

Prevalence of Anomalous origination of a Coronary Artery from the Opposite Sinus (ACAOS) in an adult population undergoing multidetector-row computed tomography for the evaluation of coronary artery disease

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BACKGROUND

- **Anomalous origination of a coronary artery from the opposite sinus (ACAOS) is estimated to be present in 0.2-2.0% of the population.**
- **In the majority of individuals, ACAOS has no hemodynamic or prognostic implications, but in a minority of cases, typically where the anomalous coronary artery takes an interarterial course to reach its correct myocardial territory, it can precipitate ischemia and sudden cardiac death (SCD).**
- **With the growing use of multidetector-row computed tomography angiography (MDCT) in the investigation of ischemic heart disease, we can expect increasing rates of incidental detection of this anomaly.**



PURPOSE

The aim of this study was to evaluate the prevalence of ACAOS in consecutive symptomatic patients, who underwent cardiac 64-slice MDCT coronary angiography for the assessment of coronary artery disease.



METHODS

- This retrospective study included 2572 patients who underwent coronary 64-slice MDCT coronary angiography from January 2008 to March 2012.
- Coronary angiographic scans were obtained with injection of 80 ml nonionic contrast medium.
- Retrospective gating technique was used to synchronize data reconstruction with the ECG signal.
- Maximum intensity projection, multi-planar reformatted, and volume rendering images were derived from axial scans.



RESULTS

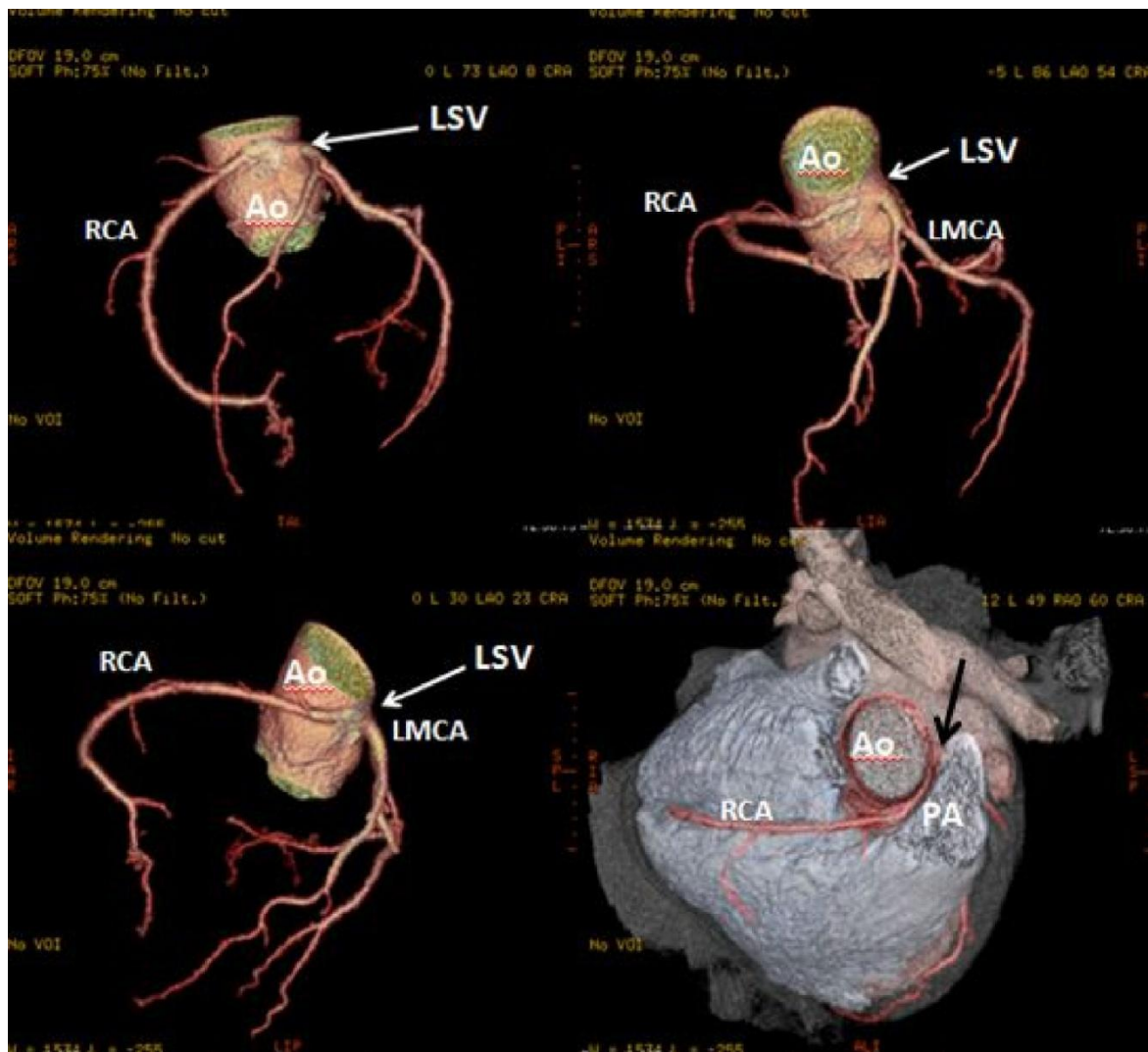
Of the 2572 patients, twenty (0.78%) were diagnosed with ACAOS,

Mean age of 54.8 ± 9.5 years (range 34-68 years)

Eighteen (90%) were males.

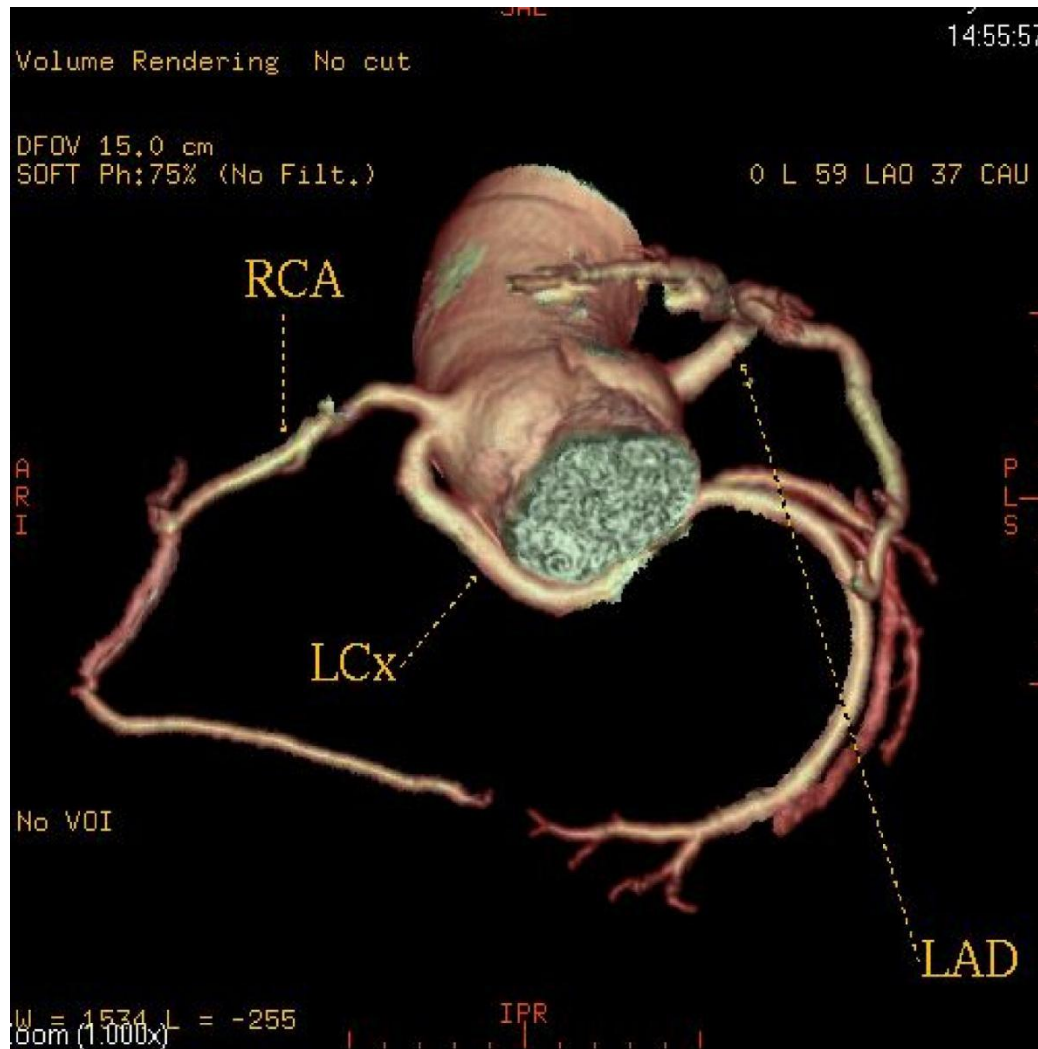


In 9 patients (0.35% or 45% of ACAOS) the RCA arose from the opposite sinus of Valsalva with a separate ostium for RCA and LM.



In four patients the anomalous RCA had a malignant inter-arterial course.

In 6 patients (0.23% or 30% of ACAOS) an abnormal origin of LCx from the right sinus of Valsalva (RSV)



Posterior course within the atrioventricular groove.

Termination of LCx was normal in all patients.

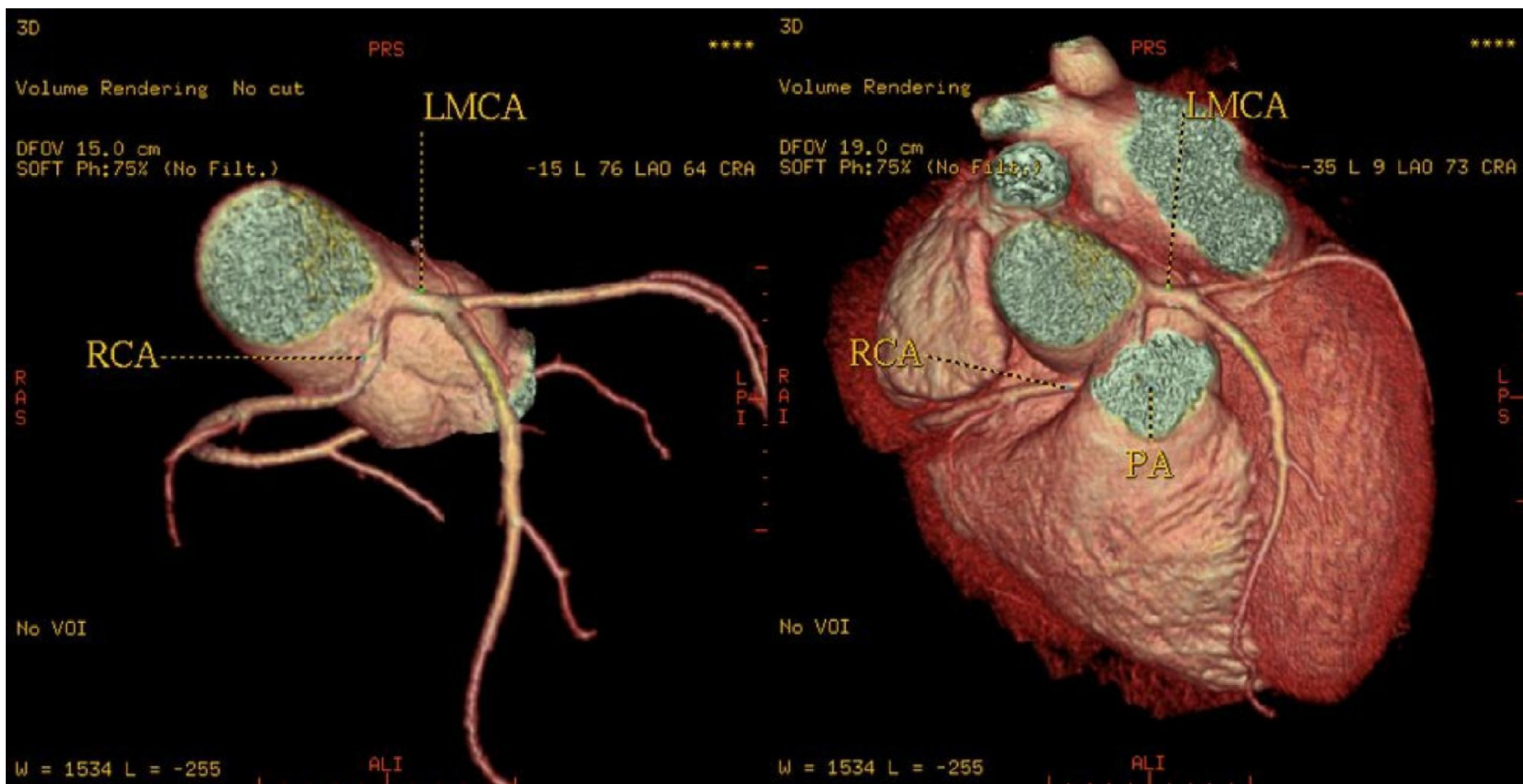
A single coronary artery was seen in 3 patients (0.12% or 15% of ACAOS).

It was originated from the RSV in one patient and from LSV in two patients.

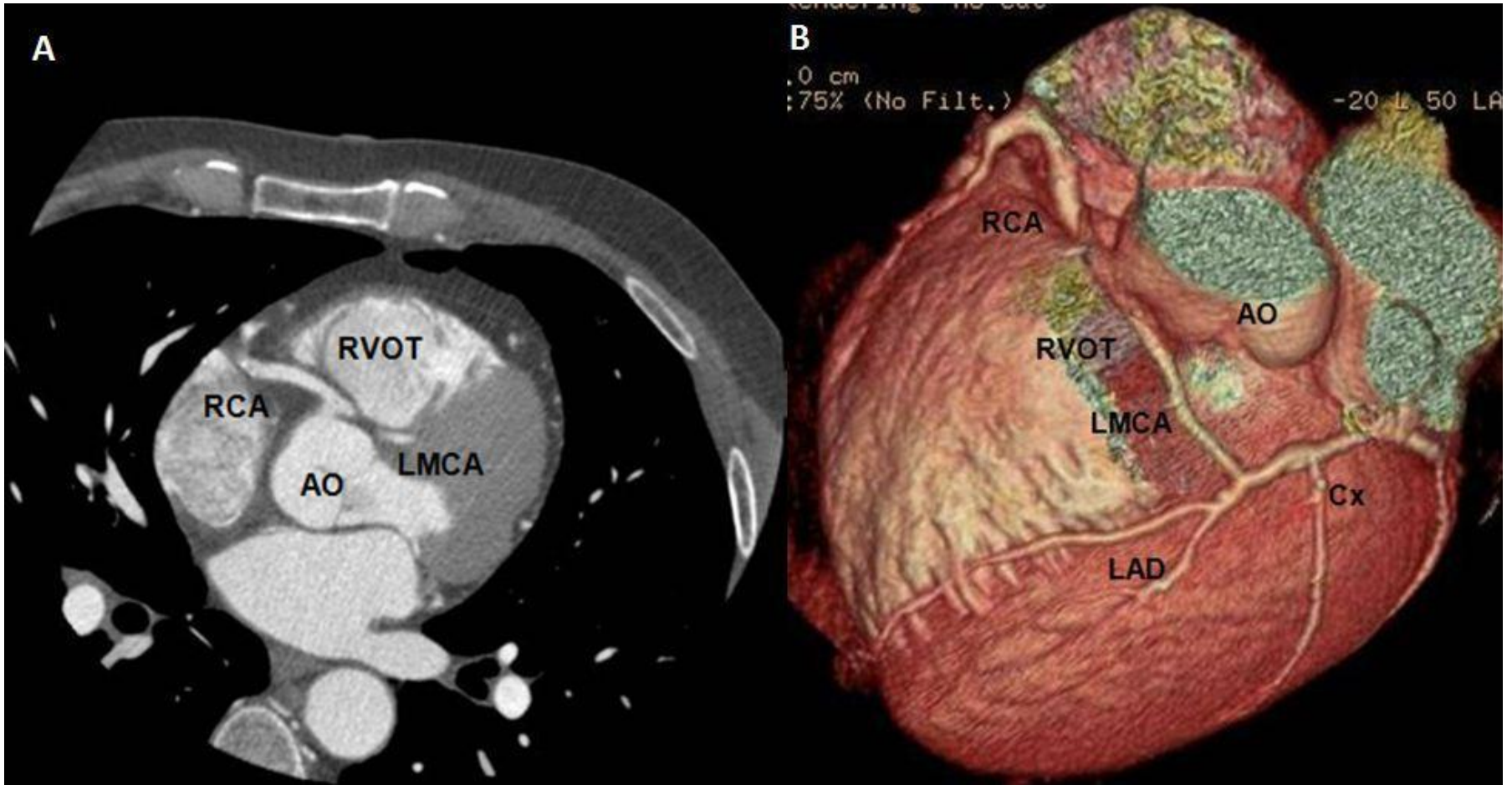
In two patients the anomalous vessel (RCA=1, LMCA=1) had a malignant course between the pulmonary artery (PA) and the aorta.



RCA had a malignant course between the pulmonary artery (PA) and the aorta.

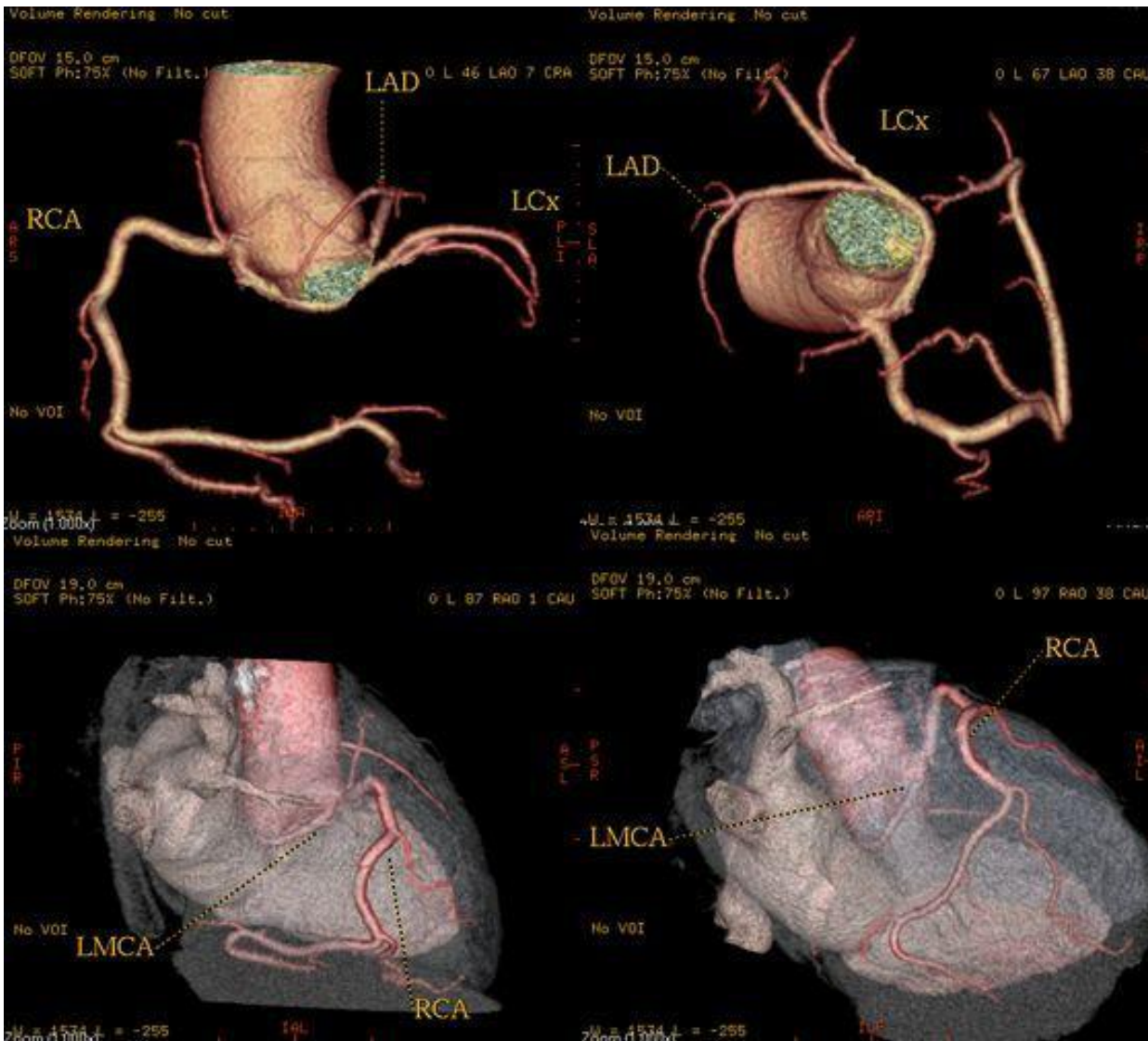


LMCA had a malignant course between the pulmonary artery (PA) and the aorta.



In 2 patients (0.08% or 3.3% of all anomalies) left coronary trunk originating from the RSV with separate ostium.

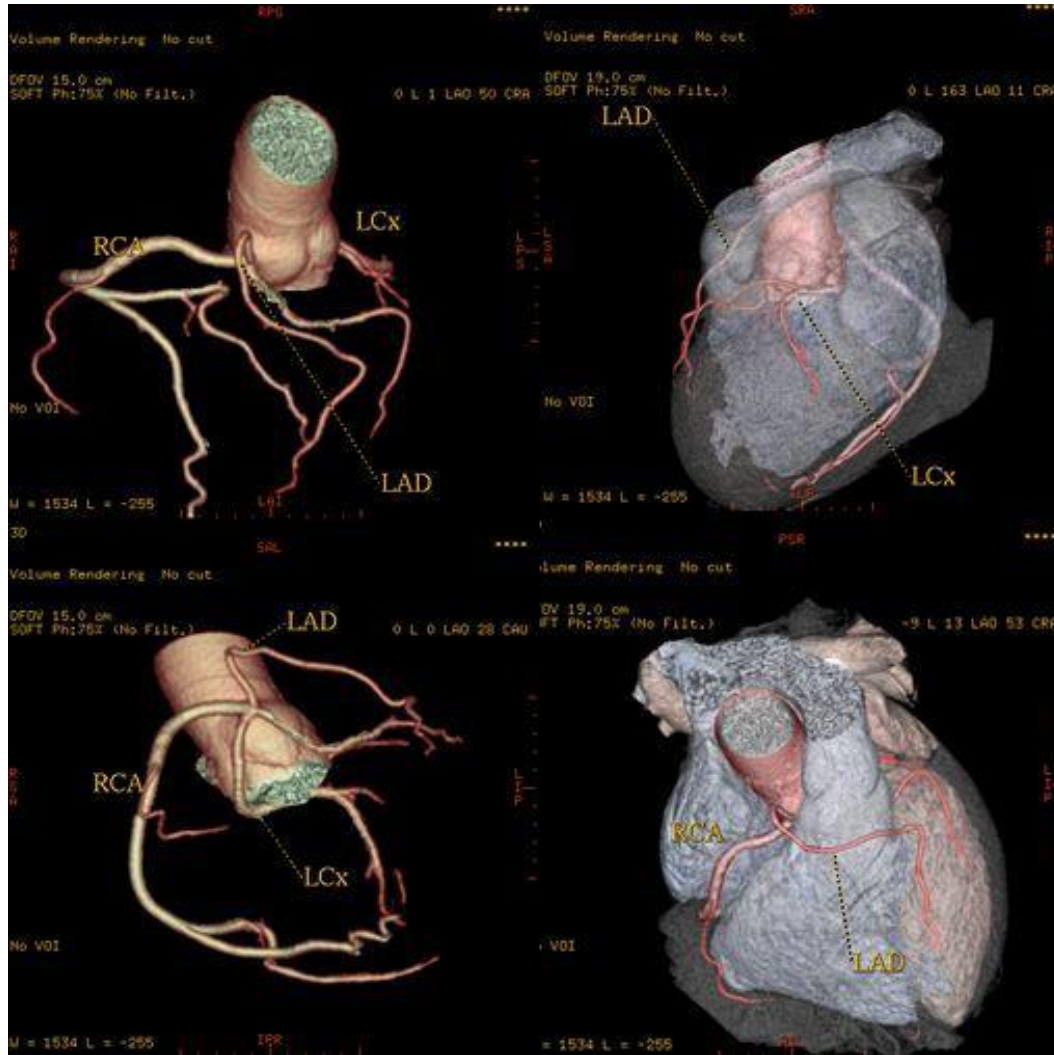




- In one patient the LMCA arose from the RSV with retro-aortic course.



In one patient the LMCA arose from the RSV with retro-aortic course.



LAD coronary artery passes anterior to right ventricular outflow tract.

Cx passes posteriorly between left atrium and aortic root to resume its normal position in left atrioventricular groove.

RCA has normal configuration..

Coronary anomalies cause 10-20% of deaths in athletes.

More over in 14-40 year olds, coronary anomalies are involved in 12% of sports-related sudden cardiac deaths versus 1.2% of non-sports related deaths, suggesting that coronary anomalies are lethal mostly during or shortly after strenuous physical activity

The clinical course of LCA from the right coronary sinus is more malignant than that of RCA from left coronary sinus.

Basso reported 27 sudden deaths in young athletes. Of these, 23 had LCA arising from the right coronary sinus and only 4 had RCA from the left coronary sinus.



The pathologic mechanism is not exactly clear.

Various mechanisms have been proposed to explain this including:

- direct compression during exercise between the pulmonary artery and aorta when these vessels dilate,
- inadequate flow through a narrow slit-like orifice of the anomalous vessel that can collapse during exercise,
- acute kinking of the long LMCA and
- spasm of the proximal portion of LMCA between the aorta and the pulmonary artery



Surely, however, it is the size of the dependent myocardium that mainly determines the clinical manifestations.

Small arteries will have a minor or nonexistent clinical expression, even when definite pathophysiologic alterations are involved. The opposite is true for larger coronary arteries.

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On the other hand, coronary arteries that pass:

- anterior to the pulmonary trunk,
-
- posterior to the aorta or
- through the interventricular septum

are rarely associated with these complications and therefore patients with these anomalies are usually asymptomatic unless atherosclerotic disease is present.



CONCLUSIONS

- The results of this study support the use MDCT coronary angiography as a safe and effective noninvasive imaging modality for defining ACAOS in an appropriate clinical setting, providing detailed three-dimensional anatomic information that may be difficult to obtain with invasive angiography.
- MDCTA allowed the identification of the ostium and proximal course of the anomalous coronary arteries and in addition, we were able to differentiate between high and low risk ACAOS.

