Percutaneous coronary angioplasty (PTCA) or coronary artery bypass grafting (CABG)—which is the appropriate therapy of coronary artery disease in uraemic patients?

K. Ivens¹, P. Heering¹, M. Leschke² and B. Grabensee¹

Clinics of 'Nephrology and Rheumatology; ²Cardiology, Pneumology and Angiology, Heinrich-Heine University, Düsseldorf, Germany

CABG and PTCA in the non-renal patient

Since Favaioaro introduced coronary artery bypass grafting (CABG) in 1969, it has become established as a standard procedure in the treatment of coronary artery disease [1]. In 1977 Grünzig introduced percutaneous transluminal coronary angioplasty (PTCA) as an alternative or complementary revascularization modality [2]. PTCA was initially used only to dilate short, non-calcified stenoses of the proximal segments of coronary arteries. With increased operator skill, improvement of catheter systems and of peri-interventional management, the indication for PTCA has been extended to patients with higher procedural risk, such as patients with multi-vessel disease, poor ventricular function, or those with complex stenoses [3].

Is there controlled evidence of efficacy of these procedures?

In recent years prospective randomized studies have been conducted to compare these two revascularization techniques PTCA and CABG in non-renal patients. The aim of these studies was to characterize benefits and risks, specifically with regard to prevention of angina pectoris, maintenance of left ventricular function and incidence of myocardial infarction or re-intervention respectively. The RITA (randomized intervention treatment of angina) study compared PTCA and CABG, covering more than 1000 patients with multiple coronary vessel disease. A comparable incidence of death or heart attack was observed during a 2-year follow-up period in the two intervention groups [4]. Compared to surgical revascularization, patients with PTCA had a higher incidence of angina pectoris and a higher requirement for antianginal medication or intervention [4]. These results were confirmed in other studies [5,6]. Despite the higher rate of re-interventions, PTCA proved to be superior with regard to length of hospital stay and hospital costs. Considering the comparatively low number of patients who qualified and the high number of patients who were excluded in all these studies, it must be remembered that the final word on these procedures is not yet in.

Moreover it is an erroneous view to consider these methods as fundamentally competing with each other. Rather they should be viewed as two valuable complementary therapeutic options, selection of which depends on the specific characteristics of the patient, particularly coronary morphology, left ventricular function and perceived risk of the intervention for the individual patient. [7]. Over the last decade, elective PTCA, an intervention associated with a low risk of mortality (< 1%) and a low complication rate (2-4% risk of myocardial infarction), has become the most commonly performed revascularization method.

Intervention in the renal patient

Despite the great success in treating end-stage renal disease by renal replacement therapy, cardiovascular complications remain the leading cause of death in this patient group. The rate of cardiovascular death is about 40-50% and thus 5-10 times higher than in the normal population [8]. The excessive mortality in this patient group is possibly attributable to the high number of cardiovascular risk factors in these patients, but may also be the result of intrinsic atherogenic factors of uraemia [9].

Angina pectoris is common in the renal patient with coronary disease, but it is not a specific sign and ischaemic symptoms may also result from microangiopathy, anaemia and other factors. On the other hand, coronary artery disease may remain asymptomatic and angina pectoris may not appear until provoked for example by a decrease in blood pressure during dialysis, severe haemorrhage, etc. Especially in diabetics with terminal renal failure, myocardial ischaemia may be completely silent despite severe coronary stenoses. Should one treat the patient with silent ischaemia? In...
a prospective study, Manske et al. [10] showed that in diabetics with end-stage renal disease due to diabetic nephropathy interventional therapy (PTCA/CABG) is superior to conservative drug therapy—so the answer is yes, at least in this patient group.

In the meantime, even in the non-diabetic patients with end-stage renal disease, interventional therapy has been firmly established in the treatment of coronary artery disease [11]. As a result of improvements in surgical techniques and introduction of intraoperative haemofiltration, coronary artery bypass grafting has become a routine clinical procedure in patients with end-stage renal disease. Meanwhile the perioperative mortality ranges between 3 and 20% [12–15]. Our own results show a 3-year survival rate of 72% and a 5-year survival rate of 55% [16]. If these results are compared with the EDTA survival statistics for dialysis patients of the corresponding age group, survival in these revascularized cardiac-risk patients is comparable with the general survival rate of all dialysis patients of the same age group. Other teams also report a very low incidence of recurrent angina pectoris following coronary artery bypass grafting. Reinterventions are rarely required [12–15].

Successful coronary artery bypass surgery increases the chances of haemodynamic stability on regular dialysis and permits further to subject the patient with successful coronary artery bypass grafting to renal transplantation [13].

**Which procedure is superior in the uraemic patient?**

No head-on comparisons between PTCA and CABG in patients with end-stage renal disease have been published. Information on the procedural results and long-term clinical outcome of PTCA are limited, since so far the results of no more than 100 patients have been published [16–20]. Clinical restenosis, i.e. recurrence or worsening of angina pectoris, has been reported in 47–82% of the cases within 6 months following angioplasty [17,18,20]. Long-term follow up after 1 year showed that only 20% of the patients who had undergone PTCA were free of cardiac events, e.g. angina pectoris, re-intervention, myocardial infarction or death [17,20]. This may have been the result of the natural history of coronary heart disease in end-stage renal failure, aggravated by the presence of coronary microangiopathy and multivessel coronary artery disease. Unfortunately in the above studies only patients who were symptomatic on follow up had been re-evaluated by coronary angiography. Consequently, a spuriously high rate of restenoses as a result of selection bias cannot be excluded. There is only one retrospective study which compared patients with end-stage renal disease with non-renal patients and showed a restenoses rate of 60% in the former versus 35% in the latter group, when evaluated by quantitative coronary angiography [21].

Although PTCA has been in clinical use for around 10 years, and even though complementary techniques, e.g. laser angioplasty and atherectomy as well as stent implantation have become available, the Achilles heel of PTCA remains a high rate of restenoses, 30–40% in the non-renal patient and even higher in the patient with renal disease. The reason for such high restenosis rate in the renal patient may relate to peculiarities of the atherosclerotic process: more diffuse coronary sclerosis, pronounced coronary calcification, complex types of stenoses. The latter may lead to grave technical problems during PTCA as well as during CABG. Currently, much research is carried out to reduce the rate of post-PTCA restenoses in the non-renal patient and this involves efforts to intensify antithrombotic therapy, apply intracoronary stents, and administer antiproliferative substances locally [22,23]. Whether these modalities will be successful in the non-renal patient, or can even be transferred to the renal patient, is yet unclear.

**Our view on coronary bypass grafting**

Currently coronary artery bypass grafting has to be considered the revascularization procedure of the first choice in patients with end-stage renal disease and coronary triple disease, regardless of left ventricular function. Eventhough coronary revascularization procedures do not prevent acute ischaemic events in most cases, complete revascularization with bypass grafts may preserve left ventricular function in case of myocardial infarction. An added benefit is improved quality of life. Furthermore, complete revascularization is warranted in these patients to prevent myocardial ischaemia. PTCA should be considered an ancillary measure which can be used as the first approach in patients with one- or two-vessel disease and favourable anatomy. It is important to remember that after PTCA even the asymptomatic patient with end-stage renal disease should be re-evaluated by angiography after 6 months. In case of restenoses, our own results suggest that early coronary artery bypass grafting is superior to repetitive PTCA attempts. Patients after complete surgical revascularization will only be reevaluated by coronary angiography in case of angina pectoris.

**Practical guidelines**

At the moment, no generally valid therapeutic guidelines can be formulated which would apply to all patients with end-stage renal disease and coronary artery disease. The decision to select therapy must be made on an individual patient-oriented basis, taking into consideration intercurrent risk factors, coronary morphological determinants, left-ventricular function and specific details of the underlying renal disease.

In the future we need adequate analysis of the results of interventional revascularization procedures, so as to provide scientific basis for the decision process. Such trial should ideally be evaluated centrally in view of the small number of cases involved.

We do not wish to close the contribution on interventional management without mentioning the overriding importance of risk factor intervention, e.g. measures to control smoking, hypertension, dyslipidaemia, left
ventricular hypertrophy, hyperparathyroidism, and diabetes mellitus. There is no controlled information available to document the benefit from such intervention, but this would very much be in agreement with what common sense dictates. In these high-risk patients, cardiovascular risk factors such as smoking, hypertension, dyslipidaemia, left ventricular hypertrophy, and hyperparathyroidism must be reduced effectively.

References


HMG-CoA reductase inhibitor treatment in renal insufficiency

C. Wanner
Division of Nephrology, University of Würzburg, Germany

Rhabdomyolysis is a severe but rare side-effect of HMG-CoA reductase inhibitor treatment (<1:1.000) in subjects with normal renal function. The risk of myositis is high only when HMG-CoA reductase inhibitors are combined with fibrac acid derivate, nicotinic acid, erythromycin, and particulary cyclosporin. Dose reduction (<50% of the maximum recommended dose) has led to the virtual disappearance of side-effects in patients after organ transplantation. Although the precise mechanism of muscle damage remains to be identified, HMG-CoA reductase inhibitors are considered as drugs of first choice for treatment of high LDL cholesterol.

In this issue of the Journal, Biesenbach et al. [1] report another patient with rhabdomyolysis during lovastatin treatment and pre-existing severe renal insufficiency. Impaired renal function or chronic renal failure per se is not a contraindication for treatment with HMG-CoA reductase inhibitors and pronounced or severe drug accumulation appears not to occur in patients with renal insufficiency. Meanwhile a considerable number of studies have assigned several hundred