Subintimal renal artery angioplasty in a case of renal artery stenosis leading to malignant hypertension

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Introduction
Renal Artery Stenosis is a common treatable cause of hypertension and is on the increase in the present population due to atherosclerosis and associated risk factors.1 Current treatment measures include lifestyle with medical management, revascularization using angioplasty (+/- stenting) and bypass surgery. Peripheral artery subintimal angioplasty was initially described in 1987.2 It is a well-known technique for revascularization and is an alternative to bypass surgery.3 The technique was initially used in femoro-popliteal arteries but has since developed and applied to arteries throughout the body. Currently there is minimal literature for its use in renal arteries. We describe a case where subintimal renal angioplasty was used to treat renal artery stenosis in a patient presenting with malignant hypertension.

Case Report
A 49-year-old male plumber was admitted following a routine Optician appointment where he was found to have raised intraocular pressure. Assessment at the emergency eye clinic found Grade IV hypertensive retinopathy, a blood pressure of 242/138 and a urine dipstick showing a trace of protein. A referral to the on-call medical team was made.

The patient was well, with no symptoms related to hypertension. His past medical history consisted of testicular cancer in his twenties (treated with orchidectomy and radiotherapy) and Carpal Tunnel Syndrome. He had no previous blood pressure problems and his only risk factor was a 20-pack a year smoking history. However, he stopped smoking seven years ago.

On examination, blood pressure remained raised at 240/140, all other vital observations were normal. Cardiovascular, respiratory, gastrointestinal and neurological examinations were unremarkable. Fundoscopy revealed bilateral retinal haemorrhages, with bulging optic disc signs more marked in the right eye.

Initial investigations did not show any renal impairment; serum urea and creatinine being 4.0 mmol/l and 68 μmol/l respectively. The patient was treated medically for malignant hypertension and investigated for secondary causes of hypertension. A renal ultrasound scan was performed and the left renal artery could not be visualized. A renal angiogram was subsequently arranged with a view to stenting. It showed an absent left renal artery with no nephrogram except for the upper pole, which was supplied by an accessory vessel (Figure 1a).

Right common femoral artery access was gained and 3D rotational angiogram performed. The right renal artery showed 50% stenosis, whereas the left renal artery was completely occluded. A subintimal tract was created and re-entry into the distal main renal artery was successful. With injection contrast a prominent capsular artery was seen, which was supplying the kidney in the absence of the main left renal artery (Figure 1b). A left subintimal renal artery angioplasty was performed using two 5cm Genesis stents (Cordis, USA) (Figure 1c) and the...
artery was successfully re-canalized (Figure 1d). The right renal artery was not treated.

Post-procedure blood pressure was 155/85 however, his renal function worsened (urea 9.9 mmol/l, creatinine 196 μmol/l) and he became pyrexial. Antibiotics were commenced to cover gastrointestinal sepsis as a procedure related complication. In retrospect the radiologist who performed the procedure deemed this unlikely. Two days post-procedure his renal function normalized and blood pressure stabilized. The patient was discharged with anti-platelet therapy. After follow-up with the Cardiology team a Beta-blocker and Ca²⁺ channel blocker were commenced to regulate his blood pressure. His General Practitioner is monitoring his blood pressure regularly and at present it is well controlled.

**Discussion**

Renal Artery stenosis is a common cause of hypertension and impaired renal function. There have been advances in both medical treatment and endovascular techniques used in the treatment of renovascular hypertension. The debate is ongoing as to the preferred method of treatment especially with regard to endovascular intervention.

Previously there has been much controversy in the timing and methods of initiating revascularization in cases of renal artery stenosis.¹ There have been a number of studies looking at the benefit of angioplasty compared with medical treatment in renal artery stenosis. Most of the studies were small and the majority showed there was no significant difference in outcome.

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Figures 1

**a.** Renal angiogram. **b.** Creation of a subintimal tract. Prominent capsular artery identified. **c.** Two balloon-mounted stents deployed into the subintimal tract. **d.** Subintimal tract opened with a good result.
with angioplasty when compared to medical treatment.4–6 This was shown in a recent large study, the Angioplasty and Stenting for Renal Artery Lesions (ASTRAL) study.7 This was a large randomized control trial comprising patients with atherosclerotic renovascular disease who then underwent revascularization and medical therapy or medical therapy alone. Over 5 years it still found no evidence to suggest clinical benefit from revascularization as opposed to medical therapy.7 However, the study itself has been heavily criticized, especially with regards to its methodology.8 All studies so far regarding renal revascularization have had significant flaws and bias, and have given no conclusive evidence as to the indications for angioplasty or the best treatment of renal artery stenosis. An ongoing trial (CORAL trial) has been started to compare revascularization with medical therapy in patients with clear indications for renal artery revascularization9 and hopefully these results may give a more definite answer.

In cases of renal artery stenosis where there is malignant hypertension and where individuals have normal renal function prior to angioplasty, as in our case, it has been suggested that early surgical intervention is beneficial.10 Percutaneous Transluminal Angioplasty (PTA) and stenting has long been used as a revascularization technique in renal artery stenosis and has gradually replaced open surgical procedures. Despite inconclusive evidence of the benefits of angioplasty in renal artery stenosis, this technique has been increasingly used for treatment of renovascular hypertension.

Subintimal angioplasty differs from PTA in that the guide wire enters the subintimal space within the vessel wall and the angioplasty balloon is then inflated within this subintimal space. The procedure carries a low risk of complications and has been shown to have a high initial success rate. It is commonly used in the treatment of peripheral vascular disease with good benefit. There is currently minimal literature on subintimal angioplasty as a technique used for the revascularization of renal arteries. Our case shows the technique had a good outcome and provides evidence for the potential use of this technique with occluded renal arteries.

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