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Original article

# Usefulness of rotational atherectomy for the implantation of drug-eluting stents in the calcified lesions of hemodialysis patients

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## KEYWORDS

Stent;  
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## Summary

**Background:** Drug-eluting stents (DES) have significantly reduced in-stent restenosis. But the calcification of coronary artery lesions in hemodialysis patients is a high-risk factor for restenosis after DES implantation. We hypothesized that percutaneous transluminal coronary rotational atherectomy (PTCRA) may be useful in the prevention of underexpansion and fracture of the stents, thereby reducing major adverse cardiac events.

**Methods:** We retrospectively compared the primary success and mid-term outcomes (major adverse cardiac events within 12 months) of hemodialysis patients with calcified coronary lesions undergoing DES implantation using PTCRA ( $n=26$ ) with those where DES was implanted without PTCRA ( $n=28$ ).

**Results:** The rates of target lesion revascularization in the PTCRA group were lower than those in the non-PTCRA group (11.5% vs 35.7%,  $p=0.026$ ). The rates of restenosis and subacute thrombosis in the PTCRA group were modestly lower than those in the non-PTCRA group (restenosis rate, 17.4% vs 17.4%,  $p=0.061$ ; subacute thrombosis rate, 0% vs 7.1%,  $p=0.31$ ).

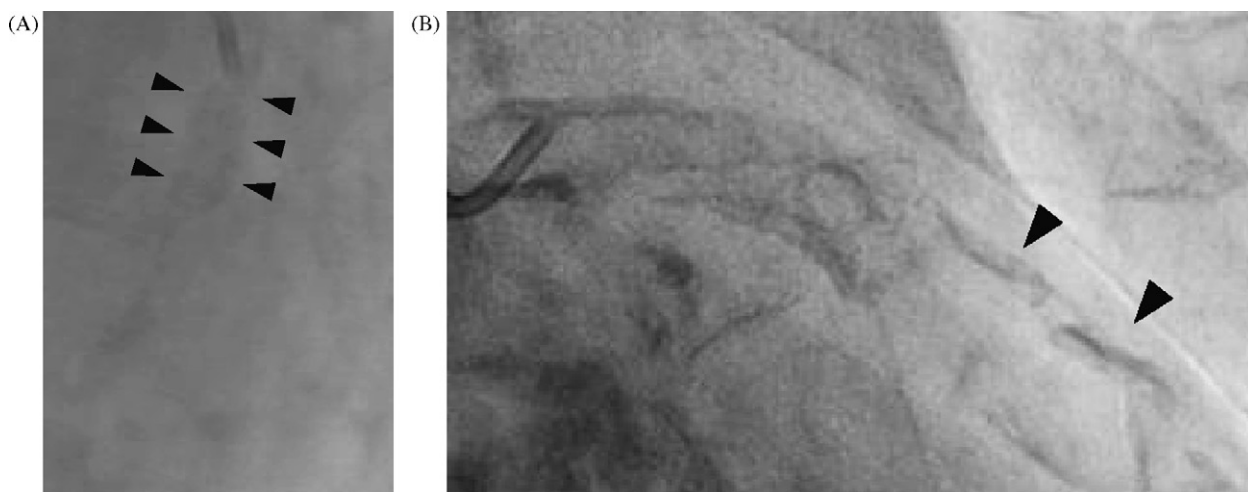
**Conclusion:** PTCRA may be useful for improving the mid-term outcome of DES implantation in hemodialysis patients with calcified lesions.

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## Background

Drug-eluting stents (DESs) have reduced the rates of in-stent restenosis (ISR) and target lesion revascularization (TLR) compared with bare metal stents [1,2]. Hemodialysis (HD) and severe calcification of coronary lesions are high-risk factors for restenosis after DES implantation

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**Figure 1** Calcified lesions. Calcified lesions were defined as those in which we could detect circular calcification or bulky calcification by coronary angiography. (A) Circular calcification of right coronary artery. (B) Bulky calcification of left anterior descending artery.

[3–7]. Many factors are thought to contribute to restenosis after DES implantation in HD patients; among them, underexpansion and fracture of stents may be closely related to ISR. We hypothesized that percutaneous transluminal coronary rotational atherectomy (PTCRA) may be useful for the prevention of underexpansion and fracture of stents, thereby reducing major adverse cardiac events after DES implantation in the calcified lesions of HD patients.

In this study, we retrospectively compared the primary and mid-term outcomes of HD patients with calcified coronary lesions undergoing DES implantation using PTCRA with those where DES was implanted without PTCRA.

## Methods

### Subjects

From July 2004 to December 2008, 74 consecutive patients with chronic renal failure on HD underwent DES implantation in our hospital. Among the 74 patients, 54 were diagnosed to have 54 lesions with severe calcification. Calcified lesions were defined as those in which we could detect circular calcification or bulky calcification by coronary angiography (CAG) (Fig. 1). Among the 54 patients with calcified lesions, 26 underwent DES implantation using PTCRA, and 28 had DES implanted without PTCRA. PTCRA was not performed in the latter 28 patients mainly because of the restriction of the procedure time. We compared the primary and mid-term outcome of DES implantation in the calcified lesions of hemodialysis patients using PTCRA (PTCRA group) to those where DES was implanted without PTCRA (non-PTCRA group).

### Primary end point

The primary endpoint was a composite of major adverse cardiac and cerebrovascular events (death from cardiac causes, myocardial infarction, ischemia-driven TLR, and cerebrovas-

cular events) within the first 12 months of follow-up. TLR was defined as revascularization for a stenosis within the stented region or within 5 mm of the distal or proximal edges of the stent.

Successful stenting was defined as a final stenosis of less than 50% of the vessel diameter after implantation of the study stent. Treatment success was defined as a final stenosis of less than 50% of the vessel diameter after any percutaneous intervention.

### Quantitative CAG

Coronary angiograms were digitally recorded at baseline, post procedure, and at follow-up with an automated edge-detection system (CAAS II, Pie Medical Imaging, Maastricht, the Netherlands). The single projection in which a stenosis appeared to be most severe was used. A contrast-filled non-tapered catheter tip was used for calibration and reference diameter was determined by interpolation. Quantitative measurements included the diameter of the reference vessel, the minimum luminal diameter (MLD), and the extent of diametric stenosis defined as [(reference vessel diameter – MLD)/reference vessel diameter]  $\times$  100. We defined ISR as stenosis of at least 50% of the MLD in the stented area and within the margins 5 mm proximal and distal to each stent edge.

### Statistical analysis

Quantitative data are presented as mean  $\pm$  standard deviation (SD) and the categorical data as frequencies (percentages). Continuous variables were compared using the unpaired *t*-test. Binary variables were compared by means of the Fisher's exact test. Statistical significance was defined as *p*-value of less than 0.05. All statistical analyses were performed using JMP 5 software (SAS Institute, Cary, NC, USA).

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