

## Abstracts of the VIIIth Renovascular Forum, Birmingham 2004

### Transplant renal artery stenosis: long-term outcome after percutaneous revascularisation

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Transplant renal artery stenosis (TRAS) is an important cause of hypertension and/or graft dysfunction in renal transplant recipients. The primary treatment of TRAS is percutaneous transluminal angioplasty (PTA) (+/-stent). This retrospective study describes the clinical outcome of patients following percutaneous renal transplant artery intervention at a single centre.

A total of 34 patients (20 male, age 24–70; 31 cadaveric recipients) underwent renal transplant angioplasty between 1993 and 2003 (prevalence of 5.7%). The indication for intervention was resistant hypertension (64%) and/or declining renal function. Mean cold ischemic time was 22.4 h (range 12–36 h), 21 (61%) had previously suffered biopsy-proven acute rejection (background rejection rate of 25–30%) and one patient had been treated for cytomegalovirus infection (2.9%). Stenosis was commonly found at the site of the arterial anastomosis of the transplanted renal artery. In 21 patients (61%), TRAS was diagnosed within the first 6 months following transplantation. Balloon angioplasty was performed in all patients and an intra-arterial stent placed in nine patients at the initial sitting, to improve vessel diameter.

Blood pressure and renal function significantly improved post-angioplasty (see Table 1).

Table 1

	Pre-angioplasty (mean)	Post-angioplasty (mean)	Difference (pre-post)	P value
Systolic (mmHg)	173	138	35 (29–41)	<0.001
Diastolic (mmHg)	97	79	17 (15–22)	<0.001
Creatinine ( $\mu\text{mol/l}$ )	253	196	77.6% (70–85)	<0.001

The mean follow-up (after angioplasty) in this group was 46.7 months (range 3–120 months). Seven patients were dialysis dependent prior to PTA. Following angioplasty, five of them recovered renal function. The remaining two patients lost their graft (one to intractable vascular rejection and the other in the setting of post-transplant lymphoproliferative disease). Re-stenosis occurred in nine patients (26%) within 2–44 months (mean 10) and was treated by stent placement in six. In-stent re-stenosis was successfully treated in one patient by repeat PTA and in a second by placement of a drug-eluting stent (paclitaxel). Major complications included one case of transient dialysis-dependent acute renal failure, and severe renal artery spasm successfully treated with verapamil injection and stent insertion. Graft loss occurred in four patients at 9 to 60 months (mean of 42.5) post-angioplasty. Three patients died during the follow-up (sepsis, lymphoma and cerebrovascular accident).

In this retrospective series, the prevalence of TRAS was 5.7%. Most symptomatic lesions occurred within 6 months of renal transplantation. Primary treatment of TRAS with PTA is safe, technically successful and leads to improved renal function and blood pressure control. Re-stenosis occurs in one quarter of cases. Repeat angioplasty or intra-

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arterial stenting can be used in such cases with good results. To our knowledge, this is the first report of use of a drug-eluting stent in this patient population.

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## A randomised controlled trial of intravenous *N*-acetylcysteine for the prevention of nephropathy induced by radiographic contrast media in vascular patients undergoing angiography

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**Background:** Radiographic contrast media (RCM) used in angiographic procedures risk acute decline in renal function (ARF) in 0–90% of patients—dependent on risk factors like chronic renal failure and diabetes<sup>[1]</sup>. Apart from proper hydration, only oral *N*-acetylcysteine has shown promise in reducing post-RCM ARF<sup>[2]</sup>, though its benefit has been challenged<sup>[3]</sup>. We investigated the effect of intravenous (IV) *N*-acetylcysteine (NAC) on renal function in patients with vascular disease receiving RCM for angiography. To our knowledge, there is no study of RCM-induced nephropathy and IV NAC in vascular patients. It is even more important in vascular patients because undoubtedly some cases of angiographically induced acute renal failure (ARF) may be due to cholesterol emboli rather than contrast nephrotoxicity.

**Methods:** A single-centre randomised double-blind placebo-controlled trial was undertaken. Vascular patients undergoing angiography were consented and segregated into those with normal and raised serum creatinine (SC). All patients received 500 ml IV normal saline 6–12 h prior to and then after angiography. Normal and raised SC groups were randomly assigned to either 1 g of NAC with normal saline or nothing (placebo). The main outcome measures were change in SC and creatinine clearance (CrCl) as measured 1, 2 and 7 days post-angiography.

**Results:** There was no significant difference in either post-angiography SC or CrCl at any of the time points measured between NAC and placebo arms whether in patients who had normal or raised SC. What was noticeable though was that at 48 h the impaired SC group had a significant reduction in CrCl ( $-16 \pm 9\%$ ) compared to those with normal SC ( $+21 \pm 9\%$ ).

**Conclusions:** IV NAC does not confer any benefit in preventing RCM-induced nephropathy. Patients with pre-existing raised SC have increased risk of renal impairment as defined by a fall in CrCl post-RCM when compared to patients with normal SC who appear to benefit from hydration.

### References

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## **Mycotic renal artery aneurysm following stent placement—a case report and review of the literature**

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Percutaneous renal artery stent placement for treatment of hypertension, to allow ACE inhibitor therapy or to prevent renal artery occlusion is now an established procedure, the complications of which are generally considered acceptable. We report the rare but catastrophic development of a mycotic renal artery aneurysm.

A 67-year-old man was referred by the cardiologists with hypertension, nephrotic range proteinuria and chronic renal impairment with a creatinine of 243  $\mu\text{mol/l}$ . He was known to have significant non-renal vascular disease, having had coronary artery bypass grafting in 2000 and a 70% left internal carotid stenosis identified by Doppler ultrasound in 2001. Renal ultrasound showed the left kidney to be smaller than the right at 9.4 cm vs. 10.8 cm, with thinned cortex in the upper pole, suggestive of scarring. MRI of his kidneys demonstrated significant bilateral ostial renal artery stenosis. Stenting of the right renal artery was undertaken to prevent occlusion and to allow treatment of his hypertension and proteinuria with an ACE inhibitor. The procedure was uneventful and there were no immediate complications. Nineteen days after the procedure he was re-admitted with malaise, weight loss, fever and hypotension. He did not complain of any abdominal or back pain. He had a neutrophil leucocytosis, with white blood cells of  $19.6 \times 10^9/\text{l}$ . His serum creatinine rose to 368  $\mu\text{mol/l}$  from an admission value of 288  $\mu\text{mol/l}$ . *Staphylococcus aureus* was cultured from blood on several occasions, despite appropriate antibiotic therapy. Echocardiography showed no evidence of endocarditis. In the face of persisting septicaemia, an abdominal ultrasound, followed by CT, was performed that demonstrated a large pseudoaneurysm of the right renal artery. He was taken to theatre and underwent bilateral nephrectomy and splenectomy but died shortly thereafter.

There are four cases in the literature of renal artery stent infection. These presented 2 weeks to several months following original stent placement. In three cases, there was an obvious conduit for infection prior to and during or soon after stent placement. Pseudoaneurysm formation was noted in two out of the four cases. Three of the cases survived treatment of the stent infection, although one subsequently required renal replacement therapy. Operative treatment was performed or considered in three out of four cases.

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## **Evaluation of split renal functions using data available from magnetic resonance renal angiography**

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**Aims:** To determine split renal functions using perfusion and volume data available from the magnetic resonance (MR) renal angiogram.

**Materials and methods:** Forty patients who had undergone MR renography (MRR) and isotope glomerular filtration rate studies were retrospectively identified. All MR examinations were performed on a 1.5 T Siemens Symphony. Nine sequential volumetric interpolated breath-hold examination (VIBE) sequences were acquired from 0 to 240 s, following intravenous injection of 2 ml of Gadoteridol (Prohance®). Peak contrast enhancement measurements from regions of interest were obtained and renal volumes calculated using the three-dimensional FLASH venous phase data. This was tested for inter- and intra-observer variability. A product of renal cortical volume and peak cortical signal intensity determined MR Perfusion Index (MRPI). The split renal function was the proportion of MRPI contributed by each kidney.

**Results:** There is excellent correlation between the isotope-derived split renal function and the MR-derived split renal function with a Pearson's linear coefficient of 0.95 and  $P < 0.0001$ . The inter-observer coefficient of variation was 8% and intra-observer coefficient of variation was 3%.

**Conclusion:** It is possible to accurately and reproducibly determine the split renal functions using the data available from MR angiography.

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## Should patients undergoing coronary angiography be warned of the risk of atheroembolism?

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A 66-year-old man presented with progressive renal failure 2 months after undergoing coronary angiography. Clinical findings included widespread mottling and discoloration of both legs with purple toes, suggesting atheroembolism (AE). The diagnosis was confirmed histologically. His course was complicated by severe acute pancreatitis. He remains dialysis dependent 4 months after his initial presentation. This patient's family found it difficult to accept AE as a complication of coronary angiography. In the belief that we had not failed to inform them of a significant risk, we conducted a literature review of the incidence of AE following this procedure.

AE was reported in 50 of 41 219 coronary angiograms in six large studies, giving an incidence of just over 1 in 1000 (0.12%). This must be an underestimate, however, as the patients in these studies were not assessed systematically for the presence of AE in every case. Two prospective studies of AE have documented an incidence of 30/2049 (1.5%). Six of these patients died, giving a risk of death from AE following coronary angiography of 0.29% which is at least as high as the risk of post-procedural myocardial infarction (MI). Evidence from autopsy and renal biopsy studies further suggests that the risks increase with age and with the severity of aortic atherosclerosis, implying that clinically important AE might be even more common in certain subgroups.

We conclude that AE following coronary angiography is at least as common as post-procedural MI and that it would be advisable therefore to warn patients specifically of the possibility of AE when explaining to them the risks associated with this invasive procedure.

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## Management of patients with type 2 diabetes mellitus and chronic renal disease: a clinical audit study

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**Introduction:** The NICE (National Institute for Clinical Excellence) guideline on management of renal disease in patients with type 2 diabetes mellitus recommends appropriate investigations to confirm the underlying causes of renal disease followed by regular input from a multidisciplinary team to optimise glycaemic and blood pressure (BP) control, to begin therapy with appropriate ACE inhibitor or alpha receptor blocker (ARB), to assess and manage cardiovascular risk factors and to monitor response to therapy and disease progression.

**Patients and methods:** Selected key audit criteria as recommended by the NICE guideline were examined in 73 patients with type 2 diabetes mellitus and chronic renal disease who attended the diabetes/renal clinic between April 2002 and April 2003 [39 males, age: mean (range) 69 (46–86) years, diabetes duration: mean (SD) 15 (9) years]. 50 (73%) patients had established cardiovascular diseases [chronic heart disease (CHD) 34/73, peripheral vascular disease (PVD) 19/73 and coronary vascular disease (CVD) 10/73] and 40 (55%) patients had diabetic retinopathy.

**Results:** 93% of the patients did have significant renal impairment with a serum creatinine  $>130 \mu\text{mol/l}$  [mean (SD) 210 (108)]. The 24 h urine albumin excretion rate was measured in 32% of patients [mean (SD) 699 (1087) mg/24 h]. The clinical diagnosis based on the presence or absence of retinopathy as well as the results of various urine, blood, imaging and renal biopsy (five patients only) results was diabetic nephropathy in 40%, probable nephropathy in 30% and other diagnoses in 30%. MR (magnetic resonance) renal angiography was requested in 20 patients and significant renal artery stenosis (RAS) was diagnosed in 12 (16%) patients (including six with severe bilateral RAS).

The key audit criteria results are summarised below:

HbA1c mean (SD) 8.4 (1.6)%	HbA1c $\leq 7.5\%$	30%
BP mean (SD) 139/76 (19/8)	median (SD) 135/76 (19/8)	
Systolic BP $\leq 135$ 51%	diastolic BP $\leq 75$	48%
Systolic BP $\leq 140$ 60%	diastolic BP $\leq 80$	75%
On ACE inhibitor or ARB therapy (with no contraindication)		88%
On three or more antihypertensive agents		64%
Cholesterol mean (SD) 4.6 (1.1)	cholesterol $\leq 5.0$	62%
On lipid-lowering agents (mainly statins)		88%
On antiplatelet agents (with no contraindication)		89%
Appropriate investigations in those with no retinopathy		90%

**Conclusions:** In patients with type 2 diabetes and chronic renal disease, non-diabetic causes of renal disease, and in particular RAS, are common and appropriate investigations are important to establish the underlying diagnosis. The key audit criteria results were generally better than nationally reported figures, and in particular mean BP achieved, rate of ACE inhibitor or ARB therapy, number of patients on multiple antihypertensive agents, rate of lipid-lowering and antiplatelet agents used as well as rate of appropriate investigations in those with no retinopathy.