

## CASE REPORT

# Anomalous origin of the circumflex artery and patent foramen ovale: a rare cause of myocardial ischaemia after percutaneous closure of the defect

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A 35 year old man with a history of transient ischaemic attack and atrial septal aneurysm underwent percutaneous closure of a patent foramen ovale (PFO) with a transcatheter device. After the procedure the patient developed effort angina not present previously. Transoesophageal echocardiography confirmed the absence of residual shunt but showed an abnormal linear image running behind the aortic root. Magnetic resonance imaging detected an anomalous origin of the circumflex coronary artery from the right coronary sinus. The anomalous artery was located between the aortic root and the PFO closing device, causing coronary insufficiency. This report describes a rare complication of transcatheter PFO closure.

Coronary anomalies are a relatively rare condition that may be encountered in about 1% of the general population.<sup>1</sup> Sudden death, the most threatening manifestation of coronary anomalies, can be encountered in a small proportion of young, otherwise normal people but the incidence increases greatly in competitive athletes.<sup>2-4</sup> The clinical consequences of the coronary anomalies vary depending on the type of abnormality present. Anomalous origin of a coronary artery from the opposite sinus of Valsalva is reported to be a possible cause of myocardial ischaemia.<sup>1</sup> The identification of patients with coronary anomalies is a major diagnostic challenge in the absence of clinical manifestations. Recently, magnetic resonance imaging has been shown to identify such patients reliably and accurately.<sup>5,6</sup>

Patent foramen ovale (PFO) is a potentially important cause of systemic embolism, particularly when associated with an atrial septal aneurysm.<sup>7</sup> Percutaneous closure of PFO is a new, very popular, and probably very effective procedure in decreasing the rate of stroke in these patients.<sup>8</sup>

We describe an unusual clinical presentation of an anomalous origin of the left circumflex artery from the right coronary sinus in a patient treated by percutaneous closure of a PFO.

### CASE REPORT

A 35 year old man had been admitted to hospital eight months previously for a transient cerebral ischaemic attack. A two dimensional echocardiogram showed an interatrial septal aneurysm with some right to left shunting caused by a PFO. Transcatheter closure of the PFO was therefore planned. Coronary angiography was not performed; however, a preprocedure maximal ergometric effort stress test was normal. The PFO was closed successfully by using an Amplatzer septal occluder. Before discharge the patient was examined by transoesophageal echocardiography that confirmed the correct delivery of the occluder. A previously undetected abnormal linear image located behind the aortic root was identified. The

patient repeated an ergometric stress test with an abnormal result, with evidence for decreased coronary reserve.

Turbo field echo, navigator based free breathing, three dimensional coronary magnetic resonance imaging was performed by using a 1.5 T imager (Philips, Best, The Netherlands). The PFO occluder device yielded a small spatially limited artefact void of signal (fig 1). In the short axis plane the origins of the right and left coronary arteries were correctly identified. The left circumflex artery had an anomalous origin from the right sinus of Valsalva (fig 2). After its origin the artery followed an anomalous course behind the aortic root. Despite the presence of the artefact, it was evident that the anomalous artery was compressed between the occluder and the aortic root. The patient improved after implementation of antianginal drug treatment. He refused surgical correction of the anomaly.

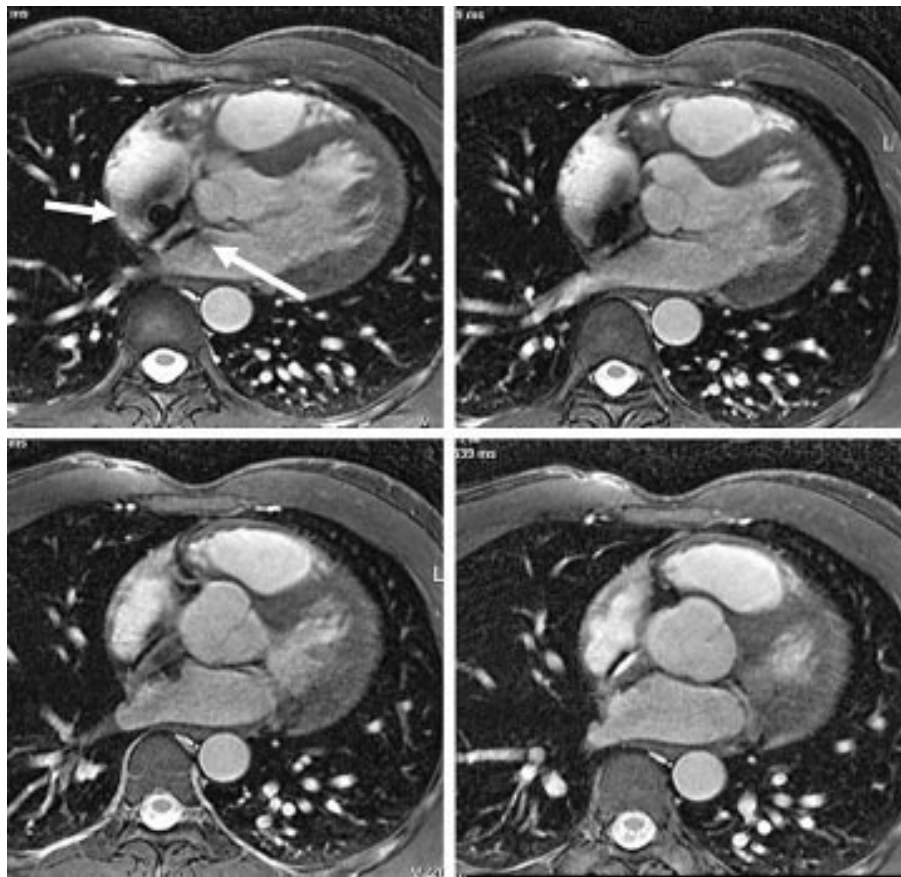
### DISCUSSION

We report a rare, previously unreported complication of PFO closure and cause of myocardial ischaemia. This case also describes a rare cause of myocardial ischaemia in a patient with an anomalous origin of a coronary artery.

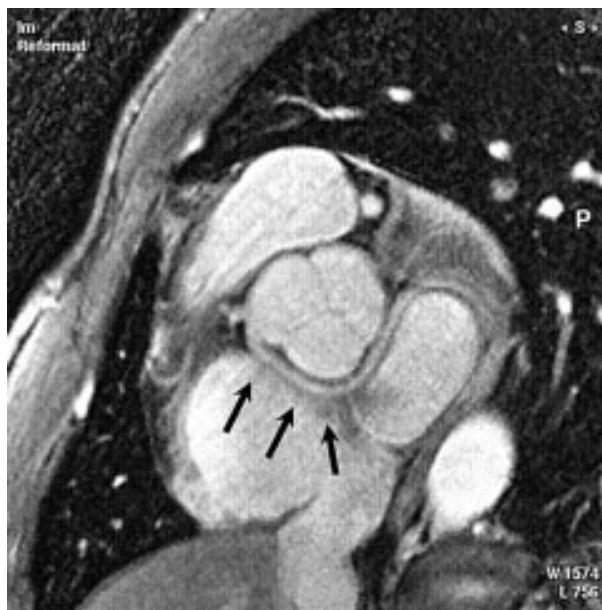
Transcatheter percutaneous closure of PFO is an increasingly common procedure performed in industrialised countries to correct a potentially important cause of systemic embolism. This procedure has been reported to have a short term complication rate of about 10% of cases. These include embolisation of the device and air embolism during the procedure. Less frequent complications are infection, pericardial effusion, and thrombus formation.<sup>9</sup> This case shows that the occluder may compress an anomalous coronary artery and cause myocardial ischaemia. This patient had a very low probability of coronary artery disease and therefore coronary angiography was not performed before the procedure. It should be stressed, however, that even conventional coronary angiography may not be the best method to detect and evaluate coronary anomalies.<sup>1</sup>

While myocardial ischaemia can be observed almost invariably when the left main coronary artery originates from the right sinus of Valsalva, it appears as a less common complication when other arteries have an anomalous origin.<sup>4</sup> An abnormal origin of the circumflex artery does not usually lead to any serious complications. However, in this case, after the placement of the percutaneous device, we found evidence for effort induced myocardial ischaemia. The most likely mechanism appears to be compression of the anomalous artery between the PFO occluder on one side and the aortic root on the other. Myocardial ischaemia was not present before the transcatheter procedure, thus eliminating the possibility of a previously undetected cause of ischaemia in this patient.

This case report highlights a possible complication not previously described of percutaneous PFO closure that should nevertheless be kept in mind because of the severe consequences it may have when it is not suspected. An abnormal



**Figure 1** Four levels of a three dimensional coronary magnetic resonance image are shown from the lowest level (upper left) to the highest (lower right). White arrows indicate the artefact cause by the patent foramen ovale occluder.



**Figure 2** Magnetic resonance imaging. Turbo field echo, free breathing, three dimensional sequence on the short axis plane of the heart and positioned through the origin of the coronary arterial vessels. The black arrows highlight the anomalous course of the circumflex artery originating from the right coronary sinus. The anomalous vessel runs behind the aortic root and finally reaches its normal position in the left atrioventricular groove. Note also the normal site of origin of the right coronary artery.

course of a coronary artery should be ruled out before placement of a device for percutaneous closure of interatrial septal defects.

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