

Surgical Methods Resection of Liver Carcinoma

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Abstract: The present narrative review aimed to highlight the surgical management of liver carcinoma (hepatocellular carcinoma), This review intended also to discuss the indications, staging and finally technique and procedures of partial or total hepatectomy. This study is a narrative review in which we performed a PubMed, Embase and SCOPUS search for relevant English language articles published up to May,2017. Multidisciplinary and a multimodal task with the surgical treatments representing the only potentially curative techniques offered today. Liver resection and liver hair transplant are the two used surgical alternatives for HCC treatment. To use the very best alternative, mindful selection of patients is required. Accurate medical diagnosis and appropriate evaluation, consisting of the degree of the disease and the status of the hepatic reserve, are essential elements to identify the treatment technique. Laparoscopic liver resection in cirrhotic liver stayed a technically challenging procedure. It needs to be carried out in centers with expertise in surgeons who can performed complex liver surgical treatment; surgeons who are experienced in laparoscopic strategy.

Keywords: Hepatocellular carcinoma (HCC), liver transplant (LT).

1. INTRODUCTION

Hepatocellular carcinoma (HCC), an epithelial tumor derived from hepatocytes, accounts for 80% of all primary liver cancers ⁽¹⁾. Worldwide, hepatocellular carcinoma (HCC) is the 6th most common cancer and has the 3rd greatest mortality of any cancer ⁽²⁾. While the burden of HCC is greatest in establishing nations, the incidence is increasing in the United States and is anticipated to continue to increase for the next 20 years ^(3,4). Roughly one-third of patients with cirrhosis due to liver disease C will ultimately establish HCC ⁽⁵⁾. Obesity likewise seems an emerging significant risk factor for the development of HCC and connects synergistically with both alcohol and tobacco utilize to additional boost the risk ⁽⁶⁾. For patients affected by this typically devastating disease, surgical therapy represents the only wish for remedy.

Surgical treatment, consisting of liver resection and liver transplant (LT), stays the most efficient treatment of patients with hepatocellular carcinoma (HCC). Nevertheless, <30% of patients with HCC are qualified for surgical treatment, mainly due to the fact that of the multiplicity of the sores which typically happens on a background of chronic liver disease ^(7,8). Over the past 10 years, there has been substantial development in the medical diagnosis and surgical treatment of HCC. The tumors are regularly determined at an early phase, in particular through the screening of high-risk patients ^(9,10). Surgery is much safer, with an appropriate total mortality rate in cirrhotic patients (<5%); also, good long-term survival, up to >50%, is achieved after sufficient physiological resections ^(11,12). Partial resection is related to a high occurrence of tumor recurrence, primarily due to the presence of the chronic underlying liver disease which is a preneoplastic state ⁽⁸⁾. Since LT gets rid of the tumor (s) and the preneoplastic underlying chronic liver disease, LT appears to be the treatment of option for little HCCs ^(7,13).

The occurrence of death from postoperative liver failure after best hepatectomy has actually been revealed to be substantially higher in patients with fibrosis or cirrhosis compared with patients with normal background liver

parenchyma⁽¹⁴⁾. Prior research studies have also revealed that for patients with typical livers a practical liver residue of 20% of standardized liver volume is sufficient to avoid postoperative liver-related death⁽¹⁵⁾, however for patients with cirrhosis, a 40% remnant is usually accepted as the lower limitation of exactly what is essential for a safe resection⁽¹⁶⁾. Although these portion point thresholds work as guidelines, they are not a direct reflection of liver function. In some locations, ICG retention screening is offered as a direct step of liver function. In the lack of this test, patients with limited functional liver residue are suggested to have preoperative portal vein embolization performed, as this allows the cosmetic surgeon to evaluate the regenerative capability of the liver prior to personnel intervention⁽¹⁶⁾.

❖ Objectives:

The present narrative review aimed to highlight the surgical management of liver carcinoma (hepatocellular carcinoma), This review intended also to discuss the indications, staging and finally technique and procedures of partial or total hepatectomy.

2. METHOD (SEARCH STRATEGY)

This study is a narrative review in which we performed a PubMed, Embase and SCOPUS search for relevant English language articles published up to May,2017 using keywords including; HCC, liver carcinoma surgery, hepatectomy, Liver resection, liver transplantation and liver carcinoma treatment. relevant papers, including cross-sectional, cohort, clinical trial, and systematic reviews, were included in our search. the search was restricted to these articles which only involving human subjects, with excluded of models and animal trails.

3. RESULTS

Liver resection Indications:

In regards to tumor status, liver resection is typically contraindicated when among the following requirements exists: (a) extrahepatic metastasis; (b) several and bilobar tumors; (c) involvement of the primary bile duct; (d) existence of portal thrombus in the main portal vein and/or the vena cava. Preoperative evaluation of patients consists of: ultrasonography (United States) and thoracoabdominal helical multiphase contrast CT scan. The precision of new generation CT scan with vascular reconstruction has actually limited the sign for angiography primarily to patients who are prepared for preoperative transcatheter arterial chemoembolization (TACE). Despite the fact that TACE can in many cases down-stage HCC, potential trials have failed to reveal any substantial advantage of this treatment prior to surgical treatment^(18,19).

Patients with HCC and tumor thrombus in the vena cava or in the portal trunk have a poor prognosis⁽²⁰⁾. This significant vascular involvement is usually connected with a large tumor for which no treatment could be anticipated. It was shown that in a chosen group of patients with typical liver function and excellent general status, comprehensive liver resection connected with removal of the vascular thrombus can accomplish favorable survival outcomes^(20,21).

The role of hepatic resection for treatment of bilobar and several HCCs is more questionable^(22,23,24). Bilobar HCCs may represent sophisticated disease with intrahepatic metastasis from one lobe to the other or may represent multifocal HCCs. In some picked patients with great liver function, the presence of a small singular sore in the contralateral lobe cases must not contraindicate the resection of the primary tumor, and in selected cases major hepatic resection can be associated with wedge resection or local ablative therapy (if the sore is not shallow)^(24,25).

Spontaneous rupture of HCC occurs in 5 - 15% of patients^(26,27). This problem is observed particularly in patients with large superficial or protruding tumors; it is connected with hypovolemic shock in less than half of the patients^(26,27). In case of hemo-peritoneum, transcatheter arterial embolization represents the very best hemostasis procedure⁽²⁷⁾. In patients with good liver function and single tumor, rupture of HCC ought to not be considered as a contraindication to subsequent optional surgical treatment^(26,28).

○ Pre-Operative assessment of hepatic failure:

Operative death is associated with the seriousness of the underlying liver disease; it is 7%-25% in cirrhotic and less than 3% in noncirrhotic patients⁽²⁹⁾. In patients with cirrhosis, surgical resection is most securely performed in those with Child-Pugh class A disease, who has a normal bilirubin and unspoiled liver function. However, even Child-Pugh class A patients may develop quick hepatic decompensation following surgery due to minimal functional hepatic reserve (30).

Helpful, the Child-Pugh category and other tools for assessing underlying liver disease, such as the model for end-stage liver disease (MELD) rating [Figure 1], are not appropriate to choose patients with enough hepatic reserve for significant resection⁽³¹⁾. Several studies have shown that a typical serum bilirubin level and the lack of clinically significant portal high blood pressure (i.e. hepatic venous pressure gradient less than 10 mmHg) are the best offered signs of acceptably low risk of postoperative liver failure after liver resection^(32,33). In lots of centers, the Child-Pugh score may be supplemented by specialized examinations such as the indocyaninegreen (ICG) retention test, especially in marginal cases (e.g. Child-Pugh B, possible mild portal high blood pressure)⁽³⁴⁾. ICG retention of 14% at 15 minutes is frequently accepted, mostly in the Asia-Pacific location, as a reflection of sufficient functional reserves for significant resection (defined as resection of more than 2 Couinaud sections)⁽³⁵⁾. The evaluation of the volume and function of residual liver need to also be resolved by hepatic volumetry, particularly due to the fact that portal vein embolization (PVE) can be a valuable tool to increase the liver residue volume prior to significant hepatic resection, particularly for right-sided tumors.

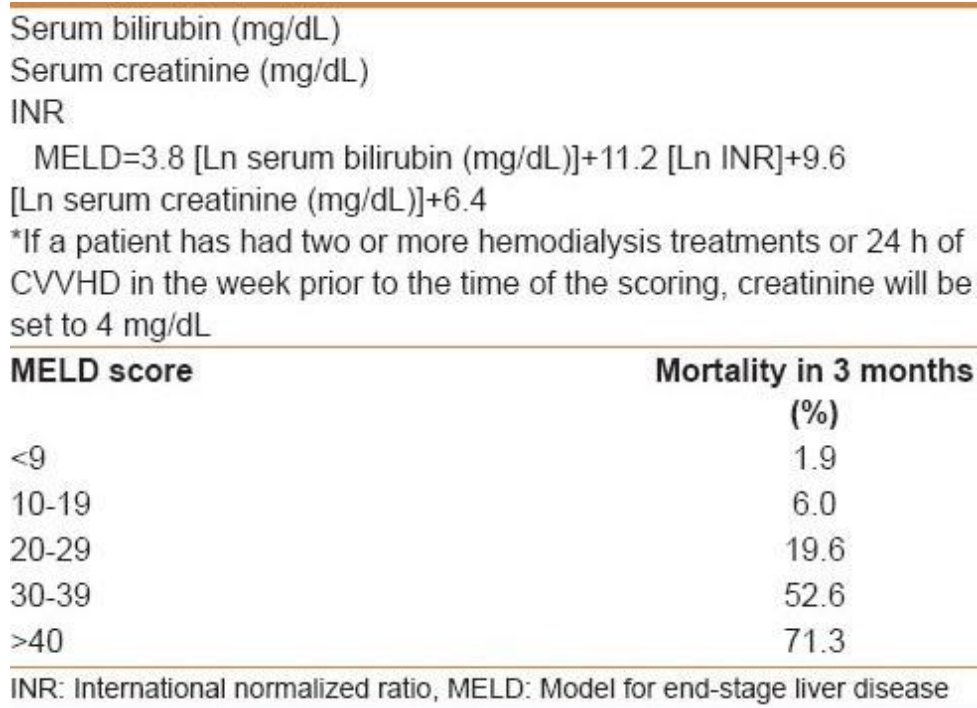


Figure 1: MELD score component, calculation, and mortality prediction

Liver resection procedures (staging, evaluation, and operative methods):

Staging: Clinical staging systems depend on non-pathologic tumor and/or patient qualities. These systems intend to stratify patients by awaited survival and viability for different treatment modalities and apply for all patients with HCC, no matter the extent of disease⁽³⁶⁾. Amongst the medical staging systems for HCC, just the Barcelona Clinic Liver Cancer (BCLC) staging system has actually been commonly evaluated, externally confirmed^(37,38), BCLC staging system was constructed on the basis of the results obtained in the setting of numerous cohort studies and RCTs by the Barcelona group. This proposal is not a scoring system as it stems from the recognition of independent prognostic consider the setting of numerous studies, adhering a staging category. This category utilizes variables connected to tumor phase, liver functional status, physical status, and cancer-related symptoms, and connects the 4 phases described with a treatment algorithm [Figure 2]^(37,38)

The BCLC system categorizes patients into 5 stages (0, A, D, b, and c) based on tumor-related variables (number, size, existence of vascular invasion, participation of lymph nodes, and presence of metastases), liver function (Child-Pugh rating), and patient practical status (ECOG)⁽³⁹⁾. Patients categorized as phase 0 are Child-Pugh A with an ECOG of 0 and have a single tumor <2 cm in size. Such patients are appropriate candidates for liver resection. Stage A patients are Child-Pugh A or B with a performance status of 0 and have 1-3 tumors, all ≤3 cm. These patients are candidates for resection, liver transplantation, or ablative therapies. Together these two groups of patients have an expected median overall survival of 60 months or longer⁽³⁹⁾. Stage B patients are also Child-Pugh A-B with a performance status of 0, but have multinodular tumors and so are not candidates for curative therapy and have an expected median overall survival of about

20 months. Patients in this class are most frequently treated with chemoembolization. Patients who are stage C are also Child-Pugh A-B, but have a lower performance status of 1-2 and have portal vein invasion, positive lymph nodes, or metastatic disease and thus, have an expected median overall survival of only 11 months. Such patients would be considered for treatment with sorafenib⁽³⁹⁾. Stage D patients are terminal patients with a performance status > 2 cm in size. Such patients are appropriate candidates for liver resection. Phase A patients are Child-Pugh A or B with an efficiency status of 0 and have 1-3 tumors, all ≤ 3 cm. These patients are prospects for resection, liver transplant, or ablative therapies. Together these two groups of patients have actually an expected median overall survival of 60 months or longer⁽³⁹⁾. Stage B patients are likewise Child-Pugh A-B with a performance status of 0, but have multinodular tumors therefore are not candidates for curative treatment and have an expected mean overall survival of about 20 months. Patients in this class are most often treated with chemoembolization.

Patients who are phase C are also Child-Pugh A-B, however have a lower performance status of 1-2 and have portal vein invasion, positive lymph nodes, or metastatic disease and thus, have an expected typical overall survival of just 11 months. Such patients would be considered for treatment with sorafenib⁽³⁹⁾. Stage D patients are terminal patients with an efficiency status > 2 and Child-Pugh C, have a restricted survival < 3 months, and must be treated with finest helpful care⁽³⁹⁾.

BCLC Staging and treatment schedule

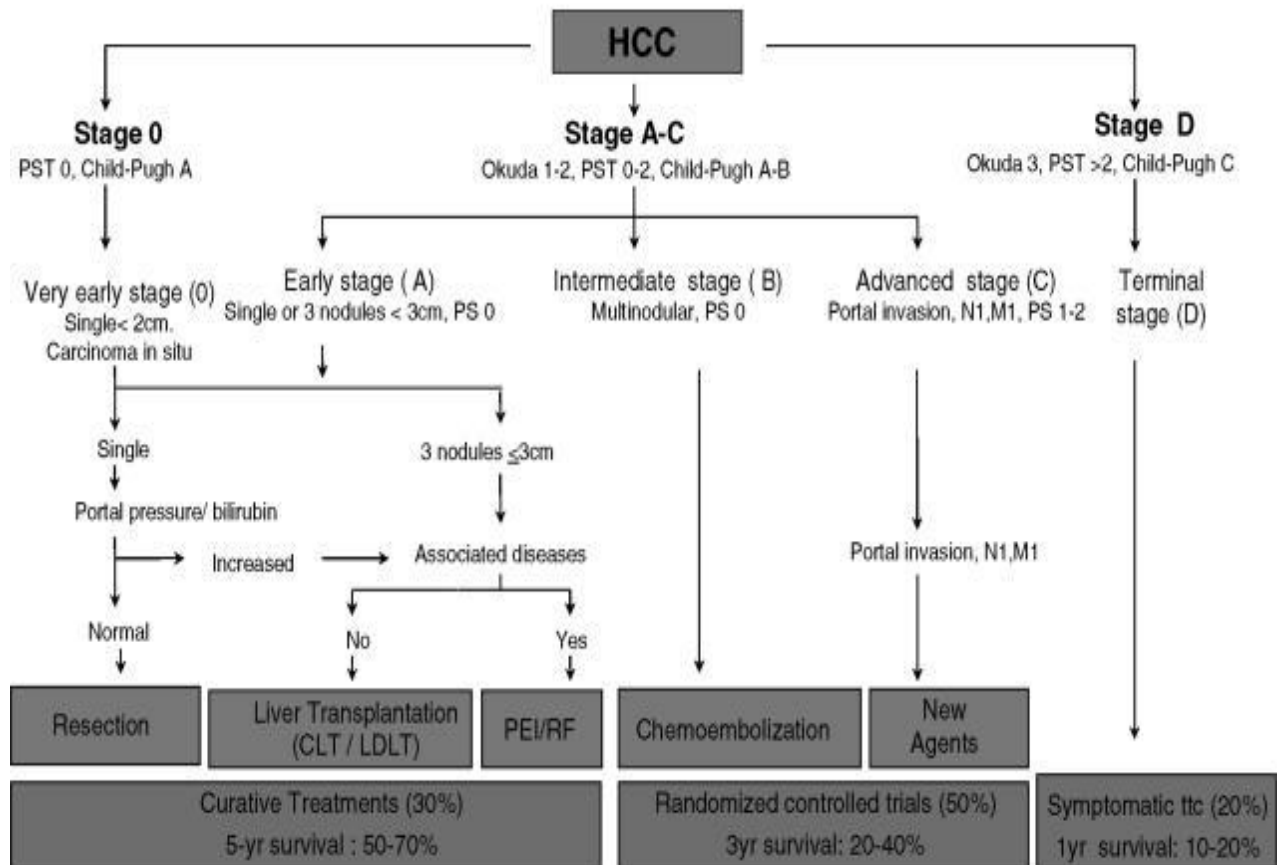


Figure 2: Barcelona-Clinic Liver Cancer (BCLC) staging classification and treatment schedule.

Evaluation: There is no general rule relating to tumor size for choice of patients for resection. Patients with smaller sized tumors are less most likely to harbor occult vascular intrusion and have a much better outcome after therapy⁽⁴⁰⁾. Patients with a solitary HCC without vascular intrusion have a similar survival likelihood regardless of the tumor size⁽⁴¹⁾. However, the presence of macro or microscopic vascular invasion is thought about to be a strong predictor of HCC reoccurrence^(42,43). Hepatic resection is controversial in patients with resectable and limited multifocal disease and/or signs of major vascular invasion⁽⁴³⁾. Multifocality is associated with lower survival, but does not exclude a good outcome in picked patients. In several studies, resection of multifocal HCC was related to 5-year survival rates of roughly 24%⁽⁴⁴⁾.

Patients with multifocal HCC who appear to benefit from resection are those with adequate liver reserve to tolerate resection, without extrahepatic disease and without major vascular invasion. Liver resection in patients with major vascular invasion should just be carried out in extremely chosen scenarios by experienced groups. Owing to the high recurrence rate after surgery, it has actually been proposed that aggressive surgical liver resection with extended lymphadenectomy ought to be thought about for patients with fibrolamellar HCC and the existence of advanced-stage disease. Intrusion of tumor to surrounding organs or regional lymph node spread, or restricted remote metastasis needs to not be thought about as contraindications for alleviative resection in patients with fibrolamellar HCC ^(45,46). Laparoscopy and intraoperative ultrasound (IOUS) may improve the choice of patients for possibly curative resection. IOUS can accurately figure out the size of the primary tumor and discover portal or hepatic vein participation, which precludes alleviative resection. Another advantage of IOUS is the identification of major intrahepatic vascular structures, which can be utilized to guide segmental or nonanatomic resections ⁽⁴⁷⁾. In noncirrhotic livers, an anatomical resection needs to be carried out. Approximately two-thirds of the functional parenchyma can be eliminated securely depending upon the age of the patient and his liver regenerative capacity. For cirrhotic patients, the resection has to get rid of the least amount of nonmalignant parenchyma possible, because the capability for liver regeneration suffers in these patients, to preserve postoperative liver function. Both anatomic and wedge resection are acceptable, although some studies suggest portal-oriented resections, making it possible for longer overall and disease-free survival when possible ⁽⁴⁸⁾.

Structural delineation of tumor extent is best achieved with dynamic multiphase computed tomography (CT) or magnetic resonance imaging (MRI) scanning ^(49,50). The common picture of HCC on a CT scan will look like an enhanced sore in the arterial phase [**Figure 3a**] with early washout of the contrast in the venous stage [**Figure 3b**] Lymph node metastases are uncommon overall (between 1% and 8%), however their existence portends an even worse result. Preoperative detection of nodal metastases is restricted by the regular existence of benign nodal enlargement in patients with cirrhosis ⁽⁵¹⁾. Highly suspicious nodes based upon enhancement similar to the intrahepatic HCC sores suggest the need for biopsy in a patient being thought about for resection ⁽⁵²⁾.

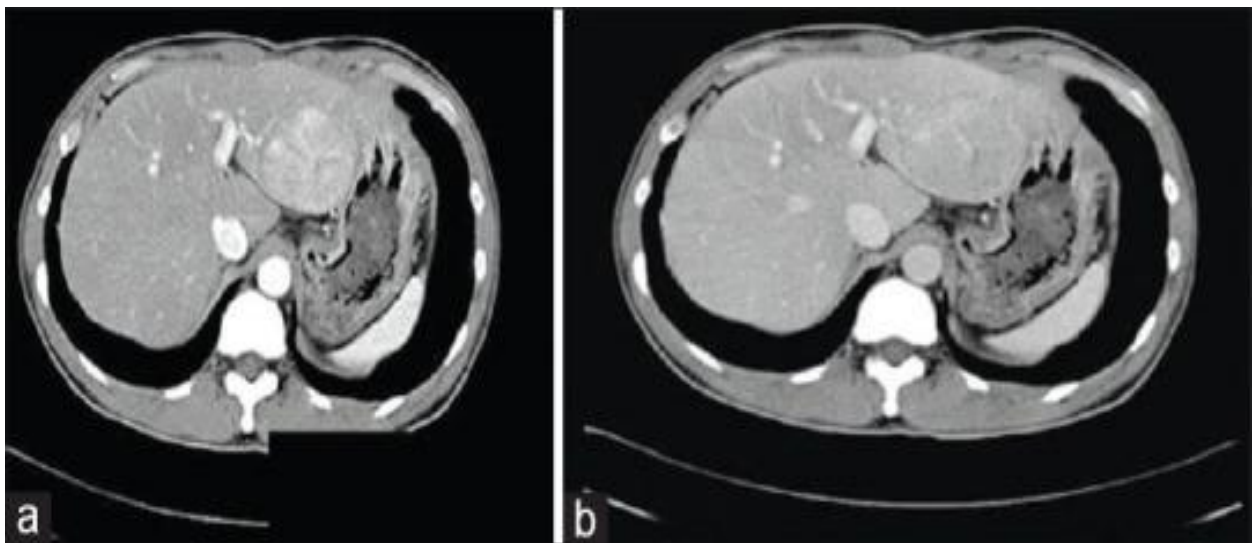


Figure 3: (a) Enhanced HCC lesion in the arterial phase of a CT scan (b) Early washout of contrast in the venous phase

Operative methods:

○ **Laparotomy liver resection method:**

HCC tumors have a propensity for local portal vein intrusion with extension toward the main portal vein, suggesting that anatomic resection of the segmental, sectional, and lobar vascular structures, depending on the site and size of the tumor, might improve outcomes. A Japanese research study compared results for 207 patients going through either anatomic (based upon vascular pedicles) or non-anatomic resections for HCC and found that anatomic resection was an independent predictor of enhanced recurrence-free survival ⁽⁵³⁾. A smaller sized French study reported similar results with the anatomic resection group having considerably enhanced disease-free survival rates ⁽⁵⁴⁾.

Micrometastases are often found within the region surrounding HCCs, providing support for using wide resection margins for these tumors⁽⁵⁵⁾. The goal of properly dealing with micrometastatic disease, however, need to be balanced against the need to preserve an optimum volume of practical liver parenchyma to lessen the risk of postoperative liver insufficiency (particularly in patients with underlying cirrhosis) and to maintain options for future treatment of frequent disease. In an effort to balance these contending goals, a potential randomized regulated trial was undertaken to compare 1 vs. 2 cm margins for patients with singular resectable HCCs⁽⁵⁶⁾. This trial, where anatomic resections were carried out in the majority of patients, discovered that 2 cm gross resection margins were related to improved total survival rates which task to the broad margin group was an independent predictor of lower risk of death in multivariate analysis. In addition, greater recurrence-free survival rates were seen in the patients in the large margin group, as were lower rates of reoccurrences at the resection margins and lower rates of multifocal recurrences. Multivariate analysis of factors related to tumor reoccurrence showed that the only 2 independent predictors were the existence of micrometases and the width of the final resection margin. Patients in the wide margin group also had considerably greater 1- and 2-year survival rates after tumor reoccurrence⁽⁵⁶⁾. These results supply compelling proof favoring making use of anatomic resections with 2 cm margins, when possible, for patients with singular HCCs.

Cross clamping of the infrahepatic vena cava is another way of decreasing blood loss during parenchymal transection. This technique has been compared with a strategy of keeping a low CVP by utilizing anesthetic methods (fluid constraint, diuretic administration, use of vasodilators) in a randomized controlled trial without regular use of portal triad occlusion⁽⁵⁷⁾. This trial discovered that infrahepatic vena cava securing was associated with substantially lower total intraoperative blood loss, lower blood loss throughout parenchymal transection, and less intraoperative hemodynamic instability than anesthetic interventions to preserve a low CVP. The group of patients in whom vena cava clamping was made use of, however, also had a considerably higher rate of pulmonary embolism, which limited the authors' interest for regular application of this technique⁽⁵⁷⁾. A 2nd randomized trial likewise compared these 2 methods in combination with portal triad occlusion⁽⁵⁸⁾. This trial likewise discovered that vena cava securing reduced blood loss during parenchymal transection and resulted in less hemodynamic changes, but in contrast to the earlier trial, likewise discovered that it was connected with a faster improvement in postoperative bilirubin levels. This trial reported comparable rates of complications in the two groups without particular reference of whether any patients suffered a lung embolism. In addition, it specifically took a look at lead to the subgroup of patients with moderate to severe cirrhosis and discovered that the impact on blood loss during parenchymal transection was likewise significant for this high-risk subgroup⁽⁵⁸⁾.

○ Laparoscopic liver resection

Over the last few years the development of laparoscopic procedures and the advancement of devoted and brand-new innovations have made endoscopic hepatic surgery feasible and safe^(59,60). Almost all kinds of liver resection have currently been carried out by laparoscopy^(60,61). The First International Consensus Conference on Laparoscopic Liver Surgery assembled in Louisville, Kentucky, in 2008⁽⁶⁰⁾, and since then, the number of laparoscopic liver resections (LLRs) has increased steadily worldwide. The number of HCC cases in which LLR is used has increased steeply over the previous five years, especially in Asia and Europe (61). LLR is related to reduced blood loss, decreased liver-specific and overall issues, and shorter postoperative hospital stays. In a declaration by the 2nd International Consensus Conference for Laparoscopic Liver Resection⁽⁶²⁾, small LLR was verified to be a standard surgical practice, but it is still in the assessment phase (IDEAL 3)⁽⁶³⁾ as it ends up being embraced by an increasing proportion of surgeons. It is uncertain whether this uses to the more complex group of patients suffering from cirrhosis⁽⁶⁴⁾.

While no randomized controlled trial has actually compared open versus laparoscopic approaches to resection in patients with HCC, four meta-analyses of nonrandomized research studies have examined both short-term postoperative and longer-term oncologic results after laparoscopic and open liver resection for this group of patients^(65,66). Each of these meta-analyses discovered that laparoscopic resection was associated with considerably less blood loss, lower transfusion requirements, lower general morbidity, and shorter length of hospital stay without a considerable distinction in length of operation, surgical margin status, or tumor recurrence rates. The two meta-analyses which analyzed postoperative mortality likewise found no considerable difference after laparoscopic versus open resection^(65,66). Specific kinds of postoperative issues were also examined in 2 of the research studies, with both finding that laparoscopic resections were related to considerably lower rates of lung issues, ascites, and lower rates of liver failure, although this reached significance in only one of the two studies^(63,66).

4. CONCLUSION

HCC management is a multidisciplinary and a multimodal task with the surgical treatments representing the only potentially curative techniques offered today. Liver resection and liver hair transplant are the two used surgical alternatives for HCC treatment. To use the very best alternative, mindful selection of patients is required. Accurate medical diagnosis and appropriate evaluation, consisting of the degree of the disease and the status of the hepatic reserve, are essential elements to identify the treatment technique. Laparoscopic liver resection in cirrhotic liver stayed a technically challenging procedure. It needs to be carried out in centers with expertise in surgeons who can performed complex liver surgical treatment; surgeons who are experienced in laparoscopic strategy.

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