

## **A New Option for Patients Facing Liver Resection Surgery -**

Ignazio R. Marino M.D. - Thomas Jefferson University Hospital

### *New Device in Use at Thomas Jefferson University Hospital Can Reduce Blood Loss during Liver Surgery*

Liver resection, the surgical removal of a portion of the liver, is an effective treatment for some patients with liver tumors. Yet the procedure comes with the risk of significant complications—particularly excessive blood loss.

Now, patients facing liver resection can participate in a clinical trial at Thomas Jefferson University Hospital, in which surgery is performed using a new, technologically advanced coagulation device that can reduce blood loss, improve safety and accelerate the recovery period.

In an investigation of alternate coagulation technology, patients in the trial led by Ignazio R. Marino, M.D., director of Jefferson's Division of Transplantation, are treated with an FDA-approved plasma coagulator called PlasmaJet, made by PlasmaSurgical Limited. PlasmaJet consists of a range of disposable hand pieces that are used for coagulation by neutral argon or thermal plasma. In the Plasmajet system, both anode (where current flows in) and cathode (where current flows out) electrodes used to generate the argon plasma are contained within the hand piece, and no ground plate is used. Therefore, because both electrodes are located within the enclosure of the hand piece, no electricity passes through the patient, as in conventional electrosurgery and argon beam coagulation.

When the PlasmaJet reaches the bleeding tissue, it gives up its kinetic energy as heat and causes coagulation of the bleeding surface, thus reducing blood loss in the patient.

Recently at Jefferson, Dr. Marino's surgical team performed several liver resections using PlasmaJet and all the patients did extremely well. Blood loss was contained and blood transfusions were not necessary despite the delicate nature of the procedures.

According to Dr. Marino, liver tumor patients are sometimes diagnosed when they seek treatment for minor persistent symptoms and discomfort, such as digestive problems or a heavy sensation in the upper abdomen.

"It is important to note that the same set of symptoms can be related to a huge variety of problems, so accurate diagnosis is essential," says Dr. Marino, professor of Surgery, Jefferson Medical College of Thomas Jefferson University. When liver tumors are suspected, patients can be diagnosed with ultrasound.

"If there is a lesion in the liver, the ultrasound would unmistakably reveal it. In cases in which the disease is more advanced, other signs may be present such as a yellowish color of the eyes or fever," says Dr. Marino. He added that in some cases, people with liver tumors have no symptoms at all.

As with all tumors, liver tumors can be either benign (noncancerous) or malignant (cancerous). According to the American Liver Foundation, the most common benign liver tumors are cavernous hemangioma, hepatocellular adenoma, and focal nodular hyperplasia. Cancerous liver tumors can be either primary tumors that originate from the liver, or metastatic tumors that start in another organ and spread to affect the liver.

Liver resection is often the best approach for patients who have tumors affecting only one area of the liver when the rest of the liver is healthy.

"However, if the tumor is arising on a liver already damaged by, for example, a viral hepatitis such as hepatitis B or C, the removal of the tumor by resection would only take care of the tumor and not the rest of the diseased liver. In other words, if the only problem is a tumor, then liver resection is the best curative approach," says Dr. Marino.

For liver patients whose livers are affected by a tumor and an underlying disease, such as hepatitis or cirrhosis, organ transplant is the best option, Dr. Marino adds. In order for liver resection to be effective in cancerous cases, the cancer should be confined to the liver.

The liver is a unique organ in that it has an ability to regenerate, or replace, viable tissue that has been removed. Yet because it is an organ rich with vital blood vessels, any surgery on the liver must be performed with the greatest care to prevent excessive blood loss. Liver surgery has long been associated with massive perioperative blood loss.

"Commonly, electrosurgery is used to coagulate bleeding. In electrosurgery, a high voltage current passes from the electrosurgical unit through the patient as a means to control bleeding by coagulation at the surgical site," says Dr. Marino. The first use of the electrosurgical unit in an operating room was in 1926. In 1987, argon beam enhanced coagulation was introduced.

As effective as electrosurgery and argon beam are, they are imperfect. "In terms of the electrosurgical unit and the argon beam, this equipment uses high-frequency current," Dr. Marino explains. "Electrical energy can pass from one conductor to another (any metal object) that is in direct contact with or in proximity to the active electrode. This energy may electrically charge the metal conductor which may cause an unwanted electrosurgical burn. These burns have been reported in the scientific literature as causing, in a limited number of cases, injuries to patients. To remedy this, active electrode monitoring is being used. By using PlasmaJet, therefore, the level of risk for the patient is greatly reduced as no electrical current passes through the patient."