Accuracy of 64-multidetector computed tomography coronary angiography in patients with symptomatic atrial fibrillation prior to pulmonary vein isolation

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Aims
Aim of our study was to investigate the value of multidetector computed tomography (MDCT) for detecting significant stenoses of coronary arteries in patients with symptomatic atrial fibrillation (AF) prior to pulmonary vein (PV) ablation (PVA).

Background
Many patients undergoing PVA for AF receive three-dimensional computed tomography or magnetic resonance tomography imaging for improving anatomical orientation.

Methods
One-hundred and eighty-one patients with AF refractory to antiarrhythmic treatment underwent ECG-gated 64-MDCT for identification of PV anatomy and simultaneous assessment of coronary vessels before PVA. No additional radiation was incurred for MDCT coronary angiography during MDCT scan. Pretest probability for obstructive coronary artery disease (CAD) was estimated. Invasive coronary angiography (ICA) was performed in all patients with at least intermediate risk of CAD.

Results
Eighty-six out of 181 patients (48%) had ICA and MDCT, 95 patients (52%) underwent MDCT alone. ICA revealed significant stenoses in 9% of the catheterized patients (8/86). MDCT investigation lead to a sensitivity of 90% (9/10), specificity of 98% (829/844 lesions), positive predictive value (PPV) of 39% (9/24), and negative predictive value (NPV) of 100% (829/830 lesions) for the detection of 50% stenoses seen on ICA. All patients with a significant stenosis were classified as patients with CAD. Overall prevalence of significant CAD detected by MDCT was found to be low with 10% of patients and 2% of all segments.

Conclusion
MDCT coronary angiography is sensitive and highly specific in patients presenting for PVA. In this group a negative scan reliably excludes significant CAD. These data suggest that MDCT coronary angiography can replace ICA prior to PVA.

Keywords
Atrial fibrillation • Coronary artery disease • Pulmonary vein ablation • MDCT angiography

Introduction
Percutaneous radiofrequency catheter ablation of atrial fibrillation (AF) with pulmonary vein isolation ablation (PVA) has evolved over the last decade and is currently recommended for symptomatic patients refractory to antiarrhythmic drug therapy.1 Imaging of the left atrium (LA) and pulmonary veins (PV) before AF catheter ablation is valuable for anatomical guidance of the procedure.2,3

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Multidetector computed tomography (MDCT) can provide pivotal information about the size, location, and number of PV ostia. In addition, pre-processed three-dimensional MDCT data sets can be integrated into three dimension mapping and navigation systems. 6,7

Accurate knowledge and optimal treatment of the underlying cardiac disease is a prerequisite before accepting patients with symptomatic AF refractory to other modes of treatment for PVA. 5 Invasive coronary angiography (ICA) is therefore often done to diagnose for possible coronary artery disease (CAD) before conducting the more invasive PVA procedure. In this context, many studies have suggested that the current generation of MDCT allows accurately MDCT-angiography to exclude significant coronary artery stenosis, with negative predictive values (NPV) of 97–100%, in comparison with invasive coronary ICA. 6–12

Therefore, the aim of our study was—in a patient group with symptomatic AF undergoing AF catheter ablation—to investigate routine diagnostic ECG-gated 64-MDCT for reconstruction of the LA and PV for additional assessment of haemodynamically significant stenoses of the coronary arteries in comparison with ICA.

Methods

Patients

In a consecutive series between April 2006 and May 2009, 181 patients (57 female, 124 male) with symptomatic therapy-refractory AF underwent ECG-gated contrast-enhanced 64-MDCT of chest and upper abdomen for identification of PV anatomy before PVA. Patient demographics were recorded for identification of the computer images and for later access of clinical information in the hospital database and files (Table 1). Median age of the study group was 57 ± 11 years (range, 21–82 years). All patients were referred from the Department of Cardiology in our institution where PV isolation was performed. Written informed consent was obtained from each patient. For all patients, cardiovascular risk factors and prevalence of angina pectoris (AP) and equivalents were noted. AF was categorized into paroxysmal, persistent, and permanent (Table 1). Exclusion criteria for MDCT were previous allergic reactions to contrast media, severe renal insufficiency, haemodynamic instability, inability to follow breath-hold commands, previous coronary stent placement, and previous bypass surgery. For all patients, cardiovascular risk factors, prevalence of AP and AP equivalents were noted. The pretest probability for obstructive CAD is estimated using the Duke Clinical Score. 13,14 Patients were categorized into a low (1–30%); intermediate (31–70%; 86 patients), or high (71–99%) estimated pretest probability group of having significant CAD. Consequently, 86 (48%) patients with intermediate probability of CAD underwent ICA and MDCT. In addition, 95 (52%) patients without an AP equivalent, few risk factors for CAD and low pretest probability underwent coronary MDCT without ICA. Seventeen patients had ICA >6 month before PV isolation. The 86 patients (48%) with at least intermediate risk for CAD 26 patients (30%) were treated with aspirin, 47 patients (55%) received a beta-blocker, 26 patients (30%) an ACE inhibitor, and 56 patients (65%) a statin. Indications for ICA were, for example, acute coronary syndrome, positive pretest examinations into treadmill-testing, during stress echocardiogram or within cardiac magnetic resonance tomography imaging (CMR), presentation of chest pain with new onset of AF, chest pain with several clinical risk variables. In case of significant coronary artery stenosis detected on MDCT, patients underwent ischaemia testing including stress examinations for provocations of ischaemia including treadmill-testing, stress echocardiogram, or stress CMR. In case of positive testing for ischaemia, patients (n = 3) received ICA as well.

Invasive coronary angiography

ICA served as the standard of reference and was performed according to standard techniques. Angiograms were evaluated by an experienced observer who was blinded to the results of MDCT coronary angiography. The coronary arteries were segmented according to the guidelines of the American Heart Association (AHA). 15 Fifty-two patients had AF during ICA. Each vessel segment was scored as being significantly stenosed, if a diameter reduction in >50% was found. Cases with stenosis of <50% luminal narrowing were defined as non-significant CAD. Coronary artery analysis was performed in all vessels with a diameter ≥1.5 mm, including those vessels distal to complete occlusions.

Imaging

All subjects received ECG-gated 64-slice MDCT (VCT Lightspeed, GE Healthcare, Milwauke, WI, USA) within 24–48 h prior to PVA using our local LA protocol. 16 One-hundred and ten patients (61% of the
angiography. The LA. No additional radiation was incurred for MDCT coronary angiography in the patient group. By visual evaluation, the readers had to determine the variability of its origin as well as their minor clinical relevance to our clinical decision making process. Numerous phases were reconstructed within the cardiac cycle to optimize structure visualization without motion artefacts. The dose length product was 706 ± 20 mGy/cm² and the CT dose index was 47 ± 3. All patients received their CT for the purpose of imaging the LA. No additional radiation was incurred for MDCT coronary angiography.

**Image analysis**

For image analysis, coronary segments as defined by the AHA were used, dividing the coronary tree into 15 segments. As previously described side branches [AHA segments 9 (diagonal branch 1), 10 (diagonal branch 2), 12 (obtuse marginal branch), and 14 (left posterolateral branch)] of the left coronary artery and the distal segment of the right coronary artery (RCA) [AHA segment 4 (posterior descending artery)] were not included in the analysis because of their small size, variability of its origin as well as their minor clinical relevance to our patient group. By visual evaluation, the readers had to determine the number of segments that could be assessed, analysing segments 1–3 (RCA), 5 (left main, LM), 6–8 (left anterior descending, LAD), and 11 and 13 (left circumflex, LCX). A coronary artery segment was considered to be of diagnostic image quality if it was visualized over its whole length and if the vessel lumen was completely depicted. Out of these segments image quality was considered as good in 75, as moderate in 23, and as poor in 2%. The segments with poor image quality were not considered for the analysis.

On a post-processing workstation (Volume Share 2, General Electric, Milwaukee, WI, USA) two blinded observers without knowledge of the patient’s clinical history, the indication for the patients referral, and the results from ICA classified each vessel segment interactively for the presence of haemodynamically significant stenoses. Similar to ICA, significant stenosis was defined as narrowing of the coronary lumen exceeding 50% and all vessels with a diameter down to 1.5 mm including those vessels distal to complete occlusions were included in the analysis. The vessel diameters were measured on reconstructions perpendicularly oriented to the vessel course. Depending on the coronary anatomy and image quality, different visualization techniques such as multi-planar reformations (MPR), maximum intensity projections, and volume rendering were used. For additional scan interpretation, bone, lung, and soft tissue window settings were used. For each patient, the anatomy of the PV ostia was identified. The time necessary to analyse the MDCT images was 4 ± 2 min for uploading the images from the picture archiving and communication system, 2 ± 0.5 min for image reconstruction time, and 5 ± 2.5 min for image interpretation. For the PVA procedure, 3D-MDCT images of the LA and the PV were reconstructed on a separate workstation and integrated with electroanatomical mapping (CARTO Merge, Biosense Webster, Diamond Bar, CA, USA).

**Electrophysiological study**

Briefly, for the electrophysiological procedure, all catheters were advanced via the femoral vein. A 6F steerable decapolar catheter (Bard Dynamic Tip, Bard Inc., Lowell, MA, USA) was positioned in the coronary sinus. After a transseptal puncture an Agilis deflectable sheath (St Jude Medical) was advanced into the LA. For ablation and mapping, a manually guided 3.5 mm open-irrigated catheter (Navistar Thermocoil, Biosense Webster) was used. Cinererrated PVA was performed using a three-dimensional mapping system (CartoMerge).

**Table 2: Detection of significant stenoses with 64-multidetector computed tomography coronary angiography in comparison with invasive coronary angiography**

<table>
<thead>
<tr>
<th>MDCT vs. ICA</th>
<th>n</th>
<th>TP</th>
<th>TN</th>
<th>FP</th>
<th>FN</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>PPV</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>All segments</td>
<td>854</td>
<td>9</td>
<td>829/844</td>
<td>15</td>
<td>1</td>
<td>90</td>
<td>98</td>
<td>38% (9/24)</td>
<td>100% (829/830)</td>
</tr>
<tr>
<td>LM</td>
<td>86</td>
<td>0</td>
<td>85/86</td>
<td>1</td>
<td>0</td>
<td>100</td>
<td>99</td>
<td>0% (0/1)</td>
<td>100% (85/85)</td>
</tr>
<tr>
<td>LAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximal</td>
<td>86</td>
<td>3</td>
<td>79/83</td>
<td>4</td>
<td>0</td>
<td>100</td>
<td>95</td>
<td>43% (3/7)</td>
<td>100% (79/79)</td>
</tr>
<tr>
<td>Medial</td>
<td>86</td>
<td>1</td>
<td>81/85</td>
<td>4</td>
<td>0</td>
<td>100</td>
<td>95</td>
<td>20% (1/5)</td>
<td>100% (81/81)</td>
</tr>
<tr>
<td>Distal</td>
<td>86</td>
<td>1</td>
<td>85/85</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>100</td>
<td>100% (1/1)</td>
<td>100% (85/85)</td>
</tr>
<tr>
<td>LCX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximal</td>
<td>85</td>
<td>1</td>
<td>81/83</td>
<td>2</td>
<td>1</td>
<td>50</td>
<td>98</td>
<td>33% (1/3)</td>
<td>99% (81/82)</td>
</tr>
<tr>
<td>Medial</td>
<td>85</td>
<td>0</td>
<td>84/85</td>
<td>1</td>
<td>0</td>
<td>—</td>
<td>100</td>
<td>0% (0/1)</td>
<td>100% (84/84)</td>
</tr>
<tr>
<td>Distal</td>
<td>85</td>
<td>0</td>
<td>85/85</td>
<td>0</td>
<td>0</td>
<td>—</td>
<td>100</td>
<td>0% (0/0)</td>
<td>100% (85/85)</td>
</tr>
<tr>
<td>RCA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximal</td>
<td>84</td>
<td>0</td>
<td>83/84</td>
<td>1</td>
<td>0</td>
<td>99</td>
<td>0% (0/1)</td>
<td>100% (83/83)</td>
<td></td>
</tr>
<tr>
<td>Medial</td>
<td>85</td>
<td>2</td>
<td>81/83</td>
<td>2</td>
<td>0</td>
<td>100</td>
<td>98</td>
<td>50% (2/4)</td>
<td>100% (81/81)</td>
</tr>
<tr>
<td>Distal</td>
<td>86</td>
<td>1</td>
<td>85/85</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>99</td>
<td>100% (1/0)</td>
<td>100% (85/85)</td>
</tr>
</tbody>
</table>

TP, true positive; TN, true negative; FP, false positive; FN, false negative; PPV, positive predictive value; NPV, negative predictive value; LM, left main coronary artery; LAD, left anterior descending coronary artery; LCX, left circumflex coronary artery; RCA, right coronary artery.
XP, Biosense Webster) in conjunction with the integrated MDCT image of the LA and real-time fluoroscopy.

**Statistical analysis**

Statistical analysis was performed using SPSS for Windows (Version 16.0, SPSS, Inc., Chicago, IL, USA). The diagnostic performance of MDCT coronary angiography for the detection of significant obstructive lesions, with quantitative ICA as the standard of reference, is presented as sensitivity, specificity, and NPV and positive predictive value (PPV). Comparisons of categorial variables were carried out using \( \chi^2 \) exact testing. \( P \)-values of \( < 0.05 \) were considered as statistically significant.

**Results**

**Lesion-by-lesion analysis between multidetector computed tomography and invasive coronary angiography**

ICA revealed significant stenoses in 9.3% (8 of 86 patients). One-vessel disease was prevalent in 75% (6 of 8) of these patients, two-vessel disease in 25% (2 of 8). Overall, 10 haemodynamically relevant obstructive coronary lesions were diagnosed (Table 2). Non-significant CAD was revealed in 17% (15 of 86 patients).

**Overall performance of multidetector computed tomography**

Altogether 854 non-stented coronary segments with a diameter as low as 1.5 mm were analysed for the detection of significant obstructive coronary stenoses. Overall sensitivity was 90% (9 of 10), the specificity was 98% (829 of 844), the PPV was 38% (9 of 24), and the NPV was 100% (829 of 830) for the detection of significantly obstructed segments (Table 2).

**False-negative results on multidetector computed tomography**

In one case, a haemodynamically relevant stenosed segment of the proximal circumflex artery was missed on the MDCT scan. This patient was correctly diagnosed by MDCT to have CAD, but incorrectly to have only single-vessel disease. In this case, ICA revealed a significant luminal narrowing of \( > 50 \)%, whereas MDCT detected a stenosis \( < 50 \)%. Furthermore, no percutaneous transluminal coronary stent implantation was necessary.

**False-positive results on multidetector computed tomography**

Because of overestimation of lesion severity, 15 segments were incorrectly classified as significantly obstructed. Eleven segments were incidental findings in patients referred to ICA due to their pretest probability and four segments were classified false positive in three patients with positive ischaemia testing after the finding of CAD on pre-procedural MDCT.

**Vessel-based analysis**

All significantly obstructed segments associated with the left coronary artery \( (n = 5) \) and the right coronary artery \( (n = 3) \) were correctly identified on the MDCT scan. In the proximal circumflex artery one stenosis was not detected and another one was discovered correctly (Table 2).

**Patient-based analysis**

MDCT coronary angiography correctly identified 829 of 844 (98%) segments without significant stenoses on angiography. No patient with single-vessel disease \( (n = 6) \) on ICA was incorrectly classified as having no significant coronary disease on MDCT. One patient with two-vessel disease on ICA was incorrectly classified as single-vessel disease and another patient was incorrectly classified as three-vessel disease. However, all patients with a significant stenosis in one or more vessels were correctly classified as patients with CAD. All patients with single-vessel disease received a percutaneous transluminal coronary stent placement. One patient with two-vessel disease received a coronary stent implantation into both narrowed lesions and the other patient needed percutaneous coronary stent implantation only into the LAD (Figure 2). Coronary artery bypass surgery was not necessary.

**Prevalence of coronary artery disease assessed by multidetector computed tomography**

A total of 1814 non-stented segments with a diameter as low as 1.5 mm were analysed by MDCT for the detection of significant obstructive coronary stenoses in all patients. Within the entire cohort significant stenoses were detected in 2% (35/1814) of all segments and in 10% (17/181) of all patients. The distribution is shown in Table 3. MDCT revealed one-vessel CAD in 7% of patients (13/181), two-vessel CAD in 2% of patients (3/181), and three-vessel CAD in 1% of patients (1/181). ICA showed that 29% (10 of 35 segments) of the detected lesions were correctly identified as true positive, while 42% (15 of 35 segments) were

**Table 3 Prevalence of coronary artery disease assessed by 64-multidetector computed tomography**

<table>
<thead>
<tr>
<th>Coronary segment</th>
<th>Segments</th>
<th>Stenoses</th>
</tr>
</thead>
<tbody>
<tr>
<td>All segments</td>
<td>1814</td>
<td>35</td>
</tr>
<tr>
<td>LCA</td>
<td>182</td>
<td>1</td>
</tr>
<tr>
<td>LAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximal</td>
<td>182</td>
<td>11</td>
</tr>
<tr>
<td>Medial</td>
<td>182</td>
<td>8</td>
</tr>
<tr>
<td>Distal</td>
<td>182</td>
<td>1</td>
</tr>
<tr>
<td>RCX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximal</td>
<td>181</td>
<td>5</td>
</tr>
<tr>
<td>Medial</td>
<td>181</td>
<td>2</td>
</tr>
<tr>
<td>Distal</td>
<td>181</td>
<td>0</td>
</tr>
<tr>
<td>RCA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximal</td>
<td>180</td>
<td>2</td>
</tr>
<tr>
<td>Medial</td>
<td>181</td>
<td>4</td>
</tr>
<tr>
<td>Distal</td>
<td>182</td>
<td>1</td>
</tr>
<tr>
<td>Prevalence (%)</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

LCA, left main coronary artery; LAD, left anterior descending coronary artery; RCX, circumflex coronary artery; RCA, right coronary artery.
detected as false positive. In 29% (10 of 35 segments), no ICA was performed. MDCT measured one-vessel disease in six patients and two-vessel disease in two patients. In these cases, follow-up examinations were conducted. Median follow-up time was 24 months.

Four out of eight patients (50%) had an ICA within the follow-up period due to clinical symptoms and positive stress testing. Two of these patients with a positive MDCT scan had significant one-vessel CAD into ICA. The other two patients had only non-significant CAD. The remaining four patients had no indication for further ICA due to the lack of clinical symptoms and a negative treadmill-testing during the observation period. In addition, non-significant CAD was revealed in 21% (38 of 181 patients). The prevalence of CAD detected by MDCT did not differ significantly according to paroxysmal, persistent, and permanent AF ($P > 0.05$).

### Acute and long-term success of pulmonary vein ablation

At the end of the initial ablation procedure $3.8 \pm 0.7$ PVs were isolated. Electrical isolation of all PVs was achieved in 90% of the patients. Considering only the initial procedure, 64% of the patients were free of AF recurrences after a mean follow-up of 12 months. Including repeat PVA freedom from symptomatic AF after a follow-up duration of $371 \pm 132$ days and $1.7 \pm 0.6$ PV isolations was 84%.

### Discussion

To our knowledge, this is the first prospective study demonstrating high diagnostic accuracy of routine ECG-gated 64-MDCT for assessment of significant stenoses of coronary arteries in the pre-procedural diagnostic work-up in patients with AF undergoing PV ablation—and at the same time as cardiac imaging for the ablation procedure is performed without further radiation exposure. The major finding of our study, which compared gated MDCT with ICA, is that 64-MDCT is a robust tool for assessing the presence of significantly obstructed coronary artery in the clinically important parts of the coronary tree (Figures 1 and 2). For segment based analysis, the overall sensitivity and specificity were found to be 90 and 98% (Table 2). This is a clinically acceptable accuracy for diagnosing CAD by means of MDCT in a low to intermediate risk population (Table 1). While MDCT-angiography of the LA and the PVs is done by many centres performing PV ablation to improve anatomic orientation, it may therefore permit simultaneous and accurate assessment of coronary status if the pretest probability is low as in our patient population.

### Atrial fibrillation and multidetector computed tomography for detection of coronary artery disease

AF is often associated with structural heart disease. Also, AF patients may manifest symptoms suggestive of CAD. In addition, AF commonly occurs in patients with CAD and it is an acknowledged predictor of mortality in those patients. Despite this, the prevalence of AF among patients with proven CAD is described as extremely low, at 0.2–5%. However, the diagnosis of CAD is an important issue in the management of AF patients prior to PV isolation.

Improved CT technology provides better temporal resolution and minimized motion artefacts, which allows coronary angiography at higher heart rates, even in cases of arrhythmia. In the study of Nucifora et al., 150 patients with AF underwent MDCT. Eighteen per cent of patients with AF were classified as having no CAD, whereas 41% showed non-obstructive CAD and the remaining 41% had obstructive CAD. They came to the conclusion that a higher prevalence of obstructive CAD was observed among patients with AF. In our study, MDCT detected significant CAD in 2% (Table 3) and non-significant CAD in 21%. ICA revealed
significant stenoses in 9.3% and non-significant stenosis in 17%. We think the different values result from the fact that Nucifora et al. had no ICA investigation and consequently a high rate of false positive results. Furthermore, several patient characteristics differ.

Improved technology for multidetector computed tomography coronary angiography

Complete visualization of all important coronary segments is a prerequisite for MDCT coronary angiography to become an established tool for the assessment of patients with suspected CAD. Non-invasive coronary imaging with ECG-gated MDCT technology can already be applied to both the assessment of significant luminal stenosis and the identification of non-stenotic atherosclerotic plaques. In a meta-analysis by Stein et al., mean sensitivity of 64-MDCT coronary angiography for significant stenosis was 90% for detection of CAD. Specificity was 88% for detection of CAD in a given patient, and 90% for all coronaries. Leschka et al. showed in their 64-MDCT-based examination a sensitivity of 94% and a specificity of 97% for the detection of significant coronary stenoses. As in our study, they also evaluated arteries >1.5 mm in diameter. Compared with these studies, we used CT coronary angiography for the first time in a very specific population at low risk for significant CAD. Our overall sensitivity of 90% and specificity of 98% is comparable. Using MDCT coronary angiography, only one significant stenosis of the proximal LCX was missed. Importantly, the patient was diagnosed correctly to have CAD, but incorrectly to have only single-vessel disease. In this case, ICA revealed a significant luminal narrowing of >50%, whereas MDCT detected a stenosis <50%. However, this stenosis was not evaluated as haemodynamically relevant and did not require intervention. This leads to the suggestion that not all significant stenosis on MDCT and ICA are directly associated with ischaemia. Our patient-based analysis showed that MDCT coronary angiography correctly identified 98% of the segments without significant stenoses in ICA. Consequently we suggest that—in this selected group of patients undergoing PV ablation for AF—MDCT angiography has almost reached the diagnostic accuracy of conventional angiography in the assessment of patients with AF to rule out haemodynamically relevant CAD (Table 2).

Influence of pretest probability of coronary artery disease on multidetector computed tomography coronary angiography

Clinically, it is crucial whether CAD may be missed by MDCT (high sensitivity) and whether a negative 64-MDCT coronary angiogram reliably excludes CAD (high NPV). In this context, it is a relative limitation of our study that ICA was not performed in all subjects. However, based on the Bayes’ theorem predictive values depend on the prevalence of the disease in the diagnosed population. In
our selected patient cohort, a prevalence of 9.3% was found for significant CAD. A 100% NPV indicated that CAD could be ruled out efficiently by 64-MDCT. This is in line with the data of previous studies who concluded that 64-MDCT allows a non-invasive assessment of haemodynamically significant CAD.3,35 Leschka et al.8 published data with a sensitivity of 94%, specificity of 97%, PPV of 87%, and NPV of 99%. Meijboom et al. investigated CT coronary angiography in patients referred for elective cardiac valve surgery. In their patient group prevalence of CAD was 25.7%. Detecting significant CAD by 64-MDCT resulted in a sensitivity of 100%, specificity of 98%, PPV of 83%, and NPV of 100%.35 Consequently, in a population exhibiting a low overall CAD risk, like a typical symptomatic AF population undergoing PVA, the results of our study with 90 sensitivity and 100% NPV suggest a potential future role of MDCT coronary angiography in all patients of whom many may currently undergo cost-extensive ICA.

Limitations

Our study has potential limitations. First, in this selected patient group presenting for PVA for symptomatic AF the prevalence of CAD was found to be low. To our opinion, this is in line with previous studies and does not directly influence the result of this study that a negative MDCT scan reliably excludes significant CAD.30–32 Second, only patients with at least intermediate estimated pretest probability underwent ICA and MDCT. Patients with low pretest probability underwent MDCT alone. From literature, there are no reasons to believe that results would differ in patients with low pretest probability for CAD.33,34,35 Third, ECG-gated 64-MDCT coronary angiography is associated with a non-negligible radiation dose.36 With advanced MDCT scanners radiation dose can be reduced to 1–3 mSv.37 However, all patients included in the study received their CT for the purpose of imaging the LA, anyway. This means that no additional radiation exposure was incurred for the additional MDCT coronary angiography.

Conclusion

In conclusion, 64-MDCT coronary angiography used in patients undergoing PVA for symptomatic AF is a sufficiently sensitive and specific tool for diagnosis of CAD. A negative MDCT coronary angiogram reliably excludes significant CAD. Limitations are known to exist in the proximal LCX and in distal branches. Because 64-MDCT often serves as routine anatomical guidance of the PV ablation procedure, it can (potentially) replace ICA prior to PVA for symptomatic AF.

Conflict of interest: none declared.

References

A 38-year-old man was transferred to our institution for percutaneous closure of an atrial septal defect (ASD). The TEE echocardiographic examination performed at the referring institution reported the presence of an uncomplicated ostium secundum ASD with adequate rims for percutaneous closure with an Amplatzer device. A repeated transoesophageal examination using the Matrix 3D TEE probe (Phillips Healthcare, Andover, MA, USA) revealed a fenestrated ASD with four distinct orifices with insufficient rims for percutaneous closure (Figure 1A). This unusual ASD morphology could only be seen after cropping of the zoom acquisition. In view of these findings, the operative team decided to cancel the percutaneous procedure due to the high likelihood of failure. This patient underwent surgical closure of his ASD, and the intra-operative findings were consistent with the 3D reconstruction exhibiting a fenestrated interatrial communication with four holes (Figure 1B).

Supplementary data are available at European Heart Journal – Cardiovascular Imaging online.