Figure 1. Abdominal vascular trauma: Approach to hematoma at laparotomy.

aspect of the fundus of the stomach to the retroperitoneum are divided, as well. Some authors recommend that the left kidney be left in the retroperitoneum, but this is only helpful if a wound is found in the juxtarenal aorta or proximal left renal artery. Because of the dense lymphatic tissue and celiac ganglia in the suprarenal periaortic area, it is very helpful to divide the left crus of the aortic hiatus of the diaphragm at the 2-o'clock position with the electrocautery.[15] The distal descending thoracic aorta will then be readily visualized and can be clamped for proximal control. Further dissection inferiorly on the diaphragmatic aorta will lead to the celiac axis and then the superior mesenteric artery. These vessels are quite close and usually assume a "V" conformation at their origins.

D. An inframesocolic midline hematoma may cover an injury to the infrarenal abdominal aorta, inferior vena cava, or the left renal vein at the midline. An injury to the cava, however, is more likely to present with a right-sided hematoma elevating the mesentery of the ascending colon. If present, the aortic injury is located under the highest point of the hematoma—the "Mount Everest phenomenom."[15] The transverse colon is elevated on to the lower chest wall, and the small bowel is eviscerated to the right. The midline retroperitoneum at the base of

the transverse mesocolon and to the left of the duodenum at the ligament of Treitz is divided longitudinally without entering the hematoma. Sharp and blunt dissection will allow for visualization of the infrarenal abdominal aorta inferior to the crossover left renal vein, and it can be clamped for proximal control. Further dissection inferiorly on the infrarenal abdominal aorta avoiding the left-sided origin of the inferior mesenteric artery will allow for visualization of an aortic injury.

E. If no injury to the suprarenal or infrarenal abdominal aorta is present under a large midline hematoma through the exposures described in C and D, the transverse colon and small bowel are placed back in the abdomen. A right medial visceral rotation, which includes elevation of the right colon after division along the line of Toldt and of the C-loop of the duodenum by an extended Kocher maneuver, is performed.[15] This allows for a visualization of the infrahepatic inferior vena cava from the confluence of the iliac veins to the liver.

F. After penetrating trauma and when preoperative imaging with a contrast-enhanced computed tomography (CT) scan has been performed, nonoperative management may be chosen. This is appropriate with a small perirenal hematoma covering a peripheral parenchymal injury with
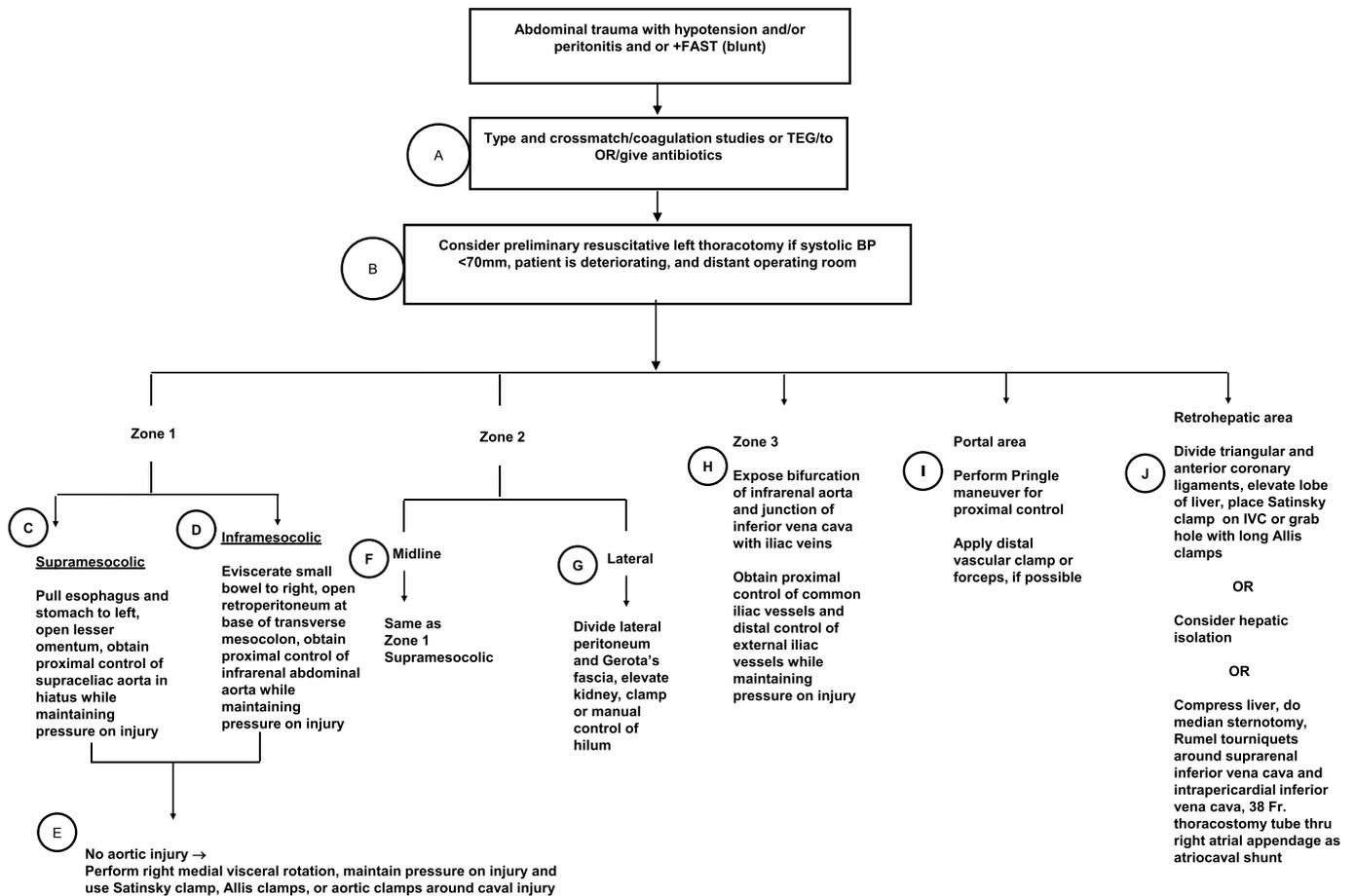
Figure 2. Abdominal vascular trauma: Approach to hemorrhage at laparotomy.

As manual or spongestick compression continues, the infrarenal inferior vena cava and both renal veins at their junctions with the cava are clamped.[15] This will give the surgeon proximal vascular control, at least. Once compression on the bleeding site is released, an isolated suprarenal perforation can be grabbed with a vascular forceps or long Allis clamp, elevated, and a Satinsky clamp applied underneath. A larger perforation can be controlled by placing a Foley balloon catheter into the hole, inflating the balloon, and placing traction on the catheter until more formal vascular control is obtained.[2] A longitudinal laceration in the cava is grabbed with a series of Judd-Allis clamps to appose the edges and control most hemorrhage.[3] An oblique or transverse laceration can be controlled by applying DeBakey aortic clamps on the inferior vena cava superior and inferior to it.With the use of the exposure technique described in 1E, an injury to the infrarenal inferior vena cava is controlled as described later for the suprarenal cava without the addition of looping and/or clamping the renal veins.

F. Same as Figure 2C.

G. Manual compression is applied to the kidney as the retroperitoneum lateral to the injured kidney and Gerota's fascia are divided. The kidney is manually elevated, and bleeding from a hilar vessel or the kidney itself is controlled manually or by placing a vascular clamp across both vessels in the hilum.

H. Manual compression is applied to the side of the pelvis where hemorrhage is occurring. On occasion, a defect in the pelvic retroperitoneum will allow the surgeon to actually grab and compress the injured vessel with a hand until proximal and distal control has been obtained. Otherwise, follow guidelines in 1H.

I. Same as Figure 1I.

J. Manual compression is applied to the overlying hepatic lobe to allow the surgical team, anesthesia, and blood bank to prepare for a major operation. If manual compression does not control hemorrhage or if preparations for the major operation to follow are completed, the triangular and anterior coronary ligaments of the hepatic lobe thought to overlie the caval injury are divided. The lobe is then manually elevated by the assistant as two suction devices are placed adjacent to the retrohepatic vena cava. A small penetrating wound or venous avulsion can be elevated by a DeBakey vascular forceps or a Judd-Allis clamp. A Satinsky vascular clamp is then placed across the cava and underneath the elevated perforation. A longer laceration not amenable to placement of a Satinsky clamp may