

# Successful Ex-Vivo Repair of an Intrahilar Renal Artery Aneurysm with Autotransplantation

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## Abstract

Renal artery aneurysm (RAA) is an unusual vascular disease. Few vascular surgeons have extensive experience with clinical management of RAA. Considerable confusion persists concerning its incidence, cause, and clinical importance. Due to lack of controlled clinical data, controversy also persists regarding the indication for treatment of asymptomatic RAA. We report the case of 46-year-old gentleman who was found to have a 3.4cm aneurysm of the left renal artery during the course of ultrasonography for non-specific abdominal pain and to have hypertension on routine examination. The aneurysm was successfully repaired by ex-vivo bench surgery and auto-transplantation.

## INTRODUCTION

Renal artery aneurysm (RAA) is an unusual vascular disease. Few vascular surgeons have extensive experience with clinical management of RAA(1). Considerable confusion persists concerning its incidence, cause, and clinical importance(2). Due to lack of controlled clinical data, controversy persists regarding the indication for treatment of asymptomatic RAA.

## CASE REPORT

The case is of a 46-year-old man who was referred with non-specific abdominal pain and deranged liver function test. He was being treated for hypercholesterolaemia.

Physical examination revealed an elevated blood pressure of 145/95mmHg. The rest of the examination was unremarkable. The requested ultrasound examination revealed a fatty liver, consistent with his condition and a mass in the region of the left kidney as an incidental finding.

Subsequent CT scan, MRI (fig. 1) and renal angiogram (fig. 2) showed a 32 x 35mm circular aneurysm arising from the left renal artery. The left kidney appeared to be supplied by a branch arising from the aneurysm itself. DTPA scan showed normal renal morphology and function.

Blood investigations were normal and possible endocrine sources for hypertension were excluded.

Ex-vivo vascular reconstruction with autotransplantation

was performed (fig. 3) and the patient made an uneventful post-operative recovery. He was discharged home on the seventh postoperative day.

A year later, the patient is asymptomatic, his blood pressure is controlled and kidney perfusion and function are normal.

## Figure 1

Fig. 1: MRI showing a 32 x 35mm RAA of the left kidney



**Figure 2**

Fig. 2: Renal artery angiogram delineating the aneurysm and branches to the left kidney



**Figure 3**

Fig. 3: Ex-vivo repair of left renal artery aneurysm



## **DISCUSSION**

Based on autopsy studies, the incidence of RAA is 0.01%. However, selected patients who undergo renal artery arteriography have an incidence of 0.3%-1%. Data generated by either autopsy studies or selected arteriographic assessment are highly suspect with regard to the actual incidence of these lesions(2). In two separate studies, RAA was documented in 0.73% (7/965) to 0.97% (83/8525) of angiograms(3,4). One carefully performed prospective autopsy study revealed 22 RAA in 15 out of 154 non-selected cases, giving a prevalence of 9.7%(4).

The Department of Surgery and Radiology of the University of Michigan reported a 2.5% incidence of RAA in 72 selected patients undergoing arteriography(2). One institution in Sweden(4) demonstrated RAA in eight of 8,500 patients undergoing angiography and established an approximate frequency of 0.09% which may be an accurate reflection of the incidence of these macro-aneurysms in the normal population.

However, if renal artery aneurysms were persistent in 1% of patients undergoing abdominal arteriography, vascular surgeons would be expected to have greater experience diagnosing and treating these lesions(5).

Types of RAA include:

- 1) True saccular RAA of unknown cause.
- 2) Fusiform aneurismal dilatation associated with fibromuscular dysplasia.
- 3) RAA dissection.
- 4) Intra-renal micro-aneurysms associated with polyarteritis nodosa.

Pathogenesis of RAA is unknown. Although arteriosclerosis is found in many RAAs, this is not a uniform finding, therefore suggesting that arteriosclerosis may not be the most important factor.

Available evidence is supportive of both congenital and acquired factors in the pathogenesis of macroscopic RAA. Pre-existing defects in the internal elastic lamina and deficiencies of smooth muscle cells at branchings of the artery may be a prerequisite to the evolution of these lesions (2).

Saccular RAAs are attributed to 75% of true RAAs. These lesions occur almost invariably at the main renal artery

bifurcation(6,7). The sizes of saccular RAAs vary from small to giant ones of 9cm, although most are less than 5cm.

Fusiform aneurysms are generally less than 2cm in diameter and usually affect the main artery trunk. They are the result of post-stenotic dilatation and are associated with arteriosclerotic changes.

The vast majority of RAA are asymptomatic. They are accidentally discovered during routine investigations such as U/S, arteriography, CT scan and MRI. However, one of the most common indications for performing angiography is renovascular hypertension.

The natural course of RAAs is unpredictable. Many stay asymptomatic; some are associated with hypertension, they may thrombose and even rupture.

Indications for repair of RAA are:

- 1) Rupture (about 3% of all RAAs rupture)
- 2) Hypertension
- 3) Acute dissection
- 4) Pregnancy
- 5) RAA size > 2cm

However, one should not be rigid in deciding to operate on RAA.

Several methods have been used to repair RAA. These are:

1. Aneurysmorrhaphy with primary repair or patching.
2. In-situ repair using a bifurcated internal iliac artery autograph.
3. Ex-vivo repair using autologous grafts such as internal iliac artery or saphenous vein.
4. Endovascular techniques such as embolisation and percutaneous placement of polytetrafluoroethylene stent-graft (PTFE).
5. Bypass grafting.

It is recommended that all these procedures are performed in highly specialized centers by an experienced vascular surgeon.

Our patient had a complicated intrahilar RAA involving all three segmental arteries, for which nephrectomy has been

recommended in the past. We have successfully repaired this aneurysm ex vivo and auto-transplanted the kidney in the left iliac fossa. The post-operative course was uneventful and the patient was discharged home on the 7th post-operative day. Kidney function a year after surgery remained normal.

### CONCLUSION

- The incidence of RAA is controversial; 20% of RAA are bilateral and in about 30% of the cases other organs are involved (8).
- The size varies from very small (0.7cm) to giant aneurysms of 9cm.
- The investigation of choice is angiography.

Concern lies in whether saccular RAA causes hypertension, whether it ruptures and when surgical treatment is needed. Although indications for surgical treatment must not be rigid, we have concluded that hypertension alone in patients with RAA is not an indication for operation and probably cannot improve unless the aneurysm is associated with a combined stenosis, which has been proven to be haemodynamically significant. The risk of rupture is very low. Asymptomatic RAA should not require surgery. However, there have been reports of ruptured RAAs of sizes of 1.5cm and larger and many authors recommend operative treatment for a RAA size greater than 3cm, when there is reasonable certainty that nephrectomy will not be required. (8) All women of childbearing age with RAA should undergo operative treatment due to the high risk of rupture of RAA during pregnancy. (9)

Although the surgery for RAA should be performed in highly specialized centers, this case report shows that these procedures are possible even in surgical units with a small catchment population, but outcome of such procedures should be constantly monitored and audited to ensure that acceptable results are being achieved.

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