Case Report

Successful endovascular treatment of bilateral renal artery paradoxical embolus by a modified standard technique*

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Introduction

Paradoxical embolism is a rare cause of severe renal artery occlusion and is frequently under-diagnosed [1]. Rapid endovascular intervention with minimal morbidity may make clot removal possible and reverse organ function [2,3].

We present here the case of a patient with an acute renal failure due to a bilateral renal artery paradoxical embolism that was successfully treated by a modified standard technique of an endovascular procedure, with a rapid mechanical and local pharmacological thrombolysis. The patient partially recovered her renal function and was able to stop dialysis.

Case report

A 70-year-old female with a past medical history of type II diabetes, hypertension and dyslipidaemia was admitted for pulmonary embolism associated with a recurrent deep vein thrombosis of the right lower extremity. The anti-coagulation treatment was initially well tolerated, but had to be diminished and then temporarily interrupted because of a subdural haematoma that was successfully treated by surgical aspiration. She was discharged with anti-vitamin K medication.

Three weeks after experiencing the pulmonary embolism, she was admitted again to the emergency room for an acute left lumbar pain. The clinical setting with acute lumbar pain in the absence of urologic or mechanical problems was suggestive of renal infarction and led us to perform an abdominal computed tomographic angiography. The latter demonstrated an occlusion of the left renal artery and a subsequent kidney ischaemia. She immediately received heparin as anti-coagulant therapy. Nevertheless, the patient’s clinical state worsened over the course of the evening with progressive renal failure and anuria. She was referred for vascular surgery with a strong suspicion of aggravation of the thromboembolic disease.

Prior to endovascular treatment, a transoesophageal echocardiography was performed, showing a permeable foramen ovale and suggesting the diagnosis of a paradoxical embolism. In order to avoid further embolism recurrences, a cava filter was immediately implanted by a jugular access just under the renal veins. Thereafter, a digital subtraction angiography was performed by a common femoral artery access, confirming the suspicion of occlusion of both renal arteries (Figure 1). Using the same access, a 6F guide catheter (RDC1, Veripath, Guidant) was introduced into the renal artery ostium. Embolectomies for renal thromboses were carried out percutaneously by a 3F Fogarty balloon catheter through the guide catheter (Figure 2). A repeated angiogram showed the patency of the main renal arteries but without any left nephrogram (Figure 3, panels a and b). Finally, she received intra-renal bolus doses of a thrombolytic agent (Urokinase; 100.000 IU in both sides). All procedures were carried out in the operating room under general anaesthesia, with a radioluminescent table and under fluoroscopic guidance.

After a short period of haemodialysis, the patient recovered a urine output and her renal function improved significantly, eventually resulting in a plateau of creatinine around 200 μmol/l, allowing for a good quality of life without haemodialysis.

The angio-MRI performed 15 days after the endovascular procedure confirmed the bilateral patency despite the absence of any nephrogram in the left kidney. A Doppler ultrasound performed at day 23 showed a persistent occlusive thrombus of the left renal artery and a non-occlusive residual thrombus of
the right one, explaining the moderate chronic renal failure.

**Discussion**

Patent foramen ovale is frequent in the general population, with an overall incidence of around 27% in an autopsy study [4]. Its clinical consequence may be paradoxical embolism, which is an acute peripheral artery occlusion due to a clotting embolus originating in the venous system and reaching the arterial system [5]. The risk factors for paradoxical embolism are the size of the foramen ovale and the presence of a right-to-left vascular shunt. The largest patent foramen ovale (approximately ≥ 4 mm in size), or those with a significant resting shunt, appear to be clinically significant [5]. Moreover, pulmonary embolism increases the pressure in the right cardiac cavities, worsening or leading to paradoxical embolism [6,7].

Several cases of paradoxical embolism have already been reported, with different clinical features, such as an unexplained isolated peripheral embolism, a combination of peripheral arterial and pulmonary embolism and/or venous thrombosis. Most artery embolic locations are cerebral, and are rarely seen in renal arteries [1,3,8–11].

The clinical outcome of the final organ damage is critically determined by an early diagnosis and fast treatment [2]. Total occlusion of renal arteries leads to renal infarction and irreversible damage within about 60 min. Unfortunately, correct diagnosis and appropriate treatment of renal artery embolism are often delayed [1].

The originality of this case is that we were able to obtain significant recovery of renal function after an early and fast endovascular intervention. The diagnosis of renal embolism was made from the clinical aspect including an acute lumbar pain followed by rapidly progressing renal failure and was confirmed by angiogram. At this time, the diagnosis of paradoxical embolism was suspected on the combination of recurrent deep venous thrombosis, pulmonary embolism and renal embolisms [8,11]. Such early diagnosis includes two steps: first, a radiological diagnosis (angiogram or angio scan) showing the renal artery occlusion with ischaemia or renal infarction, and second, the bubble transoesophageal echocardiography showing the patent foramen ovale [12,13]. In our case, the limitation of the MRI angiography led us to perform a scan angiography with increased iode toxicity for anuric kidneys. Nevertheless, this risk seemed reasonable compared with the risk of irreversible renal damage due to a delayed diagnosis. More recently, an intravascular ultrasonography has been proposed to replace the conventional diagnostic angiography [14]. Contrast transoesophageal echocardiography was rapidly performed just prior to endovascular intervention which allowed us not only to diagnose paradoxical embolism, but also to make decisions such as the placement of an inferior vena cava filter [15,16]. Contrast transoesophageal echocardiography is the most accurate diagnostic examination [13] by which we can rule out a cardiac origin of the peripheral embolus or even more so, a riding clot over the patent foramen ovale.

The early treatment includes on the one hand the prevention of further embolism by anti-coagulation and the placement of a vena cava filter, and on the other hand, thrombectomy [17]. This patient developed a paradoxical embolus 3 weeks after a pulmonary embolism under unsatisfactory anti-coagulation, certainly due to the haemorrhagic complication (subdural haematoma). This case report also illustrates an unusual endovascular use of a Fogarty catheter,
since it is classically used during open surgery. We show here that this procedure can be safe and efficient for the clearance of a peripheral embolus. To our knowledge, no equivalent experience has been reported before.

Other authors have reported multiple paradoxical embolization in mesenteric arteries and renal arteries that could be percutaneously aspirated using a mechanical aspiration device with successful mesenteric revascularization, but failure to recover renal function because of a delayed intervention (5 days) [2]. On the contrary, despite persistent and recurrent renal artery lesions, our patient was able to recover significant renal function in a time period of <24 h, allowing for discontinuation of dialysis. Rapid intravascular intervention was critical for the clinical outcome of the patient, as also mentioned by others [2]. This procedure associated the use of embolectomy with a 3F Fogarty catheter followed by a local thrombolysis. Thrombolysis leads to thrombus dissolution in smaller arteries by means of a local injection.

The endovascular procedure can restore renal perfusion for such patients and depending on its celerity, could be proposed as a first-line treatment.

Conflict of interest statement. None declared.

References


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