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Discussion

Dr. Julian K. Quattlebaum (Savannah): Dr. Sawyers kindly permitted me to read his manuscript before the meeting, and I wish to congratulate him on a most comprehensive and detailed study of the postoperative course of a most impressive series of hepatic resections.

I think, in general they illustrate what might be expected following operation of this magnitude on patients who, for one reason or another, are far from acceptable risks.

Over the years we have removed a significant portion of the liver, either as a primary procedure or as part of an even more extensive operation, on 18 patients. None of these patients developed in their postoperative course any type of postoperative bleeding, such as Dr. Sawyers', and none developed intestinal obstruction. Perhaps if some of them had lived a little longer they would have developed these complications. The common bile duct was routinely opened as the first step in the dissection of the hilus in all major resections in order to locate and protect the hepatic ducts, the duct being closed over a "T" tube.

Our troubles usually have occurred promptly in the immediate postoperative course. They have

been serious and they have usually been fatal. Five of the patients died. Two of these patients should not have died, and would not have died had they been operated upon in an institution such as that in which Dr. Sawyers works. A third patient should probabiy not have been operated on at all.

The cause of death in two patients was not unusual. One developed a massive coronary occlusion with infarction on the third day. A second developed a massive pulmonary embolism on the second day, which ended fatally. A third patient had a very bad anesthetic and immediately after operation for a tremendous hepatoma of the left lobe had complete collapse of the left lung. We were never able to re-expand the lung and he died from pneumonitis infection and anoxia.

I have always wondered if perhaps the endotracheal tube through which the anesthetic was administered might not have inadvertently been in the right main bronchus.

As so often happens in life, this particular patient was a lifelong friend of mine and a very prominent orthopedic surgeon, and of course we had a very trying time.

Another patient who had had three previous courses of perfusion chemotherapy through the hepatic artery for a very extensive growth, was really inoperable and died promptly.

The fifth patient underwent resection of the right lobe for a large tumor in a small hospital. He was found near death, with the blood he was supposed to be receiving running under the bed and covering the floor because the tube had separated from the needle. That patient, of course, should not have died.

The occurrence of subphrenic accumulation and abscess formation in two patients postoperatively emphasizes the necessity for prolonged, adequate and dependent drainage. The occurrence of pleural effusion and urinary tract infection has also been a factor in prolonging the convalescence.

The removal of a large portion of the liver is still a very formidable surgical procedure. Dr. Sawyers' paper illustrated the necessity for patients who undergo major hepatic resections to have most careful and constant postoperative attention, and such patients should undergo operation in an institution where there is a very efficient intensive care unit with other modern facilities and an efficient house staff. I might add that these facilities have been conspicuous by their absence in the care of my patients.

DR. PARKER VANAMEE (New York): Our experience with hepatic lobectomy dates back to approximately the same time as the report given here. I find little room for disagreement with the authors in any particular area. Several points should be emphasized.

First, early operation certainly is desirable unless the procedure is an elective one. In this case, we feel that bowel prep is an important part of the preoperative care, since it may prevent ammonia intoxication postoperatively.

Secondly, I would like to emphasize resection wherever possible, rather than plication, in that plication can lead to infarction which, in turn, may lead to areas of infection. In addition, two patients who also developed acute renal failure and required hemodialysis, bled into the plicated areas during dialysis, causing total infarction of the liver.

With respect to parenteral hyperosmolar alimentation, I agree in principle with its use. Perhaps Dr. Rhoads should comment. However, with a limited amount of residual hepatic tissue, the liver may not be able to handle the large glucose loads given, and, furthermore, amino acid hydrolysates contain substantial amounts of ammonia which may, if infused rapidly, lead to hepatic coma.

I also question the use of large amounts of vitamin K unless there is evidence of deficiency, since there is some evidence that excessive doses may be toxic.

Finally, I would like to suggest an avenue of investigation which might possibly help solve some of the problems in terms of hepatic regeneration and ulcer formation. Experimentally, it is known that growth hormone promotes regeneration of the liver following partial liver resection. We have recently shown that we can substantially decrease the incidence of restraint-stress ulcers by the administration of growth hormone. I wonder if growth hormone might improve the postoperative course after hepatic lobectomy.

DR. H. HARLAN STONE (Atlanta): I would like to emphasize two points.

(Slide) First, the magnitude and duration of derangements in liver function are indirectly related to how much normal liver tissue is left. Thus, following a massive resection, derangements in liver function persist for several weeks; with a relatively small resection, such as merely a left lobectomy, the patient usually regains normal liver function within a week. You must consider how much normal liver is being left behind.

Secondly, there is a tendency for blood to be sequestered into the splanchnic bed. In doing a major resection, hepatic venous outflow of the portal system is partially interrupted, so that these patients develop a transient portal hypertension and sequestrate large volumes of blood into their splanchnic bed.

(Slide) In a review of 38 liver resections, it was noted that the patient who had a 60 to 65% resection would sequestrate a volume equal to 60% of his own blood volume into the splanchnic circulation. Thus, such a patient may then go into shock in the recovery room or that same evening purely from hypovolemic shock in the systemic circuit, yet with a congestion in the splanchnic bed.

(Slide) This slide shows how dilated a small intestinal vein becomes immediately after completion of a large resection.

(Slide) A small nubbin of liver, that is, the lateral segment of the left lobe, was all that re-

mained following a major resection for hepatoma in a child.

(Slide) At autopsy, approximately 14 days later, the hypertrophied liver weighed about 25 times what it was estimated that small nubbin had weighed.

(Slide) We have found the best method of following these patients postoperatively is to monitor the central venous pressure, for there is an excellent correlation between the portal venous pressure and the central venous pressure.

DR. LEMUEL BOWDEN (New York): I have listened with much interest to the paper of Dr. Sawyers on the postoperative course of patients undergoing hepatic lobectomy.

We have been interested in major hepatic resection in the treatment of both primary and metastatic neoplasms of the liver, and have recently reviewed our experience in 53 such resections performed from 1950 to 1968 at Memorial Hospital in New York.

Postoperative fever has been by no means uncommon in our patients, but could be attributed to subphrenic or subhepatic infection, or to pulmonary infection, in all cases. I recall no instance of unexplained postoperative fever in any of these cases.

I wonder if the essayists have had long-term success in their seven patients with primary hepatic neoplasms. My reason for this question will be apparent if I may be permitted to report our 5-year end results in the 34 patients treated up to the end of 1964.

Six of these 34 patients survived for 5 years. Two have subsequently died, one at 64 months, of further metastases of leiomyosarcoma, and the other at 13½ years of an apparent second primary cancer. Four are apparently free of cancer at 7 years, 9 years, 12 years, and 12 years.

The first of these patients had metastatic adenocarcinoma to the right lobe of the liver from a sigmoid primary, but the remaining three long-term survivors all had primary hepatocellular carcinoma.

DR. GARDNER W. SMITH (Baltimore): I wish to add a technical comment on the theory that perhaps if the technic of resection could be simplified, this may simplify the postoperative care.

A year ago at the American College meeting there was an exhibit describing a liver clamp that was originally developed and used in the Army, I believe. I can not take credit for appreciating this, but Dr. Stephen Wangensteen saw it and had the machinist at the University of Virginia make one that we have since used, and I would just like, if I may, with three slides, to demonstrate this clamp.

(Slide) This is really considerably simplified. This patient has hepatoma of the right lobe, and one can see how the clamp has been used to compress the liver. Actually we cheated a little bit. This piece is off, and here's the clamp, shown where the resection was.

(Slide) This is just to demonstrate how the clamp does compress the liver parenchyma, allowing you to get good control of bleeding and be able to see the bile ducts and control them with sutures, as Dr. Sawyers described.

(Slide) And the last slide shows the specimen that was removed in this patient who did quite well postoperatively.

I would also agree that routine biliary tract decompression has caused problems for us as well, and since we have been using this clamp—we have used it four times, only—we have not used T-tube decompression on any of these patients.

DR. J. A. PINKERTON, JR. (Closing): Dr. Quattlebaum's cases have always been of interest to us. His problems with pulmonary infection have been a common problem in our cases and have emphasized the necessity for strict pulmonary toilet in the postoperative period. In addition to his remarks, we are also indebted to Dr. Quattlebaum for his pioneering efforts in the technic of hepatic lobectomy.

Dr. Vanamee's suggestion of the use of growth hormone is certainly an interesting idea which we have not used in our patients. His suggestion about the problems of ammonia intoxication and the use of bowel prep is one which has not appeared necessary in our cases, as we have encountered only one patient who might have had hepatic insufficiency. This was not substantiated clearly. It also appears in our cases that patients who have normal liver tissue remaining with uninjured bile ducts and adequate blood supply have no problem with hepatic insufficiency.

We have been very interested in Dr. Stone's studies of splanchnic pooling. Many of our patients have required more blood in the postoperative period than their anticipated needs would suggest, and undoubtedly represent this phenomenon.

In reply to Dr. Bowden's question, we have two long-term survivors in our group of seven neoplasms.

Dr. Smith's suggestion certainly is an interesting technical feature.

In closing I would like to briefly mention a very difficult problem which is occasionally encountered in hepatic trauma, and that is injury to the hepatic vein and inferior vena cava. This results in massive blood loss, which frequently is very difficult to control, and also provides the potential, at least, for air embolism when this injury is approached through an abdominal incision. In this report we included four patients who survived operation and control of this injury. Two of these patients subsequently died in the postoperative period, and autopsy of one patient revealed an embolus in the branch of the pulmonary artery to the left upper lobe.

(Slide) The first slide shows a photomicrograph of this embolus, which proved microscopically to be hepatic tissue.

(Slide) Parenchymal cells are autolysed through most of this slide, but there are remaining duct structures which are clearly recognizable.