Non-anastomotic Aneurysm Formation Along a Dacron Graft in an Aorto-Femoral-Femoral Bypass

Case Report and Review of Literature

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Abstract

This is a case report of a mid-graft rupture of a Dacron femoral–femoral bypass. The patient had undergone an aorto-bifemoral bypass approximately twenty years ago which failed, leading to a right axillary–bifemoral bypass thirteen years ago.

The patient presented to the E.D. with a supra-pubic mass. On the first E.D. visit, the patient was sent home with the diagnosis of a non-strangulated, non-incarcerated, reducible, inguinal hernia. On his second visit to the E.D., vascular surgery was consulted observing a tender, moderately pulsatile mass, measuring approximately 10 cm x 15 cm (see figure 1). A bedside duplex exam revealed a cavity with arterial flow and a laminated thrombus. The patient was admitted, and a subsequent CT scan revealed an 11.8 cm, supra-pubic, soft tissue mass, with a 7.3 cm lumen in the mid portion of the femoral-femoral graft (figures 2, 3, 4).

The patient was taken to the O.R., and cut downs were performed on the right axillary and bilateral femoral anastomoses. The PTFE graft in the right axillary was clamped, transected, and ligated with 4.0 prolene, 4 cm from it’s take off. The Dacron portion of the femoral-femoral bypass were ligated in each groin using 4.0 prolene, in continuous hemostatic fashion, and then transected. The Dacron portion of the right to left limb bypass was significantly aneurismal, with degeneration and rupture present. The femoral-femoral bypass was well incorporated without identification of purulent drainage or inflammation. Surgical sites were closed and the patient was transferred to recovery in stable condition. Due to the patient’s pre-op condition and the length of the procedure, limb revascularization was deferred.

On POD #1, Cardiology evaluated the patient for a troponin of 0.106, without EKG changes. A subsequent 2-D echo revealed a LVEF of 45-50%. Nephrology was also called to evaluate the patient, diagnosing an acute on chronic renal failure secondary to hypo-perfusion, with a serum creatinine measurement of 3.3. On physical exam, cyanosis of the left leg was subsequently confirmed by duplex, demonstrating acute occlusion of the bilateral lower extremities involving the CFA, SFA, POP, PT and AT arteries.

On POD #2, a left axillary to femoral bypass with thrombectomy of the CFA and SFA was conducted with a consecutive right axillary graft stump to right femoral artery bypass, using the previous conduit. Final graft cultures revealed no growth. Gross pathology indicated that there was a Dacron graft with significant aneurismal
degeneration along the graft. O.R. time during the second operation was 3.5 hours, with an EBL of 1,000 ml. 2 units of PRBCs were given with 2 liters of crystalloid. The patient’s urine output remained above 100 ml/hour, and temperature dropped to 36.5 degrees centigrade.

After the procedure, the patient was transferred, intubated, to the recovery room. The patient was acidodic, anemic, and hypotensive. The patient was treated with 2 units of PRBCs and a bi-carb drip, with the patient’s BP responding to fluid bolus. On POD #2, following the re-vascularization procedure and after intensive care, the patient was coded while on pressors.

Aneurysms are a known and common complication that can appear at the anastomosis site of a graft, but are very seldom located in the middle of any prosthetic vascular graft. A similar Dacron-type graft rupture has not been reported in the American based literature. In this report we present the case of an elderly man in whom a non-anastomotic aneurysm was found in a Dacron graft. The excised specimen confirmed aneurysmal degeneration along the graft itself.

It is recommended that long-term care be followed for prosthesis in all patients who undergo vascular graft insertion due to aneurysm formation both at the non-anastomotic and anastomotic sites using duplex ultrasonography.

Introduction

Axillo-bifemoral (AXBF) bypass was originally described by Blaisdell and Hall in 1963. Classically, only high risk circumstances in which there presented hostile abdominal pathology and/or prohibitive surgical risk would have been reserved for this procedure, however, in current practices, this procedure is now being performed more frequently.

There are many kinds of synthetic grafts that are used for this type of procedure. Dacron and polytetrafluoroethylene (PTFE) grafts are preferable for their lower aneurysm formation rates. Mid-graft aneurysms of a reinforced expanded polytetrafluoroethylene (ePTFE) graft in axillo-femoral bypass are rare, and only three have been reported in the American literature. No known cases of Dacron mid-graft aneurysm have been reported in similar literature sources. Conduits used in AXBF grafts may be externally supported or unsupported prostheses of either knitted Dacron or PTFE. The most common complications of synthetic grafts include early thrombosis, infection, and anastomotic pseudo-aneurysm. In this case report, we report an aneurysm along the mid portion of a Dacron graft used in the fem-fem portion of an AXBF bypass, and discuss possible causes and risk factors.

Case Report
A 79-year-old man, transferred from a care and rehab center in November 2008, presented with an increasing lump in his lower abdomen, decreased lower limb pulses bilaterally, confusion, and a low-grade fever of 100.4 °F. Patient had a past medical history of hypertension, diabetes mellitus, dementia, chronic kidney disease - stage 3; s/p aorto-femoral bypass, and axillary-bifemoral bypass x2, after the first two procedures had failed. Patient was admitted for a large supra-pubic mass with localized swelling. On CT scan and x-ray, a malfunction of the vascular graft was identified as a 7.3 cm aneurysm in the mid femoral-femoral portion of the graft, with surrounding mixed attenuated collection measuring up to 11.8 cm with supra-pubic soft tissue. (see figures 1, 2, and 3)

Figure 1 gross examination of the patient’s initial examination.

Figure 2 demonstrates the bifurcating graft break-down away from the right femoral anastomosis.
The patient was diagnosed with a ruptured femoral-femoral bypass graft, with a large hematoma on the right side of the AXBF graft, located in the supra-pubic region. Due to the acute nature of the presentation, surgical ligation and repair was performed.

The patient denied any recent trauma around the time of admission, and was unsure about the length of time in which the mass had been present. A full and complete history of the original graft placement was unable to be obtained due to the patient’s secondary expressive aphasia from a previous right frontal infarct, as well as some demonstrated, generalized confusion. Full repair of the graft was unable to be completed initially as it was determined that the patient would be unstable in a prolonged procedure, and therefore, ligation of both AXBF and the aorto-femoral bypass graft was performed with exploration of the axillary artery and bilateral femoral arteries under general anesthesia. A transverse incision was made in the supra-pubic region and the ruptured hematoma was evacuated. There was a laminated clot in the supra-pubic region, which was removed. The graft was taken out and sent for culture, which was unremarkable. Gross pathology indicated that there was a Dacron graft with significant aneurismal degeneration along the
graft. After the procedure, the patient was transferred in stable condition to the recovery room.

A second thrombectomy and re-vascularization using a bilateral axillary-femoral procedure was performed in an attempt to salvage the limbs and life of the patient due to acute bilateral lower extremity arterial thrombosis. Post-thrombectomy, there was good back-bleeding. In view of the patient’s acute renal failure, completion angiogram was not performed in this case. An anastomosis was performed between the 8 mm ringed PTFE graft and the previous Dacron graft with a 6-0 Gore-tex suture. Post-op completion of the anastomosis with good hemostasis was confirmed. The patient was transferred in stable condition to the intensive care unit (ICU). The patient tolerated the procedure well, with a stable intra-operative course. Post-closure, the graft was explored. It was identified that there was no visual pus or signs of infection, and the graft was well incorporated.

Dacron Graft Aneurysmal Disruption - Review of the Literature

Dacron prostheses have proven to be the most widely used and reliable substitute for arterial replacement. Non-anastomotic aneurismal formation in a Dacron graft is very rare, and it is suggested that possible chronic mechanical stress caused by biological tissues, preceded formation of the graft aneurysm. Dilation and aneurysm formation are reported to be caused by factors such as trauma, infection, hypertension, damage to the material during the manufacturing process (heating, crimpling), improper or excessively frequent sterilization procedures, clamp applications, and/or traumatic handling of the graft prior to placement 5, 8.

Graft failure, due to dilation of the graft at any point, is reported to occur in 1% to 3% of patients with a graft replacement of varied types - usually within 4 to 6 years after surgery 2, 7. Berger and Sauvage found this complication of graft failure in 15 of 493 grafts (3%), in their study of late deterioration of varied types of grafts 2; while Trippedstad reported an incidence of 4 out of 300 graft failures (1.3%) 15.

Only three case reports of aneurysms in reinforced ePTFE material grafts in axillo-femoral (AXF) bypass have been reported in American literature. In the case reported by Piazza, a non-anastomotic pseudo-aneurysm of a unilateral AXF bypass graft had occurred 1 year after graft insertion 14. In the other two cases, Onoe reported disruption of an AXF bypass graft, while Oz B reported a true graft aneurysm, with both seen along ePTFE type grafts 10, 11.

Only 24 graft aneurysms, in a total of 23 patients, have been documented in the Japanese literature 12, 16. In these patients, aneurysms arising from grafts were located in the inguinal region in 9 patients, and near the costal arch in 4 patients. Of these reported cases, only 4 bypass grafts were of the Dacron type. The interval from implantation of the prosthesis to when the operation for graft aneurysm was performed ranged from 1 to 13 years (with a mean of 7 years), although aneurysm formation could have occurred at
any time during this period. Cooley reported no aneurismal changes in double-velour knitted grafts, neither localized nor generalized, over a 47-month follow-up period in a series of 1,040 applications.

Advances in the manufacturing of Dacron prostheses have lead to the near disappearance of intrinsic graft failure. Definitive dilation following implantation of a modern Dacron graft has only been reported in the case presented by Kazuya and Arifumi, in which widened fibers from graft dilation during insufficient healing, caused a macroscopically delayed hemorrhage, followed by massive clot retention between the graft and the aneurismal sac. Complications in a modern, knitted Dacron graft may occur, and therefore they need careful long-term follow-up.

Discussion

By definition, an aneurysm is a permanent localized segmental or diffuse dilation of weakened, but intact, wall resulting in a sac-like structure that communicates with the arterial lumen and caused by a focal discourse of disrupted wall. These dilations consist of escaped blood contained in perivascular connective tissue, and an organized blood clot.

An aneurismal radiologic work-up and differential diagnosis can be arduous, however visualization of a contained leak or rupture is a major diagnostic feature. A contained leak is identified by the presence of laminated mural calcifications and peri-vascular mixed density masses. An aneurysm can have circumferential or partial involvement, resulting in a fusiform or saccular shape.

Conclusion

The relationship between graft dilation and related complications is reported in almost all types of prostheses. The rare non-anastomotic site deterioration of Dacron prostheses could be caused by fiber structure, traumatic handing, biological reactions and/or mechanical fatigue. Most complications usually occur in the peri-operative period. Complications appearing later occur from such stresses as trauma and infection, and thus such grafts require vigilant long-term surveillance. Intimal hyperplasia and co-morbid conditions may also contribute to graft failure. It is recommended that reducing mechanical stress caused by biological tissues is important and necessary for the graft to avoid aneurysm formation. Body position can often affect the distance in and between the axillary and femoral arteries, causing severe stress on vulnerable areas.

The definitive patho-physiological process in this case is undetermined. Although incidental trauma to the graft may have occurred - resulting in temporary disruption of the graft and presentation of a peri-graft blood collection and clot retention with interval stages of healing - due to graft degeneration, no external disruption was apparent and its genesis remains unknown. It is recommended in both the Japanese and the American
literature, that careful, long-term follow up be conducted in all patients with a vascular
graft prosthesis; using duplex ultrasonography to detect possible aneurysm formation. It
is also important that both surgeon and patient decrease the amount of stress on grafts
during and after placement. In conclusion, careful management is vital for the successful
integration and complete function of any vascular graft.

References

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