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Research Article

The Use of Coronary CT Angiography vs. Functional Stress Testing for Diagnosis of Stable Coronary Artery Disease- A Systematic Review and Meta-Analysis

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Abstract

Background: Coronary computed tomography angiography (CCTA) visualizes coronary artery anatomy, whilst useful stress testing assesses inducible cardiac ischemia. Although CCTA demonstrates higher diagnostic accuracy for coronary artery disorder (CAD) in comparison to functional testing, when using invasive coronary angiography as the reference standard, its effect on clinical outcomes remains uncertain.

Objective: This systematic evaluation and meta-evaluation aimed to compare CCTA and functional stress testing in patients with stable coronary artery disease, focusing on the major adverse cardiac events (MACE), myocardial infarction (MI), revascularization, and cardiac hospitalization.

Methods: A systematic seek of PubMed, MEDLINE, Cochrane Library, and Google Scholar databases diagnosed randomized controlled trials (RCTs) published between January 2016 and January 2025. Studies have been conducted in the event that they compared CCTA with useful stress testing in grownup patients with suspected CAD and reported patient results over at least one month of follow-up. Statistical analyses were carried out the use of random-consequences models, and heterogeneity was assessed the use of I^2 statistics.

Results: Nine RCTs comprising 4,912 participants were included. For MACE, the pooled danger ratio (RR) turned into 0.92 (95% CI: 0.60–1.40, *p* = 0.69, I^2 = 48%), indicating no enormous distinction between CCTA and functional testing. Similarly, no vast distinction changed into found for MI (RR: 0.74, 95% CI: 0.27–2.04, *p* = 0.55, I^2 = 60%), revascularization (RR: 1.40, 95% CI: 0.49–3.99, *p* = 0.53, I^2 = 62%), or cardiac hospitalization (RR: 0.91, 95% CI: 0.68–1.22, *p* = 0.53, I^2 = 0%).

Conclusion: This meta-analysis found no good-sized distinction between CCTA and practical stress testing in lowering MACE, MI, revascularization, or cardiac hospitalization fees in patients with stable CAD. While CCTA gives anatomical elements and diagnostic accuracy, these advantages might not translate into advanced medical results compared to purposeful checking out. Further studies are needed to clarify the role of CCTA in guiding management techniques for strong CAD.

Keywords: Coronary Computed Tomography Angiography; Coronary Angiography; Angiotensin Receptor-Neprilysin Inhibitors

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Introduction

Coronary computed tomography angiography (CCTA) is extensively recognized as a reliable non-invasive approach for detecting obstructive coronary artery disease (CAD) [1-3]. However, it has certain limitations in figuring out functionally large coronary stenosis, a crucial aspect in scientific decision-making, in particular for revascularization strategies [4-6]. The PROMISE trial verified that CCTA extended the rate of invasive coronary angiography (ICA) by about 50% in comparison to purposeful checking out, with over a quarter of these patients found no longer to have obstructive CAD [7]. As against cardiac magnetic resonance MPI or fractional flow reserve (FFR), dynamic computed tomography (CT) myocardial perfusion imaging (MPI) affords quantitative perfusion metrics that permit an accurate and useful assessment of myocardial ischemia [8-10]. Low-dose photograph acquisition is made possible by current trends in dynamic CT-MPI employing 0.33-era dual-supply CT systems, which offer extended detector coverage and lower tube voltage. When compared to FFR measurements, initial ex vivo research has validated encouraging outcomes within the diagnosis of hemodynamically massive lesions [11].

While coronary artery anatomy can be imaged in detail, the usage of coronary computed tomography angiography (CCTA), inducible cardiac ischemia may be assessed using functional strain testing. When invasive coronary angiography is used because the reference was well-known, CCTA indicates better diagnostic accuracy for coronary artery ailment (CAD) [12]. According to studies, CCTA outperforms popular care in terms of speeding up the triage of patients who present with acute chest pain in the emergency room. It is also safe [13,14]. For the evaluation of patients with suspected CAD, CCTA is cautioned by means of both U.S. and European cardiology guidelines [15]. Whether CCTA improves scientific consequences in patients with suspected CAD in comparison to standard practical stress testing remains unknown. The outcomes of preceding meta-analyses evaluating those modalities were inconsistent, regularly primarily based on a small number of trials, and feature ignored effects like new CAD diagnoses or changes to cardiac medication [16-19]. We carried out a systematic assessment and meta-analysis of randomized medical trials (RCTs) comparing CCTA and purposeful stress testing because the actual really worth of diagnostic tests is determined by their ability to affect clinical control and enhance patient outcomes. The reason for our evaluation changed into assessing their effects on cardiovascular outcomes and next affected person control in patients with both acute and persistent chest pain.

Rationale: The prognosis of severe coronary artery ailment (CAD) is predicated on correctly identifying each anatomical and functional abnormality of the coronary artery. Coronary CT angiography (CCTA) presents a specified visualization of coronary anatomy with superior diagnostic accuracy in comparison to invasive coronary angiography because of the reference trend. However, its capability to assess functional importance, critical for medical decision-making and guiding revascularization, remains limited. Conversely, useful pressure testing evaluates myocardial ischemia, a key determinant of diagnosis and healing approach; however, may lack sensitivity for anatomical lesions. While each modality is advocated via clinical pointers, their relative effectiveness in improving patient results, inclusive of new diagnoses, management adjustments, and cardiovascular activities, isn't always completely established. Previous meta-analyses had been inconclusive, highlighting a need for a comprehensive synthesis of information to guide scientific practice. This systematic evaluation and meta-analysis pursuits to evaluate the diagnostic and prognostic efficacy of CCTA as opposed to functional strain testing in solid CAD, addressing gaps in evidence concerning their effect on patient management and outcomes.

Objectives*:* The objective of this systematic overview and meta-analysis is to examine the efficacy of coronary CT angiography (CCTA) and useful strain testing in the prognosis and management of stable coronary artery disease (CAD). Specifically, this has a look at targets to evaluate their impact on clinical consequences, together with the accuracy of CAD diagnosis, modifications in affected person management, together with the initiation or modification of cardiac medicinal drugs, and the need for invasive techniques. Additionally, it seeks to evaluate their position in predicting cardiovascular events and enhancing patient care through synthesizing evidence from randomized scientific trials. By addressing these elements, the evaluation aims to offer clinicians evidence-based insights to optimize diagnostic techniques and enhance results for patients with stable CAD.

Methodology

Data Items

In accordance with the PRISMA recommendations [20] for systematic reviews and meta-analyses, we conducted a complete search of MEDLINE and PubMed to discover English-language randomized controlled trials (RCTs) evaluating coronary CT angiography (CCTA) and purposeful stress testing. The seek became confined to studies performed on adults between January 1, 2016, and January 10, 2025, the usage of seek phrases unique to CCTA and limited to RCTs. Eligible studies included those involving patients with suspected coronary artery disease (CAD) and reporting on downstream cardiovascular events and affected person management with a minimum follow-up of 1 month. This analysis utilized publicly available, de-identified trial-degree statistics from published research. As the records have been publicly accessible at the time of the overview, institutional overview board approval was no longer required.

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Eligibility Criteria

Studies have been included if they were randomized controlled trials (RCTs) comparing coronary CT angiography (CCTA) with practical stress testing for the prognosis and control of solid coronary artery disease (CAD). Eligible studies concerned adult participants (≥18 years) with suspected CAD, suggested downstream cardiovascular activities or affected person management consequences (e.g., medicinal drug changes, referrals for invasive techniques), and had a minimal follow-up length of 1 month. Only English-language studies published between January 1, 2016, and January 10, 2025, have been taken into consideration. Exclusion standards encompassed observational research, evaluations, or meta-analyses; research related to imaging modalities unrelated to CCTA or purposeful strain testing (e.g., decreased extremity CTA); trials addressing unrelated questions, along with diagnostic accuracy or comparisons between distinct CCTA strategies; studies lacking sufficient trial-level facts on patient outcomes; and non-English research or those outside the desired time frame.

Table 1: PICOS framework of SRMA.

Component	Description
Population (P)	Adults (≥18 years) with suspected stable coronary artery disease (CAD).
Intervention (I)	Coronary computed tomography angiography (CCTA) for the diagnosis and management of stable CAD.
Comparison (C)	Functional stress testing (e.g., exercise treadmill test, stress echocardiography, or nuclear stress test).
Outcomes (O)	Clinical outcomes and patient management data.

Search Strategy

The search strategy adopted for this systematic review includes a vast search for the literature on various databases such as PubMed, Google Scholar, and Cochrane Library. PRISMA guidelines were followed throughout the search for the articles. Different journal titles, abstracts, and full-text articles were found. Boolean operators AND/OR were used for the search strategy on different search engines. Multiple filters were also implied to make the search of articles specific.

Data Collection

Two reviewers independently carried out the take a look at selection technique, screening studies identified through the database seek and extracting relevant records. Discrepancies were resolved via consensus. Initially, all titles have been screened to exclude studies that were observational, used beside-the-point tests (e.g., imaging modalities unrelated to coronary CT angiography or purposeful pressure testing), or addressed unrelated research questions (e.g., comparing diagnostic accuracy or distinct CCTA strategies). Abstracts of the final research were then reviewed for the use of the equal exclusion criteria to ensure relevance to the examination goals.

Table 2: Search Strategy.

Sr No.	Database	Search String	Number of Records
1.	PubMed	("Coronary CT Angiography"[Mesh] OR "CCTA" OR "Coronary Computed Tomography Angiography") AND ("Stress Testing"[Mesh] OR "Functional Stress Testing" OR "Cardiac Stress Test") AND ("Stable Coronary Artery Disease"[Mesh] OR "Stable CAD" OR "Coronary Artery Disease") AND ("Randomized Controlled Trial"[Publication Type] OR "RCT") AND (("2016/01/01"[Date - Publication]: "2025/01/10"[Date - Publication]) AND "English"[Language]).	
2.	Cochrane Library	(Coronary CT Angiography OR CCTA OR Coronary Computed Tomography Angiography) AND (Stress Testing OR Functional Stress Testing OR Cardiac Stress Test) AND (Stable Coronary Artery Disease OR Stable CAD OR Coronary Artery Disease) WITH filters: Randomized Controlled Trials, English, Published between 2016 and 2025.	
3.	Google Scholar	"Coronary CT Angiography" OR "CCTA" OR "Coronary Computed Tomography Angiography" AND "Stress Testing" OR "Functional Stress Testing" OR "Cardiac Stress Test" AND "Stable Coronary Artery Disease" OR "Stable CAD" OR "Coronary Artery Disease" AND ("Randomized Controlled Trial" OR "RCT") date:2016-2025 language: English.	

Data Extraction

Two reviewers independently reviewed all research that met the inclusion standards and extracted standardized information on look at characteristics. This blanketed patient populace (e.g., acute vs. Stable chest pain), putting

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(e.g., emergency branch, inpatient, outpatient), has a look at layout (e.g., intervention and comparator arms), primary endpoints, follow-up length, patient demographics, and results. Outcomes included all-cause mortality, myocardial infarction (MI), cardiac hospitalization, invasive coronary angiography, coronary revascularization (e.g., percutaneous coronary intervention or coronary artery bypass graft surgical treatment), new CAD diagnoses, and medication changes for aspirin or statin therapy. New CAD was described as either angiographic proof of obstructive CAD (>50% obstruction) on CCTA or invasive coronary angiography. If specific data were unavailable, new CAD cases were diagnosed based on specific diagnoses, inclusive of acute coronary syndrome, stable angina, or CAD.

Data Synthesis

The primary evaluation was carried out using the Mantel-Haenszel approach. Clinical results were established into 2 × 2 tables and analyzed at the log-relative scale with a random-outcomes version. A prespecified subgroup analysis differentiated among sufferers evaluated for acute as opposed to stable chest pain. Trials that no longer record the endpoint of interest have been excluded from the denominator. Trials where no events came about in both arms have been protected by the use of a set-remember correction, adding one to all cell counts, whilst trials with activities in only one arm had been blanketed without correction. Heterogeneity was assessed using Q information and I^2 values for both average studies and subgroups. Sensitivity analyses excluded person research to assess its effect on outcomes. Publication bias was assessed visually through funnel plots.

Quality Assessment of Trials

Two authors independently evaluated the excellent of the covered trials using the Cochrane Collaboration's Risk of Bias tool for randomized trials [21]. Any disagreements were resolved via consensus.

Statistical Analysis

Statistical analyses were performed using Review Manager (RevMan), version 5.3, developed by The Nordic Cochrane Centre, The Cochrane Collaboration. Two-sided p-values much less than zero.05 have been considered statistically good sized.

Results

Study Items: A PRISMA Flowchart was made for the protected studies. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flowchart is a widely used tool to demonstrate the look at selection method in systematic evaluations and meta-analyses. It visually info each stage, from identity and screening to eligibility and inclusion, enhancing transparency and reproducibility. By documenting the range of studies at each step and the reasons for exclusions, the PRISMA flowchart offers readers a clear understanding of the technique and rigor at the back of the observational selection method. It is given in Figure 1.

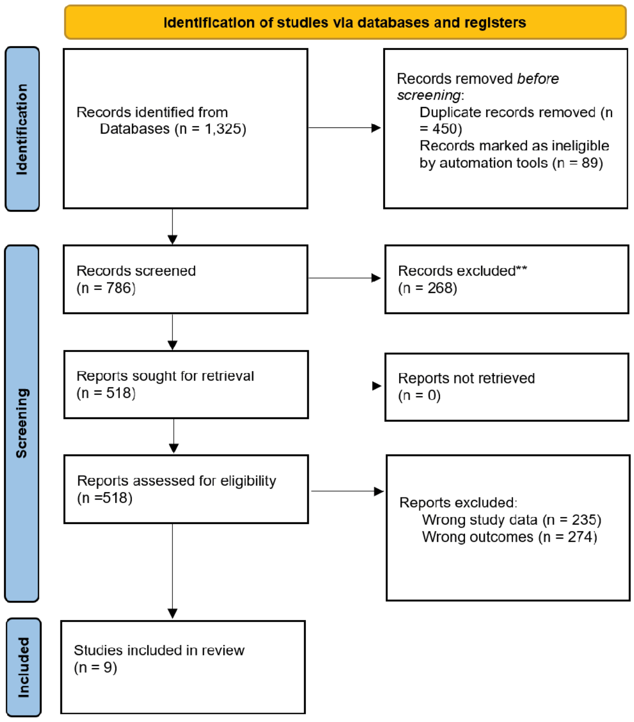

Figure 1: PRISMA FlowChart of the included studies.

Study Characteristics

The characteristics of all the included studies are given in Table 3.

Meta Analysis : A total of four forest plot was made for Major Adverse Cardiac Events (MACE), Myocardial Infarction (MI), Revascularisation, and Cardiovascular Hospitalisation. All of the outcomes were dichotomous variables.

MACE: An overall of six studies evaluating coronary CT angiography (CTA) with useful pressure testing for the diagnosis of stable coronary artery disease have been included in the meta-evaluation comparing important unfavourable cardiovascular events (MACE). The pooled analysis demonstrated no statistically significant distinction within the risk of MACE among the CTA and practical testing corporations (Risk Ratio [RR]: 0.92; 95% Confidence Interval [CI]: 0.60–1.40; p = 0.69). Heterogeneity among studies became mild (I^2 = 48%, p = 0.09), indicating a little variability in take a look at consequences. Individuals have a look at the estimate, which varies, with Sharma et al. And Uretsky et al. Contributing the greatest weight to the evaluation. Overall, the findings propose that CTA does not appreciably adjust the risk of MACE compared to purposeful stress testing in patients undergoing assessment for solid coronary artery disease.

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Table 3: Characteristics of included studies.

Sr No.	Study	Location	Study Design	Sample Size	Population	Intervention	Follow up	Comparator
1	Yu et al. 2020 [22]	China	RCT	240	patients with intermediate pretest probability of coronary artery disease	dynamic CT-MPI+CCTA-guided	1 year	CCTA-guided workup
2	Durand et al. 2017 [23]	France	a Prospective Multicenter Study	217	patients with recent chest pain, normal ECG findings, and negative troponin	CT angiography (CCTA)	1 year	dobutamine-stress echocardiography (DSE)
3	Uretsky et al. 2016 [24]	USA	RCT	411	After a poor initial troponin, I and an ECG, sufferers without recognized coronary artery disease who arrived in the emergency room complaining of chest pain have been discovered to need hospitalization for additional assessment of the chest pain.	coronary CT angiography	1 year	stress cardiac imaging
4	Sorgaard et al. 2017 [25]	Denmark	RCT	300	Patients with acute coronary syndrome who had been hospitalized recently for chest pain had been ruled out by normal electrocardiograms, normal troponin levels, and symptom relief, and they had a clinical indication for noninvasive outpatient testing.	Coronary Computed Tomography Angiography	1.5 years	CTA+CTPA
5	Grandhi et al. 2020 [26]	USA	RCT	43	Patients with chest pain who present to the emergency department (ED) at intermediate risk for ACS may be evaluated using the sensitive combined strain CTP/CTA method, which can also lead to a shorter hospital stay and lower direct expenses.	CTP/CTA	1 year	Combined stress myocardial CT perfusion
6	Lubbera et al. 2017 [27]	Netherlands	RCT	268	patients with coronary artery disease (CAD)	Comprehensive Cardiac CT With Myocardial Perfusion Imaging	2 years	Functional Testing
7	Sharma et al. 2019 [28]	USA	RCT	1908	Diabetic Patients With Suspected Coronary Artery Disease	CT Angiography	1 year	Stress Testing
8	Westra et al. 2021 [29]	China	RCT	231	Symptomatic patients with coronary artery stenosis	cardiac CT	1 year	Functional Testing
9	Arai et al. 2023 [30]	USA	RCT	294	Participants with known or suspected CAD	Stress Perfusion Cardiac Magnetic Resonance	1 year	SPECT Imaging

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Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI	Year
Westra et al. 2021 [29]	9	118	4	113	9.9%	2.15 [0.68, 6.80]	
Yu et al. 2020 [22]	5	120	7	120	10.3%	0.71 [0.23, 2.19]	
Grandhi et al. 2020 [26]	5	43	17	102	13.3%	0.70 [0.27, 1.77]	
Lubbera et al. 2017 [27]	5	130	13	138	12.1%	0.41 [0.15, 1.11]	
Sharma et al. 2019 [28]	32	936	43	972	26.7%	0.77 [0.49, 1.21]	
Uretsky et al. 2016 [24]	43	206	30	205	27.6%	1.43 [0.93, 2.18]	
Total (95% CI)		**1553**		**1650**	**100.0%**	**0.92 [0.60, 1.40]**	
Total events	99		114				

Heterogeneity: Tau² = 0.12; Chi² = 9.66, df = 5 (P = 0.09); I² = 48%
Test for overall effect: Z = 0.40 (P = 0.69)

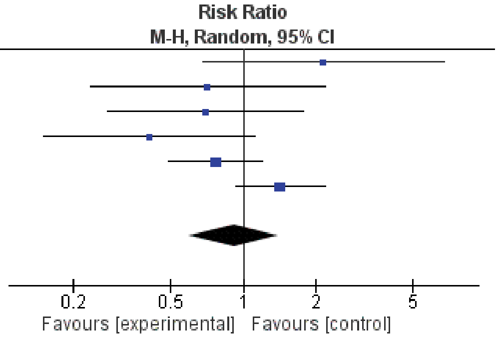

Figure 2: Forest Plot of MACE [22,24,26-29] .

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI	Year
Grandhi et al. 2020 [26]	2	43	7	102	19.9%	0.68 [0.15, 3.13]	
Lubbera et al. 2017 [27]	2	130	5	138	18.8%	0.42 [0.08, 2.15]	
Sharma et al. 2019 [28]	10	936	25	972	30.4%	0.42 [0.20, 0.86]	
Uretsky et al. 2016 [24]	13	206	0	205	9.6%	26.87 [1.61, 449.02]	
Westra et al. 2021 [29]	3	118	5	113	21.3%	0.57 [0.14, 2.35]	
Yu et al. 2020 [22]	0	120	0	120		Not estimable	
Total (95% CI)		**1553**		**1650**	**100.0%**	**0.74 [0.27, 2.04]**	
Total events	30		42				

Heterogeneity: Tau² = 0.75; Chi² = 9.99, df = 4 (P = 0.04); I² = 60%
Test for overall effect: Z = 0.59 (P = 0.55)

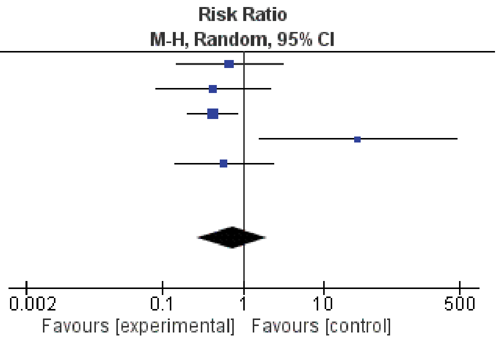

Figure 3: Forest Plot of MACE [22,24,26-29].

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI	Year
Lubbera et al. 2017 [27]	6	130	8	138	29.0%	0.80 [0.28, 2.23]	
Uretsky et al. 2016 [24]	15	206	2	205	22.6%	7.46 [1.73, 32.22]	
Yu et al. 2020 [22]	4	120	3	120	22.4%	1.33 [0.30, 5.83]	
Grandhi et al. 2020 [26]	3	43	11	102	26.0%	0.65 [0.19, 2.20]	
Total (95% CI)		**499**		**565**	**100.0%**	**1.40 [0.49, 3.99]**	
Total events	28		24				

Heterogeneity: Tau² = 0.70; Chi² = 7.96, df = 3 (P = 0.05); I² = 62%
Test for overall effect: Z = 0.64 (P = 0.53)

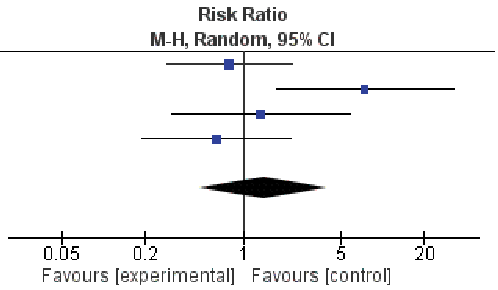

Figure 4: Forest Plot of MACE [22,24,26,27].

Study or Subgroup	Experimental Events	Experimental Total	Control Events	Control Total	Weight	Risk Ratio M-H, Random, 95% CI	Year
Lubbera et al. 2017 [27]	17	130	23	138	25.8%	0.78 [0.44, 1.40]	
Sharma et al. 2019 [28]	17	936	15	972	18.3%	1.18 [0.59, 2.34]	
Uretsky et al. 2016 [24]	28	206	33	205	40.1%	0.84 [0.53, 1.34]	
Westra et al. 2021 [29]	13	118	12	113	15.8%	1.04 [0.49, 2.18]	
Total (95% CI)		**1390**		**1428**	**100.0%**	**0.91 [0.68, 1.22]**	
Total events	75		83				

Heterogeneity: Tau² = 0.00; Chi² = 1.01, df = 3 (P = 0.80); I² = 0%
Test for overall effect: Z = 0.63 (P = 0.53)

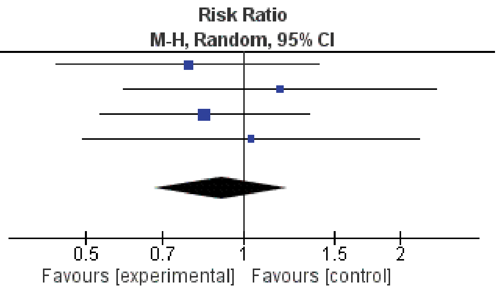

Figure 5: Forest Plot of MACE [24,27-29].

MI: Five studies have been included within the meta-evaluation assessing the occurrence of myocardial infarction (MI) among patients present process coronary CT angiography (CTA) compared with practical stress testing for the assessment of stable coronary artery disease. The pooled danger ratio (RR) becomes zero.74 (95% Confidence Interval [CI]: 0.27–2.04; p = 0.55), indicating no statistically significant difference in MI prices between the 2 diagnostic strategies. Notably, heterogeneity changed into moderate to excessive (I² = 60%, p = zero.04), suggesting widespread variability within the man or woman take a look at effects. While a few studies, such as Sharma, et al., confirmed a capacity reduction in MI danger with CTA (RR: 0.42; ninety-five% CI: 0.20–0.86), others, like Uretsky, et al., established

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an intense and imprecise effect estimate (RR: 26.87), probably due to low occasion fees. One examines (Yu et al.) was not estimable because of zero events in each hand. Overall, the analysis does not offer enough proof to verify a huge benefit of CTA over practical checking out in decreasing myocardial infarction risk.

Revascularization: Four studies were included in the evaluation evaluating the cost of revascularization strategies following coronary CT angiography (CTA) versus functional pressure testing in patients with severe coronary artery disease. The pooled threat ratio (RR) turned out to be 1.40 (95% Confidence Interval [CI]: 0.49–3.99; p = 0.53), suggesting no statistically significant difference between the two diagnostic techniques. However, heterogeneity becomes sizable ($I^2 = 62\%$, p = 0.05), indicating broad variability in observed findings. Notably, Uretsky et al. Reported a markedly higher revascularization rate within the CTA group (RR: 7.46; 95% CI: 1.73–32.22), whereas different studies showed extra balanced or decreased estimates. Given the extensive self-belief intervals and heterogeneity, these results have to be interpreted with caution. Overall, the records do not reveal a constant or widespread effect of CTA in comparison to practical trying out at the practical need for revascularization.

Hospitalization: Four randomized controlled trials comprising 2,818 participants (CCTA: n=1,390; functional stress testing: n=1,428) evaluated hospitalization rates. The pooled analysis demonstrated no statistically significant difference in hospitalization risk between the CCTA and functional stress testing groups (Risk Ratio [RR]: 0.91, 95% CI: 0.68–1.22; *p* = 0.53). Individual study results were consistent, with all confidence intervals overlapping the null value (e.g., Lubbera et al.: RR 0.78, 95% CI: 0.44–1.40; Sharma et al.: RR 1.18, 95% CI: 0.59–2.34). Heterogeneity was negligible ($Tau^2 = 0.00$, $I^2 = 0\%$, *p* = 0.80), indicating high consistency across studies. These findings suggest that CCTA does not reduce hospitalization risk compared to functional stress testing in patients evaluated for stable coronary artery disease.

Publication Bias

The funnel plot assessing guide bias protected five studies evaluating the risk ratio (RR) of hospitalization between CCTA and practical stress testing. The plot shows the usual error of the log (RR) (vertical axis) towards the RR (horizontal axis, log-scaled). Studies are dispensed throughout the RR spectrum (0.2–5), with Sharma, et al., Lubbera, et al., and Westra, et al. located close to the null cost (RR=1), whilst Grandhi et al. and Yu et al. are bigger in the direction of decrease and in higher RR ranges, respectively.

The plot demonstrates approximate symmetry across the pooled RR of 0.91 (from the meta-evaluation), with studies dispersed across precision tiers (SE (log (RR)): 0.2–0.8) without clustering in regions favoring either intervention. No clear gaps or asymmetrical patterns suggestive of guide bias are obtrusive. This aligns with the low heterogeneity ($I^2 = 0\%$) mentioned in the meta-evaluation, reinforcing self-assurance in the robustness of the pooled estimate. Overall, the funnel plot supports the conclusion that booklet bias is not likely to have notably encouraged the findings.

Risk of Bias in Studies

As mentioned earlier, ROBv2 was used to assess the risk for all the primary studies selected for meta-analysis. We used the Cochrane Risk-of-Bias tool to create a "traffic lights" plot for the final assessment. The traffic plot for the 09 studies is given below (Figure 6).

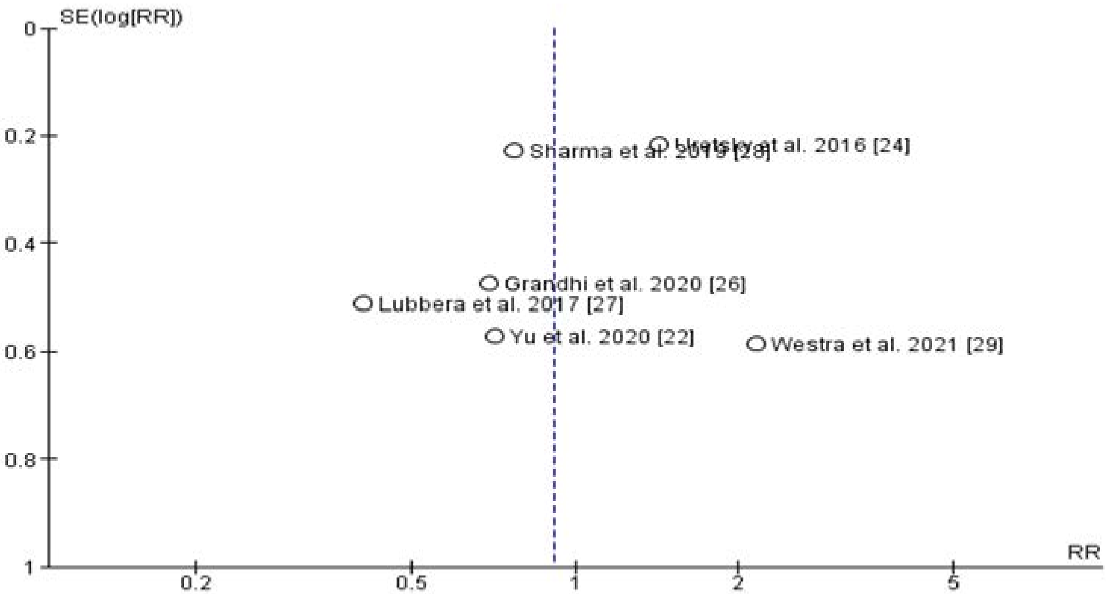

Figure 6: Funnel plot of Publication Bias.

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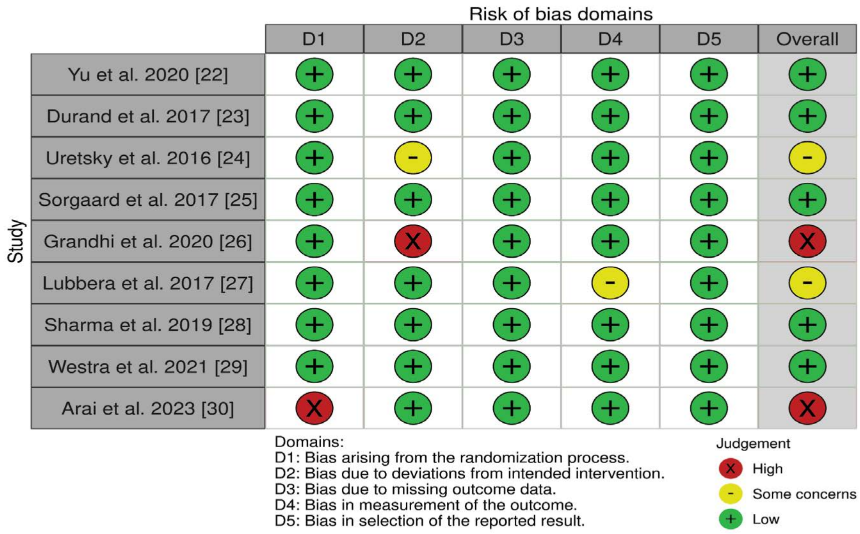

Figure 7: Traffic Light Plot of included studies

Discussion

This meta-evaluation evaluates the comparative effectiveness of coronary CT angiography (CCTA) and purposeful pressure testing in patients with strong coronary artery disease (CAD) across multiple outcomes, such as primary destructive cardiac events (MACE), myocardial infarction (MI), revascularization, and cardiovascular hospitalization. The findings reveal no widespread differences in those scientific endpoints among the two diagnostic strategies, underscoring the nuanced role of CCTA in scientific decision-making for stable CAD. To reduce down on needless invasive methods, CT-MPI + CCTA-guided patient management can be better than CCTA-guided patient management in patients with an intermediate pretest probability of coronary artery disease [22]. When comparing patients with recent chest pain, regular ECG outcomes, and poor troponin to rule out coronary artery disease, CCTA performs better diagnostically than DSE [23]. Similar discharge times, adjustments in clinical treatment plans at discharge, frequency of downstream noninvasive checking out, and repeat hospitalizations were observed while hospitalized patients admitted for a piece-up of chest pain have been randomly assigned to either CCTA or strain checking out [24]. Patients with chest pain who present to the emergency department (ED) at intermediate risk for ACS can be evaluated using the practical combined stress CTP/CTA approach, which may result in a shorter hospital stay and lower direct expenses [26]. A tiered cardiac CT protocol with dynamic perfusion imaging gives a short and powerful substitute for functional testing in patients with suspected solid CAD [27]. When diabetics with strong chest pain were supplied, a CTA strategy produced fewer negative CV results than a useful checking out approach; in this subgroup, CTA can be the first diagnostic method [28]. For the diagnosis of obstructive CAD in symptomatic sufferers providing with ≥50% diameter stenosis on coronary CTA, the diagnostic performance of CT-QFR as a second-line test became at the least comparable to MPS and CMR [29].

The absence of a statistically significant difference in MACE risk between CCTA and purposeful stress testing (RR: 0.92; 95% CI: 0.60–1.40) aligns with earlier evidence suggesting that both modalities are secure and powerful for CAD evaluation. While a few studies inside our evaluation hinted at capability advantages of CCTA in decreasing downstream activities, variability in affected person populations, examine designs, and follow-up durations probably contributed to the found heterogeneity ($I^2 = 48\%$). These findings spotlight the importance of affected person-specific factors, which include pretest probability and clinical presentation, in determining the most efficient diagnostic strategy.

Similarly, the pooled analysis for MI chance tested no statistically significant difference between CCTA and functional testing (RR: 0.74; 95% CI: 0.27–2.04), although heterogeneity changed into mild to high ($I^2 = 60\%$). Notably, studies like Sharma et al. Advised a potential reduction in MI hazard with CCTA, whereas others confirmed disparate outcomes. The variability in effect estimates, in particular in research with low occasion costs or obscure confidence durations, underscores the need for larger trials with standardized protocols to make clear this association.

For revascularization, the pooled evaluation did not show a significant difference between CCTA and functional testing (RR: 1.40; 95% CI: 0.49–3.99). However, vast heterogeneity ($I^2 = 62\%$) was found, with some studies reporting better revascularization prices within the CCTA organization. This locating may additionally replicate differences in how revascularization selections are influenced by anatomical as opposed to practical imaging results. CCTA affords

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a distinctive visualization of coronary anatomy, which may additionally result in extra aggressive management techniques in a few cases, but this did not always translate into progressed clinical outcomes.

Hospitalization fees have been similar among the 2 modalities (RR: 0.91; 95% CI: 0.68–1.22), with negligible heterogeneity ($I^2 = 0\%$). This finding reinforces the protection of both diagnostic techniques in strong CAD control, suggesting that neither approach imposes an undue burden on healthcare systems through expanded hospitalizations.

Overall, this evaluation helps the realization that CCTA and purposeful strain testing are complementary diagnostic equipment, each with unique strengths and boundaries. CCTA gives advanced anatomical resolution and might expedite diagnostic workflows, especially in emergency settings, whilst useful testing presents precious records about myocardial ischemia. The desire between those modalities needs to be tailored to the scientific situation, thinking about factors together with affected person characteristics, aid availability, and medical doctor information.

Another systematic overview and meta-evaluation indicate that, in comparison to useful strain checking out, coronary CT angiography (CCTA) is associated with a lower prevalence of myocardial infarction; however, a higher occurrence of invasive coronary angiography, revascularization, CAD diagnoses, and new prescriptions for aspirin and statins. However, no matter those differences, CCTA no longer appears to lessen mortality or cardiac hospitalization rates [31].

Future studies should raise awareness on addressing the restrictions of current research, together with small sample sizes, heterogeneity in trial designs, and variable definitions of outcomes. Trials with prolonged follow-up intervals and standardized endpoints are needed to fully understand the long-term implications of CCTA and practical checking out in strong CAD control. Additionally, fee-effectiveness analyses and patient-reported outcomes must be integrated into destiny studies to provide a extra complete assessment of those diagnostic strategies.

Conclusion

In conclusion, our findings advocate that CCTA and useful stress testing yield comparable outcomes in terms of MACE, MI, revascularization, and hospitalization for solid CAD. Both approaches remain valuable tools in present-day cardiology practice, and their use needs to be guided by patient-specific concerns and clinical judgment.

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