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Case Report

# Renal arteriovenous fistula: A rare complication of electro-hydraulic lithotripsy

**F A Abogunrin**

*Urology Department, Belfast City Hospital, Belfast, Northern Ireland*
F A Abogunrin, MRCS (Edin)

***Corresponding author:*** *F A Abogunrin (abogsloc@yahoo.co.uk)*

Renal arteriovenous fistula (rAVF) is an uncommon condition, usually iatrogenic and in most cases caused by percutaneous renal needle biopsy. This is a report of rAVF following flexible ureteroscopic electro-hydraulic lithotripsy of a lower pole renal calculus and its subsequent management. A high index of suspicion is required for the diagnosis of this rare complication, which is easily treated by radiological intervention.

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A 62-year-old man with type 1 Von Willebrand's disease was electively admitted to a Northern Ireland district general hospital for endoscopic management of a 1 cm right lower pole calculus.

After pre-operative administration of appropriate haematological factors, flexible ureteroscopic electro-hydraulic lithotripsy (EHL) stone fragmentation was done. The calculus was located in a lower pole calyx and fragmented into three pieces. A fragment floated into an upper pole calyx, and when EHL was applied to this fragment the discharging probe came into contact with the tip of a mid-pole renal papilla, producing significant haemorrhage. Because of loss of adequate visualisation the procedure was abandoned and a ureteric catheter left *in situ*. With conservative management the haematuria subsided, the ureteric catheter was removed, and the patient was discharged home 7 days after admission. Three days later he was readmitted with significant painless haematuria of sudden onset, which again settled without intervention. Over subsequent days he developed recurrent episodes of clot colic followed by significant haematuria requiring blood transfusion, interspersed with clear urine. These episodes did not respond to replacement of clotting factors, and a Doppler ultrasound scan of the right kidney subsequently confirmed the presence of a renal arteriovenous fistula reporting 'abnormal vascularity involving the mid to upper pole of the kidney with strong diastolic component'. Percutaneous selective right renal arteriography demonstrated an abnormal fistulous connection between a segmental renal artery and an early draining vein arising at the mid pole (Fig. 1 a and b). Coil embolisation of the fistula was successfully carried out (Fig. 1 c). The haematuria settled, and the patient was discharged home 10 days after readmission and reported no recurrence of symptoms at outpatient follow-up 4 weeks later.

## Discussion

Renal arteriovenous fistula (rAVF) is an uncommon condition.[1,2] First described in 1928, it is classified as congenital, idiopathic or acquired.[3,4] The congenital variety is uncommon, usually asymptomatic and an incidental finding on Doppler scanning.[1] Between 70% and 80% are acquired, with iatrogenic trauma the leading cause.[2-4] The majority of acquired fistulas are caused by percutaneous renal biopsy; 70% resolve spontaneously, and the incidence is rising with the increasing number of biopsies on both native and transplanted kidneys.[2,4] Other possible causes include nephrectomy, trauma (penetrating and blunt) and malignant renal tumour.[1,4]

EHL is a commonly used method of fragmenting urinary tract calculi, and owing to its low running costs it is still used in

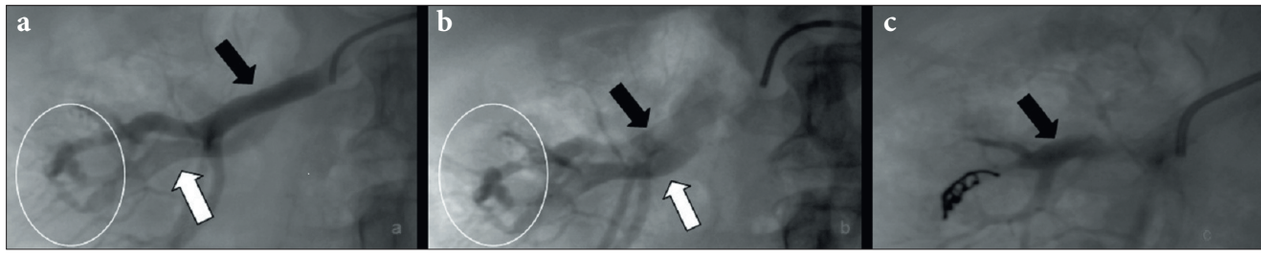


*Fig. 1. Renal arteriography demonstrating the renal artery (black arrow) and renal vein (white arrow). (a and b) The abnormal fistulous connection (circled) results in immediate filling of the renal vein following injection of contrast. (c) After coil insertion, the fistulous connection is obliterated with the renal vein no longer visualised immediately post contrast injection.*

many endo-urology units. It was invented in 1955 in Kiev,[5] with its first reported use with a flexible ureteroscope in 1988. Energy generated from a hydraulic shock wave and cavitation bubble produced from electric sparks when an EHL probe is discharged in a fluid medium is used to fragment the calculus. The shock wave is not focused, so to be effective the calculus has to be placed optimally approximately 1 mm to the probe.

Injury can occur to the surrounding mucosa, ranging from minor mucosal defects to frank perforation when the probe is in direct contact with the mucosal surface.[6,7] Repeated discharges in the same place, even at low power, can also cause significant injury.[6] Maintaining good visibility and a distance of at least 1 mm between probe and mucosa, avoiding multiple or rapidly repeated shocks, and use of the lowest possible intensity to fragment the calculus should avoid this complication.[5-7]

When significant haemorrhage occurs after EHL to fragment renal calculi, intervention is necessary if bleeding persists for more than 72 hours, as in the above case.[7,8] Clinical diagnosis of an rAVF can be difficult. Signs and symptoms include micro- or macroscopic haematuria, renal bruits, arterial hypertension refractory to medical treatment, and flank pain. A high index of suspicion is required, and if suspected, rAVF may be diagnosed with a colour Doppler ultrasound scan, renal angiography or magnetic resonance angiography.[3,5]

Treatment options for rAVF include total or partial nephrectomy, open vascular repair and radiological endovascular intervention.

First described in 1973 to manage an rAVF following renal biopsy,[2] percutaneous angiography and embolisation is the most effective method of treatment for these fistulas, having a success rate ranging between 70% and 100%.[1,7] Embolisation can be single access via the arterial route, or combined using the arterial and venous routes simultaneously.[3] Coils as used in the above case are very effective,[3] and complications are said to be rare.[1,2]

In conclusion, rAVF formation is a very uncommon complication of EHL in the upper renal tract. It may occur after any invasive or percutaneous renal intervention. If haematuria persists for more than 72 hours, the fistula should be sought. Units still utilising EHL for renal calculi need to take due care in its use.

The majority of lesions can be successfully treated by percutaneous angiography and embolisation, and this should be the intervention of first choice.

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