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REVIEW

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**Focal Impulse and Rotor Modulation with Pulmonary Vein Isolation versus Pulmonary Vein Isolation alone for Atrial fibrillation: A Systematic Review**

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**Background and Aims:** Pulmonary vein isolation (PVI) has been a preferred pacing method to treat cardiac arrhythmias especially for atrial fibrillation. Several studies have stated that pulmonary vein isolation is less potent and causes quite severe side effects. Focal impulse and rotor modulation (FIRM) is an alternative method to treat atrial fibrillation that showed poor outcome in several studies. In several studies it was found that combination of focal impulse and rotor modulation with pulmonary vein isolation has attracted attention due to its potential to treat atrial fibrillation and minimize related pacing cardiac complications. The aim of this systematic review is to compare outcome between combination focal impulse and rotor modulation with pulmonary vein isolation versus pulmonary vein isolation alone to treat atrial fibrillation patients.

**Material and Methods:** Study was systematically extracted from several databases such as PubMed, PMC, Science Direct, BMJ and MDPI on June 28th 2023 using the following keywords "pulmonary vein isolation" AND "atrial fibrillation" AND "FIRM". Extracted studies will be analyzed through several inclusion criteria such as studies published in the last 10 years, cohort studies, population studies, and observational studies. Pregnant women, pediatric patients, case reports, unfull paper, systematic review and meta-analysis were excluded in this study. Then, the quality of studies included was assessed using Newcastle-Ottawa Scale (NOS).

**Results:** Four cohort studies are suitable for data extraction consisting of 838 eligible patients. Three studies showed that combination FIRM with PVI group was more effective and reduced complication for atrial fibrillation treatment compared with those in PVI alone group. While, one other study showed that there were no significant differences to treat atrial fibrillation patients between two groups. Included studies had a good quality after assessed using NOS.

**Conclusion:** In conclusion, Patients with atrial fibrillation that are treated with combination FIRM with PVI have better outcomes than patients treated with PVI alone. However, there are various limitation studies and still need further studies.

**Keywords:** pulmonary vein isolation, atrial fibrillation, FIRM



**Safety and efficacy of minimal-and-zero-dose compared to conventional-or-standard-dose fluoroscopy catheter ablation in adult patients with cardiac arrhythmia: meta-analysis and systematic review**

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**Background and Aim:** The purpose of this review is to compare the safety and efficacy of minimal-and-zero-dose fluoroscopy (M/ZF) to conventional-or-standard-dose fluoroscopy (C/SF) in catheter ablation-treated adult cardiac arrhythmia patients.

**Materials and Methods:** We systematically searched for the latest 10 years of publication in Pubmed, SCOPUS, Web of Science, and grey literature (Google Scholar). All Studies that compare C/SF group with M/ZF group in adult cardiac arrhythmia patients who had catheter ablation are included. The random-effects model was used to derive mean difference (MD) and risk ratios (RRs) with 95% confidence interval (CI) using Review Manager (Revman) 5.4.1 Software.

**Results:** Thirty-six cohorts and 8 RCTs involving 15.363 adult patients met our inclusion criteria. There was no significant difference in immediate success rate (RR = 1.00, 95% CI, 0.99–1.01; p=0.49) or long-term success rate (RR: 1.02, 95% CI, 0.99–1.05; p=0.13) between the groups. There was no significant difference in the total procedure time between the groups [MD: -0.99 minutes (95% CI: -5.24 to 3.27 minutes; p=0.65)]. Compared to the C/SF group, total fluoroscopic is significantly lower in the M/ZF group, which in terms of MD are -10.92 minutes (95% CI, -13.67 to -8.18 minutes; p<0.00001). Meanwhile, ablation time is insignificantly lower -0.13 minutes (95% CI: -0.69 to -0.43 minutes; p=0.64). The dose area product (DAP) was not significantly different between the groups [MD: -22.95 Gy<sup>2</sup> (95% CI: -28.1 to -17.8); p<0.00001], and for the total exposure dose [MD: -11.58 mGy (95% CI: -17.16 to -5.99); p<0.0001]. The major complication did not differ between the groups (RR: 0.81, 95% CI: 0.5–1.31; p=0.39), while minor complications also did not differ (RR: 0.72, 95% CI: 0.49-1.05; p=0.09). No significant difference was found in the recurrence rate between the groups (RR: 1.01, 95% CI: 0.85–1.20; p=0.94). No significant difference was found in the successful PVI event between the groups (RR: 1.00, 95% CI: 0.99–0.01; p=0.9).

**Conclusion:** The M/ZF technique for catheter ablation in adult patients is a feasible procedure that reduces radiation exposure and ablation time without diminishing success or complication rates in the immediate or long term.

**Keywords:** Zero Fluoroscopy, Minimal Fluoroscopy, Arrhythmia, Catheter Ablation, Adults  
**Prisma Chart of Study Retrieval**

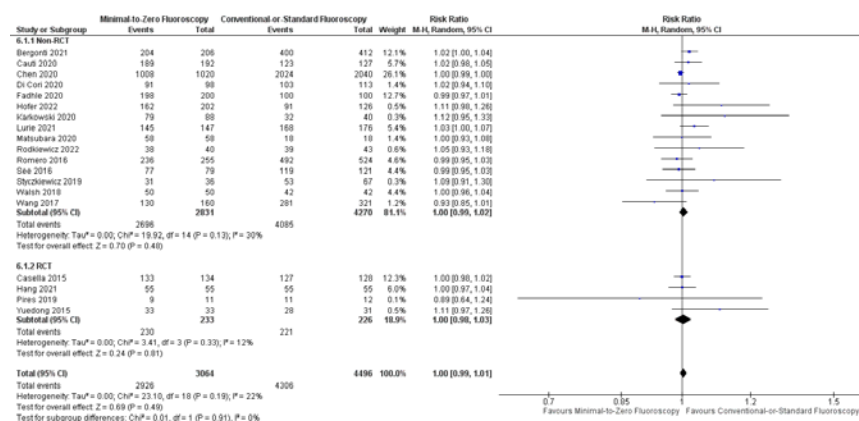


Figure 1. The forest plot of immediate success between C/SF and M/ZF groups.



**The Effect of SGLT-2 Inhibitors on The Event of Arrhythmia and Cardiac Arrest:  
A Systematic Review And Meta-Analysis Of Randomized Controlled Trials**

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**Background and aims:** Sodium glucose co-transporter-2 inhibitors (SGLT2-i) has been widely used for heart failure, atherosclerotic cardiovascular disease and diabetes mellitus, even in the setting of chronic kidney diseases. However, its effects on arrhythmia and cardiac arrest have been poorly studied. This study aims to evaluate the association of (SGLT2-i) with the event of arrhythmias and cardiac arrests.

**Materials and Methods:** Pubmed, ClinicalTrials.gov and the Cochrane Library were searched for trials published between 2013 and 2023. We included prospective, randomized, controlled trials assessing the effects of SGLT2 inhibitor on the event of arrhythmia and cardiac arrest. Summary estimates of relative risk (RR) reductions were calculated with a effects model.

**Results:** We included 23 randomized-controlled trials with altogether 80,001 patients. SGLT2i were significantly associated with a lower risk of atrial fibrillation (RR 0.94, 95% CI 0.90-0.98, **p=0.004**) and atrial flutter (RR 0.73, 95% CI 0.55-0.98, **p=0.03**). However, the risk reduction in cardiac arrest (RR 0.80, 95% CI 0.61-1.03, p=0.09), ventricular tachycardia (RR 0.96, 95% CI 0.77-1.20, p=0.73), and other arrhythmias (RR 0.90, 95% CI 0.75-1.09, p=0.29) did not reach statistical significance. Meanwhile, SGLT2i shows no reducing effect on atrioventricular block events (RR 1.03, 95% CI 0.79-1.35, p=0.83).

**Conclusion:** SGLT2i significantly reduced the risk of atrial fibrillation and atrial flutter. Further research is needed to elaborate on the mechanism by which SGLT2i protects against arrhythmias and cardiac arrest, and whether this effect is class or drug-specific.

**Keywords:** Meta-analysis; Sodium-glucose cotransporter 2 inhibitors; Atrial fibrillation; Atrial Flutter; Sudden cardiac death; Ventricular arrhythmia.



## Artificial Intelligence in Atrial Fibrillation Detection with Portable Single-lead ECG: A Systematic Review and Meta-Analysis

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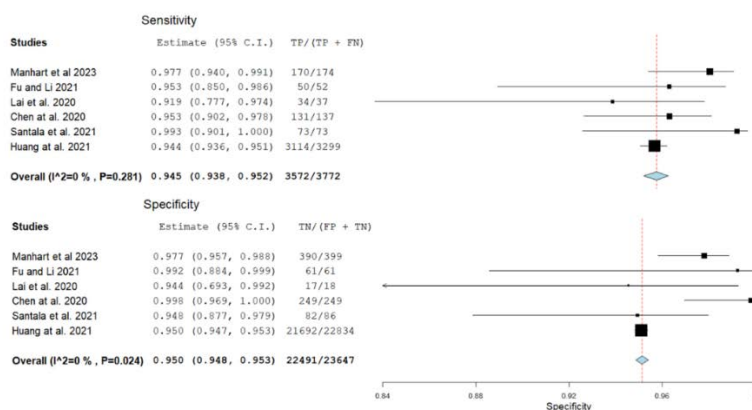
**Backgrounds and Aims:** Atrial fibrillation (AF) can result in serious health complications such as strokes, heart failure, and even death if left undiagnosed and untreated. Early detection of AF is crucial but difficult as AF could be asymptomatic. Portable and wearable devices with a single-lead electrocardiogram (ECG) have shown potential in detecting AF. However, the ECG signals recorded by these devices are often heavily corrupted with noise and artefacts, which can affect the accuracy of the device reading automation. The use of artificial intelligence (AI) in medicine was able to assist clinicians in various stages of disease management, especially in diagnosing. Therefore, this study aimed to assess the accuracy of portable single-lead ECG augmented with AI in the detection of AF.

**Materials and Methods:** A comprehensive literature review from inception until 2023 was performed utilising PUBMED, Google Scholar, and Cochrane, with the oldest paper being published in 2008. Papers validating the use of portable or wearable single-lead ECG augmented with AI in detecting AF compared to visual readings by cardiologists were screened according to our eligibility criteria. Accuracy analysis was performed using a fixed-effect model with an inverse-variance method by Openmeta Software.

**Result:** A total of six studies encompassing 27,992 ECG results were included. All of the studies suggested varying AI algorithms, but each one analysed the heart rhythm based on the ECG provided rather than pulse-based. The overall sensitivity and specificity did not differ from studies ( $I_2 = 0\%$  vs  $0\%$ ,  $p = 0.281$  vs  $0.024$ ). AI-assisted single-lead ECG devices had high sensitivity (94.5%; CI95%= 93.8 - 95.2) and specificity (95%; CI 95%=94.8 - 95.3) in detecting AF when validated to visual 12-lead or single-lead ECG reading by cardiologists as the gold standard.

**Conclusion:** AI has shown promise in assisting early and rapid detection of AF. However, further explorations on the comparison to know which AI algorithm can provide the best accuracy and investigations on cost-effectiveness are needed for implementation in clinical settings.

**Keywords:** Atrial Fibrillation, Single-lead ECG, Portable ECG, Artificial Intelligence





## Meta-Analysis of Randomized Controlled Trials: Comparing Amiodarone and Beta-Blockers for Preventing Postoperative Atrial Fibrillation in Cardiac Surgery Patients

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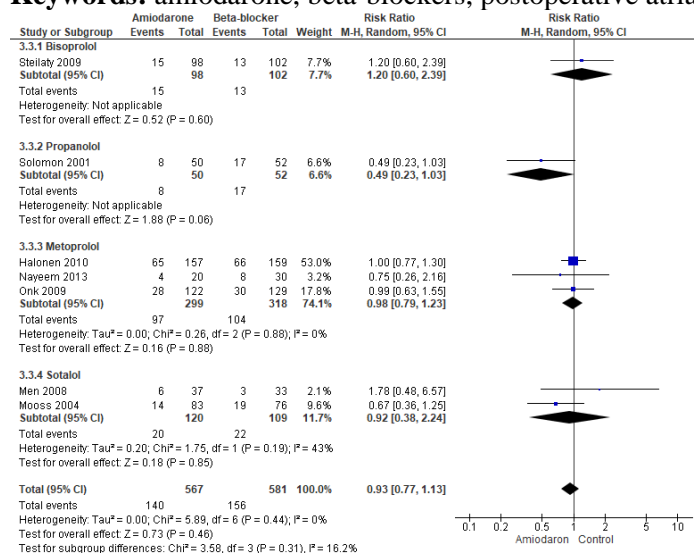
**Background and aims:** Postoperative atrial fibrillation (POAF) is a common and concerning complication following cardiac surgery. Amiodarone and beta-blockers are commonly employed pharmacological agents for the prevention of POAF. This meta-analysis aims to compare the effectiveness of amiodarone versus beta-blockers in preventing POAF among patients undergoing cardiac surgery without preexisting atrial fibrillation (AF).

**Methods:** A systematic literature search was conducted across electronic databases to identify relevant randomized controlled trials (RCTs) comparing the use of amiodarone and beta-blockers for POAF prevention in patients without preexisting AF. The primary outcome measure was the incidence of POAF. Pooled risk ratios (RRs) and standard mean difference (SMD) with 95% confidence intervals (95%CI) were calculated using a random-effects model. Subgroup analyses were performed based on specific surgical procedures and different beta-blocker drugs.

**Results:** The meta-analysis included 7 RCTs involving 1,148 patients undergoing cardiac surgery. The pooled analysis revealed no significant difference in the incidence of POAF between amiodarone and beta-blockers (RR 0.93 [95%CI 0.77 – 1.13];  $I^2 = 0\%$ ). Subgroup analyses based on surgical procedures and different beta-blocker drugs showed no statistically significant effect on POAF prevention. Furthermore, no significant differences in mortality (RR 0.80 [95%CI 0.38–1.68];  $I^2 = 0\%$ ) and hospital length of stay (SMD -0.02 [95%CI -0.16 to 0.20;  $I^2 = 0\%$ ]) were observed between the amiodarone and beta-blocker groups.

**Conclusion:** This comprehensive meta-analysis found no significant difference in the efficacy of amiodarone versus beta-blockers for preventing POAF in patients undergoing cardiac surgery without preexisting AF. Both pharmacological strategies demonstrated similar outcomes regarding POAF prevention, mortality, and hospital length of stay. Individual patient characteristics, potential side effects, and other relevant clinical considerations should guide the selection of amiodarone or beta-blockers.

**Keywords:** amiodarone, beta-blockers, postoperative atrial fibrillation, cardiac surgery



**Figure 1.** Random-effect model of treatment strategies for preventing POAF in patients undergoing cardiac surgery



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**Association of a tented T- wave and Increasing level of High sensitivity cardiac troponin T in Chronic Kidney Disease Patient: A Systematic Review**

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**Background and Aims:** A lot of study has been denoting that a chronic kidney disease (CKD) Patients showing abnormality on Electrocardiogram (ECG) and High sensitivity cardiac troponin (Hs-cTn). Tented T- Wave is found in several case of CKD patients and it is intact with increasing level of high sensitivity troponin T (Hs-cTnT) that may suspect of coronary heart disease. Therefore, our aim is to determine the association of a tented T-wave and the Increases level of High sensitivity cardiac troponin in CKD patients.

**Materials and Methods:** This systematic review used a literature search from PubMed, Europe PMC, Cochrane Library, and ScienceDirect. The inclusion criteria that were used is a randomized clinical trial, population study, cross-sectional study and cohort in the last five years. The Newcastle-Ottawa Scale was used to assess the quality of the included studies.

**Results:** A total of 8 studies involving 1245 patients were eligible for the study. Our study showed a relatively significant higher outcome in CKD patients associated with a tented T-wave and the increasing level of Hs cTnT.

**Conclusion:** Although some studies shows a good outcome of tenting T-wave and increases level Hs cTnT on a CKD patient, yet it requires more approaches and evidence.

**Keyword :** Chronic Kidney Disease, Electrocardiography, High sensitivity Troponin T



## Permanent Pacemaker Insertion in Transcatheter Aortic Valve Implantation : A Systematic Review

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**Backgrounds and aims:** Conduction defects requiring permanent pacemaker insertion (PPI) are one of the most common complications after transcatheter aortic valve implantation (TAVI). However, the predictor of PPI in post-TAVI patients is still not well known. This review aims to find out the predictor of permanent pacemaker insertion (PPI) in patients after Transcatheter Aortic Valve Implantation.

**Material and methods:** This review was conducted on 20-28 June 2023. Two independent researchers systematically extracted data from several databases, such as PubMed Central (PMC), Science Direct, and PUBMED by using MeSH terminology of keywords Pacemaker, Transcatheter Aortic Valve Implantation, Predictor. The extracted studies were then analyzed and selected according to our inclusion criteria such as studies in the last 5 years, cohort studies, case-control studies. We excluded systematic reviews, meta-analyses, case series, case reports, studies on pregnant women, children, animals. Research quality was assessed using Newcastle-Ottawa (NOS).

**Results:** From 6 studies (2568 subjects from various countries), 3 studies showed that prior Right Bundle Branch Block (RBBB) was an independent predictor for PPI post-TAVI and 2 other studies showed new-onset Left Bundle Branch Block (LBBB) also became a predictor. Besides RBBB and LBBB, one study showed Complete Heart Block (CHB) could predict the PPI utilization. All studies have proven good quality based on NOS.

**Conclusion:** In Conclusion, there were some conduction abnormalities that were associated as a predictor of PPI utilization in post-TAVI patients. However, further study is needed to confirm these findings.

**Keywords:** Pacemaker, Transcatheter Aortic Valve Implantation, Predictor





**Prognostic Value of Fragmented QRS Complex in Patients with non-ST Elevation Myocardial Infarct: a literature review**

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**Background and Aims:** Fragmented QRS (fQRS), defined as the presence of one or more notches on R or S waves without any bundle branch block in two contiguous leads, suggests heterogenous depolarization of ventricle myocardium due to ischemic, scar, or fibrosis. This conduction disturbance can become a substrate for a reentrant ventricular arrhythmia that is potentially fatal. Previous studies said it has a prognostic value for the major adverse cardiac event (MACE) in patients with acute coronary syndrome (ACS), but little is still known about its potential on non-ST elevation myocardial infarct (NSTEMI). This literature study aims to find out whether the fragmented QRS complex can be used to predict MACE in patients with NSTEMI.

**Materials and Methods:** A literature study searched three electronic databases (Pubmed, Science Direct, and Scholar Google) for previous studies using a cohort retrospective design published between 2016 and 2020. The CASP Checklist was used to assess the eligibility of the studies. Data tabulated and narration analysis for study findings was performed.

**Result:** We found 3 studies that met the inclusion criteria in this review. One study assessed short-time prognostic ( $\leq 6$  months), one study evaluated long-time prognostic ( $> 12$  months), and the last study assessed both. More than a thousand patients participated in these studies. Each study divides patients with NSTEMI into two groups based on ECG findings that is with and without fQRS complex. The Relation between the fQRS group and MACE, especially cardiovascular mortality has been analyzed.

**Conclusion:** All studies explained that Cardiac mortality in the fQRS group is higher than non fQRS. Recurrent angina, recurrent myocardial infarction, revascularization, and heart failure are also commonly happened in fQRS group. There is a significant relation between NSTEMI with fQRS and late mortality but not in-hospital or 30-days mortality. Fragmented QRS NSTEMI patients were also found to have LVEF lower than non-fQRS.

**Keywords:** NSTEMI; FQRS; prognosis; MACE



## Safety and Efficacy of Ivabradine on Patients with Cardiac Arrhythmia: A Systematic Review

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### Background and Aim

Ivabradine is a widely used therapy for patients with heart failure. Ivabradine is also used as an anti-arrhythmic therapy, especially for automatic arrhythmias. This is done by blocking the I(f) channel, a determinant of the pacemaker function of the sinus node. However, there was an underlying debate about whether or not Ivabradine was safe and effective on arrhythmia patients. These were due to theories regarding its adverse effects that may increase a patient's risk of worsening or developing unwanted arrhythmia. This study aims to prove the safety and efficacy of Ivabradine on patients with cardiac arrhythmia to eradicate theories spread out in the medical society.

### Materials and Methods

Databases such as PubMed, Google Scholar, and SpringerLink were systematically analyzed to extract studies on June 26, 2023. Keywords including "ivabradine" AND "arrhythmia" were used to gain relevant studies. Studies in English from the last five years with accessible full text, mainly clinical trials, were included in this review. Studies that were systematic reviews, meta-analyses, animal studies, and case reports were excluded. The Newcastle Ottawa Scale was then used to assess the studies' quality.

### Results

Seven clinical trials and one open-label RCT are used in this review, including 2414 participants. Six of the studies used were of good quality, and two of the studies were of fair quality based on the Newcastle Ottawa Scale. All studies show that Ivabradine is efficacious in pediatric patients with congenital heart disorders and adults. It is also associated with a limited effect on hemodynamic stability and cardiac contractility, making it favorable for patients with structural heart diseases and surgical procedures. Compared to other anti-arrhythmic agents, such as metoprolol, digoxin, and amiodarone, there is not much difference in the rate of adverse effects and rate reduction of patients with permanent AF, and may even serve as an alternative for management procedures in postoperative automatic arrhythmia patients.

### Conclusion

Ivabradine is a safe and efficient option in the treatment and management procedures of patients with cardiac arrhythmia. However, further large-scale, prospective, randomized controlled studies are required to further prove the efficacy and safety of Ivabradine as most studies included were small-scale and retrospective.

**Keywords:** ivabradine, arrhythmia



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### **A Systematic Review: The Association of Night Shift Work with The Risk of Atrial Fibrillation**

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**Background and Aims:** Sleep quality and duration are allegedly related to cardiovascular disease (CVD). Since atrial fibrillation (AF) and CVD have similar risk factors, it is interesting to see the relationship between working night shift and the risk of AF. We aimed to identify the association of night shift work with the risk of AF.

**Material and Methods:** Studies provided the association between night shift and AF were identified in PubMed, Openheart, and European Heart Journal from 2013 to 2023. Selected data using “night shift” and “atrial fibrillation” were extracted. Only the original research with selected cohort method and provide free full text access were reviewed.

**Results:** Three studies with a total of 336.556 patients were identified. These studies varied in defining the characteristic of night shift and data collection methods. The first study showed that night shift exposure was significantly associated with AF and higher due to number and duration of night shift in 40-69 years old subjects. The second study showed that night shift was associated with 10-year risk of AF in subjects <40 years but not in  $\geq 40$  years old. In contrary, the third study showed that night work was not associated with the increased risk of AF. In this review, the result is kind of varies. It is possibly caused by the limitations of the subjects' characteristic and subjectivity resulted by the questionnaire data collection used in some studies. The different results in age group might be caused by the ‘healthy worker effect’ phenomenon; that individuals with existing health issues or older age may stop doing shift.

**Conclusion:** There are different results from prior studies whether night shift increase the risk of AF or not. Since AF is a major cause of morbidity and also preventable, further study needs to be done to see the association of the night shift work with the risk of AF in each specific characteristic analysis of the subjects.

**Keyword:** *atrial fibrillation, night shift, risk*



### Evaluating the Epicardial Application of Amiodarone in Preventing Postoperative Atrial Fibrillation: A Systematic Review and Meta-analysis

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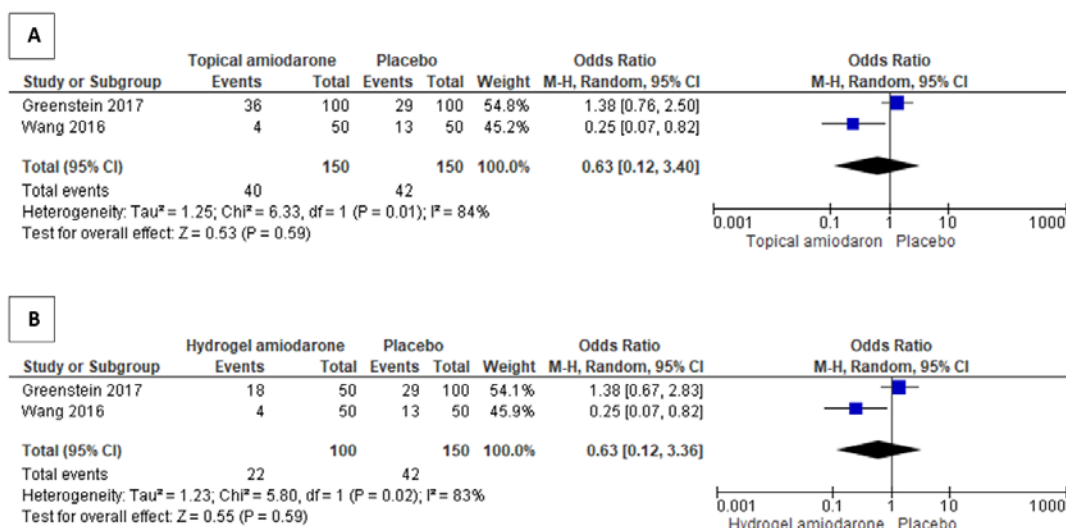
**Background and aims:** Postoperative atrial fibrillation (POAF) is a common arrhythmia following cardiac surgery associated with increased morbidity and healthcare costs. Epicardial application of amiodarone has been proposed as a potential preventive measure. This meta-analysis aims to evaluate the efficacy of topical epicardial amiodarone in preventing POAF.

**Materials and Methods:** A systematic literature search was conducted in electronic databases until July 2023. Both randomized controlled trials (RCT) and one observational study met the inclusion criteria and were included in the meta-analysis. The primary outcome was the incidence of POAF, and the secondary outcome was a stroke. Subgroup analysis was performed to assess the effect of hydrogel preparation of amiodarone.

**Results:** Three hundred subjects from one RCT and one observational study were included in the meta-analysis. The pooled analysis found no significant association between topical epicardial amiodarone and the incidence of POAF (pooled OR = 0.63 [95%CI: 0.12-3.40];  $I^2 = 84%$ ). Subgroup analysis focusing on the hydrogel preparation of amiodarone also did not reveal any significant association (pooled OR = pooled OR = 0.63 [95%CI: 0.12-3.36;  $I^2 = 83%$ ). Furthermore, there was no significant difference in stroke outcomes between the epicardial amiodarone and control groups (pooled OR = 1.35 [95%CI: 0.16-11.19];  $I^2 = 19%$ ).

**Conclusion:** Meta-analysis suggests that epicardial application of amiodarone may not significantly reduce the incidence of POAF in patients undergoing cardiac surgery. Subgroup analysis focusing on hydrogel preparation did not demonstrate any significant association either. Additionally, there was no significant difference in stroke outcomes between the amiodarone and control groups. These findings indicate that using the epicardial application of amiodarone may not be effective in preventing POAF or altering stroke outcomes.

**Keywords:** amiodarone, epicardial amiodarone, postoperative atrial fibrillation, cardiac surgery



**Figure 1.** Random-effect model for postoperative atrial fibrillation of epicardial application of (A) any topical amiodarone and (B) hydrogel amiodarone



## Amiodarone as Prophylaxis for Postoperative Atrial Fibrillation after Open Heart Surgery: A Meta-Analysis of Randomized Controlled Trials

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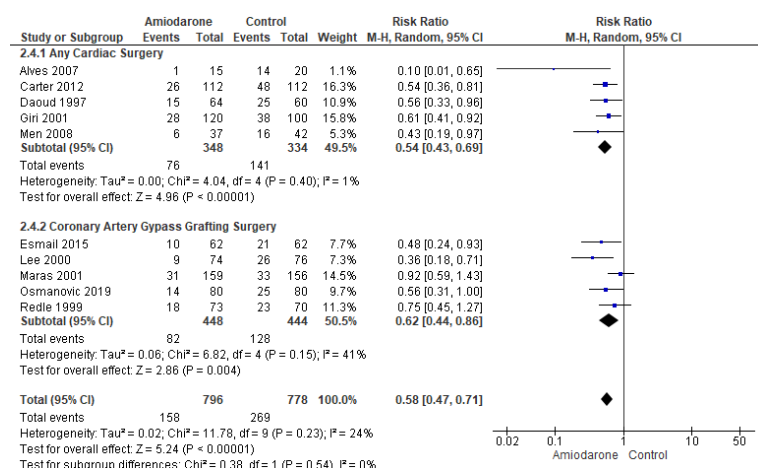
**Background and aims:** Postoperative atrial fibrillation (POAF) is a common and concerning complication following cardiac surgery. Amiodarone, an antiarrhythmic medication, has been investigated as a potential preventive strategy for POAF. This meta-analysis aims to evaluate the effectiveness of amiodarone compared to placebo or standard treatment in reducing the incidence of POAF in patients undergoing cardiac surgery without preexisting atrial fibrillation.

**Materials and Methods:** A systematic literature search was conducted in Pubmed, EMBASE, Scopus, Proquest, and ScienceDirect for articles published until July 2023. We included randomized controlled trials (RCTs) that compared amiodarone with placebo or standard treatment in patients undergoing cardiac surgery without preexisting atrial fibrillation. The primary outcome was the incidence of POAF. The secondary outcomes included mortality, stroke, and intensive care unit (ICU) LOS. Subgroup analyses were also conducted to assess the effects of amiodarone, specifically in patients undergoing coronary artery bypass grafting (CABG). Random-effect models were used due to anticipated heterogeneity.

**Results:** The meta-analysis included 10 RCTs with 1,574 patients undergoing cardiac surgery. The pooled analysis demonstrated that amiodarone significantly reduced the incidence of POAF compared to placebo or standard treatment (RR 0.58 [95%CI 0.47 - 0.71;  $I^2 = 24\%$ ). The subgroup analysis focusing on patients undergoing CABG also showed a significant reduction in the incidence of POAF with amiodarone (RR 0.62 [95%CI 0.44 - 0.86;  $I^2 = 41\%$ ). Additionally, amiodarone administration significantly reduced ICU LOS (SMD -0.55 [95%CI -1.06 to -0.04];  $I^2 = 89\%$ ). However, no significant effects were observed on mortality (OR 0.92 [95%CI 0.49-1.76]  $I^2 = 0\%$ ) and stroke (OR 0.50 [95%CI 0.23-1.06];  $I^2 = 0\%$ ).

**Conclusion:** This meta-analysis demonstrates the effectiveness of amiodarone as a prophylactic intervention in reducing the incidence of postoperative atrial fibrillation in patients undergoing cardiac surgery without preexisting atrial fibrillation. While no significant effects were observed on mortality and stroke outcomes, amiodarone administration was associated with a significant reduction in ICU LOS. Incorporating amiodarone into the perioperative management of cardiac surgery patients holds considerable potential for improving clinical outcomes by mitigating the risks associated with POAF.

**Keywords:** amiodarone, postoperative atrial fibrillation, cardiac surgery, coronary artery bypass graft



**Figure 1.** Random-effect model forest plot of postoperative atrial fibrillation in patients undergoing cardiac surgery



### Amiodarone for Atrial Fibrillation Post-Cardiac Valve Replacement Surgery: Meta-analysis Reveals Improved Sinus Rhythm and Intensive Care Outcomes

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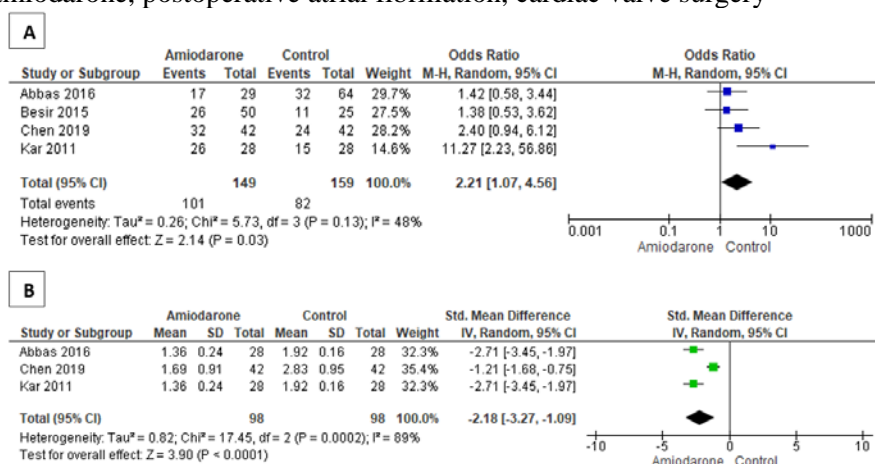
**Background and aims:** Postoperative atrial fibrillation (POAF) is a common and concerning complication following cardiac surgery. Amiodarone, an antiarrhythmic medication, has been investigated as a potential preventive strategy for POAF. This meta-analysis aims to evaluate the effectiveness of amiodarone compared to placebo or standard treatment in reducing the incidence of POAF in patients undergoing cardiac surgery without preexisting atrial fibrillation.

**Materials and Methods:** A systematic literature search was conducted in Pubmed, EMBASE, Scopus, Proquest, and ScienceDirect for articles published until July 2023. Randomized controlled trials (RCT) comparing amiodarone with a placebo or standard therapy for the prevention or treatment of POAF in patients after cardiac valve replacement were included. Data extraction and quality assessment were performed independently by two reviewers. The primary outcome measures were the composite sinus rhythm conversion and maintenance, and the secondary outcomes were intensive care unit length of stay (ICU LOS) and inotropic use.

**Results:** A total of 4 RCTs involving 308 patients undergoing cardiac valve surgery were included in the meta-analysis. The pooled analysis using the random-effect model demonstrated that amiodarone significantly increased the composite sinus rhythm conversion and maintenance compared to control groups (OR 2.21 [95%CI: 1.07-4.56];  $I^2 = 48\%$ ). Additionally, amiodarone was found to benefit the clinical outcomes in the ICU, with a significant reduction in inotropic use (OR 0.20 [95% CI: 0.07-0.54];  $I^2 = 0\%$ ) and a shortened ICU LOS (SMD -2.18 [95% CI: -3.27 to -1.09];  $I^2 = 89\%$ ).

**Conclusion:** This meta-analysis provides robust evidence supporting the use of amiodarone for postoperative atrial fibrillation (POAF) management in patients after cardiac valve replacement. Amiodarone significantly increased the composite sinus rhythm conversion and maintenance, indicating its efficacy in restoring and sustaining normal heart rhythm. Moreover, using amiodarone was associated with improved clinical outcomes in the ICU, including a reduction in inotropic use and a shortened length of stay. These findings suggest that amiodarone benefits arrhythmia control and patient recovery following cardiac valve replacement.

**Keywords:** amiodarone, postoperative atrial fibrillation, cardiac valve surgery



**Figure 1.** Random-effect model of (A) composite sinus rhythm conversion and maintenance; and (B) ICU length of stay



## Heart Failure Incidence Comparison in Patients Receiving Right Ventricular Septal Pacing vs. Right Ventricular Apical Pacing: A Systematic Review

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### Background and Aims:

A cardiac pacemaker is currently the best way to treat many bradyarrhythmias. Right ventricular leads are typically positioned at the apex, although mounting evidence indicates that this practice may be detrimental to heart performance. As a result, different sites have been investigated; one of these is pacing of the RV septum. When opposed to apical pacing, septal pacing is believed to offer a more natural activation sequence, which may improve heart performance and synchronization. Thus, this study aims to compare the incidence of heart failure between patients receiving right ventricular apical (RVA) pacing and right ventricular septal (RVS) pacing.

### Materials and Methods:

On June 29th, 2023, this review was systematically reviewed using the keywords "right ventricular pacing" AND "apical pacing" AND "septal pacing" AND "outcome" from a number of databases, including PubMed Central (PMC), Science Direct, BMJ, MDPI, and PUBMED. The studies that met our inclusion criteria, such as cohort studies, case-control studies conducted during the previous five years, and outcomes with a death rate, were then examined and extracted. Systematic reviews, meta-analyses, case reports, case series, research on pregnant women, animal studies, and unfinished publications were all disregarded. The New-Castle Ottawa Scale (NOS) was used to evaluate each eligible study.

### Results:

A total of five cohort studies were included, consisting of 1546 patients. All studies had a good quality after assessed using NOS. Three studies showed that compared to RVA pacing, RVS pacing has a lower risk of heart failure. However, two more studies found no discernible difference in the incidence of heart failure between the two groups.

### Conclusion:

In conclusion, RVS pacing has a lower risk of heart failure compared to RVA pacing. However, additional research is required to fully understand these results due to the study's limitations, such as those that revealed no significant differences between the two groups.

**Keywords:** Right Ventricular Apical Pacing, Right Ventricular Septal Pacing, Outcome



### Prognostic Role of Soluble Suppression of Tumorigenicity 2 (sST2) in Patients with Atrial Fibrillation: A Systematic Review and Meta-Analysis

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**Background and aims:** Atrial fibrillation (AF) is the most found arrhythmia in population. Patient with AF is associated with elevated cardiovascular events and death. sST2 is a novel cardiac fibrosis biomarker commonly used in predicting clinical outcome of patient with heart failure. We aim to evaluate the prognostic role of sST2 in patient with AF.

**Materials and Methods:** A systematic search of literature was performed through Pubmed, EMBASE, Cochrane Library, Scopus, ScienceDirect, and Proquest for articles published from inception until June 11<sup>th</sup>, 2023. We include studies evaluating role of sST2 in patient with AF. The outcome of interest includes AF recurrence, all-cause mortality, and heart failure. Risk of bias assessment was conducted using Quality in Prognosis Studies (QUIPS) tool.

**Results:** A total of 3492 patients from 13 studies were included in the systematic review. Nine studies provide sufficient data to be included in the meta-analysis. Elevated sST2 level is associated with higher recurrence of AF and incidence of new onset heart failure with risk ratio (RR) 5.27 (95% CI 2.31 – 12.02) and 6.59 (95% CI 1.83 – 23.71) respectively. Higher level of sST2 in serum is also associated with higher all-cause mortality and composite of all-cause mortality and HF with adjusted HR of 1.83 (95% CI 1.27 – 2.65) and 1.65 (95% CI 1.35 – 2.00) respectively.

**Conclusion:** Elevated sST2 is associated with poorer cardiovascular outcomes in patient with atrial fibrillation and may emerge as a novel biomarker to predict mortality and recurrence of atrial fibrillation.

**Keywords:** Atrial Fibrillation, sST2, Mortality, Recurrence, Heart Failure, Prognosis

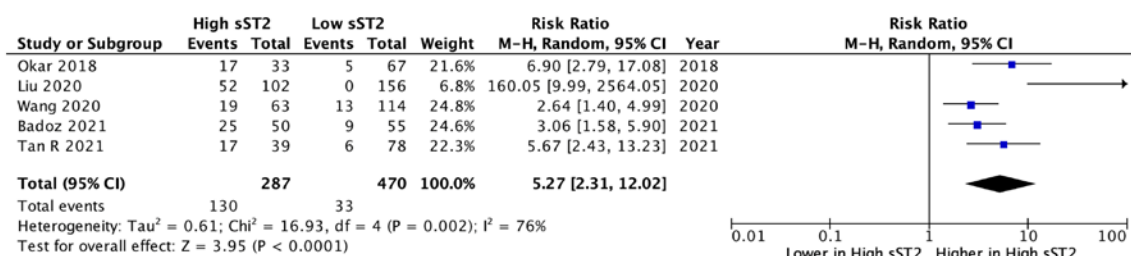


Figure 1a. Pooled Risk Ratio of sST2 in Predicting Recurrence of Atrial Fibrillation

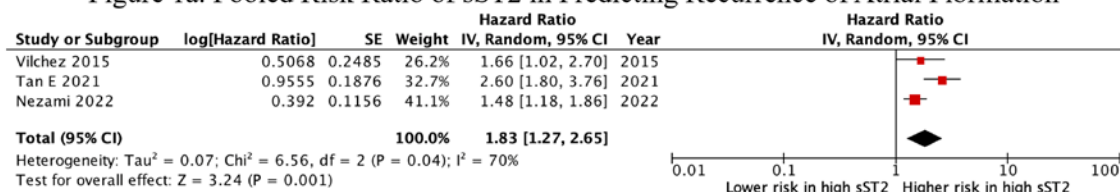


Figure 1b. Pooled Adjusted Hazard Ratio of sST2 in Predicting Mortality in Patients with Atrial Fibrillation





**Development of Non-Invasive and Clinical-Based Approach of Electrophysiological Study and Outcomes of Ventricular Arrhythmia Ablation in High-risk Repaired Tetralogy of Fallot: Systematic Review and Meta-analysis**

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**Background and aims:** Even though total repair of Tetralogy of Fallot (TOF) was done, the risk of sudden cardiac death (SCD) caused by ventricular arrhythmia (VA) in repaired TOF (rTOF) is still present. Risk stratification of rTOF who beneficial to underwent EPS and outcomes of VA ablation is still unclear. This study aims to evaluate factors associated with the development of VA in rTOF and outcomes of VA ablation.

**Materials and methods:** This systematic review and meta-analysis were conducted according to the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement. A systematic search of studies comparing the outcome of rTOF with VA ablation and rTOF without VA ablation was performed through multiple databases. Characteristics of populations with or without VA before ablation will be compared. The endpoint is VA events, SCD, and all-cause mortality (ACM) after VA ablation. Data were analyzed using Review Manager 5.4 and RStudio.

**Results:** A total of 14 studies with 1429 rTOF were included. rTOF population who developed into VA is 29.8%. The clinical factor that significantly increases the risk of VA development includes male gender [RR 2.09, 95% CI 1.27-3.45], ventriculotomy/incision history [RR 2.17, 95% CI 1.03-4.56], QRS duration >180ms [RR 2.28, 95% CI 1.45-3.59], fragmented QRS [RR 2.84, 95% CI 1.24-6.49], and moderate-severe pulmonary regurgitation [RR 3.15, 95% CI 1.48-6.73]. On non-invasive examination, High PVC burdens on 24-hour Holter monitoring and positive Late Gadolinium Enhancement increased the risk of VA [RR 3.04, 95% CI 1.54-5.85 and RR 1.15, 95% CI 1.06-1.25] (all P-value <0.05). High-risk rTOF patients underwent an EPS with VA inducibility of 77% and dramatically decreasing in VA events after ablation [RR 0.47, 95% CI 0.29–0.78, P = 0.003]. But there is no significant difference between SCD and ACM.

**Conclusion:** Tiered stratification of clinical risk, non-invasive testing, to EPS, is useful to stratify the ultimate benefit of VA ablation on rTOF.

**Keywords:** *Tetralogy of Fallot, risk factor, sudden cardiac death, ventricular arrhythmia, ablation*



## Future Direction of Catheter Ablation and Hybrid Thoracoscopic Radiofrequency Ablation of Arrhythmogenic Substrates in Inherited Primary Arrhythmia Syndromes: Systematic Review and Meta-analysis

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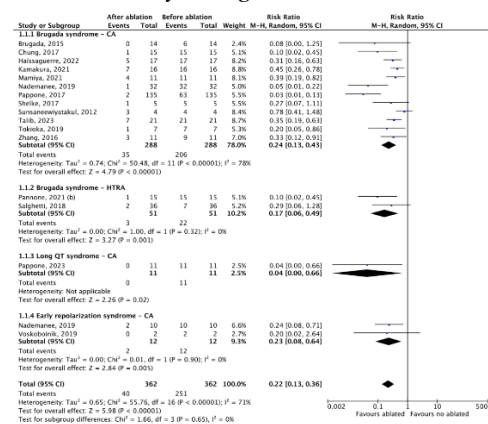
**Background and aims:** Currently, implantable cardioverter defibrillator (ICD) is proven effective prophylaxis of sudden cardiac death (SCD), but not preventing ventricular arrhythmia (VA). Some study report “arrhythmogenic substrate” on each inherited primary arrhythmia syndrome (IPAS), however ablation outcome in this location is still not established. Aims of this study is to evaluate the long-term outcome of catheter ablation (CA) and hybrid thoracoscopic radiofrequency ablation (HTRA) on IPAS.

**Materials and methods:** This systematic review and meta-analysis were conducted according to the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement. A systematic search of studies reporting VA events before and after CA and/or HTRA on IPASs, including Brugada syndrome (BrS), Long-QT syndrome (LQTS), Early repolarization syndrome (ERS), dan Idiopathic ventricular fibrillation (IVF) was performed through multiple databases. The primary outcome of this study is VA recurrency and VA burdens by conditional subgroup analysis. A random-effects model of the proportional meta-analysis was used to estimate the overall proportion of each arrhythmogenic substrate characteristics using R software (version 4.1.3), and the primary outcome was analyzed using Review Manager 5.4 by fixed-effect or random-effect Mantel-Haenszel (M-H) risk ratio (RR).

**Results:** A total of 24 studies with 635 IPASs who underwent CA/HTRA was included in this study. Arrhythmogenic substrates were distributed dominantly in epicardial RVOT on BrS dan LQTS [Proportion 0.99; 95% CI (0.96-1.00) and Proportion 0.45; 95% CI 0.16-0.75], however, on ERS had similar distribution on RV inferior and LV. All patients discontinued anti-arrhythmic drugs unless there was a recurrence. After the mean follow-up time of 32.64 months, even if there was a recurrence, CA and HTRA of arrhythmogenic substrate significantly decrease the risk of VA recurrency and VA burdens on BrS, ERS, and LQTS [RR 0.22; 95% CI (0.13–0.36); P <0.001; I<sup>2</sup> = 71%, and MD –4.70; 95% CI (–6.11– (–3.29); P <0.001; I<sup>2</sup> = 74%].

**Conclusion:** CA and HTRA on IPAS effectively decrease VA recurrence risk. Even though the recurrency does not reach 0%, but ablation strategy can provide a benefit in reducing VA burdens.

**Keywords:** *Inherited primary arrhythmia syndrome, brugada syndrome, catheter ablation, surgical ablation, arrhythmogenic substrate.*





**Fluorless Future of Catheter Ablation in Pediatric Arrhythmias With or Without Congenital Heart Disease by 3D-Electroanatomical Mapping Guidance of Zero or Near-zero Fluoroscopy Approach: Systematic Review and Meta-analysis**

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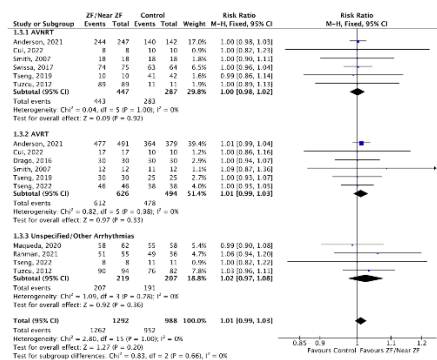
**Background and aims:** Catheter ablation (CA) procedures using fluoroscopy have severe adverse events, such as the risk of malignancy or other adverse events. Especially in pediatrics, which has increased three to four times; in addition, this population is still in the early stages of development and has a longer life expectancy than adults. 3D-electroanatomical mapping (3D-EAM) established a decrease in fluoroscopy usage, but the effectiveness in pediatric arrhythmia remains unclear. This study compares the outcome of 3D-EAM guided zero fluoroscopy (ZF) or near-zero fluoroscopy (NZF) with the conventional fluoroscopy approach CA of pediatric arrhythmias.

**Materials and methods:** This systematic review and meta-analysis were conducted according to the Preferred Reporting Items for Systematic Review and Meta-Analyses statement. A systematic search of studies comparing the outcome of 3D-EAM guided ZF/NZF with conventional fluoroscopy CA on pediatric populations with or without congenital heart disease (CHD) was performed through multiple databases. A group with a mean fluoroscopy time <1.5 minutes on population was included as NZF. The primary outcome of this study is an acute success, arrhythmia recurrence, and complication with subgroup analysis based on CHD existence and type of arrhythmia. We also analyzed procedural time as the secondary outcome. Data were analyzed using Review Manager 5.4.

**Results:** A total of 10 studies with 2279 pediatrics who underwent CA were included in this study. 3D-EAM guided ZF/NZF CA is significant in decreasing radiation exposure [MD -132.11mGy; 95% CI (-218.00mGy - (-46.23mGy); P = 0.003; I<sup>2</sup> = 84%], and fluoroscopy time [MD -15.93 minutes; 95% CI (-22.57 minutes - (-9.29 minutes); P <0.001; I<sup>2</sup> = 98%]. ZF/NZF in pediatrics with or without CHD population had an equivalent outcome on acute success and arrhythmia recurrence compared with conventional fluoroscopy CA (all P-value >0.05). ZF/NZF CA on the overall population associated with lower complications [OR 0.34; 95% CI (0.14-0.82); P=0.02; I<sup>2</sup> = 0%] but comparable results on the CHD subgroup (P >0.05).

**Conclusion:** ZF/NZF approach CA on the pediatric population is a procedure that is worth doing routinely to reduce the disadvantages of fluoroscopy.

**Keywords:** Pediatric arrhythmia, ablation, 3D-electroanatomical mapping, fluoroscopy, congenital heart disease.





**Can enhanced external counterpulsation be used as a promising modality in treatment of refractory angina pectoris patients? : A meta-analysis**

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**Background and aims**

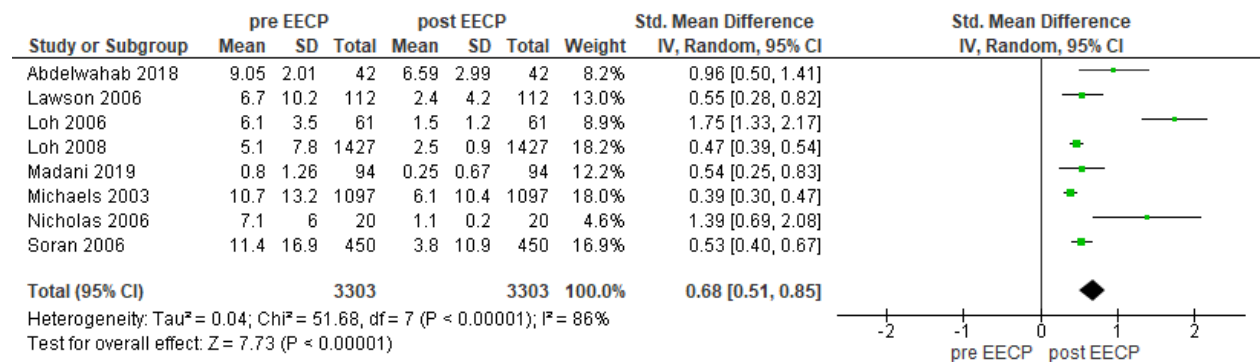
Enhanced external counterpulsation (EECP) is a non-invasive treatment for patients with stable coronary artery disease (CAD) or patient with refractory angina pectoris. Despite of treatment with PCI or CABG generally successful, number of patients with ischemic chest pain has increase or increase hospitalization rates. To cope with these problems, EECP method in several studies was reported as one of the promising treatments for relieving angina symptoms. The aim of this study was to evaluate the effectiveness of EECP for the treatment of patients with refractory angina pectoris

**Materials & Methods**

Comprehensive collection of literature sources extracted from the PubMed, Google Scholar and Scopus database which assessed the effect of Enhanced external counterpulsation (EECP) treatment on patients with chronic stable angina. The keywords used are ; eecp (enhanced external counterpulsation), refractory angina, hospitalization, nitroglycerin. Data were analyzed using Review Manager 5.3. Standard mean difference method were used to pool the data. Pooled estimate is performed using random-effects model in case of heterogeneity.

**Result**

Ten studies were reviewed with total 5677 participants in comparing the condition of pre and post EECP patients within a certain time. The parameters assessed were weekly angina frequency, use of nitroglycerin, and hospitalizations rate. The results showed significant effect post EECP treatment in all parameters; weekly use og nitroglycerin (Std mean difference = 1.78, 95% CI (0.48-0.99), p< 0.00001) ; weekly angina frequency (Std mean difference = 0.68, 95% CI (0.51-0.85), p< 0.00001) ; Hospitalization rate (Std mean difference = 0.79, 95% CI (0.32-1.26), p< 0.00001



**Figure 1. Forest plot analysis of the weekly angina frequency**

**Conclusion**

There is significant effect post EECP in reducing angina symptoms in patients with refractory angina pectoris, it also provide change in use of nitroglycerin, and reduce the number of hospitalization.

**Keyword**

Enhanced external counterpulsation (EECP), refractory angina pectoris, Nitroglycerin



## Efficacy Of Cell Therapies in Congenital Heart Disease: A Systematic Review and Meta-Analysis

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**Background and Aims:** Less than one half of patients diagnosed with critical congenital heart disease (CCHD) will survive into adulthood. Although surgical advancements have prolonged survival, many patients will develop cardiac morbidities that will eventually necessitate heart transplantation. As pediatric donors are scarce, novel therapies are warranted to preserve cardiac function. Literature in adults suggests regenerative therapies are safe and efficacious in patients with heart failure. Currently, early phase clinical trials utilizing regenerative cells for CCHD and other pediatric heart conditions are ongoing. We conducted a systematic review and meta-analysis of pre-clinical and clinical studies to test the hypothesis that cell-based/derived therapies for congenital heart disease.

**Materials and Methods:** This study was traced from Google Scholar, Pubmed, Science Direct, and Elsevier Clinicalkey digital search pages. This study included a phase I and II study that assessed patients with congenital heart diseases and was given with cell therapy VS control, followed by an assessment through echocardiography and Cardiac MRI. Quality assessment was carried out using Cochrane's Review Manager 5.4 application. A meta-analysis assessment was performed based on the Mean Differences (MD), with a 95% confidence interval (95% CI) and a significance value <0.05.

**Results:** While twelve of thirteen studies assessed EF, only three of those studies underwent meta-analysis due to lack of a suitable control arm in the remaining Three hundred sixty respondents were obtained from three combined articles contributing to this study. All of these studies compared the use of azithromycin alone and in combination. Cell-based therapy preserved EF compared to controls [MD 5.93; 95% CI (2.28, 9.58); p = 0.001].

**Conclusion:** Cell-based therapy effectively maintains ejection fraction in children with congenital heart disease. Advanced trials, such as phase three clinical trials and randomized controlled trials, need to be conducted with caution in further assessing the benefit of this therapy.

**Keywords:** Congenital Heart Disease, Cell-based Therapy, Heart Failure

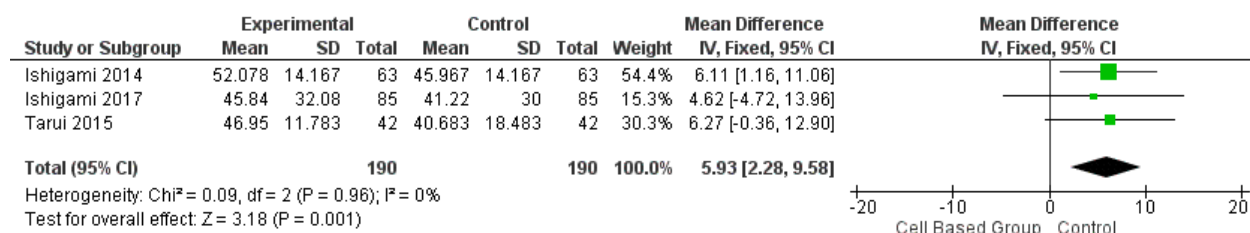


Figure 1. Forest Plot of Regenerative Cells on Ejection Fraction.



## Improvement from Left Bundle Branch Pacing as Cardiac Resynchronization Therapy, More Effective? : A Systematic Review and Meta-analysis

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**Background and Aims:** Cardiac Resynchronization Therapy (CRT) is indicated in heart failure patients with decreased Left Ventricular Ejection Fraction (LVEF) and Left Bundle Branch Block (LBBB) with LV dyssynchrony. Left bundle branch pacing (LBBP) gives a new strategy of CRT in treating heart failure patients. This review aims to find out functional and echocardiographic improvement in heart failure patients treated with LBBP.

**Material and Methods:** This review was conducted from 1-10 July 2023. Two independent researchers extracted data from PubMed Central, Science Direct, Europe PMC, and PUBMED using keywords “biventricular pacing”, “left bundle branch pacing”, “cardiac resynchronization therapy”, and “heart failure”. The extracted studies were then analyzed according to our inclusion criteria such as cohort studies, case-control studies within the last 5 years, and patients treated with LBBP. We excluded systematic reviews, meta-analyses, case series, case reports, studies on pregnant women, children. We use the PRISMA 2020 checklists and Newcastle Ottawa Scale (NOS) for quality assessment. Data analysis was performed using Cochrane RevMan 5.4.

**Results:** We found 4 cohort studies consisting of 145 heart failure subjects treated with LBBP as CRT. Comparing baseline and follow-up, all of them showed LBBP results in improvement of Left Ventricle Ejection Fraction (LVEF) on follow-up (WMD = -18.91, 95%CI: -22.36 ~ -15.46, P = 0.02, I<sup>2</sup> = 70%). Three of them also found NYHA Class improvement (WMD = 1.5, 95%CI: 1.34-1.66, P = 0.64, I<sup>2</sup> = 0%). Besides them, there is a reduction of some echocardiographic parameters like LV End-Diastolic Diameter, LV End-Systolic Volume, and LV End-Diastolic Volume (WMD = 10.35, 95%CI: 7.45-13.24, P = 0.09, I<sup>2</sup> = 59%; WMD = 73.19, 95%CI: 62.17-84.21, P = 0.4, I<sup>2</sup> = 0%; WMD = 76.50, 95%CI: 56.72-96.29, P = 0.11, I<sup>2</sup> = 54%, respectively). All studies showed to be in good quality by NOS.

**Conclusion:** In conclusion, we found that LBBP showed improvement of functional class and echocardiographic parameters in heart failure patients. However, more comprehensive further studies were required since this review only included NYHA class and some echocardiographic parameters as outcome.

**Keywords:** biventricular pacing; left bundle branch pacing; cardiac resynchronization therapy; heart failure



**Effect of Right Ventricular Apical Pacing Versus Septal Pacing on Left Ventricle Ejection Fraction: A Systematic Review and Meta Analysis**

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**Background and Aims:** Right Ventricular Apical Pacing (RVAP) has been the preferred pacing site for decades but chronic use can deteriorate cardiac function. Right Ventricular Septal Pacing (RVSP) has emerged as an alternative site but its benefits over RVAP remain unclear. The aim of this review is to compare the Left Ventricle Ejection Fraction (LVEF) between RVAP group and RVSP group.

**Materials and Methods:** Review was conducted (20-28 June 2023) and systematically extracted from several databases such as PubMed, PMC, Science Direct, BMJ and MDPI using the following keywords "right ventricular pacing" AND "apical pacing" AND "septal pacing" AND "outcome". Extracted studies will be analyzed through several inclusion criteria such as studies published in the last 10 years, cohort studies, observational studies and LVEF outcome. Pregnant women, children, case reports, case series, systematic review and meta-analysis were excluded in this study. The quality of studies included was assessed using Newcastle-Ottawa Scale (NOS).

**Results:** We found 3 cohort studies (597 subjects). Changes of LVEF from baseline to 2 years follow-up in RVAP is higher than RVSP (RVAP MD: 6.90, 95%CI: 0.48-13.32 vs RVSP MD: 3.02, 95%CI: 1.16-4.88). We also found the difference of LVEF between final follow-up in RVAP vs RVSP where RVAP was 5.06 lower than RVSP (95%CI: -1.72-11.80). Although the analysis showed RVSP results in higher LVEF as shown in two studies, the last one showed there was no significant difference in LVEF related to lead position. Included studies had a good quality after assessed using NOS.

**Conclusion:** In conclusion, RVSP results in a little lower LVEF reduction than RVAP. However, further study is needed to confirm these findings since the results are not much different.

**Keyword:** right ventricular pacing, apical pacing, septal pacing, outcome



## Minimal Fluoroscopy Approach for Permanent Cardiac Electronic Device Implantation: A Systematic Review and Meta-Analysis

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**Background:** Fluoroscopy is conventionally performed for cardiac implantable electronic device (CIEDs) therapy and carries radiation drawback for both patients and medical workers. Recently, zero to minimal fluoroscopy (ZMF) approach is introduced to reduce radiation exposure of fluoroscopy. This study compares the feasibility and safety of ZMF approach to fluoroscopy for permanent CIEDs therapy in adults.

**Materials and Methods:** A systematic literature search was conducted on PubMed, ScienceDirect, and Web of Science in March 2023. All observational or experimental studies comparing ZMF approach to fluoroscopy for adult permanent CIEDs therapy were included. Reviews, case report/series, animal studies, and non-English articles were excluded. The success rate, procedural time, fluoroscopy time, radiation dose, and complications rate were compared for each approach.

**Results:** Seven articles were included for analysis. All study used minimal fluoroscopy approach by 3D-Electroanatomic mapping. No included study used zero fluoroscopy method. The success rate, procedural time, and complication rate of ZMF for permanent CIEDs was similar to conventional method (OR:0.77, 95%CI: 0.33–4.15; SMD: 0.10, 95%CI: -0.35–0.55; and OR: 1.08, 95%CI: 0.41–2.84, respectively). The fluoroscopy time and radiation exposure were markedly reduced under ZMF approach (SMD: -1.80, 95%CI: -2.49–-1.12 and SMD: -1.26, 95%CI: -2.24–-0.29, respectively).

**Conclusion:** Minimal fluoroscopy had similar success rate, procedural time, and sum complication rate for permanent CIEDs implantation with a significant reduction of fluoroscopy time and radiation exposure.

**Keywords:** *Fluoroscopy, Cardiac Resynchronization Therapy, Heart Failure, 3D- Electroanatomic Mapping, Bradyarrhythmia*





**All-cause Death Rate Comparison in Patients Receiving Right Ventricular Septal Pacing vs. Right Ventricular Apical Pacing : A Systematic Review**

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**Background and Aims:**

The cardiac pacemaker continues to be the most successful therapy for various bradyarrhythmias. The number of patients undergoing pacemaker implantation worldwide is rising, with one million individuals receiving this treatment annually. Nonetheless, long-term right ventricular (RV) pacing could have harmful effects. There is a lack of consensus on the optimal positioning of the RV pacing lead. Studies investigating the safety and long-term prognosis of apical and septal right ventricular lead placement have been lacking. This study aims to compare the death rate between patients receiving right ventricular septal pacing versus right ventricular apical pacing.

**Materials and Methods:**

This review was systematically reviewed from several databases, such as PubMed Central (PMC), Science Direct, Europe PMC, and PUBMED on June 29th 2023 using the following keywords “right ventricular septal pacing” and “right ventricular apical pacing.” The extracted studies were then analyzed and extracted according to our inclusion criteria such as cohort studies, case-control studies within the last 5 years, and outcome with death rate. We excluded systematic reviews, meta-analyses, case series, case reports, studies on pregnant women, children. All eligible studies were assessed using New-Castle Ottawa Scale (NOS).

**Results:**

We found 4 cohort studies (1453 subjects). The studies showed various results where 2 studies preferred right ventricular septal pacing, 1 study showed better results with right ventricular apical pacing, and 1 study stating both are reasonable. In the 2 studies that support right ventricular septal pacing, it stated that it is safer and provides clinical benefits such as lowers the risk of heart failure compared to apical pacing. However the 1 study contradicted that, right ventricular septal pacing does not provide a protective effect on left ventricular function in patients with high-grade AV block in the first 2 years.

**Conclusion:**

In this study, we found that the death rate between right ventricular septal and apical pacing is not clear. There is still lack of evidence whether right ventricular septal or apical pacing is safer. Further studies are required to confirm these findings.

**Keywords:** “right ventricular septal pacing” and “right ventricular apical pacing”



## Efficacy and Safety of Empagliflozin as a Potential Treatment for Patients with Heart Failure without Diabetes

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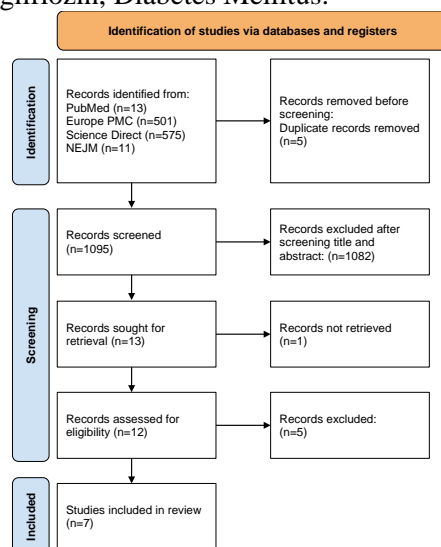
**Background and aims:** Heart Failure (HF) is a clinical syndrome that involves the structural impairment of ventricles due to disorders of the pericardium, myocardium, valves, and others, which leads to inadequate cardiac output to support the body's metabolic demands. This has caused an increase in morbidity and mortality rates worldwide. It is said that Empagliflozin has significantly reduced the risk of hospitalization and death for heart failure without diabetes. However, studies about it are still limited. This study aims to evaluate the efficacy and confirm the safety of Empagliflozin for patients with heart failure without diabetes.

**Materials and methods:** All included Randomized Controlled Trials (RCT) studies were collected from several databases, such as PubMed, Europe PMC, Science Direct, and NEJM by using the keywords "empagliflozin" AND "heart failure" AND "without diabetes", searched until June 2, 2023. Five authors searched, extracted, and evaluated the studies with inclusion criteria as RCTs within the last 5 years. We excluded studies on patients under 18 years old and studies on animals. In addition to that, the JADAD scale was used in the process of assessing the quality of the included studies.

**Results:** Seven RCTs were included after screening with a total of 10157 subjects with heart failure. Six studies confirm that empagliflozin significantly reduced the risk of heart failure outcomes, cardiovascular death, and hospitalization for heart failure, in the absence of diabetes and is safe to use. However, one of the studies indicated that empagliflozin did not affect patients with no significant heart failure. During quality assessment using the JADAD scale, two studies were high in quality and five studies were moderate in quality.

**Conclusion:** Empagliflozin showed promising efficacy and safety as a potential therapy for patients with HF without diabetes. However, further study is needed to confirm these findings.

**Keywords:** Heart failure, Empagliflozin, Diabetes Mellitus.





## THE BEST CHOICE ANTIDEPRESSANT DRUG FOR MAJOR DEPRESSION AMONG PEOPLE WITH ARRHYTHMIA

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### Background and aims

Major depression is a highly common and disabling mental health disorder. Antidepressant medications, such as selective serotonin reuptake inhibitors (SSRIs), atypical antidepressants, selective norepinephrine reuptake inhibitors (SNRIs), and tricyclic/tetracyclic antidepressants (TCAs), are commonly prescribed but need close follow-up due to documented cardiovascular risks including arrhythmias, QT prolongation, and torsade de pointes (TdP). Limited studies have assessed the safety and efficacy of antidepressants in individuals with depression and arrhythmias. This literature review aims to comprehensively evaluate and compare the existing evidence on the use of antidepressants in this population.

### Material and methods

To identify relevant studies, a literature search was conducted on electronic databases including PubMed, Google Scholar, and Science Direct. The inclusion criteria encompassed studies that investigated the use of antidepressant medications in individuals with major depression and arrhythmias. The search utilized various combinations of keywords such as "antidepressant," "arrhythmia," and their synonyms, employing logical operators "OR" and "AND" to refine the search results.

### Results

Antidepressant use in patients with major depressive disorder with arrhythmias has cardiovascular effects. TCAs produce cardiac arrhythmias such as ventricular fibrillation, ventricular premature beats, and re-entry arrhythmias because they affect electrical conduction. In addition, the risk of diastolic hypotension, tachycardia, acute myocarditis, and prolonged QTc is often found with the use of MAOIs. SNRIs have side effects of tachyarrhythmia, hypertensive crisis, and prolonged QTc thus need blood pressure monitoring, especially Venlafaxine. SSRIs are the most common antidepressants given to depressed patients. Although they have side effects such as orthostatic hypotension, mild bradycardia, and conduction abnormalities such as prolongation of QT interval. However, SSRIs do not lead to serious cardiovascular problems as long as they are used in recommended doses. Atypical antidepressants are drugs that have minimal cardiovascular side effects. In overdose, these drugs may affect heart rate. Trazodone causes prolonged QTc, impaired atrioventricular conduction, and orthostatic hypotension.

### Conclusion

SSRIs are the main choice of antidepressant drugs with no serious arrhythmia problems. An ECG is required to monitor the effect of the drug on arrhythmia.

**Keywords:** Antidepressant drug; major depression; arrhythmia



## Clinical Predictors of Postoperative Atrial Fibrillation after Coronary Artery Bypass Grafting – A Systematic Literature Review and Meta-Analysis

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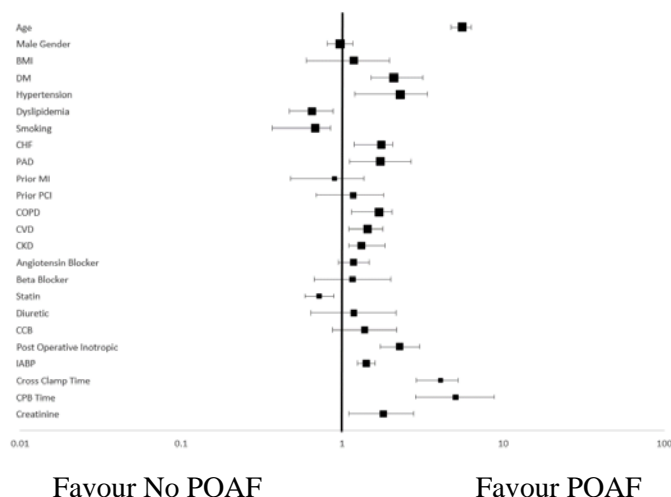
**Background and Aims:** The most common arrhythmia following cardiac surgery is atrial fibrillation (AF). Recent studies have showed that between 25 and 40 percent of postoperative patients get AF after undergoing coronary artery bypass graft (CABG). Postoperative atrial fibrillation (POAF) has been linked to an increased risk of mortality, heart failure, cerebrovascular illness, longer hospitalisation, renal insufficiency, and increased social expenditures. There are many risk models developed to predict the incidence of POAF based on clinical characteristics, though the result was conflicting between each models. This meta-analysis aim was to determine the clinical models which could predict POAF in patient underwent isolated CABG surgery.

**Materials and methods:** Multiple databases including *PubMed*, *Scopus*, and *ScienceDirect* database were searched for relevant studies in English before June 2023. Full-text articles of studies are used to compare the various clinical risk factors of POAF after isolated CABG surgery. Review Manager 5.4 was used to estimate the effects of those risk factors among eligible articles. The quality of research methods was evaluated using Newcastle Ottawa Scale.

**Results:** There were total of 19 studies with 23.014 participants, comprising 5248 patients with POAF and 17766 patients without POAF. The analysis results showed that risk of POAF could increase in patient with: older age, diabetic mellitus (DM), hypertension, chronic heart failure (CHF), peripheral arterial disease (PAD), chronic obstructive pulmonary disease (COPD), cerebrovascular disease (CVD), chronic kidney disease (CKD), longer using inotropic agent post operative, higher level of postoperative creatinine, using intra-aortic balloon pump (IABP), longer cardiopulmonary bypass (CPB) time, and longer aortic cross clamp (ACC) time. Among them older age had the greatest impact of POAF risk with OR 95%CI = 5.56 [4.76 – 6.35]. Preoperative statin treatment could reduce the risk of POAF, surprisingly, history of dyslipidaemia and current smoking also reduce those risk.

**Conclusion:** Our meta-analysis shows that older age, DM, hypertension, CHF, PAD, COPD, CVD, CKD, longer using inotropic agent post operative, higher level of postoperative creatinine, using IABP, longer CPB time, and longer ACC time were associated with increased risk of POAF.

**Keywords:** *postoperative atrial fibrillation; coronary artery bypass graft; predictors*



**Figure 1.** Forest plot of clinical predictors of POAF



**Effectiveness of Low Level Vagus Nerve Stimulation in Suppressing Atrial Fibrillation  
– A Systematic Literature Review and Meta-Analysis**

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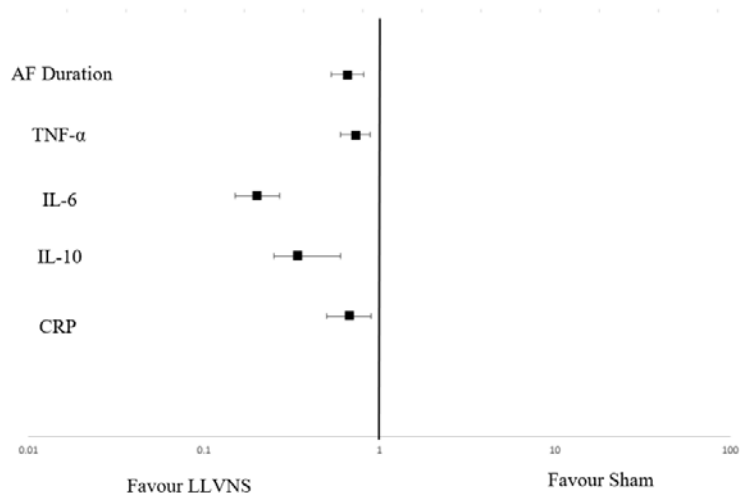
**Background and Aims:** The cardiac autonomic nervous system (CANS) plays an important role in the pathophysiology of atrial fibrillation (AF), especially in early stages. Several studies have shown that autonomic neuromodulation with low-level vagus nerve stimulation (LLVNS) can suppress AF in experimental models through neural and inflammatory pathway. There are increasing evidences that inflammation may play a major role in cardiovascular diseases including AF. In 2003, Guadino et al has demonstrated that interleukin (IL) and C-reactive protein (CRP) has been associated with AF incidence. This meta-analysis aim was to determine the effectiveness of LLVNS in suppressing atrial fibrillation.

**Materials and methods:** Multiple databases including *PubMed*, *Scopus*, and *ScienceDirect* database were searched for relevant studies in English before June 2023. Full-text articles of studies are used to evaluate the effectiveness of LLVNS in reducing the incidence of AF and inflammatory markers which contribute in AF. Review Manager 5.4 was used to estimate the effects of those risk factors among eligible articles. The quality of research methods was evaluated using Newcastle Ottawa Scale.

**Results:** There were total of 5 studies with 222 participants, comprising 107 patients as LLVNS group and 115 patients as sham group. The analysis results showed that LLVNS has better outcome compared with sham group in shorter AF duration (OR 95%CI = 0.66 [0.53 – 0.81]), lower TNF- $\alpha$  level (OR 95%CI = 0.73 [0.6 – 0.88]), lower IL-6 level (OR 95%CI = 0.2 [0.15 – 0.27]), lower IL-10 level (OR 95%CI = 0.34 [0.25 – 0.6]), and lower CRP level (OR 95%CI = 0.67 [0.5 – 0.9]).

**Conclusion:** Our meta-analysis suggest that LLVNS suppresses AF and attenuate inflammatory marker in AF patients, supporting its use to treat AF patients.

*Keywords: low level vagus nerve stimulation; atrial fibrillation; inflammatory markers*



**Figure 1.** Forest plot of outcome comparison between LLVNS and sham control



## Predictive Markers for Irreversible Left Ventricular Dysfunction Following Catheter Ablation in Patients with Premature Ventricular Contraction Induced Cardiomyopathy – A Systematic Literature Review and Meta-Analysis

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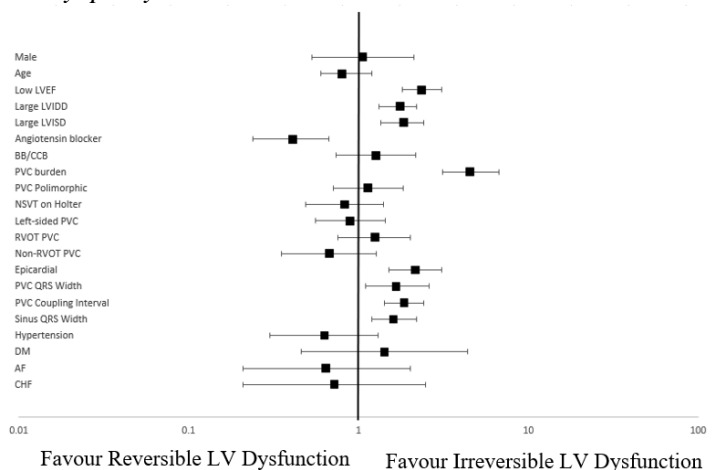
**Background and Aims:** Frequent premature ventricular contraction (PVC) can lead to PVC-induced cardiomyopathy (PIC), which in turn can result in a left ventricular (LV) dysfunction. Catheter ablation has progressively become a potential first-line therapy in patients with PVC-induced cardiomyopathy and should be strongly considered. However, the irreversibility of LV dysfunction after catheter ablation in PIC patient is still in shade. We carried out a systematic literature review and meta-analysis in order to identify the factors that are capable of accurately predicting the irreversibility of LV dysfunction following catheter ablation in PIC patient.

**Materials and methods:** Multiple databases including *PubMed*, *Scopus*, and *ScienceDirect* database were searched for relevant studies before June 2023. Literatures was screened by using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). It would be assessed further for its variables which could predict the LVEF improvement in PIC patients who underwent catheter ablation. Review Manager 5.4 software was used to compile and show the summary of included studies through a random or fixed effect model. The quality of research methods was evaluated using Newcastle Ottawa Scale tool.

**Results:** Seven studies involving 521 patients were included. We found irreversible left ventricular dysfunction in PIC patients underwent catheter ablation were associated with low baseline LVEF (OR 95%CI = 2.35 [1.8 – 3.1]), large LVIDD (OR 95%CI = 1.75 [1.32 – 2.2]), large LVISD (OR 95%CI = 1.85 [1.36 – 2.42]), high PVC burden (OR 95%CI = 4.51 [3.14 – 6.7]), epicardial origin (OR 95%CI = 2.16 [1.5 – 3.1]), wide PVC QRS duration (OR 95%CI = 1.66 [1.1 – 2.6]), long PVC coupling interval (OR 95%CI = 1.85 [1.42 – 2.41]), and wide sinus QRS duration (OR 95%CI = 1.6 [1.2 – 2.2]). Moreover, administration of angiotensin blocker (ACE inhibitor or ARB) could increase possibility of reversible left ventricular dysfunction in such patient with OR 95%CI = 2.44 [1.49 – 4.2]).

**Conclusion:** Our meta-analysis shows that high PVC burden, low baseline LVEF, and epicardial origin of PVC are the strongest predictors of irreversible left ventricular dysfunction in patient with PIC who underwent catheter ablation.

**Keywords:** left ventricular ejection fraction recovery; catheter ablation; premature ventricular complex induced cardiomyopathy



**Figure 1.** Forest plot of predictors of no reversible LV dysfunction after ablation on PIC patient



**The Effectiveness of radiofrequency catheter ablation vs Cryoablation techniques for treating atrial fibrillation: A systematic review and meta-analysis study.**

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**Background:** Atrial fibrillation (AF) must be effectively treated to reduce the risk of stroke and heart failure. Cryoballoon ablation (CBA) and radiofrequency ablation (RFA) have been proven to be effective and safe treatments for AF. This systematic review and meta-analysis compares CBA and RFA techniques for freedom from atrial fibrillation.

**Methods:** We conducted the literature review after locating articles comparing CBA and RFA techniques for AF in PubMed, ProQuest, EBSCO, Google Scholar, and Cochrane. The articles were obtained using the PRISMA diagram, evaluated via the PICO analysis, and the data was processed using review manager 5.4.1. Using aggregated risk ratio (RR) and mean difference (MD) for categorical and continuous data, respectively, overall effects were calculated. We also calculated the confidence interval (CI) at 95%.

**Result:** We included 13 papers with 2981 individuals in the sample, and there was no significant difference in freedom from atrial fibrillation over a time span of 12–30 months in patients with CBA group or RFA group (OR: 1.02 [0.87-1.19], 95% CI, I<sup>2</sup>: 24%, p=0.85). The fluoroscopy time was shorter in the RFA group (mean difference 3.07; 95% CI: -3.86 to 10.00; p 0.39).

**Conclusion:** CBA and RFA have been shown to be equally effective in the management of AF. There is no significant difference between CBA and RFA in terms of effectiveness, but the choice of technique can take into account the timing of fluoroscopy and the complications caused by each procedure.

**Effect of SGLT-2 Inhibitor on Arrhythmia In Patients With Chronic Kidney Disease: A Systematic Review And Meta-Analysis Of Randomized Controlled Trials**

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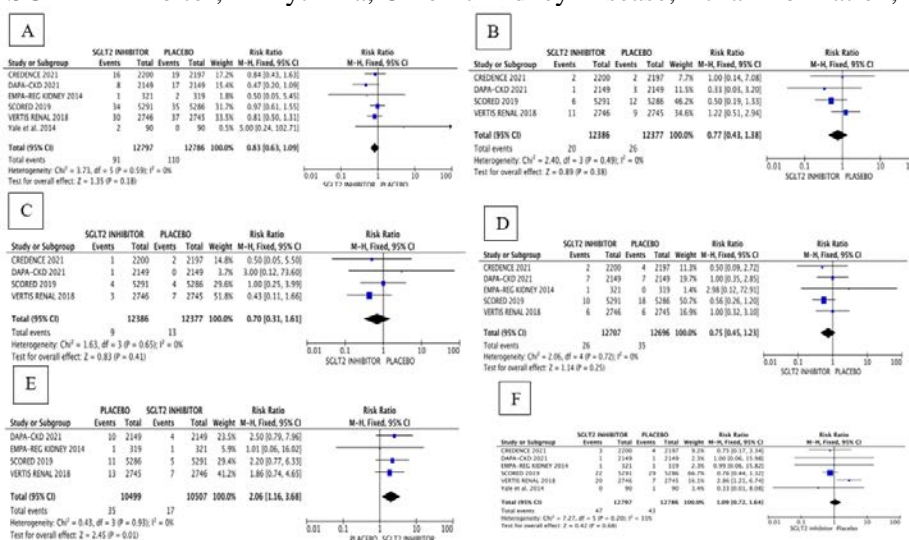
**Background and aims:** Chronic kidney disease is frequently associated as a complication and occurrence of diabetes mellitus. Diabetes mellitus type 2 is related to a high incidence of atrial fibrillation (AF) and atrial flutter (AFlut). Sodium-glucose cotransporter-2 inhibitors (SGLT2 inhibitors) have emerged as a key disease-modifying therapy to prevent the progression of chronic kidney disease (CKD). But the effects of SGLT2 inhibitor on arrhythmia in patients with chronic kidney disease (CKD) is still uncertain. We undertook a systematic review and meta-analysis to investigate the effects of SGLT2 inhibitors on arrhythmia including AF, AFlut, ventricular tachycardia (VT), atrioventricular block (AV Block), cardiac arrest, and other arrhythmias.

**Materials and Methods:** We systematically searched Scopus, Proquest, Pubmed, and the Cochrane Library for trials published in May 2023. We included prospective, randomized, controlled trials assessing the effects of SGLT2 inhibitor (SGLT2i) on arrhythmia adverse events in CKD patients. Summary estimates of relative risk (RR) reductions were calculated with a fixed effects model. This study includes six trials in which the population is 100% CKD.

**Results:** Six RCTs involving 25,583 patients were included in the meta-analysis. Compared to the control group, the SGLT2i therapy showed a statistically significant lower risk of cardiac arrest adverse events in CKD patients (Risk Ratio=2.06, 95%CI=1.16, 3.68, **p=0.01**). It also showed a lower risk of AF (p=0.18), AFlut (p=0.38), VT (p=0.41), AV Block (p=0.25), and other arrhythmias (p=0.68) in the SGLT2 inhibitor group compared to placebo but not statistically significant.

**Conclusion:** SGLT2 inhibitor is significantly associated with a lower risk of cardiac arrest adverse events. It also has a lower risk of arrhythmia and cardiac arrest adverse events but is statistically insignificant.

**Keywords:** SGLT-2 Inhibitor, Arrhythmia, Chronic Kidney Disease, Atrial Fibrillation, Atrial Flutter



**Figure 1.** Forest Plot (A) Atrial fibrillation p= 0.18; (B) Atrial flutter p=0.38; (C) Ventricular tachycardia p=0.41; (D) Atrioventricular block p=0.25; (E) Cardiac Arrest Events **p=0.01**; (F) Other Arrhythmias p=0.68





## Rhythm Versus Rate Control Strategies in Patients with Asymptomatic Atrial Fibrillation: A Systematic Review and Meta-Analysis

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**Background and aims:** Atrial fibrillation (AF) is the most common arrhythmia in population. Asymptomatic AF presents a unique challenge in clinical practice, as the absence of symptoms does not necessarily indicate a favourable outcome. This meta-analysis aimed to compare the impact of rhythm and rate control therapies in asymptomatic AF patients and to inform optimal management strategies.

**Materials and Methods:** A systematic search of literature was performed through Pubmed, EMBASE, Cochrane Library, Scopus, ScienceDirect, and Proquest for articles published from inception until June 11<sup>th</sup>, 2023. We included studies comparing the outcomes of rhythm control strategies with rate control strategies or usual care in patients with asymptomatic AF. Rhythm control strategies may include anti-arrhythmic drugs, ablation, and/or cardioversion. Risk of bias assessment was conducted using ROBINS-I and RoB-2 tools.

**Results:** A sum of 1859 patients from two studies were included in the systematic review and meta-analysis. Random-effect model showed lower risk of composite adverse outcome in asymptomatic AF patients receiving rhythm control strategies, although the association only approached statistical significance (HR 0.64 [95% CI 0.40 – 1.02];  $I^2 = 58\%$ ). However, sensitivity analysis using fixed-effect model favours rhythm control strategies (HR 0.69 [CI 95% 0.53 – 0.90];  $I^2 = 58\%$ ). Furthermore, the systematic review revealed that a study exhibited a significant effect. Subgroup analysis of the study demonstrated favourable outcomes with rhythm control strategies in patients with a left atrial diameter  $\leq 50$  mm (HR 0.36 [95% CI 0.17 – 0.77];  $p < 0.01$ ) or CHA2DS2-VASc score  $\geq 3$  (HR 0.49 [95% CI 0.24 – 0.99];  $p < 0.01$ ). These findings suggest that specific patient characteristics, such as left atrial diameter and higher CHA2DS2-VASc score, may influence the effectiveness of rhythm control therapy in asymptomatic AF.

**Conclusion:** Rhythm control strategies may have a beneficial effect in decreasing adverse outcomes of selected asymptomatic AF patients, such as those with shorter LA diameter or higher CHA2DS2-VASc scores. Further research should be conducted to explore characteristics of asymptomatic AF patients who may gain benefit from this strategy.

**Keywords:** Asymptomatic atrial fibrillation, rhythm control, rate control, outcome

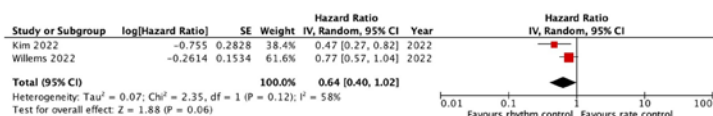


Figure 1a. Random Effect Model of Treatment Strategies in Patient with Asymptomatic AF

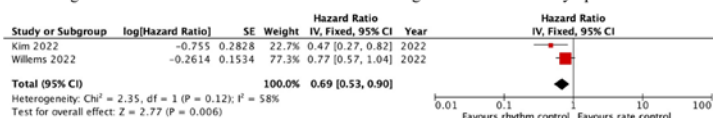


Figure 1b. Fixed Effect Model of Treatment Strategies in Patient with Asymptomatic AF



**Cardiac resynchronization therapy outcomes in narrow and wide QRS complex population: focused on left ventricular function: a systematic review and meta-analysis of randomized controlled trials.**

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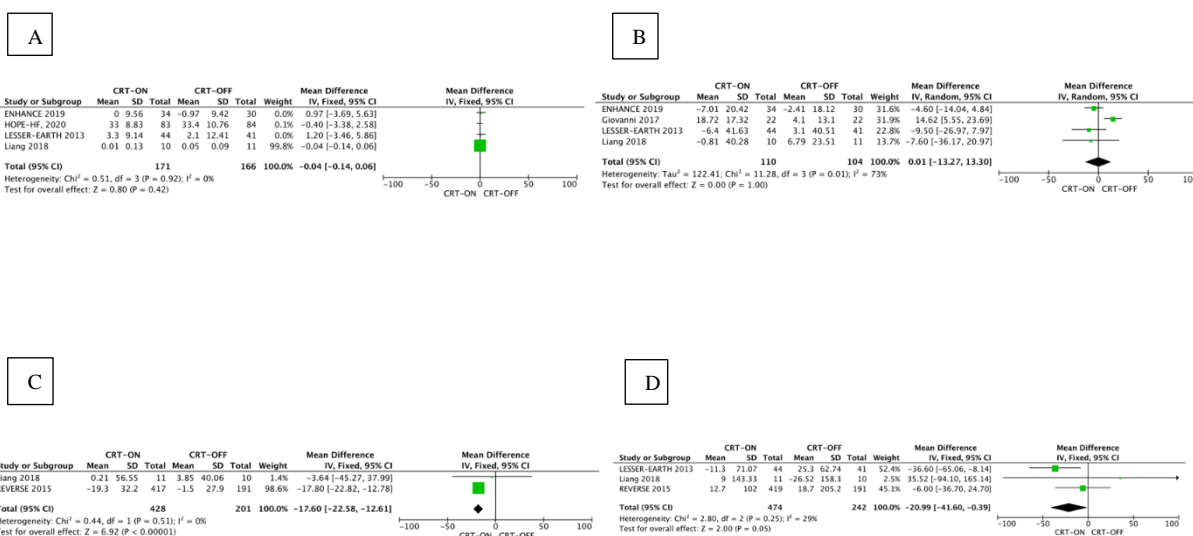
**Background and aims:** Dyssynchrony or poor ventricular coordination is a problem that causes abnormal ventricular function. Optimization of cardiac work through the use of cardiac resynchronization therapy (CRT) is increasingly being developed for improving cardiac function in patients with ventricular dyssynchrony, controversy exists in the use of CRT, especially in narrow QRS. We performed a meta-analysis in an attempt to identify the outcome after CRT was used that focused on the left ventricular function.

**Methods:** A meta-analysis of 6 randomized controlled trials, comparing the active CRT group (CRT-ON) with CRT with deactivated CRT group (CRT-OFF), was conducted including wide and narrow QRS. Outcomes were left ventricular ejection fraction (LVEF), left ventricular end-diastolic volume (LVEDV), left ventricular end-systolic volume (LVESV), and six minutes walking test (SMWT) result.

**Results:** There was a significant difference in LVEDV (mean difference: -17.60, 95% CI: -22.58, -12.61, **p<0.00001**) and 6MWT (mean difference: -20.99, 95% CI: -41.60, -0.39, **p=0.05**) between the group. Meanwhile, there was no significant difference for the LVEF (mean difference: -0.04, 95% CI: -0.14, 0.6, p=0.42) and LVESV (0.01, 95% CI: -13.27, 13.30, p=1.00) between the group.

**Conclusion:** This meta-analysis showed a significant effect on LVEDV and 6MWT between the group, the LVEF between the group was not different, and this may show the different effects of CRT in the narrow QRS complex.

**Keywords:** Cardiac resynchronization therapy; dyssynchrony; LVEF; LVEDV; LVESV



**Figure 1.** Forest Plot (A) LVEF p= 0.42; (B) LVESV p=1.00; (C) LVEDV p<0.00001; (D) 6MWT p=0.05.



**Digoxin use for long term rate control in atrial fibrillation is associated with a higher risk of all-cause mortality compared to beta-blockers – A systematic review and meta-analysis**

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**Background:** Rate control in atrial fibrillation serves to control the typical high heart rate found in atrial fibrillation patients and prevent long-term complications and outcomes derived from the high atrial rate often found in atrial fibrillation. Digoxin, a digitalis glycoside is still often used in hospitals and medical centres in Indonesia for long-term rate control in patients with chronic atrial fibrillation and heart failure, despite multiple guidelines steering away from long-term digoxin use to other antiarrhythmics such as beta-blockers and calcium channel blockers. This study aims to compare the safety of digoxin use compared to beta blockers in patients with atrial fibrillation.

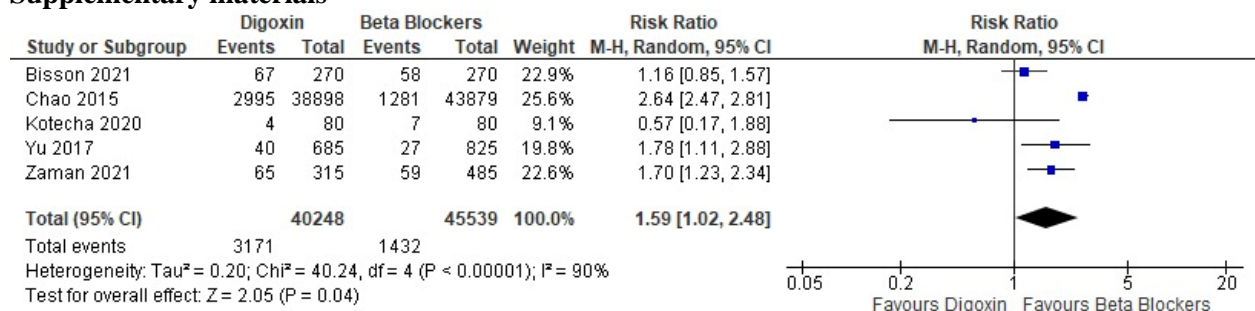
**Materials and Methods:** We searched the online databases PubMed (Search conducted on June 2023), ScienceDirect (Search conducted on June 2023), and Cochrane Library (Search conducted on June 2023) for studies evaluating the use of digoxin and betablockers in patients with chronic atrial fibrillation with or without heart failure. Using a random effects model, weighted relative risk (WRR) with 95% confidence interval (CI) were used to measure the effects of long-term use of digoxin compared to beta-blockers.

**Results:** To compare the long-term effects of digoxin use in patients with chronic atrial fibrillation compared to beta-blockers, we analysed a total of 5 studies consisting of controlled trials and cohort studies. Long-term use of digoxin for rate control in chronic atrial fibrillation patients were associated with a significantly higher risk of all-cause mortality compared to long term beta-blocker use. (WRR 1.59, I<sup>2</sup>=90%; 95% CI [1.02;2.48] p=0.04).

**Conclusion:** This study revealed that long term use of digoxin for rate control in patients with chronic atrial fibrillation is associated with an increased risk of all-cause mortality when compared to long term beta-blocker use.

**Keyword:** atrial fibrillation, rate control, digoxin, beta-blockers

**Supplementary materials**



**Figure 1.** The risk of all-cause mortality between long term digoxin use for rate control compared to beta-blockers



**All-cause mortality rate in Ventricular Tachycardia patients underwent Catheter Ablation vs Antiarrhythmic Drug Therapy : A systematic review and meta-analysis of Randomized Controlled Trials**

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**Background and aims**

Ventricular tachycardia (VT) is a serious irregular heart rhythm that originates from the ventricles and is characterized by three or more consecutive beats at a rate exceeding 100 per minute. This condition poses a significant risk to life and is the primary cause most sudden cardiac deaths in the United States. Catheter ablation, which was initially introduced two decades ago, has progressively become a more significant aspect of ventricular arrhythmia treatment and now utilized more frequently at an earlier stage in the management of VT. However, the objective of this study is to evaluate the all-cause mortality rate in VT patients who underwent either catheter ablation (CA) or antiarrhythmic drug therapy (AAD).

**Materials and methods**

A systematic review and meta-analysis of published RCTs between February 2014 and February 2023 was performed. The keywords "catheter ablation" AND "antiarrhythmic drug" AND "ventricular tachycardia" were used in a search conducted on PubMed databases. The primary outcome in this study was all-cause mortality rate in VT patients underwent CA or AAD that calculated with the use of hazard ratios (HR). PRISMA guideline was used to conduct the included study. Inclusion criteria in this study was >18 years old patient who underwent VT ablation or had an episode of ventricular tachycardia during treatment with amiodarone or another class I or class III AAD during 6 months. Exclusion criteria was animal study, case reports, pediatric patients, and single-arm studies. JADAD scale and NOS was used to assess the study included.

**Results**

Three studies consist of 2 RCTs and 1 cohort studies were included out of 20 studies identified. 603 patients (303 patients underwent CA and 300 patients underwent AAD) were analyzed in this study. Meta-analysis showed that the all-cause mortality rate has a Hazard Ratio (HR) of 0.77 [0,56-1,06] at 95% CI. I<sup>2</sup> value indicates low heterogeneity, which is equal to 0%. All studies had a rigorous quality based on JADAD scale and NOS.

**Conclusion**

From the result, it can be interpreted that there is no significant difference in mortality from all causes between patients who underwent Catheter Ablation and Antiarrhythmic Drug Therapy.

**Keyword** catheter ablation, antiarrhythmic drug, ventricular tachycardia



**Brain Natriuretic Peptide Levels Comparison in Patients Receiving Right Ventricular Septal Pacing vs. Right Ventricular Apical Pacing: A Systematic Review**

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**Background and Aims:** Traditionally, right ventricular apical pacing (RVAP) has been the preferred pacing method to treat various cardiac arrhythmias. However, research suggests that RVAP may cause side effects such as ventricular dyssynchrony and left ventricular dysfunction. As an alternative, right ventricular septal pacing (RVSP) has attracted attention due to its potential to preserve cardiac function and minimize pacing-related complications. The aim of this systematic review is to compare the levels of Brain Natriuretic Peptide (BNP) in patients receiving right ventricular septal pacing (RVSP) versus right ventricular apical pacing (RVAP). By examining the BNP levels, this review intends to assess the impact of these two pacing techniques on cardiac function and their potential to induce heart failure.

**Material and Methods:** Study was systematically extracted from several databases such as PubMed, PMC, Science Direct, BMJ and MDPI on June 28th 2023 using the following keywords "right ventricular pacing" AND "apical pacing" AND "septal pacing" AND "outcome". Extracted studies will be analyzed through several inclusion criteria such as study that published in the last 10 years, cohort studies, population studies, observational studies and RCTs. Pregnant women, pediatric patients, case reports, unfull paper, systematic review and meta-analysis was excluded in this study. Then, the quality of studies included was assessed using Newcastle-Ottawa Scale (NOS).

**Results:** Two RCTs and three cohort studies are suitable for data extraction consisting of 641 eligible patients. Three studies support that BNP levels were reduced in RVSP group compared with those in RVAP group. While, two others studies showed that there were no significant difference on plasma BNP levels between two group. Included studies had a good quality after assessed using NOS.

**Conclusion:** In conclusion, BNP levels in patients received RVSP were experiencing important reduction from baseline levels than in RVAP group. However, there is still need further studies to clarify this result due to limitation in this study such as findings that showed no significant difference on BNP levels between two group.

**Keywords:** right ventricular pacing, apical pacing, septal pacing, outcome



## Ability of AI-Enhanced ECG for Atrial Fibrillation Detection : A Systematic Review

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### Background and aims

Atrial fibrillation (AF) is the most common form of arrhythmia characterized by irregular and rapid electrical impulses in the atrium of the heart. Early and accurate detection of atrial fibrillation is critical for appropriate treatment and timely intervention to avoid undesirable outcomes. Integrating AI algorithms into ECG analysis presents an opportunity to improve the accuracy, efficiency and accessibility of AF detection. Therefore, this systematic review aims to assess the ability of AI-assisted ECG to detect AF.

### Materials and methods

Relevant studies identified through comprehensive search strategy from several databases, such as PubMed and Science Direct using keywords related to "Artificial Intelligence" AND "Arrhythmia Detection" on 28th of June 2023. This systematic review conducted following PRISMA guideline. The search restricted to studies published in English. Full-text articles of potentially relevant studies will then be selected through inclusion criteria that is studies evaluating the diagnostic ability of AI-enhanced ECG algorithms for detecting atrial fibrillation on human participants. Animal studies, review articles, case reports, systematic review, and meta-analysis were excluded. Quality of included studies assessed using NOS tools and JADAD scale.

### Results

Four cohorts and one RCT are included for this systematic review with a total of 183187 patients. All of the studies included agree that ECG recorder integrated with an AI algorithm improves atrial fibrillation detection yield. These research used a variety of AI algorithms and ECG recorders, and they all demonstrated higher sensitivity and specificity when compared to traditional ECG analysis. All five studies had a decent quality based on NOS and JADAD scale.

### Conclusion

In conclusion, this systematic review validates the ability of AI-enhanced ECG algorithms to improve AF detection. However, more study and development are required to improve their performance, remove existing limits, and ensure their effective implementation in clinical practice.

### Keyword

artificial intelligence, arrhythmia detection, atrial fibrillation



**Left Atrial Strain as Predictor of Atrial Fibrillation Recurrence  
in Patients Undergoing Catheter Ablation: A Systematic Review and Meta-Analysis**

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**Background and Aims:** Atrial fibrillation (AF) is a common cardiac arrhythmia that worsens patient quality of life, particularly as it contributes to increase risk of thromboembolic event and mortality. Catheter ablation (CA) is an effective rhythm restoring treatment in AF patient, but recurrence after CA is still a major problem, ranging as high as 25-30% of all cases. Recently, some studies suggested a relationship between left atrium (LA) strain, measured by two-dimensional speckle tracking echocardiography (2D-STE), and AF recurrence after CA procedure. We aim to assess the latest evidence on the left atrial strain as a predictor of AF recurrence in patients after undergoing catheter ablation.

**Materials and Methods:** We performed a comprehensive search on topics that assesses LA strain and AF recurrence from inception up until March 2023.

**Results:** There were a total of 991 patients from 8 studies. The pooled analysis showed that left atrial strain was lower in AF recurrence group (mean difference -6.36 [-7.73, -4.99],  $p = 0.0001$ ;  $I^2: 61\%$ ,  $p = 0.01$ ). It also showed that the hazard ratio was (0.94 [0.88, 1.00]  $p = 0.03$ ;  $I^2: 84\%$ ,  $p < 0.0001$ ).

**Conclusion:**

LA strain emerged as predictor of atrial fibrillation recurrence in patients undergoing catheter ablation. These findings suggested that LA strain might have important implication for the selection of patients with AF undergoing catheter ablation. It implies the added value of LA strain measurement, and should be implemented as part of systemic evaluation of AF patients before CA. Further research is needed to explore the optimal cut-off values of LA strain to predict AF recurrence and to validate the predictive value of LA strain in larger and multicenter studies.

**Keyword :** Left Atrial Strain, Atrial Fibrillation Recurrence, Catheter Ablation



**Efficacy and safety of conventional-or-standard-dose compared to minimal-and-zero-dose fluoroscopy catheter ablation on paediatric patients with cardiac arrhythmia: meta-analysis and systematic review**

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**Background and Aim:** In patients with persistent arrhythmias, catheter ablation under fluoroscopic supervision is conventional. However, children's long-term radiation hazards are occasionally underestimated. Intracardiac catheters can now be visualised utilizing zero or minimal fluoroscopy methods. This review compares zero or minimal-dose fluoroscopy to conventional or standard-dose fluoroscopy in catheter ablation-treated paediatric cardiac arrhythmia patients.

**Materials and Methods:** The latest 10 years of publication in Pubmed, SCOPUS, Web of Science, and Google Scholar as grey literature were systematically searched. Studies that compare conventional-or-standard-dose fluoroscopy (C/SF) group with zero-and-minimal-dose fluoroscopy (Z/MF) group in paediatric cardiac arrhythmia patients who had catheter ablation are included. The random-effects model was used to derive standardized mean difference (SMD) and odd ratios (ORs) with 95% confidence interval (CI) using Review Manager (Revman) 5.4.1 Software.

**Results:** Nine cohorts out of 3,837 searched studies involving 1,986 paediatric patients met our inclusion criteria. There was no significant difference in immediate success rate (OR = 1.03, 95% CI, 0.12–8.62; p=0.98) or long-term success rate (OR: 5.33, 95% CI, 0.10–278.27; p=0.41) between the groups. There was no significant difference in the total procedural time between the groups [SMD: 0.56 minutes (95% CI: -0.08 to 1.19 minutes; p=0.09)]. Compared to the C/SF group, total fluoroscopic and ablation times are significantly lower in the Z/MF group, which in terms of SMD are -1.89 minutes (95% CI, -2.75 to -1.03 minutes; p<0.01) and -1.33 seconds (95% CI: -2.45 to -0.21 s; p=0.02), respectively. The dose area product (DAP) was not significantly different between the groups [SMD: -2.17 Gy·cm<sup>2</sup> (95% CI: -5.49 to 1.15); p=0.20], but not for the total fluoroscopy dose [SMD: -1.90 mGy (95% CI: -2.48 to -1.31); p=0.20]. The complication rate was 6.01% out of 73 successful ablation procedures and did not differ between the groups (OR: 4.39, 95% CI: 0.24–80.21; p=0.32). No significant difference was found in the recurrence rate between the groups (OR: 0.88, 95% CI: 0.40–1.95).

**Conclusion:** The Z/MF technique for catheter ablation in paediatric patients is a feasible procedure that reduces radiation exposure and ablation time without diminishing success or complication rates in the immediate or long term.

**Keywords:** Zero Fluoroscopy, Minimal Fluoroscopy, Arrhythmia, Catheter Ablation, Pediatric





**Efficacy and Safety of Etripamil Intranasal Administration for Supraventricular Tachycardia  
: A Systematic Review**

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**Background and Aims:**

Supraventricular tachycardia (SVT) is a common cardiac arrhythmia that necessitates immediate intervention to relieve symptoms and prevent further consequences. Etripamil, an intranasal calcium channel blocker, has emerged as a viable therapy option for SVT. This systematic review aims to assess the efficacy and safety of etripamil intranasal administration in the treatment of SVT.

**Material and Methods:**

The review was conducted (24-29 June) using electronic databases such as PubMed using the following keywords “etripamil” and “Supraventricular tachycardia”. Extracted studies were then analyzed and extracted according to our inclusion criteria, such as cohort studies, population studies, observational, randomized clinical trials within the last ten years, and termination of adjudicated PSVT after drug administration. We excluded pregnant women, animal testing, children, case reports, case series, systematic reviews, and meta-analyses. All eligible studies were assessed using the JADAD scale.

**Results:**

We found three randomized controlled trials (486 subjects) which included in our studies. The studies showed several different results in the median-to-time conversion. 1 study shows that the median time to conversion with etripamil was <3 Minutes, another study shows no difference between the conversion rate for etripamil and the placebo. Lastly, another study shows that the median conversion time for etripamil was 17.2 minutes. However, all studies show that the use of etripamil was well tolerated and safe and showed a higher conversion rate from SVT to sinus rhythm (65-95%) compared to the placebo group. Adverse events were mainly nasal discomfort and nasal congestion. All studies showed good quality based on JADAD scale.

**Conclusion:**

Etripamil administered intranasally appears to be an effective and safe treatment option for the termination of SVT episodes. The high efficacy rate and the ability to self administer unsupervised could empower patients to treat SVT episodes by themselves without the need for medical intervention. However, further research is needed to establish optimal dosing and long-term safety.

**Keywords:** “etripamil” and “Supraventricular tachycardia”



**Identification of Ventricular Arrhythmia Predictors in Mitral Valve Prolapse: A Systematic Review and Study-Level Meta-Analysis**

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**Background and Aims:** Recent research has indicated an association between mitral valve prolapse (MVP) and the occurrence of ventricular arrhythmia (VA). Consequently, we undertook a comprehensive meta-analysis of pertinent studies with the aim of identifying the non-invasive parameters that might help identify MVP patients who are at a greater risk of developing VA.

**Material and Methods:** A systematic literature search was conducted on PubMed, ScienceDirect, and Cochrane Library to identify relevant studies published until April 2023. The meta-analysis included studies that compared MVP patients with VA to those without such condition. The fixed and random effects model was employed to calculate the odds ratio (OR) or mean difference (MD), along with their corresponding 95% confidence intervals (CI), for each parameter analyzed.

**Results:** The meta-analysis included six studies with a total of 936 participants. Those with VA were found to have several distinguishing characteristics compared to those without. Higher prevalence of inverted T-wave were found more prevalent in patients with VA (OR: 2.27; 95% CI: 1.67-3.10;  $p < 0.00001$ ). Patients with VA also exhibited a longer QTc interval on the resting electrocardiogram compared (MD: 14.73; 95% CI: 9.39-20.08;  $p < 0.00001$ ). Those patients with VA had a longer anterior mitral leaflet length compared to those without (MD: 2.67; 95% CI: 2.02-3.31;  $p < 0.00001$ ). Those patients also had a higher likelihood of experiencing bi-leaflet prolapse (OR: 1.65; 95% CI: 1.22-2.24;  $p = 0.001$ ). There was no significant difference in mitral annular disjunction incidence on both groups. (OR: 1.96; 95% CI: 0.76-5.08;  $p < 0.00001$ ).

**Conclusion:** Based on our comprehensive meta-analysis, we have identified several risk factors associated with VA in MVP. These risk factors include t-wave inversion, longer QTc interval, mitral annular disjunction, bi-leaflet prolapse, and longer anterior mitral valve leaflet.

**Keyword:** Mitral valve prolapse, ventricular arrhythmia, ECG, Echocardiography



## MAGNESIUM SULFATE (MgSO<sub>4</sub>) AS AN ADJUNCT IN ATRIAL FIBRILLATION MANAGEMENT

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**Background&Aims:** Atrial fibrillation, the most common arrhythmia in clinical practice, affects approximately 2.2 million adults in the United States and has an estimated occurrence of 1 per 1000 person-years in the United Kingdom. Individuals with atrial fibrillation face a fivefold higher chance of experiencing a stroke caused by blood clots, as well as a twofold greater risk of death compared to the general population. Various medications are commonly employed to control atrial fibrillation with rapid ventricular response (AFRVR), including rate-controlling agents and antiarrhythmic agents. Magnesium is often used as an additional therapy, although its effectiveness in managing AFRVR has been a subject of debate due to its physiological and pharmacological properties. This study aimed to analyze the effect of magnesium sulfate as an adjunct for atrial fibrillation

**Materials and Methods:** We conducted an updated systematic review and meta-analysis, focusing exclusively on placebo-controlled, randomized clinical trials. The aim was to re-evaluate the impact of IV magnesium (Mg<sup>2+</sup>) as an adjunct in managing atrial fibrillation with rapid ventricular response. Three researchers searched the Pubmed, Google Scholar, and Cochrane Library (2000 to 2023) databases independently.

**Results:** We included 9 studies consists of 1,825 patients for analysis. Intravenous MgSO<sub>4</sub> were used in 909 patients and placebo were used in 916 patients. The heterogeneity of all studies is considerably high, as described by the I<sup>2</sup> value of 58% and p-value = 0.03. This study showed when compared to placebo, the IV MgSO<sub>4</sub> addition as an adjunct showed greater sinus conversion rate (RR: 1.20; 95%CI = 1.03-1.39; p=0.02) and ventricular rate reduction (mean ventricular rate reduction: 7.22; 95%CI = 3.15-11.29; p=0.0005). There was no significant difference in safety parameters including hypotension and bradycardia events (RR: 2.40; 95%CI = 0.53-10.81; p=0.25).

**Conclusion:** Magnesium sulfate combined with standard therapies is effective in rate control and modestly effective in rhythm control for rapid atrial fibrillation (AF) when compared to standard therapies alone.

**Keywords :** Atrial fibrillation; Atrial fibrillation with rapid ventricular response; Magnesium; Magnesium sulphate

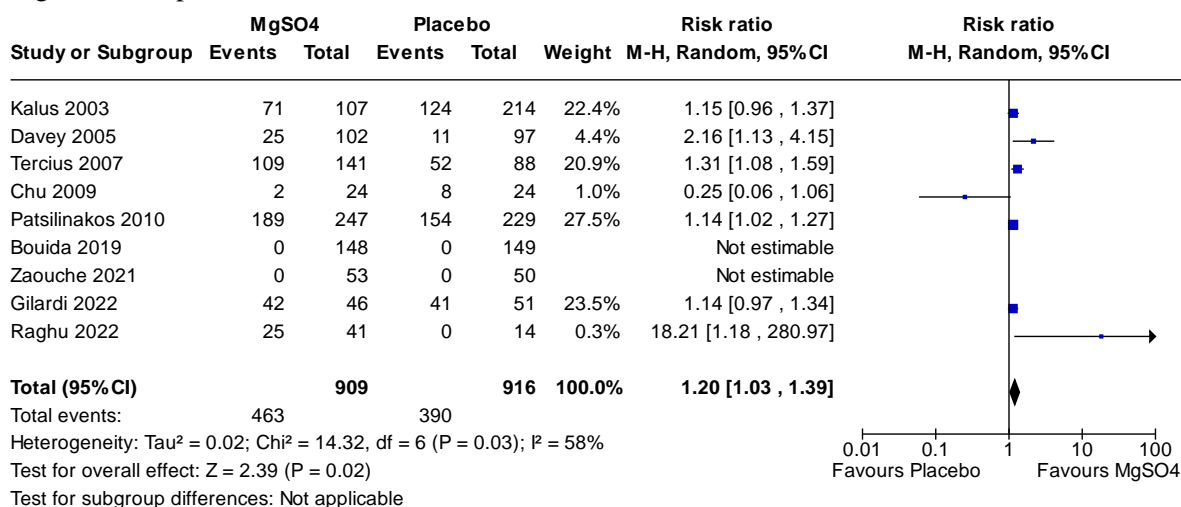


Figure 1. Forest plot of sinus conversion rate in MgSO<sub>4</sub> and placebo patients



## Exploring the Transformative Role of Artificial Intelligence in Atrial Fibrillation: A 5-Year Bibliometric Analysis of Research Trends and Insights

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**Background and Aim:** Artificial intelligence (AI) involves the utilization of machines to process data and perform tasks that typically require human cognitive abilities. AI technology has shown promise in automating and assisting disease diagnosis. Additionally, ongoing efforts are being made to develop AI tools that can enhance disease prognosis prediction, treatment response assessment, and offer novel perspectives on health and disease. The aim of this study was to analyze recent trends and publication activity in the field of Atrial Fibrillation (AF) utilizing AI through a bibliometric analysis conducted over the past five years.

**Materials and Methods:** A systematic search was conducted using the Web of Science Core Collection database to identify pertinent publications on the topic of artificial intelligence in atrial fibrillation over the past five years. Quantitative analysis was performed using the VOSviewer software, employing statistical, data mining, and data visualization techniques to analyze various bibliometric indicators.

**Results:** A total of 461 publications related to artificial intelligence in atrial fibrillation were identified over the past five years, with an impressive H-index of 26 and an average of 8.11 citations per paper. The annual publication output showed an upward trend, peaking in 2022. The United States contributed the highest number of publications (175), followed by China (77) and England (61). Among the relevant affiliations, several universities from the USA emerged as the most prominent publications, including Mayo Clinic (60), Harvard University (29), and Massachusetts General Hospital (20). The most research topics were divided into five distinct clusters: mobile health, machine learning, deep learning, electrocardiography, and stroke. These clusters represent the most common areas of focus in the publications, reflecting the primary research interests and directions in the field.

**Conclusion:** The bibliometric analysis of research articles reveals that the use of AI in AF has become increasingly prominent. The analysis indicates that AI has been successfully integrated with digital devices and diagnostic technologies, allowing for widespread screening and improved diagnostic assessments. These findings suggest that AI has the capacity to revolutionize the field of medicine in relation to AF, providing innovative methods for enhanced patient management and improved outcomes.

Keywords : artificial intelligence, atrial fibrillation, bibliometrics



## Chemotherapy-Induced Cardiotoxicity on T Peak to T End Interval Prolongation: A Systematic Review and Meta-Analysis

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### Background and Aim:

Chemotherapy is an important treatment to increase the chance of survival of cancer patients in certain stages. However, chemotherapy also has complications in heart conditions that cause electrophysiological alteration as shown on the electrocardiogram (ECG). Cardiotoxicity is a well-known side effect of chemotherapy, and one of the manifestations of this toxicity is the prolongation of the T peak to T end (TpTe) interval on ECG. The TpTe interval represents the heterogeneity of ventricular repolarization, and a prolonged TpTe interval has been associated with an increased risk of arrhythmogenic event such as ventricular arrhythmias and sudden cardiac death. We aim to assess the latest evidence on association between chemotherapy-induced cardiotoxicity and T peak to T end (TpTe) interval prolongation.

**Materials and Methods:** We performed a comprehensive search on topics that assesses Chemotherapy and T peak to T end interval from inception up until June 2023.

**Results:** There were a total of 124 patients who underwent chemotherapy from 3 single center prospective cohort studies. The pooled analysis showed that TpTe was prolonged in patients after chemotherapy (mean difference 19.79 ms [1.66, 37.91],  $p = 0.03$ ;  $I^2: 79\%$ ,  $p=0.008$ ). Subgroup from heart rate was also higher in patients after chemotherapy (mean difference 6.06 [3.01, 9.11  $p<0.0001$ ;  $I^2: 0\%$ ,  $p=0.70$ ])

**Conclusion:** The study concluded that chemotherapy-induced cardiotoxicity is associated with a significant prolongation of the TpTe interval on ECG, which may increase the risk of ventricular arrhythmias and sudden cardiac death. Therefore, monitoring of TpTe interval should be considered in patients undergoing chemotherapy. When TpTe prolongation is found during chemotherapy period, it is advised that, during oncologists should have close monitoring with cardio-oncologists to ensure optimum patient management.

**Keywords:** Cardiotoxicity, Chemotherapy, T peak to T end Interval, Meta-analysis



## Six-Minute Walk Test Comparison in Patients Receiving Right Ventricular Septal Pacing vs. Right Ventricular Apical Pacing: A Systematic Review

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**Background and Aims:** The specific placement of the pacemaker implantation site may vary depending on the patient's condition or specific clinical circumstances. There is an ongoing debate about whether right ventricular septal pacing (RVSP) is superior to right ventricular apical pacing (RVAP) for patients requiring pacemaker implantation. Conflicting studies and varying clinical experiences exist in the discussion. This highlights the importance of further research and studies to determine the optimal pacemaker implantation site between RVSP and RVAP. Hence, one of the methods to systematically review is to compare the outcomes of patients in both groups. Six-minute walk time (6MWT) is one of the outcome measures to assess patient's functional capacity. This study aims to compare the six-minute walk test outcome in patients with RVSP and RVAP.

**Materials and Methods:** Studies were systematically extracted from databases such as PubMed, PMC, and ScienceDirect on May 25, 2023. Keywords such as "right ventricular pacing" AND "apical pacing" AND "septal pacing" AND "outcome" were used to extract studies. Eligible studies were then selected based on the inclusion and exclusion criteria. Studies in English manuscripts from the last 10 years were included. Studies with inaccessible full text, studies that were systematic reviews, meta-analyses, and case reports were excluded. Newcastle-ottawa scale (NOS) and JADAD scale were used to assess the quality of the studies included.

**Results:** A total of three Randomized controlled trials and one retrospective cohort study is included in this study with a total of 674 patients. All three randomized controlled trials showed good quality based on JADAD scale. While the retrospective cohort study showed good quality based on NOS. All studies have shown that in patients with RVSP have longer 6MWT compared to patients with RVAP. Besides that, the studies have also shown that the 6MWT improved in both patient groups in follow-ups after both RVSP and RVAP.

**Conclusion:** Current studies demonstrated that patients with RVSP have better outcome in 6MWT duration. This shows patients with RVSP have better functional capacity.

**Keywords:** right ventricular pacing, apical pacing, septal pacing, outcome

**Cardiorenal Outcome in Patients with Chronic Kidney Disease and Type 2 Diabetes Receiving Finerenone as Treatment: A Systematic Review**

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**Background and Aims:** Optimal management in the world of clinicians depends on various factors involved. This includes a particular understanding of the best treatment available for the patients involved. Finerenone is a receptor antagonist and is thought to have favorable clinical effects on cardiovascular and renal outcomes in patients with chronic kidney disease (CKD) with type 2 diabetes (T2D). However, it remains uncertain whether Finerenone is a safe treatment option for patients with CKD and T2D. This systematic review aims to clarify the safety and efficacy of the use of Finerenone on patients with the conditions mentioned above compared to a placebo.

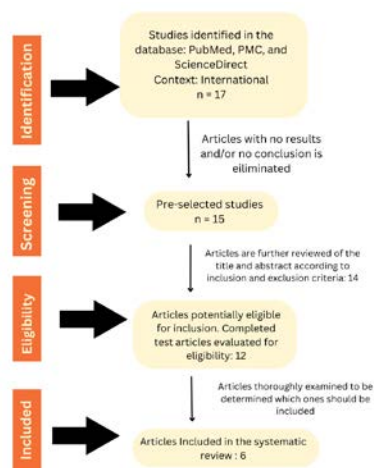
**Materials and Methods:** Data was gathered from PubMed, PMC, and ScienceDirect on May 2, 2023, using keywords associated with chronic kidney disease and finerenone and were limited to publications in the last 5 years. Publications without accessible full papers, case reports, and review studies were excluded. JADAD scores were used to assess the quality of the included studies. The safety of finerenone is assessed by looking at the incidence of cardiovascular-related death and renal-related death.

**Result:** After screening seventeen studies, 6 studies were included comprising 13.026 patients. The quality assessment of the included studies using the JADAD score generated excellent quality. The assessed studies have shown that Finerenone can reduce the risks of CKD progression, and cardiovascular and renal events, including patients across the spectrum of CKD and with T2D. The studies assessed have also shown that patients receiving finerenone have a higher incidence of hyperkalemia-related discontinuation. Although, patients who received Finerenone showed a lower incidence of cardiovascular-related death and renal-related death if compared to patients who took placebo.

**Conclusion:** Finerenone is associated with reduced risk of CKD progression, and improved cardiorenal events in patients with CKD and Type 2 Diabetes compared with placebo.

**Keywords:** “Finerenone”, "Renal Insufficiency, Chronic". “Cardiovascular”

Prisma Figure





## Safety and Efficacy of Leadless Pacemaker Implantation in Patients with Transcatheter Aortic Valve Implantation

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**Background and aim:** Atrioventricular blockage or other complications during transvenous pacemaker implantations are common in patients who underwent transcatheter aortic valve implantations (TAVI). As an intervention, conventional transvenous single-chamber pacemakers (SCPs) or transvenous dual-chamber pacemakers (DCPs) are usually used post-TAVIs. However, a newer generation of leadless pacemakers (LPMs) has been introduced. It may be suitable as an alternative for frail TAVI patients or patients requiring ventricular pacing post-TAVI, due to its less invasive nature. This study aims to prove the relevance and safety of these leadless pacemakers in patients of post-TAVI or post-THVRs, especially compared to the more common SCPs and DCPs.

**Materials and Methods:** Databases such as PubMed, PMC, and SpringerLink were systematically searched to extract studies on June 26, 2023. Keywords including “leadless pacemaker” AND “aortic valve” were used to identify relevant studies. Studies in English from the last 5 years with accessible full text were included in this review. Studies that were systematic reviews, meta-analyses, and case reports were excluded. Newcastle Ottawa scale scores were then used to assess the studies' quality.

**Results:** After screening sixteen studies, four cohort studies were included in this review comprising 411 participants. All studies showed good quality based on the Newcastle-Ottawa scale. All studies showed that leadless pacemakers are safe and efficient. It is associated with low complications and relatively shorter hospital stays. LPMs may therefore represent an effective pacing option for patients who had underwent aortic valve implantation.

**Conclusion:** Leadless pacemakers show that it is a safe and efficient option to use in patients with aortic valve intervention.

**Keywords:** leadless pacemaker, aortic valve implantation





**Improved brain perfusion after rhythm control strategies in atrial fibrillation: a systematic review**

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**Background and aims:** Growing evidence suggests that individuals with atrial fibrillation (AF) are at increased risk of cognitive impairment and dementia, even in the absence of stroke. It is intuitive to perceive the link between those conditions and brain hypoperfusion as an underlying mechanism. Rhythm control is well recognized as one of the main strategies to treat AF. It was shown that cardioversion to sinus rhythm improves brain perfusion. Nevertheless, whether the link is causal is still an open question. This systematic review aimed to assess whether rhythm control in atrial fibrillation plays a role in brain perfusion.

**Materials and Methods:** A systematic search for eligible studies was conducted in Scopus, PubMed, Cochrane Reviews, ProQuest, and EBSCOhost from inception until April 30<sup>th</sup>, 2023. Studies focusing on brain perfusion after any rhythm control in atrial fibrillation were considered.

**Results:** A total of 9 studies with 368 participants were included. Six of them performed electrical cardioversion as the rhythm control strategy. The majority of the studies (7 of 9) revealed that restoration of sinus rhythm significantly improves brain perfusion. One of the remaining two also supports a significant improvement only in the specific region deeply associated with cognition. Another interesting related brain outcome was both studies providing data on MMSE was in line showing significantly improved score after rhythm control.

**Conclusion:** Successful rhythm control in AF plays an important role in improving brain perfusion. Thus, it may become a promising therapeutic strategy for reducing the incidence of cognitive impairment in individuals with AF. However, larger prospective studies and randomized trials are needed.

**Keywords:** atrial fibrillation, rhythm control, cardioversion, ablation, brain perfusion, cerebral blood flow



## Aminophylline for Atrioventricular Block due to Inferior Myocardial Infarction: a Systematic Review of Experimental Studies.

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### Background and Aims

Aminophylline is still frequently used for atrioventricular (AV) block due to inferior myocardial infarction (IMI). This drug competitively antagonizes adenosine that increases during ischemic process hence depressing sinus node activity and impairs AV node automaticity and conduction. However, the efficacy of this drug is mainly based on case reports. This study aims to review experimental studies regarding the efficacy of aminophylline in AV-block due to IMI.

### Materials and Methods

We searched 5 databases (ClinicalTrials.gov, PubMed, PMC, CENTRAL, and EMBASE) using keywords 'aminophylline' AND 'AV block'. We included experimental studies investigating aminophylline in patients with late AV-block due to IMI. We excluded studies with topics irrelevant to clinical question and studies using languages other than english. Studies were searched for inclusion by title and abstract then full-text by 2 independent reviewers. Quality assessment was to be performed based on study design.

### Result

521 records were identified. 2 studies by Altun et al (1998) and Starsberg et al (1991) were included for the final review. The two studies are single-intervention experimental studies without randomization, control, and blinding. Altun et al found conduction improvement and increase in ventricular rate (VR, from 57±9 bpm to 89±17 bpm). Starsberg et al found conduction improvement with insignificant increase in VR (53±14 to 55±16 bpm) and a significant decrease in atrial rate (AR, 90±11 to 85±13 bpm (p<0.02)) as displayed below (Table 1).

Table 1. Results

Author (year)	n	Male	Age (years)	AV-block appearance (days)	Aminophylline dose	AV-block	Mean VR before-after	Mean AR before-after	Conduction improvement
Altun (1998)	8	62,5%	67±8.8	2 to 5	240 mg initial, 240 mg 1 hr following	2:1 Mobitz II (2)	57±9-89±17	104±16-95±25	All to 1:1
						CHB (6)			5 to 1:1, 1 to Mobitz I
Starsberg (1991)	15	73,3%	71±8	2 to 6	7 mg/kg	Mobitz I (5)	53±14-55±16	90±11-85±13 (p<0.02)	2 to 1:1
						Mobitz II (6)			1 to Mobitz I 3:2
						CHB (4)			1 to AV dis AJR and 2 to AJR

AR:atrial rate;VR:ventricular rate;dis: dissociation;CHB:complete heart block.

### Conclusion

The studies regarding the efficacy of aminophylline remain limited. Aminophylline may increase ventricular rate and improve AV-block with inconsistent results. This may be due to the difference in aminophylline dosage (single vs double dose), heterogeneity in population, and timing of ECG reading. Further studies using a controlled, blinded, and randomized design are needed for a more conclusive result. Currently, 1 ongoing trial is listed on clinicaltrials.gov.

### Keyword

Aminophylline, high degree AV-block



## Catheter Ablation Role as Ventricular Tachycardia Captor In Patients With Implantable Cardioverter Defibrillator: A Systematic Review And Meta-Analysis

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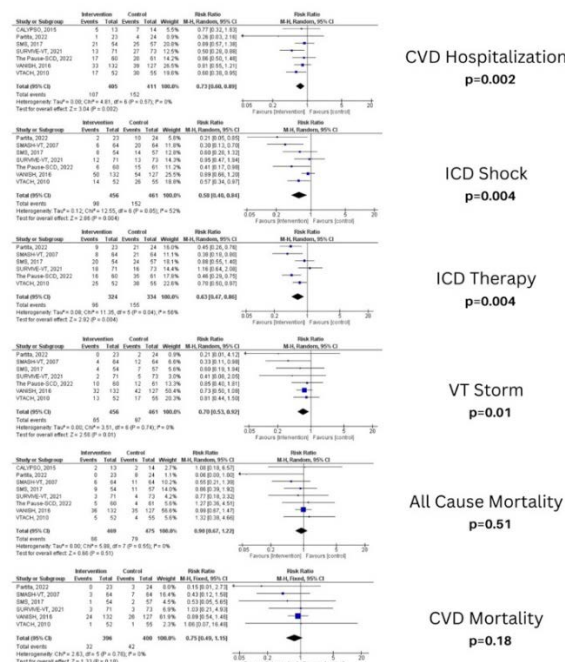
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**Background and aims:** Implantable Cardioverter Defibrillators (ICD) are used to prevent sudden cardiac death, but can lead to higher mortality rates and reduced quality of life. Previous studies have indicated that catheter ablation may effectively reduce the occurrence of ICD-related events. This study examined the effectiveness of catheter ablation (CA) for ventricular tachycardia in ICD patients. **Materials and methods:** We collected randomized controlled trials from 4 databases (PubMed, Proquest, Cochrane Library, and Google Scholar) covering the period from 2007 to 2021. Our objective was to evaluate the effectiveness of catheter ablation (CA) in preventing ventricular tachycardia (VT) in patients with implantable cardioverter-defibrillators (ICD). The pooled-risk ratio (RR) for each outcome was analyzed.

**Results:** The study included a total of 8 randomized controlled trials involving 945 patients. The results showed that catheter ablation significantly reduced cardiovascular (CVD) hospitalization (RR: 0.75; 95% CI: 0.60 to 0.89; P = 0.002), ICD shock (RR: 0.58; 95% CI: 0.40 to 0.84; P = 0.004), ICD therapy (RR: 0.63; 95% CI: 0.47 to 1.86; P = 0.004), and VT storm (RR: 0.70; 95% CI: 0.53 to 0.92; P = 0.01) compared with control. However, there was no significant difference in the risk of all-cause mortality (RR: 0.90; 95% CI: 0.67 to 1.22; P = 0.51) and cardiovascular mortality (RR: 0.75; 95% CI: 0.49 to 1.15; P = 0.18).

**Conclusion:** The findings demonstrated that catheter ablation in patients with ICD led to a reduction in CVD hospitalization, ICD shock, ICD therapy, and VT storm. However, there was no observed improvement in all-cause mortality and cardiovascular mortality.

**Keywords:** Implantable cardioverter defibrillator, Ventricular tachycardia, Catheter ablation



**Figure 1.** Forest plot showing the effect of catheter ablation on CVD Hospitalization, ICD Shock, ICD Therapy, VT Storm, All-cause mortality, and CVD Mortality



## Safety and efficacy Mavacamten as promising treatment for Hypertrophic cardiomyopathy: A Systematic Review

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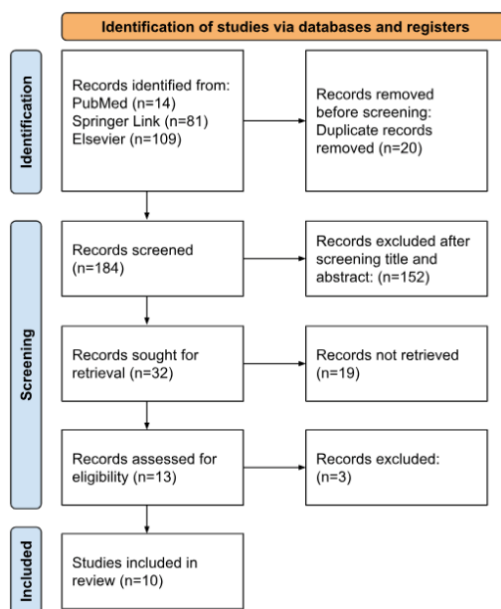
**Background and Aims:** The condition known as hypertrophic cardiomyopathy (HCM) causes the muscular wall of your heart to thicken. The disease-specificity and efficacy of the available HCM medications are inadequate, frequently needing interventional therapy. Myosin inhibitors have the ability to alter the pathogenesis of HCM and ameliorate symptoms. It is said that Mavacamten can manage and treat MCH. However, studies about it are still limited. Therefore the aim of the study was to determine the safety and efficacy of Mavacamten in HCM.

**Materials and Methods:** All included studies were derived from Pubmed, Elsevier, SpringerLink, and Cochrane databases by keyword "Mavacamten" and "Hypertrophic cardiomyopathy". Four authors searched, extracted, and evaluated the studies. The extracted studies were then analyzed and selected according to our inclusion criteria as RCTs within the last five years and subjects with HCM. We excluded systematic reviews, meta-analyses and animal studies. The JADAD scale was utilized to assess research quality, and only high-quality studies were considered in this analysis.

**Results:** Ten RCT studies were included after screening with a total of 1943 patients with HCM. Mavacamten delivers safe and efficient results through a clinical response, according to all trials. There was an improvement in LVOT, according to five trials. Increased exercise capacity was discovered in two investigations. Shown a rise in patients' quality of life, but additional study is required to substantiate the findings. One study stated that Mavacamten therapy within 16 weeks improved diastolic function All studies have proven good quality based on the JADAD scale.

**Conclusion:** Mavacamten is recommended as treatment for hypertrophic cardiomyopathy.

**Keyword:** Mavacamten, Hypertrophic cardiomyopathy, LVOT





## Exploring the impact of funny channel inhibitor (ivabradine) on heart rate reduction and bradycardia event in heart failure: a systematic review and meta-analysis

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**Background and aims:** Chronic heart failure affects 2-3% of the population in developed countries, and there is a direct correlation between a high resting heart rate and increased risk of mortality and cardiovascular problems. Interestingly, lowering the heart rate has been shown to improve outcomes. Ivabradine has been known to target the heart rate without affecting other channels, making it a promising option. However, some trials have been showing multiple cases of symptomatic bradycardia. Our objective is to evaluate the efficacy of Ivabradine in reducing heart rate and assess potential negative effects such as bradycardia in individuals with heart failure.

**Materials and methods:** A comprehensive literature search was conducted across PubMed, Cochrane, and Scopus databases to identify relevant clinical trials comparing the efficacy of ivabradine to usual care in patients with heart failure. The inclusion criteria focused on studies that assessed key outcomes such as mortality, worsening heart failure, and incidences of bradycardia. The pooled-risk ratio (RR) was calculated for each outcome to provide a quantitative analysis of the collective evidence.

**Results:** Our analysis included a total of 27 studies, encompassing 25,515 participants. The findings indicated a higher likelihood of experiencing symptomatic bradycardia (RR: 4.18; 95% CI: 2.94 to 5.94;  $P < 0.001$ ) and asymptomatic bradycardia (RR: 3.57; 95% CI: 2.67 to 4.78;  $P < 0.001$ ) with the use of ivabradine. There was no significant difference between ivabradine and usual care in all-cause mortality (RR: 0.97; 95% CI: 0.89 to 1.06;  $P = 0.48$ ) or cardiovascular-related mortality (RR: 0.96; 95% CI: 0.88 to 1.04;  $P = 0.31$ ). On the other hand, there was a reduced likelihood of worsening heart failure with ivabradine treatment (RR: 0.81; 95% CI: 0.75 to 0.88;  $P < 0.001$ ), although the evidence for this outcome was not as strong.

**Conclusion:** Our study demonstrated that the use of ivabradine was associated with an increased likelihood of symptomatic and asymptomatic bradycardia. No significant difference was observed in all-cause mortality, therefore did not impact overall survival rates. Additionally, there was reduced evidence suggesting a beneficial effect of ivabradine on worsening heart failure, indicating limited support for its effectiveness in this regard.

**Keywords:** Ivabradine, Heart Failure, Bradycardia, Mortality

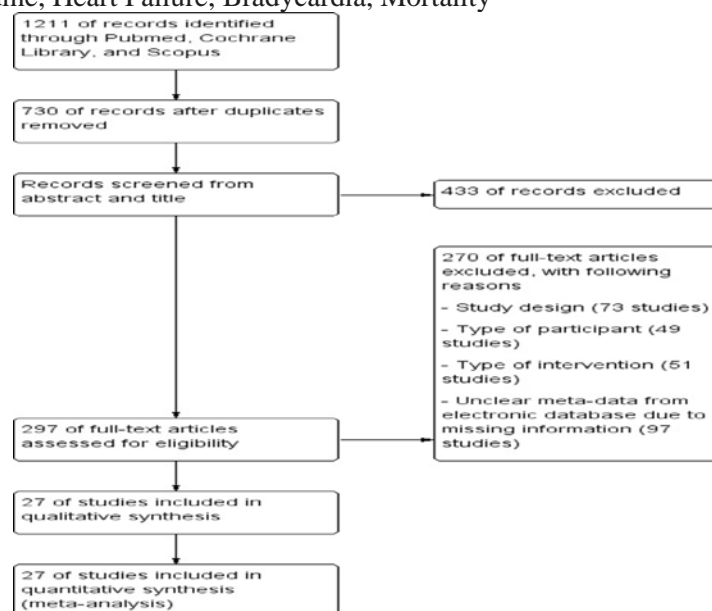


Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses Flowchart



## Pulsed Field Ablation's Safety and Efficacy in Treating Atrial Fibrillation: A Systematic Review and Meta-Analysis

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### BACKGROUND & AIMS

With its prevalence increasing globally, atrial fibrillation (AF) is the most common cardiac arrhythmia attributed to morbidity and mortality. Drugs based therapy is the current standardize treatment for AF. However, numbers of population have resistant atrial fibrillation that couldn't be solved with drugs which eventually raised the needs for other treatment modality in treating atrial fibrillation. For the most part, thermal ablation techniques have been employed to treat AF as several studies shows sinus rhythm is better maintained following ablation. Unfortunately it's linked to esophageal, phrenic nerve, and aortic issues that are brought on by indiscriminate tissue destruction. By using extremely brief electrical pulses to cause breaches in cell membranes, pulsed field ablation (PFA), a non-thermal ablative technique, successfully achieve cell death which makes it a novel method for cardiac ablation of AF. PFA In this study, we aimed to evaluate the effectiveness and safety of PFA.

### MATERIALS & METHODS

This study was reported based on PRISMA criteria. The literature search was conducted in databases such as MEDLINE, Scopus, ScienceDirect, and Cochrane. CMA was the tool used to provide pooled estimates of effect size of each single-armed study. Restricted ML was used based on heterogeneity level. Risk of Bias was assessed for each study using ROBINS-I for the non-randomized clinical trial and the JBI checklist for the observational studies.

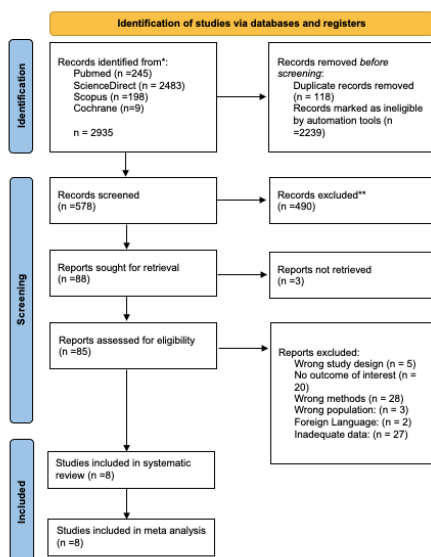
### RESULT

Generating pulsed field ablation technique in atrial fibrillation has the overall mean procedural time of 94.534 [67.262 ; 121.806 with 95% CI  $p < .001$ ] and fluoro time of 18.118 [12.063 ; 24.173 with 95% CI  $p < .001$ ]. Risk of arrhythmia recurrence observed were significantly reduced with the proportion of 0.0092 [0.0091;0.0023  $p = 0.04$ ]. The procedure itself also does not initiate adverse events such as pericardial tamponade, vascular complications requiring surgery, and stroke with the proportions of complication of 0.0165 [0.0040; 0.00989  $p < .01$ ].

### CONCLUSION

PFA has been proven to be safe and effective in treating atrial fibrillation.

**Keyword:** pulsed field ablation, atrial fibrillation, arrhythmia





**Pulsed-field ablation vs standard care ablation in paroxysmal Atrial Fibrillation**

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**Background and aims:** Pulse-field ablation (PFA) has become a viable and secure option for patients seeking catheter ablation. While initial findings are promising, there is a lack of additional information regarding the outcomes. Therefore, the purpose of this study was to evaluate the effectiveness and safety of this innovative method.

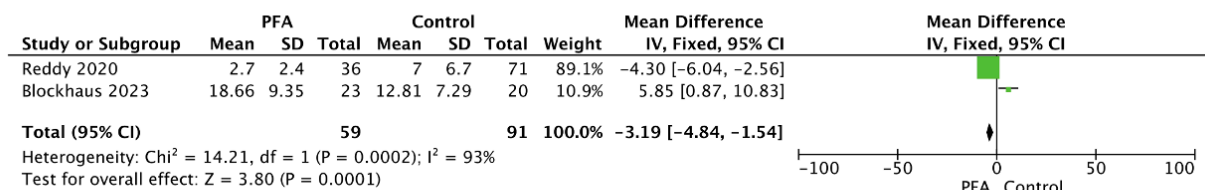
**Materials and methods:** The PubMed, Cochrane Library, Proquest, and Clinicaltrial.gov databases were searched until July 2023. We included 3 studies in this systematic review and meta-analysis. The PFA, radiofrequency ablation (RF), and cryoballoon ablation (CB), were included in this study. The primary endpoints of this study are fluoroscopy time and complications due to the procedure. The analysis was done using Review Manager 5.1 Analyzer.

**Results:** Three studies were included, reporting 191 patients with atrial fibrillation who underwent PFA, RF, and CB. The fluoroscopy time mean difference between the PFA group and the control group is 95% CI -3.19 [-4.84, -1.54] min, with significant **p value=0.0001**. Isolation of all pulmonary veins was 100% successful. Complications were detected during or after the PFA procedure at a rate of 4.87% (p=0.91), with 95% CI indicating a low-risk procedure.

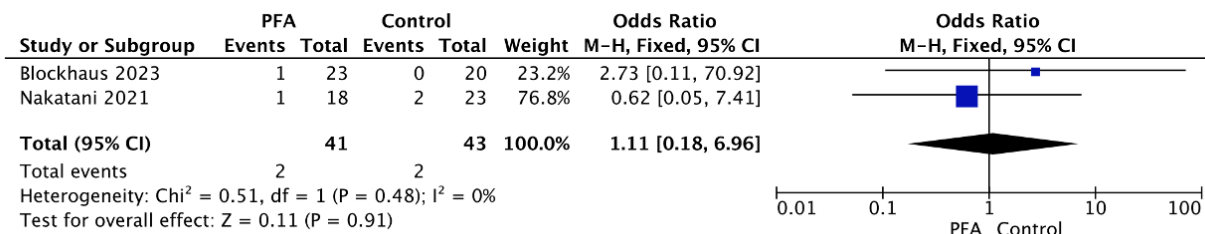
**Conclusion:** Using pulsed-field ablation as a new treatment for atrial fibrillation has proven safe and effective

**Keywords:** atrial fibrillation, pulmonary vein isolation; pulsed-field ablation, radiofrequency ablation, and cryoballoon ablation

(A)



(B)



**Figure 1.** Forest Plot (A) Fluoroscopy time **p= 0.0001**; (B) Complication **p=0.91**



**Outcomes of Modified Maze III vs Cut-and-sew in Rheumatic AF**

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**Background:** The global prevalence of atrial fibrillation (AF) in a global population with rheumatic heart disease (RHD) is 32.8% (range: 4.3%–79.9%). Currently catheter ablation is one of the recommended procedures for AF. While initial findings are promising, there is a lack of additional information regarding the safety. Hence, this review aims to evaluate the safety and efficacy of this procedure.

**Materials and Methods:** A systematic search of relevant studies on catheter ablation for patients with AF was performed. The databases that we searched were PubMed, Cochrane Library, Proquest, and Clinicaltrial.gov. We included 2 studies in this systematic review and meta-analysis. Ablation strategies with modified Maze III vs **Cut-and-sew** were included in this study. The primary outcomes are 30-days mortality, and all-cause of mortality.

**Result:** Two studies were included, reporting 1284 patients with atrial fibrillation who underwent

**Conclusion:** Ablation using modified Maze III is safe, although it is not significant.

**Keywords:** atrial fibrillation, rheumatic atrial fibrillation; all-cause mortality

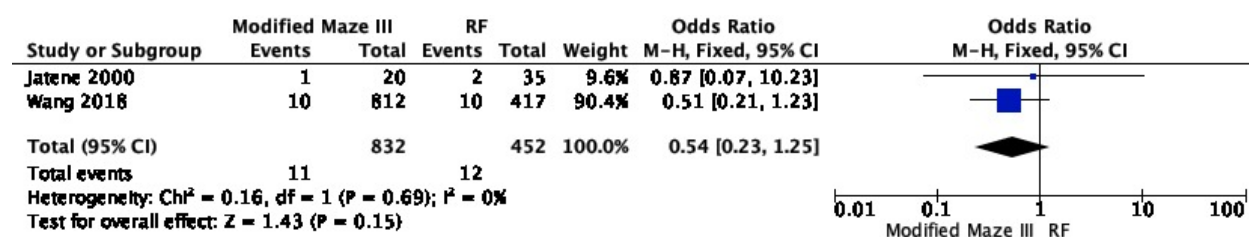


Figure 1. Forest Plot 30-days mortality