Case report

Asymptomatic presentation of renal arteriovenous malformation: a case report and review of literature

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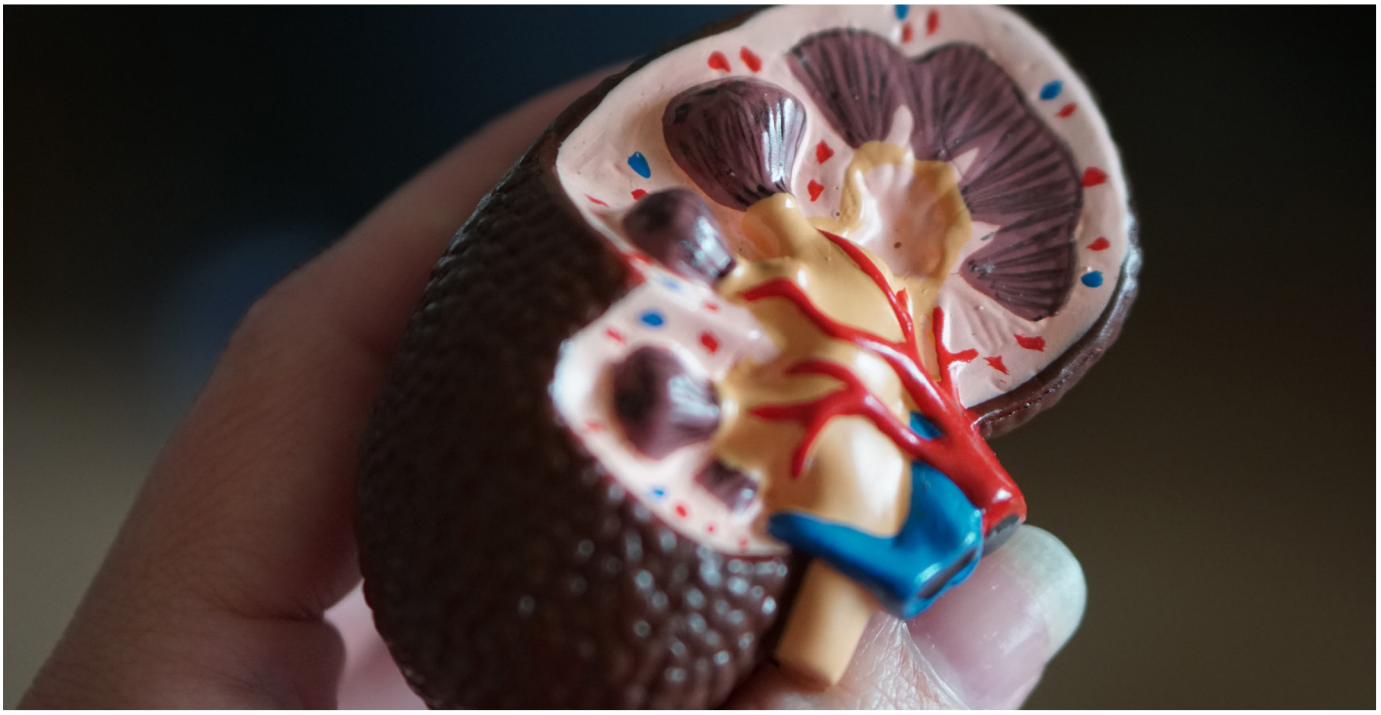

Abstract

Renal arteriovenous malformations (AVM) are a rare finding with fewer than 200 cases reported in the literature. Most commonly, RAVM present symptomatically with haematuria; other presentations include high-output heart failure, refractory hypertension, spontaneous rupture, and a renal mass. We present the clinical and computed tomography findings of an asymptomatic 34-year-old man with an incidental finding of a large (3cm) acquired left RAVM. We discuss the treatment options, by way of a full and relevant review of the literature, and illustrate the need for future research into the natural history of RAVMs, with the possibility of active surveillance as a management option in RAVMs.

Abbreviations

AVM - arteriovenous malformation
BP - blood pressure
CT - computerised tomography
DMSA - Dimercaptosuccinic Acid
eGFR - estimated glomerular filtration rate
IgA - Immunoglobulin A
RAVM - renal arteriovenous malformation

Introduction

Arteriovenous malformations (AVMs) are a rare finding in the kidney with fewer than 200 cases reported in the literature.[1] AVMs are abnormal connections between arteries and veins where blood does not flow through the standard capillary network, but instead through an abnormal vessel network termed a nidus.[2] Incidental findings of renal AVMs are even rarer with less than 30 asymptomatic cases described.[3] AVMs of the kidney are classified as congenital, acquired or idiopathic, and intra or extrarenal. Acquired AVMs are the most common type making up approximately 80% of all renal AVMs, with specific causes including iatrogenic, commonly by renal biopsy or surgery, and trauma, infection or malignancy.[3,4] Anatomically, AVMs are sub-classified into three types: angiomatous, in which a single artery feeds multiple interconnecting distal branches and draining veins; cirsoid, where multiple arteries interconnect by varix-like malformed vessels to form a vascular bed;[5] and cavernosal, where a pre-existing arterial aneurysm invades then erodes into an adjacent vein.[2] 75% of congenital cases present with haematuria,[6] whereas acquired causes are more likely to present with cardiovascular changes, like hypertension, spontaneous rupture with or without haemodynamic collapse, cardiomegaly, and high output heart failure due to increased venous return causing increased preload.[5] Other presentations are from mass effect, like a renal mass, varicocele if on the left, and abdominal distention.[7]

Most cases of incidental asymptomatic renal AVMs are small, defined as less than 2cm.[3] We report the case of a large, 3cm, asymptomatic acquired AVM.

Case report

A 34-year-old male was referred to the urology department with an incidental left renal mass detected on a routine ultrasound scan. The patient had a background of IgA nephropathy diagnosed in 2012 by left renal biopsy, which was well managed on ramipril with a BP of 138/89, eGFR >90, and creatinine of 91 as of May 2021. The patient had no other medical conditions, his performance score was 0, and he was asymptomatic, reporting no episodes of haematuria. A CT arteriogram was conducted which showed a 3cm well-defined left renal pelvic cavernous type AVM **(Figure 1)**, which was fed by a distended anterior branch of the left renal artery with increased blood shunted into a distended renal vein within the left kidney. The aetiology was thought to be secondary to the previous renal biopsy taken in 2012. The differential renal function was assessed by a DMSA scan showing 53% on the right and 47% on the left kidney with the AVM. A multidisciplinary team of urologists and interventional radiologists decided upon a watchful wait approach due to the patient's asymptomatic presentation, with future interventions, namely nephrectomy or embolisation, only considered when local or cardiac symptoms and potential risks outweigh the risk of treatment.

Literature review

A literature review was conducted using PubMed with search criteria "renal arteriovenous malformation" of English articles after the year 2000, this resulted in 80 relevant papers.

From the literature the possible treatment options are: [2,4]

1. Conservative treatment. A less preferred option with the risk of spontaneous haemorrhage, but without operative risk and loss of renal parenchyma. Little data exists on the progression of asymptomatic renal AVMs, although a case report of five congenital renal AVMs showed that with hypertension management alone no other treatment was required.[5]

2. Surgical

   a. Partial nephrectomy. This option has technical difficulty in large AVM, and in the case, the large, cavernous saccular mass was central within the kidney and seemed to be directly feeding to the main renal vein. This is a possible option available to centres with access to robotically assisted surgery, allowing the AVM to be removed while maintaining renal parenchyma.
   b. Radical nephrectomy. One case showed that nephrectomy gave good six-month outcomes regarding renal function and cardiac status.[4] However, this option tends to be used in life-threatening intra-abdominal haemorrhage or haematuria[8] and does lead to significant loss of healthy renal parenchyma. Radical nephrectomy has also been shown to be a good modality in cases with concomitant tumour, a rare cause of acquired renal AVMs.[2,5]
   c. Renal autotransplantation with on-table dissection is an option for experienced centres of renal transplant.
   d. Ligation of the AVM, which is typically for segmental branches of the renal artery.[4]

3. Embolisation by interventional radiology. Minimally invasive options are the most common treatment modality for renal AVM, with one study reporting that embolisation was used in 77% of renal AVM[3] and a case series reporting its use in 92% of cases.[8] Emobilisation can be by coil, alcohol, liquid embolic or gelfoam to embolise the feeding artery of the AVM. The modality of choice is at the discretion of the interventional radiologist on the vasculature and hemodynamic factors. Embolisation is thought to be the go-to treatment for renal AVMs as it preserves unaffected renal parenchyma function, rarely has side effects, and has a reported 91.7% success rate in treating haematuria, with normal post-procedural blood pressure and renal function.[8] However, it is not without risk, including pulmonary embolism,[9] dislodgement and migration[10] with coils, and with all modalities post-embolisation syndrome and the risk of recurrence.[10]

The possible complications of renal AVM have been well documented. What is unclear is when AVMs present and how many cases go on to never present or cause complications. High output heart failure is a well document presentation of AVMs, typically presenting in patients aged over 30.[10] The need for cardiology involvement in these cases is complicated, high output heart failure can cause hypertrophic cardiomyopathy which has a worse prognosis than that of a radical nephrectomy. Because of their rarity, little data exists on the best management of these cases, so does treatment need to be tailored to the complication or to the anatomy of the AVM itself?

Conclusion

The natural history of renal AVMs is poorly understood, and data does not exist on the prognosis of conservative management in the cases of incidental asymptomatic renal AVMs. Little is known about which of the treatment modalities has the best efficacy and which is most appropriate for given cases. While small asymptomatic AVMs can be treated conservatively with watchful waiting, interventional ambivalence still exists for the treatment of asymptomatic cases of large renal AVMs. The decision of if or how to treat these patients needs to be taken on an individual basis after careful consultation with the patient and consideration of individual patient factors. More research is needed as to the best treatment modality for RAVMs.

Consent

Verbal informed consent was obtained for discussion of this case report and use of accompanying images.

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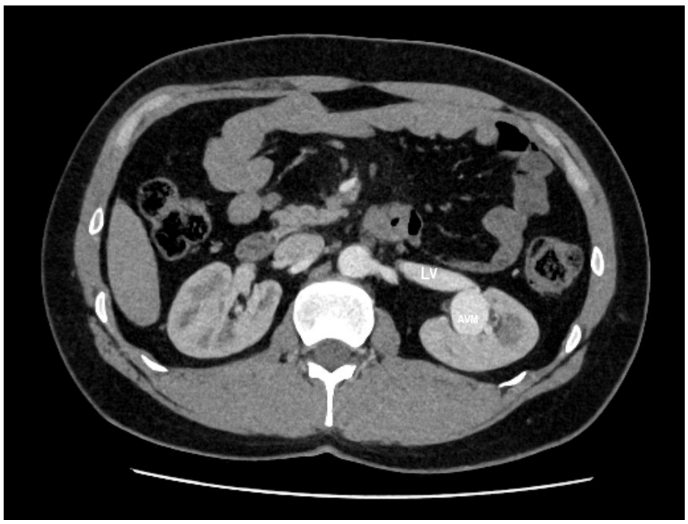

Figure 1. Axial CT showing 3cm Left Renal Arterial Venous Malformation of the Patient

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George Garratt is a final year medical student at the University of Leicester, having completed an intercalated MRes on retinal development George aspires in becoming an active medical researcher of the future.