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A Case of Intraparenchymal Pseudoaneurysms in Kidney Allograft

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Conflict of interest: None declared

Patient: Male, 31
Final Diagnosis: Intraparenchymal pseudo-aneurysms in kidney transplant
Symptoms: Asymptomatic
Medication: —
Clinical Procedure: Percutaneous renal biopsy
Specialty: Transplantology

Objective: Diagnostic/therapeutic accidents
Background: Percutaneous needle biopsy is routinely performed for renal allograft management. Vascular complications of the procedure include pseudoaneurysm and arterio-venous fistulae formation. Delayed diagnosis of these complications is due to their mostly asymptomatic and indolent nature.
Case Report: We present a case of extensive intraparenchymal pseudoaneurysm formation within the inferior pole of the allograft, diagnosed two years following the most recent biopsy procedure.
Conclusions: Renal pseudoaneurysms may only be diagnosed years after their formation as they are typically asymptomatic.

MeSH Keywords: Allografts • Aneurysm, False • Iatrogenic Disease • Kidney • Transplantation

Full-text PDF: http://www.amjcaserep.com/abstract/index/idArt/897968

Background

Percutaneous needle biopsy is an integral part of renal allograft transplant management [1]. This minimally invasive procedure is commonly performed in transplant recipients when rejection is suspected [2]. This simple, useful procedure does, however, have risks; arterio-venous fistulae and pseudoaneurysm formation, or both, comprise the common vascular complications [1,3]. Imaging provides essential diagnostic value in the presence of such complications [3]. Renal pseudoaneurysms are usually evaluated with duplex ultrasound and computed tomography for diagnostic confirmation and intervention planning [4]. On angiography, a pseudoaneurysm appears as a spherical extravascular collection of contrast material that opacifies during the arterial phase and often persists into the late venous phase [5].

Renal pseudoaneurysms are caused by hemorrhage secondary to destruction of the arterial wall from the biopsy needle trauma. Subsequently, in the course of the repair processes of the perivascular tissues, the exsanguinated blood is liquefied and dissolved, leaving a sac continuous with the endoluminal space [6].

Case Report

We present the case of a 31-year-old African male patient with end-stage renal disease secondary to hypertension. Postcadaveric renal transplant was performed in June 2012. The graft was implanted in the right iliac fossa. An initial transplant protocol biopsy targeting the inferior renal pole was performed in October 2012 using a 14F Tru-Cut biopsy needle. Histology of the specimen indicated the presence of two medium-sized arteries and one large artery and no features of immunological rejection. A second, one-year post-transplant protocol biopsy was performed in August 2013. No early rejection was reported. During the first half of 2015, the patient's creatinine levels began to increase, and he was investigated for possible allograft rejection. During planning for a renal biopsy, a pulsatile abdominal mass over the right iliac fossa with associated bruit was detected. A graft renal aneurysm was suspected clinically, and a computed tomography (CT) angiogram of the abdomen was performed.

CT angiography confirmed the presence of multiple, single-lobed, intraparenchymal, segmental renal artery pseudoaneurysms. The largest pseudoaneurysm diameter measured 2.53 cm (Figure 1). The pseudoaneurysms were exclusively located within the inferior pole and pelvis of the allograft, while the superior renal pole had normal intraparenchymal arteries. There were no features of renal infarct. The allograft renal artery anastomosis with the right external iliac was normal. There was no

Figure 1. Computed tomography angiogram, coronal reconstruction demonstrating aneurysmal dilatation of intraparenchymal renal artery branches. There is relative sparing of the superior renal pole arterial branches.

Figure 2. Computed tomography angiogram, maximum intensity projection (MIP) image. The arrow indicates the renal artery anastomosis with the right external iliac artery. Note that there is no aneurysmal dilatation at this level.

aneurysmal dilatation or stenosis at this level (Figure 2). The extrarenal renal artery and iliac arteries were unaffected. There was no active extravasation of contrast to suggest aneurysmal

rupture or leak. There was no hydronephrosis or features of ureteric obstruction in the allograft collecting system.

The native kidneys were atrophic bilaterally in keeping with end-stage hypertensive renal disease. The native renal arteries and their major branches opacified normally and were devoid of aneurysmal dilatation. There were no mural plaques of the aorta or its major branches to suggest early atherosclerotic changes.

In an effort to prevent possible pseudoaneurysm rupture or leak, selective endovascular stenting of the affected renal artery branches was attempted following the CT diagnosis of the pseudoaneurysms. The presence of large pseudoaneurysms was the indication for the intervention. Due to the multiplicity of the pseudoaneurysms and endovascular technical factors, not all the arterial branches could be targeted for stenting – providing only partial rupture protection. This intervention was believed to act as a temporary measure prior to definitive allograft nephrectomy and retransplantation.

Discussion

The pseudoaneurysm formation is a likely complication of percutaneous needle biopsy because of the predominance of the pseudoaneurysms within the inferior renal pole, the targeted biopsy site, and the unaffected superior pole. Intrarenal arterio-venous fistulae and pseudoaneurysms are almost exclusively the result of arterial trauma induced during percutaneous needle biopsy, although infectious etiologies have been described [4,5]. Pseudoaneurysms may be intrarenal or extrarenal [4]. Extrarenal pseudoaneurysms are rare and often have a worse prognosis, complicating fewer than 0.1% of renal transplants, and may be associated with technically difficult surgeries, post-transplant infections, and chronic rejection [3–5].

Vascular complications are reported to occur in 10% of renal transplant patients and are the most common cause of allograft dysfunction in cadaveric kidney transplantation [5,7]. The rate of vascular complications following percutaneous core biopsies in both native and transplanted kidneys ranges from 0.9% to 15% [5,7]. This wide discrepancy is thought to be secondary to the benign and asymptomatic course of these lesions; however, pseudoaneurysms may present with pain or pulsatile abdominal mass, as noted clinically in our case [5].

The possibility of true aneurysms was considered. True intra-abdominal visceral aneurysms are usually a result of degeneration of the arterial media in the setting of atherosclerotic disease, fibromuscular dysplasia, and collagen vascular disorders, and up to half are discovered incidentally at imaging. In view the allograft recipient's age and lack of arterial plaques, intraparenchymal renal aneurysms were unlikely to have developed from atherosclerotic disease.

Fibromusclar dysplasia affecting the donor renal artery was excluded on the CT angiogram because of the absence of renal artery stenosis and typical "string of beads" appearance. CT angiography is described as the most specific screening modality for renal artery fibromuscular dysplasia, while intra-arterial angiography is regarded as the gold standard confirmatory test [8].

Inflammatory and collagen vascular disorders, including Ehlers-Danlos and Williams syndromes and neurofibromatosis, could not be excluded in the donor allograft; however, they do represent possible differential diagnosis for visceral aneurysms. Renal and visceral artery stenosis may be in keeping with collagen vascular disorders and may mimic fibromuscular dysplasia [8]. Genetic studies and phenotypic traits were not available for the cadaver donor.

The investigation and diagnosis of aneurysmal disease in our case occurred 24 months following the most recent biopsy, indicating insidious progression. Nakatani et al. describe a case of arterio-venous fistula and large pseudoaneurysm diagnosed five years after renal biopsy, illustrating their indolent nature [6]. Clinical suspicion is essential, as is the need for adequate imaging protocols (fine-slice CT angiography or formal digital subtraction angiography to ensure an accurate diagnosis is made) [9].

With the expansion of the pseudoaneurysms over time, compression effects may have restricted intrarenal circulation, causing local ischemia and an element of renal dysfunction as evidenced by elevation of the creatinine level. Allograft dysfunction may rarely result from extrinsic compression of graft vessels, and urgent intervention may be required in the event of rupture. Graft failure may result in aneurysm formation, and conversely, the presence of aneurysms may be the etiology of the failure [4].

The vast majority of small pseudoaneurysms or arteriovenous fistulae are treated conservatively and resolve spontaneously [2,7]. Intervention is recommended in instances of symptomatic pseudoaneurysm, aneurysm diameter greater than 2.5 cm, expansion on follow-up, and infectious etiology [4]. There is a high risk of pseudoaneurysm rupture without treatment and intervention is secondarily beneficial in the setting of renovascular hypertension, which may be associated with renal pseudoaneurysms. Open surgical management is often associated with graft loss; moreover, endovascular repair using stent grafts or coil embolization can provide arterial control during surgical repair [4]. Recognition and repair before rupture have a more favorable outcome [10].

In the presence of severe hemorrhage or infection, stent grafting can be used as a temporary measure until such time that a controlled transplant nephrectomy can be performed. In the setting of infectious etiology, the possibility of the stent graft initiating sepsis exists and evaluation of the potential risks is suggested [4].

Other modalities described for renal transplant pseudoaneurysm management include ultrasound-guided, percutaneous thrombin injection in anatomically suitable cases, the use of covered kissing stents to repair complex anastomotic pseudoaneurysms, or a combination of thrombin injection followed by stent placement [4]. Endovascular embolization with the use of coils or gelatin sponge has been described with a greater than 80% success rate in preventing hemorrhage and rupture while preserving renal parenchyma.

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Conclusions

Despite the importance of percutaneous needle biopsy in the management of kidney transplant patients, the risk of iatrogenic pseudoaneurysm formation exists. Aneurysmal pressure effects may result in allograft dysfunction. Renal pseudoaneurysms may only be diagnosed years after their formation and are usually asymptomatic. Intervention is recommended where pseudoaneurysms increase in size on follow-up examination or aneurysmal diameter measures more than 2.5 cm.

Statement

The authors declare no conflicts of interest.

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