

DISCUSSION

DR. H. HARLAN STONE (Atlanta): Over a 16-year period, 21 patients with portal vein injury and three with both the portal vein and the superior mesenteric vein injured, were explored at Grady Hospital in Atlanta. In these 24 patients, an additional 28 major vascular injuries were noted and such accounted for most of the death.

(Slide) Of 21 patients with a portal vein injury alone, there were 15 deaths. Our mortality was almost double what has been described by the group at Houston with no survivors when both the superior mesenteric vein and the portal vein have been injured. The usual cause of death was hypovolemic shock; yet a number of patients died from bleeding diatheses as a consequence of massive transfusions.

There are two main problems to be considered in the postoperative period. One is splanchnic pooling. This occurs if the portal vein has been ligated, as frequently needs to be done, or when thrombosis complicates a lateral repair.

(Slide) This patient had a lateral phlebectomy of the left branch of the portal vein. A postoperative angiogram demonstrated that it was thrombosed, while the right branch was still open. Such usually happens within only a few hours of the repair. No patient with reconstruction of portal flow had vein patency when we had the opportunity to examine the vessel later at autopsy or by angiography. Thus, splanchnic pooling becomes an important consideration and may demand massive amounts of extra intravenous fluid post-operatively.

Secondly is the horrible situation where both hepatic artery and portal vein have been injured. Under these circumstances, we generally have elected to reconstitute the portal vein, rather than the hepatic artery. It is most easily done by anastomosing a segment of saphenous vein into the stump of the portal vein proximally, and then bringing that down to the side of the superior mesenteric vein. If one tries to reanastomose the portal vein end to end, exposure is lost as the two ends are pulled together.

DR. WALKER REYNOLDS (Anniston, Alabama): I enjoyed the paper given by Dr. Beall with his emphasis on the multiplicity of injuries in association with the injury to the portal vein as the cause of the high mortality rate in these patients. I would add that the location of the wound of the portal vein itself also has considerable importance in the difficulty in handling this situation. I will report a case in which this was my number one problem.

A 37-year-old male was shot in the left cheek, right shoulder, and right anterior chest. When seen in the emergency room he was in borderline shock 98/68, and was prepared for operation with Ringer's lactate solution until blood was available. The wounds of entrance were in the right anterior chest wall, right shoulder, and face.

The patient was taken to the operating room where the abdomen was opened through a midline incision and due to the voluminous amount of blood we were unable at first to determine the source of bleeding. We knew that it was probably in the liver with an associated injury to a large blood vessel. We then resected the falciform ligament bringing the liver forward where we could see the bullet wound of entrance into the liver itself. The wound was large enough that we were able to introduce our finger into the track of the bullet through the liver to try to determine the direction of the injury which was found to be toward the caudate lobe and through the hilar structures of the liver. Therefore, we decided to pass a rubber catheter down through the path of the bullet so that we could follow the bullet track by having direct exposure in removing a wedge section of the liver with the apex toward the track of the bullet itself as we could see no other way of getting to the actual site of the bleeding. This was done with Allen clamps pointed toward the track using Mersilene retention sutures.

(Slide) This shows the portal vein and the wound of entrance which was just above the gallbladder. The bullet came out at the hilar region at the junction of the portal vein and the right and left hepatic branches. The gallbladder was attached to the wedge of the liver which was removed to visualize the origin of the hemorrhage.

(Slide) This shows a much wider liver resection than necessary in this patient, but illustrates the fact that we were able to use hemoclips to save time with bleeders as we were working against time due to the severe hemorrhage.

We found out immediately that the medium hemoclip was not large enough to occlude the liver vessels; therefore, we used the large size hemoclip which occludes 4-11 mm vessels. We then proceeded down the track until we reached the portal vein division of the hepatic branches where we found the rent in the portal vein. We immediately

put pressure in the area, released it and gradually occluded the area with a large hemoclip which was successful in controlling the hemorrhage.

I am certain that we would not have been able to repair the rent in the portal vein with a suture ligature as the bleeding was too rapid and the area would fill with blood before one could place the suture ligature. We did use an additional arterial suture to help repair the area once the bleeding was under control. Once we had opened the abdomen and the severe hemorrhage noted, the patient went into shock and remained in shock throughout the course of the operation.

We were working against time during the entire operation. At one time there was no blood pressure for 15 minutes. The bullet itself had previously been removed having been found in the omentum. There was also an injury to the pancreas. The area was drained and the patient closed.

He was still in shock even though he received 12 pints of blood during the operation. However, on reaching the recovery room, the blood pressure returned to a normal range, and he followed an almost uneventful recovery with the nasogastric suction being removed the third day. He was carried on antibiotics Lincocin and Chloromycetin and otherwise followed conservative measures during his hospital stay.

(Slide) This shows the technique that we consider very valuable in reaching difficult places of bleeding by using direct pressure with one's finger and a large hemoclip to ligate the bleeding vessel. In this case, we do not know whether we completely occluded the portal vein or not. We did ligate a branch of the hepatic artery. The patient's SCOT went up to 176 but returned to normal range by the time of discharge. He was discharged on the 13th hospital day and has had no complications from his portal vein injury.

DR. W. ANDREW DALE (Nashville): The most significant portal vein injury which ever occurred was in 1894 and resulted in the death of the President of the French Republic at that time, Sadi Carnot, who was assassinated by an Italian anarchist. As sometimes happens, the long-term effects of this event eventually outweighed by far the immediate excitement which it provoked.

The inability of the senior surgeons of that time to repair the portal vein at once attracted the interest of a medical student. His name was Alexis Carrel. Carnot's portal vein injury triggered Carrel's entry into experimental vascular surgery, where his monumental achievements soon included suture repair of all types of vessels, grafts, and even transplantation of a dog's head. In 1912 he was awarded the Nobel Prize for these accomplishments.

Alexis Carrel spent his life in the laboratory, rather than in the clinical operating room, and as far as I can determine never personally repaired a portal vein. The presentation we have heard answers the question which stimulated Carrel's illustrious career. His accomplishments undergird all vascular surgery today, and I am sure that Alexis Carrel would join me in congratulating Dr. Mattox, Dr. Espada, and Dr. Beall upon their clinical solution of this problem.

DR. KENNETH L. MATTOX (Closing discussion): Dr. Stone, within the last three weeks we have had two additional injuries which arrived too late to include in the series; so now Houston has twenty-four in their total series, just as Atlanta has had. Unfortunately, both of these two patients died.

Dr. Reynolds has emphasized the difficulties of intraoperative exposure and several logistic problems. We remind you that the Fogarty balloons can occasionally be used as intravascular occluding devices in attempts to exposure.

We want to thank Dr. Dale for his historic note, and to remind him that we too are using Carrel's suture methods.

(Slide) Dr. Child has reviewed for us the effects in the primate of portal vein ligation, or occlusion, and this results in an immediate fall in blood pressure, a portal pressure which rises within thirty minutes, decrease in liver volume, and normal liver function tests soon afterwards. There is an immediate pelvic collateralization, with delayed collateralization within a month.

(Slide) Dr. Fish, from Galveston, has presented a number of techniques of repair in his review of portal vein reconstruction, both for trauma and if the portal vein has to be resected for tumor. The variety of these techniques underlines the fact that as long as accepted methods are utilized, and the portal vein is expeditiously handled, attention being placed on the other associated injuries, we can expect survival in a good number of these patients.