crescentic, as is frequently the case of IAH.[5] None of the cases showed intramural blood pools or ulcer-like projections, so characteristic of IAH.[2,4] However, some of the typical imaging signs of IAH were also present in patients with aortitis, such as central displacement of intimal calcification, hyperintensity in noncontrast CT images, and absence of enhancement with contrast administration.[2,4] Regarding the aortic valve, it is possible to have significant AR in both conditions. In aortitis, AR may result from aortic valve inflammation (7 cases in this series).

Laboratory parameters are not very specific; in aortitis, C-reactive protein and erythrocyte sedimentation rate are usually elevated (6 patients of this series),[2–4] but they can occasionally be normal. Acute phase reactants may also be increased in IAH. Thus, these parameters are not definitive. A laboratory parameter that could ultimately be useful in the emergency department is the D-dimer. In patients with AIH, D-dimers are usually high. D-dimer levels were slightly high in 1 of our patients and normal in the other. Unfortunately, they were not measured in the other patients.

PET/CT imaging may play a key role in establishing the diagnosis of aortitis and assessing the extent of the disease to other aortic segments. In addition, it is very helpful in the follow-up of these patients to monitor the therapeutic response.[4] In IAH FDG uptake is null or low intensity.

Interestingly, most cases of aortitis in this series (8 patients) were IgG-4 aortitis.[2] Hypothetically, this type of aortitis may be more likely to simulate an IAH. IgG4-related disease may also present as other cardiovascular conditions, such as pericarditis or intracardiac pseudotumors. Although heart failure as a consequence of valvular dysfunction is usually the form of presentation in cases of intracardiac mass, cardiac arrest and conduction disturbances have also been described as a result of IgG4-related disease.[6] Aortitis is no longer a rare condition, and must be considered in the differential diagnosis of patients with AAS, particularly IAH.

In summary, in patients presenting to the emergency room with chest pain and a thickened ascending aortic wall, the following features should give rise to suspicion of aortitis: absence of a long-lasting history of hypertension, circular aortic wall thickening with absent intramural blood pools or ulcer-like projections, and normal D-dimer values (table 1).

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Diagnostic accuracy of angiography-based quantitative flow ratio in patients with left main disease

Valor diagnóstico del cociente de flujo cuantitativo obtenido mediante angiografía en presencia de lesiones en el tronco común izquierdo

To the Editor,

A large mass of heart muscle is dependent on lesions in the left main coronary artery (LMCA), making revascularization of this structure perhaps more important than in other locations. In general, the decision to revascularize is based on angiography findings.

The quantitative flow ratio (QFR) is a new index that has shown good agreement with the fractional flow reserve (FFR), a value obtained invasively in several clinical situations. The QFR uses 2 coronary angiography views to estimate the FFR based on computational fluid dynamics and 3-dimensional reconstruction without the need for a pressure wire. There is very little evidence on QFR use in the LMCA, and the manufacturers themselves advise against using it in lesions affecting the ostium or bifurcation

This retrospective, observational study in daily clinical practice was designed to assess the diagnostic performance of the QFR to estimate the FFR obtained with an invasive technique and to compare it with angiographic evaluation in inconclusive LMCA lesions

Angiograms of all patients with LMCA stenosis between 30% and 70% by visual estimation and 1 FFR study were analyzed in a single center between January 1, 2018 and May 15, 2019. Studies not including 2 views separated by at least 25° angulation and those of insufficient quality for QFR assessment were excluded.

The visual assessment was carried out by 2 operators whose experience included more than 1000 procedures for functional assessment of coronary lesions. Operators were blinded to the FFR results.

The QFR was measured with the Medis Suite XA QAngio XA 3D QFR software, version 3.2.28.0 (Medis, The Netherlands),[1] taking the angiographic location of the pressure wire sensor as the distal point and without knowledge of the FFR value.

In total, 66 studies from 57 patients were analyzed. Fifty-four studies (81.8%) from 45 patients were suitable for determining the

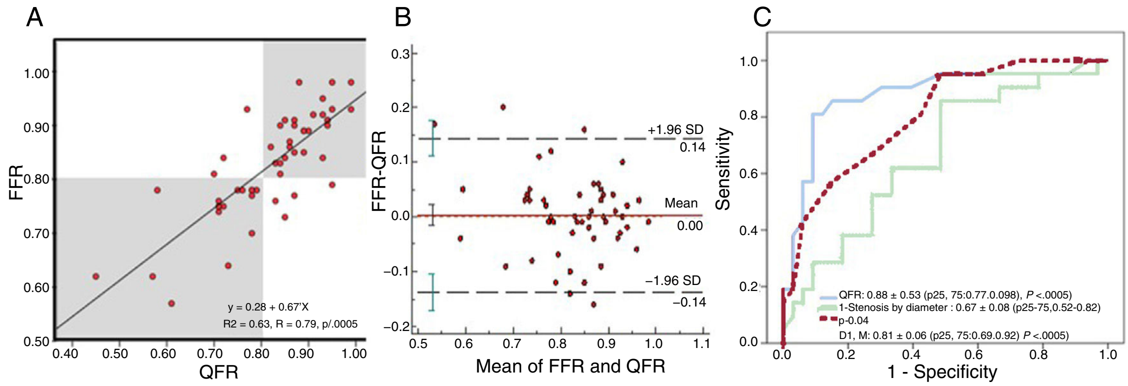

Figure 1. A, Scatter plot with regression line between the fractional flow reserve (FFR) and quantitative flow ratio (QFR) values. Continuity equation and R and R2 values. B, Bland-Altman plot for the FFR and QFR values. C: ROC curves of the QFR values, stenosis by diameter, and minimum lumen diameter (MLD).

Table 1
Baseline characteristics of the patients and procedures

Age, y	71 ± 9.4
Women	13 (28.9)
Hypertension	30 (66.7)
Diabetes mellitus	14 (31.1)
Smoker	22 (48.9)
Hyperlipidemia	30 (66.7)
Previous myocardial infarction	9 (20)
LVEF, %	56.5 ± 9.5
Normal	28 (62.2)
Moderately decreased	8 (17.8)
Mildly decreased	7 (15.6)
Previous revascularization	23 (51.1)
Indication	
Stable ischemic heart disease	21 (46.7)
NSTEACS	6 (13.3)
STEACS	18 (40.0)
Hyperemia method	
Intracoronary adenosine	35 (77.8)
Intravenous regadenoson	10 (22.2)
Lesion location	
Ostial	6 (13.3)
Medial	1 (2.2)
Distal	38 (84.4)
Medina classification	
1-0-0	23 (51.1)
1-0-1	3 (6.7)
1-1-0	8 (17.8)
1-1-1	4 (8.9)
Angiography classification	31 (68.9)
Mild	2 (4.4)
Moderate	9 (20.0)
Severe	20 (44.4)
QCA of the LMCA lesion	
Minimal lumen diameter, mm	1.82 ± 0.35
Degree of stenosis by diameter, %	46.77 ± 8.94
Degree of stenosis by area, %	61.40 ± 12.37
Length of the lesion, mm	14.83 ± 6.55
Reference diameter, mm	3.46 ± 0.64
QFR study	
Length of the segment studied, mm	53.38 ± 17.87
QFR of the segment	0.82 ± 0.11
QFR in the LMCA	0.88 ± 0.08
ΔQFR (LMCA)	0.11 ± 0.08
Residual QFR (LMCA)	0.94 ± 0.08
QFR ≤ 0.80	20 (37)
FFR study	
FFR	0.83 ± 0.09
FFR ≤ 0.80	21 (38.9)
Mean difference, QFR-FFR	0.007 ± 0.00
Mean difference, QFR-FFR (absolute value)	0.047 ± 0.03
Diagnostic value of the visual estimate (reference, FFR ≤ 0.80)	
Sensitivity, %	66.6 (44.1-89.2)
Specificity, %	84.8 (71.1-98.6)
PPV, %	73.7 (51.3-96.1)
NPV, %	80 (65.3-94.7)
Agreement	78
Diagnostic value of the QFR (reference FFR ≤ 0.80)	
Sensitivity, %	81.0 (64-98.0)
Specificity, %	90.9 (79.6-97.2)
PPV, %	85.2 (67.0-95.2)
NPV, %	88.2 (75.9-98.1)

FFR, fractional flow reserve; LMCA, left main coronary artery; LVEF, left ventricular ejection fraction; NSTEACS, non-ST-segment elevation acute coronary syndrome; STEACS, ST-segment elevation acute coronary syndrome; NPV, negative predictive value; PPV, positive predictive value; QCA, quantitative coronary analysis; QFR, quantitative flow ratio
Values are expressed as the number (%), mean ± standard deviation, or mean (range).

QFR. Eight studies were excluded because they lacked 2 views separated by 25° in which the bifurcation of the trunk was visible without overlapping branches, and 4 because they showed severely calcified lesions impeding proper delineation of the vessel borders (table 1).

An FFR value ≤ 0.80 was obtained in 21 studies (39%). The visual estimate concurred with FFR ≤ 0.80 in 78%. Concordance between the QFR and FFR values obtained (with a cutoff ≤ 0.80) was 87% (correlation coefficient, R = 0.79) (figure 1A,B).

Areas under the receiver operating characteristic (ROC) curve were 0.88, 0.67, and 0.81 for QFR, stenosis by diameter, and minimum lumen diameter, respectively (figure 1C).

The agreement and area under the ROC curve values obtained in our study are similar to or somewhat lower than those found in other locations. In a meta-analysis including 9 studies involving 1111 vessels and comparing the FFR and QFR, the area under the ROC curve was 92%.[2] In another meta-analysis,[3] the length of the lesion, higher degree of stenosis, and diabetes were factors associated with greater discrepancy between the FFR and QFR. As bifurcation and ostial lesions have been excluded from the studies to date, it cannot be determined whether these locations may be a cause of disagreement between the 2 indices. LMCA lesions mainly affect the bifurcation, which makes QFR calculation more complex.

Angiography-derived indices are attributed the advantages of greater applicability with lower costs, procedure times, and complications. It is controversial whether these indices represent a closer approximation to physiological lesion assessment or a reversal with a return to morphological assessment.[4] The FFR incorporates microvascular involvement when determining the indication to revascularize an epicardial lesion. In a recent study,[5] microvascular involvement was associated with lower diagnostic yield of the QFR in predicting the FFR value. An index that is not specific to the lesion could lead to inappropriate decisions based on cutoffs similar to those used in intracoronary ultrasound and optical coherence tomography.

A limitation of this study is the small number of procedures included, among which 20% were unsuitable for measurement. Thus, it should be considered a pilot study. Measurements were not performed in a central laboratory, but they were done by operators certified in QFR determination, and intracoronary adenosine was used in most of the studies, without involvement of the ostium.

In conclusion, this study, the first to compare QFR and FFR findings in the LMCA, shows that retrospective QFR determination can be performed in more than 80% of LMCA lesions with $>$ 85% agreement, which is higher than that obtained by angiography. In consideration of the clinical importance of LMCA lesions, we believe that the functional repercussions should be one of the factors to take into account in the decision to revascularize vessels with moderate stenosis.

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