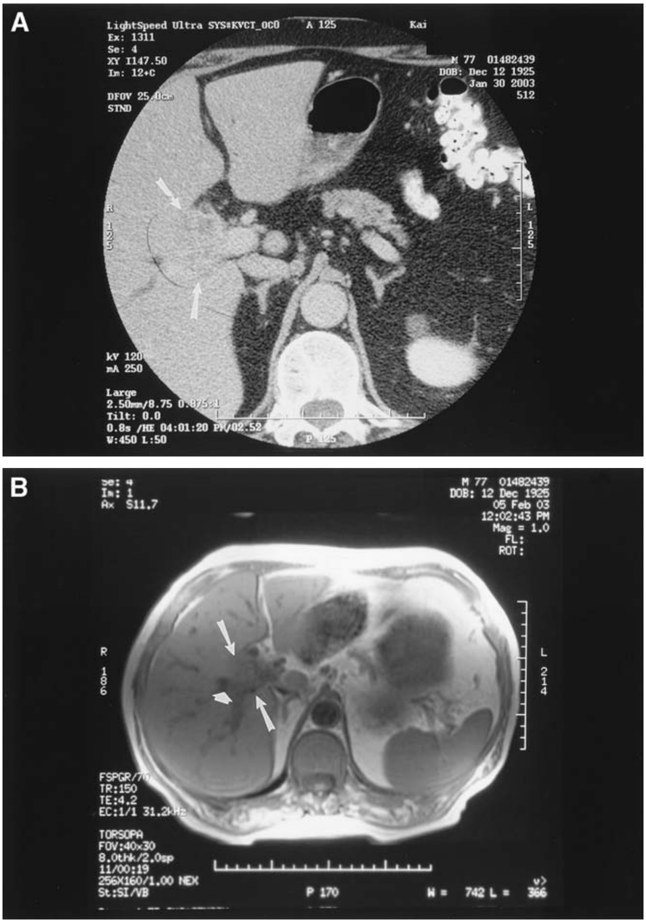

Fig. 2. (*A*) CT scan and (*B*) MRI in patient with HCCa (same patient as Fig. 1). The CT scan demonstrates an ill-defined hypodense mass in the hilus of the right lobe of the liver (*between arrows*), whereas the MRI reveals more extensive hepatic parenchymal involvement (*between arrows*) with invasion of the right main portal vein (*arrowhead*).

included enlargement of the surface coil, allowing a greater signal-to-noise ratio with a decreased scan time. This allows acquisition of images within a single breath-hold, to minimize motion artifact. Therefore, given the possible superiority of MRI/MRC over traditional imaging of invasive biliary imaging (PTC or ERCP) with CT scan, it has become our practice to evaluate those patients in which HCCa is a likely diagnosis, based on limited initial evaluation of the patient (primarily ultrasound), and to proceed with an MRI/MRC for initial evaluation of potentially resectable tumors.

Metastatic disease

Despite the use of preoperative MRI or CT scans, approximately one quarter of patients are still found at operative exploration to harbor advanced nodal, peritoneal, or hepatic metastases that preclude curative resection. The use of 2-[^{18}F]fluoro-2-deoxy-D-glucose positron emission tomography (PET) has been shown to be useful in the staging of a variety of solid-organ malignancies such as melanoma, colorectal cancer, esophageal cancer, and non-small cell lung cancer [44]. Though early reports are beginning to demonstrate its utility for the detection of metastatic disease not identified on traditional preoperative studies, its utility for cholangiocarcinoma is still being investigated [45–49]. Kluge et al reported the sensitivity of PET scans for staging 26 patients with cholangiocarcinoma; of 10 found to harbor metastatic disease at exploration, PET scan accurately identified 7 of these preoperatively [49]. In their series of 30 patients, Kato et al found that PET scanning was superior to traditional CT scanning for the detection of nodal metastasis (86% versus 50%) [47]. Although these data are from series with small numbers of patients, given the utility of PET scan in other malignancies, it may ultimately be demonstrated to be beneficial in the preoperative staging of HCCa.

Despite recent improvements in radiologic imaging, the resolution capacity of currently available technology still fails to detect subcentimeter metastases. For this reason, some have advocated the use of staging laparoscopy before open exploration in those patients thought to harbor localized disease based on preoperative imaging [50–52]. The group from Memorial Sloan-Kettering Cancer Center in New York has presented one of the largest experiences to date [52]. In their report of 56 patients with hilar cholangiocarcinoma, 14 (25%) were found at laparoscopy to be unresectable (eight peritoneal metastases, four hepatic metastases, and two nodal metastases). Similarly, Vollmer et al reported their experience in 23 patients with cholangiocarcinoma: 4 (17%) were found to be unresectable, based on laparoscopy with the use of intraoperative ultrasound [50]. Therefore, these data suggest that, given limitations in current preoperative radiologic imaging, staging laparoscopy may be a useful technique to identify those patients with metastatic disease for whom curative surgical resection is not possible.

Tumor staging

There are currently two primary staging systems used for HCCa (Table 2). The first is that of the American Joint Committee on Cancer (AJCC), which incorporates extent of tumor invasion into the wall of the bile duct, as well as nodal metastasis, and finally, distant metastasis [53]. This staging system is used for all cholangiocarcinomas, and therefore may not accurately differentiate between the different patterns of tumor growth of HCCa versus

Table 2
AJCC staging system for cholangiocarcinoma

Group staging	Tumor staging	Nodal staging	Metastasis staging
Stage 0	Tis	N0	M0
Stage I	T1	N0	M0
Stage II	T2	N0	M0
Stage III	T1,2	N1,2	M0
Stage IVA	T3	Any	M0
Stage IVB	Any	Any	M1

Abbreviations: Tis, carcinoma in situ; T1, tumor invades to fibromuscular layer; T2, tumor invades perifibromuscular tissue; T3, tumor invades adjacent structures; N1, metastasis in lymph nodes of hepatoduodenal ligament (ie, cystic duct, pericholedochal, or hilar); N2, metastasis in distant regional lymph nodes (ie, paraduodenal, periportal, celiac, superior mesenteric, peripancreatic, or posterior pancreaticoduodenal); M0, no distant metastases; M1, distant metastases.

Adapted from American Joint Commission on Cancer, editors. AJCC cancer staging manual 5th edition. Philadelphia: Lipincott-Raven; 1997; with permission.

distal cholangiocarcinomas. This system is helpful in identifying prognostic subsets, but is applicable only to the minority of patients who undergo surgical resection, because the T staging requires transmural histopathologic evaluation of the tumor. The modified Bismuth-Corlett classification system for HCCa is a more anatomic description of the location of the tumor [54]. That is, it groups those tumors based upon their extension into the hepatic ductal system (Table 3). Although this system provides an anatomic classification that can guide therapy (either resectional or palliative), it does little to describe those patients who are surgical candidates, or to provide prognostic information about each subset.

The Memorial Sloan-Kettering Group has proposed a modification to the AJCC system that takes into account biological factors related to HCCa [10]. This is directed at alterations in the T stage and includes a variety of factors that are identified on preoperative imaging. The goal of this modification is to allow categorization of those patients who are appropriate

Table 3
Modified Bismuth-Corlette classification for hilar cholangiocarcinoma

Type	Anatomic location
Type I	Below the confluence of the right and left hepatic ducts
Type II	Confined to the confluence of the right and left hepatic ducts
Type IIIa	Extension into the right hepatic duct
Type IIIb	Extension into the left hepatic duct
Type IV	Extension into the right and left hepatic ducts

Adapted from Bismuth H, Corlett MB. Intrahepatic cholangioenteric anastomosis in carcinoma of the hilus of the liver. Surgery, Gynecology and Obstetrics 1975;140:170–8; with permission.

candidates for exploration with attempted surgical resection, as well as to provide anatomic information as to the local extent of the tumor. The modification of the T staging is as follows: T1, tumor confined to the right, left, or confluence without portal vein involvement of liver atrophy; T2, same as T1, but with ipsilateral liver atrophy; T3, same as T1, but with ipsilateral portal vein atrophy without main portal vein involvement; and T4, tumor involving both right and left hepatic ducts to secondary radicles bilaterally, or main portal vein encasement. This system has been validated in their series of 225 consecutive patients with hilar cholangiocarcinoma [10]. This staging system provides data that is helpful during preoperative evaluation, such as defining the T stage based on the likelihood of successful curative resection, and also the likelihood of survival. The limitations of this system are its absolute dependence on accurate preoperative identification of the extent of the tumor and on correct interpretation of preoperative radiologic imaging, which may not be available to all physicians involved in the management of HCCa. This categorization of HCCa provides an accurate way to identify patients likely to have resectable disease, however, as well as a way to group patients into accurate prognostic subsets. It is indeed these areas in which there have been significant advances that have altered the perioperative management of hilar cholangiocarcinoma.

Operative approaches

Although long-term survival following treatment for HCCa is uncommon, only those patients treated with surgery ever achieve this chance for long-term survival [2]. Perhaps in the future systemic therapy will become more effective, to allow for prolonged survival in those patients who are not surgical candidates, but current therapy is relatively ineffective and patients with either N2 or M1 disease are essentially incurable. Although there have been recent reports of increased survival following surgical treatment of HCCa, it is important to remember that these are the minority of patients, and that if significant advances are to be made in the treatment of this disease, they will come from the development of more effective systemic therapy.

Recently, there have been an increasing number of reports that have demonstrated an increase in survival rates following curative resection, with more recently treated patients achieving a better survival [12,20,21]. The reasons for this are unclear, but probably include a combination of factors, including better patient selection, more effective local resectional technique, better perioperative care, and perhaps a change in the biology of this disease. Of these possible factors, the most clearly demonstrated is the effect of surgical technique on outcome. In most studies that have examined survival following resection of HCCa, the presence of positive histologic margins remains one of the most important predictors of poor outcome [12,18,22]. In fact, survival of patients who undergo resection but are left with positive histologic margins is only slightly better than that of patients who do not undergo resection at all. The median survival of patients who undergo a curative resection and have histologically negative margins may be two to three times the length of those patients whose margins of resection are positive. Therefore, long term survival is really only achieved in patients who undergo curative resection in which the margins of resection are histologically negative.

Despite these studies demonstrating the prognostic significance of margin status on outcome, few studies have clearly reported the location of the positive margin. Evidence from examining the effect of performing hepatic parenchymal resection in addition to the biliary resection, and the incidence of positive histologic margins, indicates that the proximal bile duct (or less likely, the proximal soft-tissue margin) is the culprit. Recent studies have reported an inverse correlation of the performance of a hepatectomy with the finding of positive histologic margins in the resected specimen [15,18,19,55]. In reports with infrequent performance of major hepatic resection (<30%), the incidence of positive margins was usually in excess of 60%, whereas in those reports of frequent performance of major hepatic resection (>60%) the incidence of positive margins decreases to less than 30%. These data strongly suggest that curative resection with histologically negative margins requires a hepatic resection in a significant fraction of patients with HCCa.

This association of hepatic parenchymal resection, negative histologic margin, and survival benefit becomes even clearer when the data of combined caudate lobe resection are examined. The biliary ductal drainage of the caudate lobe enters the CHD near the posterior aspect of the confluence of the right and left hepatic duct. It has been increasingly recognized that that HCCa frequently extends into the biliary ductal radical of the caudate lobe, and that failure to resect this may contribute to a positive histologic margin and poorer overall survival [56]. In contrast, the limited studies that have compared survival outcomes based solely on the performance of a caudate resection, performed as part of the curative resection of HCCa, observed increased survival in the group that underwent caudate lobe resection [17,56–58]. Nimura et al first reported, in a series of 91 patients, that histologically negative margins were obtained in 86% of patients when a caudate lobe resection was performed, achieving a median survival of 33 months [56]. Furthermore, in their series of 75 resected patients, Gazzaniga et al reported a 25% 5-year survival in patients who underwent caudate resection, compared with a 0% 2-year survival in patients who did not [17]. Finally, in a direct comparison of outcomes of HCCa treated at the Lahey Clinic in Burlington, Massachusetts and Nagoya University in Japan, prolonged survival was observed in the Japanese cohort, which was attributed to the higher incidence of histologically negative margins of resection associated with the frequent performance of caudate lobe resection [58]. Although it is unlikely that a prospective trial will ever be done to specifically determine the benefit of caudate lobe resection, anatomic data indicate that the caudate bile ductal branch is a frequent source of positive margins following bile duct resection alone, and the addition of caudate lobectomy to resection of HCCa may be the optimal method to ensure histologically negative margins of resection.

These studies of extended or radical resection of HCCa (ie, inclusion of hepatic parenchymal resection) indicates that the impact on survival is by the provision of histologically negative resection margins. Multivariate statistical analysis performed as part of these series fails to demonstrate that hepatic resection is correlated with any survival benefit independent of margin status [15,21,22,59]. The converse of this observation is that the hepatic parenchymal resection did not have an adverse outcome on survival. Although the addition of major hepatic resection increases operative time and perhaps total blood loss, current data suggests that perioperative morbidity and mortality are no different from those in isolated bile duct resections [14,16,18,23]. The major sources of morbidity remain infectious complications and biliary complications (anastomotic or hepatic parenchymal leak), with mortality rates generally around or slightly under 10%. These data must be carefully interpreted, as these reports are generally from centers in which major hepatic resections are frequently performed. Several studies have demonstrated the correlation between surgical volume and perioperative mortality for major hepatic resection [60–63]. Therefore, although recent published series demonstrate median survival times in excess of 3 years (and some of up to 5 years) following curative resection with negative histologic margins, these figures may not be representative of outcomes achieved for patients treated outside of these specialty centers.

The final aspects of surgical resection involve the role of major vascular resection and the extent of nodal dissection. Because extended hepatic parenchymal resection increases the likelihood of achieving histologically negative margins of resection, perhaps this same philosophy can be extended to the vasculature of the porta hepatis. The data supporting the inclusion of major vascular resection, particularly the portal vein, come primarily from Japan [13,64]. As noted for hepatic parenchymal resections, the perioperative morbidity and mortality were not increased when major portal venous resection and reconstruction was performed as part of the resection of HCCa, but the published series are small in numbers and come from centers with an extensive experience in complex hepatobiliary surgeries. Current guidelines support major vascular resections if the expertise is available, as the provision to the patient of a curative resection with histologically negative margins remains the only hope of long-term survival. As to the nodal dissection, Kitagawa et al determined the location and incidence of nodal metastases in 110 patients with HCCa [65]. The most commonly involved nodal basin was the pericholedochal (43%), followed by the periportal nodes (30.9%), and the common hepatic nodes (27.3%). The celiac and superior mesenteric lymph nodes were rarely involved, suggesting that dissection of the primary tumor along with the lymph node-bearing tissue of the porta hepatis extending to the common hepatic artery is sufficient for staging as well as disease control.

Palliation

More than half of all patients who undergo surgical exploration will harbor unresectable HCCa [12–18]. Therefore, the optimal method of palliation is a frequent decision made intraoperatively. Whereas the above discussion demonstrates the superiority of a R0 resection (histologically negative margins) compared with an R1 resection (histologically positive margins), there is less information on the outcome of R2 resections (residual gross disease). Furthermore, performing a bilio-enteric bypass of the malignant obstruction does not appear to confer a survival benefit when compared with exploration without any surgical palliative procedure [16]. As the survival of these patients is short (median survival less than 12 months), the focus of therapy should be on durable palliation of symptoms, with minimal risks. If left untreated, the jaundice in these patients can cause pruritus that impacts quality of life [66]. Furthermore, the biliary obstruction may progress to hepatic insufficiency and death independent of tumor-related causes. Therefore, for patients with unresectable disease, palliation should focus on the optimal method of biliary decompression for permanent relief of jaundice.

In patients who do not undergo exploration, there is fairly good evidence that percutaneously placed metal stents offer superior palliation to either endoscopically placed stents or plastic stents. The mean patency rate on metal stents (approximately 9 months) is about twice as long as that of plastic stents; furthermore, the incidence of stent occlusion requiring intervention is below 20% for metal stents, but anywhere from 40% to 70% with plastic stents [67–68]. In a retrospective review of 59 patients with unresectable HCCA, Born et al found that endoscopically placed stents have fewer acute complications than percutaneously placed stents (11% versus 33%), though 25% of patients initially treated endoscopically required conversion to percutaneously placed stents for adequate palliation of jaundice [69]. Furthermore, it remains difficult for the endoscopist to place stents that fully decompress both the right and left hepatic duct in patients with extensive ductal involvement of HCCa. Unfortunately, a significant number of patients develop recurrent jaundice that is due to ongoing tumor growth resulting in both occlusion of the endoprosthesis, as well as proximal extension that occludes biliary radicals too proximal to adequately stent [70–73]. Although external drainage remains an option, this method of palliation can be associated with various complications (eg, cholangitis) if long-term treatment is planned.

If unresectable disease is identified at exploration, then consideration should be given to performing a palliative bilio-enteric bypass, if technically feasible. Although there are no comparative data examining surgical bypass and endoscopic or percutaneous stenting for HCCa, available data report that palliative surgical bypass can be performed without significant morbidity or mortality [16]. Furthermore, because both the endoscopic and percutaneous stents have significant risks of stent occlusion and cholangitis, it seems reasonable to perform a durable palliative proceed when technically feasible. This seems most appropriate for Bismuth-Corlette Type I and Type II lesions, in which the uninvolved proximal biliary tree is accessible for a bilio-enteric anastomosis. This decision must be made balancing the risks of the operation and the potential benefit of a durable relief of jaundice, though realizing that operative complications may lead to the premature death of the patient.

Summary

HCCa remains an uncommon malignancy, though increasing use of more radical surgery has led to prolonged survival in those patients who undergo curative resection. The extent of these resections suggest that the best results are likely to be obtained in centers with the resources and experience to conduct these operations in a safe fashion [74]. Until major advances in the systemic therapy of HCCa are made, however, the management should focus on optimal preoperative imaging and palliation of jaundice with improvement in quality of life.

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