Supraceliac Aortic Occlusion: A Safe Approach to Pararenal Aortic Aneurysms

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Twenty-four patients who underwent surgery for pararenal aortic aneurysms between January 1992 and April 1997 are reviewed. Eighteen patients had primary atherosclerotic aneurysms, three patients had symptomatic infected aneurysms, two patients had an aneurysm proximal to a prior aortic repair, and one patient had a pseudoaneurysm of a proximal aortic graft anastomosis. Thirteen patients underwent elective operation, five had an urgent operation, and six patients underwent an emergency procedure. Five patients had the proximal aortic clamp placed between the renal arteries (Group I), three patients had it placed between the superior mesenteric and the renal arteries (Group II), and 16 patients had it placed in a supraceliac location (Group III). Aneurysm size, age, sex, preoperative blood chemistries (including hemoglobin, hematocrit, liver function studies, and coagulation studies) were similar in all groups. Two patients in Group III were on hemodialysis preoperatively. Preoperative renal function (blood urea nitrogen and creatinine) was the same in all groups. Visceral ischemic time was 43.4 ± 9.37 min to the distal kidney in Group I, 26.6 ± 7.63 min in Group II, and 24.5 ± 6.22 min in Group III. Mean transfusion requirements were similar in all groups. Two patients in Group I required postoperative hemodialysis. No patient in either Group II or III developed renal insufficiency. Mortality was the same in each group but was related to the urgency of operation (elective 7.6%, urgent 40%, emergent 50%). Intrarenal clamping (Group I) was associated with more renal and gastrointestinal complications than either suprarenal or supraceliac clamping. Although suprarenal and supraceliac clamping had similar results, our preference is supraceliac clamping because it is technically easy to achieve and is associated with few end-organ complications. (Ann Vasc Surg 1998;12:335-340.)

INTRODUCTION

Most aortic aneurysms involve the infrarenal aorta and can be managed by cross clamping the aorta distal to the renal arteries. The incidence of postoperative renal insufficiency and visceral organ damage with the cross clamp in this position is in the range of 1%-2%. A small proportion of abdominal aneurysms, however, occur in close proximity to the renal arteries and preclude clamping the aorta in the standard location. In order to manage these aneurysms, the aortic clamp has to be placed proximal to the renal vessels. Patients with anastomotic aneurysms from a previous aortic reconstruction and some patients with large mycotic aneurysms also may require the placement of a more proximal aortic clamp. The risks of postoperative renal and visceral ischemia, as well as intraoperative and postoperative coagulopathy have been known to be increased by this maneuver.

We have recently reviewed our experience with 24 patients who underwent pararenal aneurysm resection between January 1992 and April 1997. During this retrospective review we noted three locations for placement of the proximal aortic clamp: (1) Between the renal arteries in those patients who had an aneurysm that began at the level of the

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more distal renal artery but with normal tissue between the renal arteries, (2) proximal to both renal arteries but distal to the superior mesenteric artery (SMA), and (3) proximal to the celiac axis. We have attempted to determine whether intraoperative and postoperative complications were adversely affected by placing the clamp in any of the above locations.

METHODS AND MATERIALS

Twenty-four patients underwent pararenal aortic surgery for aneurysmal disease at Winthrop-University Hospital between January 1992 and April 1997. There were 15 males and 8 females. The mean age of the population was 72.8 ± 6.3 years. The mean aneurysm size was 6.91 ± 1.53 cms.

The operative procedure was considered elective if it was scheduled and performed on the elective operating room schedule. It was considered urgent if the patient was admitted with a new onset of back or abdominal pain but without hemodynamic deterioration or computerized axial tomographic (CT) evidence of leak. Operative intervention was generally carried out within 24-48 hours of admission. Surgery was considered emergent when the patient presented with either hemodynamic instability or pain and radiographic evidence of leak or rupture. Thirteen patients underwent elective operations, five had an urgent operation, and six patients underwent an emergency operation.

Eighteen of the 24 patients underwent primary repair of typical “atherosclerotic” aneurysms. Three patients who had undergone aortic grafting previously underwent reoperation. One of these patients developed a large anastomotic pseudoaneurysm and two patients developed aneurysmal dilation of the aorta proximal to the previous anastomosis.

Three patients had infected aneurysms. One patient was on long-term hemodialysis, had an ischemic cardiomyopathy, and a known 5.5 cm AAA. He developed pseudomonas sepsis, severe back pain, and rapid expansion of the aneurysm to 7.5 cm. Culture of his aneurysm at the time of surgery demonstrated staphylococcus aureus and pseudomonas. The second patient had insulin-dependent diabetes mellitus and had undergone transmetatarsal amputation for a septic foot. He continued to have spiking fevers and blood cultures positive with coag (+) staphylococcus aureus. Culture of aneurysm contents after urgent resection was positive for coagulase (+) staphylococcus aureus. The third patient was a patient who developed a pseudoaneurysm of his aorta after cardiac catheterization and had persistently positive blood cultures for staphylococcus aureus. Culture of pseudoaneurysm contents in patient #3 disclosed coagulase (+) staphylococcus aureus.

Twelve patients had a straight tube graft inserted and nine had a bifurcation graft placed. The three patients with infected aneurysms had the aorta oversewn and an axillary femoral graft placed. Two patients in this series were on hemodialysis preoperatively.

The proximal aortic anastomosis was performed either with a continuous 3-0 polypropylene suture or with interrupted, mattress, pledged, 2-0 ticon sutures. Distal aortic anastomoses were performed with a continuous 3-0 polypropylene suture. In patients who underwent placement of a bifurcated graft the distal anastomoses were performed with a continuous 4-0 or 5-0 polypropylene suture.

All operations were performed under general anesthesia with endotracheal intubation. Most patients had an epidural catheter inserted for postoperative analgesia. Radial artery lines and Swan Ganz catheters were used for hemodynamic monitoring in all patients. Seven thousand-five hundred units of heparin were administered prior to aortic clamping. Twelve and a half grams of IV mannitol was administered prior to proximal aortic clamping. A cell saver was utilized in all patients. Twenty-two of 24 patients had operations performed through a midline abdominal incision and 2 patients had a retroperitoneal incision.

Postoperative electrocardiogram (EKG) and CPK and CPK MB were obtained in all patients. Perioperative infarction was determined by EKG changes or elevation in CPK MB. Postoperative pulmonary insufficiency was defined by intubation for longer than 48 hours postoperatively. Statistical analysis was performed by using analysis of variance and pairwise comparison.

RESULTS

Five patients had the clamp placed between the renal arteries (group I), 3 patients had a suprarenal clamp placed proximal to the renal arteries but distal to the SMA (group II), and 16 patients had a supraceliac clamp placed (group III). Preoperative variables (sex, age, aneurysm size) were similar in groups I, II, and III (Table I).

The majority of the aneurysms were atherosclerotic (18/24). One patient in group II and 2 patients in group III had an infected aneurysm. Two patients in group III had a new aneurysm proximal to a prior repair and one patient had a pseudoaneurysm of a