Renal artery ablation instead of pulmonary vein ablation in a hypertensive patient with symptomatic, drug-resistant, persistent atrial fibrillation

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Sirs:

A 58-year-old female with a history of paroxysmal atrial fibrillation (AF) and essential arterial hypertension (HTN) presented to an external institution with palpitations and progressive symptoms and signs of cardiac decompensation. She had been hospitalized twice for episodes of AF and HTN within the last 2 years and was on a daily medication with metoprolol (95 mg), valsartan (320 mg), hydrochlorothiazide (25 mg), minoxidil (10 mg), and aspirin (100 mg). On admission, blood pressure was 165/100 mmHg, and surface ECG confirmed recurrence of AF with an irregular ventricular rate of 130–150 bpm. Rate control was pursued by up-titration of β-blocker dosage and additional administration of digoxin, and therapeutic anticoagulation was initiated. Recompensation was rapidly achieved giving intravenous loop diuretics. Subsequent echocardiography revealed mild left atrial (LA) dilatation, mild mitral regurgitation, and normal systolic but impaired diastolic left ventricular function. While the exact duration of AF was not known, electrical cardioversion was attempted after exclusion of LA thrombi by transesophageal echocardiography. Stable sinus rhythm, however, could not be achieved, even though the patient underwent another electrical cardioversion attempt after administration of amiodarone (8 g in 8 days). Anticoagulation was continued and the patient was referred to our institution for pulmonary vein ablation.

When the patient presented to our center, there were no clinical signs of heart failure but persisting dyspnoea and atypical angina upon mild exertion. Blood pressure was 160/90 mmHg despite a daily medication with metoprolol (190 mg), valsartan (320 mg), minoxidil (10 mg), spironolactone (25 mg) and furosemide (60 mg). Blood pressures at home (self measurements in the sitting position) had varied between 140 and 160 mmHg (systolic) and 90 and 110 mmHg (diastolic). Serum electrolytes and estimated glomerular filtration rate (eGFR) were within normal ranges. The surface ECG showed that the patient was still in AF, now with a resting ventricular rate of 85 bpm. Twenty-four hour Holter monitoring showed persisting AF with a ventricular rate ranging between 79 and 126 bpm. Echocardiography was repeated and confirmed the previous findings, with additional evidence for significant pulmonary hypertension [estimated systolic pulmonary artery pressure (PAP) ~70 mmHg]. Cardiac catheterization revealed post-capillary pulmonary hypertension (PAP systolic 76 mmHg, PAP diastolic 40 mmHg, PAP mean 53; pulmonary capillary wedge pressure 37 mmHg, left ventricular end-diastolic pressure 34 mmHg) and markedly elevated systemic vascular resistance (4,822 dyn × s × m²/cm², normal range 1,970–2,390 dyn × s × m²/cm²). Angiography excluded significant coronary artery disease. Findings were interpreted as diastolic dysfunction on the basis of chronic hypertension and associated hypertensive heart disease. We discussed all findings with the patient, postponed the LA ablation procedure and recommended ablation in the renal arteries for renal denervation as an initial step for intensified treatment of HTN and potential improvement of her AF. Upon written informed consent, a total of 15 radiofrequency ablation lesions (max. 8 W for 120 s, respectively) were applied in the right (eight locations, see Fig. 1) and left (seven locations) renal artery using a Symplicity® Catheter (Medtronic/Ardian Inc., USA). No peri-interventional complications occurred, and the patient was discharged in sinus rhythm after AF had
converted spontaneously (under ongoing amiodarone medication).

Three months later, the patient presented to our outpatient clinic and reported marked improvement in symptoms and exercise capacity. She had no more dyspnoea or angina upon exertion and did not report any palpitations. Amiodarone had been stopped 6 weeks earlier because of transient coughing, whereas antihypertensive medication had not been altered. Blood pressure at presentation was 145/80 mmHg. Ninety-six hour Holter monitoring confirmed stable sinus rhythm with a heart rate of 59–102 bpm. Echocardiographic findings were stable except for a significant decrease in estimated systolic PAP (26 mmHg as compared to 70 mmHg 3 months earlier). Digoxin medication was stopped and furosemide was replaced by hydrochlorothiazide (25 mg daily). Another 3 months later the patient was still free of symptoms and in normal sinus rhythm. Ambulatory blood pressure during 24 h Holter monitoring was 111/60 mmHg on average, with a maximum systolic value of 148 mmHg and a maximum diastolic value of 81 mmHg. Blood testing indicated that renal function had remained normal after the ablation procedure (eGFR 84 ml/min), whereas microalbuminuria was diagnosed before renal denervation but excluded during follow-up. Four days of ECG holter monitoring 5 months after amiodarone medication had been stopped confirmed stable sinus rhythm and ruled out asymptomatic AF recurrences. Atrial ectopy had decreased to an average of 2/h as compared to 26/h 3 months earlier. Along with these findings, echocardiography showed a progressive decrease of the left atrial diameter from 45 mm just prior to renal ablation to 40 and 36 mm 3 and 6 months thereafter.

Individual selection of the most appropriate therapy for persistent AF can be cumbersome in subjects that present with heart failure symptoms and cardiovascular co-morbidity. As in the present case, attempts to restore and preserve sinus rhythm appear justified if AF is not long-standing (duration <1 year), if the LA is not significantly enlarged, and if symptoms persist despite sufficient rate

![Fig. 1](image-url)
control and in the absence of severe structural heart
disease.

In our patient, rhythm control was pursued, and in line
with current guidelines [1], pulmonary vein ablation was
indicated after antiarrhythmic drug treatment (with ami-
darone) had failed to maintain sinus rhythm. Despite the
given indication, however, it is well appreciated that the
success rate of LA ablation is only moderate in persistent
AF [1, 2]. In fact, repeated ablation is often required and
may in some cases not be restricted to the elimination of
triggers (e.g., pulmonary vein isolation) but may also
require modification of the perpetuating atrial substrate
(e.g., creation of lines of block, targeting sites with com-
plex and fractionated electrograms) [2]. Hypertension and
LA dilatation have been identified as strong independent
predictors of unsuccessful AF ablation [3]. One study
found that LA stiffness, a parameter related to left ven-
ctricular diastolic dysfunction, independently predicted
unsuccessful AF ablation, whereas LA diameter or LA
volume index did not [4].

Catheter ablation in the renal arteries (renal sympathetic
denervation) has evolved as a novel therapeutic option for
drug-resistant HTN [5, 6]. Its beneficial effects on sym-
pathetic nerve activity [7], the renin-angiotensin-aldoster-
one system [8], cardiac afterload and left ventricular
diastolic dysfunction [9] have also inspired recent interest
in its potential impact on AF [10, 11]. Of note, a very
recent randomized clinical study performed in subjects
with drug-resistant HTN and symptomatic AF demon-
strated significantly higher success rates of pulmonary vein
ablation after 12 months if the procedure was combined
with renal artery denervation [12]. The present case is in
line with this study and supports the notion that HTN and
its associated changes and sequelae are not only an
important substrate but also a hitherto underestimated
therapeutic target for persistent AF. Furthermore, it has
been speculated that renal artery denervation may have an-
tiarrhythmic effects beyond those that result from a pure
reduction of cardiac afterload (Fig. 1). Recent interest has
focused on the role of excessive central sympathetic drive
in chronic disease and on the effects of its reduction by
renal denervation [13]. Specifically, reduction of systemic
sympathetic activity has also been proposed as an antiar-
rhythmic mechanism, by which renal ablation may sup-
press atrial fibrillation [10, 12] and refractory ventricular
tachyarrhythmias [14]. Although the patient in our present
case was on high-dose β-blocker medication, one can not
exclude that reduction of sympathetic activity also had
direct effects on atrial electrophysiology (e.g., reduction of
atrial ectopy).

In summary, this case illustrates that in patients pre-
senting with ‘symptomatic, drug-resistant’ AF, careful
evaluation and optimized treatment of the underlying
substrate (e.g., HTN) should precede consideration for
invasive LA ablation procedures. Whether renal denerva-
tion in patients with drug-refractory hypertension and atrial
fibrillation has an antiarrhythmic effect beyond normali-
zation of blood pressure and cardiac hemodynamics (e.g.,
due to a reduction of sympathetic activity) remains to be
determined.

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