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CARDIO ROUNDS NEWSLETTER

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Dear Doctor,

Greetings from Micro Labs Limited. We are happy to bring you "Cardio rounds" which contains latest and interesting news in the field of Cardiology

Prognostic Value of quantitative flow ratio (QFR)-Consistent Revascularization in patients with myocardial infarction and multivessel disease

Cardiovascular disease

INTRODUCTION- Patients with myocardial infarction (MI) and multivessel coronary artery disease (CAD) are at high risk for future cardiovascular events. Numerous studies have shown that completed revascularization guided by physiology was linked to better clinical results for fractional flow reserve (FFR). Despite worries about microvascular dysfunction brought on by inflammation, vasoconstriction, thrombus formation, or microembolization, multiple investigations have shown the viability and diagnostic accuracy of FFR in non-culprit arteries in the context of myocardial infarction. However, limitations such as the need for hyperemia and procedural complexity have made FFR less commonly used.[1] A new technique for determining the hemodynamic significance of coronary lesions is the quantitative flow ratio (QFR), which was based on a three-dimensional reconstruction of the channel and an estimate of the flow velocity of its contrast material. QFR eliminates the need for pressure wires and drug-induced hyperemia, in contrast to wire-based techniques like FFR or instantaneous wave-free ratio (iFR).[2] However, it is still unknown how QFR impacts the prognosis in patients with MI and multivessel coronary artery disease. So, this study aimed to assess the prognostic impact of QFR-consistent complete revascularization, where revascularization decisions aligned with QFR assessments, compared to QFR-inconsistent revascularization in patients with MI and multivessel CAD.[1]

METHODS- This retrospective study included 792 patients with MI and multivessel CAD who underwent primary percutaneous coronary intervention (PCI). Exclusion criteria were cardiogenic shock, type 2 MI, prior coronary artery bypass grafting (CABG), and angiographic issues preventing high-quality QFR analysis. Patients were classified into two groups: QFR-consistent PCI (n=646), where revascularization matched QFR recommendations, and QFR-inconsistent PCI (n=146), where at least one vessel was treated or left untreated contrary to QFR guidance. The primary endpoint was a composite of all-cause death, non-fatal MI in non-culprit vessels, and ischemia-driven revascularization. QFR analysis was performed offline by blinded investigators, and all lesions with a QFR $\leq$0.80 were considered hemodynamically significant.

RESULTS- It was shown that the baseline characteristics have no significant differences between the groups in terms of age, sex, and cardiovascular risk factors. However, patients with QFR-inconsistent PCI had more severe coronary lesions. Of the 146 patients in the QFR-inconsistent group, 83 were undertreated (lesions with QFR $\leq$0.80 not revascularized), and 63 were overtreated (lesions with QFR >0.80 revascularized). Out of 1,320 non-culprit lesions analyzed, QFR values were significantly lower in the QFR-inconsistent group (0.88 vs. 0.98 in the QFR-consistent group). The QFR-inconsistent group also had longer lesion lengths and

greater diameter stenosis. At two years, the primary endpoint occurred in 22 (3.4%) of the QFR-consistent PCI patients and 27 (18.5%) of the QFR-inconsistent PCI patients (hazard ratio [HR] 0.17, 95% CI 0.10-0.30, p<0.001). The difference was driven by reduced rates of nonfatal MI (1.2% vs. 5.5%, HR 0.21) and ischemia-driven revascularization (2.0% vs. 15.1%, HR 0.13) in the QFR-consistent group (Figure 1). Patients in the undertreatment subgroup of QFR-inconsistent PCI had the highest event rates (25.3%), followed by the overtreatment subgroup (9.5%).

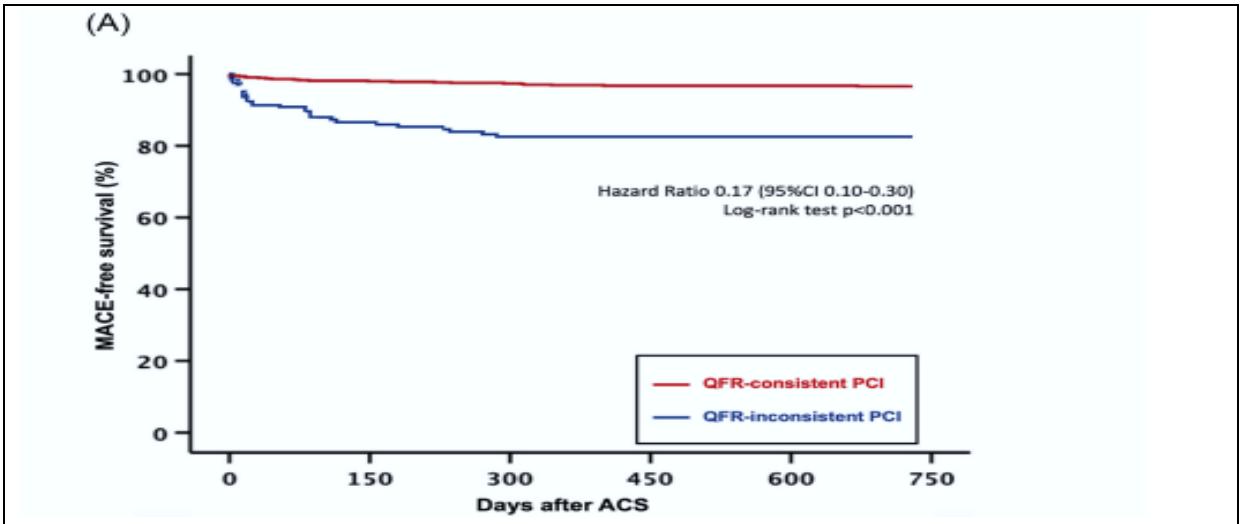

Figure 1. Kaplan-Meier curves for the primary endpoint in patients with QFR-consistent and QFR-inconsistent PCI.

DISCUSSION- The findings highlighted the prognostic benefits of QFR-consistent complete revascularization in patients with MI and multivessel CAD and shown QFR-consistent revascularization reduced adverse cardiovascular events compared to inconsistent revascularization. This study underscored QFR's potential as a valuable alternative to wire-based FFR, providing reliable functional lesion assessment without the procedural challenges of FFR.[1] Similarly, Zhang et al. evaluated QFR-based PCI in an all-comers population and reported that QFR-guided strategies were associated with better two-year outcomes compared to angiography-based decision-making.[3] This aligned with the current study's findings that QFR-consistent revascularization led to significantly lower rates of nonfatal myocardial infarction and ischemia-driven revascularization.

CONCLUSION- QFR-consistent revascularization was associated with a significantly lower risk of adverse cardiovascular events compared to QFR-inconsistent approaches in patients with MI and multivessel CAD. These results suggest that QFR-guided strategies could improve decision-making during PCI, offering a practical and effective approach for complete revascularization.

In patients with MI and multivessel CAD, QFR-consistent revascularization was linked to a noticeably decreased incidence of adverse cardiovascular events than QFR-inconsistent techniques.

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Impact of Obesity and Depressive Symptoms on Chest Pain in Patients with Nonobstructive Coronary Artery Disease

INTRODUCTION- Nonobstructive coronary artery disease (NOCAD) is a common condition that presents with chest pain (CP) despite the absence of significant blockages.[1] Also, it accounts for less than 50% of stenosis in coronary arteries. Understanding the risk factors for CP in NOCAD is crucial for developing targeted interventions to alleviate symptoms and improve outcomes. Obesity and depressive symptoms are two potential risk factors that may influence the prevalence and severity of CP in NOCAD. Obesity is a well-documented risk factor for cardiovascular disease, and studies have linked it to an increased risk of angina in the general population. However, its role in patients with NOCAD is not fully understood. Similarly, depression has been associated with more frequent and severe CP in various cardiac conditions. Obesity with angina in individuals with established NOCAD on angiography is unclear. So, this study aimed to investigate the relationships between obesity, depressive symptoms, and CP in patients with NOCAD, hypothesizing that both factors would be associated with a higher prevalence and frequency of CP.[2]

METHODS- This was a prospective study involving 814 participants from the Emory Cardiovascular Biobank, aged 20-90, who underwent left heart catheterization between 2003 and 2022. Eligible participants were aged 20-90 years and had angiographically confirmed NOCAD. Individuals with obstructive coronary artery disease (≥50% stenosis), heart failure, valvular disease, or other significant comorbidities were excluded. Data collection included demographic and clinical information, such as age, sex, race, medical history, and social determinants of health. Obesity was defined using a body mass index (BMI) of 30 or higher, with further classification into obesity classes based on BMI ranges. Depressive symptoms were assessed using the Patient Health Questionnaire-9 (PHQ-9), a validated tool for screening depression, with scores indicating symptom severity. CP frequency was measured using the Seattle Angina Questionnaire (SAQ), a self-administered questionnaire that includes items on physical limitations, angina frequency, treatment satisfaction, and quality of life. The angina frequency domain score (AFCS), calculated from responses about the frequency of CP and nitro-glycerine use, was used as the primary measure of CP. Statistical analyses involved logistic regression to determine factors associated with CP prevalence and linear regression to assess CP frequency. A mediation analysis was conducted to explore the role of depressive symptoms in the association between obesity and CP.

RESULTS- The average age of the study population was 58.8 years, with 52.6% of participants being female. Obesity was present in 42.7% of the sample, and CP was reported by 71.5%. The mean AFCS was 76.4, indicating varying degrees of angina frequency across the cohort. Compared to individuals without obesity, those with obesity had a higher prevalence of CP (77.6% vs. 67%, p<0.001) and reported more frequent CP (lower AFCS, p=0.02) (Figure 1). Multivariable analyses showed that obesity was independently associated with a 1.7 times higher likelihood of experiencing CP, even after adjusting for demographics, cardiovascular risk factors, and social determinants. Additionally, depressive symptoms, as indicated by higher PHQ-9 scores, were independently correlated with CP prevalence (OR 1.07, p=0.03). Interaction analyses revealed that the association between obesity and CP was more pronounced in men and individuals without depression, while women and those with depression showed higher baseline CP regardless of obesity status. Mediation analysis indicated that depressive symptoms partially mediated the association between obesity and CP, accounting for approximately 12.6% of the relationship. This suggests that addressing depressive symptoms may help alleviate CP in patients with NOCAD who are also obese.

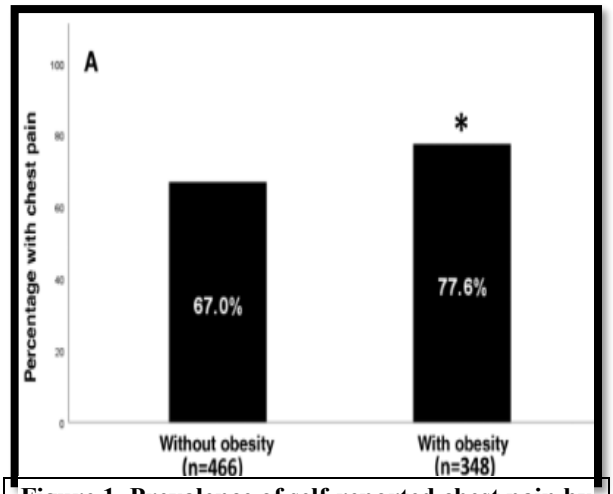

Figure 1. Prevalence of self-reported chest pain by obesity status

DISCUSSION- The association between depressive symptoms and CP observed in this study was also consistent with previous findings in cardiac populations.[2] A systematic review by Mommersteeg P et al. highlighted the higher prevalence of CP in individuals with NOCAD who also experienced anxiety and depression. Like the current results, they found that depressive symptoms were associated with a greater burden of CP. These findings suggest that the psychological state of patients plays a crucial role in the perception and severity of chest pain, potentially mediated by neurohormonal pathways and inflammatory processes that are affected by both depression and obesity.[3]

CONCLUSION- This study concluded that for individuals with NOCAD, obesity was linked to both the prevalence and frequency of self-reported chest pain, and this relationship was unaffected by demographics, medications, depressive symptoms, social determinants of health, or risk factors for CVD. Men and those without depression have a stronger correlation between self-reported chest pain and fat. In patients with NOCAD, the relationship between obesity and self-reported chest pain was partially mediated by depressive symptoms, and more severe depressive symptoms were independently linked to self-reported chest pain prevalence and burden.

In patients with nonobstructive coronary artery disease, obesity and depressive symptoms were independently linked to CP; in men, in particular, this association was partially mediated by depressive symptoms.

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Relationship between non-high-density lipoprotein cholesterol to high-density lipoprotein cholesterol ratio and major adverse cardiovascular and cerebrovascular events in coronary artery disease

INTRODUCTION- Dyslipidemia is a significant contributor to adverse outcomes in patients with coronary artery disease (CAD), which remains a leading cause of mortality worldwide. Managing dyslipidemia traditionally focuses on reducing low-density lipoprotein cholesterol (LDL-C). However, residual cardiovascular risks persist even with aggressive LDL-C lowering, necessitating the identification of novel lipid indices that better predict adverse events.[1] The total cholesterol content of lipoproteins containing apolipoprotein B is known as non-high-density lipoprotein cholesterol (non-HDL-C). This comprises low-density lipoproteins (LDL), lipoprotein (a), intermediate-density lipoproteins (IDL), and very low-density lipoproteins (VLDL) and their metabolic remnants.[2] The non-high-density lipoprotein cholesterol to high-density lipoprotein cholesterol ratio (NHHR) integrates both atherogenic and anti-atherogenic lipid parameters and has emerged as a potential risk marker. Nevertheless, there was a dearth of data regarding the association between the NHHR and the chance of adverse outcomes for CAD patients. So, this study aimed to evaluate the association between NHHR and the risk of major adverse cardiovascular and cerebrovascular events (MACCEs) in CAD patients undergoing percutaneous coronary intervention (PCI).[1]

METHODS- A retrospective analysis was conducted using data from 2251 patients who underwent PCI. Patients were included if they had complete data on total cholesterol (TC) and high-density lipoprotein cholesterol (HDL-C) levels. The primary outcome was the incidence of MACCEs, which included cardiac mortality, acute myocardial infarction (AMI), stroke, and repeat revascularization. Patients were categorized into quintiles based on NHHR values: quintile 1 (<2.15), quintile 2 (2.15–2.77), quintile 3 (2.78–3.39), quintile 4 (3.40–4.22), and quintile 5 (>4.22). Data on demographics, clinical presentation, comorbidities, and treatment were collected. Logistic regression models were used to assess the relationship between NHHR and MACCEs, adjusting for confounders such as age, sex, smoking status, comorbidities (heart failure, atrial fibrillation, diabetes, hypertension), and medication use.

RESULTS- This study showed that over a median follow-up of 29.8 months, 270 patients experienced MACCEs. Patients in quintile 3 (NHHR 2.78–3.39) had the lowest adjusted odds

of experiencing MACCEs (OR 0.64, 95% CI 0.42–0.99), while those in quintile 5 (>4.22) had an elevated risk (OR 1.17, 95% CI 0.74–1.64). Specifically, quintile 5 patients were more likely to be smokers and exhibited elevated levels of total cholesterol (TC), triglycerides (TG), and low-density lipoprotein cholesterol (LDL-C). Furthermore, they had a higher prevalence of ST-segment elevation myocardial infarction (STEMI) and a greater history of diabetes. In contrast, patients in quintile 1 were typically older, more likely to be male, and presented with non-ST-segment elevation acute coronary syndrome (NSTE-ACS). They also had higher high-density lipoprotein cholesterol (HDL-C) levels and a greater percentage of bifurcation lesions. RCS analysis revealed a U-shaped association between NHHR and MACCEs, with the lowest risk observed at an NHHR of approximately 3.119 (Figure 1). Below this value, higher NHHR was associated with a decreased risk of MACCEs, while above this threshold, the risk increased significantly. Subgroup analysis demonstrated consistent U-shaped relationships across different patient demographics, except for younger patients (<65 years), where a linear association was observed.

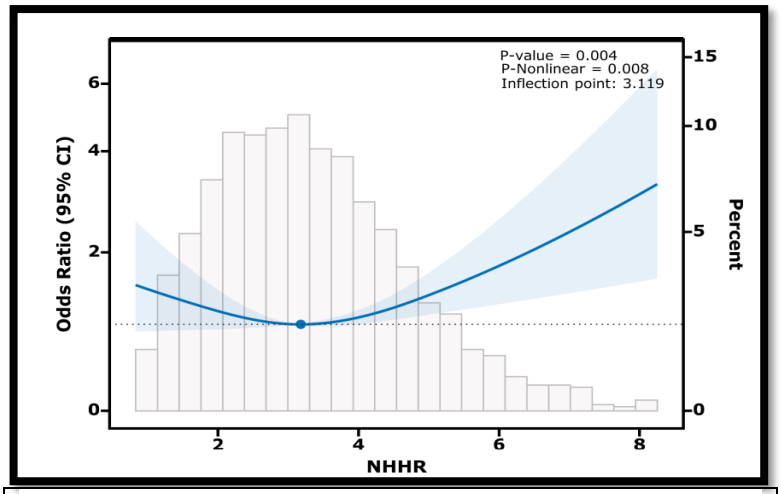

Figure 1. Association between NHHR and MACCEs in CAD patients with PCI

DISCUSSION- This study confirmed a U-shaped association between NHHR and the risk of MACCEs in CAD patients undergoing PCI, indicating that both very high and very low NHHR values were linked to increased adverse event risk. The findings suggested that NHHR was a more comprehensive lipid measure than individual lipid parameters like LDL-C, as it encompasses a balance of pro- and anti-atherogenic lipoproteins.[1] You J et al. reported similar associations between NHHR and adverse outcomes but did not completely explore non-linear relationships or adjust for confounders. This study extends those findings by employing RCS analysis to better delineate the dose-response relationship and identify an optimal NHHR range for minimizing risk.[3]

CONCLUSION- This study concluded that the clinical utility of NHHR as a predictor of MACCEs in patients undergoing PCI, with an optimal range around 3.119 associated with the lowest risk. These findings suggested that NHHR could guide more personalized lipid management strategies in CAD patients.

In patients with CAD having PCI, this study shows a U-shaped relationship between the baseline NHHR and the incidence of MACCE.

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A rare case on Primary intracardiac leiomyoma

INTRODUCTION- Primary intracardiac leiomyoma is rare, accounting for a very small percentage of all cardiac neoplasms. Most cardiac tumors are benign, with myxomas being the most common.[1] Leiomyomas, benign tumors of smooth muscle origin, are typically found in the female genital tract but can occasionally occur in other locations, including the heart.[2] These tumors can pose significant risks due to potential obstruction of cardiac structures or embolization, despite their benign nature. This case report presented an uncommon case of a primary leiomyoma in the left ventricle of a 60-year-old female, emphasizing the clinical features, diagnostic process, and surgical management.[2]

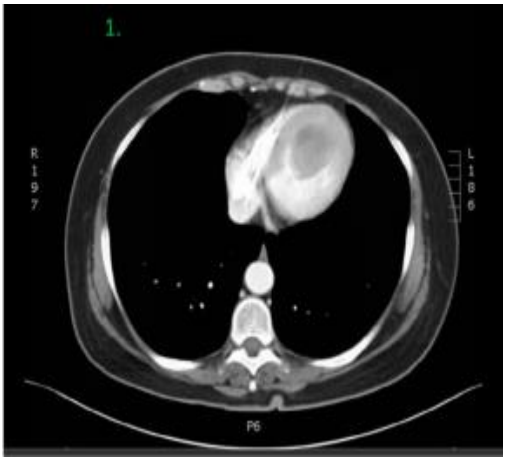

Figure 1. A lobulated, well-defined, hypodense tumor measuring 5 cm was found inside the left ventricle on a computed tomography (CT) scan obtained with contrast of the chest.

CASE PRESENTATION- A 60-year-old female with a history of smoking and permanent pacemaker implantation eight years prior presented for a routine checkup, during which atrial fibrillation was detected on electrocardiography. Her medical history included episodes of intermittent dizziness, initially addressed by pacemaker implantation due to significant pauses detected by a Holter monitor. Physical examination showed stable vital signs and no remarkable findings. Echocardiography revealed a large, pedunculated mass in the left ventricle, attached near the apex and occupying most of the cavity. The mass obstructed the left ventricular outflow tract and impaired mitral valve function. Severe left ventricular systolic dysfunction with an ejection fraction of 20% was noted. Further imaging included a contrast-enhanced computed tomography (CECT) scan, which confirmed a lobulated, well-defined hypodense mass occupying most of the left ventricle, measuring 5×4.3×4 cm (Figure 1). Magnetic resonance imaging (MRI) corroborated these findings, with no evidence of pericardial or pleural effusion, lung lesions, or intra-abdominal masses. The coronary angiography showed normal coronary arteries, ruling out coronary artery disease as a contributing factor. Given the obstructive nature of the mass and its impact on the patient's cardiac function, surgical intervention was deemed necessary. The patient was admitted for a planned surgical resection. Under general anesthesia, a median sternotomy and pericardiotomy were performed, followed by cardiopulmonary bypass. The heart was arrested with

cardioplegia, and a left ventriculotomy was carried out, providing access to the mass. Intraoperative findings revealed a firm, pedunculated mass adherent to the ventricular wall, which was carefully dissected and completely excised without complications. The excised mass was subjected to histopathological evaluation. Gross examination showed a firm, oval, well-circumscribed tumor with a smooth outer surface. Microscopic analysis revealed interlacing bundles of smooth muscle cells with minimal nuclear atypia, consistent with leiomyoma. No necrosis, hypercellularity, or significant mitotic activity was observed. Immunohistochemical staining was positive for smooth muscle actin (SMA), desmin, H-Caldesmon, and muscle-specific antigen (MSA), confirming the smooth muscle origin of the tumor. Estrogen and progesterone receptor tests showed faint nuclear staining, while myogenin and myoglobin were negative, ruling out other muscle tumors. Postoperatively, the patient had a smooth recovery in the cardiac intensive care unit and was discharged home in stable condition. Follow-up echocardiography showed an improved ejection fraction of 30-35%, with no residual mass or pericardial effusion. At the four-year follow-up, the patient remained asymptomatic, with no evidence of recurrence on routine imaging studies, and reported a good quality of life.

DISCUSSION- In the present case, a primary intracardiac leiomyoma was found in the left ventricle of a 60-year-old female, diagnosed incidentally during a routine check-up. The tumor was asymptomatic, and there was no evidence of systemic or extracardiac myomas, confirming its primary cardiac origin. Histopathology showed spindle cell morphology, consistent with leiomyoma.[2] Comparatively, other case reports like Song L et al.[3] and Qin C et al.[4] also described incidental diagnoses in asymptomatic patients, supporting the trend of incidental findings in primary intracardiac leiomyomas. Guar K et al. documented similar histological features and a lack of systemic spread, reinforcing the primary nature.[1] Although most cases were in the right ventricle, left ventricle occurrence, as in the present case, remains particularly rare.

CONCLUSION- Primary intra-cardiac leiomyomas are uncommon benign tumors of the mesenchymal tissue. The right ventricle predilection was present in every instance previously documented in the literature. These cases were surgically excised and showed no signs of recurrence after being determined to be benign spindle cell lesions based on histology. In SFH, aberrant signaling can result in congenital cardiac conditions. Therefore, SHF, a rich source of multipotent cellular progenitors, was suggested by tumor etiology hypotheses.

In SFH, aberrant signaling can result in congenital cardiac conditions. Multipotent cellular progenitors are abundant in SHF, which was suggested by tumor etiology theories.

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