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Quantitative Flow Ratio (QFR) Directed Revascularization Approach for Patients Receiving Primary Valve Surgery Having Coronary Artery Disease

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Conflicts of Interest
There are no conflicts to declare.

ABSTRACT

Background: Diagnostic Coronary Angiography (DCA) is the gold standard for detecting coronary artery disease (CAD). Percutaneous Coronary Intervention (PCI) is being done more often in patient with multivessel coronary artery disease (CAD). This study describes the effectiveness of a QFR-directed revascularization procedure and a coronary angiography (CAG)-directed revascularization procedure in patients with scheduled primary valvular surgery having coronary artery lesions with diameter stenosis of 50%. Within 30 days of surgery, the combined outcome of (all-cause of death, non-fatal myocardial infarction, non-fatal stroke, unplanned coronary revascularization, new renal dysfunction involving dialysis).

Methods: The study is conducted through QFR procedure along with heart disease like Aortic stenosis (AS), in patients receiving primary valve surgery, like Aortic valve replacements having coronary artery disease. So, the results of this method are to compare the usefulness and cost-effectiveness of a QFR-guided PCI strategy versus an angiography-guided PCI strategy in patients undergoing primary valve surgery having coronary artery disease.

Result: It shows that QFR strategy is the new advanced method, where patients can save time and money at the same time and less invasive the effectiveness of a QFR-guided PCI strategy against an angiography-guided PCI strategy is that QFR-guided approach have better clinical results and more cost-effective than a conventional angiography-guided strategy, as shown by a lower prevalence of MACE (major adverse cardiac event) at one year. on the other side, coronary artery disease is often linked to valvular heart disease (VHD). In valve cardiac surgery patients, the CAD was detected in 27.75% of all severe VHD patients, for 32% of aortic valve disease isolated and for 15% of mitral valve of isolated patients. In patients with severe aortic stenosis there was a significant relationship between CAD and aortic valve disease. Larger studies are required in the future to determine the potential causal relationship.

Conclusion: We come to know that QFR guided strategy is very effective the QFR-guided approach has better clinical results and be more cost-effective than a conventional angiography-guided strategy, as shown by a lower prevalence of MACE (major adverse cardiac event) at one year. On the other side, the TAVR and PCI will be the main driver in aortic stenosis and coronary artery disease (CAD) is significantly correlated with AS. remember that coronary artery disease (CAD) associated with valvular heart disease (VHD). SAS is the most common valve problem that necessitates surgical or percutaneous treatment. CAD, on the other hand, is one of the leading causes of death in developed countries. There are several risk factors for CAD and degenerative SAS, and they are usually identified jointly in clinical practice. Even though transcatheter aortic valve replacement (TAVR) has drastically changed the therapeutic approach to SAS in recent years, the right treatment of patients with concomitant CAD remains a point of contention due to a shortage of data in the literature.

Keywords: QUANTITATIVE FLOW RATIO, CORONARY ARTERY DISEASE, VALVULAR HEART DISEASE, COMPARISON, SURVAY, COMPARATIVE ANALYSIS.

Introduction

Cardiovascular disease (CVD) is the leading cause of death worldwide, coronary artery disease (CAD) and valvular heart disease (VHD) are responsible for major cardiovascular events. Valvular heart disease is less often than heart failure, ischemic heart disease, and hypertension, but it's correlated to heart function weakening with high fetal consequences Patient with sever valvular aortic stenosis (AS) often have concomitant calcified coronary artery disease (CAD). High age, infirmity, and co-morbidities make these individuals a very high risk for surgery. Over the last decade we are using the Diagnostic coronary angiography (DCA) which is the gold standard for detecting coronary artery disease. Angiographic images, but it often struggles to connect the functional significance of a stenosis, because the stenosis is not clearly measure. resulting in excessive revascularizations or treatment delays. Several studies have shown that FFR-guided coronary procedures have good clinical outcome in patients with stable coronary artery disease despite the clear advantages, (fractional flow reserve) FFR is inconsistent and slow clinical acceptance. So, the aims of this study are to identify the significance of a new advance method called Quantitative flow ratio (QFR) which is guided through vascularization strategy for a patient undergoing primary valve surgery having coronary artery disease. The new angiographic approach is a Quantitative Flow Ratio that enables the fast calculation of fractions without the use of adenosine or pressure wire. This research study is designed to estimate the effectiveness of a QFR-strategy against the angiography- guided strategy for percutaneous coronary artery intervention in patients with coronary artery disease**,** the valve of QFR of all target's coronary arteries with diameter stenosis of 50 percent or less (visual estimation) and suitability for CABG revascularization will be calculated. If the QFR is less than 0.80, CABG revascularization of the target blood vessels will be performed simultaneously. If the QFR is greater than 0.80, no CABG revascularization of the target blood vessels will be performed. When compared to the FFR, the QFR reliably detects hemodynamically relevant coronary stenosis during coronary angiography

clinically QFR strategy took less time to analyze, it could be done online during revascularization approach for patient undergoing primary valve surgery having coronary artery disease (CAD). The purpose of this study is to assess the prevalence and association between two cardiac entities of significant coronary artery disease (CAD) in patients with serious valvular heart disease (VHD) like Aortic stenosis (AS) There are two sections of the study the first primary valvular heart disease having coronary artery disease. The second valve surgery due to primary mitral and/or aortic valvular heart disease which is performed by the device QFR guided strategy. Remember Even if there is no evidence of ischemia or only low-risk noninvasive findings, the most recent appropriate use criteria suggest that revascularization before TAVR is reasonable. However, according to a recent systematic review and meta-analysis, only around 25% of patients with CAD underwent revascularization before TAVR, which did not show any therapeutic advantage and resulted in higher procedural difficulties.

Materials and methods

The study's goal is to compare the clinical results and cost-effectiveness of a QFR-guided PCI strategy in patients receiving primary valve surgery having CAD. So, PubMed, EMBASE, and SCOPUS electronic databases were searched for relevant studies analyzing outcome parameters of interest. Between patients who had TAVR/PCI and those who had SAVR/CABG, the study's objectives were the rate of total myocardial infarction and stroke within 30 days, as well as the rate of 30-day death and 2-year mortality. This is a retrospective analysis of a total of more than 50 different published papers related to QFR-guided or an angiography-guided revascularization for a patient receiving primary valve surgery having coronary artery disease. At least one lesion appropriate for PCI with 50 percent -90 percent stenosis in an artery with a reference diameter of 2.5 mm is present in the participants scheduled for coronary angiography.

The key outcome measure is the 1-year rate of major adverse cardiac events (MACE), which is made up of all-cause death, any myocardial infarction, and any ischemia-driven revascularization. One-year MACE, excluding periprocedural myocardial infarction, is the primary secondary end point. Individual MACE components and cost-effectiveness end points are examples of secondary end points. The sample size provides 85 percent power to show that QFR guidance is superior to angiography guidance.

0n the other side we are going to compare the base line characteristic of patient such as age, gender, smoking, hypertension, and so on of a patient who have primary valve disease combined with coronary artery disease.

Adult patients with stable or unstable angina pectoris or post–acute MI (72 hours) who are scheduled for coronary angiography with planned or potential PCI are included in the study cohort. By visual examination, patients must have at least one lesion with a percent diameter stenosis (DS percent) between 50% and 90% in a coronary artery with a 3.5 mm reference vessel diameter and be eligible for DES implantation as established by the investigators.

General inclusion criteria			
1	Age great than or equal to 18 years		
2	Stable or unstable angina pectoris, or post-acute MI(>72h) or equal.		
3	Able to understand the trial design & provide written informed consent		
4	Eligible for PCI by operator assessment angiographic inclusion criteria		
5	At least 1 lesion of 50%-90% diameter stenosis in a coronary artery with		
	>2.5mm reference vessel diameter by visual assessment.		

Population	Patients with coronary artery disease and significant aortic stenosis.
intervention	Transcatheter aortic valve replacement with staged or concurrent percutaneous coronary intervention for severe native valve aortic stenosis.
Comparators	Surgical aortic valve replacement with coronary artery bypass grafting for severe native valve aortic stenosis.
outcomes	
survival	30 days mortality at least.
safety	Cardiovascular events at least 30 days
Study type	Observational study randomized control trial.

Procedural characteristics and patient:

A total of 1380 patients were included in the final analysis. All investigations included only individuals with combined AS and CAD; those who had concurrent operations on other valves or other surgical procedures were excluded.

The mean age in the TAVR plus PCI group (80.9 6.04) was greater than in the SAVR plus CABG group (79.3 4.29). Prior MI (42.5 percent vs 28.6 percent), pulmonary illness (23.1 percent vs 16.0 percent), dialysis (4.3 percent vs 1.7 percent), and NYHA class III/IV were all more common in the TAVR + PCI group (67.6 percent vs 56.7 percent). In all three investigations, full revascularization (PCI or CABG) was done whenever possible. Meanwhile, when comparing SAVR with CABG to TAVR plus PCI, the prevalence of multiple vessel disease was higher (72.4 percent vs 64.4 percent, P =.018). The total surgical method took longer in terms of total intervention time, length of intensive care unit stays, and length of hospital stay (Table 2). None of the studies looked at the distribution of interventions based on whether they were voluntary or emergency.

Table 2 preprocedural details and baseline characteristics

	SAVR/CABG	TAVR/PCI	P value
Total number	700	346	
Age year.	79.3+/-4.29	80.9+/-6.04	<.0001
male	428(61.0)	201(58.0)	.387
BMI, kg/m2	26.2+/-3.9	26.0+/-4.45	.457
Clinical history			
Neurologic disorders	65(9.3)	37(10.7)	.54
Prior MI	200(28.6)	147(42.5)	<.0001
DM	260(37.1)	110(31.8)	.105
Pulmonary disease	112(16.0)	80(23.1)	.0068
Pulmonary hypertension	157(22.4)	90(26.0)	.225
Dialysis	12(1.7)	15(4.3)	.022
NYHA class III/IV	397(56.7)	234(67.6)	.0009
Mitral valve disease	294(42.0)	139(40.2)	.624
Total number	627	281	
Multiple vessel disease	454(72.4)	181(64.4)	.018
Periprocedural details			
Total intervention time, min	223.64+/-52.5	59.9+/-30.8	<.0001
Length of ICU stay, h	56.14+/-65.18	39.58+/-35.9	<.0001
Length of hospital stay, d	12.1+/-6.77	8.35+/-5.95	<.0001

CABG stands for coronary artery bypass grafting; ICU stands for intensive care unit; PCI stands for percutaneous coronary interventions; SAVR stands for surgical aortic valve replacement; TAVR stands for transcatheter aortic valve replacement.

Endpoints and survival of TAVR pulse PCI verses SAVR pulse CABG:

Figure 1-5 summarizes the results of each of the included studies as well as the paper's primary findings. The results of a random effect meta-analysis revealed no significant differences in 30-day safety outcomes, (Figure 1) myocardial infarction (TAVR/PCI versus SAVR/CABG: OR: 0.52; 95 percent CI: 0.201.33; I2 = 0%); stroke (TAVR/PCI vs SAVR/CABG: OR: 0.88; 95 percent CI: 0.451.73; I2 = 0%). (Figure 2).

There was also no significant difference in 30-day and 2-year death rates between TAVR/PCI and SAVR/CABG patients (OR: 0.72; 95 percent CI: 0.431.21; I2 = 0%) (Figure 3); (OR: 1.50; 95 percent CI: 0.772.94; I2 = 81 percent) (Figure 4).

Permanent pacemaker implantation was more common in the TAVR/PCI group (OR: 3.97; 95 percent CI: 1.848.58; I2 = 81%). (Figure 5).

Figure1: 30 days MI, coronary artery bypass graft, confidence interval (CL), SAVR.

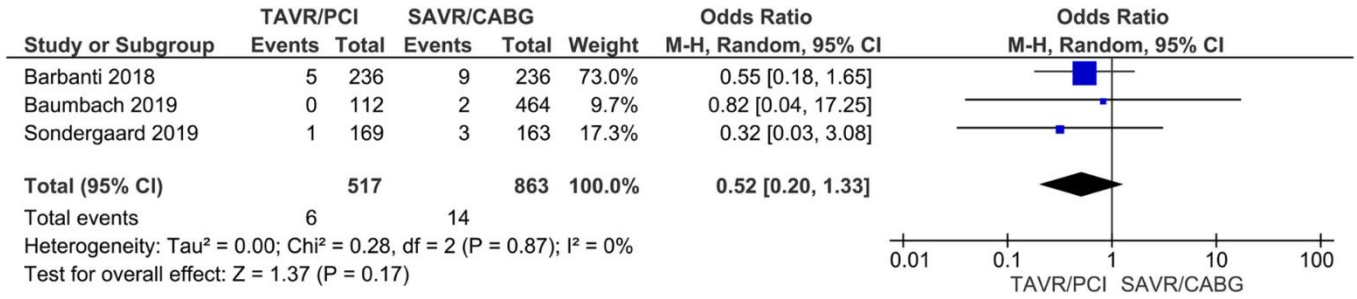


Figure 2: 30 days stroke, CABG, confidence interval (CL), SAVR.

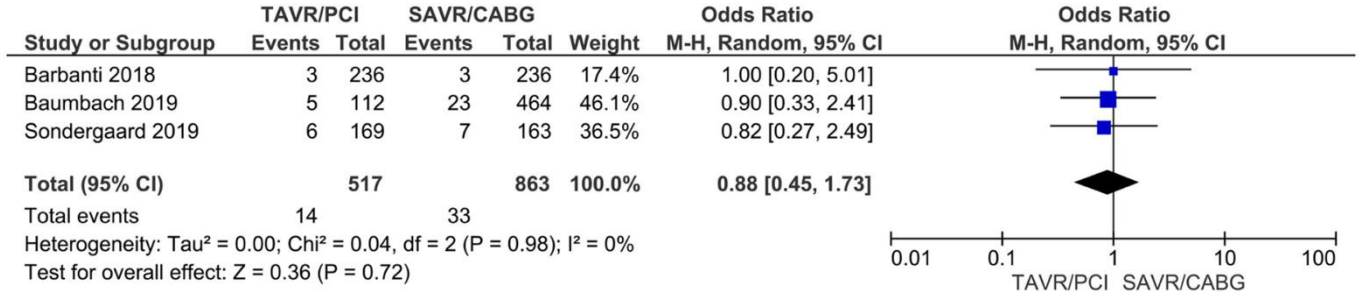


Figure 3: Thirty days Mortality, CABG, CL, SAVR.

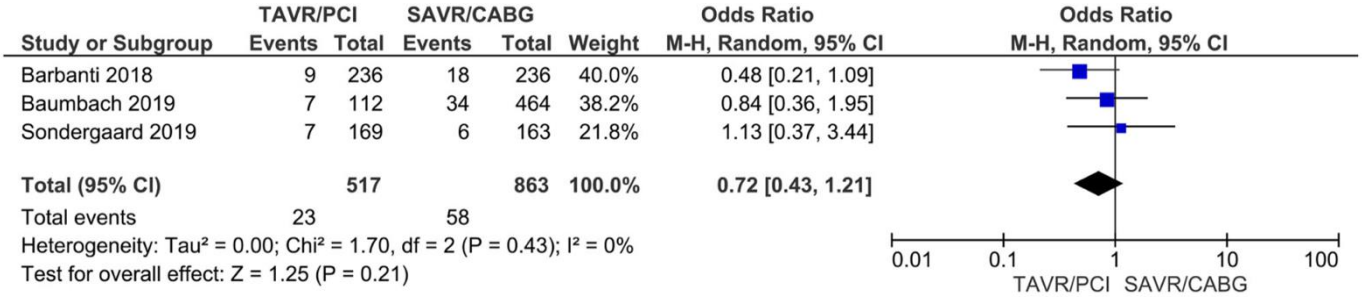


Figure 4: Two-year mortality coronary artery bypass graft (CABG), CL, SAVR.

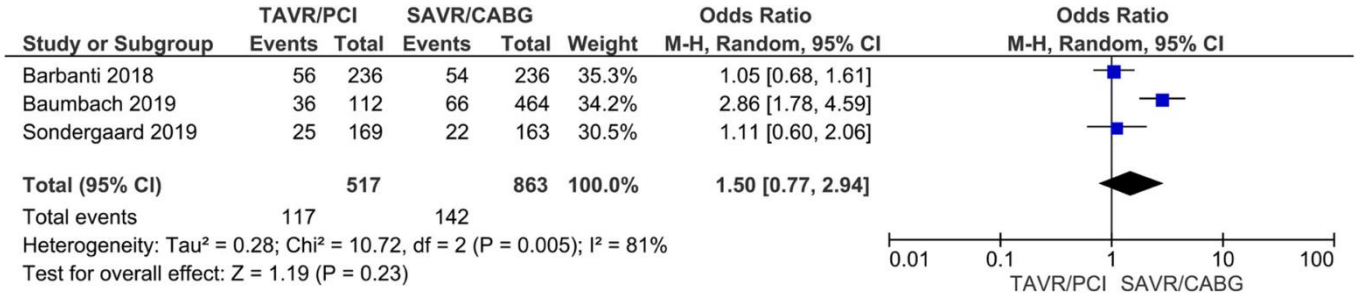
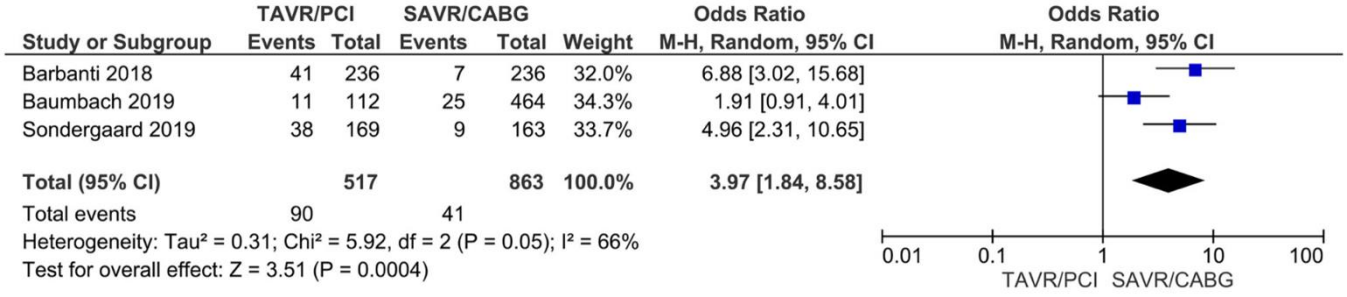


Figure 5: post procedural pacemaker implantation, CABG, CL, SAVR.



In patients with severe AS and CAD, this meta-analysis shows that there is no significant difference in short-term safety results when treated with total percutaneous versus total surgical therapy. Similarly, there is no change in mortality rates between early and late life. However, more evidence is needed to help patients choose the right treatment for them. SAS is the most frequent valve condition that requires surgical or percutaneous intervention. On the other hand, in developed countries, CAD is one of the top causes of death. CAD and degenerative SAS have several risk factors and are frequently diagnosed together in clinical practice. Even though transcatheter aortic valve replacement (TAVR) has profoundly altered the therapeutic approach to SAS in recent years, the proper therapy of patients with concurrent CAD remains a matter of debate due to a shortage of data in the literature.

QFR-guided strategy: the new angiographic approach is a Quantitative Flow Ratio (QFR) that enables the fast calculation of fractions without the use of adenosine or pressure wire. This research study is designed to estimate the effectiveness of a QFR-strategy (QFR-directed) approach against the angiography- guided strategy for percutaneous coronary artery intervention in patients with coronary artery disease**,** initiated by the investigator, a patient and a clinical assessor will be used in the QFR group, where the valve of QFR of all target's coronary arteries with diameter stenosis of 50 percent or less (visual estimation) and suitability for CABG revascularization will be calculated. If the QFR is less than 0.80, CABG revascularization of the target blood vessels will be performed simultaneously. If the QFR is greater than 0.80, no CABG revascularization of the target blood vessels will be performed. When compared to the FFR, the QFR reliably detects hemodynamically relevant coronary stenosis during coronary angiography.

As we all know that FFR is the gold standard, but because of the time consuming and cast of the patients and the hyperemic state of the patients with Adenosine and adenosine tri-phosphate lead to a new technique called QFR (Quantitative flow ratio) how it comes there is a study below called tu at Al the International multicentral favor pilot study.

The comparison of QFR to FFR is found from four prospective studies which are as below

Tu et al (FAVOR Pilot).[1]

Westra et al (WIFI II).[2]

Xu et al (FAVOR II China).[3]

Westra et al (FAVOR II Europe-Japan.[4]

Based on the different mean hyperemic "low speeds" the following 3 QFR measurements are constructed:

1; fQFR; a fixed empiric hyperemic flow velocity (HVF) of 0.35m/s that was derived from previous FFR studies was used for computations

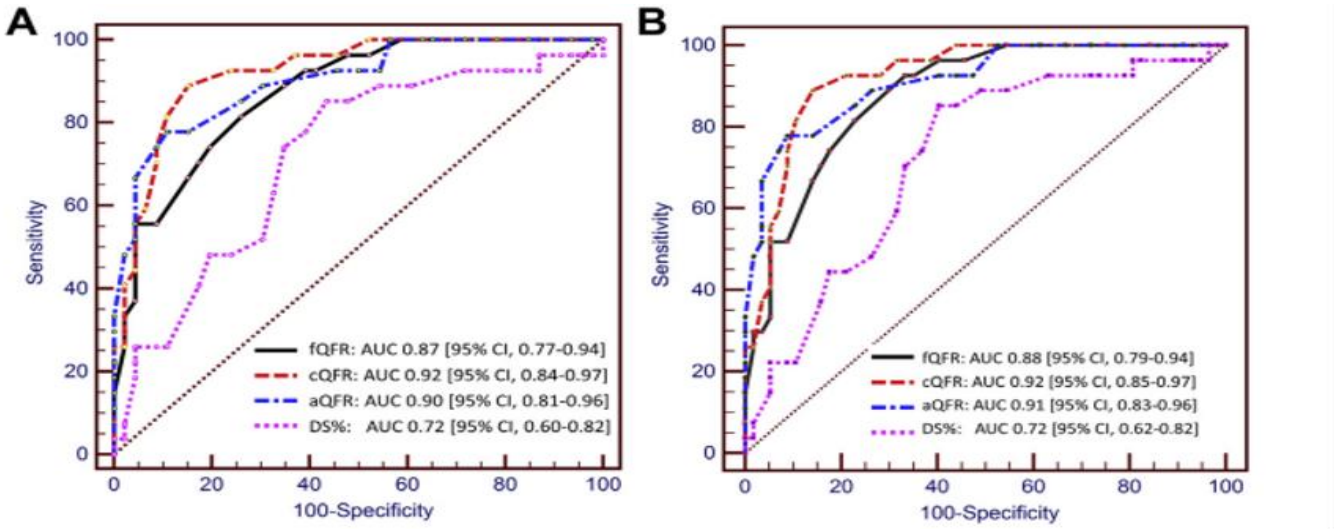
2; cQFR frame count FC analysis was performed without pharmacologically induced hyperemia to derived the HFV

3; aQFR; FC analysis was performed during hyperemia induced by intravenous administration of Adenosine or Adenosine triphosphate. the real HFVs were derived, and the software calculated 2 new QFR pullbacks.

The following quadratic function has been used to evaluate the correlation between the Baseline fluid velocity with contrast medium (CFV) injection and the HFV:

HFV=ao+a1.CFV+a2.CFV (square).

Comparison of receiver functionally important stenosis Curves Comparison below.



(A). Patient by patient. (B) For each vessel. When compared to the anatomic parameter DS percent, the AUC for fQFR, cQFR, and aQFR was substantially higher. 14 percent diameter stenosis; AUC 14 areas under the receiver-operator characteristics curve; other abbreviations as in

The QFR measurement enhanced 3D QCA-based stenosis significance diagnostical accuracy. Diameter stenosis derived from QCA for lesions (99%) was available (2D-QCA and 3D-QCA). QFR diagnosis was superior to QCA diagnosis in terms of sensitivity (95 percent CI: 77–90) versus 45 percent (95 percent CI: 40–51), p 0.001, precision (95 percent CI: 84–91) versus 73 percent (95 percent CI: 69–76), p 0.001, and overall accuracy (95 percent CI: 85–89) versus 63 percent (95 percent CI: 60–66), p 0.001. The favorable outcome of the cQFR, where pharmacological hyperemia is not required but results like aQFR are observed, shows the potential of large acceptance through a reduction in procedure time, risk and cost of FFR-based lesion examination.

A new and simple approach has been developed for the fast calculation of FFR called QFR (Quantitative flow ratio). Coronary flow QFR derived versus without the full hyperemia induced pharmacologically both were equally useful to calculate the significance of stenosis. That how much lesions cover the area of the legumin of

the vessels.[5]

Diagnostic accuracy of QFR: Overall, there was 87 percent (95 percent CI: 85–89) compatibility between QFR and FFR classification, with QFR's ability to estimate FFR values exceeding the 0.80 cut-point being lower. Positive predictive value: 80 percent (95 percent CI: 76–85); negative predictive value 95 percent (95 percent CI: 93–96); positive likelihood ratio: 6.25 (95 percent CI: 5.01–8.03); negative likelihood ratio 0.11 (95 percent CI: 0.08–0.16); positive likelihood ratio 0.11 (95 percent CI: 0.08–0.16); positive likelihood ratio 0.11 (95 percent CI: 0.08–0.16); positive likelihood ratio 0.11 (95 percent CI: The 95 percent QFR hybrid-limits for yielding sensitivity and specificity >95 percent, respectively, were 0.76 and 0.87.respectively allowing for wire and adenosine free lesion to evaluation in 65% of all coronary artery vessels.

QFR guided strategy verses CAG guided strategy for PCI:

To receive a better net result with drug-eluting stents (DES), with multivessel coronary artery disease (CAD) percutaneous coronary intervention is being used more often and lesions with complex anatomy (DESs).[6] To prevent needless stent implantation, it is important to recognize the lesions that cause ischemia. The invasive computation of hyperemic fractional flow reserve (FFR) has been considered the gold standard for determining whether coronary ischemia necessitates revascularization. The study of FAME[7] (fractional flow reserve versus angiography for guiding percutaneous coronary intervention) study, the FAME 2[8] (fractional flow reserve-guided PCI versus medical therapy in stable coronary disease) study, and a recent meta-analysis 6 have all shown that FFR-guided PCI improves long term clinical net result. DEFINE-FLAIR (functional lesion assessment of intermediate stenosis to guide revascularization)[9] and iFR-SWEDEHEART (the instantaneous wave-free ratio versus fractional flow reserve in patients with stable angina pectoris or acute coronary syndrome) both recently published trials found that iFR-guided PCI was non inferior to FFR-guided PCI in terms of (MACE). Despite this, guidewire-based physiologic indices are still underutilized in clinical practice due to concerns about increased procedure time, costs, and possible complications from pressure wire instrumentation. Angiography is not the criterion standard, and there is a belief which is not supported by evidence that it is for these reasons, coronary angiography is still the most common procedure for determining whether to perform coronary revascularization in many centers around the world, including those in developing countries where the resources and heath care are limited, on the other side.

The QFR ratio is a new angiographic method for the quick calculation of FFR through (3D) reconstruction of the coronary artery and fluid dynamics calculation. When compared to invasive FFR, the FAVOR pilot study (diagnostic accuracy of fast computational approaches to derive fractional flow reserve from diagnostic coronary angiography) confirmed the feasibility of offline measured QFR in determining physiologically significant stenosis with 86% of accuracy. Subsequently, in China, Europe[10] and Japan, the FAVOR II (QFR diagnostic accuracy measurements for coronary stenosis online) studies evaluated the accuracy of the QFR online for the identification of significant functional stenosis.12 The results of this study were evaluated in China, Europe and Japan. 308 patients were enrolled by FAVOR II China and FFR measurements were

compared to online QFR. Online QFR was 92.4 per cent and 92.7 per cent, both per patient and per boat diagnostic accuracy with FFR the standard. FAVOR II Europe-Japan recruited 310 patients and found that QFR had substantially higher sensitivity and specificity than (QCA) in detecting functionally important stenoses (sensitivity 87 percent vs 44 percent, P b.001; specificity 87 percent vs 77 percent, P =.002)[11]. The studies above have shown the feasibility and precision of QFR to describe the severity of functional stenosis and may lead to wider clinical applications. However, no planned, randomized clinical trial comparing a QFR more complete angiography-guided (QFR-guided) approach to angiography-only (angiography-guided) guidance in terms of clinical results and cost effectiveness has been conducted to date. As a result, we are conducting the pivotal FAVOR III China trial (comparison of quantitative flow ratio guided and angiography guided percutaneous intervention in patients with coronary artery disease.

Clinical implication of QFR:

Since QFR research took less time to analyze, it could be done online. Furthermore, data on individual functional severity in multiple coronary stenosis can be supplemented with online QFR, which may be useful in coronary revascularization. When using QFR for a more accurate clinical assessment, we should keep in mind the significant gap in agreement between QFR and FFR at about 0.8. The hybrid approach may be able to partly solve the problem based on a sub-analysis of the current cohort. The diagnostic efficiency of QFR for FFR 0.8 was tested in small lesions with QFR 0.75 or >0.85 (n=85). the diagnostic performance of QFR for FFR less than or equal to 0.8 was very good with the diagnostic accuracy, sensitivity, specificity, PPV, and NPV of QFR for FFR 0.8 were all excellent, with 96 percent, 84 percent, 100 percent, 100 percent, and 96 percent, respectively.[5] FFR should be determined in lesions with QFR 0.75–0.85 using this proposed hybrid process. This may be a complex method of assessing myocardial ischemia that incorporates both QFR and FFR[12]. In the evaluation of intermediate coronary stenosis, QFR had strong correlation and agreement with wire based FFR, as well as high diagnostic accuracy, implying that it could be used as a substitute for estimating myocardial ischemia. The measurements of QFR are that the Online QFR shall be measured in accordance with standard operating procedures by Angio Plus (pulse medical imaging technology, Shanghai, China) Two angiographic images are transmitted by networks to the QFR system with a minimum 25° projection angle separation. For QFR computation, the difference flow model with the different flow velocity established on changed TIMI frame numbers is used. 3D vessel reconstruction provides quantitative vessel anatomical parameters during QFR measurement, including lumen diameter of the reference and lesion, lesion length, and optimum projection angles. The operator shook patients in the QFR guided group the use of a post procedural QFR calculation is recommended but not necessary

Results

This study is the first randomized trial to compare the effectiveness in terms of expense of a QFR-guided PCI strategy versus an angiography-guided PCI strategy in patients undergoing primary valve surgery having CAD.

The QFR-guided approach has better clinical results and more cost effective than a conventional angiography-guided approach, as shown by a lower prevalence of major adverse cardiac effect at one year. This result shows that QFR strategy is the new advanced strategy where patients can save time and money and less invasive. On the other side patients with severe AS and CAD, this meta-analysis shows that there is no significant difference in short-term safety results when treated with total percutaneous versus total surgical therapy. Similarly, there is no change in mortality rates between early and late life. However, more evidence is needed to help patients choose the right treatment for them. SAS is the most frequent valve condition that requires surgical or percutaneous intervention. While in developed countries, CAD is one of the top causes of death. CAD and degenerative SAS have several risk factors and are frequently diagnosed together in clinical practice. Even though transcatheter aortic valve replacement (TAVR) has profoundly altered the therapeutic approach to SAS in recent years, the proper therapy of patients with concurrent CAD remains a matter of debate due to a shortage of data in the literature.

Conclusion

As we know that CVD is the leading cause of death worldwide. The main causes of major cardiovascular events are coronary artery disease and valvular heart disease. While VHD are less common than heart failure, hypertension, or ischemic heart disease it is linked to heart functional loss and a high risk of death. The most common type of acquired VHD in Europe and North America is nonrheumatic degenerative aortic stenosis (AS). There is a study in cardiovascular department of the University Hospital, Notre-Dame de Secours (NDSUH),[13] From December 2010 to December 2016, a retrospective study was conducted on 1,308 patients who had severe VHD surgery. Patients with isolated aortic valve disease were split into two subgroups (aortic stenosis [AS] and [AR]), patients with mitral valve disease into two subgroups (mitral stenosis [MS] and mitral regurgitation [MR]), and patients with combined connected to mitral valve disease into two subgroups (mitral stenosis [MS] and mitral regurgitation [MR]). A mean transaortic gradient of > 40 mmHg is characterized as extreme aortic valve area under cover of less than 1 cm2.The presence and absence of significant CAD were examined in a coronary angiography formed before the operation. The presence of 50 percent luminous narrowing on any major coronary arteries or >50% narrowing in the left main coronary artery defined Angiographically significant CAD. The same reference physicians in the NDSUH cardiovascular department examined the echocardiography and coronary angiography of the trans thoracic. Included from the trial were patients with incomplete clinical data or with prior CABG, rheumatic cardiac disease, prefer angioplasty, or aged >40 years. Systematically, the data were analyzed via statistical software SPSS 20. In the comparison of qualitative data, a chi-square test was used. Statistically significant was considered a P value < 0.05. The purpose of this study was to assess the prevalence and association between two cardiac entities of significant coronary artery disease (CAD) in patients with serious valvular heart disease (VHD). Our investigation is aimed at introducing the theory of possible causal relations. The results of this study are that 1002 patients with isolated aortic valve disease, two hundred and forty-two patients with isolated mitral valve disease, and 66 patients with combined aortic and mitral valve disease were among the 1308 patients with extreme VHD. CAD was detected

in 27.75% of all severe VHD patients, for 32% of aortic valve disease isolated and for 15% of mitral-valve-isolated patients. In patients with severe aortic stenosis and with significant relationships between CAD and aortic valve disease, the statistical analysis showed a high prevalence, mainly severe AS ($p < 0.0001$).so we come to conclusion from this study that In VHD patients the prevalence of CAD is 27,75% and is closely correlated with aortic valve disease, extremely severe AS. Larger studies are required in the future to determine the potential causal relationship. CAD is often linked to VHD. This study estimates that in valve cardiac surgery patients the prevalence of significant CAD is 27,5% and is highest in AS patients. The research shows that CAD is meaningfully correlated with aortic valve disease, particularly AS. Future research are therefore necessary to assess a possible causal link and to demonstrate whether the strength of preventing CAD in the clinical environment may have a positive effect in decrease or delaying the incidence of, especially, AS valvular hear disease.

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