Indirect Complication of AV Graft Thrombectomy-Thrombolysis Secondary to Previously Attempted Placement of a Temporary Hemodialysis Catheter

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ABSTRACT

Common interventional procedures on frequently encountered patients may wrongly place one on a track that deals with the task at hand while not assessing the global patient. Nowhere is this more problematic than in the dialysis population where in the course of achieving and maintaining vascular access, the interventionist becomes exceedingly familiar with each patient and his or her particular clinical history. Unfortunately, events that may have occurred in the past few hours may rarely be overlooked. We present a case of patient mortality as an indirect result of an upper extremity polytetrafluoroethylene graft thrombectomy-thrombolysis procedure that followed attempted non-tunneled catheter placement via the groin.

KEYWORDS: Dialysis, pseudoaneurysm, graft thrombolysis, stent graft

Objectives: Upon completion of this article, the reader should be aware of the pitfalls that could lead to complications related to graft thrombolysis and the importance of preoperative screening even in the most familiar of patients.

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CASE REPORT

A 75-year-old woman with history of end-stage renal disease presented to the emergency department after failed hemodialysis secondary to occlusion of her right brachial artery to axillary vein polytetrafluoroethylene (PTFE) graft. An attempt to place a temporary venous catheter for dialysis via the right groin was abandoned after failed cannulation of the femoral vein with excessive bleeding at the access site, which was controlled manually. Because the patient's serum laboratory values

were acceptable, the clinical team abandoned further attempts at venous access and consulted interventional radiology (IR) for possible clearing of her thrombosed graft the following day. The patient was seen by the interventional team who knew the patient well, informed consent was obtained, and she was scheduled for the first case the next day. Because of the late hour and attempted catheter placement, the patient was admitted to the hospital. During the evening, a small hematoma was noted, and serial hematocrit remained stable between

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Case-Based Complications in Interventional Radiology: Lessons

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0.29 and 0.33. Computed tomography (CT) scan of the abdomen and pelvis demonstrated a small hematoma along the right anterior abdominal wall, tracking down to the right groin (Fig. 1A). The patient remained hemodynamically stable. The interventional team was not contacted, and no chart notations were made to document the evening activities. The next morning the patient was taken to IR for chemical thrombolysis and mechanical thrombectomy of her right upper extremity PTFE graft. The procedure was performed without incident. During the procedure, 2 mg of tissue plasminogen activator (tPA) was administered directly into the graft, and 4000 U of heparin were given intravenously. The graft was cleared with an 8-mm ClearwayTM (Atrium, Hudson, NH) using a push/pull technique via crossing sheath access. The venous anastomosis was treated with a combination of a 7- and 8-mm ConquestTM (Bard, Tempe, AZ) and Fluency (Bard, Tempe, AZ) due to a persistent venous anastomotic stenosis. The venous outflow was treated with a 12-mm AtlasTM (Bard, Tempe, AZ) for an in-stent stenosis within the right subclavian vein. After flow was restored to the graft, the access sheaths were removed with a purse string suture for hemostasis.

Following the procedure, the patient was sent directly to the dialysis unit whereupon during initiation of hemodialysis, she was found to be lethargic and minimally responsive. An adequate blood pressure reading could not be obtained. The patient was taken directly to the medical intensive care unit where her partial thromboplastin time (PTT) was > 150 seconds and her hematocrit dropped to 0.22. Aggressive resuscitation was performed incorporating blood products including fresh-frozen plasma (FFP), packed red cells and platelets, as well as intravenous fluid. On physical examination, the previously noted abdominal wall hematoma had significantly enlarged, which was confirmed by a repeat CT

(Fig. 1B). A FemoStop[®] device (Radi Medical Systems, Inc., Wilmington, MA) was applied to the right groin by the clinical team.

IR was consulted, and an arteriogram was performed demonstrating a pseudoaneurysm arising from the proximal right superficial femoral artery (Fig. 2A). A 6 × 40 mm Fluency[®] stent graft (Bard, Tempe, AZ) was deployed, completely excluding the pseudoaneurysm (Fig. 2B). Despite an excellent radiographic result, the patient continued to deteriorate in the medical intensive care unit, developing worsening lactic acidosis despite fluid resuscitation and inotropic support. It was felt that secondary to massive hemorrhage; significant end-organ damage had resulted. Multiorgan failure ensued, leading eventually to expiration of the patient 2 days following clearing of the dialysis graft and 24 hours following treatment of her arterial injury.

DISCUSSION

The complication presented here is one of omission, that is, failure to evaluate the patient properly by the IR team prior to the procedure. It is very easy, and of course very wrong, in a busy interventional practice to simply consent a patient who is well known to the service for a procedure that is safely performed several times a day in almost identical individuals. Although the medical system has instituted measures to prevent important data from being overlooked, there is simply no excuse for a lack of diligence in the preprocedure evaluation of all patients undergoing interventional procedures.¹

The above notwithstanding, it is difficult to know the extent to which the interventional procedure with its associated anticoagulant and fibrinolytic measures contributed to the patient's subsequent hemorrhage. Hemorrhage was already present and rebleeding may have been inevitable, but this is merely speculation. The

Figure 1 (A) Initial computed tomography (CT) examination obtained after unsuccessful right femoral vein cannulation shows a small hematoma (arrowheads). Fluid within the peritoneal cavity was consistent with her known history of cirrhosis. (B) Repeat CT scan post graft thrombectomy-thrombolysis procedure and initiation of hemodialysis with gross interval enlargement of the hematoma (arrowheads).

Figure 2 (A) Right femoral arteriogram demonstrates a pseudoaneurysm arising off the proximal right superficial femoral artery (arrow) with an overlying FemoStop[®] device. (B) Post stent-graft repair arteriogram with exclusion of the pseudoaneurysm.

dosage of tPA and heparin were both relatively small, but given the initial increase in the PTT following the procedure confirms this as a contributing factor to the progression of the hematoma and the decompensation of the patient. However, a degree of coagulopathy is often present in the dialysis-dependent population and may be easily exacerbated.²

If the problems with hemorrhage were known prior to the attempted graft clearance, several options should have been considered. The graft may not have been approached and a tunneled catheter placed via veins

in the upper body. The graft could have been cleared mechanically without using a fibrinolytic agent and possibly not even an anticoagulant, although we have found the latter to be essential. Dialysis then should have been performed with no or a lower dose of anticoagulant as well. Interestingly, a great deal of discussion among the members of the interventional team has noted that most would not have changed their technique given the stable patient and perceived low doses of antithrombotic medications being administered even if the events of the prior evening were known. However, all acknowledge

the difficulties defending this technique in the face of the patient's outcome and agree our practice from this point forward should be altered accordingly.

Given the patient's instability, we opted for angiography without confirming the presence of a pseudoaneurysm by sonography and planned stent grafting if possible rather than injection of thrombin if a pseudoaneurysm was found. We had postulated that the puncture site may be low, which was correct in this relatively obese patient, and that the vessel may have been quite lacerated because the clinical team actually placed the temporary dialysis catheter fully in the patient before realizing there was a problem. This case also serves to demonstrate the complications associated with femoral vein accesses for temporary catheter placement. This site is often favored by many because it carries no risk for pneumothorax, falsely obviating the need for image guidance.³ This likely accounts for its frequent use in placing temporary dialysis catheters. However, as is often the case, a lack of imaging guidance and anatomical understanding of the relationship between the femoral artery and its bifurcation vessels relative to the femoral vein may lead to a low access within the upper thigh, resulting in traumatic injury of the superficial femoral artery as in this case.

The point of this discussion is not so much the management of the complication but the need for an awareness of the dissociated care of the hemodialysis patient that may result in multiple factors, both known

and unknown, contributing to a potentially devastating complication. It is vitally important that continuous communication about concerns over potential complications, which are the result of hemodialysis access management, are made between clinical staff, who may be attempting placement of temporary access, and the interventionists to establish a care plan in the event a complication occurs. The lack of evaluation regarding arterial injury from attempted temporary dialysis catheter placement, coupled with the coagulopathic state induced by this procedure and the initiation of hemodialysis, undoubtedly contributed to the patient's demise. A thorough evaluation of patients, even ones known well to the interventional service, is mandatory. Interventionists should also be wary of administering anticoagulant and fibrinolytic agents to patients who have had difficult and failed attempts at placement of temporary hemodialysis catheters.

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