Yttrium-90 Radioembolization as a Palliative Treatment for Liver Tumors: A Case Study

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The best chance of cure for patients with liver cancer is surgical removal, but many tumors are too large or invasive. In addition, chemotherapy is frequently unsuccessful in this patient population. A case study is featured involving a patient determined to be a candidate for Yttrium-90 radioembolization, a minimally invasive liver-directed treatment used to target primary and metastatic liver tumors by delivering radioactive microspheres directly to the tumor. This article provides an introduction to the procedure, as well as practical information for nurses caring for patients with liver cancer following Yttrium-90 radioembolization.

At a Glance
- Yttrium-90 radioembolization allows larger radiation doses to be used without affecting healthy tissues.
- An outpatient procedure, Yttrium-90 radioembolization results in fewer side effects than standard treatment.
- Although Yttrium-90 radioembolization can extend and improve quality of life, its intent is palliative, not curative.

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About 140,000 people in the United States are diagnosed with colon cancer each year, with more than half developing liver tumors during their lifetime (Society of Interventional Radiology, 2015). Blood supply from the colon feeds the liver through the portal vein, allowing cancer cells to easily migrate (Memorial Sloan Kettering Cancer Center, 2015). In cases of liver cancer, the best chance of cure is surgical removal; however, many tumors are too large or invasive. Ninety percent of patients with liver cancer are not candidates for surgery, and chemotherapy is often unsuccessful in curing liver metastases. Although many noninvasive tests can be used to diagnose liver cancer, a biopsy must be performed to confirm malignancy (Kooby et al., 2010). The purpose of this case study is to provide an introduction to Yttrium-90 radioembolization, a relatively new treatment for liver cancer, and to offer practical information necessary for nurses to supply family-centered care to those patients undergoing Yttrium-90 radioembolization.

Case Study

A 52-year-old man named C.F. presented with abdominal pain, hematochezia, and a weight loss of about 20 pounds. A colonoscopy was performed, revealing a 5 mm lesion in the colon. Biopsy results were consistent with invasive adenocarcinoma. C.F. underwent a computed tomography (CT) scan that showed a 3.6 cm rectosigmoid mass with multiple liver lesions suspicious for metastatic disease. His treatment included 12 cycles of chemotherapy. CT and positron-emission tomography (PET) scans performed throughout C.F.’s treatment showed decreasing size of the liver lesions but residual uptake at the primary tumor. C.F. then underwent resection of the primary tumor and continued with postoperative radiation therapy and chemotherapy. A PET scan performed one month after radiation therapy and chemotherapy showed a good response, and, at two months postprocedure, a magnetic resonance imaging (MRI) scan showed characteristics of treated liver metastases. At that time, follow-up with interval imaging studies was scheduled. An MRI scan done six months postprocedure showed an increase in the size of the two liver lesions. The interventional radiology team was consulted regarding liver-directed radioembolization therapy.

At the time of the consultation, C.F. had no complaints and continued to work. He was not undergoing chemotherapy, and he denied skin color changes, chest pain, shortness of breath, nausea, vomiting, abdominal pain, and changes in urine or stool characteristics. His most recent MRI scan showed that two of the four liver lesions had increased in size. The size of the other two lesions remained unchanged. His physical examination was normal.

After review of his history, his physical examination, and results of the imaging studies, C.F. was determined to be a candidate for liver-directed therapy with Yttrium-90 radioembolization. To
prepare for the procedure, a CT scan was ordered to evaluate liver blood flow and tumor volumes.

Pathophysiology

Interventional radiologists use the vascular system to deliver treatment directly to a tumor without affecting other body parts. Blood supply to the tumor can be cut off through radioembolization, in which radiation is delivered to the tumor, or chemoembolization, in which chemotherapy is delivered to the tumor (Society of Interventional Radiology, 2015).

Employed to treat primary and metastatic liver tumors, Yttrium-90 radioembolization is a minimally invasive liver-directed treatment that involves delivering radioactive microspheres to the tumor. It can extend and improve quality of life but its intent is palliative, not curative. Using fluoroscopy, a catheter is threaded through the femoral artery to the liver and then into the blood vessels that supply the tumor. Tumors derive 90% of their blood supply from the hepatic artery where Yttrium-90 beads are lodged. There, they radiate the tumor, causing cell death. This technique allows larger radiation doses to be used without affecting healthy tissues; although the tumors derive blood supply from the hepatic artery, the liver derives 80% of its blood supply from the portal vein (Kooby et al., 2010; Society of Interventional Radiology, 2015). This difference in circulation offers an advantage to radioembolization because the Yttrium-90 beads can be delivered directly to the selected tumor (Lewandowski & Salem, 2006).

Yttrium-90 radioembolization is an outpatient procedure that results in fewer side effects than standard treatment (Lewandowski & Salem, 2006). The main side effect is fatigue, which can last as many as 10 days postprocedure. Patients may also experience minimal abdominal pain and nausea (Sato et al., 2008). Complications from the femoral puncture (e.g., bleeding, infection) may also arise. However, the procedure offers improved quality of life with few to no side effects and a low risk profile.

Case Progression

C.F. underwent a preplanning session to determine placement of the Yttrium-90 beads. An angiogram with embolization was performed by feeding a small catheter through the femoral artery and up to the liver. Contrast was then injected to determine blood flow through the liver. After evaluating blood flow, two cystic duct stents were placed to stop the flow of radiation to the gallbladder. The radiation dose was calculated based on liver and tumor volumes but was split in half because both lobes of the liver were affected.

One week later, C.F. returned for radioembolization, which was done under anesthesia because C.F.’s chronic pain prevented him from lying flat for the preprocedure. An arterial puncture to the femoral artery was performed, and a catheter was fed to the tumor in the right lobe of the liver. The first dose of radioembolization was injected into the tumor. After recovering in the postanesthesia care unit, C.F. was admitted for observation and discharged on the following day. C.F. did not have any complications from the procedure, and the only side effect he experienced was fatigue. At his one-month follow-up, C.F. had no remaining side effects. Further imaging was scheduled for his next follow-up, at two months postprocedure, to determine if the radioembolization was effective and to schedule the left liver lobe dose of Yttrium-90.

Impact on Nursing

Many patients receive Yttrium-90 radioembolization as an outpatient and are not admitted to the hospital. However, some patients require extra monitoring and are hospitalized overnight. Patients who generally require hospital admission have received anesthesia or have a procedural complication. When patients are admitted, vital signs and assessments should be done according to protocol. The femoral puncture site should be assessed for redness, swelling, bleeding, and drainage. If the site is bleeding, pressure should be applied until the bleeding subsides. Some bruising at the puncture site is normal. The leg should be assessed for pain, numbness, coolness, and discoloration because these may be signs of altered blood flow. If patients experience any of these symptoms, their healthcare provider should be notified (Merriweather & Sulzbach-Hoke, 2012).

The external dose of radiation from patients who receive Yttrium-90 is below regulatory limits and may not be discernable from background radiation. However, to reduce exposure, close contact should be allowed only for short time periods for the first three days postprocedure. If prolonged contact is necessary, it should be done from the patient’s left side because the liver is located on the right side of the body. Pregnant nurses should not care for these patients, and pregnant women should not visit during the first three days postprocedure (American College of Radiology, 2014). Children should be instructed to sit three feet away from the patient for the first three days following treatment. All bodily fluids should be handled with gloves. Trace amounts of radiation can be found in urine for 24 hours. Standard disposal of urine and stool down the drain or toilet is acceptable.

Gloves should be worn as a standard precaution when attending to dressings (American College of Radiology, 2014). After the procedure, patients may resume routine medications and restart a regular diet. They should not take a shower or bath until postoperative day one. Patients should not engage in any strenuous activity (e.g., lifting, sports, heavy cleaning) and should avoid bending more than necessary whichever leg was used for the procedure for 24 hours postprocedure (American College of Radiology, 2014). In addition, specific hospital policies should be referenced and followed.

Implications for Practice

About 70% of people with untreated cancer will develop a liver tumor, with many cases of metastatic liver cancer originating with tumors in the colon (Society of Interventional Radiology, 2015). Although surgical removal of liver tumors offers the best cure, many liver tumors are inoperable. Radioembolization, which has been used to treat primary and metastatic liver tumors, is not curative but can extend and improve quality of life. In addition, radioembolization has few side effects because it is minimally invasive and involves delivering radiation directly to the tumor. Most procedures are done on an outpatient basis (Society of Interventional Radiology, 2015).

As more patients undergo this procedure, more patients will be admitted to hospitals because of postoperative complications or the need for anesthesia.
Consequently, nurses must understand the pathophysiology of liver cancer and the procedural progression. The care for these patients does not differ greatly from that of other patients with cancer. However, limiting exposure is imperative, as is handling bodily fluids with appropriate protective equipment (Society of Interventional Radiology, 2015).

**Conclusion**

With blood flow from the colon to the portal vein, colon cancer has one of the highest rates of metastasis to the liver (Memorial Sloan Kettering Cancer Center, 2015). Many liver tumors are not amenable to surgical resection because of size or location. As such, embolization with Yttrium-90 beads directly to the liver tumors may be the treatment of choice for these patients. This procedure is safe, effective, and minimally invasive, with few side effects, and it may improve quality of life.

**References**


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