What’s Old Is New Again: Patients Receiving Hepatic Arterial Infusion Chemotherapy

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Hepatocellular carcinoma (HCC) ranks as the eighth most common cancer in the world. Although uncommon in North America, the incidence of HCC in the United States has increased by 70% since the 1980s (Yu, Yuan, Govindarajan, & Ross, 2000). Estimates suggest that approximately 17,300 people in the United States will develop HCC in 2003 (Jemal et al., 2003). Generally, the most frequent causes of malignant hepatic disease in the United States are metastases from melanoma and primary tumors of the gastrointestinal tract, breast, and lung. Approximately 30% of patients with colorectal cancer present with liver involvement, and an additional 60% develop liver metastases (Kemeny, Kemeny, & Lawrence, 2000). The liver is the initial site of metastasis in 4% of breast cancers, 15% of lung cancers, and 24% of melanomas (Kemeny, et al., 2000). Reviews of autopsy series revealed that the prevalence of liver metastases was 70% in patients with melanoma, 45%–60% in those with breast carcinoma, and 30%–50% in those with lung carcinoma (Gilbert & Kagan, 1976; Weiss, Grundermann, & Torhorst, 1986).

The increased frequency of the liver as the initial site of metastasis is thought to be caused by the liver’s large blood supply, which originates from the portal and systemic systems. Researchers have suggested that humoral factors that promote cell growth and cellular factors such as adhesion molecules favor metastatic spread to the liver (Kemperman, Diessens, La Riviere, Meijne, & Roos, 1995; Long, Hip, & Brodt, 1994). Others speculate that the liver’s geographic proximity to other intra-abdominal organs may facilitate malignant infiltration by direct extension (Bhattacharya, Rao, & Kowdley, 2002).

Surgical resection and systemic chemotherapy are standard treatments for hepatic disease. However, surgery is not an option for patients with advanced disease, and the response rate from systemic chemotherapy remains low. An alternative therapy for patients with HCC or cancers with liver metastases is hepatic arterial infusion of chemotherapy directly into the liver. This method allows a high total body clearance and hepatic extraction to generate high hepatic and low systemic exposures. Nursing care of patients receiving hepatic arterial infusion of chemotherapy includes patient education and monitoring for complications.

Key Words: carcinoma, hepatocellular; neoplasm metastasis; infusions, intra-arterial

HAI chemotherapy has been performed for more than 40 years as treatment for HCC and hepatic metastases. In the early 1970s and 1980s, approximately 375 patients were enrolled in randomized clinical trials comparing HAI therapy with systemic chemotherapy in the treatment of unresectable liver metastases from colorectal cancer (Venook & Warren, 2001). Researchers conducting early trials found response rates of more than 50% when compared to systemic therapy. However, HAI chemotherapy failed to show a survival advantage (Allen-Mersh, Earl, Fordy, & Houghton, 1994; Chang et al., 1987; Hohn et al., 1989; Martin et al., 1990; Rougier et al., 1992). For example, Chang et al. randomized 64 patients to HAI of flouxuridine (FUDR) versus systemic FUDR and observed response rates of 62% in the HAI group and 17% in the systemic group. Two-year survivals were not statistically significant (22% and 15%, respectively). Another randomized trial conducted by Martin et al. reported a response...
rate of 48% with HAI of FUdR and 21% with systemic FUdR. Again, survival was not significantly different, but time to disease progression was increased in the HAI arm (15.7 months) compared to the systemic chemotherapy study arm (6 months).

Hohn et al. (1989) conducted a similar study comparing HAI and systemic FUdR. Forty-two percent of the patients in the HAI group achieved a complete or partial response compared to 10% in the systemic chemotherapy group. Median survival was 503 days in the HAI group versus 484 days in the systemic group. In this study, patients in the systemic chemotherapy group were allowed to cross over to the HAI group. The patients who did cross over had increased survival rates compared to those who did not.

A multicenter, randomized trial of 163 patients compared HAI of FUdR with systemic bolus of 5-fluorouracil (5-FU) chemotherapy (Rougier et al., 1992). The response rate was 49% in the HAI arm and 14% in the systemic arm, with a median survival of 15 months and 6 months, respectively.

Allen-Mersh et al. (1994) compared quality of life and survival of patients receiving HAI versus systemic chemotherapy. The quality of life of patients receiving HAI was improved with decreased toxicity, increased physical activity, and reduced rates of anxiety and depression. In this study, a significant improvement in survival occurred in the HAI group compared to the systemic group (405 days versus 226 days).

Recently, because of a high rate of disease recurrence following curative resections, researchers have developed a renewed interest in the use of HAI chemotherapy as neoadjuvant therapy with the aim of improving results in resectable liver metastases (Schlag, Benhidjeb, & Strozyckinski, 2002).

Rationale

HAI chemotherapy is an appropriate consideration when the liver is the only or primary site of disease. The major advantage of HAI over systemic chemotherapy is the possibility to achieve higher drug concentrations in the tumor site while reducing systemic exposure and side effects. Liver metastases deprive their blood supply from the hepatic artery, whereas normal hepatocytes are perfused predominately by the portal vein (Ackerman, 1992). When chemotherapy is administered via IV, a fraction of the drug reaches the liver. In contrast, chemotherapy administration via the hepatic artery results in high local drug concentrations, exposing the metastatic cells to levels of drugs that cannot be achieved by systemic therapy. For drugs with a steep dose-response curve, this may result in enhanced antitumor activity. Common chemotherapeutic agents used in HAI are carmustine, cisplatin, FUdR, 5-FU, and mitomycin C (Koa & Kemeny, 2000) (see Figure 1). This regional advantage is amplified further in cases of high total body clearance of the drug (Ensinger, 2002). Moreover, high first-pass hepatic extraction of the drug results in elevated local concentrations with lower systemic exposure, allowing the delivery of higher doses of drugs (Collins, 1984).

Methods of Placement

Several methods are used to deliver HAI chemotherapy: a catheter placed percutaneously, arterial access port, or surgically placed implantable pump.

Percutaneous Catheters

Most of the early studies of HAI used monthly percutaneous hepatic artery catheterization to deliver chemotherapy. With this method, a radiopaque 5-Fr to 8-Fr Silastic® catheter (Bard Medical Division, Covington, GA) is placed in the common femoral artery and advanced to the hepatic artery during an angiographic procedure under local anesthesia. The catheter is secured to the skin at the insertion site with sutures or elastic tape and connected to an external bedside pump. A catheter flow study is performed after each catheter placement to verify hepatic perfusion. Daily plain films of the kidneys, ureters, and bladder are performed to confirm proper catheter placement. Repeat flow studies can be done for patients who complain of midgastrointestinal pain to rule out extrahepatic perfusion. Usually, the catheter is removed after the completion of each chemotherapy course (three to five days) and reinserted prior to the next monthly course. Hospitalization and bed rest are required during infusion of the chemotherapy because of potential complications, which include increased risk of deep vein thrombosis, catheter dislodgment, kinking or breaking of catheters, infection, or hemorrhage. Because of these complications, many cancer centers favor the more patient-convenient method of a subcutaneous pump or subcutaneous access device with an external portable pump, which allow for ambulatory treatment.

Subcutaneous Ports and Pumps

Because subcutaneous implanted ports and pumps require surgical intervention, most surgeons perform preoperative scanning to rule out extrahepatic disease and avoid unnecessary surgery. In addition to the scanning, angiography is performed preoperatively to exclude the presence of anomalous arteries. Twenty percent of patients receiving HAI chemotherapy have hepatic arterial anomalies, the most frequent being origin of the right hepatic artery from the gastroduodenal artery and left hepatic artery from the left gastric artery (Mathur & Allen-Mersh, 2001).

Implanted arterial ports are placed during a laparotomy or laparoscopy. The ports have small metal or plastic bodies with raised silicone septums that allow for rescoring after frequent needle sticks. Generally, the tip of the arterial port catheter is placed in the common hepatic artery. The catheter then is attached to the port, located in a surgically created subcutaneous pocket on either side of the lower rib cage, where it is sutured to the fascia. Postoperatively, dye is injected into the catheter to verify complete hepatic perfusion and to rule out extrahepatic misperfusion. In the case of extrahepatic perfusion, embolization of the accessory vessels can be attempted (Bloom et al., 1999).

Similarly, implanted pumps are placed during a laparotomy. During this surgical procedure, the hepatic and gastroduodenal arteries are identified and the hepatic artery is cannulated by passing the arterial catheter through an arteriotomy in the gastroduodenal artery to the hepatic artery. The catheter then is secured and connected to a subcutaneously implanted continuous pump located in the lower abdomen. The implanted pump contains a reservoir that is filled with either chemotherapy or heparinized saline. Venook (1997) advocated the use of a technetium-99m macroaggregated albumin scan prior to infusion to assess adequacy of complete liver perfusion and ensure that no misperfusion occurs. Venook also recommended performing cholecystectomy and total devascularization of the distal stomach and proximal duodenum to minimize the risk of drug-induced cholecystitis and misperfusion, respectively.

The arterial port and implantable pump are accessed by inserting a noncoring needle. The major advantage of implantable pumps

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose Range</th>
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<tr>
<td>cisplatin</td>
<td>100 mg/m²</td>
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<tr>
<td>5-fluorouracil</td>
<td>1,000 mg/m²</td>
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<tr>
<td>fluorouridine 0.1–0.3 mg/kg/day</td>
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<tr>
<td>irinotecan 25 mg/m² per day</td>
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<td>mitomycin C 10 mg/m²</td>
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<td>oxaliplatin 125 mg/m² per cycle</td>
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<tr>
<td>paclitaxel 200 mg/m²</td>
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<td>vinblastine 10 mg/m²</td>
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**Figure 1. Agents Used to Deliver Hepatic Arterial Infusion Chemotherapy and Usual Dose on Dose Range**

*Note. Based on information from Koa & Kemeny, 2000.*
over ports is that infusion pumps can provide different flow rates and infusion volumes of 20–60 ml. Depending on the type of implanted pump, the flow rate can be constant or variable.

Several types of implantable pumps have been approved by the U.S. Food and Drug Administration for HAI chemotherapy. The IsoMed® Constant-Flow Infusion System (Medtronic® Corporation, Minneapolis, MN) and the Model 3000 Series Constant Flow Implantable Infusion Pump (manufactured by Arrow-Therex Corporation, Walpole, MA, and marketed by Codman and Shurtleff, Inc., a Johnson & Johnson Company, Raynham, MA) are used frequently (Martin, 2002).

The IsoMed and Model 3000 Series store and release a prescribed amount of chemotherapy in a constant flow, minimizing the peaks and valleys often seen with traditional drug-delivery systems. Both pumps are made of an outer round titanium shell with silicone rubber septum. The IsoMed differs from the Model 3000 Series in that the IsoMed has a secondary port for bolus injections. Complete descriptions of and manufacturers’ specifications for the two pumps can be found by contacting the manufacturers.

The advantages of the hepatic arterial port or pump include convenience with repeated therapies and no required hospitalization or bed rest. However, the disadvantages are the higher initial cost for surgical insertion and weekly maintenance flushing.

**Patient Eligibility and Response**

Generally, HAI chemotherapy should be reserved for patients with primary liver disease or metastases confined to the liver. Furthermore, patients should have a Karnofsky performance status of greater than or equal to 60%, hepatic tumor involvement of less than or equal to 30% of the liver, adequate renal function (serum creatinine less than or equal to 2.0 mg/dl), and adequate hepatic function (total bilirubin less than or equal to 1.5 mg/dl, aspartate aminotransferase [AST] less than or equal to 2.5 times the upper normal reference value, or alanine aminotransferase [ALT] less than or equal to 2.5 times the upper normal reference value) without severe abdominal ascites (van Riel, van Groeningen, Giaconne, & Pinedo, 2000). Ideal candidates are patients who have adequate bone marrow function (absolute neutrophil count greater than or equal to 1,500/mm³ and platelet count greater than or equal to 100,000/mm³) and are at least three weeks from previous therapy and have recovered from associated toxicities. Patients with portal vein occlusion should not be considered because of the risk of hepatic ischemia.

The use of HAI chemotherapy as treatment for metastatic cancer of the liver has been the focus of recent clinical research. The specific response rate from HAI chemotherapy is dependent on the natural history of the primary tumor. In uveal melanoma with liver metastases, response rates of more than 40% with median survival of 10 months were reported following HAI chemotherapy (Leyvraz et al., 1997; Salmon et al., 1998; Woll, Bedikian, & Legha, 1999).

Ikeda et al. (1999) conducted a phase I and II study of 26 patients with liver metastases from breast cancer who received HAI doxorubicin and 5-FU and reported similar results. Seven of 13 evaluable patients (54%) responded. The median duration of response was 5.8 months, and median survival was 25.3 months.

A study at Memorial Sloan-Kettering Cancer Center in New York, NY, randomly assigned 156 patients who had resection of hepatic metastases to receive six cycles of HAI of FUDR and dexamethasone plus IV 5-FU, with or without leucovorin, or six weeks of similar systemic therapy alone (Kemeny et al., 1999). Overall survival at two years was 86% in the group treated with combined therapy and 72% in the group given monotherapy. Median survival was 72.2 months in the combined-therapy group and 59.3 months in the monotherapy group, with a median follow-up of 62.7 months.

The results of these studies suggest that HAI therapy given after resection or with systemic therapy improves response rates and overall survival. However, additional randomized studies are needed to quantify the benefits of HAI therapy.

**Complications**

One of the main concerns regarding HAI chemotherapy is its complications (see Figure 2 and Table 1) (Barnett & Malafa, 2001). HAI chemotherapy can produce systemic side effects such as myelosuppression, mucositis, emesis, and diarrhoea; however, these generally are not as severe as those produced by systemic chemotherapy. Severe diarrhoea, gastritis, and ulcer disease may occur from inadvertent perfusion of the stomach and duodenum via small collaterals originating from the hepatic artery (Dizon & Kemeny, 2002). This can be prevented by dissecting these collaterals at the time of pump placement or by employing these vessels during percutaneous catheter insertion. The addition of proton pump inhibitors may decrease the severity of gastric toxicity.

Hepatobiliary toxicity caused by chemical hepatitis is one of the most frequent and serious dose-limiting complications. It can occur in 30%–80% of patients receiving HAI chemotherapy and is observable clinically as an increase in baseline serum AST, ALT, alkaline phosphatase, or bilirubin (Harmanthas, Rotstein, & Langer, 1996; Kemeny, 1987; Rougier et al., 1992; Yasuda

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**TABLE 1. COMPLICATIONS OF HEPATIC ARTERIAL INFUSION**

<table>
<thead>
<tr>
<th>Complication</th>
<th>Signs and Symptoms</th>
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<td>Pump pocket infection</td>
<td>Fever</td>
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<td>Tenderness</td>
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<td>Erythema</td>
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<td>Swelling</td>
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<td>Drainage</td>
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<td>Malaise</td>
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<td>Catheter displacement</td>
<td>Abdominal pain</td>
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<td></td>
<td>Burning</td>
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<td>Swelling</td>
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<td>Fluid leakage</td>
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<td>Thrombosis</td>
<td>Abdominal pain</td>
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<td>Pump alarming</td>
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<td>Chemical hepatitis</td>
<td>Decreased appetite</td>
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<td></td>
<td>Generalized malaise</td>
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<td></td>
<td>Jaundice</td>
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<td></td>
<td>Abdominal pain</td>
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<tr>
<td>Bone marrow toxicity</td>
<td>Fatigue</td>
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<td></td>
<td>Bleeding</td>
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<td></td>
<td>Ecchymosis</td>
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<tr>
<td></td>
<td>Fever</td>
</tr>
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<td></td>
<td>Dyspnea</td>
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*Note. Based on information from Barnett & Malafa, 2001; Dizon & Kemeny, 2002; Habbe et al., 1998.*
et al., 1990). Generally, when HAI chemotherapy is complete or withdrawn, the liver enzymes will return to normal within four weeks.

Another concern about HAI chemotherapy is complications associated with catheter access devices. Aldright et al. (2002) studied 56 patients who received an arterial device for HAI chemotherapy. Twenty-eight patients underwent laparotomy to implant the catheter into the hepatic artery; the other 28 patients received a percutaneous catheter in the hepatic artery through a transaxillary percutaneous access. They found that the overall incidence of device-related complications that caused discontinuation of HAI chemotherapy was 42.7% in the percutaneous group and 7.1% in the laparotomy group ($p = 0.005$). These complications included catheter displacement (35.7%), hepatic artery thrombus (3.5%), and catheter occlusion (3.5%) in the percutaneous group, as well as catheter occlusion and hepatic artery thrombosis that occurred in 3.5% of the patients in the laparotomy group. Similarly, Wickremesekera, Cannan, and Stubbs (2000) reported a high incidence of technical problems with hepatic artery access ports that were placed in 127 patients. Technical problems such as hepatic artery thrombus, catheter blockage, duodenal ulcer, gastrointestinal bleeding, extravasation, and infection prevented continued use of the port in 43 of the patients.

Campbell et al. (1993) reported only 12 technical complications in 70 catheter placements during an eight-year period. These complications included catheter obstruction, hepatic misperfusion, and hepatic artery thrombosis. Campbell et al. noted that the technical complications were related to the presence of variant arterial anatomy or the inexperience of the surgeon placing the catheter. Habbe et al. (1998) reviewed 44 patients who had 106 HAI catheter placements. In this study, they found a higher complication rate in catheters that were placed using the left brachial artery as compared to the femoral artery. Complications included eight brachial artery thromboses, six hepatic arterial dissections, four hepatic arterial thromboses, four catheter malfunctions, and one cerebrovascular accident.

### Implications for Practice

Despite the use of HAI chemotherapy over the years, new developments and techniques in this treatment continue to be challenges to oncology nurses. Patients receiving HAI chemotherapy are placed on a higher acidity level of care because of the frequent monitoring required postprocedure. Hence, oncology nurses must have a working knowledge of the nursing implications associated with HAI chemotherapy.

### Percutaneous Catheters

Patients receiving HAI chemotherapy via percutaneous catheters connected to external pumps require close monitoring. Generally, HAI therapy is administered through the common femoral artery and requires strict bed rest and limited flexion of the extremity. Log rolling patients for linen changes and placement of bedpans are acceptable as long as the affected extremity remains straight. The head of the bed may be elevated 30 degrees to eat and read. Immobilized patients may develop problems with the skin, respiration, gastrointestinal tract, or urinary tract. Nurses should instruct patients in preventive measures such as deep-breathing exercises to aid in full expansion of the lungs, ankle and foot exercises to decrease venous stasis, and adequate fluid intake to ensure urine flow and decrease incidence of constipation.

The catheter remains in place for the duration of therapy (usually three to five days). Intra-arterial or peripheral heparin is administered to maintain therapeutic anticoagulation to prevent thrombus formation. Assessment of the catheter site for hematoma, infection, and bleeding is essential. Patients should be observed for signs and symptoms of catheter migration or dislodgment. These signs and symptoms include dyspepsia, nausea, vomiting, diarrhea, gastritis, pain from peptic ulcers, or upper abdominal pain from pancreatitis. Nurses should monitor and document vital signs, pulses distal to the insertion site, color and skin temperature of the extremity, capillary refill, and nerve sensation every four hours.

Another component of the nursing assessment of patients receiving HAI therapy includes the daily monitoring of laboratory tests. Prothrombin and partial thromboplastin times should be monitored frequently to determine whether adequate anticoagulation exists to prevent catheter occlusion or thrombus formation. Daily monitoring of patients’ liver function tests and complete blood counts could detect early signs of hepato-biliary toxicity (elevated AST, ALT, alkaline phosphatase, or bilirubin) and bone marrow suppression (decreased hemoglobin, low platelet count, or low white blood cell count).

### Subcutaneous Arterial Ports and Pumps

Nursing management of patients with implantable pumps or ports is essentially the same as that for those with percutaneous catheters, except for the postoperative care. Patients with an implantable pump or port require assessment of the incisional site for drainage, redness, or other signs and symptoms of infection.

### Hepatic arterial ports

Hepatic arterial ports are associated with a variety of technical problems. One of the most common problems leading to the discontinuation of HAI chemotherapy via an arterial port is hepatic arterial thrombosis. This problem is believed to be an idiosyncratic response to 5-FU, which results in arteritis and thrombus, and generally occurs in the first few cycles of HAI therapy (Wickremesekera et al., 2000).

Healthcare providers have no known way of avoiding this problem, so nurses must recognize the signs and symptoms of hepatic arterial thrombosis. Most patients will present with complaints of severe upper abdominal pain that radiates through to the back during chemotherapy or at the time of flushing. A contrast study through the port often will show extravasation into the retroperitoneal tissues. The catheter usually is removed if thrombosis or extravasation is present.

Another technical problem associated with hepatic arterial ports is catheter blockage. In this situation, the chemotherapy will not infuse and the port cannot be flushed. Generally, pulsing small volumes of urokinase into the port can clear the blockage. Nurses can help prevent catheter blockage by maintaining positive pressure at all times on any syringe connected to the port during flushing and thereby not allowing blood to pass back into the catheter. Some groups advocate flushing hepatic arterial ports at weekly intervals; however, Wickremesekera et al. (2000) suggested that a flushing schedule with heparinized saline 100 units/ml every four weeks is sufficient to minimize catheter blockage.

Duodenal fistulation is an unusual technical problem associated with hepatic arterial ports and one of the more serious problems that may occur. Duodenal fistulation occurs after extravasation of HAI chemotherapy into the supraduodenal tissues and results in erosion of the duodenal walls that communicate with the gastroduodenal artery. As a result, upper gastrointestinal bleeding occurs, which can be mild or severe depending on the location of the erosion and the amount of blood loss. Prompt recognition of the signs and symptoms of upper gastrointestinal bleeding can save a patient’s life. Nurses should assess patients for early symptoms of faintness or giddiness, nausea, and dyspepsia. Vital signs must be evaluated for tachycardia, hypotension, and tachypnea. Patients’ hemoglobin and hematocrit should be monitored every day.
8–12 hours. Stools must be tested for gross or occult blood, and 24-hour urinary output should be recorded to detect anuria or oliguria. Furthermore, if perforation exists in the free peritoneal cavity, patients may complain of sudden, severe upper abdominal pain that may be referred to the shoulders, especially the right shoulder, because of irritation of the phrenic nerve. If patients are suspected of having a duodenal fistula, HAI chemotherapy must be discontinued immediately. A catheter angiography, gastroscopy, and computed tomography scan are performed, and, if a fistula is seen, patients are sent to surgery for removal of the catheter and repair of the fistula.

Some of the previously listed technical problems associated with hepatic arterial ports are avoidable and others are not, but oncology nurses should be aware of them and make every effort to overcome them to optimize the therapeutic effects of HAI chemotherapy.

Subcutaneous infusion pump: Management of the subcutaneous implanted infusion pump is essentially a nursing function. Oncology nurses who take care of patients receiving HAI chemotherapy via implanted infusion pumps should gain knowledge of the device and its features, required maintenance, and associated complications. When accessing the pump, nurses must minimize entry into the system and use aseptic techniques to limit the risk of infection. Nurses should access the pump with a noncorning needle that is inserted perpendicularly to the pump septum to avoid improper administration of the chemotherapy into the subcutaneous tissue. Immediately following the needle insertion, the catheter should be flushed with 5 cc of normal saline. Nurses must use at least a 10 cc syringe to flush the catheter to avoid increasing the pressure in the system.

The implantable pump should be refilled at regular intervals and not be allowed to run empty. Rapid injection of fluid or overfilling of the reservoir may cause damage to the pump or affect infusion accuracy. Using the formula in Figure 3 should help nurses to minimize the possibility of an empty pump.

General maintenance of the pump requires that the nurse empty the pump every two weeks if the flow rate is less than 3.25 cc per day; however, if the flow rate is more than 3.25 cc per day, the pump is emptied weekly. During routine assessment and maintenance of the pump, nurses should notify a physician or advanced practice nurse of signs and symptoms of infection, pain or swelling at the pump site, development of erosion or seroma, or an unusual resistance while flushing the catheter.

### Future Research

The main objective in administering HAI chemotherapy is to generate high hepatic and low systemic exposure. A number of studies are in the process of evaluating other systemic chemotherapies and anticancer agents (e.g., viruses, liposomes, gene therapy vectors) to determine whether they possess the pharmacokinetic properties necessary to achieve a durable response and increase survival in patients with primary or metastatic liver disease.

### References


Chang, A.E., Schneider, P.D., Sugarbaker, P.H., Simpson, C., Culane, M., & Steinberg, S.M. (1987). Prospective randomized trial of regional versus systemic continuous 5-fluorodeoxyuridine chemotherapy in the treatment of HCC or metastatic liver disease remains controversial. Most studies show that HAI chemotherapy provides response rates that exceed those of systemic therapy. However, researchers disagree on the significance of this therapy in patient survival. More randomized studies comparing HAI therapy with systemic therapy are needed to fully evaluate the response, quality of life, and overall survival advantage.

Because the toxicities of HAI chemotherapy are less severe than most systemic treatments for HCC or liver metastases, many researchers will continue the quest for other antitumor agents to give regionally. Oncology nurses are in a position to assist patients in the education and identification of these protocols as a possible treatment option.

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### Conclusion

The use of HAI chemotherapy in HCC or metastatic liver disease remains controversial. Most studies show that HAI chemotherapy provides response rates that exceed those of systemic therapy. However, researchers disagree on the significance of this therapy in patient survival. More randomized studies comparing HAI therapy with systemic therapy are needed to fully evaluate the response, quality of life, and overall survival advantage.


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Rapid Recap

**What’s New Old Again: Patients Receiving Hepatic Arterial Infusion Chemotherapy**

- Hepatic arterial infusion (HAI) chemotherapy is used to treat hepatocellular carcinoma and hepatic metastases.
- The major advantage of HAI over IV chemotherapy is the ability to achieve higher drug concentrations in the tumor site (liver) while reducing systemic exposure and side effects.
- Percutaneous catheters are inserted into the femoral artery and advanced to the hepatic artery to deliver HAI chemotherapy. They are removed on completion of each chemotherapy course, given over three to five days at monthly intervals.
- Subcutaneous ports are placed during laparotomy or laparoscopy and remain in place indefinitely. An external infusion pump is connected to the intra-arterial port to deliver chemotherapy, administered over three to five days at monthly intervals.
- Implanted HAI pumps are placed during a laparotomy. The pump contains a reservoir that is filled with either chemotherapy or heparinized saline (to maintain catheter patency between treatments).
- HAI chemotherapy complications include catheter displacement, catheter thrombosis, chemical hepatitis, and bone marrow toxicity.


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