Aortic endograft thrombosis after colorectal surgery in lithotomy position

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Aortic endograft limb occlusion is a serious complication after endovascular abdominal aortic aneurysm repair. We describe a yet unreported cause of endograft limb occlusion, the lithotomy position. Two patients with abdominal aortic aneurysm and colorectal cancer underwent an initial endovascular repair followed by cancer resection in the lithotomy position. Aortic endograft limb occlusion occurred in both patients immediately after the cancer operation. Percutaneous rheolytic thrombectomy was performed successfully in both patients. Pelvic surgery requiring the lithotomy position should be performed with caution in patients with aortic endografts, because it can result in endograft occlusion. (J Vasc Surg 2004;39:1112-4.)

CASE REPORTS

Case 1. A 73-year-old man with coronary artery disease, hypertension, and diabetes mellitus had a 1-week history of rectal bleeding. A well-differentiated adenocarcinoma of the proximal rectum was proved in a biopsy specimen obtained at colonoscopy. In addition, a computed tomography (CT) scan of the abdomen showed an incidental finding of a 6.8-cm infrarenal AAA, without rectal cancer metastasis. Preoperative workup revealed no hypercoagulable disorder. Initial endovascular repair of the aneurysm was performed with the AneuRx bifurcated stent graft (Medtronic/AVE, Santa Rosa, Calif). A completion angiogram showed a patent aortic endograft, without endoleak. Palpable pulses were presented in both lower extremities at completion of the operation. After an uneventful recovery, the patient underwent elective abdominal perineal resection in the standard lithotomy position, with a pull-through coloanal anastomosis, 1 week later. The operation did not require extensive pelvic dissection, and the total operative time was 4 hours. The placement of pelvic retractors did not affect the ileal artery circulation. The patient did not experience perioperative hypotension or require inotropic support. Two hours later, right lower leg coolness developed, with lost palpable pulses in the right lower extremity. An urgent diagnostic arteriogram was obtained through the brachial artery, which revealed complete occlusion of the right iliac endograft limb (Fig 1). Additional images revealed no distal runoff vessels. No identifiable cause of the aortic endograft limb thrombosis was found. Percutaneous mechanical thrombectomy was performed with the AngioJet rheolytic thrombectomy catheter (Possis Medical, Minneapolis, Minn) over a guide wire, which successfully reestablished the arterial flow in the iliac endograft and the distal femoropopliteal arteries. Systemic heparin (100 U/kg) was given intravenously during the thrombectomy procedure, and no postoperative anticoagulation therapy was administered. A completion angiogram showed a patent aortic endograft, with restoration of distal runoff vessels (Fig 2). The patient recovered satisfactorily, and was discharged home after 1 week. Follow-up visits showed no vascular sequelae in the extremity, and surveillance CT scans showed regression of the AAA at 1 year.

Case 2. A 68-year-old man with a known 6.4-cm AAA underwent colonoscopy because of a recent episode of bright rectal bleeding. Well-differentiated adenocarcinoma of the distal rectum was diagnosed after biopsy of a rectal mass. Staged treatment strategy with initial endovascular AAA repair followed by abdominal perineal resection was planned. Preoperative workup revealed no hypercoagulable disorder. The aneurysm was first successfully repaired with the AneuRx bifurcated stent-graft (Medtronic/AVE). The patient was discharged to home on postoperative day 1, with palpable pulses in both lower extremities. One week later he underwent elective abdominal perineal resection in the standard lithotomy position; operative time was 3 hours 40 minutes. The operation did not require extensive pelvic dissection, and placement of pelvic retractors did not affect the ileal artery circulation. The patient did not have perioperative hypotension or require inotropic support. Immediately after the operation the right lower leg was cyanotic, without a palpable right femoral pulse. The patient was repositioned supine, and aortography was performed through the brachial artery approach. Complete occlusion of the
right endograft limb was found, which was successfully treated with the AngioJet rheolytic thrombectomy catheter (Possis Medical). Systemic heparin (100 U/kg) was given intravenously during the thrombectomy procedure, and no postoperative anticoagulation therapy was administered. No evidence of mechanical compression, endograft migration, or displacement was found. A completion angiogram showed successful restoration of the aortic endograft, as well as entire right lower extremity circulation. The patient had an uneventful postoperative recovery, and was discharged to home after 9 days. He had no complications related to the endograft limb occlusion at 1-year follow-up.

**DISCUSSION**

These cases are notable because they implicate an unusual cause of endograft limb thrombosis, the lithotomy position. Moreover, the successful outcome of percutaneous rheolytic thrombectomy underscores the utility of this treatment method.

Although complications related to the lithotomy position have been described, most have been neurovascular sequelae, including deep venous thrombosis, lower extremity compartment syndrome, rhabdomyolysis, and neuropraxia. A recent case was reported in which acute aortic thrombosis developed after elective low anterior resection of rectal cancer with the patient in the lithotomy position.8 Lozman et al9 similarly reported a patient with an iliac artery aneurysm in whom iliofemoral thrombosis developed after colorectal surgery with the patient in the lithotomy position. These unusual complications of arterial thrombosis, along with our two cases, suggest a causative role of the lithotomy position in impairment of the lower extremity circulation. This hypothesis has been examined by researchers in various clinical investigations. In a study by Halliwill et al,10 who analyzed the relationship between lower extremity blood pressure and various lithotomy positions in young healthy volunteers, there was a predictable reduction in lower extremity blood pressure with the high lithotomy position. In another study, in which the lower extremity compartment pressure was measured in patients undergoing colorectal surgery in the lithotomy position, researchers found that the compartment pressure was significantly reduced to less than 30 mm Hg when the patient was in the lithotomy position for longer than 5 hours.11 The study also found that lithotomy-related compartment pressure was further reduced with the reversed Trendelenburg position.11

We postulate that the source of arterial thrombosis in our patients originated in the iliac artery distal to the endografts, due in part to vessel kinking created by the lithotomy position. This observation is based on several factors. The modular endografts used in our patients have a
nitinol-supported skeleton, which provides longitudinal support, rendering them relatively resistant to kinking. When these nitinol-supported endografts are implanted in the common iliac artery, the lithotomy position confers a mechanical force that creates acute flexion in the non-stented external iliac artery. The lithotomy-induced vessel curvature could also occur at the junction between the endograft attachment site and the distal common iliac artery. The acute flexion of an atherosclerotic plaque-laden artery, which is common in elderly patients with an underlying AAA, likely causes vessel kinking and results in thrombotic occlusion. The clinical significance of hip flexion resulting in iliac kinking was also highlighted in a recent report in which endograft limb thrombosis developed after a hip arthroplasty procedure. In addition to these mechanical factors that result in endograft limb thrombosis, there are other possibilities that may have contributed to the thrombotic occlusion in our patients. Preoperative bowel preparation for an abdominal operation may render patients hypovolemic. With hypovolemia, any signification of bowel preparation for an abdominal operation may render the thrombotic occlusion in our patients. Preoperative mechanical factors that result in endograft limb thrombosis, solution jets that are directed backward to coaxial outflow channels. This generates a vacuum force that draws the thrombus into the catheter. One advantage of this thrombectomy method is that the catheter can be delivered through a small-bore introducer sheath percutaneously, in contrast to conventional Fogarty thromboembolectomy, which requires an operative vessel exposure. We chose the brachial arterial approach in our patients, because it enables thrombectomy of either endograft limb from the iliac artery to the distal femoropopliteal segment, if necessary. In contrast, a contralateral femoral approach may pose a technical challenge when positioning the catheter across the aortic bifurcation, because of the acute angle created by the aortic endograft. An ipsilateral femoral approach poses a different treatment challenge. Although it may enable retrograde thrombectomy of the iliac artery, a separate antegrade catheter is needed to remove the femoropopliteal thrombus in the event of distal thrombus propagation.

As endovascular technology continues to be refined and gain increased public awareness, more patients with AAA will likely undergo this minimally invasive therapy. Consequently, many of these patients may subsequently undergo other operations that require use of the lithotomy position, such as urologic, gynecologic, or colorectal procedures. To prevent the complications that occurred in our patients, we recommend the following treatment principles. First, a thorough vascular examination should be performed once the patient is placed in the lithotomy position. If diminution of arterial pulses or Doppler signals is noted in the lower extremity, the flexion angle of the hip and knee should be reduced until baseline arterial flow is reestablished. Second, it is important to monitor the patient’s fluid status during abdominal or pelvic operations, either with central venous pressure or pulmonary capillary wedge pressure measurement, to avert perioperative hypovolemia, which might be precipitated by preoperative bowel preparation or intraoperative blood loss. Third, avoid the use of the sequential compression device or prolonged Trendelenburg position, which can result in reduced lower extremity perfusion in patients placed in the lithotomy position. Last, avoid prolonged use of the lithotomy position, if possible. This can be accomplished by placing the patient in the lithotomy position for only a portion of the operation, and the remainder of the procedure can be performed before establishing the lithotomy position. Alternatively, the patient can be re-placed in an alternative supine position when the lithotomy position is no longer needed.

In conclusion, we describe a yet unreported cause of aortic endograft limb thrombosis, the lithotomy position. Physicians should have heightened awareness of this thrombotic risk when patients with a previously implanted endograft undergo pelvic procedures in the lithotomy position.

REFERENCES
