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ELECTROCARDIOGRAPHIC P-WAVE MORPHOLOGY AND THE RISK OF NEW-ONSET ATRIAL FIBRILLATION: A SYSTEMATIC REVIEW AND META-ANALYSIS

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ЕЛЕКТРОКАРДИОГРАФСКА МОРФОЛОГИЯ НА Р-ВЪЛНАТА И РИСКЪТ ОТ НОВОПОЯВИЛО СЕ ПРЕДСЪРДНО МЪЖДЕНЕ – СИСТЕМАТИЧЕН ОБЗОР И МЕТААНАЛИЗ

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Abstract. **Introduction:** Atrial fibrillation (AF) is linked to substantial morbidity and mortality due to its association with stroke and embolism. Early identification is difficult because AF is often asymptomatic. Electrocardiographic (ECG) features, particularly P-wave morphology, have been proposed as predictors of AF. However, previous findings remain inconsistent. This study evaluates the association between P-wave morphology and new-onset atrial fibrillation (NOAF). **Material and methods:** Data were retrieved from PubMed, ScienceDirect, Cochrane Library, ProQuest, and Sage Journal. Eligible studies used cohort or case-control designs involving NOAF populations and reported ECG parameters of P-wave morphology. The endpoint was NOAF occurrence. Outcomes were expressed as odds ratios (ORs) for categorical variables and standardized mean differences (SMDs) for continuous variables, each with 95% confidence intervals (CI). **Results:** Ten cohort studies (854 NOAF and 3477 non-NOAF patients) were included. Patients who developed NOAF had significantly longer P-wave duration than those who did not (SMD = 0.29, 95% CI = 0.17-0.41, $p < 0.05$). Both partial and advanced interatrial blocks were significantly associated with NOAF (OR = 1.99, 95% CI = 1.52–2.60, $p < 0.05$; ORs = 2.50, 95% CI = 1.70–3.68, $p < 0.05$). We found no statistically significant differences in P-wave amplitude or dispersion. **Conclusion:** Prolonged P-wave duration and the presence of interatrial block were associated with the incidence of NOAF. Larger prospective studies are needed to confirm these findings.

Key words: atrial fibrillation; electrocardiography; p-wave

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Резюме. **Въведение:** Предсърдното мъждене (ПМ) е свързано със значителна заболеваемост и смъртност поради асоциацията му с инсулт и емболични събития. Ранното му идентифициране е трудно, тъй като ПМ често протича безсимптомно. Електрокардиографските (ЕКГ) характеристики, особено морфологията на Р-вълната, са предложени като предиктори на ПМ. Въпреки това резултатите от предходни проучвания остават противоречиви. Настоящото проучване оценява връзката между морфологията на Р-вълната и новопоявилото се предсърдно мъждене (NOAF). **Материал и методи:** Данните бяха извлечени от PubMed, ScienceDirect, Cochrane Library, ProQuest и Sage Journals. Допустимите проучвания бяха кохортни или проучвания тип „случай–контрола“, включващи популации с NOAF и

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отчитащи ЕКГ параметри, свързани с морфологията на P-вълната. Крайната точка беше появата на NOAF. Резултатите бяха представени като коефициенти на вероятност (OR) за категориалните променливи и стандартизирани средни разлики (SMD) за непрекъснатите променливи, като за всички показатели бяха изчислени 95% доверителни интервали (CI). **Резултати:** Бяха включени 10 кохортни проучвания, обхващащи 854 пациенти с NOAF и 3477 пациенти без NOAF. При пациентите, при които се развива NOAF, е установена значимо по-голяма продължителност на P-вълната в сравнение с пациентите без развитие на NOAF (SMD = 0.29, 95% CI = 0.17-0.41, p < 0.05). Както частичният, така и напредналият интерпредсърден блок са значимо свързани с NOAF (OR = 1,99, 95% CI = 1,52–2,60, p < 0,05; OR = 2,50, 95% CI = 1,70-3,68, p < 0,05). Не са установени статистически значими разлики по отношение на амплитудата или дисперсията на P-вълната. **Заключение:** Удължената продължителност на P-вълната и наличието на интерпредсърден блок са свързани с честотата на поява на NOAF. Необходими са по-мащабни проспективни проучвания за потвърждаване на тези резултати.

Ключови думи: предсърдно мъждене; електрокардиография; P-вълна

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Introduction

Atrial fibrillation (AF) is a common cardiac arrhythmia linked to significant morbidity and complications. The prevalence increases with advancing age and is strongly associated with cardiovascular risk factors, including hypertension, diabetes mellitus, and obesity. Additionally, AF has a bidirectional relationship with heart failure, with each condition increasing the risk and severity of the other, leading to a greater overall risk of mortality [1, 2].

AF has a major clinical impact, significantly increasing the risk of embolism and stroke. AF-related strokes are often more severe, disabling, and fatal than strokes from other causes. Because many AF episodes are asymptomatic or intermittent, the condition often remains undiagnosed until complications arise. Thus, early detection is crucial, enabling timely initiation of anticoagulation and rhythm control therapies to prevent stroke, progression of heart failure, and premature death [3].

AF primarily involves the atrium and is characterized by both structural and functional remodelling. These atrial alterations often precede the initial manifestation of AF and can be identified through electrocardiographic (ECG) assessment. Because the P-wave reflects atrial depolarization on ECG, P-wave morphology has emerged as a valuable marker for predicting AF occurrence. Evidence from prior studies suggests that several parameters of P-wave morphology, such as duration, voltage dispersion, and P-wave terminal force in lead V1 (PTFV1), including interatrial blocks (IAB), are potential predictors of AF development.

ECG is widely available and routinely performed as part of standard clinical assessment. Compared with other cardiac rhythm monitoring modalities, such as Holter monitoring, ECG is more accessible, cost-effective, and easier to perform. In addition, it can be integrated with artificial intelligence to improve AF detection. As a result, ECG may serve as a practical tool for large-scale, targeted AF screening [4].

However, evidence on the association between P-wave morphology and AF development remains inconclusive. For instance, Enriquez et al. demonstrated a significant association between IAB and AF, whereas Roessel et al. reported no significant relationship. Furthermore, no previous systematic review and meta-analysis have specifically evaluated the value of P-wave morphology for NOAF [4].

Therefore, this systematic review and meta-analysis aimed to evaluate the association between P-wave morphology and the development of NOAF.

Materials and methods

We conducted this study in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis 2020 statement. This study was registered in PROSPERO on 12 July 2026 (CRD420261447370). Protocol registration occurred after initial database searches but before formal data extraction and statistical synthesis [5].

Eligibility criteria

The inclusion criteria comprised studies that met all of the following conditions: (1) cohort or case-control studies, either prospective or retrospective in design, (2) studies that included populations with NOAF, (3) studies that measured ECG parameters related to P-wave morphology. NOAF is defined as the development of AF in individuals without previous diagnosis of this condition. The specific definition of NOAF used in each included study is presented in Supplementary Table S1. P-wave duration (PWD) was measured in milliseconds in lead II, and P-wave amplitude (PWA) was also measured in lead II and expressed in millivolts. Interatrial block refers to delayed atrial conduction across the Bachmann bundle. We defined partial IAB (pIAB) as P-wave prolongation ≥ 120 ms, whereas advanced IAB (aIAB) also showed a biphasic P-wave morpholo-

gy in the inferior leads. We defined P-wave dispersion as the difference between the maximum and minimum PWD recorded across the 12-lead ECG. While these standard criteria served as reference benchmarks, we systematically extracted specific ECG measurement techniques, lead selections, and diagnostic cut-offs reported in individual included studies, as detailed in Supplementary Table S2. The primary endpoint was the occurrence of NOAF. We excluded duplicates, case reports or case series, review articles, abstracts, commentaries, editorials, studies with no measured ECG parameter, and studies of previously diagnosed AF.

Data sources and search strategy

We conducted a data search up until 27 September 2026 in PubMed, ScienceDirect, Cochrane Library, ProQuest, and Sage Journal using the keywords "atrial fibrillation or new-onset atrial fibrillation or p-wave or p-wave amplitude or p-wave duration or interatrial block". The complete search strategy for each database was provided in Supplementary Table S3. We included PubMed, Cochrane Library, and ProQuest as primary sources because they cover most cardiovascular literature relevant to our study. To compensate for potential indexing omissions, we expanded our secondary searches to ScienceDirect and Sage Journal. The search strategy did not specify a particular outcome or endpoint to broaden the scope. No language restrictions were applied. We addressed any search issues through discussion.

Data Extraction and Bias Assessment

Two independent reviewers screened the titles and/or abstracts of studies relevant to the research question. Deduplication and screening were conducted using the Rayyan tools. The screening results were then manually assessed based on the predetermined inclusion and exclusion criteria. For all eligible studies, full-text data were extracted and compiled into a Google Sheet. The extracted information included the first author's name, year of publication, study design, population characteristics, measured ECG parameters, non-ECG parameters, follow-up duration, and study location. The quality of each included study was assessed using the Newcastle-Ottawa Scale (NOS). NOS scores of 7 or higher were considered high quality. The Grading of Recommendations Assessment, Development, and Evaluation (GRADE) framework was used to evaluate the certainty of each parameter [6].

Statistical Analysis

The extracted data were analyzed using Cochrane Collaboration Review Manager version 5.4. We assessed dichotomous parameters with odds ratios (ORs) using the Mantel-Haenszel method and analyzed continuous parameters using standardized mean differences (SMD) with the inverse-variance method to account for different ECG measurement methods. We also calculated adjusted ORs (aORs) using the inverse-variance method to account for potential confounders and different follow-up durations. We reported all effect estimates with 95% confidence intervals (CIs) and visualized the results using forest plots. Statistical significance was defined as a p-value <0.05, with significance also considered when the 95% CI did not cross the middle line on the forest plot. Heterogeneity across studies was assessed using the I^2 statistic and Cochrane's Q test. An I^2 value of less than 50% indicated low or no significant heterogeneity, and a fixed-effect model was applied. In cases where $I^2 > 50\%$, indicating substantial heterogeneity, a random-effects model was used. A p-value of < 0.05 for Cochrane's Q test was considered statistically significant for heterogeneity. For outcomes with high heterogeneity ($I^2 > 50\%$), a sensitivity analysis was conducted using the leave-one-out method, in which each study was excluded sequentially to assess the impact on overall heterogeneity and to identify potential sources of variability. Funnel plots were generated for all parameters [7, 8].

Results

The literature search yielded initially 7677 studies from five databases. After deduplication and title and/or abstract screening, 29 articles were assessed for eligibility. Articles that focused on AF recurrence, abstracts, post-ablation AF patients, or those that did not report P-wave morphology were excluded. Finally, ten studies were considered eligible and underwent meta-analysis (Fig. 1).

Patient characteristics

As shown in Table 1, all 10 included studies were cohort studies conducted in various countries. The cohort comprised a total of 4331 patients, grouped into NOAF (n = 854) and non-NOAF (n = 3477). The mean age of the study population was 64.31 ± 11.73 years, with 2980 males (68.8%) and 1351 females (31.2%). The shortest follow-up period was 12 months, reported by Cinier et al. Some included studies also measured echocardiographic parameters such as left ventricular ejection fraction and left atrial diameter. Two studies included stroke risk assessment tools such as CHA2DS2-VASc and CHADS2. One study by Karacop et al. measured ECG using Holter monitoring, whereas Kreimer et al. utilized loop recorders. Patients were followed up via telephone interviews or medical record review.

P-wave duration

As shown in Fig. 2, patients who developed NOAF had a significantly longer P-wave duration than those

who did not develop NOAF (SMD = 0.29, 95% CI = 0.17-0.41, p < 0.00001, I2 = 2%). We used the fixed-effect model and did not perform further sensitivity analysis due to the low heterogeneity. Although eight included studies reported PWD data in Table 1, three were excluded from our meta-analysis because their results were presented as categorical rather than continuous variables.

P-wave amplitude

Our analysis found no statistically significant difference in P-wave amplitude between the NOAF and non-NOAF groups (SMD = 0.12, 95% CI = -0.26-0.49, p = 0.55, I2 = 91%). However, this pooled effect was accompanied by substantial heterogeneity. Therefore, rather than demonstrating a definitive absence of association, this non-significant finding reflects severe inconsistency across the included studies, suggesting an inconclusive overall effect. In Table 2, the sensitivity analysis showed that sequentially excluding individual studies did not reduce heterogeneity, indicating that the observed heterogeneity was not driven by a single outlier. The overall effect remained consistent after removing studies. We excluded the study by Alexander et al. from this analysis because it used a categorical variable. This study grouped PWA into > 0.2 mV, 0.1-0.2mV, and < 0.1 mV.

Interatrial block

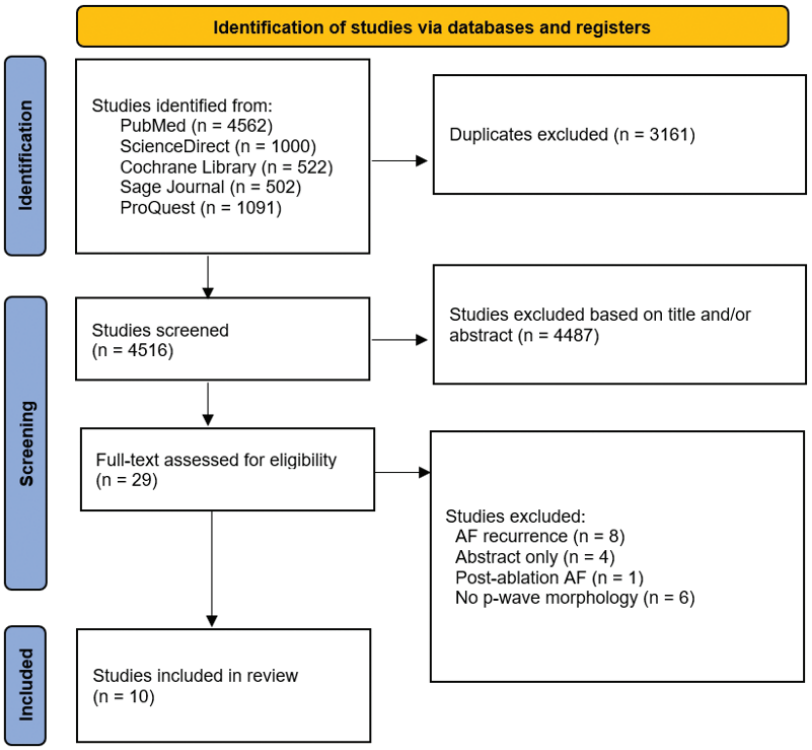
Figure 2 presents our analysis of the interatrial block parameter. Both pIAB and aIAB were strongly associated with the development of NOAF (ORs = 1.99, 95% CI = 1.52–2.60, p < 0.00001, I^2 = 0%; ORs = 2.50, 95% CI = 1.70–3.68, p < 0.00001, I^2 = 45%; respectively). We used a fixed-effect model and did not perform a leave-one-out method due to low heterogeneity (I^2 < 50%). Our adjusted analysis yielded similar results for pIAB and aIAB (aORs = 2.35, 95% CI = 1.36–4.05, p = 0.002, I^2 = 14%; aORs = 3.46, 95% CI = 2.06–5.82, p < 0.00001, I^2 = 0%; respectively) (Supplementary Figure S1). As shown in Table 1, aIAB was reported by seven of the ten included studies. However, Kreimer et al. was excluded from this analysis because their data were presented as a hazard ratio. Similarly, the study by Yang et al. was excluded because aIAB and pIAB were analyzed as a single combined outcome.

P-wave dispersion

Our analysis of P-wave dispersion demonstrated no statistically significant difference between patients who developed NOAF and those who did not (SMD = 0.79, 95% CI = -0.94-2.52, p = 0.37, I2 = 98%). Due to the limited number of available studies (n = 2) and extreme statistical heterogeneity, this quantitative pooled effect size for P-wave dispersion was statistically unstable and clinically uninterpretable. Individually, Yoshizawa et al. demonstrated that P-wave dispersion was an independent predictor of NOAF (p = 0.001), whereas Kreimer et al. reported no significant difference between the NOAF and non-NOAF groups (p = 0.761). Marked differences in ECG measurement techniques and comorbidities between these two studies explain the substantial heterogeneity, preventing a definitive pooled quantitative interpretation.

Bias assessment

Publication bias could not be evaluated using a funnel plot due to the small number of included studies for each parameter. We conducted a quality assessment using NOS (Supplementary Table S4). All included studies were considered high quality (NOS ≥ 7). However, domain-level evaluation revealed vulnerabilities, particularly in the comparability domain, where all studies received only a single star due to the lack of multivariate adjustment for major confounders. A summary of findings using the GRADE framework was presented in Table 3.



AF – Atrial Fibrillation; PRISMA – Preferred Reporting Items for Systematic Review and Meta-Analysis

Fig. 1. PRISMA 2020 flow diagram

Table 1. Study characteristics

Study	Design	Population (n)	ECG parameter	Follow-up period	LA dimension (mm)	Comorbidities	Location
Yoshizawa 2014 [9]	Retrospective cohort	NOAF (68) & Non-NOAF (68)	PWD, PWA, P-wave dispersion, max PWD	Not mentioned	41.7 ± 6.09	CHF, Cardiomyopathy	Japan
Ali 2015 [10]	Retrospective cohort	NOAF (29) & Non-NOAF (68)	PWD, aIAB	Mean 32 ± 18 months	45.5 ± 7.8	CHF with CRT	Canada
Enriquez 2015 [11]	Retrospective cohort	NOAF (67) & Non-NOAF (120)	PWD, aIAB	Mean 25.5 ± 15.1 months	43.8 ± 6.19	Post-atrial flutter ablation	Multicentre
Roessel 2017 [12]	Retrospective cohort	NOAF (80) & Non-NOAF (160)	PWD, pIAB, aIAB, PAC	Median 85.4 months	Not mentioned	None	Spain
Cinier 2018 [13]	Prospective cohort	NOAF (35) & Non-NOAF (163)	pIAB	12 months	36.12 ± 4.79	Myocardial infarction	Turkey
Alexander 2019 [14]	Retrospective cohort	NOAF (140) & Non-NOAF (536)	PWD, PWA, pIAB, aIAB	Mean 37.2 months	38.6 ± 6.0	None	Canada
Jacobsson 2020[15]	Retrospective cohort	NOAF (46) & Non-NOAF (164)	aIAB, pIAB	Median 100.8 months	Not mentioned	CHF with CRT	Sweden
Karacop 2021 [16]	Retrospective	NOAF (150) & Non-NOAF (490)	PWD, PWA, PWD/PWA ratio	Mean 55.4 months	39.22 ± 1.88	None	Turkey
Kreimer 2021 [17]	Retrospective cohort	NOAF (75) & Non-NOAF (291)	PWA, PWD, P-wave dispersion, aIAB, PTFV1, PR duration, QRS duration, QRS axis, T axis, QT interval	Mean 20.6 ± 13.5 months	38.0 ± 5.5	None	Germany
Yang 2024 [18]	Retrospective cohort	NOAF (164) & Non-NOAF (1417)	PWD, PWA, pIAB, aIAB, MVP score	Not mentioned	36.6 ± 4.1	Myocardial infarction	China

aIAB, Advanced Interatrial Block; CHF, Congestive Heart Failure; CRT, Cardiac Resynchronization Therapy; ECG, Electrocardiographic; LA, Left Atrial; MVP, Morphology-Voltage-P-wave Duration; NOAF, New-onset Atrial Fibrillation; pIAB, Partial Interatrial Block; PTFV1, P-wave Terminal Force in Lead V1; PWA, P-wave Amplitude; PWD, P-wave Duration

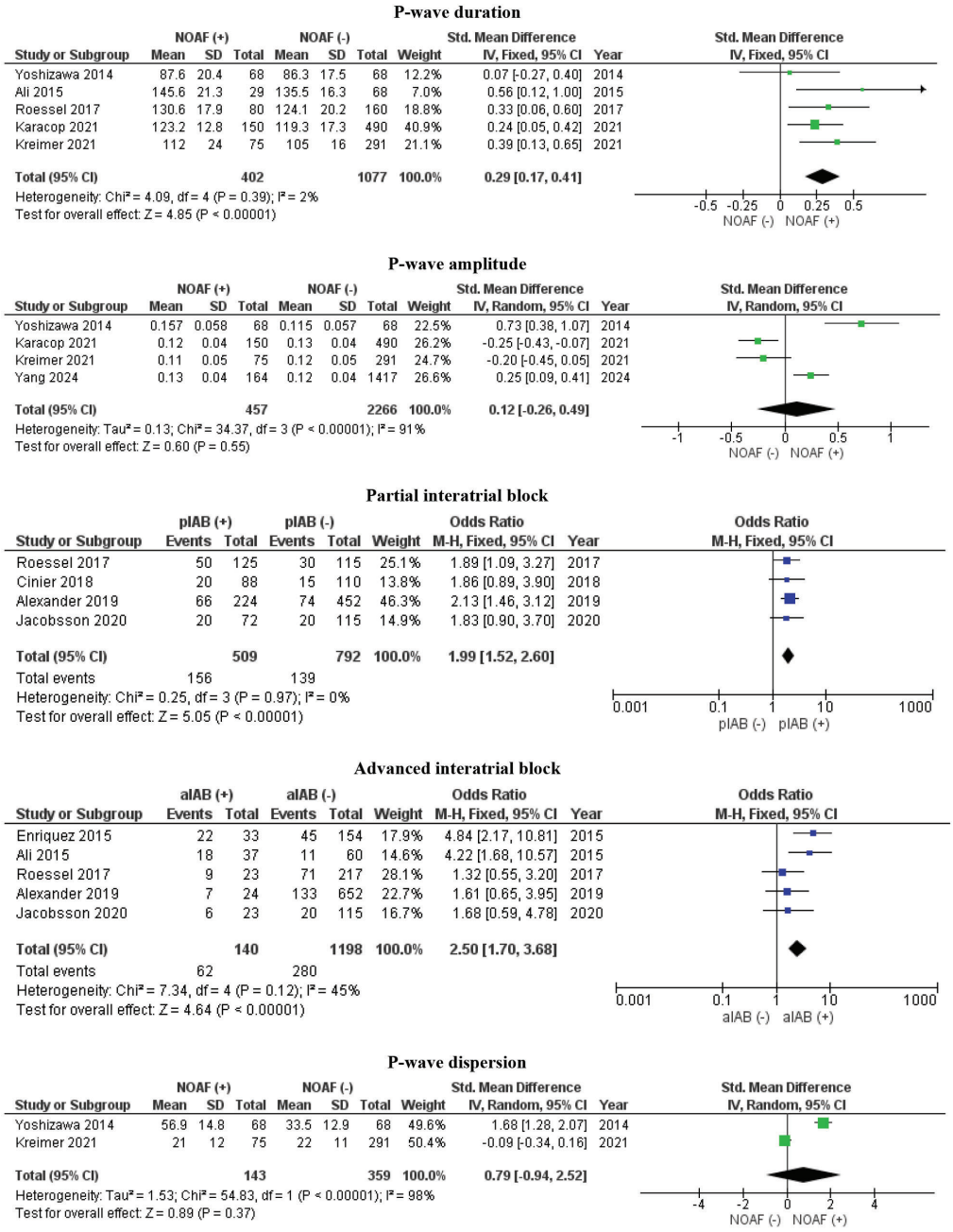
Table 2. Sensitivity analysis using leave-one-out method

	Pooled effect	P-value	I2
P-wave Amplitude			
Yoshizawa 2014, removed	-0.06 (-0.41-0.28)	0.73	89%
Karacop 2021, removed	0.24 (-0.19-0.68)	0.27	89%
Kreimer 2021, removed	0.22 (-0.25-0.70)	0.36	93%
Yang 2024, removed	0.07 (-0.44-0.59)	0.78	92%

Table 3. GRADE summary of findings

Parameter	Initial	Risk of Bias	Inconsistency (I2)	Indirectness	Imprecision	Publication bias	Overall certainty
P-wave duration	Low	Low risk	2%	Serious indirectness	95% CI (0.17-0.41)	Unevaluated	Very low
P-wave amplitude	Low	Low risk	91%	Serious indirectness	95% CI (-0.26 – 0.49)	Unevaluated	Very low
pIAB	Low	Low risk	0%	Serious indirectness	95% CI (1.52-2.60)	Unevaluated	Very low
aIAB	Low	Low risk	45%	Serious indirectness	95% CI (1.70-3.68)	Unevaluated	Very low
P-wave dispersion	Low	Low risk	98%	Serious indirectness	95% CI (-0.94 – 2.52)	Unevaluated	Very low

CI, Confidence Interval; GRADE, Grading of Recommendation Assessment Development and Evaluation



aIAB, Advanced Interatrial Block; CI, Confidence Interval; IV, Inverse Variance; M-H, Mantel-Haenszel; NOAF, New-onset Atrial Fibrillation; pIAB, Partial Interatrial Block; SD, Standard Deviation

Fig. 2. Forest plot of pooled estimates using Mantel–Haenszel odds ratios for categorical parameter and inverse-variance standardized mean differences for continuous parameter

Discussion

The primary findings of our study demonstrate that prolonged PWD, pIAB, and aIAB were associated with the development of NOAF. We observed no significant differences in the remaining parameters between patients with and without NOAF.

The diagnosis of AF is established by ECG documentation, which remains the gold standard. However, diagnosis may be more challenging in asymptomatic or intermittent cases detected during long-term monitoring. In addition, P-wave-derived ECG parameters may serve as non-invasive markers of atrial structural and conduction abnormalities and have been associated with the development of NOAF [19,20].

Our included study population was predominantly elderly. The increased incidence of NOAF in this population may be attributed to age-related atrial remodelling. Aging is associated with progressive atrial fibrosis and conduction abnormalities, resulting in slower

electrical conduction and prolonged P-wave duration. Furthermore, increased arterial stiffness and left ventricular diastolic dysfunction can elevate atrial pressure and promote left atrial enlargement, creating a favourable substrate for atrial arrhythmogenesis. Collectively, these structural and electrophysiological alterations increase susceptibility to AF in older adults. Therefore, age is a well-established predictor of AF [21].

PWD is a widely accepted non-invasive measurement of atrial conduction time. It represents the total time required for electrical propagation across both atria. Therefore, prolonged PWD indicates delayed atrial conduction, often due to subclinical structural abnormalities, such as fibrosis. Fibrosis disrupts normal atrial architecture through excessive extracellular matrix accumulation, which separates cardiomyocytes and interferes with effective electrical coupling. These structural alterations lead to reduced conduction velocity, increased conduction heterogeneity, and greater dispersion of refractoriness, ultimately promoting the development of re-entry circuits, which is one of the key mechanisms responsible for the initiation of AF. Therefore, delayed atrial conduction, reflected by prolonged PWD, may facilitate re-entry formation and increase susceptibility to AF [22, 23].

PWA generally reflects the voltage of atrial depolarization and is influenced by atrial myocardial mass and conduction properties. However, unlike parameters such as PWD, which represent intra- and interatrial conduction time and heterogeneity, PWA may not adequately capture the underlying electrophysiological substrate predisposing to AF. Evidence from previous studies also suggests inconsistent associations between PWA and AF incidence. This may be explained by the fact that AF is more strongly related to conduction delay, electrical remodelling and structural heterogeneity rather than the amplitude of atrial depolarization. Although this physiological difference may account for conflicting findings across the literature, the extreme heterogeneity in our pooled effect precludes a definitive conclusion regarding the precise association of PWA with NOAF [24].

Our findings are consistent with previous evidence indicating that both pIAB and aIAB are associated with a high risk of NOAF. IAB reflects abnormalities in atrial conduction, including delayed conduction across the Bachmann bundle, intra-atrial conduction delay, and LA enlargement. These alterations represent a combination of impaired atrial conduction and structural remodelling, which have been associated with underlying atrial pathology such as fibrosis, thereby increasing susceptibility to AF. Therefore, both pIAB and aIAB may serve as simple, non-invasive marker of atrial remodelling and increased susceptibility to NOAF. While our meta-analysis shows crude associations between P-wave morphology and NOAF, it remains unclear whether adding these markers to validated models, such as the CHARGE-AF score, provides incremental predictive value. Further studies are needed to evaluate whether these markers offer predictive performance beyond other established variables, such as age, hypertension, or baseline cardiac structure [15, 25, 26].

Previous studies suggest that P-wave dispersion is associated with AF development because it reflects heterogeneous and discontinuous atrial conduction. However, our findings remain inconclusive due to high variability across studies. In the study by Baykan et al., P-wave dispersion was significantly associated with NOAF in the univariate analysis but was non-significant after multivariable adjustment, suggesting confounding by other clinical factors. These factors may include a history of myocardial infarction, differences in follow-up duration, and older age. The severe heterogeneity observed in the analysis of P-wave dispersion may be attributable to differences in study characteristics. For example, Yoshizawa et al. included patients with heart failure and had a shorter follow-up duration than Kreimer et al., which may have affected the detection of NOAF. In addition, Kreimer et al. included a larger study population with loop recorder measurements, which may have further contributed to the observed variability [27].

This meta-analysis has several major limitations. First, although our search strategy spanned multiple major databases and open-access repositories, subscription-based databases such as Embase and Web of Science were not queried. However, two additional platform searches were conducted to minimize the risk of missing eligible studies. Second, substantial clinical heterogeneity persisted due to diverse patient populations (post-myocardial infarction, heart failure, cardiac resynchronization therapy) and variable AF surveillance protocols (Holter and loop recorder). Although statistical heterogeneity was low for some parameters, clinical heterogeneity remains a limitation that restricts direct applicability to a general, unselected population. Third, the leave-one-out method for PWA did not resolve the heterogeneity, and further sensitivity analyses cannot be performed due to the small number of studies. Fourth, certainty evaluation using the GRADE framework yielded very low ratings for all parameters, likely driven by the retrospective design of the included studies, heterogeneous outcome ascertainment, and reliance on unadjusted estimates. Further prospective studies are therefore recommended to incorporate a broader range of ECG parameters and to separately include populations with AF recurrence to enhance the validity of the findings.

Conclusion

This systematic review and meta-analysis demonstrated that several ECG parameters were significant-

ly associated with NOAF incidence. Specifically, prolonged P-wave duration, advanced interatrial block, and partial interatrial block were significantly correlated with NOAF, whereas P-wave amplitude and P-wave dispersion showed inconclusive associations due to heterogeneity. Further large-scale prospective studies are warranted to validate these markers, broaden the range of evaluated ECG parameters, and include populations with AF recurrence.

Statement and Declarations

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Conflict of Interest – There is no conflict of interest in conducting this study.

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