Hepatocellular carcinoma (HCC), or hepatoma, is the fifth most common cancer worldwide. In the United States, the incidence of HCC has increased by nearly 75% since the 1980s. The rise in HCC diagnoses in the United States has been attributed to an increased number of patients infected with viral hepatitis and better diagnostic techniques. The management of HCC begins with diagnostic confirmation, followed by accurate staging. Historically, the prognosis for patients with HCC has been poor; however, improved surveillance and radiologic imaging techniques have led to earlier detection of HCC and an increased opportunity to treat patients. Treatment options for HCC include surgical and nonsurgical modalities. Surgical therapy, by way of partial hepatectomy or orthotopic liver transplantation, is the only potentially curative surgical therapy, by way of partial hepatectomy or orthotopic liver transplantation, is the only potentially curative treatment for HCC, but most patients are not eligible for these procedures by the time of diagnosis. Palliative options include ablative techniques, radiation, and systemic therapies. As the incidence of this malignancy continues to rise, oncology nurses, who are an integral part of the multidisciplinary team caring for these patients, must be aware of current management for HCC. This article will provide an overview of the complex management of patients with HCC in the United States.

Key Words: liver neoplasms, liver transplantation, fibrosis with HBV and HCV (Ryder, 2003). Alcoholism is another major risk factor associated with HCC in the United States (El-Serag & Mason, 1999). Alcoholism, HBV, and HCV are linked with the development of cirrhosis, which fosters an environment that is conducive to the development of HCC (Hassan et al., 2002). McCaughan, Koorey, and Strasser (2002) postulated that the ongoing process of hepatocellular injury, inflammation, regeneration, and repair characterizes cirrhosis favors carcinogenesis. The risk of developing HCC varies and correlates with the state and etiology of cirrhosis. Approximately 70% of hepatomas develop in cirrhotic livers, with an annual incidence of 3%–5% (Koea, 2001; Llovet & Beaugrand, 2003). Additional risk factors for the development of cirrhosis and HCC include hemochromatosis, primary biliary cirrhosis, autoimmune cirrhosis, and exposure to highly toxic carcinogens (e.g., aflatoxins) and androgens (Cha et al., 2002).

HCC has a lower global prevalence than HBV; however, HCV has been linked to more than 50% of the HCC cases in the United States (Monte & Wright, 2001). In the United States, approximately 3.9 million patients are infected with chronic HCV, compared to roughly 1.25 million with seroprevalence of HBV (El-Serag & Mason, 1999). An increase in
the number of patients in the United States infected with HCV and HBV has contributed to a greater incidence of cirrhosis. Less commonly, HBV has been linked to HCC in the absence of cirrhosis; however, this has not been observed with HCV (Koea, 2001; Llovet & Beaugrand, 2003; Nakakura & Choti, 2000; Yu & Keeffe, 2003). The annual probability of developing HCC after exposure and infection to HBV is an estimated 0.5%, which increases to 2.4% in HBV infection with cirrhosis. In patients infected with HCV and cirrhosis, HCC develops at an annual rate of approximately 5% (Cha et al., 2002; El-Serag & Mason). Often, a latency period of 10–30 years exists from the time that patients are exposed to HBV and/or HCV and the development of HCC, which explains why the incidence of HCC in the United States is largely in older patients. Several factors, including alcohol use, age at time of exposure, and coinfections with HBV, HCV, and/or HIV, appear to influence the rate of progression from HBV and HCV to cirrhosis and HCC (Koea).

Heavy alcohol consumption is a precursor to the development of alcoholic cirrhosis, a condition in which 2%–3% of affected patients develop HCC (Hamnett & Gollan, 2001). Alcohol is believed to act as a cocarcinogen in cirrhosis, leading to the development of HCC. Additionally, alcohol ingestion and chronic HBV and HBV appear to have a synergistic effect in accelerating the progression of liver disease and the development of HCC (Bhattacharya & Shuhart, 2003; Koea, 2001).

Another risk factor is hemochromatosis, which is an inherited disorder that causes excess iron to accumulate in the liver and leads to cirrhosis. Patients with cirrhosis from hereditary hemochromatosis have a higher risk of developing HCC (i.e., 7%–22%); however, cases of HCC have been reported in the absence of cirrhosis in patients with hemochromatosis (Hamnett & Gollan, 2001; Ryder, 2003).

Another potential risk for HCC is exposure to aflatoxins. These fungal toxins can contaminate crops, including maize and groundnuts, in humid conditions; exposure to these toxins has been linked to HCC. Evidence also suggests that the combination of dietary exposure to aflatoxins and infection with HBV increases the probability of developing HCC (Di Bisceglie, 2002; Hall & Wild, 2003; Koea, 2001).

Primary biliary cirrhosis is another cause of HCC. This disease causes bile duct injury and subsequently leads to liver damage. Studies have shown conflicting results about the level of risk associated with the development of HCC in patients with primary biliary cirrhosis (Caballeria et al., 2001).

Androgens in the form of anabolic steroids are a confirmed risk factor in the development of HCC. The use of oral contraceptives has been associated with the development of benign liver tumors, but their use has not been proven to be a risk factor in the development of HCC (Hall & Wild, 2003; Hamnett & Gollan, 2001; Koea, 2001).

Symptoms and Clinical Presentation

In the early stages of HCC, most patients are asymptomatic. Unfortunately, more than 80% of patients are symptomatic by the time of diagnosis (Hamnett & Gollan, 2001). Patients with symptomatic HCC complain of nonspecific symptoms such as right upper abdominal pain, weight loss, weakness, fullness, anorexia, and possible jaundice (Gogel et al., 2000; Rilling & Drooz, 2002). The most common finding on physical examination is an enlarged, irregular, and nodular liver. Other physical findings in the advanced stages of disease include hepatic bruits, ascites, splenomegaly, jaundice, wasting, and fever (Di Bisceglie, 2002; Lau, 2000). Jaundice and abnormal liver function tests may not develop until late in the disease course because of the functional reserve of the liver (Qin & Tang, 2003).

Diagnostic Imaging

Radiologic Imaging

Radiologic imaging plays an important role in the management of HCC, including screening, confirmation of diagnosis, treatment planning, therapy options, and follow-up (Lee, O’Malley, Kachura, Haider, & Hambidge, 2003). Differentiating HCC from benign lesions can be very challenging even for experienced radiologists. Currently, researchers are debating the ideal imaging technique for diagnosis and staging of HCC. Ultrasound, computed tomography (CT), magnetic resonance imaging (MRI), and angiography commonly are used. Numerous groups have compared the sensitivity of imaging modalities for the diagnosis and detection of HCC with varying results. Although the imaging modalities are similar, direct comparison is limited because the sensitivity of detection depends on equipment, operator skill, and technique (Szklaruk, Silverman, & Chamsangavej, 2003). Imaging protocols for HCC often are based on institutional preferences. The following provides a brief synopsis of the tests most commonly used for the evaluation of HCC.

Ultrasound or sonogram: This procedure uses sound waves to determine the extent of disease and is noninvasive and inexpensive. Ultrasound is operator dependent, and technical expertise is required to yield accurate results. Ultrasound has been used as the screening imaging modality for HCC in patients with a history of chronic liver disease (Di Bisceglie, 2002). In staging, ultrasound can provide information about the size and number of lesions as well as vascular invasion. Ultrasound’s screening and disease workup in patients with HCC have been limited by its lack of reliability in distinguishing HCC from other solid lesions in the liver (Szklaruk et al., 2003). In patients with end-stage cirrhosis, ultrasound results in a low sensitivity (Coakley & Schwartz, 2001). This mode of imaging is not helpful for the diagnosis of extrahepatic liver disease. Advances in ultrasound technique by way of color doppler and sonographic contrast may improve sensitivity and ability in differentiating HCC from other small tumors in the liver.

Triphasic and helical computed tomography scans: A CT scan uses x-rays to produce cross-sectional images of the organs (see Figures 1 and 2). Helical CT scanning has allowed for scanning of the entire liver twice in the arterial dominant phase during a single breath, resulting in imaging during the arterial, portal venous, and equilibrium phases of contrast enhancement (Fulcher & Sterling, 2002; Noguchi et al., 2003). The appearance of the lesions in various phases allows for differentiation among a variety of liver tumors. Hepatomas are hypervascular hepatic tumors and are best visualized during the arterial phase (Brancaletti, Baron, Peterson, & Marsh, 2003; Fulcher & Sterling).

Magnetic resonance imaging: MRI develops images using a magnetic field and radio waves to create multiple sequences to...
Characterize tissues. Tumor components appear to have different levels of brightness during various sequences, allowing for differentiation of liver tumors (Fulcher & Sterling, 2002). Images frequently are enhanced with gadolinium contrast because gadolinium has an excellent safety profile and is well tolerated by patients who are allergic to iodine contrast agents that often are used with CT scans. Thus, MRI provides a good alternative for patients who are unable to tolerate CT contrast. MRI typically has been the preferred method of imaging when evaluating a patient with a cirrhotic liver and attempting to differentiate between malignant and benign tumors and regenerative nodules; however, advances in technology have made CT results comparable to MRI (Carlos et al., 2003; Noguchi et al., 2003). In addition, MRI is less appealing because of its expense and limited availability.

Positron emission tomography: The positron emission tomography (PET) scan is a nuclear medicine study that uses fluorodeoxyglucose, a glucose analog, to assess for the presence of metastatic disease. The glucose analog is injected and patients are scanned to detect any areas of increased uptake, or “hot spots,” because malignant cells have a higher glucose metabolism than nonmalignant cells (Braccia & Heffernan, 2003). PET has a high incidence of false-negative results (i.e., 40%–50%) in the detection of HCC (Ho, Yu, & Yeung, 2003). Despite this, PET scans may prove to be a valuable part of the workup and management of select patients with HCC, including those being evaluated for surgical resection and liver transplantation, where distant metastases would be a contradiction to therapy. Additional studies need to be done to fully determine the value and role of PET in the diagnosis and management of patients with HCC (Wudel et al., 2003).

Angiography: Angiography of the liver, performed either with a transfemoral approach or noninvasively using specialized three-dimensional reconstruction of CT or MRI images, provides information on the hepatic arterial anatomy and other vessels (DeMatteo & Fong, 1999). Angiography also plays an essential role in hepatic artery embolization (Sziklark et al., 2003). This examination is recommended for patients who will undergo hepatic artery infusion pump placement.

Screening and Diagnosis

Screening and Diagnosis

Serum alpha fetoprotein and imaging studies assist in the screening and diagnosis of HCC. Screening, with the intent of detecting tumors at an early stage when treatment could be curative, has been advocated for patients with cirrhosis, HBV, and HCV. Most screening protocols for individuals with cirrhosis include sonograms and alpha fetoprotein testing every six months, with additional cross-sectional imaging by CT or MRI when a suspicious nodule is detected or when the alpha fetoprotein level increases (Bruijx et al., 2001; Bruijx & Llovet, 2002; Hammett & Gollan, 2001; Kotesh & Thuluwath, 2002; Schwartz & Miller, 2001). Contrast helical CT has become a commonly used screening tool for detecting HCC in patients with advanced cirrhosis (Brancatelli et al., 2003). A normal alpha fetoprotein level is less than 20 ng/ml. A measurement of 400 ng/ml or a progressive increase in alpha fetoprotein levels over time is highly suggestive of HCC (Yu & Keeffe, 2003). An alpha fetoprotein level of more than 500 ng/ml along with a suspicious lesion on imaging studies is considered diagnostic (Choti, 2002; Nakakura & Choti, 2000). At this time, screening had not been found to impact survival (Korea, 2001; Llovet & Beaugrand, 2003; Schwartz & Miller).

If a patient does not have a markedly elevated alpha fetoprotein level or radiologic findings typical of HCC, an image-guided liver biopsy may be required to confirm the diagnosis (Yu & Keeffe, 2003). Needle biopsy carries with it the potential risks of bleeding, tumor rupture, and dissemination of malignant cells along the needle biopsy tract (Choti, 2002; Nakakura & Choti, 2000). Seeding of tumor cells in the needle tract occurs in 1%–3% of patients (Ryder, 2003).

Surveillance is very important for all patients who undergo treatment. Follow-up consists of imaging studies every three to six months for two years and then annually. If initially elevated, alpha fetoprotein levels are checked every three months for two years and then every six months.

Staging

Staging

Staging is essential for the management of HCC because treatment depends on the functional status of the liver and the extent of the tumor. Additionally, clinical staging is vital for comparison among groups in therapeutic trials and among different studies. Unlike the staging for other gastrointestinal cancers, the optimal staging system for HCC has been a controversial issue. The lack of consensus about HCC staging probably reflects the wide variations in the pathologic features of patients with HCC. The prognosis of HCC is unique in that it is influenced not only by tumor characteristics but also by the underlying status of the liver (Poon & Fan, 2003). Tumor characteristics and liver function vary among patients with HCC. Current staging classifications used for HCC worldwide are the Child-Pugh Staging (CPS) system, Okuda staging system, American Joint Committee on Cancer and International Union Against Cancer Tumor-Node-Metastasis staging system, Cancer of the Liver Italian Program score, Barcelona Clinic Liver Cancer staging system, and Chinese University Prognostic Index. The CPS and Tumor-Node-Metastasis staging systems are the tools that are used most frequently in the United States.

The CPS classification is the most widely applied system. The system assesses the functional status of the liver in patients with cirrhosis and contains five variables: serum bilirubin and albumin levels, prothrombin time, ascites, and encephalopathy. CPS divides patients into low (class A), intermediate (class B), and high (class C) risk, with 10 levels of difference between the least ill patient to the most advanced (Angermayr et al., 2003). An estimated 50%–90% of patients with CPS class A cirrhosis will survive one year untreated compared with only 20% of those with CPS class C (Ryder, 2003). A limitation of CPS is that metastatic disease is not graded.

The American Joint Committee on Cancer and International Union Against Cancer Tumor-Node-Metastasis staging system is used widely for HCC predicted survival after surgical resection. The system examines tumor characteristics, including size, number, and location of tumor nodules; presence of vascular invasion; perforation of visceral peritoneum; and invasion of adjacent organs (Poon & Fan, 2003). Tumor classification ranges from stage I–IV. Because this system is based on imaging, substantial understaging may occur (Yu & Keeffe, 2003). Pathologic staging systems have been used to predict prognosis after resection and patient selection for adjuvant therapy (Vauthey et al., 2002).
Treatment Options

Treatment is based on the location of the tumor, extent of the disease, presence of distant metastases, and underlying liver function. The only proven potentially curative therapy for HCC remains surgical resection, either partial hepatectomy or orthotopic liver transplant (OLT) (Donckier et al., 2003; Lau, 2000; Ryder, 2003). Systemic and regional treatment modalities are considered to provide palliation or if a patient is unlikely to survive surgical resection because of inadequate liver function, has multiple resectable lesions, or requires tumor growth control while awaiting liver transplant. Regional ablative treatments include hepatic arterial embolization, percutaneous ethanol injection (PEI), radiofrequency ablation, and cryosurgery. Radiation therapies, both internal and external methods, are potential treatment options. Chemotherapy can be administered systemically as well as regionally via hepatic artery infusion pump or chemoeMBOLization. Other systemic therapies include antihormonal and biologic response modifiers. Many of these palliative treatments have not been tested or proven efficacious in randomized clinical trials. Treatment regimens encompassing multiple modalities have been used, and some of these combinations may prove to be beneficial in clinical trials.

Surgical Treatment

Surgical resection: Surgical resection by way of partial hepatectomy has demonstrated long-term benefits in clinical trials, with five-year survival rates of greater than 30%, and is considered the treatment of choice (Cha et al., 2002; Jarnagin et al., 2002; Koea, 2001; Yu & Keeffe, 2003). The treatment goal of partial hepatectomy is complete excision of the tumor with negative histologic margins, while leaving enough normal tissue to regenerate and sustain life (D’Angelica et al., 2003; Donckier et al., 2003). In determining operability, clinicians should assess the potential of the residual liver to support hepatic function and regenerate. In a healthy liver, as much as 80% may be removed surgically, with the expectation that the remaining liver will regenerate sufficiently for survival; however, the process of regeneration can be impeded in the cirrhotic liver (Braccia & Heffernan, 2003). Segmental resection allows for maximum preservation of the liver parenchyma and often is used in patients with cirrhosis.

As a result of improved patient selection and refined surgical techniques, resection has been found to be safe. A significant improvement in mortality and morbidity has been seen since the 1980s. Most major cancer centers report an operative mortality of less than 5% in noncirrhotic patients. One study examined operative mortality in patients with and without cirrhosis and reported it was 5% and 3.7%, respectively (Cha et al., 2002; Choti, 2002; Fortner & Blumgart, 2001; Jarnagin et al., 2002). Difficulties related to surgical resection are size of the tumor, tumor site, number of tumors, and vascular and extrahepatic involvement (Jiao et al., 1999). Patients with a CPS of 5–6 (class A), a small (< 5 cm) encapsulated tumor, no portal hypertension, a tumor in only one lobe, and minimal or no cirrhosis have the best prognosis. However, if all disease can be removed by resection, patients should not be excluded for tumors larger than 5 cm or multiple bilateral tumors. Contraindications to resection include advanced cirrhosis and extrahepatic metastases (Cha et al.; Choti; Koea, 2001). Unfortunately, less than a third of patients with cirrhosis and HCC are surgical candidates because of the severity of cirrhosis and/or the diffuse distribution of the tumor (Cha et al.; Yu & Keeffe, 2003). Additionally, most patients experience a recurrence in the remnant liver, even after curative resection (Rilling & Drooz, 2002).

Orthotopic liver transplant: In theory, total hepatectomy with OLT is the optimum treatment for HCC (Cha et al., 2002; Little & Fong, 2001). OLT allows for removal of the primary tumor and the cirrhotic hepatic parenchyma, both of which decrease life expectancy. Besides restoring complete liver function, OLT is the only therapeutic treatment that ensures complete removal of all malignant cells and preneoplastic tissue in a cirrhotic liver (Yu & Keeffe, 2003). Initially, OLT produced poor results in patients with HCC, which was attributed largely to inadequate patient selection. In one study, OLT produced survival rates comparable to liver resection with one-, three-, and five-year survival of 40%–82%, 16%–71%, and 26%–45%, respectively (Little & Fong).

OLT may be considered in only a small subset of patients. Selection criteria for liver transplant in patients with HCC include a single tumor that is smaller than 5 cm in diameter; has no more than three tumor nodules, each less than 3 cm in diameter; has no vascular invasion; and has no extrahepatic disease (National Comprehensive Cancer Network, 2003; Rilling & Drooz, 2002; Schwartz & Miller, 2001). Tumors larger than 5 cm, lymph node involvement, vascular invasion, and poorly differentiated tumor histology all negatively impact patient survival after OLT for HCC (Yu & Keeffe, 2003). Patients being evaluated for OLT should undergo a metastatic workup, including CT scans and a bone scan prior to being placed on a waiting list.

Major challenges for OLT are cadaver liver scarcity and wait times (Choti, 2002; Rilling & Drooz, 2002). In patients awaiting transplants, ablative techniques have been used in an attempt to stall tumor progression; however, additional studies are needed to prove the benefit of using these techniques prior to transplant (Llovet & Beaugrand, 2003; Rilling & Drooz; Schwartz & Miller, 2001).

The use of living donor liver transplant is under investigation at some centers. In this procedure, a portion of a live donor’s liver is removed, the recipient undergoes a complete hepatectomy, and the donor liver is transplanted. Because of ethical concerns regarding informed consent and the risk of donor mortality and morbidity, this procedure remains controversial (Broering, Sterneck, & Rogiers, 2003).

Partial hepatectomy versus orthotopic liver transplant: No randomized, controlled trials have compared hepatic resection and OLT in patients with HCC (Yu & Keeffe, 2003). However, in a retrospective study of 120 patients with cirrhosis, where 60 underwent transplantation and 60 underwent resection, no differences in three-year survival rates were demonstrated (Cha et al., 2002). Other studies have shown no difference in prognosis after resection of HCC in cirrhotic and noncirrhotic patients (Jarnagin et al., 2002; Poon et al., 2000). In the face of a donor organ shortage, resection should remain the initial treatment of choice (Poon et al.). OLT should be reserved for patients with contraindications to hepatic resection or as salvage transplantation after failed resection.

Palliative Treatment

Ablative therapy: Ablative therapy is based on the principle that decreasing the volume of viable tumor or preventing new tumor growth can lead to longer survival in selected patients. This requires the absence of extrahepatic and/or diffuse micrometastatic disease (Parikh, Curley, Fornage, & Ellis, 2002).

Hepatic arterial embolization or chemoEMbolization: Because the liver’s blood supply is derived from the hepatic artery and the portal vein, the liver is a unique target for regional treatment. Normal hepatic tissue receives the majority of its blood supply from the portal vein. Liver tumors, however, receive 80% of their blood supply from the hepatic artery in contrast to 20%–30% for normal hepatic tissue (Cha et al., 2002). This feature makes the tumor an easy target.
because occlusion of the hepatic arterial blood supply can induce ischemia without affecting the remaining uninvolved liver (Venook et al., 1990).

Hepatic arterial embolization cuts off the blood supply to the tumor with an agent such as gelatin sponge particles (Lau, 2000; Nakakura & Choti, 2000) and may be performed with or without chemotherapy. The addition of chemotherapy, hence chemoembolization, combines intra-arterial delivery of chemotherapy with embolization of the hepatic artery. This technique delivers high-dose chemotherapeutic agents (often doxorubicin hydrochloride, mitomycin, and cisplatin) to the tumor and exposes tumor cells to high doses of the agent for prolonged periods of time (Geschwind, 2002; Groen, 1999). Doses are based on hepatic function, not body surface area.

Randomized clinical trials have shown conflicting results regarding the efficacy of hepatic arterial embolization with and without chemotherapy when compared to supportive care (Geschwind, 2002; Lau, 2000). Many of these trials have been criticized for lack of stratification and too many uncontrolled variables such as various staging systems, timing of tumor detection, and etiology of cirrhosis (Geschwind). Despite the conflicting results regarding efficacy in randomized clinical trials, hepatic arterial embolization is the most commonly used ablative therapy and is the standard of care at many institutions for patients with unresectable HCC confined to the liver.

**Percutaneous ethanol injection:** PEI uses ultrasound guidance, a commonly used, minimally invasive method for treating HCC (Barnett & Curley, 2001). With imaging guidance, 95% of absolute ethanol is injected into the tumor, usually under local anesthesia with sedation (Choti, 2002; Yu & Keeffe, 2003). PEI causes less damage to surrounding nontumorous tissue than resections; therefore, multiple treatments are better tolerated in this population that is at high risk for recurrent and second primary tumors (Nakakura & Choti, 2000). A small lesion, less than 2 cm, requires only one treatment for complete ablation. Larger tumors may require additional treatments given twice a week for as long as three weeks.

In general, PEI is recommended for patients with small unresectable lesions, less than 3 cm in diameter and three or fewer in number (Choti, 2002). Contraindications to PEI include massive ascites, bleeding tendency, extrahepatic disease, obstructive jaundice, portal vein thrombosis, and CPS class C. Because of tumor necrosis, low-grade fever and pain may occur for one to three days following PEI (Yu & Keeffe, 2003). Serious complications such as hemorrhage, hepatic insufficiency, abscess, bile duct necrosis, hepatic infarction, and hypotension are rare, occurring in less than 5% of patients (Lin, Lin, & Liaw, 1997).

**Radiofrequency ablation:** This procedure uses heat to kill tumors. A radiofrequency electrode is inserted into the tumor by ultrasound, CT, or MRI guidance percutaneously, laparoscopically, or during open surgery. As the temperature in the tissue elevates, cells begin to die, resulting in necrosis (Parikh et al., 2002). The amount of blood flow to the lesion is a critical determinant of temperature response to a given increment of heat. Tumor size and location can impact the efficacy of treatment; larger tumors are more difficult to treat and have a higher risk of recurrence (Choti, 2002). Radiofrequency ablation generally is recommended for patients with lesions smaller than 6 cm (Curley, 2003).

Significant complications are rare but may include persistent fever, pain, arrhythmia, hemorrhage, pleural effusion, and liver abscess or failure. The only absolute contraindication for this procedure is extrhepatic disease or the inability to ablate the entire tumor volume. Radiofrequency ablation is an option for patients with poor liver function (CPS class B or C) and small nonresectable hepatocellular tumors. Additional clinical trials are needed to further evaluate efficacy and long-term outcomes of this therapy.

**Cryosurgery:** Cryosurgery is the oldest of the local temperature-related ablation techniques. The application of subzero temperatures has been performed safely in patients with HCC and cirrhosis who have inadequate liver reserve and/or multifocal disease (Aguayo & Patt, 2001). A cryoprobe containing liquid nitrogen is placed into the tumor using an introducer. Cryosurgery operates on the principle that rapid freezing and thawing cause cell death (Yu & Keeffe, 2003). This can be performed laparoscopically under ultrasound guidance or as an operative procedure. Because surgery is required for this approach, it rarely is used in patients who are not resection candidates (Choti, 2002).

Many patients treated with this ablative option experience transient postoperative fever and abnormal liver function tests. Overall complication rates are 50%, including hypothermia with associated coagulopathy, cardiac arrhythmia, biliary fistulae, bleeding, thrombocytopenia, electrolyte imbalances, cryogenic shock, pleural effusions, acute renal failure, and intrahepatic abscesses (Barnett & Curley, 2001). Survival rates of patients treated with cryosurgery alone were 80%, 52%, and 40% at one, three, and five years, respectively (Zhou & Tang, 1998).

**Radiation Therapy**

External beam radiation: This type of radiation can be used for palliation and pain control, but it rarely is used as a single modality because it provides a short survival benefit and offers only a 15%–30% response rate (Sitzmann, 1995). Acute toxicity (e.g., elevated liver function tests) and chronic toxicity (e.g., gastroduodenal ulcers) are common.

Internal radiation: Internal radiation is delivered via the feeding arteries of HCC by selective intra-arterial injection of radioactive isotopes (Yu & Keeffe, 2003). Despite achieving a reasonable tumor response, radioactive compounds have not demonstrated a survival benefit compared with other liver-directed treatments.

Regional chemotherapy: Hepatic arterial infusion pumps are used to deliver chemotherapy directly to the liver. The pump is surgically implanted under the skin in the right or lower quadrant of the abdomen. A catheter connected to the pump is positioned in the hepatic artery, and a continuous dose of chemotherapy is delivered into the liver (Ensminger, 2002). Higher doses of chemotherapy can be administered directly into the liver using this approach. Clinical trials are needed to further evaluate the efficacy of this treatment.

Systemic therapy: HCC generally has been considered to be resistant to chemotherapy (Leung & Johnson, 2001). As a primary or adjuvant therapy, single-agent and combination regimens do not result in overall improvement in survival and are not recommended outside of clinical trials (Choti, 2002; Lau, 2000).

Other systemic therapies include antihormonal and biologic response modifiers, neither of which has been shown to increase survival in clinical trials. These systemic therapies are not recommended as standard treatment for HCC outside of clinical trials (Leung & Johnson, 2001).

**Nursing Management**

When patients are diagnosed with HCC, they have many fears, concerns, and questions regarding the disease and treatment options. Nurses play an integral part in educating patients, providing support, and acting as patient advocates. Expert nursing management is essential for patients undergoing treatment for HCC. The technical nursing care required is dependent on the treatment (e.g., a patient who has had a liver transplant would require different care than a patient who has undergone systemic chemotherapy). General nursing care for this patient...
population includes monitoring vital signs, laboratory data, pain control, and hydration status and teaching, such as the disease process, symptom management, and the various treatments that are available. Therefore, to provide appropriate nursing care, nurses must understand the disease process, screening process, and different treatment options.

Conclusion

Incidence of HCC has risen significantly in the United States. Although multiple treatment options exist for the management of HCC, the prognosis of HCC remains poor, with a dismal five-year survival of less than 5% (Zhu, 2003). Despite progress in the management of HCC by surgical resection, the majority of these patients will experience local recurrence, which impacts long-term survival (Little & Fong, 2001). Many techniques and therapies are promising, but prospective randomized clinical trials should be devised to evaluate the efficacy of these treatments. Oncology nurses are an integral part of the multidisciplinary team and often are responsible for coordinating care. Therefore, nurses must be aware of and understand the different liver-directed procedures and the nursing implications that accompany the care of these patients.

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References


### Rapid Recap

#### Current Treatment for Hepatocellular Carcinoma

- Hepatocellular carcinoma (HCC) is the fifth most common of all malignancies and results in one million deaths each year worldwide.
- In the United States, the incidence of HCC is on the rise.
- The exact etiology of HCC is unknown; however, hepatitis B and C and cirrhosis are associated strongly with the development of HCC.
- Early diagnosis and proper staging are essential in the treatment of HCC.
- Treatment options include surgical resection, orthotopic liver transplant, nonsurgical chemotheraphy, ablative techniques, and radiation.
- Multiple treatment options are available, but the five-year survival rate remains low.